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Developing Supplementary Reading and Writing Materials for English Major University Students.

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Abstract- The steps of the research were (1) conducting a needs analysis, (2) revising the syllabus and (3) developing supplementary workbook based on the syllabus and need analysis. The research used a questionnaire as the instrument to get responses from the students about their target and learning needs. Results showed that students need practicing a variety of reading and writing skills with different task types. In addition, pictures should be used in materials so that students are motivated and understand the materials more. Furthermore, the length of reading tasks should be from 450 to 550 words or over and each unit should consist of 3 to 5 tasks. The implication of the findings would be the base of teaching and learning process, especially in designing the learning materials for the English reading and writing skill.

Index Terms- reading and writing, supplementary material, English majors, university students, material design

I. INTRODUCTION

Supplementary Materials Based on Constructivism Principles Supplementary materials in this article are in the form of extended materials designed to provide sufficient exposure and opportunities for language skill's practices. according to (Vygotsky, 1978) in (Cooperstein & Weidinger; 2004), an important aspect of constructivism is the need for social interaction. Social interaction is not only essential for knowledge construction, but it also allows students to verify their understanding, group activity increases discussion, experimentation, enthusiasm, and participation.

In the current development of education, there has been a shift in the paradigm of learning from teacher-centred learning to student-centred learning. In this new paradigm, students are "expected to take charge of their own learning or in other words, they are targeted to develop autonomy in learning" (Nunan, 2003, p. 193). Students should be active in searching and show a lot of initiative in learning, in terms of what they will learn, how they will learn, and how they will assess their own learning. This kind of learning is believed to have a high impact in language learning; enriching students' knowledge and improving their language skills.

Receptive skills and productive skills are the two categories in language skills. "Receptive skills are the skills to understand the message being heard and read, while the productive skills are those that produce messages or ideas through spoken and written text" (Mundhe, 2015, p.65). Reading is one receptive skill, and writing is a productive one. For English learners, mastering these two skills is of an obvious importance if they want to utilize the language for both academic and communicative purposes. Reading and writing courses are compulsory subjects at SFL – TNU, the focus is to prepare the students to be able to develop reading skills as well as be able to write graph and map description in English.

II. LITERATURE REVIEW

Materials development

According to Tomlinson (1998, p. 2), materials development refers to anything to provide sources of language input and to exploit those sources in ways which maximize the likelihood of intake. Material development refers to a process of producing and using the materials for language learning including materials evaluation adaptation, design, production, exploitation, and research (Tomlinson, 2012, p. 143). In sum, materials development is the process by which a teacher can put the objectives and goals of the course into units and tasks. In developing the materials, there should be guidelines that can be used as considerations for the material developers so that the materials do not deviate from the goals. Graves (2000, p. 156) describes a list of considerations for developing materials including: (i) Learners (Materials should make relevant to learners' experience and background. It should also make relevant to their target needs; what they need to function in the target situation. Besides, materials should make relevant to their affective needs); (ii) Learning (developers should take the notion of learning into consideration. Materials should engage in discovery, problem solving, and analysis; and develop specific skills and strategies); (iii) Language (materials should be accurate in the form of grammar, functions, vocabulary, etc. It should also

integrate four skills of speaking, listening, reading and writing) and (iv) Activity/task types (activities included in materials should aim for authentic tasks. Besides, the variety of them should also be taken into consideration: variety of medium, variety of organisation, variety of skills, etc).

Steps of materials development

Dick and Carey (1996) proposed a process in systematic instructional design. This design allows the materials developers to link instructional learning strategy with the designed learning outcome as (1) determine instructional goal; (2) analyze the instructional goal; (3) analyze learners and contexts; (4) write performance objectives; (5) develop assessment instruments; (6) develop instructional strategy; (7) develop and select instruction; (8) design and conduct formative evaluation; (9) revise instruction and (10) summative evaluation. Accordingly, Tomlinson (1998, p. 98), the steps to develop materials are illustrated in the diagram below:

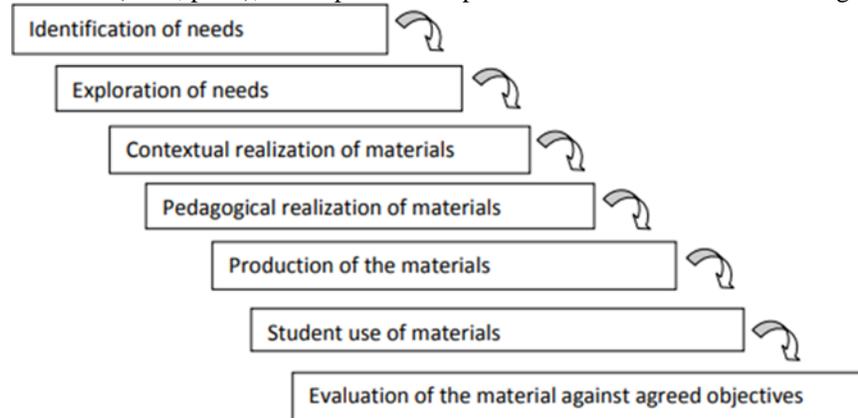


Figure 1: Steps in material development (Tomlinson, 1998, p.98)

Identification of need for materials:

The first step is identification of need for materials. In this step, materials developers identify a need to fulfill or problem to solve.

Exploration of need:

The second step is exploration of needs. The materials developers need to explore the area of needs or problems in term of the appropriateness of the language and function.

Contextual realization of materials:

The third step is contextual realization of materials. The contextual realization involves the suitable ideas, contexts, and text.

Pedagogical realization of materials:

The fourth step is pedagogical realization of materials. The pedagogical realization involves the appropriateness of the exercises and activities and the appropriateness of the instruction.

Production of materials:

The fifth step is production of materials. The physical production of the materials is designed in the form of the book including the layout, type size, and cover.

Student use of materials:

The sixth step is student use of materials. In this step, the materials developers can use the developed materials in the classroom. It can be followed by completion of worksheet at home and checking it in the next class.

Evaluations of materials:

The last step is evaluation of materials. Students can give comments and difficulties with the worksheet.

In this study, the author would like to adapt the model proposed by Jolly & Bolitho in Tomlinson (1998, p. 98) to develop supplementary materials for reading and writing course. Within the scope of the study, the steps consist of conducting needs analysis, revising the syllabus and developing the first draft of the material basing on the syllabus and need analysis.

III. METHODOLOGY

This research was aimed to design a supplementary workbook for English Written Proficiency Advance 1 at SFL - TNU. Specially, it was aimed to address the following research questions: “What are the students’ target needs and learning needs for English Written Proficiency Advance 1 workbook?”

153 second-year English major students at SFL – TNU participated in this study. The age of the students varies from 18 to 22. They were almost female and come from different regions in Vietnam. Some of them are from urban areas; some are from rural or remote areas. Their level of English was upper-intermediate.

Survey questionnaire was used as the instrument of the research. The questionnaire was adapted from Triandari (2015). The questionnaire has been divided into 2 sections. The first section included demographic questions such as gender, faculty, and major for the respondents. The second section included multiple choice questions related to students’ target and learning needs in reading and writing.

In this study, the author adapted the model proposed by Jolly & Bolitho in Tomlinson (1998, p. 98) to develop supplementary materials for reading and writing course. Within the scope of the study, the steps consist of conducting needs analysis, revising the syllabus, and developing the first draft of the material basing on the syllabus and need analysis.

Step 1: Conducting a needs analysis

This step was conducted at the early stage of the research. The researchers administered sheets of questionnaire to 153 second-year students of English, guided them to complete their questionnaires, and requested them to return their completed questionnaires to the researchers for later data analysis. The participants were also notified that the collected data was only used for the purposes of the research and kept confidential.

Step 2: Revising the syllabus

The syllabus was revised based on the need analysis.

Step 3: Designing the supplementary workbook

The supplementary workbook was later developed based on the syllabus and student’s needs. The tasks should be modified in order to make the students able to learn independently for enrichment purposes, as the materials were intended to make students become autonomous learners and reach their optimum level of development.

IV. FINDINGS AND DISCUSSION

1. The Results of Needs Analysis

After analyzing the results gaining from the questionnaires, the following is the detailed discussion of the students’ target and learning needs.

Table 1: Students’ view on reading and writing demands in the target situation

Question 1	Items	N	f	Percentage (%)
Level of English ability for reading and writing you should have in order to support your studying in the course should be	a. able to understand main ideas of simple and short texts about daily life, and able to write simple sentences related to the texts.	153	20	13.1%
	b. able to understand main and supporting ideas of longer texts, and able to write longer texts like paragraphs on the same theme or topic.	153	45	29.4%
	c. able to understand various kinds of texts, literal and implied meaning on the texts, and able to write complex texts like essays or reports in the form of language and content.	153	88	57.5%

In relation to the demands of the target situation, most of the students (57.5%) claimed that in order to read and write effectively in the target situation, they needed to understand various kinds of texts, literal and implied meaning on the texts, and able to write complex texts like essays or reports in the form of language and content. Only 13.1% of the respondents stated that they had to be able to understand main ideas of simple and short texts about daily life, and able to write simple sentences related to the texts, which is the least choice. 29.4% students chose that they should be able understand main and supporting ideas of longer texts, and able to write longer texts like paragraphs on the same theme or topic.

Table 2: Students’ proficiency levels

Question 2	Items	N	f	Percentage (%)
Generally, your ability to read and to write in English language currently is at level.	a. beginner (be able to read and write simple texts in English language)	153	0	0
	b. intermediate (be able to read and write in English language although it is not fluent yet)	153	143	93.5%
	c. advanced (be able to read and write English language correctly and fluently)	153	10	6.5%

As can be seen from Table 2, most students were at intermediate reading and writing level (93.5%) while no one was at beginner reading and writing level. 6.5% of the students stated that they were at the advanced level in these two skills.

Table 3: Students’ difficulties in reading

Question 3	Items	N	f	Percentage (%)
In reading, you have difficulties in	a. recognizing grammatical word classes (N, V...)	153	15	9.8%
	b. recognizing particular meaning in different grammatical forms.	153	73	47.7%

	c. recognizing tense, agreement, and pluralization in sentences.	153	15	9.8%
	d. recognizing main idea and supporting details	153	50	32.7%

It can be seen from the table above that many students have difficulties in recognizing meaning from contexts (47.7%). About 32.7% students stated that they feel hard to identify the main and supporting ideas in texts. The percentages of students who had difficulties in recognizing grammatical word classes and main idea as well as supporting details were equal with 9.8% for each option.

Table 4: Students' difficulties in writing

Question 4	Items	N	f	Percentage (%)
In writing, you have difficulties in	a. writing a text with correct grammar and vocabulary.	153	40	26.2%
	b. writing a text to describe pictures, graphs, tables, graphics, etc.	153	93	60.8%
	c. complete missing words in a paragraph.	153	10	6.5%
	d. making right sentences with correct structure and punctuation	153	10	6,5%

According to the table, the majority of students had difficulties in writing texts with to describe pictures, graphs, tables, graphics, etc. was 60.8%, which is followed by those who found it hard to write a text with correct grammar and vocabulary (26.2%). The percentages of students who felt completing missing words in paragraphs and making right sentences with correct punctuations and structures were equal with 6.5% for each.

Table 5: Students' general wants in reading skill

Question 4	Items	N	f	Percentage (%)
What reading skills do you want to practice and improve?	a. identifying main idea and supporting details	153	30	19.6%
	b. distinguishing facts from opinions	153	40	26.2%
	c. scanning and skimming	153	73	47.7%
	d. inferring	153	10	6.5%

From the table above, it can be concluded that many students wanted to improve the skills of scanning and skimming as well as distinguishing facts from opinion (47.7% and 26.2% respectively). The third position belonged to identifying main idea and supporting details with 19.6%. The least option was inferring with 6.5%.

Table 6: Students' general wants in writing skill

Question 6	Items	N	f	Percentage (%)
What writing skills do you want to practice and improve?	a. writing sentences with correct grammatical patterns and vocabulary	153	35	22.9%
	b. being able to interpret data from a chart, graph, or table.	153	80	52.3%
	c. being able to summarize the information	153	10	6.5%
	d. being able to paraphrase sentences	153	28	18.3%

As can be seem from table 6, 52.3% students wanted to improve their skill in interpreting data from a chart, graph or table. Meanwhile, the percentage of students who wanted to improve skill of writing sentences with correct grammatical patterns and vocabulary was 22.9%. The number of students who wanted to be able to paraphrase sentences and summarize the inforamtion was 18.3% and 6.5% respectively.

Table 7: The length of reading text

Question 7	Items	N	f	Percentage (%)
	a. < 350 words	153	20	13.1%

In your opinion, how long is the appropriate text in reading?	b. 350 – 450 words	153	23	15%
	c. 450 – 550 words	153	60	39.2%
	d. > 550 words	153	50	32.7%

From table 7, it could be concluded that the preferred text length of the majority of students was from 450 to 550 words (39.2%) and over 550 words (32.7%). The percentage of students chose that the length should be less than 350 words and from 350 - 450 words was 13.1% and 155 respectively.

Table 8: Pictures in materials

Question 8	Items	N	f	Percentage (%)
In your opinion, the existence of pictures in materials is	a. not helpful	153	5	3.4%
	b. helpful	153	48	31.2%
	c. very helpful	153	100	65.4%

According to the table, most of the students (about 65.4%) stated that the existence of pictures in the materials was very helpful to the students in order to understand the materials. 31.2% of students claimed that the use of pictures was helpful. The rest was 3.4% of the students who had opinion that the existence of pictures in the materials of grammar learning had no effect to the materials.

Table 9: Reading tasks

Question 9	Items	N	f	Percentage (%)
In your opinion, what kind of task that you like the most when you are doing reading exercises?	a. multiple choice	153	56	36.6%
	b. answering optional questions	153	10	6.5%
	c. true/false	153	30	19.6%
	d. gap-filling	153	27	17.7%
	e. matching	153	30	19.6%

As can be seen from table 9, the majority of students would like to do multiple choice (36.6%), followed by true/false and matching with the equal number of 19.6%. 17.7% students liked gap-filling and only 6.5% of them liked answering optional questions.

Table 10: Writing tasks

Question 10	Items	N	f	Percentage (%)
In your opinion, what kind of task that you like the most when you are doing writing exercises?	a. filling in the blank	153	20	13.1%
	b. arranging random sentences	153	13	8.5%
	c. rewriting the sentences	153	15	9.8%
	d. writing chart, graph and table description	153	75	49%
	e. matching	153	30	19.6%

Looking at the table above, it can be seen that writing chart, graph and table description and matching were the task types that students most preferred with 49% and 19.6%. Filling in the blank, arranging random sentences and rewriting sentences accounted for 13.1%, 8.5% and 9.8% respectively.

Table 11: The number of tasks in materials

Question 11	Items	N	f	Percentage (%)
	a. less than 3	153	0	0%

In your opinion, how many tasks should be in one unit of materials?	b. from 3 to 5	153	105	68.6%
	c. more than 5	153	48	31.4%

Table 11 indicated that the number of tasks in one unit should be from 3 to 5 (68.6%). Meanwhile 31.4% students stated that there should be more than 5 tasks in a unit. None of the students chose the option “less than 3”.

In summary, the findings of needs analysis questionnaire revealed that the students needed a supplementary workbook for more practice in reading and writing skills with different task types. In addition, pictures should be used in materials so that students are motivated and understand the materials more. Furthermore, the length of reading tasks should be from 450 to 550 words and each unit should consist of 3 to 5 tasks.

2. The supplementary workbook

After analyzing the survey questionnaire, the author revised the reading and writing syllabus. Based on the syllabus and need analysis, the first draft of the workbook was designed with two parts: reading and writing as follow:

Part 1: Reading – consists of 12 units and 2 practice tests. In each unit, there are a variety of exercises which help students to revise the vocabulary related to the topic in the textbook and practice reading as well as writing skills.

Two practice tests make students easier to be familiar with the tests they will take part in.

Unit 1: Travel

Unit 2: Fashion

Unit 3: Disappearing Animals

Unit 4: Big Money

Unit 5: Celebrations around the world

Unit 6: It’s a Mystery

Practice test 1

Unit 7: Health & Fitness

Unit 8: Space & Flights

Unit 9: The Changing Family

Unit 10: The Future of Education

Unit 11: The Mystery of memory

Unit 12: Comics

Practice test 2

Part 2: Writing- includes the data interpretation, structure and process in writing data transformation. Furthermore, students will have chance to practice writing some types of data description.

Unit 1: Introduction to Data Interpretation

Unit 2: Describing Line Graphs

Unit 3: Describing Bar Charts

Unit 4: Describing Pie Charts

Unit 5: Describing Tables

Unit 6: Describing a Combination of Charts/ Graphs/ Tables

Unit 7: Describing Processes

Unit 8: Describing Maps

V. CONCLUSION

Target needs and learning needs

Based on the results of the needs analysis, it can be concluded that the students’ needs can be listed as follows:

In relation to the demands of the target situation, most of the students claimed that in order to read and write effectively in the target situation, they needed to be to understand main and supporting ideas of longer texts, and able to write longer texts like paragraphs on the same theme or topic.

The majority of students were at intermediate reading and writing level. Many students have difficulties in recognizing meaning from contexts and identifying the main and supporting ideas in texts. In addition, a number of students had difficulties in writing texts with correct grammar and vocabulary as well as writing a text to describe pictures and graphs.

From results above, it can be concluded that many students wanted to improve the skills of scanning and skimming as well as identifying main idea and supporting details. A part from that, students wanted to improve their skill in writing sentences and paragraphs.

The results of needs analysis questionnaire also show that students need practicing a variety of reading and writing skills with different task types. In addition, pictures should be used in materials so that students are motivated and understand the materials more. Furthermore, the length of reading tasks should be from 250 to 450 words and each unit should consist of 3 to 5 tasks.

The workbook

The workbook contains 12 units for reading (plus 2 practice tests) and 8 units for writing. The appropriate supplementary reading-writing material includes a number of characteristics like providing large experience of language use in texts, discovering more about

how the language is used, and providing many opportunities to produce language. It is in line with the theory proposed by Tomlinson (1998) on the principles of good supplementary materials. Instead, the activities included in the materials are highly encouraged the students to sharpen their reading and writing language skills. In addition, the exercises in the workbook consist of the skills such as information processing, analysing, and/or speculating.

Analyze and understand all the provided review comments thoroughly. Now make the required amendments in your paper. If you are not confident about any review comment, then don't forget to get clarity about that comment. And in some cases there could be chances where your paper receives number of critical remarks. In that cases don't get disheartened and try to improvise the maximum.

REFERENCES

- [1] Cooperstein, Susan & Kocevar-Weidinger, Elizabeth. Beyond active learning: A constructivist approach to learning. *Reference Services Review*, 2004 32. 141-148.
- [2] Dick, W. & Cary, L. *The systematic design of instruction*. Harper Collins. 1996.
- [3] Graves, K., *Designing language courses: A guide for teachers*. Boston: Heinle & Heinle Publishing. 2000
- [4] Jolly, D. & Bolitho, R., *A framework of materials writing*. In Tomlinson, Brian (Ed.), *Materials Development in Language Teaching* (90-115). Cambridge University Press. 1998.
- [5] Nunan, D., *Second language teaching and learning*. Boston: Heinle and Heinle Publisher. 2003
- [6] Mundhe, G. B., *Teaching receptive and productive language skills with the help of techniques*. IJE. 2015.
- [7] Tomlinson, B., *Materials development in language teaching*. New York: Cambridge University Press. 1998.
- [8] Tomlinson, B., *Developing language course materials*. RELC. Singapore. 2012.
- [9] Triandari, R. O., *Developing reading and writing learning materials for grade eight students of SMP Negeria 4 Magelang*. Unpublished Thesis. University Putra Malaysia. 2015.

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Surgical Approach Selection for Adults Cervical Trauma: The Evidence Based Controversies for The Last 20 Years

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Abstract- Background

The current management of various cervical trauma is still being disputable between spine surgeon due to lack of cervical treatment consensus, remarkably related to surgery determination and surgical approach preference. Thus, each surgical approach is unlike and comprises some advantages also drawbacks.

Aim

The purpose of this study is to compare various surgical technique and define which procedure will result a better outcome.

Materials and Methods

The determination of pertinent studies was administered following to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The applicable reports were assembled thorough a meticulous searched using PubMed, Science Direct, Medline, Cochrane Library databases, trial registries and the reference list of reports until August 2020. We analyzed the pre-postoperative neurological assessments, intraoperative complications, surgical time period, estimated blood lost, clinical scores, imaging, fusion rates

Result

The preliminary search revealed 116 inherent articles. Thus, we attained 8 matched studies (491 total samples). The anterior technique yields a better fusion rate particularly in the burst fractures, cervical facet dislocations, odontoid fractures and flexion distraction injuries. On contrary, in more severe translation, posterior and combined approach may become the treatment options.

Conclusion

Based on included studies, five studies stated that the anterior approach in cervical injury has been proved to have a higher success rate than posterior approach or combined approach. However, the approach selection depends on the surgeon's experience and the cervical fracture pattern.

Index Terms- cervical trauma, anterior technique, posterior technique, combined techniques, cervical surgical instrumentation

I. INTRODUCTION

Cervical trauma is the most common cause of disabilities, which often leads to the devastating health problems particularly in the younger age less than 40 years old. The high energy injuries are often associated, especially caused by motor vehicle accidents (39.5% to 55%), violence (14.9 to 29.5%), falls from height (18.8% to 23%), and sport injuries (7.3% to 11.1%) which result the irreversible spinal cord injury and a debilitating condition. Cervical fractures are the most challenging issue in the developing country. Trauma over vertebral column is around 6 % from the total cervical fractures, more than 50% cases involve trauma to the spinal cord and adjacent structures. The occurrence of Spinal Cord Injuries (SCI) ranges between 27 until 47 cases per million populations, nearly 10% of a total cervical trauma is categorized as a poly-trauma patient; approximately less than 50% cases are associated with neurological deterioration.¹⁻⁴

The mechanism of injury, a motoric and sensory assessment has a direct correlation to confirm the anatomical involvement. The upper cervical and sub-axial cervical have a different anatomical feature, for the example, the upper cervical (C1 and C2) have a wider diameter than the lower cervical, this peculiarity is being correlated with low risk injury to the spinal cord in the upper segment. The most frequent location of injury in cervical trauma is the atlantoaxial segment followed with sub-axial cervical in C6-7.^{4,5}

A preliminary evaluation, an appropriate imaging, a precision diagnosis and management take the major part to dictate cervical trauma prognosis. The prevalence of reported missed trauma ranges from 4% to 30%. Reported as a frequent reason is due to the insufficient imaging evaluation. The odontoid, teardrop, facet and hangman's fracture is the hallmark cervical injury pattern which are usually overlooked. However, with suitable guidance and treatment, the risk of neurological impairment can be remarkably reduced.

Furthermore, an ideal imaging acts as a cardinal key to regulate the extensions of cervical trauma and what the anatomical part is being involved.⁵

Some classification has been designated to classify numerous types of fracture in regard to specify the prompt treatment and acknowledge some differentiation of the each technique's characteristic results in varies cervical fractures. The current common classification for cervical fracture are the Sub-axial Cervical Spine Injury Classification (SLIC) and the *Arbeitsgemeinschaft für Osteosynthesefragen* (AO) cervical fracture classification.⁶

The earliest management is decompression over neural elements in spinal cord, which is best achieved using traction, typically applied with tongs. Relates to several type cases such as a bilateral facet dislocation, flexion distraction injury and the other severe damages, this act may not help to reduce neurological deficits. Neurological unresolved and evolved to spinal cord compression may become the absolute indication to urgent surgical reduction with the suitable techniques. A surgical technique in unstable cervical injury has undertaken many proceed, comprising the applicable of instrumentation to relay instant stability and accomplish cervical alignment to nurture bone incorporation. For the anterior technique, the utilization of anterior cervical plating, whereas, in *in vitro* research, posterior lateral mass screw, plate and rod application are well recognized as a higher-ranked of biomechanically stable than other techniques. Nevertheless, the affirmation study respecting to which approach to use in unstable cervical fractures and SCI are not being further established. Thus, each technique, anterior and posterior approach have its popularity to acquire stability and carry out a fusion. For anterior technique, reconstruction in anterior column can be performed directly, less muscle will be split and uncomplicated dissection over anterior part. Previous studies provoke that anterior approach is more tolerable post-operatively for most of the patients. On contrary, some authors disclosed that posterior approach attained its popularity because this technique yielded the higher rate of union and a good clinical result.^{1,2,6-9}

The accepted guidance for upper and lower cervical fractures has shortage studies amidst the orthopedic surgeons, specifically to determine the surgical and non-surgical indication, thus, which surgical techniques are applicable and yield to restore anatomical function. The lack of standard glossary and cervical trauma scoring system is the paramount drawbacks of cervical fracture treatments.^{1,2,6-8}

Consequently, the aim of this study is to validate the differentiation between anterior, posterior or combined fixation in diverse cervical fractures because limited studies have been found to systematically review these approach, to particularly elucidate its varies outcomes from pre-postoperative neurological assessment, intraoperative complication, surgical time period, estimated blood lost, clinical score (Japanese Orthopedics Score/ JOA, American Spinal Cord Injury Association/ ASIA, Frankel score, Neck Disability Index/ NDI), imaging judgement and fusion rates.

II. MATERIALS AND METHODS

Search Strategy

The determination of pertinent studies was administered following to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The applicable reports were assembled thorough meticulous searched using PubMed, Science Direct, Medline, Cochrane Library databases, trial registries and reference list of reports until August 2020 to distinguish all of the published literature which has documented the numerous cervical surgical technique in adult cervical trauma cases. We screened the qualified studies criteria using Boolean Operator. The keywords are *Anterior approach OR anterior technique OR anterior decompression stabilization fusion AND posterior approach OR posterior technique OR posterior decompression stabilization fusion AND cervical trauma OR cervical injury OR spinal cord injury cervical OR cervical facet dislocation OR cervical fracture*^{10,11}

All immanent sections of literatures including study eligibility, qualification, trial object and selection, variables data, assessment risk of bias and irrelevant data studies were conducted by independent authors. Identical, equivalent and irrelevant studies were withdrawn. Titles and abstracts were analyzed. Furthermore, the final studies have undertaken all-inclusive screening for this review's criteria.

Table 1. Boolean Operators

Search engine	Key Words	Result
PubMed	<i>Anterior approach OR anterior technique OR anterior decompression stabilization fusion AND posterior approach OR posterior technique OR posterior decompression stabilization fusion AND cervical trauma OR cervical injury OR spinal cord injury cervical OR cervical facet dislocation OR cervical fracture</i>	54
Science Direct	<i>Anterior approach OR anterior technique OR anterior decompression stabilization fusion AND posterior approach OR posterior technique OR posterior decompression stabilization fusion AND cervical trauma OR cervical injury OR spinal cord injury cervical OR cervical facet dislocation OR cervical fracture</i>	36

Cochrane	<i>Anterior approach OR anterior technique OR anterior decompression stabilization fusion AND posterior approach OR posterior technique OR posterior decompression stabilization fusion AND cervical trauma OR cervical injury OR spinal cord injury cervical OR cervical facet dislocation OR cervical fracture</i>	17
Medline	<i>Anterior approach OR anterior technique OR anterior decompression stabilization fusion AND posterior approach OR posterior technique OR posterior decompression stabilization fusion AND cervical trauma OR cervical injury OR spinal cord injury cervical OR cervical facet dislocation OR cervical fracture</i>	9

Methods

The specification criteria for literature consideration to this review

Types of studies

The liberated author included Randomized Controlled Trial (RCT), quasi-randomized (non-randomized population) and the experimental design with a maximum level II evidence (Table 2). The level of selected study’s evidence was categorized on the behalf of the criteria authorized by the North American Spine Society and the Oxford Centre for Evidence Based Medicine: ¹⁰⁻¹³

1. Level I: High quality randomized trial or prospective studies, about previously testing in developed diagnostic criteria on consecutive patients, sensible costs and alternatives; values obtained from many previous studies with multiway sensitivity analyses; systematic review of Level I Randomized controlled trials (RCTs) and Level I studies

2. Level II: Lesser quality (RCT); prospective comparative study; retrospective study untreated controls from an RCT; lesser quality prospective study; development of diagnostic criteria in consecutive patients; sensible costs and alternatives; values obtained from limited studies; with multiway sensitivity analyses; systematic review of Level II studies or Level I studies with inconsistent results.

Types of populations

We specified all of the literature which analyzed human study in relate to adult with confirmed cervical trauma, varies from distraction-flexion dislocation, sub-axial cervical fracture dislocation, cervical burst fracture, odontoid fracture, atlanto-axial fracture accompanied with or without neurological involvement. The minimum post-operative evaluation is three months.

Types of interventions

Characteristic were comparative trials between different surgical techniques for those fractures. The principal comparative was the anterior versus posterior technique with the application of open or closed reduction followed with fixation.

1. Anterior surgical techniques:

- Open anterior cervical reduction and fixation
- Closed anterior cervical reduction and open surgical fixation

2. Posterior surgical techniques

- Open posterior cervical reduction and fixation
- Closed posterior cervical reduction and open surgical fixation

3. Combined techniques (Started with closed reduction)

- Anterior-posterior
- Posterior-anterior

4. Combined techniques (Open reduction)

- Anterior-posterior
- Posterior-anterior

Types of result evaluation

Primary outcomes

- Post-operative neurological and clinical assessment (American Spinal Cord Injury Association/ ASIA, Frankel classification, Japanese Orthopedics Score/ JOA, Neck Disability Index/ NDI)

Secondary outcomes

- Intraoperative evaluation (surgical time period, estimated blood loss)
- Length of stay (LOS)
- Neck-pain (Visual Analog Scale/ VAS)
- Radiographic assessment (sagittal alignment, cobb angle, bone fusion rates)

We included all studies which measured the primary or secondary outcome alone

Table 2. Validity Search Methods

Authors	Journal	Description Study	Conclusion	Model	Level of Evidence
Brodke et al (2003)⁷	Journal of Spinal Disorders & Techniques	Randomized comparative study of anterior vs posterior approach in unstable cervical injuries and associated spinal cord injuries	There were no significant differences in fusion rates, alignment, neurologic recovery, or long-term complaints of pain in patients treated with either anterior or posterior fusion and instrumentation	Human	II
Toh et al (2005)¹⁴	Journal of International orthopedics	Retrospective comparative study. Anterior vs posterior or combined instrumentation in the burst fractures or teardrop dislocation fractures over middle and lower cervical spine	Based on the anatomical and neurological findings, the study demonstrates that anterior fusion is preferable to posterior fusion for the treatment of burst fractures and tear-drop dislocation fractures of the middle and lower cervical spine.	Human	II
Song et al (2008)¹⁵	Journal of Clinical Neuroscience	Prospective comparative study of combined anterior and posterior fixation with anterior fixation alone in the distraction-flexion injury in the lower cervical spine	In those with a bilateral dislocation, the fusion time was increased when only anterior fixation/fusion had been performed but the clinical results, such as neurologic recovery and complications, were similar in the four groups. Overall, anterior fixation/fusion alone in a bilateral dislocation is recommended as an alternative method.	Human	II
Kwon et al (2007)²	Journal neurosurgery spine	A prospective randomized controlled trial of anterior compared with posterior stabilization for unilateral facet injuries of the cervical spine	both the anterior and posterior fixation approaches appear to be valid treatment options. Although statistical significance was not reached in the primary outcome measure, some secondary outcome measures favored anterior fixation and others favored posterior treatment for unilateral facet injuries.	Human	I
Yuan et al (2018)¹⁶	Journal of orthopedic Surgery and Research	Retrospective cohort study of anterior cannulated screws fixation and posterior instrumentation of C1-2 without fusion in the treatment of odontoid fracture	For fresh type II odontoid fractures, high rate of fracture union can be achieved by both ACSF and PIWF. For most fresh type II odontoid fractures, anterior screw fixation was the best option for its simplicity and preservation of normal atlanto-axial rotary function. Posterior instrumentation without fusion could preserve most of the atlanto-axial rotary function and lead to moderate neck discomfort and is also a good alternative if anterior screw fixation is contraindicated	Human	I

Liu et al (2019) ¹⁷	European Spine Journal	Retrospective comparative study. The anterior only approach vs the posterior – anterior approach in cervical facet dislocation	Compared with the conventional posterior–anterior approach, the novel anterior-only approach with two reduction techniques, including Caspar pins kyphotic Para median distraction and anterior facetectomy, achieved a 100% reduction success rate and induced less surgical trauma, indicating that this method can be recommended as an alternative for lower cervical facet dislocation.	Human	II
Luksanapruksa et al (2019) ¹⁸	Asian Spine Journal	Retrospective cohort study to compare posterior approach and combined approach of cervical fractures in ankylosing spondylitis	Both posterior and combined approach provided good clinical results. posterior surgery had lower EBL, lower postoperative complication rate, and shorter length of stay than combined approach surgery; none of these differences were statistically significant	Human	II
Ren et al (2020) ¹⁹	Journal of Scientific Reports	Prospective comparative study of long term outcome in anterior reduction and interbody fusion fixation vs posterior reduction and short segmental pedicle screw fixation for lower cervical dislocation	The posterior approach was associated with greater loss of alignment by two years (P = 0.012) and at final follow-up (P < 0.001). The posterior approach group had more blood loss (P < 0.001), longer operation times (P < 0.001), longer hospital stays (P < 0.001) The anterior approach is better than the posterior approach for preserving cervical lordosis, which is associated with a better long-term effect.	Human	II

Study Quality Assessments

We analyzed all of the published literature to assess its title and abstract which has matched with this review’s criteria. Moreover, the authors will extract all collected studies in respect of the inclusion basis. Quality appraisal and the content of included published literature were discussed until finalization of the highly qualified and eligible study to be reviewed.

All aspects of studies, including a methodological quality, variables data and risk of bias assessment, were appraised by each author with filling up forms. Forms were collected by the main author then all authors gathered to discuss any contradicting points.

III. RESULT

Search Result

Preliminary search revealed 116 inherent articles. The persisting data after eliminate identical studies were 60 articles. Moreover, we appraised all studies manually for its pertinence and qualification. Thus, we attained 8 matched studies (491 total samples) and reviewed several comparative surgical techniques in the different cases of cervical trauma. All articles had varied level of evidence, range from level I – II. Minimum duration of follow up is started as early as 3 months until 17 years

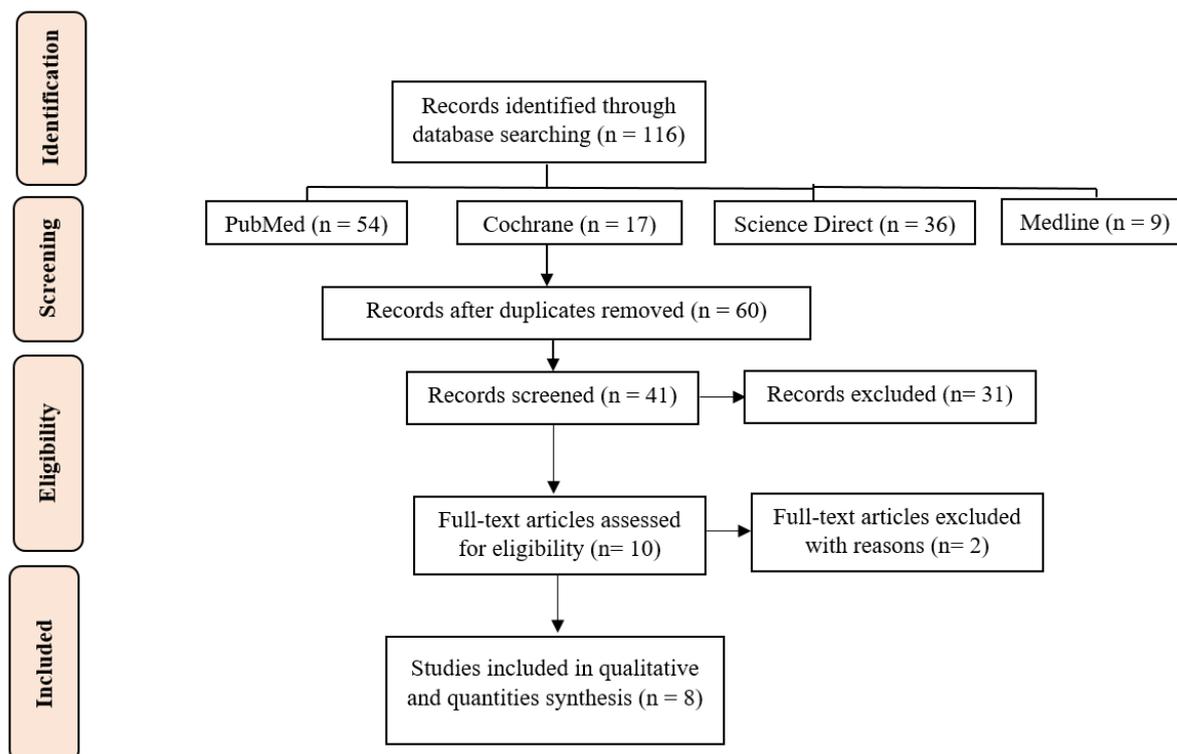


Fig 1. PRISMA Flow Chart Describing Search Process

Outcomes

Primary Outcomes

For the neurological post-operative parameters including Frankel, ASIA, JOA and NDI, there were neurological improvement in each group with no significant difference between those scores. In Brodke et al published literature, it has been analyzed that the anterior group, 70% of total patient improved minimal 1 Frankel grade and 57% in the posterior group. Toh et al study found that 9 of 24 patients treated anterior fixation has yielded the improvement of neurological outcome whereas the posterior group patients did not show any neurological improvement. No significant difference has been found in the case of unilateral and bilateral facet dislocation which treated with anterior technique only and combined technique. According to Yuan et al, anterior cannulated screw fixation (ACSF) and posterior instrumentation of C1-2 without fusion (PIWF) resulted an immediate spinal stabilization without neurologic deterioration. No significant difference among anterior-only group and anterior-posterior in cervical facet dislocation cases in respecting of Liu et al. Song et al also stated that no significant different in neurological outcome between the anterior fixation and combined approach with a cervical flexion-distraction injury. It also applied on Ren's studies, that there were no difference between anterior and posterior reduction with short segmental pedicle screw fixation in cervical facet dislocation. ^{1,2,7,14-18}

Secondary Outcomes

Brodke et al, there were 2 cases of pseudoarthrosis in the anterior group and none in the posterior group. No significant difference over neck pain, fusion rates, sagittal alignments and neurologic recovery. The restoration of spinal canal diameter has been achieved approximately 60 % in the anterior approach while the posterior approach has been restored spinal canal only 6% according to Toh et al study in the burst fracture and tear drop dislocation. As claimed by Song et al, a longer time of fusion rates in bilateral facet dislocation treated with anterior technique only than combined technique, whereas, no difference has been found among vertebral height, Cobb's angle, fusion rate and neurologic recovery in each approach. On the other hand, on the result study of Kwon et al, anteriorly treated patients cause less postoperative pain, a lower rate of wound infection, a higher rate of radiographically fusion and better alignment. Based from NDI score in Yuan et al, NDI in PIWF was statistically higher than ACSF. Liu et al has been analyzed that longer duration of surgical time and greater blood loss intra-operative in anterior-posterior approach than anterior-only. Nonetheless, Ren et al research showed that the posterior fixation consequence a greater loss of alignment, more blood loss, longer operation time and hospital stays than anterior technique. ^{1,2,7,14-18}

Table 3. Characteristic Outcome Studies

<i>Parameter</i>	Brodke et al (7)	Toh et al (14)	Song et al (15)	Kwon et al (2)	Yuan et al (16)	Liu et al (17)	Luksanapruksa et al (18)	Ren et al (19)
Sample size (M:F)	47 (37 : 10)	31 (29 : 2)	50 (40 : 10)	42 (31 : 11)	36 (28 : 8)	93 (80 :13)	33 (31 : 2)	159 (107 : 53)
Age	33 -38	14 – 69 Mean: 29.3	20 - 66	33 – 41.1	22 – 70 Mean: 41.5	21 - 73	42 - 85	19 - 76
MOI	- 33 MVA - 11 fall - 3 diving - 1 assault	- 21 MVA -10 fall	-37 MVA - 9 fall - 2 diving	N/A	- 14 MVA - 22 falls	- 24 MVA - 28 fall - 41 other	N/A	N/A
Cervical trauma	Bilateral facet fracture, burst fracture + bilateral facet disruption, burst fracture, unstable extension injury	Burst fracture and Teardrop dislocation fractures	Distraction flexion injury	Isolated acute unilateral facet dislocation	Odontoid fracture	Unilateral and bilateral facet dislocation	All cervical fractures	Unilateral/ bilateral dislocation with or without facet joint fracture between C3-T1
Involved levels								
C1-2					36			
C2-3								
C3-4	47	1				6	1	20
C4-5		2	13	6		13	9	49
C5-6		16	26	10		33	7	55
C6-7		6	9	25		33	14	31
C7-T1		6	2	1		8	2	4
Follow up	6 mo – 17 mo	6 mo – 14 yrs Mean: 23.5 mo	19 mo – 96 mo Mean: 47 mo	6 wks – 12 mo	3 mo – 60 mo Mean: 43.1 mo	12 mo	6.4 mo – 195.46 Mean: 69.9 mo P=0.88	10 yrs – 17 yrs P = 0.052
Interval injury surgery	< 5 days of injury (50% anterior, 70% posterior) > 5 days of injury (50% anterior, 30% posterior)	26 (four days of injury) 5 (elective surgery)	N/A	N/A	ACSF:5 days PIWF:14 days	N/A	1 – 7 days	3 days

Surgical techniques	-A:Anterior discectomy fusion -Posterior: Posterior decompression fixation fusion	- Group A: Anterior decompression fusions - Group B: Anterior decompression fusions - Group C: Posterior fixation + anterior decompression, posterior fusion alone	- Group A: anterior fixation/fusion (Allen stage 1,2) - Group B: anterior fixation/fusion (Allen stage 3,4) - Group C: combined anterior and posterior fixation/fusion (Allen stage 1,2) - Group D: combined anterior and posterior fixation/fusion (Allen stage 3,4)	- Group A: single-level anterior discectomy or fusion -Group B: posterior cervical fusion	- ACSF - PIWF	-Group A: posterior decompression-ACDF -Group B: anterior facetectomy	-Group A: Posterior decompression -Group B: Combined approach (anterior + posterior decompression)	-Group A: anterior reduction and interbody fusion and fixation -Group B: posterior reduction and short-segmental pedicle screw fixation
Pre-operative parameters								
Frankel score	-Anterior group: 2.2 -Posterior group: 2.3 P > 0.05	Group A: A (8), D (2), E(1) Group B: A (9), D (3), E (1) Group C: A (6), E (1) P > 0.05	N/A	N/A	N/A	N/A	N/A	N/A
ASIA score	- Anterior group: 43 - Posterior group: 40 P > 0.05	N/A	Motoric: A:B ; p = 0.116 A:C ; p = 0.419 B:D;p = 0.109 sensory A:B ; p = 0.127 A:C; p = 0.376 B:D;p = 0.284	N/A	N/A	Group A: 3.32 Group B: 2.77 P > 0.05	N/A	Group A: 3.1 ± 1.1 Group B: 3.2 ± 1.1 P= 0.512
JOA score	N/A	N/A	N/A	N/A	N/A	Group A: 10.38 Group B: 8.17 P > 0.05	N/A	Group A: 9.5 ± 3.6 Group B: 9.6 ± 3.4 P= 0.798

NDI score	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Group A: 29.8 ± 8.2 Group B: 28.6 ± 6.3 P= 0.326
Intra-operative complication	N/A	N/A	N/A	N/A	No complication in both group	N/A	Group A: 1 dural tear Group B: 1 dural tear P=0.52	Group A: 29 Group B: 8 P= 0.004
Surgical time period	N/A	N/A	-Group A: 98.9 ± 18.7 (70–150) -Group B: 98.0 ± 14.1 (80–120) -Group C: 238.0 ± 29.5 (210–280) -Group D: 239.2 ± 30.61 (210–255) P > 0.05	-Group A: 134 min -Group B: 103 min P > 0.05	ACSF: 2.8 h PIWF: 3.6 h P > 0.05	Group A: 274.0 ± 114.7 min Group B: 88.6 ± 35.0 min p = 0.000	Group A: 161.1 min (100–327 min) Group B: Posterior 213.6 min (126–362 min) Anterior 70.2 min (48–110 min) P = 0.16	Group A: 72.1 ± 9.2 Group B: 93.0 ± 11.3 P= 0.000
Estimated blood loss	N/A	N/A	N/A	Both group: < 100 ml	ACSF: 37 ml PIWF: 198 ml P > 0.05	Group A: 275.0 ± 183.2 ml Group B: 92.5 ± 84.0 ml p = 0.000	Group A: 306.38 Group B: Posterior 458.33 ml (100–700 ml) Anterior 122.4 ml (25–337 ml) ml (50–750 ml) P=0.16	Group A: 71.5 ± 14.6 Group B: 102.4 ± 18.5 P= 0.000
Post-operative Parameters								
Frankel score	- Anterior group: 3.1 - Posterior group: 2.3 P > 0.05	Group A: A (6), B (2), E (3) Group B: A (7), B (2), E (4) Group C: A (6), E (1) P > 0.05	N/A	N/A	N/A	N/A	N/A	N/A

ASIA	- Anterior group: 64 - Posterior group: 54 P > 0.05	N/A	Motoric A and B: P = 0.116 A and C: P = 0.419 B and D: P = 0.109 P > 0.05 Sensory A and B: P = 0.127 A and C: P = 0.376 B and D: P = 0.284 P > 0.05	N/A	N/A	Group A: 3.70 Group B: 3.13 P = 0.900	Neurologic improvement (ASIA > 1) Group A: 33.33% Group B 60 % P = 0.57	Group A: 4.6 ± 0.8 Group B: 4.7 ± 0.7 P = 0.631
JOA	N/A	N/A	N/A	N/A	N/A	Group A: 11.75 Group B: 9.37 P = 0.717	N/A	Group A: 14.2 ± 1.6 Group B: 14.4 ± 1.0 P = 0.212
LOS	N/A	N/A	N/A	- group A: 1 – 24 days - group B: 1.5 – 42 days P > 0.05	N/A	N/A	Group A: 13.09±9.39 (3–32) Group B: 16.60±9.02 (8–32) P = 0.09	Group A: 8.6 ± 1.5 Group B: 13.4 ± 2.3 P = 0.000
Pain (VAS)	- Anterior group: 7 - Posterior group: 7 P > 0.05	N/A	N/A	-Group A: 2.1 ± 0.5 -Group B: 3.0 ± 0.4 P > 0.05	ACSF: (-) PIWF: (+) P > 0.05	N/A	N/A	Group A: 3 Group B: 6 P = 0.125
NDI	N/A	N/A	N/A	N/A	ACSF: 5% PIWF: 13%	N/A	N/A	Group A: 7.3 ± 1.7 Group B: 6.7 ± 1.4 P = 0.015
Radiological evaluation	- Anterior group: anterolisthesis neutral - Posterior group: anterolisthesis neutral	N/A	Cobb angle decrease in all group	Sagittal alignment Group A: 5° kyphosis - 20° of lordosis Group B: 11° Lordosis - 19° kyphosis P = 0.0001	N/A	N/A	N/A	Kyphotic angle Group A: -3.5 ± 2.6 Group B: -1.8 ± 2.9 P = 0.000

Fusion rates	- Anterior group: 90% - Posterior group: 100% P > 0.05	Group A: 60.2% Group B: 61% Group C: 6% P > 0.05	Group A: 3.7 ± 2.1 months (range 3–12) Group B: 6.0 ± 2.8 (3–12) Group C: 3.6 ± 1.34 (3–9) Group D: 3.8 ± 2.2 (3–3) P > 0.05	Group A: 100% Group B: 89% P = 0.49	ACSF: 90.9% PIWF: 96% P > 0.05	Both group: 100%	N/A	Group A: 64.4 ± 62.5 Group B: 59.5 ± 57.7 P = 0.515
Re-surgery	N/A	N/A	N/A	N/A	Both group: 0	N/A	Both group: 0 P = 0.99	N/A

* M:F Male: Female; MOI mechanism of injury; MVA motor vehicle accident; ACSF Anterior Cannulated Screw Fixation; PIWF Posterior Instrumentation Without Fusion; ACDF anterior corpectomy discectomy fusion; ASIA American Spinal Cord Injury Association grade; JOA Japanese Orthopedic Association; NDI neck disability index

IV. DISCUSSION

The pertinence of this review is being correlated with a higher prevalence of cervical fractures in our daily practice. The debatable issue regarding cervical fixation approach between anterior and posterior, due to deprivation of evidence based cervical approach comparisons. The incidence of cervical trauma is approximately 150,000 people per year in North America, nearly 15,000 of total cervical trauma is associated with SCI (1 from 25,000 people per year). The higher trend of advanced technology in cervical surgical fixation is not being well paralleled with the expansion of the evidence based consensus nor surgical guidance. For the example, it is commonly being questioned among Orthopedic surgeons; “when is the application of surgical fixation” or “what type of cervical fracture which can be treated with surgical reduction or closed reduction alone”.^{1,2,4,6-9,19,20}

Just about 50 years ago, cervical surgical stabilization has already widely progressed, Smith and Robinson first reported their approach for what they called anterior discectomy and fusion.^{1,7,9} Plating over anterior cervical provides innumerable satisfaction as a complement to ACDF (Anterior Cervical Discectomy and Fusion), it delivers more rigidity to bone fixation, withstand in to bone graft settling and evolution of segmental kyphotic, stimulate more bone’s fusion rates, give less burdensome for external support and help to diminish graft extrusion. On the other hand, anterior cervical plating has some pitfall such as; prolonged surgical time and cost and anterior fixation revision will be more difficult if the anterior plate must be detached. Furthermore, there are some related complication to anterior cervical plating such as esophageal erosion caused by loosening plates and screws, peri-plate ossification in the adjacent segment.^{3,8,21,22,23}

According to Kwon et al, some hypotheses was being provoked from radiological evaluation in respect of comparison between anterior and posterior techniques. From anterior group, there were no case of pseudoarthrosis, while in the posterior group, there were two cases had been found from total of 19 cases. Thoroughly said the difference of fusion rates is 100% for anterior and 89% posterior. In *in vitro* study, for biomechanically aspect in severe unstable cervical spine compared with unilateral facet dislocation model had exemplified that posterior fixation had generally resulted more exceptional than anterior. Johnson and colleagues, outlined that the risk of failure was increasing nearly two third, if flexion-distraction trauma which involved fracture of the endplate were treated with single segment anterior fusion alone. Kwon also stated that a surgeon might face more difficulty to reduce unilateral dislocation with an anterior technique, hence, posterior approach would be preferred to manage the reduction. An annihilating complication for elderly patient associated with anterior technique is the swallowing difficulties which can be susceptible to an aspiration pneumonia.^{2,9,23,24}

The anterior-only technique associated with minimal iatrogenic soft tissue trauma. As well as, the decompression can be done with the direct monitoring to evade the spinal cord trauma. On the authority of Liu et al, this conventional anterior reduction and fixation methods has yielded a two weeks’ reduction rate estimated from 60% to 100%. In contrast, the failure percentage of anterior technique was ranged from 25% to 40% because the constraint of locked joint could not be directly extended by anterior approach only. In the opinion of Oberkircher et al. the determination of anterior reduction stability fully depends on the integrity of facet joint whereas anterior reduction only cannot obtain a sufficient stability particularly in patient with articular process fracture. Nonetheless, posterior technique will be needed for severe posterior column trauma cases to give more stability in posterior column.^{4,17,21,24}

A better outcome has been delineated by previous studies using the posterior techniques. Biomechanical study have provided a superiority of posterior technique compared to anterior and higher stability of the cervical pedicle screw. This approach is mainly acceptable for posterior compression cases of the spinal cord or posterior column injury due to directly reduction and provides more stability. Moreover, Liu et al has analyzed that the prevalence of traumatic disc herniation may be high in cervical facet dislocation cases, estimated from 0.7 to 42%, 29 of 93 patients (31.2%) had been correlated with traumatic disc herniation in Liu's experimental study. It can be concluded that the risk of iatrogenic neurologic deterioration during posterior technique may be increased. The posterior fixation alone cannot do the decompression over disc and ligaments, hence, the anterior fixation may be needed to achieve a good result.^{9,13,17,23,24}

The combination of anterior and posterior technique results a superior outcome than the posterior or anterior fixation alone. This combination technique can provide more stability and adequate decompression as confirmed by previous studies. On the other hand, this combination approach may need a good physical condition of the patient, and this procedure may increase the risk of postoperative infection and iatrogenic trauma in spinal cord because of the greater trauma, prolonged anesthesia and changes of the intraoperative position. In the other opinion, this technique also required a longer surgical time, more blood loss and attach more segment.^{13,14,17,24}

Conclusion

In summary, the successful reduction and fixation may be accomplished by either anterior or posterior approach in variety of cervical trauma combined with spinal cord injury. However, based on the included studies, five studies analyzed that the anterior approach in heterogeneity of cervical injury has been proved to have a higher success rate than posterior approach or combined approach. Other studies investigated that there were no statistically difference between anterior, posterior and combined techniques in cervical trauma. Consequently, the approach selection depends on the surgeon's experience and the cervical fracture involvement.

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REFERENCES

- [1] 1. The Surgical Approach to Subaxial Cervical Spine Injuries An Evidence-Based Algorithm Based on the SLIC Classification System. Dvorak, Marcel F. 2007, Subaxial Cervical Spine Injuries.
- [2] 2. A prospective randomized controlled trial of anterior compared with posterior stabilization for unilateral facet injuries of the cervical spine. Kwon, Brian K. 2007, Journal of neurosurgery spine.
- [3] 3. Anterior Fusion for Rotationally Unstable Cervical Spine Fractures. Colucci, Robert Lifesom Michael. 2000, Spine Journal.
- [4] 4. *Cervical spine trauma*. Torretti, Joel A. india : s.n., 2007, springer.
- [5] 5. Surgical approaches for cervical spine facet dislocations in adults (review). Curto, Del. 2014, Cochrane Library.
- [6] 6. Traumatic Injuries of The Cervical Spine: Current Epidemiological Panorama. Negrelli, Marco Aurelio Cotegipe. 2018.
- [7] 7. Comparison of Anterior and Posterior Approaches in Cervical Spinal Cord Injuries. Brodke, Darrel S. 2003, Journal of spinal disorders and techniques.
- [8] 8. Cervical spine injuries associated with lateral mass and facet joint fractures: New classification and surgical treatment with pedicle screw fixation. Kotani, Yoshihisa. 2005, European Spine Journal.
- [9] 9. Current advancements in the management of spinal cord injury: A comprehensive review of literature . Shah, Manan. 2019, Journal of Surgical Neurology.
- [10] 10. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P). David Moher, Larissa Shamseer. 2015, BMC Part of Springer Nature.
- [11] 11. *A Guide for systematic reviews: PRISMA*. Adin, Ayse. 2019, Turkish Archives of Otorhinolaryngology, pp. pp. 57 -58.
- [12] 12. *Oxford CEBM evidence levels of evidence (introductory document)*. Howick, Jeremy. 2011, Oxford center for evidence based medicine.
- [13] 13. Surgical treatment of traumatic cervical facet dislocation: anterior, posterior or combined approaches? Lins, Catarina C. 2016.
- [14] 14. Surgical treatment for injuries of the middle and lower cervical spine. Toh, Eiren. 2005, International Orthopaedics.
- [15] 15. Anterior versus combined anterior and posterior fixation/fusion in the treatment of distraction-flexion injury in the lower cervical spine. Song, Kyun-Jin. 2006, Journal of Clinical Neuroscience .
- [16] 16. The comparison of clinical outcome of fresh type II odontoid fracture treatment between anterior cannulated screws fixation and posterior instrumentation of C1-2 without fusion: a retrospective cohort study. Yuan, Suomao. 2018, Journal of Orthopedic surgery and research.
- [17] 17. Comparison of a novel anterior-only approach and the conventional posterior–anterior approach for cervical facet dislocation: a retrospective study. Liu, Ke. 2019, European Spine Journal.
- [18] 18. Comparison of Surgical Outcomes of the Posterior and Combined Approaches for Repair of Cervical Fractures in Ankylosing Spondylitis. Luksanapruksa, Panya. 2018, Asian Spine Journal.
- [19] 19. Comparison of anterior and posterior approaches for treatment of traumatic cervical dislocation combined with spinal cord injury: Minimum 10-year follow-up. Ren, Chungpeng. 2020, Journal of nature research.
- [20] 20. Epidemiology of Traumatic Spinal Cord Injury in Developing Countries: A Systematic Review. Rahimi-Movaghar, Vafa. 2013, Neuroepidemiology.

[21] 21. Indications and techniques for anterior cervical plating. John M. Rhee, Jong-Beom Park. 2005, Review article.

[22] 22. New clinical guidelines on the spinal stabilisation of adult trauma patients –consensus and evidence based. Maschmann, Christian. 2019, Scandinavian Journal of Trauma.

[23] 23. Complications of anterior cervical spine surgery: a systematic review of the literature. Yee, Timothy J. 2020, Journal of spine surgery.

[24] 24. Biomechanical evaluation of the impact of various facet joint lesion on the primary stability of anterior plate fixation in cervical dislocation injuries: a cadaver study. Oberkircher, Ludwig. 2014, Journal of neurosurgery.

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Patellofemoral Pain Syndrome: Literature Review

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Abstract- Patellofemoral pain syndrome is defined as a pain in the front of the knee. This syndrome commonly happens in young athletes with prevalence rate of 33% and 18% between men and women. PFPS can be caused by malalignment of extensor lower extremity, knee and hip muscle imbalance also overuse injury during exercise. PFPS can be divided into three categories including patellofemoral instability, patellofemoral pain with malalignment and patellofemoral pain without malalignment. Diagnosis in PFPS can be obtained from history taking and physical examination, especially physical examination of lower extremities extensor. The main treatment is usually physical therapy that strengthen the extensor mechanism, patellar tapping / brace, and the use of NSAIDs, while surgery is rarely done, except in Patellofemoral Pain Syndrome which is refractory.

Index Terms- Anterior Knee Pain, Patellofemoral Pain syndrome, Runner's Knee.

I. INTRODUCTION

Pain in front of the patella (anterior knee pain), has several different names, such as patellofemoral pain syndrome/PFPS, runner's knee, or jumper's knee. The incidence of anterior knee pain/patellofemoral pain syndrome is very high and occurs around 22/1000 people per year. The incidence in young women is about twice as often as men. The causes of anterior knee pain are very multifactorial, including overuse of the extensor apparatus (tendonitis, incisional tendinosis), patellar instability, condral and osteochondral damage. (Petersen & Ellerman, 2014)

II. DEFINITION

Patellofemoral pain syndrome (PFPS) is characterized by retro or peripatellar pain, especially during heavy load activities, such as climbing and descending stairs. Aside from pain, the clinical presentation of this syndrome can usually be in the form of muscle weakness as well as biomechanical changes in the lower limb. PFPS is the most common syndrome that can be caused by excessive use of extremities and is commonly experienced by active individuals. Physiotherapy can be done to reduce the intensity of pain and functional limitations which are associated with PFPS. Traditional treatments aim to improve patellar alignment and strengthen knee muscles. However, some studies

show the influence of other joints, such as the hip. (Santos, Oliveira, & Ocarino, 2014) Several studies say that 74% of individuals who experience PFP will have limitation or stop sports activities due to excessive pain (Glaviano, Kew, & Hart, 2015)

III. EPIDEMIOLOGY

PFPS is one of the most common complaint found in young adults and adolescents, especially for those who have profession as an athlete. It is reported that nearly 25% -30% of all sports medicine injuries and up to 40% of clinical visits with knee problems are associated with PFPS. The incidence of PFP is 33% and 18% of all knee injuries in each female and male athlete, respectively. This is also one of the injuries that often occur in athletes participating in soccer, volleyball and running. The incidence of young adult women is about 2-10 times more often compare to men. (Halabchi, Abolhasani & Mirshahi, 2017)

IV. RISK FACTORS

PFPS risk factors can be either intrinsic or extrinsic. Extrinsic risk factors are the involvement of biomechanical factors due to the relative anatomical location of the knee, namely the proximal part (upper femur, pelvis and trunk), local (around the patella and patellofemoral joint), and distal (gastrocnemius and ankle). These risk factors can be anatomical (increased femoral anteversion, trochlear dysplasia, patella alta and steel or excessive foot pronation) and biomechanical (muscle tension or weakness), general joint laxity, gait abnormalities, and so on. (Halabchi, Abolhasani & Mirshahi, 2017)

On the other hand, intrinsic risk factors are patella and malalignment of the lower limb with muscle and soft tissue imbalance. Bone abnormalities such as dysplasia in the medial and lateral areas of the trochlear groove in the presence of asymmetrical patellar facets can reduce patellar stability and increase the risk of PFPS. Malalignment of the lower limb can also have a significant influence on patellofemoral biomechanics and increase the risk of PFPS. In PFPS there will be external weakness of pelvic rotation and abduction. (Hryvniak, Magrum, & Wilder, 2014)

V. CLASSIFICATION

PFPS can be classified based on the mechanism of injury, radiographic results, biomechanics and alignment factors that contribute to dysfunction and pain. PFPS is divided into three categories including patellofemoral instability, patellofemoral pain with malalignment and patellofemoral pain without malalignment. (Hryvniak, Magrum, & Wilder, 2014) This classification system is designed to help the choose further treatment, but this classification system cannot easily apply clinically. The innovative classification system by Holmes and Clancy (Table 1) allows the classification of various pathellofemoral pathologies seen in runner injuries and clarifies PFP or instability associated with malalignment. (Collado & Fredericson, 2010)

Table 1. PFPS Classification (Collado & Fredericson, 2010)

Classification of Patellofemoral Pain Syndrome
Patellofemoral Instability 1. Subluxation or dislocation, single episode 2. Subluxation or dislocation, recurrent 3. Chronic dislocation of patella 4. Associated fracture
Patellofemoral pain and malalignment 1. Increased functional Q-angle 2. Tight lateral retinaculum (lateral patellar compression syndrome) 3. Grossly inadequate medial stabilizers 4. Electrical dissociation 5. Patella alta 6. Patella baja 7. Dysplastic femoral trochlea
Patellofemoral pain without malalignment 1. Tight medial and lateral retinacula 2. Plica 3. Osteochondritis dissecans 4. Traumatic patellar chondromalacia 5. Fat pad syndrome 6. Patellofemoral osteoarthritis 7. Patellar tendinitis 8. Quadriceps tendinitis 9. Prepatellar bursitis 10. Apophysitis 11. Symptomatic bipartite patella 12. Other trauma 13. Reflex sympathetic dystrophy.

VI. 6. MECHANISM/PATHOLOGY

PFPS is a diagnosis that characterized by anterior knee pain, which can be multifactorial and is caused by a combination of lower limb malalignment, muscle imbalance around the hip and knee joints, as well as overuse in sports. Each of these factors can play an important role in the development of patellofemoral pain.

6.1 Malalignment

Malalignment of the lower limb is a common cause of PFPS. The structural cause of PFPS can be in the form of an

increase in Q angle in load-bearing activity, genu valgum, tibia varum, and patellar malalignment. This patellar stability includes complex interactions between the alignment of the femur and tibia, the osseous geometry of the patellofemoral joint, and the soft tissue resistance around the patella. Trochlear groove plays an important role in osseous stability of the patella, and trochlear hypoplasia is a common cause of congenital patellar instability. This hypoplasia often results in a cascade of pathological abnormalities including patellar malalignment, as well as causing instability or dislocation, and often kondromalacia patella. These patellofemoral malalignment factors have an important role in the pathophysiology of PFPS.

6.2 Muscle Imbalance

Muscle imbalance is important contributor to patellar maltracking which can cause PFPS. This imbalance includes loss of volume and strength of quadriceps muscles, especially vastus medialis obliquus (VMO). For example, quadriceps muscle tension can directly increase contact pressure between the articular surface of the femur and patella, whereas tension in harmstring and gastrocnemius can indirectly increase joint reaction patellofemoral by producing a constant flexion to the patella, while also limiting talocrural dorsiflexion, resulting in compensation of pronation in the subtalar joint and increased Q-angle dynamics. Iliotibial band tension (ITB) can also affect the normal patella, distal ITB joins with superficial fibers and deep lateral retinaculum, and affects the patellar slope and excess pressure on the lateral patella. Hypermobility also increases lateral patellar movements due to laxity in the patellofemoral medial ligament or patellomeniscal ligament, as well as association with patellar subluxation or dislocation. (Collado & Fredericson, 2010)

6.3 Overactivity

Overactivity is often a factor that contributes to the development of patellofemoral pain. As reviewed in epidemiological studies, the highest prevalence of patellofemoral pain is in active young patients. Rapid acceleration in activities such as athletics or military training often results in PFPS in adults. Some of the above have an important role in the complex pathophysiology of PFPS (Rothermich & Glaviano, 2015). Pathophysiological processes such as peripatellar synovial lining and fat pad and increased in metabolic activity of the patella (similar to the initial stages of stress fracture) have been proven to be important etiologies in PFPS.

6.4 Theory of tissue homeostatic

Preliminary observations on the development of the theory of homeostasis of PFPS tissue by Dye, when there were patients with complaints of anterior knee pain in the absence of chondromalacia or malalignment with an evaluation of technetium 99m methylene diphosphonate bone scan on the knee to see any other pathological abnormalities of bone. The network homeostasis theory states that the joint is more than a mechanical structure, and is an active metabolic system. This theory links pain with other physiopathological causes such as increased bone remodeling, increased intraosseous pressure, or peripatellar synovitis which causes a decrease in "Envelope of Function" (or "Envelope of Load Acceptance"). According to Dye, the Envelope of Function describes a variety of energy loading / transfer in

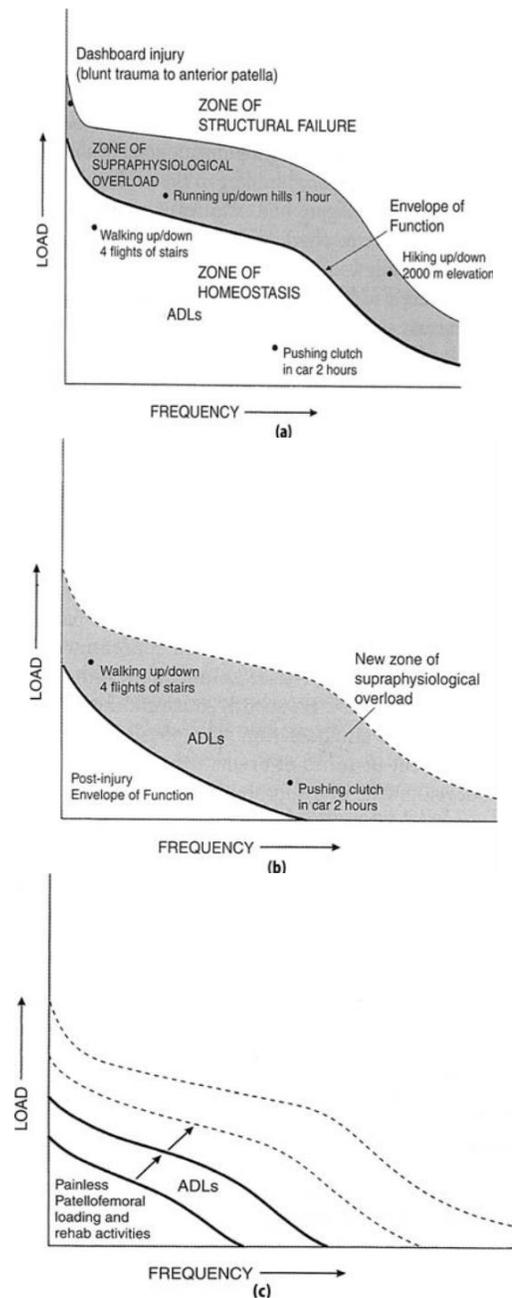
accordance with the network system homeostasis, which is the mechanism of healing and maintaining normal tissue.

Envelope of Function in young people and athletes is bigger than inactive parents. The Envelope of Function is an area called the Homeostasis Zone. A load that exceeds the Envelope of Function but is not enough to cause a macrostructure failure is called the Supraphysiological Overload zone.

The following four factors determine the Envelope of Function or Zone Homeostasis: (1) anatomic factors (morphological, structural integrity and biomechanical characteristics of tissue); (2) kinematic factors (dynamic control of joints involving proprioceptive sensory output, cerebral and cerebellar motor sequences, spinal reflex mechanisms, muscle strength and motor control); (3) physiological factors (genetically determined by the mechanism of molecular and cellular homeostasis which determine the quality and extent of tissue repair); and (4) treatment factors (type of rehabilitation or surgery performed).

According to Dye, loss of osseous parts and soft tissue homeostasis play a role in the emergence of PFPS compared to structural characteristics. Structural factors such as chondromalacia patellae, PFM, as long as joint loading is still in the Envelope of Function, will not cause symptoms.

The Envelope of Function is often reduced after an injury episode to a level where if there are many previous daily activities that can be well tolerated (for example, going up stairs, sitting and rising from a chair) may lead to subversion of tissue healing and advanced symptoms. Reducing the loading of the Envelope of Function enables normal tissue healing. According to Dye, many patients with PFPS show quadriceps reflex inhibition caused by transient impingement of swollen, peripatellar soft tissue that is conserved such as inflammatory synovium with normal alignment. (Alfonzo, 2006).



Picture 1. Envelope of Function Theory. (Alfonzo, 2006)

6.5 Role of loading in Patellofemoral pain

Various types of activities that involve patellofemoral loading (for example, up or down stairs, squatting, kneeling, flexing) are recognized as potential factors for anterior knee pain. The patellofemoral joint is considered to be the component that is able to withstand the greatest loading on the human body, therefore it becomes one of the musculoskeletal components that does not have the ability to restore functional tissue as before in the event of injury and loss of homeostatic function. Stress experienced by the patellofemoral joint is caused by the applied load and surface area in the area of the patella and the touching femur.

Estimation of the strength of the combined reactions produced at the patellofemoral joint, under compression and tension in daily activities, are calculated based on multiples of

body weight, which is estimated to be about 3.3 times body weight in activity that require walking up or down stairs, up to 7.6 times body weight in squatting, and up to 20 times body weight in jumping activity. As noted above, the actual stress on the patellofemoral joint depends on the surface area of the patella and the femur that is in contact when the load is applied. High strength can produce a burden that exceeds normal musculoskeletal capacity, produces symptomatic symptoms and pathophysiological processes that cause patellofemoral pain.

VII. CLINICAL MANIFESTATION

Patients with PFP usually have symptoms of diffuse pain in the back, under or around the patella which exacerbated by activities such as squatting, running, climbing stairs or descending stairs. If patients were asked to locate the pain, patients can place their hands above the anterior aspect of the knee or show a circular area around the patella (circle sign). Symptoms usually occur gradually, although some of them may be acute and are caused by trauma. Pain can be unilateral or bilateral and is usually described as deep and sharp pain. Occasionally, patients report stiffness or pain when sitting long with knee flexion (theater or moviegoer sign). Patients sometimes also report knee giving way or feeling locked. This perceived instability may be due to an inhibitory effect of pain on quadriceps contraction, but must be distinguished from instability in patellar dislocation, subluxation or knee ligament injury. Occasionally, there is mild swelling.

PFP is also associated with overuse, changes in sports activities, including changes in frequency, duration and intensity of exercise. Training programs should also be assessed for errors during training, including increasing the intensity of exercise too quickly, inadequate recovery time and extreme training. The use of improper footwear, sudden heavy weight training, certain activities (squats and lunges) and running on uphill surfaces. A history of trauma, including patellar subluxation or dislocation, as well as previous surgery must be recorded, because they can directly injure the articular cartilage or change the strength in the patellofemoral area until PFP occurs. (Halabchi, Abolhasani & Mirshahi, 2017)

VIII. PHYSICAL EXAMINATION

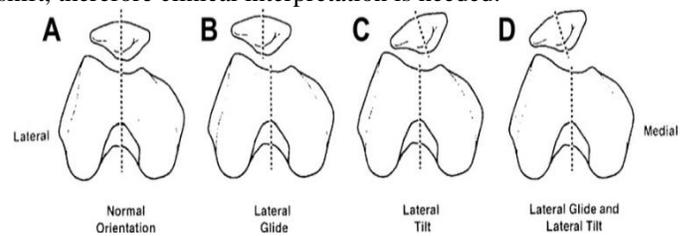
According to consensus of The Fourth International Patellofemoral Pain Research states that, anterior knee pain that appears in squatting maneuvers is the best examination on PFP with sensitivity of 80%. Palpation of patellar edge pain in PFP is evident in 71% -75% of people. Patellar grinding and inhibition tests (for example, Clarke's test) have low sensitivity and limited diagnostic accuracy for PFP. In another prospective study of diagnostic values on five general tests, the authors report three vastus tests of medial coordination, patellar apprehension and eccentric steps to have a positive ratio. (Halabchi, Abolhasani & Mirshahi, 2017)

8.1 Supine Examination

The difference in leg length can be seen by measuring the distance from the anterior superior iliac spine to the highest point of the medial malleolus. A leg length discrepancy of more than 1.0 cm can have side effects on the lower extremities when running.

The knee joint is then observed and palpated to see if there is any swelling. At least 20 to 30 mL of fluid in the knee joint can inhibit VMO function. The examination then focuses on palpation of the patella and pain of the peripatellar tissue. The lateral retinaculum is joined by vastus lateral and ITB, and pain that is often palpable in this area is associated with chronic and recurrent stress from malalignment of the patella. Ventral or dorsal patellar tendon pain is associated with patellar bursitis and tendinopathy, whereas pain on the patellar tendon side is associated with inflammation of the fat pad Hoffa.

Grelsamer and McConnell described 4 components that were believed to affect the static or dynamic position of the patellar: glide, tilt, rotation, and anterior-posterior. The glide test is an assessment of the lateral/medial shift of the patella, and measures the distance from the patellar midpole to the medial and lateral femoral epicondyle with knee flexion up to 200. The glide component is examined using a measuring tape to record the distance from the midpatella to the lateral femoral epicondyle and the distance from the midpatella to the medial femoral epicondyle. The midpatella point is determined by visual assessment. A lateral displacement of the 5 mm patella causes 50% reduction in tension in the vastus oblique medialis. In PFP patients, it is usually very natural to experience a lateral shift, therefore clinical interpretation is needed.



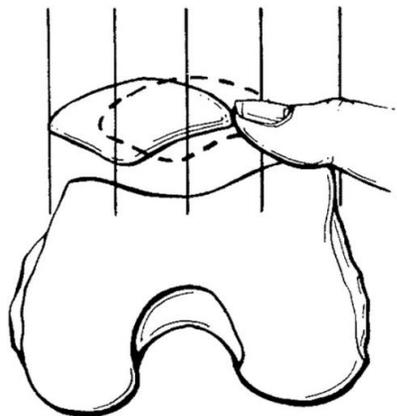
Picture 2. Patella orientation with Lateral Glide and tilt components

The patellar slope compares the height of the anterior aspect at the medial patellar border with the height of the anterior aspect to the lateral patellar border. This slope is considered normal when two level limits in the frontal plane. In mild slopes, more than 50% of the depth of the lateral border can be palpated but the posterior surface is not palpable; and in slopes less than 50% of the depth of the lateral border can be palpated. To determine the dynamic slope, active and passive contractions are simulated to move the patella medially. If the lateral tilt is very severe, this can cause lateral patellar compression syndrome, and requires surgical management.

Measurement of the rotation angle also helps to determine the deviation of the long axis of the patella on the long axis of the femur, and is believed to be another indication that certain parts of the retinaculum become tense and are a potential source of symptoms. In normal rotation, the line connecting the superior and inferior poles of the patella is parallel to the long axis of the femur. If the inferior pole is medial to the long axis of the femur, this indicates internal rotation; if the inferior pole of the patella is lateral to the long axis of the femur, this signifies external rotation. Anteroposterior alignment (A-P) evaluation is to assess whether the inferior pole is tilted posteriorly compared to the superior pole. Tilt can irritate the fat pad and is common in patients who experience pain in the extension or hyperextension of the

knee, because the inferior pole is located on the fat pad. These patients are often diagnosed with patellar tendonitis, and usually experience pain with a quadriceps examination and a leg lift. A-P slope occurs when the distal third of the patella, or inferior patellar pole, cannot be palpated as a third superior and superior pole. The anterior-posterior dynamic slope can be determined during maximal quadriceps contraction. If the inferior pole disappears and forms a hollow, then the test is positive.

In the assessment of patellar mobility, this test is performed with knee flexion of 20° to 30° with relaxed quadriceps. This test is done by resting the patient's knee on the examiner's thigh or with a small pillow under the patient's knee. The patella is divided into 4 longitudinal quadrants, and the patella is moved medially and laterally with the thumb and index finger of the examiner to determine patellar shift. Lateral displacement of 3 quadrants indicates restraint in the medial section. Lateral quadrant displacement 4 defines the presence of patellar dislocation. The medial shift from only one quadrant indicates the presence of a tense lateral retinaculum and is usually correlated with an abnormal passive patellar tilt test. There is an association between patellar hypomobility and ITB. Medial shifts in quadrants 3 or 4 show the presence of patellar hypermobility without lateral resistance, and are often seen in generalized lateral ligament laxity. Hypermobility with lateral patellar glide is correlated with laxity in the patellofemoral or patellomeniscal medial ligament and patellar subluxation. When the test is positive, it is specific to patellar instability. Stability of the ligaments in both knees is also checked, especially if there is a history of previous knee trauma. Anterior and posterior cruciate ligament deficiency is also associated with peripatellar pain. The range of motion of the pelvis, the femoral acetabular impingement test, and the faber maneuver must be performed to check for pathological presence in the knee to the articular pelvis.



Picture 3. Medial and Lateral Patellar Mobility Assessment

8.1.1 Medialis Vastus Coordination Test

In the supine patient's position, the examiner places a fist under the knee of the subject and asks the patient to extend the knee slowly without pressing or lifting away from the examiner's fist. Patients are instructed to achieve full extension. The test is considered positive when there is a lack of coordination on full extension, so the patient cannot do the extension using hip extensors or flexors. A positive test may be an indicator of vastus medialis obliquus muscle dysfunction.



Picture 4. Vastus Medialis Coordination Test

8.1.2 Patella apprehension test

The patella apprehension test, also called the Fairbanks Apprehension test, is done with the patient in the supine and relaxed position. The examiner uses one hand to push the patient's patella as lateral as possible, in order to obtain a lateral patellar glide. Starting with knee flexion at 30°, the examiner grasps the patient's foot at the ankle/heel, combining flexion on the knee and pelvis. This lateral glide is maintained during this test. The test is considered positive when pain occurs.



Picture 5. Patellar Apprehension Test

8.1.3 Waldron test (First and Second Phase)

To perform the Phase I Waldron test, the patient lies on his back and the examiner presses the patella toward the temporary fatigue while performing passive knee flexion with the other hand (Figure a). For Phase II, the patient stands to do a full squat, and the examination slowly compresses the patella towards the femur (figure b). In both phases, crepitation and pain during certain parts of the range of motion are considered pathological signs of PFPS.



Picture 6. Waldron's Test (A) Phase 1, (B) Phase 2

8.1.4 Clarke Test (or Grinding Patellofemoral test)

The Clarke test is performed with the patient lying supine with both knees held by a pad, to form knee flexion (10° - 20°) and patellofemoral articulation in the patellofemoral joint. While the patient is relaxed, the examiner presses the distal patella (with the hand on the superior patella) and then asks the patient to contract the quadriceps muscle. If the patient's pain occurs during the test, the test will be considered positive. However, as explained earlier, the Clarke Test is not recommended as a diagnostic test for PFPS because of the lack of understanding of the underlying mechanism.



Picture 7. Clarke's Test

8.2 Standing Examination

8.2.1 Alignment statis

Alignment of pelvic anatomy and lower extremities has a role in the occurrence of PFPS, and is called a 'static alignment' because this examination can be done when the patient is not moving. Alignment of the lower limb is evaluated by the presence of femoral anteversion; knee position (genu varum, valgum, or recurvatum); external tibial rotation; and alignment weight bearing legs and ankles. The clinical measurement of lower limb alignment is the Q-angle. The Q-angle is formed by a line connecting the anterior superior iliac spine to the center of the patella to the anterior tibial tuberosity. This angle is considered to draw a line on the force that occurs in quadriceps. Some studies found that an angle greater than 160° was a risk factor for PFPS

8.2.2 Dynamic alignment

Dynamic malalignment can occur due to poor muscle control in the lower extremity segment. The examination can be done by doing single leg squats. Poor dynamic alignment can be seen when the clinician observes a consistent pattern when the patient performs a single leg squat or step down resulting in

excessive contralateral pelvic drop; pelvic adduction and internal rotation; knee abduction and external tibial rotation and hyperpronation. When an MRI is carried out with a weight bearing, it has been proven that internal femoral rotation usually occurs in PFPS. This concept also contributes to femoral weakness in PFPS, as well as pelvic abductors and external rotators. Weakness of the gluteus medius can produce contralateral pelvis. Weakness in medial gluteus causes the contralateral pelvis to fall, and places the stance leg in the adduction position, accompanied by excessive internal rotation of the femur and tibia, and hyperpronation of the subtalar joint. Immediate lateral movement of the patella, accompanied by a full extension knee can be categorized as abnormal, which is called a positive J-sign, this movement is due to excessive lateral force when the patella moves to the femoral trolea when flexing 10° and 30° , this is found in some people with patellofemoral instability. (Collado & Fredericson, 2010)

8.2.3 Eccentric step test

For the eccentric step test, the patient does not use footwear. Steps as high as 15 cm or more is accurate, height is equivalent to 50% of the length of the tibia. The patient stands on the board, hands on the hips and slowly steps down. The patient must keep a hand on the pelvis during this test. After the patient does a test with 1 foot, and is repeated with the other leg. Previous warm-up or practice on this test is not permitted, this test is considered positive if there is pain during the test.

Picture 8. Eccentric Step Test

8.2.4 Standard step-down test

The standard step-down test is similar to the eccentric step test, except that the patient must stand with his hands folded on his chest and squats 5-10 times in a row slowly, until the heels touch the floor, maintaining their balance with one squat per 2 seconds. Scoring of deviations in the trunk, pelvis, hips and knees indicates the time of onset of anterior gluteus medius, torsion of abduction of the hip, and decreased lateral trunk force.





Picture 9. Standard Step Down Test

8.2.5 Lateral step-down test

Lateral step down test is a modification of the standard step down test, where the movement is in the lateral direction. The instructions for the lateral step down test are as follows: Patients are asked to stand on one foot 15 cm apart. Then the knee is bent about 60° during the examination, the patient is then asked to bend and touch the opposite leg, then return to the starting position. During this test, we can be assessed several things, such as arm strength to maintain balance, body alignment, pelvic plane (pelvis plane), knee posture and balance.

8.2.6 Single Leg Squat

Single-leg squats are dynamic checks on the hips and quadriceps. This maneuver requires higher mechanical strength than bilateral squats, which require compensation such as valgus on the knee. This may be partly due to smaller restraints and an increase in the amount of dynamic control needed in all fields during single leg squats. Compared with controls, PFPS patients showed increased ipsilateral body resistance, falling contralateral pelvis, hip adduction and knee abduction during one leg squatting. As noted earlier, the general intrinsic risk assessment of the PFPS factor is very important in physical examinations as well as for planning appropriate rehabilitation programs.



Picture 10. Single Leg Squat

8.3 Sitting Examination

In a seated position, the height of the patella can be assessed. Prominent infrapatellar fat pad often accompanies the patella alta, as does the genus recurvatum. Patella alta is more commonly seen in women and is a common finding in congenital subluxation of the patella, as it causes the patella to enter the femoral sulcus while flexing the knee. Patella baja is less common and can be seen as a complication of anterior cruciate ligament reconstruction. When the tibia tubercle is located more lateral than normal, therefore the patellar tendon becomes a slightly lower at a certain angle rather than directly downward, in addition there is also a torsion of the proximal external tibial. Dynamic patella tracking is a measure of patellar instability. During this evaluation, the examiner asks the patient who is seated to actively for knee extension from 90° to full extension, and observes the pattern of patellar movement from the front. In most individuals, the patella appears to move proximally straight, with a slight lateral shift near the terminal extension (J-sign). The term J-sign describes the path of the patella with maltracking. Instead of moving superiorly with knee extension, the patella also deviates laterally on the terminal extension as it exits the trochlear groove, to make an inverted J-shaped path. (Collado & Fredericson, 2010)

8.4 Side Lying examination

In a side-lying position, with knees bent at 20° , the lateral retinaculum can be evaluated for excessive tightness by passively moving the patella medially. To test the inner fibers, the hands are placed in the middle of the patella, and anteroposterior pressure at the medial border of the patella is applied. The lateral border of the patella should move freely from the femur, and the palpation of tension in the retinacular fibers should be similar. In this position the rigor of ITB can be evaluated by the Ober test, and gluteus medius can be tested if there is a strength deficit.

8.5 Examination with Pronation Position

This position allows a more accurate assessment of ligament of the front and rear legs, subtalar position, gastrocsoleus, and quadriceps muscle length.

8.6 Observational Gait Analysis

Observational gait analysis is one of the most important aspects of checking, evaluating dynamic functions by observing the runner's angle when walking and running. It has been found that shocks with excessive impact during the heel strike phase and the propulsion phase while running can increase the risk of PFP. (Halabchi, Abolhasani & Mirshahi, 2017)

IX. INVESTIGATION (IMAGING)

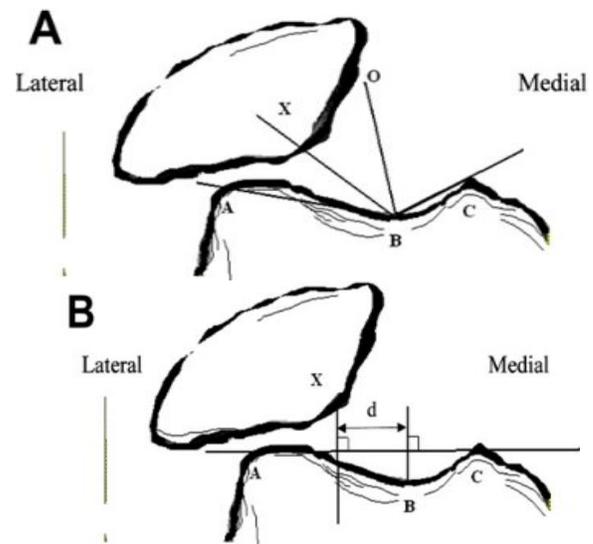
The diagnosis of PFPS mainly depends on the patient's history. Radiography is an adjunct to clinical evaluation and physical examination. It is important to get radiographs on runners with a history of PFPS and no improvement after several weeks of conservative treatment, or if there is a history of trauma or dislocation that has just occurred. Sometimes radiographic findings do not correlate well with clinical complaints and it is often difficult to distinguish between injuries and normal finding. When imaging is indicated, plain knee radiograph (A-P, lateral weight-bearing, and axial) is useful for eliminating other causes of

anterior knee pain, including bipartite patella, osteoarthritis, and loose bodies. On standard knee A-P radiographs, one can identify accessory center ossification, degenerative joint disease, and other unrelated conditions, such as bone tumors. Lateral view is very helpful for assessing the height of the patella. Several techniques are used to measure the distance between the tibia plateau to the inferior pole, which must be equivalent to the length on the surface of the articular patella. The normal range is 1.0, if higher indicates patella alta. This view can also help evaluate the presence of degenerative changes in the patellofemoral joint, osteochondritis in patellar distress, patellar morphology, trochlear groove dysplasia and central accessory ossification and ectopic calcification of the retinaculum. The position and orientation of the patella towards the trochlear groove can also be evaluated by sulcus angle, congruent angle, and patellar tilt angle. The angle of the sulcus can be measured with the angle on the trochlear bone. With the knee flexed at an angle of 35°-45°, while the normal sulcus angle is around 145°. Patellar instability is associated with depth in the trochlear, where if the trochlear is getting steeper it can be associated with patellar pain without instability.

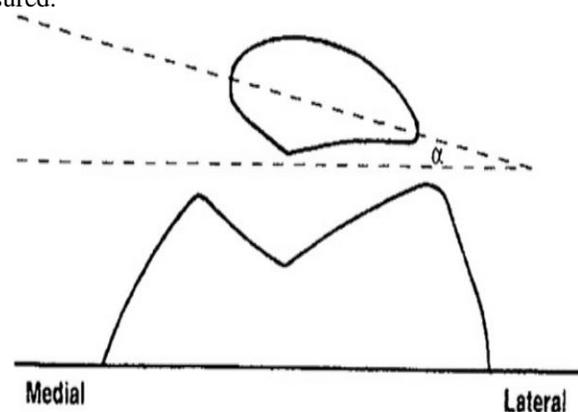
Congruent angles defined as index of medial/lateral subluxation of the patella in the trochlear groove, almost the same as the physical examination assessment on the patellar glide, and in normal joints, the average angle is 6° (standard deviation 11°). The new axial linear displacement measurement can be a simple alternative method for evaluating the position of the patella relative to the trochlear groove similar to the congruence of angular measurements. The patellar tilt angle is an index of the medial/lateral tilt of the patellar plane relative to the femur. In the normal patellofemoral joint, the angle formed by the lateral patellar facet and each horizontal line must be open laterally, where patients with subluxation of the patella, the lines used to determine the angle are parallel or medially open. For this evaluation to be accurate and repeatable, radiographs must be taken with vertical legs and the film disk is kept parallel to the ground surface. Slope angles between 0° and 5° are normal, 5° to 10° are thresholds, and angles greater than 10° are considered abnormal.

If surgery is to be performed and a plain photo examination results are negative, MRI or computed tomography (CT) scan should be used to further evaluate the existence of patellar tracking. Serial CT scans taken at knee flexion angles in the range of 0° to 30° can provide greater information regarding patellar tracking in trochlear grooves. Measurements of sulcus angles, congruent angles, and patellar tilt angles can be done on CT scan and may help to determine the cause of patellofemoral pain. Three malalignment patterns can be characterized by congruent angles and patellar tilt angles: lateral subluxation without lateral tilt, subluxation with slope, and slope without subluxation

Kinematic studies can also be done with MRI without radiation exposure. In addition to defining the patellofemoral abnormality, MRI can also assist in assessing degenerative joint changes, such as cartilage fissure or thinning, subchondral edema of the bone marrow, subchondral cysts, and other pathological entities such as synovial plica and patellar tendinitis.



Picture 11. A) BO Congruent Corner Lines are ABC bisector angle lines. The BX path passes through the lowest point on the medial edge of the patella. The OBX angle is the fit angle. If the BX line falls to the medial side of the BO line, the angle is expressed as a negative degree. If it falls to the lateral side of the BO line, it is expressed as a positive degree. (B) the reference line is drawn by connecting the most lateral anterior aspects (A) and medial (C) trochlear facets. The line is drawn perpendicularly from the depth of the sulcus (B) through the line reference (AC). Another line is drawn perpendicular to the posterior aspect of the patellar spine (X) through the reference line. To get the measurement distance from the lateral, (d) 2 intersections are measured.



Picture 12. Patellar tilt angle. The slope of the angle is measured by the line joining the patella angle to the horizontal line (Halabchi, Abolhasani, & Mirshahi, 2017)

X. MANAGEMENT

10.1 Operative Management

For most patients with patellofemoral pain, surgical intervention is usually not indicated. Surgery can be considered when a patient is refractory to non-operative management for 6 to 12 months. Interventions must be carried out according to appropriate indications, including abnormalities that can be specifically handled by surgery. Surgical management includes

patellar realignment, resurfacing, and arthroplasty. Lateral Release Realignment is a proximal realignment procedure that is most appropriate for patients with lateral retinaculum tightness and lateral patella tilt. This procedure is minimally invasive, using arthroscopy or combined with an open approach. Pain and instability due to medial patellar subluxation are serious complications, often arising after aggressive surgery. Some patients may require a realignment procedure, including proximal imbrication or medial patellofemoral ligament reconstruction. The initial movement of the knee is very important to avoid stiffness after surgery. Tibia osteotomy is also used as a distal realignment procedure and is most appropriate for patients with lateral malalignment accompanied by lateral and distal patellar facets. Patients with patellofemoral pain are often successfully treated with medial tibia tubercle transfer. Anteromedial transfer is another type of surgery and is an option that can reduce the patellar burden and reduce postoperative stiffness. Full-weight bearings must be avoided for 6 weeks to allow healing after osteotomy. Distal realignment procedures are generally contraindicated for proximal and medial patellar facet lesions. Cartilage restoration resurfacing procedures, including autologous chondrocyte implantation (ACI-C) and osteochondral transfer, have had success in a population of patients with patellofemoral pain caused by defects in the patellofemoral joint cartilage.

The final surgical options include patellofemoral arthroplasty, which is indicated in the case of late stage osteoarthritis degeneration, and may allow a return to sports activities with some limitations. The effectiveness of surgical interventions for patellofemoral pain remains difficult to assess, because most of the available researches are a series of uncontrolled cases. Another surgical option that arises is patellofemoral trochoplasty to treat patients with patellofemoral dysplasia by deepening the trochlear duct. This procedure has shown good short-term results for patients with dysplasia. However, little evidence is available to support long-term success.

10.2 Non operative Management

Although many patients with patellofemoral pain can improve with surgical management, non-operative care remains a mainstay for initial management of the problem. The spectrum of non-operative management options includes a variety of treatment modalities. Patellar tapping, bracing, pharmacology, and the use of therapeutic ultrasound are non-operative treatment options that are controversial in the literature and have not been universally accepted.

10.2.1 Rehabilitation

PFPS management must include a comprehensive rehabilitation program. Symptom control (activity modification, nonsteroidal anti-inflammatory drugs, ice packs, patellar tapping, or brace) is the first stage, then the patient can be classified by the mechanism that is thought to cause the pain: abnormal patellofemoral joint mechanism, changes in alignment or movement in the lower extremities, and overuse

a. Strengthening Quadriceps Muscle

Strength restoration and quadriceps function have been shown to be a significant contributing factor in reducing the patellofemoral symptoms. During open chain training, the quadriceps muscle strength required by the knee for extension will increase as the

knee moves from 90° to full extension. In addition, contact area of the patellofemoral joint will be reduced when the knee is extended, thereby increasing joint stress. Conversely, during closed chain exercises, strength in the quadriceps muscles will be minimal when the knee is extended, therefore stress is reduced. This exercise includes: lunges, wall slides, and leg press machines. Both open chain and closed strengthening exercises must be carried out so that reinforcement can be done throughout the range of motion. Isometric and kinetic open chain exercises, such as knee extension, are recommended if there is a significant quadriceps weakness or pain during weight bearing. As soon as possible, patients can do core exercises during a rehabilitation program that includes a quadriceps strengthening regimen with closed kinetic chains, which is more effective than isokinetic and open chain exercises.

To improve quadriceps eccentric control, rehabilitation programs include exercises performed while standing on one leg. In this position, the lower abdominal and gluteal muscles work together to maintain pelvic level, simulating the activity of the stance gait phase. Activation of the lower abdomen and oblique muscles helps to reduce anterior rotation of the pelvis therefore produce internal rotation of the femur.

b. Patellar Tapping

Correcting abnormal patellar posture using the Grelsamer and McConnell tapping technique is one of the way to optimize the entry of the patella in the trochlea, and this transition step in rehabilitation process is for patient who is unable to do strengthening exercises due to pain. Tapping the patella in individuals with symptoms during exercise up and down the stairs can reduce symptoms by up to 50%. In addition, increase in quadriceps activity can help increase loading in the knee joint.

c. Patellar Brace

Patients with patellar pain report reduced pain from properly using dynamic patellar brace stabilization. Powers et al found that 50% of subjects experienced improvement in symptoms with the use of patella brace stabilization. Further studies showed no effectiveness was found on the use of patellar braces on patellar tracking as measured by MRI kinematics. (Halabchi, Abolhasani & Mirshahi, 2017)

10.2.2 Neuromuscular Electrical Stimulation

This treatment method is electrically induced muscle contraction and can be used to complete or replace voluntary contractions during physical therapy. This modality shows an increase in the electrical capacity of VMO patients who have undergone neuromuscular electrical stimulation. However, its use in isolation has not been proven to exceed the efficacy of formal physical therapy programs. This therapy is not widely accepted as a substitute for physical therapy and remains a controversial complement to physical therapy in the treatment of patellofemoral pain patients. (Rothermich & Glaviano, 2015)

XI. CONCLUSION

Patellofemoral pain syndrome characterized by a collection of clinical symptoms of anterior knee pain with multifactorial causes, in the form of a combination of malalignment of the lower

limb, muscle imbalance around the hip joint and knee, as well as overuse in sports, without any pathological abnormalities in the patellofemoral cartilage. PFPS is characterized by pronation in the subtalar joint, thereby increasing Q-angle.

Another theory states there is an imbalance in network homeostasis, which causes macrostructure failure. Network homeostasis throughout the system is described as "Envelope of Function", this can be influenced by several external factors. Symptoms are usually diffuse pain in the area around the patella, and there is a feeling of locking (knee giving way) in the knee. PFPS can also be detected through physical examination, such as anterior knee pain that appears when patient squat (squatting maneuver).

Non-operative treatment of PFPS remains the main management choice, this can be in the form of tapping, bracing, pharmacological, and the use of therapeutic ultrasound.

REFERENCES

- [1] Alfonzo, V. S. (2006). Background: Patellofemoral Malalignment versus Tissue Homeostasis. In V. Alfonzo, *Anterior Knee Pain and Patellar Instability*. Spain: Springer.
- [2] Collado, H., & Fredericson, M. (2010). Patellofemoral Pain Syndrome. *Clinical Sports Medicine*.
- [3] Dye, S. (2005). The Pathophysiology of Patellofemoral Pain, A Tissue Homeostasis Perspective. *Clinical Orthopaedic and Related Research*.
- [4] Fu, F. H. (2001). Sport Injuries mechanism, prevention and treatment. In D. A. Stone. Philadelphia: Lippincot william and wilkins.
- [5] Glaviano, N., Kew, M., & Hart, J. (2015). ORIGINAL RESEARCH:DEMOGRAPHIC AND EPIDEMIOLOGICAL TRENDS IN PATELLOFEMORAL PAIN. *The International Journal of Sports Physical Therapy* .
- [6] Guillen-Garcia, P., & Rodriguez-Vazquez, J. (2014). Morphogenesis of the patellofemoral joint;Patellofemoral Anatomy; Anatomy and biomechanical of medial patellofemoral ligament. In A. Gobbi, J. Mendes, & N. Nakamura, *The Patellofemoral Joint: State of the Art in Evaluation and Management*. Springer.
- [7] Halabchi, F., Abolhasani, M., & Mirshahi, M. (2017). Patellofemoral pain in athletes: clinical perspectives. *Open Access Journal of Sports Medicine*.
- [8] Hryvniak, D., Magrum, E., & Wilder, R. (2014). Patellofemoral Pain Syndrome: An Update. *Musculoskeletal Rehabilitation*.
- [9] MN, E. (n.d.). Patellofemoral Pain Syndrome. *Sports and orthopaedic specialist*.
- [10] Petersen, W., & Ellerman, A. e. (2014). Patellofemoral Pain Syndrome. *Knee Surgeon Sports Traumatology Arthroscopy*.
- [11] Rothermich, M., & Glaviano, N. (2015). Patellofemoral Pain Epidemiology, Pathophysiology, and Treatment Option. *Clinical Sports Medicine*.
- [12] Santos, t., Oliveira, B., & Ocarino, J. (2014). Effectiveness of hip muscle strengthening in patellofemoral pain syndromes patients: a systematic review. *Brazilian Journal of Physical Therapy*.
- [13] Scuderi, G. (1995). The patella. In *The Patella* (p. 5). New York: Springer.
- [14] Tria, A., & Alicea, J. (1995). Embryology and Anatomy of the Patella. In L. Kibiuk, & G. Scuderi, *The Patella*. New York: Springer.
- [15] Waryasz, G., & McDermont, A. (2008). Patellofemoral pain syndrome (PFPS): a systematic review of anatomy and potential risk factors. *BioMed Central*.

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An Investigation of The Causes and Challenges of Non-Performing Loans: A case of a Zambian Bank

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Abstract- Non-performing loans are a burden on any country's economy and exert downward pressure on its growth. The aim of the study was to investigate the causes and challenges of non-performing loans in the banking sector in Zambia using a quantitative method approach, with descriptive survey as the design. The research adopted a positivism, deductive approach, case strategy, mono method and cross section time horizon. The sampling technique used was the simple random sampling with a sample size of 78 respondents. Quantitative data analysis was used on primary data collected. The research findings indicated that economic down turn, high interest rates, loss of reliable income are some of the major causes and challenges of non-performing loans in the banking sector. The findings also showed that poor credit collection and monitoring contributes to the challenges of non-performing loans in the banking sector and thus contributing to higher levels of non-performing loans. NPLs are caused by moral hazard and imprudent lending practices by bank employees and owners. High Rate of Unemployment also contribute to causes of high NPLs. The study recommended that commercial banks should always have adequate information about its clients and continue strengthening their credit policies and ensure that there is continuous training for its staff. Banks needs to further have excellent risk management processes in place for them to manage credit risk. This will help in avoiding non-performing loans which would be a cost to the bank. In addition to this, the banks should take proper credit assessment and risk management techniques 'to minimize the bank exposure to a higher NPL.

Index Terms- Non-Performing Loans, Moral Hazard, Adverse Selection

I. INTRODUCTION

Commercial Banks play an important role in the development of an economy as they act as financial intermediaries in the financial system of any economy in the world. If the financial system has challenges and is not working well, it has an impact on the overall performance of the economy. Sustainable economic growth and development will only be achieved if the financial system is well developed and one of the characteristics is through lending and timely repayment of loans in the economy. Banks are faced with different types of risks which are influenced by different factors. According to Jarrah (2012), "the sources of risks facing financial institutions are systematic risk factors which have an impact on all financial institutions in the market and are beyond the banks control whilst non-systematic risk are related to the bank specific variables. Banks are currently faced with the growth of Non-Performing Loans which is a major challenge and problem in the financial sector and economy. Non-performing loans (NPLs) are important because they reflect the credit quality of the loan portfolio of banks, and in aggregate terms, reflect the credit quality of the loan portfolio of the banking sector in a country. An understanding of the factors that influence the level of non-performing loans is crucial for the risk management function of banks and for national bank supervisors responsible for banking stability.

Non-performing loans (NPLs) are commonly considered a micro prudential issue. Recently, however, the significant rise of problem loans has made the problem relevant to policy makers, who are concerned that high levels of NPLs will increase systemic risk and impair core functions, such as the supply of credit to the real economy (Draghi, 2017;

ESRB, 2019). The increasing amounts of Non-Performing Loans which have to be provided for in the financial institutions income statements or written off impact on the performance of the banking sector. Mabvure et al (2012) state that, high incidences of non-performing loans can potentially cripple the country's financial sector. According to Gosh, (2015), the weakening of a bank's asset quality may lead to a decrease in economic efficiency, impair social welfare, and weaken economic activity and financially threatening for the banking system. Banks generate their major income from loans which also constitute the greatest risk to the banks. Loans are classified as non-performing loans after being in default for more than 90 days. According to the International Monetary Fund, a loan is non-performing when payment of interest and /or principle are past due by 90 days or more, or interest equal to 90days or more have been capitalized, refinanced, or delayed by agreement or payment are less than 90 days overdue, but there are other good reasons such as debtor filing for bankruptcy, leading to misgiving that payments will be made in full.

The causes of nonperforming loans are usually attributed to the lack of effective monitoring and supervision on the part of banks, lack of effective lenders' recourse, weaknesses of legal infrastructure, and lack of effective debt recovery strategies (Adhikary, 2006).

According to Gorter and Bloem (2002), cited in Agnes (2010), non-performing loans are also mainly caused by an inevitable number of wrong economic decisions by individuals and plain bad luck (inclement weather, unexpected price changes for certain products, etc.). Under such circumstances, the holders of loans can make an allowance for a normal share of non-performance in the form of bad loan provisions, or they may spread the risk by taking out insurance. Other causes are mainly attributable to low GDP growth, high unemployment rate, banks' lending practices, low bank covenants, credit culture in the country, interest rates, supervisory and legal frameworks.

Slower economic growth

Economic downturns are often seen as one of the main causes of lower debt and collateral quality and higher stocks of NPLs held by banks. The immediate consequence of large amount of NPLs in the banking system is bank failure as well as economic slowdown. The gross domestic product (GDP) growth is inversely related to non-performing loans, suggesting that an improvement in the real economy translates into lower non-performing loans. Economic growth means an increase in national income/national output. When there is slower rate of economic growth, living standards increase at a slower rate. The decrease in economic growth is accompanied by an increase in unemployment and a risk of deepening social polarization.

A healthy financial system promotes economic growth and as further stated by Schumpeter (1969), a weak financial system grappling with non-performing loans (NPLs) and insufficient capital could undermine growth. Non-performing loans (NPLs) are a burden for both lender and borrower; they contract credit supply, distort allocation of credit, worsen market confidence and slow economic growth. Morakinyo and Sibanda (2016), as cited by Zeng (2012), observed that loans in the economy as boosting total consumptions and resulting in yielding positive social utility while non-performing loans are viewed as a source of financial pollution (Minsky, 1964, 1995; Stiglitz & Weiss, 1981) that negates social utility. Zeng further argues that NPLs have two economic implications. Firstly, economic growth could decline if NPLs grow, causing resource allocation inefficiency. Secondly, capital requirements will increase as a result of the growth of NPLs as erosion of capital occurs due to funds being trapped in such entities, making it impossible for the banks to fund new, economically viable ventures.

Since the start of the global economic recession in late 2007, commercial banks' credit quality indicators have deteriorated significantly, due to the rise in unemployment rates, challenging business conditions and to some extent the significant increase in credit by consumers to support their expenditures. Slow economic growth is the key factor restraining the banking system's development.

Morakinyo and Sibanda, (2016) state that earlier economists focused on the importance of banks as a driver of economic growth. In 1911, Schumpeter argued that a weak banking system grappling with non-performing loans and insufficient capital or with firms whose credit worthiness has been eroded because of high leverage or declining asset values are examples of financial conditions that could undermine growth, just as a healthy financial system promotes growth. Furthermore, financial development through capital efficiency and growth in productivity can affect the economic growth rate (Hondroyiannis, Lolos, & Papapetrou, 2005).

Linking up with Schumpeter (1969), Hou and Dickinson (2007) maintained that the effect of NPLs on the economy is that resources are tied down in unproductive sectors thereby impeding economic growth and economic efficiency, which then impacts negatively on the banking system's lending behaviour. This outcome can ultimately lead to credit crunch, a situation where financial institutions restrict credit supply below the average level identified for a given market condition (Gertler & Kiyotaki, 2010). Banks shy away from engaging in new credit risk, which ordinarily would have resulted in an equilibrium position, hence creating a scenario of excess loan demand. This defensive action by financial institutions, which includes reducing credit extension to

even viable projects, limits the ability of the overall economy to grow.

Lack of effective monitoring and supervision

It is widely accepted that bank regulation and prudential supervision exists to promote an efficient and competitive banking system; to prevent the occurrence of unnecessary financial disruptions caused by banking panics and failures; and to reduce depositor's risk exposure to episodes of financial distress.

In order to ensure effective credit monitoring, it is essential to examine credit monitoring tools. At the ground level, we should periodically receive a certified statement of actual cost of the project from the borrower. The actual cost as per the certified statement submitted by the borrower should be compared with the projected statement of project cost to be incurred at each stage of the project. For cost overrun, if noticed, close monitoring is called for to prevent the account from turning into NPLs.

Due to inefficient management of advancing loans without regard to credibility of borrowers, compromising regulations and socio-economic political pressures, the Greece financial sector took a downturn in the financial crunch of 2007 according to Louzis (2012). In their seminal paper, Berger and DeYoung (1997) examine the relationship between loan quality, cost efficiency and bank capital. They find that banks devoting few resources to credit selection and monitoring, even if they are more cost-efficient in the short term, will have a larger amount of NPLs in the future. The same effect occurs when managers do not have the skills to measure credit risks and to properly assess loans collaterals.

High lending rates

According to Collins and Wanjau (2011), Interest rate is defined as the cost incurred by the borrower for the use of money they borrowed from a lender or a financial institution. This price has an impact on the financial performance of the commercial banks in particular through its loan or credit extended. This rate normally fluctuates as per creditworthiness of the borrowers and depends upon the loan's objectives (WorldBank, 2018). Thornton et al, (2015) defined it as the interest rate charged by banks to the private sector. The deregulation, characterized by abnormally high-interest rates, is the major reason behind most of the banking and financial crises as stated by Fofack, (2005). The Non-Performing Loans increase significantly in response to higher interest rates (Castro, 2013). According to Espinoza & Prasad (2010), when economy is going down and the interest rates are going high, Non-Performing Loans will rise. An increase in interest rate weakens loan payment capacity of the borrower therefore non-performing loans and bad loans are positively correlated with the interest rates.

High interest rate have a significant and positive relationship with Non-Performing Loans. When banks increase interest rate, there is an additional payment burden on borrowers resulting in increased defaults (Stiglitz and Weiss, 1981; Reddy, 2002; Boyd and Nicolo, 2005; Keeton and Morris, 1987; Fofack, 2005; CollinDufresne & Goldstein, 2001; Asari et al, 2011). Some of the studies have also shown a weaker or insignificant relationship between interest rate and Non-Performing Loans (Kaplin et al, 2009; Patnaik and Shah, 2004; Epinoza and Prasad, 2010). The study of Sinkey (2002) shows that increase in interest rate negatively impacts the loan defaults. Similarly, the study of Rajan and Dhal (2003) indicates a significant association of high cost of borrowing and Non-Performing Loans (NPLs).

Banks with high interest rate charges comparatively face higher default rate or non-performing loans. Sinkey and Greenwalt (1991), Rajan and Dhal (2003) and Waweru and Kalini (2009) in their respective studies in the US, India and Kenya on the commercial banks indicated that high interest rate charged by the banks is one of the internal factors that leads to incidence of non-performing loans. Messai and Jouini (2013); Farlan et al, (2012); Chikoko et al, (2012) and Vatansever and Hepşen (2013) assert that high interest rate charged on borrowers increase the level of non-performing loans. On the same note Louzis, Vouldis and Metaxas (2010) indicated that floating interest rate raised major problem to borrowers thereby increasing the level of non-performing loans. Waweru and Kalani (2009) affirm that high interest rate charged on borrowers will force them to indulge in risky activities and it is usually accepted by risk borrowers. According to Khemra, Saba, & Pasha, (1987), banks which charge relatively higher interest rates and lend excessively are likely to incur higher levels of non-performing loans.

Rising government arrears

A further factor affecting the rise in NPLs is the amount of sovereign debt, which curbs investments (Makri et al., 2014; Ghosh, 2015) and weakens the banking system when it is high, thus accentuating the possibility of a crisis (Reinhart and Rogoff, 2011).

Poor Management of Loan Portfolio

Poor loan portfolio management has been cited as another important cause of non-performing loans by different scholars. According to Messai and Jouini (2013), Management inefficiencies are positively related with future rise in NPLs. Waweru and Kalani (2009) assert that non-performing loans are caused by poor credit risk management practices. Well-structured credit philosophy and credit culture will reduce management inefficiencies hence reduce non-performing loans. This is a controllable cause of non-performing loans hence Fernández, Jorge and Saurina (2000) cited in Waweru and Kalani (2009) indicated that growth of bank lending and prudential

guidelines are always on the agenda of bank supervisors. Waweru and Kalani (2009) further indicated that it is difficult for banks to follow prescribed guidelines in a competitive environment where lending institutions compete for market share and profits. However, failure to follow prescribed guidelines in lending increases non-performing loans which can lead to bank failure. In this case it is mandatory to follow prudent lending practices. Some banks have un-sound credit assessment procedures and they insist on credit quantity at the expense of quality loan book. There are also issues of poor risk consciousness among lenders which increases NPLs (Ning-ning, 2009).

Insider Lending and Moral Hazard

Shingjergji (2013) and Waweru and Kalani (2009) indicated that NPLs are caused by moral hazard and imprudent lending practices by bank employees and owners. Bank management might engage in insider lending and charging exorbitant interest to risky clientele in order to maximize return which promotes moral hazard. Brownridge (1998) cited in Waweru and Kalani (2009) stated that insider loans are considered to be major contributors to failed banks. According to the Reserve Bank of Zimbabwe Monetary Policy Statement (2014) non-performing loans are increased by insider loans. This is a confirmation of researches done in other countries.

Waweru and Kalani (2009) indicated that in Kenya, moral hazard and insider loans perpetuate imprudent lending behaviour in the financial services sector. Some banks with weak internal control suffer from moral hazard (Ning-ning 2009). Borrowers usually engage in more risky activities than what was agreed with the bank.

High Rate of Unemployment

Shingjergji (2013), Messai and Jouini (2013), Farlan et al, (2012) and Vatansever and Hepşen (2013) agreed that high rate of unemployment in any country has a positive relationship with increased NPLs. Louzis, Vouldis and Metaxas (2010) added that unemployment affects the borrowers’ source of income which weaken the ability to repay borrowed funds. There is a strong positive relationship between NPLs and high rate of unemployment Lazea and Luga (2012).

3. Methodological Approach

The quantitative research approach was used in this study, with descriptive survey as the design. The population of the study was made up of 150 staff comprised of lending officers, operations officers and branch managers in Lusaka District found in Lusaka province of Zambia. Using the Yamane Taro (1967) formula, 108 respondents were selected for the study. The simple random approach was used. The researcher used a structured questionnaire to gather data from the respondents. However, only 78 respondents returned complete filled in questionnaires. This represents a 72.22%

response rate. The data collected from the respondents was coded and processed using Statistical Package for Social Science (SPSS) whilst descriptive statistical tools such as frequencies and percentages were used. Tables and graphs were used to present the results.

Results and Discussion

Non-Performing Loans are a big challenge in banks

Table 4.4. shows that 70.5% of the respondents stated that NPLs are a big challenge in the banks. 19.2% of the respondents were not sure that NPLs are a challenge whilst 10.3% of the respondents disagree that NPLs are a big challenge in banks. It can be observed that from the responses from the respondents, NPLs are a big challenge in the bank.

Table 1. NPLs are a big challenge in banks

Respondents	Frequency	Percent
Agree	55	70.5
Neutral	15	19.2
Disagree	8	10.3
Total	78	100.0

Source: Survey Data (2021)

Economic downturn

According to table 4.5 below, 60.3% of the respondents strongly agree that economic down turn has contributed to increasing levels of NPLs in the banks and 28.2% agree giving a total of 88.5% of the respondents agreeing that NPLs have increased due to economic down turn. 5.1% of the respondents are not sure whilst 6.4% of the respondents disagree that economic down turn has contributed to the increasing levels of NPLs

Table 2. Economic down turn

Respondents	Frequency	Percent
Strongly Agree	47	60.3
Agree	22	28.2
Not Sure	4	5.1
Disagree	5	6.4
Total	78	100.0

Source: Survey Data (2021)

Interest rates impact NPLs

Table 4.6 Shows that 43.6% of the respondents strongly agree and 23.1% agree that interest rates have a significant impact on NPLs. 14.1% respondents are not sure whilst 19.2% disagree. It can be observed that the majority of respondents agree that interests do have an impact NPLs.

Table 3. Interest rates impact NPLs

Respondents	Frequency	Percent
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Strongly Agree	34	43.6
Agree	18	23.1
Not sure	11	14.1
Disagree	15	19.2
Total	78	100.0

Source: Survey Data (2021)

NPLS can be controlled if banks strengthen supervision of loan appraisals

According to Table 4.7, 64.1% strongly agree and 25.6% agree that NPLs can be controlled if banks increase the system of loan appraisals whilst 10.3% of the respondents disagree that NPLs can be controlled if banks increase the system of loan appraisals. This would therefore reduce Indo Bank Zambia experiencing NPLs

Table 4. NPLS can be controlled if banks strengthen supervision of loan appraisals

Respondents	Frequency	Percent
Strongly Agree	50	64.1
Agree	20	25.6
Disagree	8	10.3
Total	78	100.0

Source: Survey Data (2021)

Loss of reliable source of income

Table 4.8 shows that 70.5% of the respondents strongly agree and 21.8% agree that loss of reliable source of income increases the levels of non-performing loans, whilst 7.7% of the respondents strongly disagree

Table 5. Loss of reliable source of income

Respondents	Frequency	Percent
Strongly Agree	55	70.5
Agree	17	21.8
Strongly Disagree	6	7.7
Total	78	100.0

Source: Survey Data (2021)

Aggressive lending leads to large NPL volumes

According to table 4.9, it indicates that 56.4% of the respondents agree that aggressive lending leads to large NPL volumes whilst 19.2% agree. 12.8% disagree and 11.5% strongly disagree that aggressive lending leads to large NPL volumes.

Table 6. Aggressive lending leads to large NPL volumes

Respondents	Frequency	Percent
Strongly Agree	44	56.4
Agree	15	19.2
Disagree	10	12.8
Strongly Disagree	9	11.5
Total	78	100.0

Source: Survey Data (2021)

Company failures influences the level of NPLs

Table 4.10 shows that 66.7% of the respondents strongly agree and 29.5% agree that company failures influence the level of NPLs whilst 3.8% of the respondents disagree that company failures influence the level of NPLs

Table 7. Company failures influence the levels of NPLs

Respondents	Frequency	Percent
Strongly Agree	52	66.7
Agree	23	29.5
Disagree	3	3.8
Total	78	100.0

Source: Survey Data (2021)

Reduced buying ability of consumers contributes to NPLS

Table 4.13 below revealed that 57.7% of the respondents strongly agree whilst 19.2% agree that reduced buying ability of consumers contributes to NPLs whilst 10.3% disagree and 12.8% of the respondents strongly disagree

Table 8. Reduced buying ability of consumers contribute to NPLs

	Frequency	Percent
Strongly Agree	45	57.7
Agree	15	19.2
Disagree	8	10.3
Strongly Disagree	10	12.8
Total	78	100.0

Source: Survey Data (2021)

Inadequate mechanisms to gather and disseminate credit information

Table 4.14 shows that 12.8% agree that there are inadequate mechanisms to gather and disseminate credit information whilst 10.3% of the respondents are not sure. 25.6% of the respondents disagree and 51.3% strongly disagree that there are inadequate mechanisms to gather and disseminate credit information

Table 9. Inadequate mechanisms to gather and disseminate credit information

Respondents	Frequency	Percent
Strongly Agree	58	74.4
Agree	11	14.1
Disagree	9	11.5
Total	78	100.0

Source: Survey Data (2021)

High NPLs adversely affect fresh credit proposals and credit growth

According to table 4.16 below, 56.4% of the respondents strongly agree that higher NPLs may adversely affect attitude towards fresh credit proposals and credit growth. 19.2% agree

whilst 12.8% of the respondents disagree and 11.5% strongly disagree.

Table 10. High NPLs adversely affect fresh credit proposals and credit growth

Respondents	Frequency	Percent
Strongly Agree	44	56.4
Agree	15	19.2
Disagree	10	12.8
Strongly Disagree	9	11.5
Total	78	100.0

Source: Survey Data (2021)

5. Conclusion

The research concluded that economic down turn, high interest rates, loss of reliable income are some of the major challenges of non-performing loans in the banking sector. The research also showed that poor credit collection and monitoring contributes to the challenges of non-performing loans in the banking sector and this also contributes to higher levels of non-performing loans.

The research also showed that rising government arrears have continued to contribute to the causes of NPL due to the fact that it curbs investment. Poor loan portfolio management has been cited as another important cause of non-performing loans. NPLs are caused by moral hazard and imprudent lending practices by bank employees and owners. High Rate of Unemployment also contribute to causes of high NPLs.

REFERENCES

[1] Curak, M., Pepur, S. and Poposki, K., 2013. Determinants of non-performing loans—evidence from Southeastern European banking systems. *Banks & bank systems*,.

[2] Cucinelli, D. (2015). “The impact of non-performing loans on bank lending behavior: Evidence from the Italian banking sector”. *Eurasian Journal of Business and Economics*, 8, 59-71.

[3] Daniel, K. K., &Wandera, M. (2013).Effects of Credit Information Sharing on Nonperforming Loans. *European Scientific Journal*, 9 (13), 1857 – 7881

[4] Daniel, T. (2010). Issues of non-performing loan. Privately owned commercial banks in Ethiopia. *Journal of financial economic policy*, 10 (5), 145-148

[5] Fofack, H. and Fofack, H.L., 2005. Nonperforming loans in Sub-Saharan Africa: causal analysis and macroeconomic implications (Vol. 3769). World Bank Publications.

[6] Fundanga, c.m.2011. Innovative financial products on the zambian market in relation to credit interest rates and the private sector development.03 june, Lusaka..

[7] Joseph, Mabvure, T., Edson, G., Manuere, F., Clifford, M., &Michael, K . (2012). Non Performing loans in Commercial Banks: A case of CBZ Bank Limited In Zimbabwe

[8] Klein, N. (2013) ‘Non-Performing Loans in CESEE: Determinants and Macroeconomic Performance’, IMF Working paper: 13 (72)1-24.

[9] Kwambai, K. D. and Wandera, M. (2013) Effects of Credit Information Sharing on Non-Performing Loans: The Case of Kenya Commercial Bank', *European Scientific*

[10] Ndegwa, A., 2010. Strategic responses to the challenge of non-performing loans by Commercial Bank of Africa (Doctoral dissertation, University of Nairobi, Kenya).

[11] Ombaba, K.B.M., 2013. Assessing the Factors Contributing to Non-Performance Loans in Kenyan Banks.

[12] Richard, E., 2010. Factors that cause non-performingloans in commercial banks in Tanzania and strategies to resolve them. *Moving Africa Toward Sustainable Growth and Technological Development*, 11, pp.16-23.

[13] Samir, D. and Kamra, D., 2013. A comparative analysis of non-performing assets (NPAs) of selected commercial banks in india. *Opinion: International Journal of Management*, 3.

[14] Nyoni, T. (2018). Information asymmetry in the banking sector: A Zimbabwean Scenario. *International Journal of Marketing & Financial Management*, 6(1), 45-51.

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The Application of Quizizz Games on Vocabulary Retention of Non-English Majors Students: A Case Study at Thai Nguyen University of Education

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Abstract- The research was conducted at Thai Nguyen University of Education with non-English majored students to investigate the effects of Quizizz games in facilitating students' vocabulary retention and students' attitudes toward the use of Quizizz games in vocabulary learning. The study followed the quasi-experimental research model, with 82 students participated in the control and experimental groups. Data were collected through two instruments including pretest and posttest, and questionnaires distributed after the research period. The analysis of the data showed that the application of Quizizz games was beneficial to students. It made vocabulary learning more effective, increased vocabulary retention, and made the learning more motivating to students. Therefore, it was suggested that Quizizz games should be introduced in EFL classes.

Index Terms- Vocabulary retention, Quizizz games

I. INTRODUCTION

1.1. Rationale

The application of information technology in teaching English can be considered as one of the effective methods to encourage and increase students' interest in learning. The advent of a wide range of devices such as computers, smartphones, internet, social networks, etc. has been creating an endless connection in space and time in the process of teaching and learning in general and English in particular.

Game-based learning apps are tools used in various educational fields to make the learning and teaching process more enjoyable. According to studies in the field of education, computer games provide an enjoyable and comfortable learning environment for students and improve their problem-solving skills (Ebner & Holzinger, 2007)

In the process of learning foreign languages, learning vocabulary is considered a difficult part of language learning for learners, without vocabulary, language cannot be used effectively and no language can stand without words (Meara, 1980). Having an extensive vocabulary will help learners express themselves clearly and communicate well with clarity. Many recent studies show that one of the methods that make teaching and learning English vocabulary more interesting and effective is using available applications on smartphones or tablets. These applications can be flexibly applied in English teaching to support the development of the four skills of listening, speaking, reading, and writing as well as improving pronunciation, vocabulary development and reinforce grammar for learners. However, the use of these applications in teaching English to students of Thai Nguyen University of Education has not yet been noticed, students still face many difficulties in developing skills and especially in increasing students' vocabulary retention. In order to help students at Thai Nguyen University of Education have more tools to practice English in general and vocabulary in particular, the researchers decided to use Quizizz as a kind of game-based learning platform to help students develop their vocabulary retention.

1.2. Aims and Objectives of the Research

This study aimed to develop students' vocabulary retention by using Quizizz as a kind of game-based learning platform. There are 2 main objectives of this study, which can be seen below:

- + to measure the impact of Quizizz games on the students' vocabulary retention.
- + to investigate the learners' attitudes toward the use of Quizizz games in their vocabulary learning.

1.3. Research Questions

The researchers outlined 2 main questions as below:

- i. To what extent does the use of Quizizz games improve the students' vocabulary retention?
- ii. What are the learners' attitudes toward the use of Quizizz games in their vocabulary learning?

1.4. Scope of the research

This study was conducted at Thai Nguyen University of Education, Viet Nam and the research was done in the first-year semester of the academic year 2021-2022.

1.5 Significance of the research

The findings of this study were extremely important for the first-year students because they provided them a new way for improving their vocabulary retention by using vocabulary games. Furthermore, the findings were important to English teachers because they revealed the value of a new way for their students' vocabulary learning.

II. LITERATURE REVIEW

2.1. Vocabulary

Hornby (1995) defined vocabulary as "the total number of words in a language; vocabulary is a list of words with their meanings"(p.133). The way to look at vocabulary is similar to McCarthy (1990) who views vocabulary of a language as the words of that language, which is "a freestanding items of language that has meaning". Vocabulary can be defined as "the words of a language, including single items and phrases or chunks of several words which convey a particular meaning, the way individual words do" (Lessard-Clouston, 2013).

Hiebert and Kamil (2005) defined vocabulary as "knowledge of the meanings of words" that comes in at least two forms: oral and print. When speaking or reading orally, oral vocabulary refers to a set of terms for which individuals know the meanings. While writing or reading silently, print vocabulary consists of those words for which the meaning is known.

According to Nation (2001), word knowledge can be divided into productive vocabulary which focuses on the words that a person selects to use while speaking and writing and receptive vocabulary which concentrates on the ability to understand a word when it is heard or seen. Similarly, Thornbury (2002) explained that basically knowing a word means knowing its form and meanings, including the knowledge of spoken and written form, the grammatical behavior, derivations, collocations, register, connotations, word's frequency, and meanings.

According to Harmer (2007, p.229), it is necessary for learners to learn a word in context to see how it is used. He also stated that it is essential for learners to learn both meaning and form of a new word and these aspects of a word should be presented in close conjunction in order to ensure a tight meaning-and-form fit.

The critical role of vocabulary in language learning has been widely acknowledged by a number of researchers. According to Wilkins (1972), "without vocabulary, nothing can be conveyed while Lewis (1993) stated that vocabulary is "the core or heart of language". Therefore, promoting vocabulary learning has been a sustainable goal emphasized by any English training program, especially at basic levels.

2.2. Technology in language learning

Using information technology has become an important part of the learning process in and out of the classroom. According to Bull and Ma (2001), technology provides unlimited resources for learners. Harmer (2007) and Genç İter (2015) emphasize that teachers should encourage learners to find appropriate activities through the use of computer technology to succeed in language learning. Also, according to Harmer (2007), computer-based language activities can enhance collaborative learning among learners and can provide learners with the fastest information and provide them with relevant materials.

According to Traore and Kyei-Blankson (2011), the use of technology can motivate learners to learn vocabulary as highly

interactive technological learning materials are able to engage learners in learning. Learning activities are enhanced and enriched through the use of technology in the language classrooms. Traore and Kyei-Blankson (2011, p. 563) added that the use of technology gives the learners a “sense of freedom, motivation and encouragement they need for learning”.

2.3. Quizizz games in vocabulary learning

In recent years, educational apps have been used extensively in higher education such as Kahoot, Quizizz. These apps enable students participate in class activities by using their own mobile phones or computers.

Being a game-based educational app, Quizizz brings multiplayer activities to classrooms and makes in-class exercises interactive and fun. According to Hamel (2016), Quizizz allows all students to practice together as they use computers, smartphones or tablets. Quizizz creates excitement for players by providing a game show-style review game that puts the entire experience in the hands of learners. Besides, Quizizz is a free tool that allows teachers to quickly turn practice activities into fun activities with many players. This tool also allows learners to access from various devices such as mobile phones and computers without the need for a username or password. To be able to participate, learners simply need to visit the Quizizz website, enter the game code provided by their teacher, and start playing. Teacher can keep track of the process and, once the quiz is completed, teacher can download the report to assess students' performance.

Quizizz can be considered as a fun way for learners to review their vocabulary and recall events form the game. It might help students remember the language associated with it as well as draw students' attention and increase their participation in the teaching and learning process.

III. RESEARCH METHOD

This study was designed according to experimental research. Participants of the study were divided in to control and experimental group, each of which was a class with 41 first-year students. The former group received no special treatment while Quizizz games were used for vocabulary learning of the later one in the period of 15 weeks. In the study Pre-test and Post-test were used by the researchers. The former was provided to both groups before the experimental group received the treatment. At the end of the research period, a posttest was given to both groups to collect data for analysis. Questionnaires after the application of Quizizz games were also distributed to students in experimental group to collect their opinions towards vocabulary learning after Quizizz games were used.

IV. FINDINGS AND DISCUSSION

The results of the study collected from two types: pre-test and post-tests; questionnaires are summarized as followings

4.1. Pre-test and post-tests results

4.1.1. Pre-test results

Table 1 and 2 below compare two different groups, namely CG (Control Group) and namely EG (Experimental Group) in terms of the differences in pre-test results

Table 1. Pre-test results of the Control group

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	41	1.50	4.00	2.8659	.78282
Valid N (listwise)	41				

Table 2. Pre-test results of the Control group

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	41	1.00	4.00	2.8049	.74898

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	41	1.00	4.00	2.8049	.74898
Valid N (listwise)	41				

It can be seen that the average score of the pre-test in CG was 2.8659 with a standard deviation of 0.78282 and that of the EG was 2.8049 with a standard deviation of 0.78282. The similarity of the test results implied that the two groups' vocabulary retention were the same before Quizizz games was employed to vocabulary learning.

4.1.2. Post- test results

As can be seen from the tables below, either with or without treatment, both groups achieved some improvement over a period of time. Significantly, the EG achieved better results than those gained by the CG. In the pre-test, the minimum and maximum scores of the two groups were not distinctly different. To be more specific, the lowest scores were 1.5 and 1.0, respectively, for the control and experimental group, while the maximum scores were both 4.0. However, for the post test, it is recognizable that the figures for both the minimum and maximum scores of the EG were higher than those of the CG. While the minimum and maximum scores of the experimental group were in turn 5.0 and 9.0, the figures for the control group were 4.5 and 7.5.

Table 3. Post test results of the Control group

	N	Minimum	Maximum	Mean	Std. Deviation
Post-test	41	4.50	7.50	5.8171	.67783
Valid N (listwise)	41				

Table 4. Post test results of the Experimental group

	N	Minimum	Maximum	Mean	Std. Deviation
Post-test	41	5.00	9.00	7.1951	.95445
Valid N (listwise)	41				

The tables also indicates that after the treatment with the use of Quizizz games, the average score by the experimental and control group were 7.19 and 5.81, respectively. It is recognizable that in the post test, the experimental group's average score was significantly higher than before. This result indicated that the intensive use of Quizizz reflected positive impact on students' vocabulary learning.

4.2. Findings from the questionnaires with the experimental group

To capture students' interest towards the use of the Quizizz games in vocabulary learning and the benefits they got from the application of the app in their classroom, the post-intervention questionnaires were applied. Table 5 depicts students' attitudes towards vocabulary learning through the use of Quizizz games. After the treatment, it was recognizable that students' attitudes towards vocabulary learning were mostly positive. More students found Quizizz games are very interesting (58,5%) and interesting (29,3%). Only a total of 12% students found that the use of Quizizz games was slightly interesting (12.2%).

Table 5. Students' interest towards the use of the Quizizz games in vocabulary learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 3	5	12.2	12.2	12.2
4	12	29.3	29.3	41.5

5	24	58.5	58.5	100.0
Total	41	100.0	100.0	

According to Table 6 below, the number of students who strongly agreed and agreed that Quizizz games help them learn words easily accounted for 58,5% and 31,7% respectively which is the largest proportion of the chart. In contrast, the data for those who acknowledged that they partly agreed with the benefits of Quizizz was lower, at 9,8%. The result also indicates that that most students perceived Quizizz games as a useful tool in learning English vocabulary.

Table 6. Students’ opinions about the effectiveness of using games in memorizing words

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 3	4	9.8	9.8	9.8
4	13	31.7	31.7	41.5
5	24	58.5	58.5	100.0
Total	41	100.0	100.0	

When being asked about the frequency of words used after doing quiz on Quizizz on developing students’ skills of reading, listening, speaking and writing, 35 out of 40 students (accounting for 85.4%) completely agreed and agreed that Quizizz games had positive effects on developing their language skills.

Table 7. Students’ opinions about the frequency of words used after doing quiz on Quizizz on developing students’ skills of reading, listening

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 3	6	14.6	14.6	14.6
4	12	29.3	29.3	43.9
5	23	56.1	56.1	100.0
Total	41	100.0	100.0	

The results of this study were quite consistent across a number of previous studies to the point that over 80% of the participants of this research also shared the opinions that Quizizz games should be used for practising language skills because it helps to stimulate extrinsic and intrinsic motivation in EFL learners.

Table 8. Students’ opinions about the use of Quizizz games on developing skills of reading, listening, speaking and writing

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 3	7	17.1	17.1	17.1
4	9	22.0	22.0	39.0
5	25	61.0	61.0	100.0

Table 8. Students’ opinions about the use of Quizizz games on developing skills of reading, listening, speaking and writing

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	7	17.1	17.1
	4	9	22.0	39.0
	5	25	61.0	100.0
Total	41	100.0	100.0	

The study highlights the key point that due to the application of Quizizz games, students in the experimental group achieved much better results compared to those in the control group who did not received any treatment. This fact implied that Quizizz games had positive effects on students’ vocabulary learning.

The data analysis has shown that at first, students in both control and experimental group were at the similar level of vocabulary. However, after 15 weeks of research period, only experimental group who received special treatment under the implementation of Quizizz games made significant changes in the results. Quizizz games, therefore, was considered not only a way to practising vocabulary but also a form of entertainment for a number of students and the majority of the students in the experimental group would like to use Quizizz games for developing their language skills.

V. CONCLUSION AND RECOMMENDATIONS

This study investigates the impacts of Quizizz games in developing the first-year students’ vocabulary learning as well as students’ attitudes toward the use of the technique in vocabulary learning. Findings from the data collected showed that Quizizz games were effective. After the research period, students in the experimental groups found that the use of Quizizz games made vocabulary learning more interesting to them.

Based on the findings of the study, the following recommendations are suggested:

1. There should be greater focus on the effectiveness of Quizizz in developing English language in general and EFL vocabulary learning in particular.
3. More interest should be given to gamification’s Apps, digital games and gamified online quizzes that offer the EFL students more practice in a fun and interesting atmosphere..

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REFERENCES

1. Bull, S., & Ma, Y. (2001) Raising learner awareness of language learning strategies in situations of limited recourses. *Interactive Learning Environments*, 9(2), 171 -200. doi: 10.1076/ilee.9.2.171.7439
2. Gençter, B. (2015). How does technology affect language learning process at an early age? *Procedia - Social and Behavioral Sciences*, 199(2015), 311 – 316. doi: 10.1016/j.sbspro.2015.07.552
3. Harmer, J. (2007). *The Practice of English Language Teaching*. Harlow: Longman.
4. Hamel. (2016). *Interactive quizizz cheatsheet*.
<https://hosted.learnquebec.ca/eslcommunity/wpcontent/uploads/sites/20/2016/05/Interactive-Quizzes->
5. Hornby, A. S., (1995). *Oxford advanced learners' dictionary of current English*. Oxford: Oxford University Press.

6. Hiebert, E. & Kamil M. (2005). *Teaching and learning vocabulary: Bringing research to practice*.
7. Ebner, M., & Holzinger, A. (2007). Successful implementation of user-centered game based learning in higher education: An example form civil engineering. *Computer & Education*.
8. Lawrence Erlbaum Associates Publishers.
9. Lessard-Clouton (2013). *Teaching vocabulary*. TESOL Book Publications Committee
10. Lewis, M. (1993). *The Lexical Approach*. Language Teaching Publications.
11. McCarthy (1990). *Vocabulary*. Oxford University Press
12. Meara, P. (1980). Vocabulary acquisition: A neglected aspect of language learning. *Language Teaching and Linguistics Abstracts*.
13. Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.
14. Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge: Cambridge University Press
15. Schmitt, N. (2005). Current trends in vocabulary learning and teaching. In J. Cummins & C. Davison (Eds.), *International Handbook of English Language Teaching* (pp.827-841). Dordrecht, Boston: Kluwer Academic Publishers
16. Schmitt, N. (2010). *Researching Vocabulary: A Vocabulary Research Manual*. New York: Palgrave Macmillan.
17. Traore, M., & Kyei-Blankson, L. (2011). Using literature and multiple technologies in ESL instruction. *Journal of Language Teaching and Research*, 2(3), 561-568.).
18. Thorbury, S. (2002). *How to teach vocabulary*. England: Pearson Education Limited. Ur, P., (1998). *A course in language teaching*. Cambridge University Press.
19. Tomlinson, B. (2009). *Materials development in language teaching*. Cambridge: Cambridge University Press

Effect Of Procurement Tendering Management On Performance Of Vendors In Nyamira County, Kenya

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I. INTRODUCTION

Purpose: This study explored the effect of procurement tendering management on performance of vendor in Nyamira County, Kenya. The study is anchored on different theories relevant to specific objectives in this study.

II. STATEMENT OF THE PROBLEM

In a quite some time now, procurement tendering management has been facing a problem in many ways. Procurement tendering management has a lot of weaknesses hence bringing about loss of value for money and general compromised integrity and vulnerability to entire procurement tendering management. Vendors control management, risk management, legal jurisdiction and payment management is greatly affected if not well managed in the procurement tendering management (Mutai & Osoro, 2021)). Integrity is a global problem and inadvertently leads to loss of a lot of funds through bribery, bureaucracy, corruption and efficiency in public procurement. In Kenya, the Public Procurement and Asset Disposal Act (PPAD) Act 2015 sought among other things to promote competition, integrity, free and fairness of procurement and asset disposal procedures, increase transparency and accountability in the procurement tendering management, to increase public participation and confidence in the procedures Public Procurement Regulatory Authority 2020. This study sought to address the causes and validity of stakeholder concerns, and fill the gap by conducting a study to determine effect of procurement tendering management on performance of vendors in Nyamira County, Kenya. In view of the foregoing, this study was done in the Kenyan context so as to bridge the existing gap with the new knowledge as a result of this study.

2.2.1 Agency Theory

The agency theory clarifies reasons why some conduct or choices shift when shown by a group of individuals. The idea was crafted by Adolf Augustus Berle and Gardiner Means in 1932 when they discovered the issues of the agent and principle. They

researched the ideas of agency and how they applied in the improvement of enormous foundations. They found the interests of managers of a specific firm contrast from those of the proprietor of the firm, and applied the ideas of agency principle to clarify the beginning of those contentions (Phillips, 1997). The theory clarifies the connection between the principles that distributes work to someone else who is known as the agent. It clarifies their disparities in practices or choices by understanding that the two gatherings often have various objectives and free of their separate objectives may have various mentalities towards hazards. The theory discloses how to best arrange connections in which one gathering distribute the work while another gathering accomplishes the genuine work. In such manner, the principle looks for an agent to finish the work which they can't do (Murtishaw & Sathaye, 2006).

According to Ross (1973), the theory, all parties are driven by self-interest and it is assumed, dooms agency theory to inevitable inherent disputes. This suggests that if the parties are motivated by self-interest, the contacted actors are likely to be motivated by self-interested purposes which are not in the best interest of the principal, leading to disagreement since their objectives have become too significantly different. The agents are expected to conduct only in the collective interest of their principals. In the informed manner of the risk-sharing research popular in the 1960s and 1970s, Jensen and Meckling formed Berle and Means' work to develop agency theory as a standardized framework (Armitage & Conner, 1999).

By arguing that companies are organized to minimize the cost of having agents to pursue the principals' wishes (Reed, 1999). The agency theory suggests that multiple actors in a situation with the same goals should have various motives, and therefore these motivations can manifest in a myriad of contexts. It argues that there will always be partial objective conflict among parties, that efficiency and effectiveness are tightly connected, and that statements amongst principals and agents will always be imbalanced. This theory has been used in a spectrum of perspectives, and I have experimented with it. Government, finance, economics, economy, and advertising are representations of such disciplines (Locke & Latham, 1990). The agency theory is thought to be relevant for this in order to understand the effect of tender risk management on procurement tendering management

on performance of Nyamira County, Kenya, hence it gives a theoretical background for this study.

2.2.2 Game Theory

Many economic decisions involving more than one actor like buyer and supplier lead to the formation of a sequential, strategic game that involves expectation by one player of the other player's actions (Ajzen, 2012). Games like Prisoner's Dilemma have been used to showcase how significant number of people between two main characters increases the possibility of cooperative engagement. This is because interpersonal interactions enable people get to know one other, establish confidence, and counter the insufficient knowledge about the party's likely actions that is available in a specific contact.

And if the other party's intentions are unknown in a one-off contact, the theory predicts that both actors will fight to maximize their individual value (Eisenhardt, 1989). Based on the aforementioned foundation, the integrated supply chain management approach's basic assumptions are that the actors are logical and reasonable but may face information overload problem, and that the actors are self-interested utility maximizers who will cooperate though the continuous interaction under which greater overall gains can be actually realized. This rationale has been deployed in the integrated supply chain management literature to acquire an understanding of how buyers and suppliers might well be encouraged to collaborate over time and innovate to produce a greater pool of value rather than fighting over a fixed pool of value (Lefrancois, 2000). The idea that customers and suppliers should be trusting and transparent with one another, providing information through methods like open book costing to signify their commitment and future plans, is a critical component of this approach. As a result, the study employs game theory to determine the effect of procurement tendering management on performance of vendors in Nyamira County, Kenya.

2.2.3 Tendering Theory

Douglas (2003), who observed that referred tendering theory can also be seen as merely a procedural or standard theory rather than a concise or constructive one. Tendering theory, as shown by this claim, is nothing other than a paradigm of rational behavior, and rationality, according to this claim, it is a fundamental principle. Seeing as the approach of tendering theory, like almost all other social science theories, will be universal theories insensitive to the clarification of real behavior. According to Armitage and Conner (1999), tendering theory is not only about how tendering can be done, but also about outcomes which if accomplished would have consequence that can be observed, checked, confirmed, or falsified, whether aimed for or postulated as an axiom. As a result, the a priori statement that theories like tendering theory, which stipulate rationality and can be expressed in a normative manner as decision laws, cannot also be descriptive or optimistic is invalid. Such an assertion must be based on empirical evidence.

The reasoning for this statement is that it largely acknowledges that infringements of fair conduct will result in penalties. Only logical behavior or, more precisely, burning sensation, has a chance of succeeding in the market (Jensen & Meckling, 1976). The main difference between tendering theory and decision analysis theory commonly known as decision theory

is that tendering theory can help with universal optimization, while decision theory promotes using testing techniques to manipulate any single objective function, regardless of its functional type (Armitage & Conner, 1999). This study thus used Tendering Theory to establish the effect of tender control on on performance of vendors in Nyamira County, Kenya, hence giving a theoretical background of this study.

2.3.1 Tender Risk Management

Tendering is a Procurement Procedure whereby potential Suppliers are invited to make a Firm and unequivocal offer on the price and terms in which they will supply specified goods, Services or works which on acceptance shall be the basis of a subsequent contract (Habib & Hasan, 2017). Tendering is based on the principles competitiveness, fairness and accessibility, transparency, openness and probity. Internationally, all Public entities are subjected to open tendering by law so as to prevent fraud, waste, unethical practices or local protectionism (global trade negotiation 18th Dec.2006). Tendering language in Botswana is very similar to that employed by the World Bank. The Botswana Ministry of Finance is the ministry responsible for government procurement of consulting work. Although in the past the rules concerning procurement were very complicated and open to conflicting interpretations, in 2001 these rules were simplified and consolidated under one law (Chang & Lin, 2019).

The tendering cycle, where uncertainties are considered and incorporated to the contract value, that's where a large part of the project cost is completed. Hazards have generally been either not managed at all or quantified as a percent of the value of the contract, as per various research which have been carried out (Setiawati & Wahyono, 2017). Nonetheless, this perspective has changed over the decades, indicating that many more than half of contractors still don't really employ any formalized risk assessment techniques all throughout procurement procedure. Contractors should embrace systematic methodologies to make more accurate projections considering the importance of tender risk management in the procurement procedure. Structured management systems can make the difference between failure and success in the construction business, that's becoming more intricate. In order to effectively and efficiently store and process the available information, extremely sophisticated projects and an increased amounts of information involve the implementation of structured and formal methodologies. The adoption of computer software tools to manage these approaches is advocated (Cundell, Guilfoyle, Kreil & Sawant, 2020).

Contractors should be motivated and encouraged to embrace structured risk management practices and develop more awareness about their predictions through using of the tools. However, Daulay and Sapura (2019), reveal that there are few tender risk management support tools available, while those who are readily accessible have significant shortcomings. As little more than a result, constructing a support tool that is precisely tailored to the organizational requirements for tender risk management in the procurement tendering management could be a feasible option. The fact that tender risk management is essential not only for the success of a single project but for the overall company necessitates additional investigation.

2.3.2 Tender Control

There are several main steps that are mostly used in the tender control process (Guo, Liu & Peng, 2017). First, Tender control process is determined: the organization requesting the tender will determine the type Of tender that will be used, as well as what will be involved in the tender process. Second, request for tender is prepared: the request for tender outlines what is required, the contractual requirements and how you should respond. Thirdly, tenders are invited: the value, complexity and business category determines how tenders are invited. Fourthly, suppliers respond: you should first obtain all relevant documentation. At this stage it's important to attend any pre 14 tender briefing sessions being conducted, clarify any uncertainties, plan your response, prepare your response and submit your response in the right format, on time and at the right location. Other stages are fifth stage, this is the stage of evaluation and selection: each tender will be checked for compliance, and if compliant, then evaluated against the criteria specified in the tender documentation. The tender that offers best value for money will win the business. Six, involves notification and debriefing: when a contract has been awarded, the successful tenderer will be advised in writing (of the outcome. Unsuccessful tenderer are also advised and offered a debriefing interview. Finally, contracts established and managed: generally a formal agreement will be required between the successful tenderer and the relevant agency. This study aimed at investigating factors that makes this process ineffective (Grant, 2020).

According to Hussein and Makori (2018) the Public Procurement and Disposal Act 2005 section 45(1), it states what should be kept and maintained in tendering process. Procurement records shall be kept by all Public Procurement entities. Procurement entity shall keep records for each procurement for at least six years after the resulting contract was entered into or, if no contract resulted after the procurement proceedings were terminated. The records for procurement must include the description of the goods, works or services being procured, if a procedure other than open tendering was used, the reasons for doing so, Copy of the advertisement as it appeared in the newsletter or publication, the name and address of the person marking the submission, the price and the summary of the other terms and conditions of the tender, proposal or quotation, a summary of the evaluation and Comparison of tenders, proposals or quotations, including the evaluation criteria used, if the Procurement proceedings were terminated without resulting in a contract, the explanation of Why they were terminated, a copy of every document the act requires the procuring entity to Prepare and such other information or documents as are prescribed (Ongeri, & Osoro, 2021). Keeping the above record are vital because after a contract has been awarded or the Procurement proceedings have been terminated, the procurement entity shall on request, Make the records available for the procurement available to a person who submitted the Tender, proposal or quotation or, if direct procurement was used, a person with whom the Procurement 23 entity was negotiating .The procurement entity may charge a fee for making the Records available but the fee shall not exceed the costs of making the records available.

2.3.3 Procurement Practices

Unethical practices in Public Procurement was also facilitated by the lack of transparency in the system; the applicable

procedures were invariably inaccessible to the public according to Parilla and Abadilla (2021), make matters worse, Kenyan law does not prohibit public officials from participating in private enterprise. Indeed, the civil service is by far the most important launching pad for businessmen in Kenya as it gives senior government officials and politicians access to public resources, such as lucrative public procurement contracts. The participation of public officials in private enterprise has thus been a key source of corruption in public procurement, since the rules established to guard against conflicts of interest have invariably been breached (Ongeri, & Osoro, 2021). Procurement procedure are part of the procurement process which relate to the guidelines for acquiring of appropriate goods and services at the best possible cost to meet the needs of the organization in terms of quality, quantity, time and location.

According to Payne and Petrenko (2019), they viewed procurement practices as the sequential steps or techniques for getting a task done while Wanjiku and Mwangangi (2018) stated that procurement practices involves decision making where the authority in charge of the process compares several purchase requisitions that have been sent in reaction to a necessity, against pre-determined conditions prior to picking one or denying all of them. During bid evaluation, each offer must be carefully considered, on an equal basis, against the published evaluation criteria. The process must follow the approach and methodology set out in the procurement documents. The evaluation panel must determine the best 8 supplier based on the information provided by suppliers in their offer. The evaluation should take into account capability, capacity and value for money over the whole-of life of the procurement. While Ongeri, and Osoro, (2021), measured procurement practices into specification definition, bid invitation, bid evaluation and contract negotiation. In this study, procurement practices measured through tendering practices, supplier assessment and material control. The indicators of tendering practices will be; open tendering, restricted tendering, competitive tendering and single source tendering. Supplier assessment was measured by supplier capacity, turn-around time, and supplier consistency and supplier competency. Material control practices was measured by; inventory quantity levels, inventory planning control system, material handling and storage and physical distribution.

According to Wanjiku and Mwangangi (2018) training is the process of acquiring knowledge and skills by the Team who participate in the public tendering process for efficient and effective service delivery. Through training participants acquire new sets of values and attitudes. The appreciation of their inherent but untapped potential and reinforce their self-confidence and sense of autonomy as opposed to dependency. For any project to be implemented successfully people involved must be trained. The training offered must be of quality to ensure effective implementation of tendering process. If this is lacking then the tendering process will be adversely affected (Mkonu and Gichana, 2019). According to the Public Procurement and Disposal Act 2005 section (7) procurement shall be staffed with procurement professionals whose qualifications have been recognized by the authority. The authority shall facilitate the establishment of an examination body for procurement professionals and shall ensure support for their professional association. These means that learning is knowledge and

knowledge is power (Mohammad & Akram, 2017). This study aimed at investigating whether road constructing agencies trained their staff and the influence of the training on effectiveness of tendering process.

2.3.4 Information and Communication Technology

Information processing and communication technologies can range from the traditional modes to the modern internet-based and electronic technologies. The traditional methods include modes like face-to-face communication, telephone call, postal mails, courier services, memos, extension phones and many others. These modes, however traditional, are important depending on the size of organization and the kind relationship and activities carried out between the organization and its customers like suppliers (Mkonu and Gichana, 2019). The application of ICT, both within and between organization provide opportunities for improvement in the data storage, analysis and communication in many areas of procurement activities. The increased speed of transmission of data can shorten lead-times and bring about improvement in the synchronization of activities at different points in the supply chain. ICT reduces the duplication of data generation and the volumes of paperwork hence reduction in costs. Electronic exchange of information can lead to improvements in both the efficiency and effectiveness of procurement. ICT has opened up possibilities that could not have been available. It has changed what people do and has altered the environment for decision making. ICT systems can be both internal and external connectivity to an organization. Internal technologies link various points of an organization with restricted access to information. External technologies on the other hand link other organizations like suppliers and partners in the supply chain. Information sharing over these two categories of technology is on the platform of agreement on what to be shared and what not to be shared. The internal and external technologies include intranets, extranets and internet-based technologies (Möller & Halinen, 2017).

In order to meet today's operating challenges, managers are turning to ICT to enhance the services for clients, businesses and visitors, and improve internal efficiencies by lowering costs and increasing productivity. The executives are implementing scalable communication infrastructures to enhance economic development, draw new customers and businesses, and above all, offer excellent services to consumers (Muhalia, Ngugi & Moronge, 2021). According Mumelo, Odoyo and Onditi (2017) in Kenya, manual systems are a cause of key inefficiencies in regulation and operations of the function. ICT needs to be adopted to ensure proper functioning of the procurement system. This does not only involve computerization of the system but scaling communication technology. With globalization and internet connectivity, there is need to upscale the function in Kenya. The old methods of doing business consist of buyers managing forecasts and communicating requirements to suppliers via phone, fax and e-mail. Spreadsheets and manual reports are passed between the trading partners. These manual processes are slow and cumbersome. They cannot support today's demand-driven enterprises. According to Onger and Osoro (2021), supply chain procurement professionals 11 spend too much time "putting out fires" and reacting to daily problems. They cannot seem to find the time to develop strategic relationships with suppliers and deploy improved business processes that eliminate shortages.

The various aspects that hinder ICT growth in developing nations are infrastructure, business environment (financial, legal), social factors (such as poverty, illiteracy, urbanization level), educational factors and cultural environment. Procurement of goods, works, and services through use of ICT is emerging worldwide with the potential to transformation processes, improve market access, and promote integrity in public procurement. Studies in other countries show that ICT is a predecessor to superior performance of the procurement system. For instance, Marodin, Frank, Tortorella and Fetterman (2017), observed that the Government of Chile is using ICTs to facilitate the procurement from small businesses using a new business model and this has positively affected on the functioning of the procurement system especially, since the integration of online services in the system. Information access has been improved tremendously due to this. The system in Kenya if properly strengthened through integration of ICT can also yield these benefits. Procurement can take many forms, from uploading select information such as tender notices to a website to very comprehensive systems including the entire procurement process. Whatever complexity an ICT system might display, its use creates an immediate potential for making information public and widely available and thereby enhance transparency (Möller & Halinen, 2017).

2.3.5 Performance of Vendors in Nyamira County

The process of procurement is a critical process for almost all company especially manufacturing company as procurement determines the quality, cost, delivery of raw materials and most importantly the ongoing production operation of manufacturing company. To ensure everything goes smoothly depend on a right and appropriate vendor selection process. The selection and evaluation of vendors have been a widely discussed topic in the literature. Based on previous study, vendor is ought to satisfy a widely known standard of the following Rights Rule: right product, condition, quantity, time, customer, place and costs (Onger & Osoro, 2021). The most popular criterion considered by the decision makers for evaluating and selecting the most appropriate vendor is quality, followed by delivery, price/cost, manufacturing capability, service, management, technology, research and development, finance, flexibility, reputation, relationship, risk, and safety and environment. There are four most influential criteria that should be noted and evaluated in order to acquire the best and appropriate vendor to take on the procurement, which are: items quality, items delivery, items cost and item productivity.

Currently, most of industries have been focused on how to manage the vendor database in order to select the best vendor with good qualifications to procure their services or products. However, there is lack of information due to the number of vendor that has been increasing significantly until now. In general, the problem statements of this research paper to support the procurement response from the vendor during procurement tendering process, lack of vendor information for selection in procurement process, and inflexibility in procurement process. From these reasons, the aim of this paper is to develop a vendor management and e-procurement systems using android platform in order to carry out the problem in current procurement process. Vendor rating is a system for recording and ranking the performance of a supplier based on a variety of issues, such as the delivery of performance,

the quality of items, lead time and financial capacity of the supplier (Mkonu & Gichana, 2019). Vendor rating is an essential process to effectively purchasing of items in an institution.

The Kenyan perspective of vendor rating is companies who evaluate their suppliers find that they have better visibility into supplier performance, uncover and remove hidden cost drivers, reduce risk, increase competitive advantage by reducing order cycle times and inventory, gain insight on how to best leverage their supply base, and align practices between themselves and their suppliers. Companies pursuing supplier assessment commonly see over a 20% improvement in supplier performance metrics e.g., on-time delivery, quality, and cost. Some of the parameters they apply are lowest price on a bid and the track record of the suppliers in the previous orders they supplied. Bhutani (2021) views vendor rating as the process of measuring the performance of a vendor (supplier). His study notes the importance of measuring performance of the vendors by first establishing the issues that are unique to the company and fashioning a way to monitor how suppliers deliver on orders. The guiding principle towards understanding the effectiveness of the suppliers is the track record and the principles instituted by the organization itself to assure delivery of their orders. In effect the vendor rating as an avenue where an organization can continually assess the suppliers determining those that are effective in undertaking their roles. The study adopted descriptive research design, where both qualitative and quantitative research was combined as they support each other, one uses numerical and the other words. Descriptive research design will be employed since there will be quantitative data. Census survey was used in this study as all elements were selected. The study used purposive sampling technique was used since the respondents had the same characteristics, experience and skills. The target population of this study was 228 respondents who comprised heads of procurement, head of finance, head of administration and pre-qualified suppliers in Nyamira County.

The study sought to establish the effect of tender risk management on performance of vendors in Nyamira County. Many statements were structured to which the respondents responded to on a five-point Likert scale as shown in Table 1. The findings on the question as to whether there is tender risk control on performance of vendors; majority agreed with the statement with a mean score of 4.333 and standard deviation of 0.894. On whether there is risk transfer in on performance of vendors, the majority were in agreement with a mean of 3.750 and a standard deviation of 0.967. The study further sought to establish whether risk mitigation mechanism is put place by the county to mitigate risk in all levels in the procurement tendering management, the majority agreed with the statement with a mean of 3.500 while the standard deviation 0.910. The finding is congruent there are several main steps that are mostly used in the tender control process (Guo, Liu & Peng, 2017). Overall, the average scores on procurement procedures show a mean score of 3.861 and standard deviation of 0.924 implying majority were in agreement with all the statements.

Table 1 Tender Risk Management

Tender Risk Management	Mean	Standard Deviation
Show your level of agreement that there is risk control on performance of vendors in Nyamira County, Kenya	4.333	0.894
Show your level of agreement that there is risk transfer on performance of vendors in Nyamira County, Kenya	3.750	0.967
Show your level of agreement that there is risk mitigation on performance of vendors in Nyamira County, Kenya	3.500	0.910

Model summary

The study adopted a multiple regression analysis so as to establish the relationship of independent variables and dependent variables. The data showed that the high R squared is 0.712. It shows that the independent variables in the study are able to contribute 71.2% on performance of vendors in Nyamira County, Kenya if this research finding is implemented, while the remaining 29.8% is variations are other factors not covered in this study. This is in line with the findings of Ongeru and Osoro (2021).

Table 2: Regression Model Summary

Model	R	R ²	Adjusted R ²	Std Error of the Estimate
1	0.844	0.712	0.698	0.001

III. CONCLUSIONS

According to this study findings, the study concludes that tender risk management is the first important factor that affects vendors' performance in Nyamira County, Kenya. The regression coefficients of the study show that tender risk management has a significant influence on vendors performance in Nyamira County, Kenya. This shows that tender risk management has a positive influence on vendor's performance in Nyamira County, Kenya. Also the regression coefficients of the study show that tender control has a significant influence on vendor's performance in Nyamira County, Kenya. Further the study concludes that quality of supplies is the third important factor that affects vendor's performance in Nyamira County, Kenya. Finally, the study concludes that supplier financial capacity is the fourth important factor that affects vendor's performance in Nyamira County, Kenya. This shows that supplier financial capacity has a positive influence on vendor's performance in Nyamira County, Kenya.

REFERENCES

[1] Abushaikha, I., Salhieh, L., & Towers, N. (2018). Improving distribution and business performance through lean warehousing. *International Journal of Retail & Distribution Management*, 46(8), 780-800. <https://doi.org/10.1108/ijrdm-03-2018-0059>

- [2] Achieng, J. B., Paul, S. N., & Mburu, L. K. (2018). Influence of inventory management practices on performance of retail outlets in Nairobi City County. *International Academic Journal of Procurement and Supply Chain Management*, 3(1), 18-43.
- [3] Adewale, A. G., Olalekan, S. O., & Ademola, A. (2020). Channel of Distribution and Organizational Performance: Evidence from Selected Confectionary Businesses in Ogun State, Nigeria. *Hallmark University Journal of Management and Social Sciences*, 2(2), 123-128.
- [4] Ahmad, K., & Zabri, S. M. (2018). The mediating effect of knowledge of inventory management in the relationship between inventory management practices and performance: The case of micro retailing enterprises. *Journal of Business & Retail Management Research*, 12(02). <https://doi.org/10.24052/jbrmr/v12is02/tmeokoinitrbimpaptcomre>
- [5] Akar, E., & Dalgic, T. (2018). Understanding online consumers' purchase intentions: A contribution from social network theory. *Behaviour & Information Technology*, 37(5), 473-487. <https://doi.org/10.1080/0144929x.2018.1456563>
- [6] Alase, A. O. (2017). The tasks of reviewing and finding the right organizational change theory. *International Journal of Educational Leadership and Management*, 5(2), 198. <https://doi.org/10.17583/ijelm.2017.2631>
- [7] Ali, A., & Haseeb, M. (2019). Radio frequency identification (RFID) technology as a strategic tool towards higher performance of supply chain operations in textile and apparel industry of Malaysia. *Uncertain Supply Chain Management*, 215-226. <https://doi.org/10.5267/j.uscm.2018.10.004>
- [8] Allen, W., Cruz, J., & Warburton, B. (2017). How decision support systems can benefit from a theory of change approach. *Environmental Management*, 59(6), 956-965. <https://doi.org/10.1007/s00267-017-0839-y>
- [9] Ascarza, E., Neslin, S. A., Netzer, O., Anderson, Z., Fader, P. S., Gupta, S., ... Hardie, B. G. (2017). In pursuit of enhanced customer retention management: Review, key issues, and future directions. *Customer Needs and Solutions*, 5(1-2), 65-81. doi:10.1007/s40547-017-0080-0
- [10] Asudi, A. A., & Shale, N. (2019). Role of Warehouse Layout Design on Performance of Distribution Firms in Kenya; Case of DHL Supply Chain. *International Journal of Social Sciences and Information Technology*, 5(5), 22-38.
- [11] Atekes, J., U., D. & Dida, B., W. (2017). Agile Supply Chain Management Practices for Efficient Service Delivery. *International Journal of Social Policy, Management and Administration*, 5(2), 31-50.
- [12] A. Azarnivand and M. E. Banihabib, (2017). "A multi-level strategic group decision making for understanding and analysis of sustainable watershed planning in response to environmental perplexities," *Group Decision and Negotiation*, vol. 26, no. 3, pp. 629-648, 2017. View at: Publisher Site | Google Scholar
- [13] Habib and M. M. Hasan, (2017). "Business strategy, overvalued equities, and stock price crash risk,"
- [14] *Research in International Business and Finance*, vol. 39, pp. 389-405, 2017. View at: Publisher Site | Google Scholar
- [15] Ajzen, I. (2012). The theory of planned behavior. In P. A. M. Lange, A. W. Kruglanski, & E. T.
- [16] Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 1, pp. 438-459), England: Sage. Crossref Google Scholar
- [17] Ajzen, I. (2020). *The Theory of Planned Behavior: A Bibliography*. <https://people.umass.edu/ajzen/tpbrefs.html> Google Scholar.
- [18] M. Rugman and A. Verbeke, (2017). *Global Corporate Strategy and Trade Policy*, vol. Routledge, New York, NY, USA, 2017.
- [19] Pratiwi, W. Sutopo, R. Zakaria, and A. M. Rasli (2017)., "Formulating strategy through
- [20] QSPM based on SWOT framework: a case study spin-off company in Malaysia," *Advanced Science Letters*, vol. 23, no. 9, pp. 8646-8651, 2017. View at: Publisher Site | Google Scholar
- [21] Armitage, C. J., & Conner, M. (1999). The theory of planned behaviour: Assessment of predictive validity and perceived control. *British Journal of Social Psychology*, 38(1), 35-54. Wiley Online Library Web of Science@Google Scholar
- [22] Badwan, J. J., Al Shobaki, M. J., Naser, A., Youssef, M., & Amuna, A. (2017). Adopting Technology for Customer Relationship Management in Higher Educational Institutions. *International Journal of Engineering and Information Systems (IJEAIS)*, 1(1), 20-28.
- [24] Barnier, B. (2020, February 28). Economic efficiency definition. Investopedia. https://www.investopedia.com/terms/e/economic_efficiency.asp
- [25] Basheer, M. F., Siam, M. R., Awn, A. M., & Hussain, S. G. (2019). Exploring the role of TQM and supply chain practices for firm supply performance in the presence of information technology capabilities and supply chain technology adoption: A case of textile firms in Pakistan. *Uncertain Supply Chain Management*, 275-288. <https://doi.org/10.5267/j.uscm.2018.9.001>
- [26] Bhutani. (2021, January 21). Trends to look out for in warehousing & logistics industry in 2021. Cushman & Wakefield. <https://www.cushmanwakefield.com/en/india/insights/trends-to-look-out-for-in-warehousing-logistics-industry-in-2021>
- [27] Boit, J.S & Osoro, A. (2021), Factors Affecting Women in Strategic Management on Performance of County Government in Trans Nzoia, Kenya. *The International Journal of Business & Management* ISSN 2321-8916 October 2021 Vol 9 Issue 10
- [28] Bhattacharya, Sudipto, and Anjan V. Thakor. "Contemporary Banking Theory," *Journal of Financial Intermediation*, vol. 3 (October 1993), pp. 2-50.
- [29] Haynes, N. Nunnington, and T. Eccles (2017). *Corporate Real Estate Asset Management: Strategy and Implementation*, Taylor & Francis, Abingdon, UK, 2017.
- [30] Chang, W., & Lin, Y. (2019). The effect of lead-time on supply chain resilience performance. *Asia Pacific Management Review*, 24(4), 298-309. doi:10.1016/j.apmr.2018.10.004
- [31] I. Setiawati and A. C. Wahyono, (2017) "Purposing division strategy for pharmaceutical
- [32] producer Dexa Medica in the demanding market," *International Journal of Learning and Change*, vol. 9, no. 4, pp. 367-383, 2017. View at: Publisher Site | Google Scholar
- [33] Creswell, J. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. (4th Ed). Thousand Oaks, Sage Publications.
- [34] Crossman, A. (2019). *Convenience Samples for Research: A Brief Overview of the Sampling Technique*. Science Tech, ThoughtCo Publishers.
- [35] Cundell, T., Guilfoyle, D., Kreil, T. R., & Sawant, A. (2020). Controls to Minimize Disruption of the Pharmaceutical Supply Chain During the COVID-19 Pandemic. *PDA journal of pharmaceutical science and technology*, 74(4), 468-494. <https://doi.org/10.5731/pdajpst.2020.012021>
- [36] Daulay, R., & Saputra, R. (2019). Analysis of customer relationship management and marketing strategies against competitive advantage on the company's distributor in Medan city. *Proceedings of the Proceedings of the 1st International Conference on Economics, Management, Accounting and Business, ICEMAB 2018, 8-9 October 2018, Medan, North Sumatra, Indonesia*. <https://doi.org/10.4108/eai.8-10-2018.2288694>
- [37] Dubey, R., Gunasekaran, A., & Papadopoulos, T. (2017). Green supply chain management: Theoretical framework and further research directions. *Benchmarking: An International Journal*, 24(1), 184-218. <https://doi.org/10.1108/bij-01-2016-0011>
- [38] Douglas, D. (2003). Inductive theory generation: A grounded approach to business inquiry. *Electronic journal of business research methods*, 2(1), 47-54.
- [39] Efstathiou, G. (2018). Translation, adaptation and validation process of research instruments. *Individualized Care*, 65-78. doi:10.1007/978-3-319-89899-5_7
- [40] Eisenhardt, K. (1989) Agency theory: An assessment and review, *Academy of Management Review*, 14: 57-74.
- [41] G. Cattani, J. F. Porac, and H. Thomas, "Categories and competition," *Strategic Management Journal*, vol. 38, no. 1, pp. 64-92, 2017. View at: Publisher Site | Google Scholar
- [42] G. Cokins, *Strategic Business Management: From Planning to Performance*, John Wiley & Sons, New York, NY, USA, 2017.
- [43] G. Genoveva and S. T. Siam, "Analysis of marketing strategy and competitive advantage,"
- [44] *International Journal of Economic Perspectives*, vol. 11, no. 1, pp. 1571-1579, 2017. View at: Google Scholar

- [48] G. Jamali, E. Karimi Asl, S. Hashemkhani Zolfani, and J. Šaparauskas, "Analysing larg supply
- [49] chain management comopitive strategies in iranian cement industries," *E+M Ekonomie a Management*, vol. 20, no. 3, pp. 70–83, 2017. View at: Publisher Site Google Scholar
- [50] Goldratt, E.M. (2017). What is this thing called the Theory of Constraints? North River Press, Croton-on-Hudson, NY.
- [51] Guo, J., Liu, Z. Y., & Peng, T. (2017). The Impact of Bank Loans on Corporate Risk-Taking:
- [52] Promote or Inhibit? *Accounting Research*, No. 2, 42-48 + 96.
- [53] Grant, M. (2020, July 1). Customer service. What is customer service? Investopedia. <https://www.investopedia.com/terms/c/customer-service.asp>
- [54] Hoover, T. C., & Buzdar, A. (2017). Ethical considerations in human subjects research. *Ethical Challenges in Oncology*, 145-157. doi:10.1016/b978-0-12-803831-4.00009-9
- [55] Hussein, N. A., & Makori, M. (2018). Influence of Inventory Management Practices on Performance of Commercial State Corporations in Kenya: A Case of Kenya
- [56] Habib, A., & Hasan, M. M. (2017). Business Strategy, Overvalued Equities, and Stock Price Crash Risk. *Research in International Business and Finance*, 39, 145
- [57] I. Hyväri, "Roles of top management and organizational project management in the effective company strategy implementation," *Procedia - Social and Behavioral Sciences*, vol. 226, pp. 108–115, 2016. View at: Publisher Site | Google Scholar
- [58] Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3(4), 305–360.
- [59] Hussein, N. A., & Makori, M. (2018). Influence of Inventory Management Practices on Performance of Commercial State Corporations in Kenya: A Case of Kenya Electricity Generating Company. *The Strategic Journal of Business Change and Management*, 5(1), 960-983.
- [60] Imran, M., Hamid, S. N., Binti Aziz, A., & Hameed, W. (2019). The contributing factors towards E-logistic customer satisfaction: A mediating role of information technology. *Uncertain Supply Chain Management*, 63-72. <https://doi.org/10.5267/j.uscm.2018.5.002>
- [61] Ismail, N., Kinchin, G., & Edwards, J. (2017). Pilot study, does it really matter? Learning lessons from conducting a pilot study for a qualitative PhD thesis. *International Journal of Social Science Research*, 6(1), 1. doi:10.5296/ijssr.v6i1.11720
- [62] Ismail, N., Kinchin, G., & Edwards, J. (2017). Pilot study, does it really matter? Learning lessons from conducting a pilot study for a qualitative PhD thesis. *International Journal of Social Science Research*, 6(1), 1. <https://doi.org/10.5296/ijssr.v6i1.11720>
- [63] Kaleka, A., & Morgan, N. A. (2017). Which competitive Advantage(s)? Competitive advantage–market performance relationships in international markets. *Journal of International Marketing*, 25(4), 25-49. <https://doi.org/10.1509/jim.16.0058>
- [64] Karim, N. H., Abdul Rahman, N. S., & Syed Johari Shah, S. F. (2018). Empirical evidence on failure factors of warehouse productivity in Malaysian logistic service sector. *The Asian Journal of Shipping and Logistics*, 34(2), 151-160. <https://doi.org/10.1016/j.ajsl.2018.06.012>
- [65] Ken Research. (2020, December 18). Kenya logistics and warehousing market, Kenya freight forwarding market, Kenya logistics industry growth: Ken research. <https://www.kenresearch.com/blog/2019/08/kenya-freight-forwarding-market-analysis/>
- [66] Kenton, W. (2020, January 29). Understanding purchase order lead time. Investopedia. <https://www.investopedia.com/terms/p/purchase-order-lead-time.asp>
- [67] Ketokivi, M., & Mahoney, J. T. (2020). Transaction cost economics as a theory of supply chain efficiency. *Production and Operations Management*, 29(4), 1011-1031. <https://doi.org/10.1111/poms.13148>
- [68] Kinyanjui, J.N., Gakuu, C.M. and Kidombo, H.K. (2015) monitoring and Evaluation Skills, Performance Contracting System and Organizational Performance in Government Ministries in Kenya. *International Journal of Scientific and Research Publications*, 5(7).
- [69] Kim, R. Y. (2020). The impact of COVID-19 on consumers: Preparing for digital sales. *IEEE Engineering Management Review*, 48(3), 212-218. <https://doi.org/10.1109/emr.2020.2990115>
- [70] Knight Frank. (2016). Logistics Africa: Sub-Saharan Africa's Emerging Logistics Property Sector. <https://content.knightfrank.com/research/1114/documents/en/2016-4022.pdf>
- [71] Kumar, R. (2016). Economic Order Quantity (EOQ) Model. *Global Journal of Finance and Economic Management*, 5(1), 1-5.
- [72] Lade, P., Ghosh, R., & Srinivasan, S. (2017). Manufacturing analytics and industrial Internet of things. *IEEE Intelligent Systems*, 32(3), 74-79. <https://doi.org/10.1109/mis.2017.49>
- [73] Kongsong W. (2017). The Effect Of Contract Planning On Construction Project Performance. *International Journal of Applied Engineering Research*, 12(23), 13310-13313.
- [74] Lefrancois, G. R. (2000). *Theories of Human Learning: What the old man said* (4th edition). California: Wadsworth.
- [75] Li, D.-y., & Liu, J. (2014). Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *Journal of Business Research*, 67 (1), 2793-2799.
- [76] Liu, M. X., & Li, L. E. (2019). Strategic Differences, Financial Flexibility and Operating Performance Fluctuations. *Journal of Shanxi University of Finance and Economics*, 41, 80-92.
- [77] Li, Z. G., & Shi, X. W. (2016). Strategic Differences, Management Characteristics and Bank
- [78] Loan Contracts: Based on the Perspective of Risk-Taking. *Journal of Zhongnan University of Economics and Law*, No. 2, 68-77 + 159.
- [79] Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice-Hall.
- [80] L. Oliveira, P. T. S. Nascimento, A. M. Mello, and A. Fleury, "Costs and benefits of following cost strategies in value chains," in *Proceedings of the IEEE Portland International Conference on Management of Engineering and Technology (PICMET)*, pp. 501–509, Portland, OR, USA, September 2016. View at: Google Scholar
- [81] L.-T. Lu, "Strategic planning for Xiaomi: smart phones, crisis, turning point," *International Business Research*, vol. 10, no. 8, p. 149, 2017. View at: Publisher Site | Google Scholar.
- [82] JLL. (2020). Kenya Warehouses. Kenya Warehouses | JLL. <https://kenyawarehouses.live.jll.com/>
- [83] Lin, M., Lin, C., & Chang, Y. (2020). The impact of using a cloud supply chain on organizational performance. *Journal of Business & Industrial Marketing*, 36(1), 97-110. <https://doi.org/10.1108/jbim-04-2019-0154>
- [84] Logistics Update Africa. (2021). FROM magazine: Demand surges for Grade-A warehouses in Africa. <https://www.logupdateafrica.com/demand-surges-for-gradea-warehouses-in-africa-supply-chain>
- [85] Majid, U. (2018). Research fundamentals: Study design, population, and sample size. *Undergraduate Research in Natural and Clinical Science and Technology (URN CST) Journal*, 2(1), 1-7. <https://doi.org/10.26685/urncst.16>
- [86] Marodin, G. A., Frank, A. G., Tortorella, G. L., & Fetterman, D. C. (2017). Lean production and operational performance in the Brazilian automotive supply chain. *Total Quality Management & Business Excellence*, 30(3-4), 370-385. <https://doi.org/10.1080/14783363.2017.1308221>
- [87] Masudin, I., Kamara, M. S., & Zulfikarjah, F. (2018). Impact of inventory management and procurement practices on organization's performance. *Singaporean Journal of Business Economics and Management Studies*, 6(3), 32-39. <https://doi.org/10.12816/0044429>
- [88] Mathivathanan, D., Govindan, K., & Haq, A. N. (2017). Exploring the impact of dynamic capabilities on sustainable supply chain firm's performance using grey-analytical hierarchy process. *Journal of Cleaner Production*, 147, 637-653. <https://doi.org/10.1016/j.jclepro.2017.01.018>
- [89] Mazareanu, E. (2019, November 7). Logistics industry: Issues for warehouse/DC operations U.S. 2019. Statista. <https://www.statista.com/statistics/930506/major-issues-for-warehouse-dc-operations-united-states/>
- [90] Mazareanu, E. (2020, June 10). Number of warehouse in U.S. Statista. <https://www.statista.com/statistics/873492/total-number-of-warehouses-united-states/>
- [91] Melati, M., & Slamet, A. (2019). Application Economic Order Quantity (EOQ) for Control of Raw Material Inventory. *Management Analysis Journal*, 8(4), 453-462.
- [92] Mkonu, A. M., & Gichana, J. O. (2019). Relationship between inventory management policies and supply chain performance of retail supermarkets in

- Nairobi city County in Kenya. *International Journal of Supply Chain and Logistics*, 3(2), 63. <https://doi.org/10.47941/ijsc.v3i2.294>
- [93] Mohajan, H. K. (2017). Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University. Economic Series*, 17(4), 59-82. doi:10.26458/1746
- [94] Mohammad, S. A. A., & Akram, A. M. (2017). Inventory management, cost of capital and firm performance: Evidence from manufacturing firms in Jordan. *Investment Management and Financial Innovations*, 14(3), 4-14. [https://doi.org/10.21511/imfi.14\(3\).2017.01](https://doi.org/10.21511/imfi.14(3).2017.01)
- [95] Möller, K., & Halinen, A. (2017). Managing business and innovation networks—From strategic nets to business fields and ecosystems. *Industrial Marketing Management*, 67, 5-22. <https://doi.org/10.1016/j.indmarman.2017.09.018>
- [96] Muhalia, E. J., Ngugi, P. K., & Moronge, M. (2021). Effect of warehouse management systems on supply chain performance of fast-moving consumer goods manufacturers in Kenya. *International Journal of Supply Chain Management*, 6(1), 1-11. <https://doi.org/10.47604/ijscm.1192>
- [97] Mumelo, J., Odoyo, F. S., & Onditi, L. A. (2017). Influence of Supplier Relationship on Performance of Small Scale Enterprises in Bungoma Town, Kenya. *International Journal of Business and Social Science*, 8(3), 57-66.
- [98] Murtishaw, H. & Sathaye G. N (2006). *Underlying Theories: The Principal and Agent*. New York, USA: International (P) Limited.
- [99] Mutai, K. V. & Osoro, A. (2021). Strategic Engineering Management on Performance of all Commercial Banks in Nyeri County, Kenya. *International Journal of Scientific and Research Publications*, Volume 11, Issue 10, October 2021 530 ISSN 2250-3153
- [100] M. E. David, F. R. David, and F. R. David, "The quantitative strategic planning matrix: a new marketing tool," *Journal of Strategic Marketing*, vol. 25, no. 4, pp. 342–352, 2017. View at: Publisher Site | Google Scholar
- [101] M. J. Mazzei and D. Noble, "Big data dreams: a framework for corporate strategy," *Business Horizons*, vol. 60, no. 3, pp. 405–414, 2017. View at: Publisher Site | Google Scholar
- [102] M. Katsioloudes and A. K. Abouhanian, *The Strategic Planning Process: Understanding Strategy in Global Markets*, Taylor & Francis, New York, NY, USA, 2016.
- [103] M. M. E. Tehrani, "Analyzing strategic factors associated with issuance of environmental liability insurance policy in developing countries using SWOT and QSPM," *International Journal of Environmental Science and Development*, vol. 8, no. 5, pp. 359–365, 2017. View at: Publisher Site | Google Scholar
- [104] M. Pazouki, S. A. Jozi, and Y. A. Ziari, "Strategic management in urban environment using SWOT and QSPM model," *Global Journal of Environmental Science and Management*, vol. 3, no. 2, pp. 207–216, 2017. View at: Google Scholar
- [105] Niraula, S. R. (2019). A review of research process, data collection and analysis. *Insights in Biology and Medicine*, 3(1), 001-006. doi:10.29328/journal.ibm.1001014
- [106] Nnamdi, O. (2018). Strategies for managing excess and dead inventories: A case study of spare parts inventories in the elevator equipment industry. *Operations and Supply Chain Management: An International Journal*, 128-138. <https://doi.org/10.31387/oscm0320209>
- [107] Nobil, A. H., Sedigh, A. H., & Cárdenas-Barrón, L. E. (2018). A generalized economic order quantity inventory model with shortage: Case study of a poultry farmer. *Arabian Journal for Science and Engineering*, 44(3), 2653-2663. <https://doi.org/10.1007/s13369-018-3322-z>
- [108] Onger, N. V. & Osoro, A. (2021). Effect of Warehouse Consolidation on Performance of Registered Distribution Firms in Nairobi City County, Kenya. *The International Journal of Business & Management* ISSN 2321–8916. October, 2021 Vol 9 Issue 10
- [109] Parilla, E. S., & Abadilla, M. E. (2021). Supply Chain Management Adoption and Its Effect on Profitability of Philippine MSMEs. *Review of Integrative Business and Economics Research*, 10(1), 167-188.
- [110] Payne, G. T., & Petrenko, O. V. (2019). Agency theory in business and management research. *Oxford Research Encyclopedia of Business and Management*. <https://doi.org/10.1093/acrefore/9780190224851.013.5>
- [111] Ponte, B., Costas, J., Puche, J., Pino, R., & De la Fuente, D. (2018). The value of lead time reduction and stabilization: A comparison between traditional and collaborative supply chains. *Transportation Research Part E: Logistics and Transportation Review*, 111, 165-185. doi:10.1016/j.tre.2018.01.014
- [112] Potjanajaruwit, P. (2018). Competitive advantage effects on firm performance: A case study of startups in Thailand. *Journal of International Studies*, 11(3), 104-111. <https://doi.org/10.14254/2071-8330.2018/11-3/9>
- [113] Pourhejazy, P. (2020). Destruction decisions for managing excess inventory in e-Commerce logistics. *Sustainability*, 12(20), 8365. <https://doi.org/10.3390/su12208365>
- [114] Phillips, R. (1997). "Stakeholder theory & a Principle of Fairness." *Business Ethics Quarterly*. 7, 51-66.
- [115] P. Mao, S. Li, K. Ye, and H. Cai, "A field theory based model for identifying the effect of organizational structure on the formation of organizational culture in construction projects," *KSCCE Journal of Civil Engineering*, vol. 21, no. 1, pp. 45–53, 2017. View at: Publisher Site | Google Scholar
- [116] Radadiya, T. (2017). Advance Technology, New Innovation Utilizes in Warehouse, Logistics and Supply Change Management. *International Journal of Science and Research*, 6(11), 876-894.
- [117] Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics & Management Sciences*, 06(02). <https://doi.org/10.4172/2162-6359.1000403>
- [118] Ratheeswari, K. (2018). Information communication technology in education. *Journal of Applied and Advanced Research*, 3(S1), 45. doi:10.21839/jaar.2018.v3is1.169
- [119] Ross, S. (1973). The economic theory of agency: The principal's problem. *American Economic Review*, 63(2), 134–139.
- [120] Reed, D. (1999). Stakeholder change management theory: A critical theory perspective. *Business Ethics Quarterly*, 9(3), 453-483.
- [121] Sanders, K. (2018). Media review: Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches. *Journal of Mixed Methods Research*, 13(2), 263-265. <https://doi.org/10.1177/1558689817751775>
- [122] Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 69(S2), 107-131. doi:10.1007/s11577-017-0454-1
- [123] Shah, A., & Course, S. (2018). Building the business case for quality improvement: A framework for evaluating return on investment. *Future Healthcare Journal*, 5(2), 132-137. <https://doi.org/10.7861/futurehosp.5-2-132>
- [124] Sharma, G. (2017). Pros and cons of different sampling techniques. *International Journal of Applied Research*, 3(7), 749-752.
- [125] Sraha, G., Sharma, R. R., Crick, D., & Crick, J. M. (2020). International experience, commitment, distribution adaptation and performance: A study of Ghanaian firms in B2B export markets. *Journal of Business & Industrial Marketing*, 35(11), 1715-1738. doi:10.1108/jbim-05-2019-0197
- [126] Statista. (2020). Ecommerce - Africa | Statista market forecast. <https://www.statista.com/outlook/243/630/ecommerce/africa>
- [127] Statista. (2020). Warehousing & support activities for transportation. <https://www.statista.com/outlook/9140/109/warehousing-support-activities-for-transportation/united-states>
- [128] Stenius, O., Marklund, J., & Axsäter, S. (2018). Sustainable multi-Echelon inventory control with shipment consolidation and volume dependent freight costs. *European Journal of Operational Research*, 267(3), 904-916. <https://doi.org/10.1016/j.ejor.2017.12.029>
- [129] Sunol, H. (2020, September 25). Consolidation warehouse – Its meaning, benefits, and drawbacks. *Warehouse Technology Articles | Cyzerg*. <https://articles.cyzerg.com/consolidation-warehouse-meaning-benefits-and-drawbacks>
- [130] Sekaran, U., & Bougie, R. (2013). *Research Methods for Business: A Skill Building Approach* (6th Edition). New York: John Wiley and Sons Inc.
- [131] Shepherd, N. G. & Rudd, J. M. (2014). The influence of context on the strategic decision-making process: A review of the literature. *International Journal of Management Reviews*, 16(3), 340–364. doi: 10.1111/ijmr.1202
- [132] Sikdar, P., Kumar, A., & Makkad, M. (2015). Online banking adoption: A factor validation and satisfaction causation study in the context of Indian banking customers. *International Journal of Bank Marketing*, 33(6), 760-785.
- [133] Sun, J., Wang, B. Q., Cao, F., & Liu, X. Q. (2016). Does Corporate Strategy Affect Earnings Management? *Management World*, No. 3, 160-169.

- [137] S. R. Clegg, C. Carter, M. Kornberger, and J. Schweitzer, *Strategy: Theory and Practice*, SAGE, Los Angeles, CA, USA, 2011. *Accounting Earnings Management Behavior*. *Accounting Research*, No. 10, 23-29 + 96.
- [138] Tarver, E. (2020, September 3). How is the economic order quantity model used in inventory management? Investopedia. <https://www.investopedia.com/ask/answers/052715/how-economic-order-quantity-model-used-inventory-management.asp>
- [139] The Economic Times. (2020, May 13). Warehousing & logistics sector to grow at 35% in 2021: Report. <https://economictimes.indiatimes.com/industry/services/retail/warehousing-logistics-sector-to-grow-at-35-in-2021-report/articleshow/75704458.cms?from=mdr>
- [140] Theofanidis, D., & Fountouki, A. (2018). Limitations and delimitations in the research process. *Perioperative Nursing*, 7(3), 155-162. <https://doi.org/10.5281/zenodo.2552022>
- [141] Tilisi Research. (2018). The Warehousing Market in Kenya. *Research Tree Africa*. <http://researchtreeafrica.com/wp-content/uploads/2019/01/Warehousing-Market-Research-Report-Aug-2018.pdf>
- [142] Vaillancourt, A. (2017). Procurement consolidation in humanitarian supply chains: A case study. *International Journal of Procurement Management*, 10(2), 178. <https://doi.org/10.1504/ijpm.2017.10002182>
- [143] Varpio, L., Paradis, E., Uijtdehaage, S., & Young, M. (2019). The distinctions between theory, theoretical framework, and conceptual framework. *Academic Medicine*, 95(7), 989-994. <https://doi.org/10.1097/acm.0000000000003075>
- [144] Vatumalae, V., Rajagopal, P., & Kaliani Sundram, V. P. (2020). Warehouse management system of a third party logistics provider in Malaysia. *International Journal of Economics and Finance*, 12(9), 73. <https://doi.org/10.5539/ijef.v12n9p73>
- [145] Vodopivec, M., Mandeljc, R., Makovec, T., Malej, A., & Kristan, M. (2018). Towards automated scyphistoma census in underwater imagery: A useful research and monitoring tool. *Journal of Sea Research*, 142, 147-156. <https://doi.org/10.1016/j.seares.2018.09.014>
- [146] Wanjiku, J. M., & Mwangangi, P. (2018). Influence of logistics management on distribution performance of fast moving consumer goods in Nairobi city county, Kenya. *International Journal of Business Management & Finance*, 1(38), 651-671.
- [147] White, G. (2019, January 11). Warehousing: A foundation for economic growth. *Biz Community*. <https://www.bizcommunity.africa/Article/410/552/197417.html>
- [148] Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *The Journal of Law and Economics*, 22(2), 233-261. <https://doi.org/10.1086/466942>
- [149] Umana, E. A. (2019). Conflict Resolution Strategies And Organizational Performance: An Exploratory Analysis. *International Journal of Economics, Commerce and Management*, United Kingdom, 7(5).
- [150] Yan, T., Yang, S., & Dooley, K. (2017). A theory of supplier network-based innovation value. *Journal of Purchasing and Supply Management*, 23(3), 155-362. <https://doi.org/10.1016/j.pursup.2017.02.002>
- [151] Zhang, Y., Lin, W., Huang, M., & Hu, X. (2019). Multi-warehouse package consolidation for split orders in online retailing. *European Journal of Operational Research*, 289(3), 1040-1055. <https://doi.org/10.1016/j.ejor.2019.07.004>
- [152] Zunic, E., Delalic, S., Hodzic, K., Besirevic, A., & Hindija, H. (2018). Smart warehouse management system concept with implementation. 2018 14th Symposium on Neural Networks and Applications (NEUREL). [doi:10.1109/neurel.2018.8587004](https://doi.org/10.1109/neurel.2018.8587004)
- [153] Zwikael, O., Chih, Y., & Meredith, J. R. (2018). Project benefit management: Setting effective target benefits. *International Journal of Project Management*, 36(4), 650-658. <https://doi.org/10.1016/j.ijproman.2018.01.002>
- [154] Zylbersztajn, D. (2018). Measurement costs and governance: Bridging perspectives of transaction cost economics. *Caderno de Administração*, 26(1), 1. <https://doi.org/10.4025/cadadm.v26i1.44220>
- [155] Wang, B. Q., Hou, C. R., & Sun, J. (2018). Research on the Impact of Corporate Strategy on Corporate Performance. *China Soft Science*, No. 1, 127-137.
- [156] Wang, H. C., Zhang, X. P., Hou, C. R., & Li, X. Y. (2017). Corporate Strategic Differences and
- [157] the Cost of Equity Capital—Research on the Mediating Effect Based on Operational Risk and Information Asymmetry. *China Soft Science*, No. 9, 99-113.
- [158] Wang, H. C., Zhong, K., Hao, E. Q., & Hou, C. R. (2018). Corporate Strategic Positioning and
- [159] Corporate Financial Behavior: Theoretical Research Framework and Recommendations. *Financial Research*, No. 6, 3-13.
- [160] Zhang, H. L., & Wen, T. (2016). Validity Test and Screening of Alternative Indexes of Audit Quality. *Audit Research*, No. 4, 67-75.

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A Dummy Variable Regression Analysis of the impact of social media on university students' academic performance. A Case Study at the College of Arts and Sciences, the University of Alabama at Birmingham, USA.

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Abstract- This study focused on the impact of social media on university students' academic achievement at the University of Alabama at Birmingham's College of Art and Sciences. The demographic data and educational information were analyzed using descriptive statistics, and a dummy variable regression model was generated to assess the impact of social media on students' academic performance. Many respondents had less study time as a result of their strong participation in social media activities, resulting in low academic performance, according to the survey. Gender is not a factor in predicting a student's academic performance (GPA), according to the study. Furthermore, the investigation indicated that, in this current day, restricting the use of social media to students is inappropriate. As a result, students should be informed about how social media affects their academic performance.

Index Terms- social media, academic performance (GPA), dummy variable regression, Study time

I. INTRODUCTION

The internet's use has had a remarkable influence on the social connection among persons in today's global network of huge transmission. Because of the internet's invention, social media has grown in popularity and is now the most extensively utilized communication medium among students, particularly at the university level. Social media is a type of electronic communication in which people use the internet to share information, ideas, personal messages, and a variety of other things. Instructors are using technology to improve their delivery to increase learning among students, and this is shown in the widespread usage of social media in higher education. Social media also facilitates internet education learning by promoting

communication among stakeholders in the educational environment (Choney, 2010). Furthermore, social media is a useful tool for performing research and discussing personal academic interests and may also be utilized to form academic groups and improve e-textbook functionality by connecting students with collective ideas to collaborate (Chanche et al., 2012). On the academic front, studies have been conducted to determine the impact of social media use on student academic performance. The usage of social media in the educational arena encourages students to participate in extensive and in-depth studies through conversation. Performance, according to Tuckman (1975), is a person's outward demonstration of understanding, concepts, skills, ideas, and knowledge. He claimed that grades are used to describe a student's performance. As a result, students' academic performance must be carefully monitored and managed, considering all of the factors that can influence their academic performance positively or negatively. Academic performance is defined by Kobal and Musek (2001) as a student's knowledge, which is expressed in numbers and represents the degree of his or her adaptation to schoolwork and the educational system. Students' usage of social media has reached epidemic proportions, affecting their study time, grammar, and spellings when interacting on social media, and diverting their attention away from their studies (Ndaku, 2013). Even though social media has a lot of advantages, it also has a lot of drawbacks. As a result, there is a pressing need to investigate the impact of social media on students' academic performance.

1.1 Statement of the problem

It is impossible to overstate the importance of social media use among today's youth. Because of its growing popularity, economists and professors are debating if the amount of time spent on these sites will have an impact on students' grades. Choney

(2010), MehMood & Taswir (2013), Kist (2008), and Jacobsen & Forste (2011) believe that the use of technology such as the internet is one of the most important elements that might affect students' educational performance positively or negatively. Many parents and guardians are concerned that their children are wasting too much time on social media platforms and not studying enough. Even though many parents are concerned about their children's continual use of social media sites, many students continue to do so daily. Considering this, the purpose of this study is to determine the impact of students' use of social media sites on their academic performance.

1.2 Objectives of the study

The study's general objective was to determine the impact of social media on student academic achievement. The following were the study's specific objectives:

- i. To examine the impact of the average study time on students' academic performance.
- ii. To identify if gender has any impact on students' academic performance.

1.3 Research questions

- i. What is the impact of social media (Facebook, WhatsApp, Twitter, Instagram, Tiktok, LinkedIn, and others) on the students' academic performance?
- ii. What is the relationship between gender and academic performance?
- iii. What is the relationship between study time and academic performance?

1.4 Literature review

Junco et al (2010) define social media as "a set of online websites, services, and activities that promote collaboration, community building, involvement, and sharing." It is impossible to overstate the importance of social media use among today's youth. Many researchers, including Choney (2010), San Miguel (2009), and Enriquez (2010), looked into students' use of social media sites and found that it had a negative impact on their academic performance. According to a Nielsen Media Research study done in June 2010, about 25% of students' internet time is spent on social networking sites (Jacobsen & Forste 2011). According to data presented at the American Educational Research Association's annual conference in San Diego, California (2009), social media users study less and generate lower grades (Abaleta et al, 2014). Students primarily use social media sites for sociability rather than academic goals (Oye, Adam & Zairah 2012). Despite this, numerous research point to the benefits of using social media for learning. Furthermore, according to Oye, Adam, and Zairah (2012), the majority of students believe that social networking platforms help them progress academically. Junco, Heibergert, and Loken (2011), for example, found that using Twitter for academic and co-curricular discussions has a beneficial influence on college students' grades. This is due to

increased stakeholder engagement outside of regular classroom activities through the usage of Twitter. Lambic (2016) conducted a study with 139 students in Sombor (Serbia) to see if there is a link between the rate at which students utilize Facebook as a learning tool and their academic success. The findings revealed a link between the frequency with which students use Facebook for educational purposes and their academic achievement. According to Gregory, Gregory, and Eddy (2014), forming a Facebook group dedicated to mathematics course topic training and discussion outside of the classroom can significantly boost student commitment, fulfillment, and performance in a calculus course. Social media can be utilized in the classroom to increase student engagement and encourage greater learning (Kabilan, Ahmad & Abidin, 2010). In their study of Malaysian students using social networking sites and their impact on academic performance, Oye, Adam, and Zairah (2012) discovered that social networking sites utilized for only social and non-academic purposes have a negative impact on academic performance. Lau (2017) used students in Hong Kong to investigate the effects of social media and social multitasking on academic performance. He asserted that using social media for academic reasons did not have a substantial impact on academic performance. Using social media for non-academic purposes, on the other hand, has been shown to have a negative impact on academic achievement. According to Karpinski (2009), social media has a negative impact on students' academic performance that is far bigger than the benefits of using social media platforms. People all over the world have become addicted to the internet, which has resulted in more students utilizing social media than ever before. Those who are hooked users love to use the internet to put off their personal and professional duties, according to Nalwa and Anand (2003), with the result being poor academic performance. According to Karpinski (2009), users of social media platforms (Facebook, WhatsApp, etc.) dedicate less time to their academics than nonusers, resulting in poorer GPAs. According to Karpinski and Duberstein (2009), among the many distractions faced by today's generation, social media platforms (such as Facebook, WhatsApp, and others) remain a key source of distraction. Based on the available evidence, there is reason to suspect that social media use and academic performance are related.

1.5 Methodology

The research was conducted at the University of Alabama at Birmingham's faculty of arts and sciences. Stratified sampling technique was used to obtain information from 600 students using well-structured questionnaires. The demographic data and educational information were analyzed using descriptive statistics, while the impact of social media on students' academic achievement was assessed using dummy variable regression analysis. The analysis was carried out using MINITAB software.

1.6 Results

Descriptive statistics

Table 1: Descriptive Statistics

Variable	social media plat	Total Count	N	N*	Percent	Mean	SE Mean	StDev
GPA	Facebook	140	140	0	23.3333	3.3463	0.0353	0.4179

	Instagram	69	69	0	11.5000	3.6319	0.0542	0.4503
	LinkedIn	57	57	0	9.5000	3.3572	0.0694	0.5237
	Other	59	59	0	9.8333	2.9953	0.0277	0.2125
	Tiktok	194	194	0	32.3333	3.1191	0.0293	0.4084
	Twitter	65	65	0	10.8333	3.7166	0.0468	0.3770
	WhatsApp	16	16	0	2.6667	3.416	0.102	0.406
Average Study Time	Facebook	140	140	0	23.3333	4.094	0.109	1.287
	Instagram	69	69	0	11.5000	4.607	0.152	1.261
	LinkedIn	57	57	0	9.5000	4.149	0.196	1.479
	Other	59	59	0	9.8333	3.141	0.152	1.167
	Tiktok	194	194	0	32.3333	3.7985	0.0909	1.2664
	Twitter	65	65	0	10.8333	5.826	0.135	1.092
	WhatsApp	16	16	0	2.6667	4.094	0.276	1.103
Average time on social media	Facebook	140	140	0	23.3333	4.500	0.150	1.780
	Instagram	69	69	0	11.5000	3.471	0.155	1.289
	LinkedIn	57	57	0	9.5000	4.123	0.194	1.468
	Other	59	59	0	9.8333	3.8559	0.0514	0.3945
	Tiktok	194	194	0	32.3333	4.592	0.102	1.425
	Twitter	65	65	0	10.8333	2.585	0.126	1.014
	WhatsApp	16	16	0	2.6667	4.063	0.322	1.289

Variable	social media plat	Minimum	Median	Maximum
GPA	Facebook	2.5800	3.3700	3.9300
	Instagram	2.6600	3.9300	3.9300
	LinkedIn	2.4500	3.2500	3.9300
	Other	2.8200	2.8200	3.4800
	Tiktok	2.5300	2.9500	3.9300
	Twitter	2.8000	3.9300	3.9300
	WhatsApp	2.770	3.530	3.920
Average Study Time	Facebook	2.000	4.300	6.000
	Instagram	2.400	5.500	5.500
	LinkedIn	2.200	3.900	6.000
	Other	1.500	3.500	4.500
	Tiktok	1.6000	3.5000	6.5000
	Twitter	2.500	6.500	6.500
	WhatsApp	2.400	4.050	5.900
Average time on social media	Facebook	2.000	4.500	7.000
	Instagram	2.500	3.000	6.500
	LinkedIn	2.000	3.500	6.500
	Other	3.5000	4.0000	5.5000
	Tiktok	2.500	4.500	7.500
	Twitter	2.000	2.000	5.500
	WhatsApp	2.000	3.500	6.000

Field Data, 2022

To assess the impact of social media on students' academic performance, descriptive statistics were used. From the table above, Data was solicited from a sample of 600 respondents. Tiktok is the most widely used social media platform among students at the College of Arts and Sciences at the University of Alabama at Birmingham representing 32.33% and WhatsApp is the least used platform with only 2.67% of the population. The

highest GPA obtained is 3.93 and the least GPA is 2.45. The maximum number of hours spent by a student studying is 6 hours 30 minutes and the least time is 1 hour 30 minutes. The maximum time spent on a social media platform is 7 hours 30 minutes and the least time spent is 2 hours.

Analysis

We want to assess the impact of social media on the academic performance of students using a dummy variable regression analysis. In dummy variable regression, we need a reference group or variable.

Table 2: Regression Equation

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3.2224	0.0806	39.98	0.000	
Average Study Time	0.1562	0.0102	15.33	0.000	2.13
Average time on social media	-0.13500	0.00974	-13.86	0.000	2.25
Gender					
M	-0.0086	0.0211	-0.41	0.682	1.08

Regression equation analysis

From the table above, Males=1, Non-males=0.

In this analysis, each variable is compared with the reference group. A positive regression coefficient indicates that GPA is higher for males than non-males and a negative regression coefficient means that GPA is lower for males. From the table above, the GPA of males is lower than the GPA of Non-males. Again, the GPA of a student changes (increase/decrease) by 0.1562 for an hour change (increase/decrease) in study time. Thus, the more hours a student spent studying, the better the GPA when all the other factors are held constant. The GPA of a student decreases by 0.135 for an hour increase in the time spent on social media. Thus, spending more time on social media affects the GPA of a student. Essentially, studying for more hours improve GPA and vice versa; spending more hours on social media leads to a lower GPA. This implies students who use social media sites frequently turn to perform poorly academically. This study backs up MehMood and Taswir's (2013) findings that the usage of technology, such as the internet, can have a beneficial or negative impact on students' performance. Choney, (2010) and San Miquel (2009), for example, believe that students' use of social media has a negative impact on their academic performance.

Significance of regression coefficients and multicollinearity

Since the model has more than one predictor variable, we need to determine the variables that contribute to the prediction of GPA. From the table above, average study time and average time on social media are both statistically significant at a 0.05 level. This means that average study time predicts GPA beyond chance level, even after the effect of gender and average time spent on social media are considered. Similarly, average time spent on social media predicts GPA beyond chance level, even after the effect of gender and average study time are considered. On the other hand, gender is not statistically significant at 0.05 level. This means that gender does not contribute to the prediction of GPA. Multicollinearity assesses the relationship between the predictor variables. If multicollinearity is high, significance tests on regression coefficients can be misleading but if multicollinearity is low, then the tests can be informative. We can use the Variance Inflation Factor (VIF) to determine multicollinearity. Since the VIF values are very small, they imply that there is no multicollinearity among the predictor variables.

Coefficient of multiple determination

Table 3: Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.244486	72.82%	72.69%	72.45%

This value is used to determine how much of the variability in GPA is being explained by the dummy variable regression model. From the table above, the R-squared value is 72.82%. This means 72.82% of GPA variation can be explained by gender, average study time, and average time on social media.

1.7 Conclusion

According to the results of the dummy variable regression analysis, average study time and average time spent on social media are significant predictors of a student's GPA, and gender cannot be used to determine a student's GPA. We may deduce that time spent studying has a positive effect on students' academic performance, whereas time spent on social media has a detrimental impact. Again, gender has no impact on the academic performance of students. As a result, students who lack time management skills are vulnerable to the detrimental effects that social media platforms have on their users.

1.8 Limitations

Participants were asked how much time they spent studying or using social media on a typical day to determine the independent variables of average study time and average time spent on social media. Even though this question reliably counts time usage, it is unclear whether users are active when they check in to a particular social networking platform. Future research should consider the context of social media use rather than just the quantity of time spent on them. Finally, looking at the social media usage of just one university student may not be enough to fully explain its impact on the students' academic performance in general.

1.9 Recommendation

The following recommendations were made based on the findings:

Students should be encouraged to utilize their phones to augment their library study rather than constantly conversing with pals. Students should be encouraged to limit the amount of time they spend on social networking sites each day and instead use those hours to read novels and appropriate academic publications to expand their knowledge. It is also suggested that students be warned about the negative effects of social networking site addiction on their academic performance during orientation. They should be directed to websites that will benefit their academic work and research.

REFERENCES

[1] Abaleta, A. B, Centaza, S.M, & Calimlim, M. E. (2004). Impact of Social Networking on the Academic Performance of College Students in Arellano University-(Unpublished Dissertation) pp. 1-19.
 [2] Choney, S. (2010). Facebook Use Can Lower Grades by 20 Percent, Study Says. Retrieved from http://www.msnbc.com/id/39038581/ns.technology_and_sciencetech_and_gadgets/.Retrieved 14/08/13.

- [3] Davis, C. H. F., Canche, M. S. G., Deil-Amen, R., & Rios-Aguilar, C. (2012). *Social Media in Higher Education: A Literature Review and Research Directions*. Arizona: The Centre for the Study of Higher Education at the University of Arizona and Claremont Graduate University.
- [4] Enriquez, J.G. (2010) Facebook and Other Online Social Networking Sites Can Lower Grades, Study Says. <http://seerpress.com/facebook-and-other-online-social-networking-sites-can-lower-grades-studysays/6935/>.Retrived 14/08/13.
- [5] GreGory, P., GreGory, K., & Eddy, E. (2014). The instructional network: Using Facebook to enhance undergraduate mathematics instruction. *Journal of Computational Mathematics and Science Teaching*, 33, 5–26.
- [6] Jacobsen, W. C., & Forste, R. (2011). The Wired Generation: Academic and Social Outcomes of Electronic Media Use Among University Students. *CyberPsychology Behaviour & Social Networking* 18, (5) pp.6, 275-285.
- [7] Junco, R., Heiberger, G., & Loken, E. (2011). The Impact of Social Media and Social Networks on Education and Students of Pakistan. *International Journal of Computer Science*, 9, 407-410.
- [8] Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning*, 27(2), 119-132.
- [9] Kabilan, M., Ahmad, N., & Abidin, M. (2010). Facebook an online environment for learning of English in institutions. *Internet High Education*, 13, 179–187.
- [10] Karpinski, A. C. (2009). “A description of Facebook use and academic performance among undergraduate and graduate students,” paper presented at the Annual Meeting of the American Educational Research Association, San Diego, Calif.
- [11] Kirschner, P. A., & Karpinski, A. C. (2010). Facebook and academic performance. *Computational Human Behaviour*, 26, 1237–1245.
- [12] Kist, W. (2008). I gave up MySpace for lent: New teachers and social networking sites. *Journal of Adolescent & Adult Literacy*” 52 (3) pp. 245-247.
- [13] Kobal, D., & Musek, J. (2001). Self-concept and academic achievement: Slovenia and France. *Personal Individual Differ*, 30, 887–899.
- [14] Kubey, R., Lavin, M., & Barrows, J. (2001). Internet use and collegiate academic performance decrements: Early findings. *J. Commum.*, 51 92): pp. 366-382.
- [15] Kumekpor, T. K. B. (2002) *Research Methods and Techniques of Social Research*. Accra: Sonlife, 117-118.
- [16] Lau, W. W. F. (2017). Effects of social media usage and social media multitasking on the academic performance of university students. *Computational Human Behaviour*, 68, 286–291.
- [17] Lambic, D. (2016). Correlation between Facebook use for educational purposes and academic performance of students. *Computational Human Behaviour*, 61, 313–320.
- [18] Meh Mood, S., & Taswir, T. (2013). The effect of social networking sites on the Academic Performance on students in the college of applied sciences. *International Journal of Arts and Commence*, 2(1), 111-123.
- [19] Ndaku, A. J. (2013). Impact of Social Media on the Students’ Academic Performance in Ghana. *Networking*, 18 (5), 275-285.
- [20] Oye, N. D., Adam, M. H., & Zairah, A. R. N. (2012). Model of perceived influence of academic performance using social networking. *International Journal of Computational Technology*, 2, 24–29.
- [21] Quansah, J., Dwamena, Y., Kwabla, F. J., & Kanyir, K. C. (2016). Students’ Engagement in Social Media and Its Mainstay for Teaching and Learning. The Case of the Wa Nursing Training College. *American Journal of Educational Research*, 4, 961–969.
- [22] San Miguel, R. (2010) Study on Facebook and Grades Becomes Learning Experience for Researcher. *TechNewsWorld*.<http://www.technewsworld.com/rsstory/66805.html?wlc=1286985671&wlc=1287195471> Retrieved 20/08/13.
- [23] Schneider N. (2010) Facebook, Other Social Network Sites Could Lead to Lower Grades for Students.http://www.associatedcontent.com/article/1650000/facebook_other_social_network_sites.html?cat=4. Retrieved 20/08/13.
- [24] Tang, J. K. T., Yau, H. N., Wong, S. F., & Wong, S. K. (2015). The impacts on learning via social media: A study on post-secondary students in Hong Kong. *Community of Computational Information Sciences*, 559, 195–208.
- [25] Tuckman, H.P. (1975). Teacher Effectiveness and Student Performance. *Journal of Economics Education*, 7, 34–39.
- [26] Van der Schuur, W. A., Baumgartner, S. E., Sumter, S. R., & Valkenburg, P. M. (2015). The consequences of media multitasking for youth: A review. *Computational Human Behaviour*, 53, 204–215.

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Enhancing the first year students' English communicative competence through role-play activities at Thai Nguyen University of Technology

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Abstract- This paper presents a study on the application of role-play activities to the first year students at Thai Nguyen University of Technology and deals with the question if role play enhances the students' communicative competence. In the research, the experimental method was used. The pre-test and the post-test were assigned to both the control group and the experimental group to collect data. Then the data was analyzed through the descriptive statistical procedures of SPSS Version 20. The findings indicate that the students' communicative competence was improved through role-play activities. The students used their grammar and vocabulary more correctly and appropriately. Additionally, the students' pronunciation was improved substantially with intelligibility and they also communicated with each other better. Therefore, role play should be encouraged at Thai Nguyen University of Technology.

Index Terms- communicative competence, control group, experimental group, role play

I. INTRODUCTION

Globalization requires a common language in which people can communicate with each other. Among the languages, English plays an important role, which makes globalization more possible and effective (Bodapati, 2016). English language has become a compulsory subject at schools and universities in Viet Nam so that students can use English to exchange in the globalization process.

In order to meet the demand, university graduates not majoring in foreign languages in Vietnam are required to achieve a B1 level of English proficiency according to the Common European Framework of Reference for Languages. Regarding spoken interaction, students at this level can exploit a wide range of simple language to deal with most situations likely to arise whilst travelling. They can enter unprepared into conversation on topics that are familiar, of personal interest or pertinent to everyday life (e.g. family, hobbies, work, travel and current events) according to European Framework of Reference for Languages. It is, however, difficult for Vietnamese students in general and students at Thai Nguyen University of Technology

(TNUT) in particular to reach B1 level, especially the criterion of spoken interaction. This is firstly because students at Vietnamese high schools unequally pay attention to the four English skills. They only focus on reading, writing and grammar, which are tested in the national high school exam to finish schools. The untested speaking skills in the exam make students ignore it during their studying; and when going to university, they find it hard to speak in English. Moreover, students at Thai Nguyen University are often placed in a big class with more than 40 students. Students, therefore, have less chances to practice, discuss and talk to each other in English. In addition, students do not have many opportunities to communicate with foreigners in real life.

In the context of TNUT, appropriate techniques and strategies need to be implemented. Role play is one of communicative techniques which develops fluency in language students, promotes interaction in the classroom and increases motivation. (Ladousse, 1989).

Being aware of effectiveness of role play in increasing interaction and the necessity of improving the students' communicative competence at TNUT, I decided to conduct this research.

II. LITERATURE REVIEW

2.1. Communicative competence

There have been many different theories and definitions of communicative competence up to now. Chomsky (1965) defines that competence is the speaker-hearer's knowledge of his language.

In the following years, Hymes (1972) and Campbell and Wales (1970) propose a broader notion of competence, that of communicative competence. This notion is intended by them to not only grammatical competence (or implicit and explicit knowledge of the rules of grammar) but also contextual or sociolinguistic competence. (as cited in Canale and Swain 1980)

Canale and Swain indicate that communicative competence refers to both knowledge and skill in using this knowledge when interacting in actual communication. Knowledge refers here to what one knows about the language and about other aspects of

communicative language use; skill refers to how well one can perform this knowledge in actual communication. (as cited in Richards & Smichdt 1983, p.5).

In their book, Canale and Swain (1980) also point out that communicative competence refers to the relationship and interaction between grammatical competence, or knowledge of the rules of grammar, and social competence, or knowledge of the rule language use.

2.2. Definition of role play

Ladousse (1989) defines what role play means by looking at the words themselves. He shows that when students assume a role, they play a part (either their own or somebody else's) in a specific situation; play means that the role is taken on in a safe environment in which students are as inventive and playful as possible.

Having the same opinion with Ladousse, Ur (1996) shows that role play is used to refer to all sorts of activities where learners imagine themselves in a situation outside the classroom, sometimes playing the role of someone other than themselves, and using language appropriate to this new context. In term of the number of participants in a role play activity, he demonstrates that the role play is done in pairs very often, sometimes it involves interaction between five or six different roles.

2.3. Types of role play

In his book, Littlewood (1981) mentions that there are four types of role play.

The first type is role-playing controlled through cued dialogues. In this kind of role play activity, learners will normally have their cues printed on separate cards. These cues enable them to predict a large proportion of what the other will say and to prepare the general gist of their own responses.

The second type is role-playing controlled through cues and information. One learner is given detailed cues and the other has information that enables him to respond as necessary.

The third type of role play is role-playing controlled through situation and goals. In this role play, learners are initially aware only of the overall situation and their own goals in it. They must negotiate the interaction itself as it unfolds, each partner responding spontaneously to the other's uncommunicative acts and strategies.

The fourth type is role-playing in the form of debate or discussion. This kind is a variation of role-playing activity. The situation is a debate or discussion about a real or simulated issue. The learners make sure that they have adequate shared knowledge about the issue and different opinions or interests to defend.

Looking into the four types of role play, the author decided to select the third type that is role-playing controlled through cues situation and goals for students to practice. This type is suitable to students and help them to develop their creativity and interaction. In this research, all the situations were designed for pair work on role cards.

2.4. Relation between role play and communicative activities

Role play plays an important role in communicative activities. According to Littlewood (1981), role play is a kind of communicative activity. He shows that role play is a social interaction activity which is an important technique for creating a wider variety of social situations and relationships.

Through role play, the range of functions, structures and the areas of vocabulary that can be introduced, go far beyond the

limits of other pair or group activities, such as conversation, communication games, or humanistic exercises. Furthermore, a very wide variety of experience can be brought into the classroom. When students carry out a successful role play, they will develop their ability to interact with other people, practice speaking skills in any situation and build up the social skills from a very low level. Role play is one of a whole gamut of communicative techniques which develops fluency in language students, which promotes interaction in the classroom and which increases motivation. (Ladousse, 1989).

III. METHODOLOGY

3.1. Participants

The participants in the study were 40 first-year students majoring in electrical engineering, including 4 female students and 36 male students. They were all in the beginner level and at the end of the course they were expected to reach level 2 (A2) according to Vietnam's English 6-level language proficiency framework or they can communicate in simple and routine tasks.

To conduct the research, the participants were divided into two groups namely the control group and the experimental group. Twenty students were chosen for the control group and 20 students were in the experimental group.

3.2. The instruments

The study was conducted with a combination of the two main data collection instruments including pre-test, post-test and observations.

3.2.1. Pre-test and post-test

The pre-test and post-test were designed in the form of speaking and carried out to both the control group and the experimental group. Before role play was applied, both control group and experimental group were given a pre-test in which the students played roles to make conversations using situations on the card. After 15 weeks of the treatment, the students in control group and experimental group were required to do the post-test with the same situations of the pre-test.

3.2.2. Observations

The observations were implemented for 15 weeks. During that time, the author took notes information about the students' participation and interaction.

3.3. Data collection procedures

When students did the pre-test and post-test, their performance was recorded and marked by the teacher using assessment scales-level A2 of Cambridge English. Then the data was analyzed through the descriptive statistical procedures of SPSS Version 20.

IV. RESULTS AND DISCUSSIONS

4.1. Results from the pre-test and the post-test

4.1.1. Results of the average scores.

After being rated, the average scores of the students were demonstrated in the following table.

		Mean	N	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Control group	Pre-test	5.0000	20	1.62221	.36274	.000
	Post-test	7.3500	20	1.75544	.39253	
Experimental group	Pre-test	4.9000	20	1.71372	.38320	.000
	Post-test	9.7500	20	1.48235	.33146	

Table 1: The paired t-test results of the scores

It can be seen from Table 1 that the Sig (2-tailed) was 0.000 smaller than 0.05 which showed that there was an average difference between the pre-test and the post-test of both the control group and the experimental group. As for the control group, the scores of the post-test were 7.35 higher than those of the pre-test with M=5.00. In table 1, the average scores of the pre-test and post-test of the experimental group were significantly different with M=4.90 and M=9.75 respectively. To compare the results of the post-test between the control group and the experimental group, it was clear that the average scores of the experimental group were much higher than those of the control group. Mean of the control group was 7.35 while mean of the experimental group was 9.75.

As reported above from the results, the control group changed in a positive way. However, the mean difference was not the most remarkable because the results of the post-test in the control group were 2.35 points larger than those of the pre-test while the scores of the post-test was 4.85 points higher than those of the pre-test gained by the students in the experimental group. It can be concluded that there was a considerable change after 15 weeks of the intervention. Participants in the experimental group improved their communication skills a lot after the treatment of role play.

4.1.2. Results according to each assessment criterion

When students in the control group did the pre-test and post-test, the results were rated in term of vocabulary, pronunciation and interactive communication and shown in the following graphs.

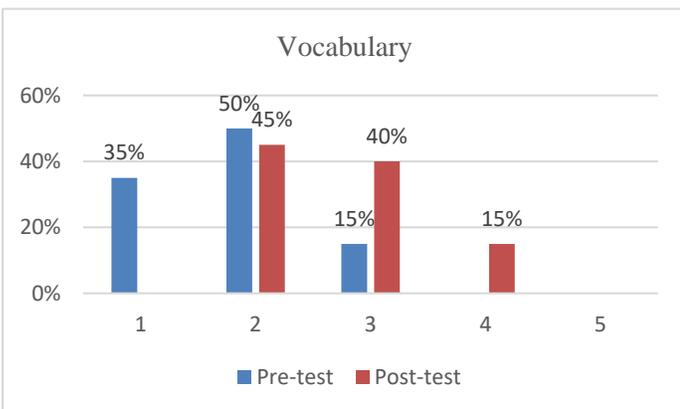


Figure 1: Comparison of scores in term of Vocabulary obtained by the control group in the pre-test and post-test

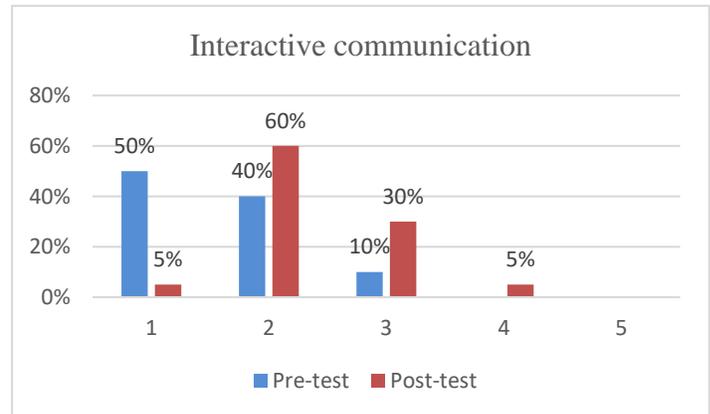


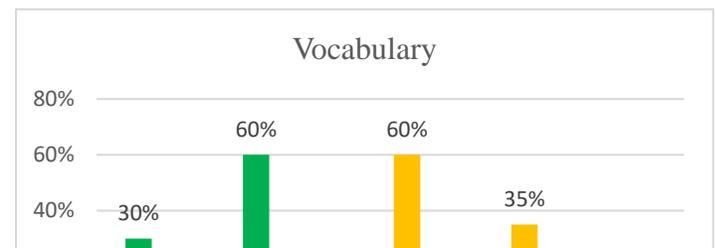
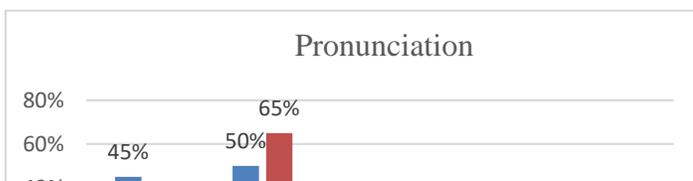
Figure 3: Comparison of scores in term of Interactive communication obtained by the control group in the pre-test and post-test

As illustrated in Figure 1, according to vocabulary criterion, 35% of the students got 1 point while 50% of the students had 2 points and only 15% of the students obtained 3 points in the pre-test of the control group. Nevertheless, in the post-test none of the students got 1 points, 45% and 40% of the students had 2 and 3 points respectively. The number of the students reaching 4 points was 15%.

It is revealed from Figure 2 that none of the students got 5 points based on the criterion of pronunciation in both the pre-test and post-test. In the pre-test, the percentage of students got 1, 2 and 3 points was 45%, 50% and 5% respectively. However, the number of students receiving 1 point decreased significantly at 5% so the students getting 2 points increased to 65%. Likewise, 25% of the students obtained 3 points, rising by 20% compared to the pretest and only 5% of them had 4 points.

In reference to the category of interactive communication, from Figure 3, there were still students getting 1 points with 50% in the pre-test and 5% in the post-test. The percentage of students obtaining 2, 3 points in the pre-test was 40%, 10% and in the post-test was 60%, 30% respectively. Only 5% of the students in the post test reached 4 points.

Looking at the experimental group, the data rated in term of the three criteria was shown in the three graphs below.



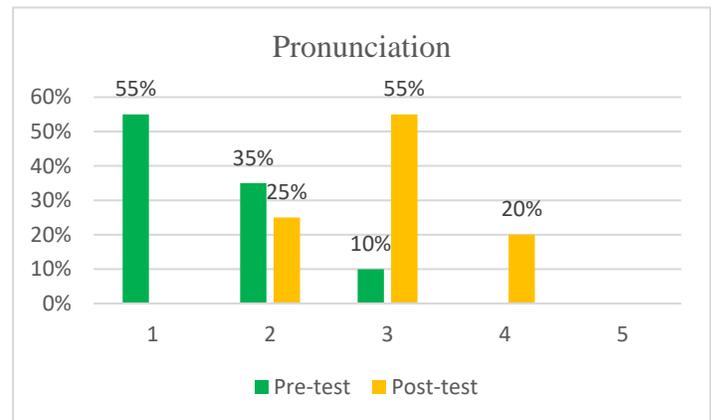


Figure 5: Comparison of scores in term of Pronunciation obtained by the experimental group in the pre-test and post-test

only
number
with

From the results above, it is obvious that there was some improvement in the control group in which the students' vocabulary was enhanced most. Nevertheless, the students' pronunciation and interactive communication were slightly improved. In comparison with the control group, the experimental group's communicative competence was improved substantially after role play had been applied.

After 15 weeks of the treatment, the students could make a great progress in vocabulary. They obtained 3, 4 or 5 points and none of them got 1 or 2 points changing a lot compared to the pre-test. They could, furthermore, improve their pronunciation and interactive communication especially interactive communication. Through role play, they interacted better with 40% of the students getting 4 points while none of them reached 4 points before the treatment. It is clear that their vocabulary, pronunciation and interactive communication could be improved considerably after the intervention.

It is actually evident that the students of the experimental group made considerable enhancements in communicative competence after taking part in role play activities in 15 weeks. This change was apparent compared with the control group.

4.2. Results from the observation

It can be reported from the observations that most of the students actively participated in role play activities with high excitement. Moreover, they also positively interacted with each other because the situations were similar to their real-life. Besides, the students could improve the ways to control the conversations and keep them going.

However, the author had difficulties in managing the class since the class was a bit noisy when students took part in role play activities.

V. CONCLUSION

In the paper, role play activities used in the classroom have been explored. The results show that the scores of the experimental group were better than the scores of the control

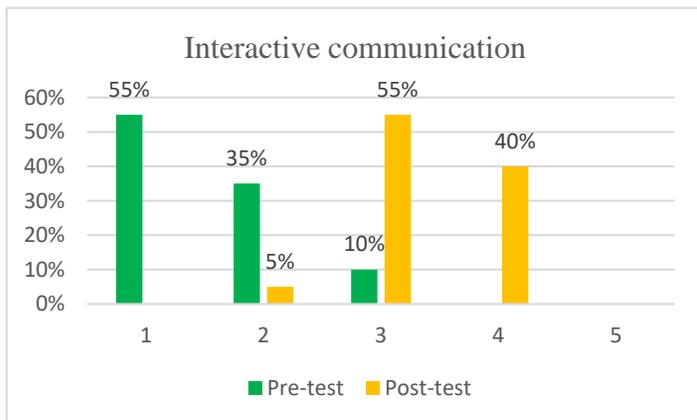


Figure 6: Comparison of scores in term of interactive communication obtained by the experimental group in the pre-test and post-test

Figure 4 shows the scores in term of vocabulary. It can be seen that in the pre-test of the experimental group, the percentage of the students got 1 and 2 points was 30% and 60% respectively while none of the students in the post test got 1 or 2 points. Moreover, only 10% of the students in the pre-test received 3 points, but the percentage rose to 55% in the post test. The number of students obtaining 4 points in the post-test was 40% and 5% was a number for the students reaching 5 points.

Another assessment criterion in the tests was pronunciation which was illustrated in Figure 5. It is clear from Figure 5 that in the pre-test the number of students with 1 points made up 55%, but the percentage of students getting 2 and 3 points was lower

group in the post-test. It cannot be denied that using role play could enhance communicative competence than using other kinds of activities, demonstrated by the results of the control group without the intervention of role play.

Through role play, the students pronounced more correctly and intelligibly and sometimes they could use some phonological rules such as linking and stress etc... They also improved their vocabulary and grammar considerably as they could use appropriate vocabulary and correct simple grammatical forms when taking part in real-life situations. Especially interacting in a conversation was easier and they could make the conversation smoother and exchange with each other. From the observations they were, furthermore, enthusiastic about the activities and engaged in the tasks.

In fact, role play was very effective in enhancing communicative competence for the first year students at Thai Nguyen university of Technology.

Because of the benefits of role play in teaching speaking skills and enhancing communicative competence, teachers should fully exploit it. It is suggested that teachers should choose the types of role play which are appropriate to their students' level and teachers' purpose of teaching. Moreover, teachers should decide the number of students in each role play activity that is proper with students' interest and topics. It is also recommended that teachers prepare different useful languages so that students can use them in each role play activity.

Besides, selecting materials is important so it is advisable that teachers utilize materials in which topics and situations can interest students and are familiar with students' everyday life. This stimulates students to participate in role play activities and use language more properly. In addition, when choosing course books, teachers should pick up the course books in which role play activities are included and can adapt them to suit to their students.

In conversing with each other, students can make some noises but teachers should not worry. It is advisable for teacher to go around the class and keep the control.

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REFERENCES

- [1] Canale, M. (1983). *From communicative competence to communicative language pedagogy*. In Richards, J. C., & Schmidt, R. W. (Eds.), *Language and Communication*, 2-27. London: Longman.
- [2] Canale, M., & Swain, M. (1980). *Theoretical bases of communicative approaches to second language teaching and testing*. *Applied Linguistics*, 1, 1-47.
- [3] Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, Massachusetts: M.I.T Press.
- [4] Doff, A. (1988). *Teaching English: a training course for teachers*. New York: Cambridge University Press.
- [5] Doff, A. (1988). *Teaching English: a training course for trainers handbooks*. The British Council: Cambridge University Press Inc.
- [6] Bodapati, P.B. (2016) . Impact of Globalization on English Language. <https://ashvamegh.net/impact-of-globalization-and-english-language>. Vol.II, Issue.XXIII
- [7] Ladousse, P. (1989). *Role Play*. Oxford University Press.

- [8] Little, W. (1981). *Communicative Language Teaching*. Cambridge: Cambridge University Press.
- [9] Richards, J.C & Schmidt, R.W. (1983). *Language and Communication*. Pearson Education.
- [10] Ur, P. (1996). *A Course in English Language Teaching*. Cambridge: Cambridge University Press.
- [11] The RelEx team . (2011) *Relating language examinations to the Common European Framework of Reference for Languages: Learning, teaching, assessment (CEFR) Highlights from the Manual*. Council of Europe

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Government Policy Through Indonesian Cross-Border Development With Malaysia In Facing Military Threats To Support The Defense Economy

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Abstract- Cross-border areas are an inseparable part of the Unitary State of the Republic of Indonesia (NKRI) which is essentially the foremost "veranda" of the Unitary State of the Republic of Indonesia and is the face of Indonesia for countries with direct borders and has very important and strategic meaning, both from a defense-security perspective as well as economic, social, and cultural perspectives, where each region has different characteristics and characteristics from one another. The purpose of this study is to analyze the policies issued by the government in dealing with military threats through the development of cross-border areas to support the national defense economy. This research method uses descriptive qualitative with library/literature studies. The results of the research and discussion show that the government's policy in its implementation is to deal with military and non-military threats to support the defense economy.

Index Terms- government policies, development, cross-border, military threats

I. INTRODUCTION

National Defense is a crucial part based on a State, both in the context of the economy as well as the security of the State. According to Parmitha, et., al. (2021) a country has 2 elements of resilience, including social security and national security. Social security is divided into 2, namely food security and economic security. Meanwhile, national security is resilience based on threats from other countries, both military and non-military. National security is centered on social security, and this also affects resilience in the context of national security, especially in national border areas. So this is related to using existing threats to the defense of the State.

The existence of the threat itself is defined as something that must be managed by the national defense system to ward off all forms of potential disturbances that endanger state sovereignty, the territorial integrity of the Republic of Indonesia, and the safety of all Indonesians (Muradi, on Widiartan, 2020). The existence of types of threats, both military and non-military, must be analyzed into collective threats as a result of which it can test the extent to which the state defense system can be implemented.

If the economy is weak, it will become the target of foreign countries & use the ease of entering & intervening in the Indonesian state. Therefore, Indonesia must have a reliable ability to maintain and maintain the survival of the nation and state, to achieve the expectations of the Indonesian state as stated in the preamble of the 1945 Constitution, namely to protect the entire Indonesian nation and all of Indonesia's bloodshed and to promote the general welfare, educate the nation's life and participate in carrying out global order from independence, peace never dies & social justice (Zein, 2016).

In other terms, threats, both military and non-military, can influence the behavior and patterns of national defense. Military threats, for example, the seizure of border areas, in addition, there is illegal logging, human trafficking, drug distribution, and so on. This is explained by Widiartana (2020) that military threats are generally caused by problems of cross-border violations committed by Indonesian citizens to neighboring countries, or vice versa. Therefore, it has become the policy of the National Border Management Agency (BNPP) to regulate the life & management of border areas. So that in addition to regulating legally, there is also a need for political confirmation that the border area of the State is the end based on the reach of the highest power of a State.

Border area means an inseparable part based on the Unitary State of the Republic of Indonesia (NKRI) which in essence is the foremost "veranda" based on the Unitary State of the Republic of Indonesia and is the face of Indonesia as a country with direct borders, and has a very crucial & strategic meaning, both from a defense-security perspective, as well as economic, social, and cultural perspectives, in which each region has characteristics & characteristics that are different from one another. According to Gede, et., al. (2018) the border of a country must have 2 aspects; Frontaire & Boundaries, which the Boundaries are transition zone between different life situations and also reflect antagonistic forces based on bordering countries. Meanwhile, the frontier still allows for mutual interpenetration between 2 bordering/neighbor countries.

BNPP's legal basis is the 1945 Constitution, Law 43 of 2008 concerning State Territory, Law no. 23 of 2014 concerning Regional Government, Government Regulation of the Republic

of Indonesia Number 55587, Government Regulation No. 26 of 2008 concerning the National Spatial Planning, Presidential Decree No. 12 of 2010 concerning BNPP, Presidential Decree No. 44 of 2017 concerning amendments to government regulation no. 12 of 2010, and BNPP Regulation No. 1 of 2015 (widiartana, 2021). If this border area is not managed properly and effectively, it puts the country's sovereignty at stake, of course, we do not want some of Indonesia's territory to be lost due to defeat in an international court, or because of a unilateral claim to Indonesian territory as happened with the islands of Sipadan and Ligitan.

towards the border areas. Malaysia". Besides that, there are also problems related to economic and social vulnerability at the border, this research was conducted by Paramitha et., al. (2021) in which the social and economic life of border communities, especially in Sambas Regency, generally still maintains its cultural authenticity and still relies on its natural potential or wealth. This situation has become the main capital and strength so that most of them are relatively stable in facing the situation of social distancing policies and closing the borders of the border posts.

Therefore, the problem that arises is how the government's policy is to assist the people in the border areas in supporting the defense economy, as well as how the government's efforts to build a cross border between Indonesia and Malaysia are in the face of military threats.

II. RESEARCH METHOD

This research is qualitative research with a case study approach. According to (Creswell, 2014) states that qualitative research is a method to explore and understand the meaning that comes from social or humanitarian problems, case study research with an exploratory approach. It was done to explore unique and interesting cases in certain limited systems. It is also more detailed in describing a phenomenon by collecting data directly. This study used certain data collection techniques, such as observation, interviews, audiovisual sources, documentation, and reports were analyzed descriptively. This research case is explored by researchers by investigating problems related to the focus of this research, understanding the phenomenon, and generalizing it into conclusions. According (to Moleong, 2012) argues that qualitative research is research that aims to understand the phenomena experienced by research subjects in natural object conditions.

The data exposure in this study refers to the concept of literature study research so that the description of the data generated from the literature study is sought either from the results of scientific research or news reports.

III. FINDINGS AND DISCUSSION

The border of a country or the state's border is known at the same time as the birth of the state. The state in the modern sense has been known since the 18th century in Europe. The state border is a geographical space that from the beginning was an area of a power struggle between countries, which was mainly marked by the struggle to expand the boundaries between countries. As part of the history and existence of the state, the history of border areas cannot be separated from the history of the birth and end of various countries (Gede, et., al. 2018).

According to Whittersley (1982), as quoted by Dhisksit that the boundary is a state boundary or border where by demarcation the location of the country in a predetermined world rotation, and binding together on its people under the law and a sovereign government, while the frontier is the area borders in a country that has limited space for movement but because of its location close to other countries so that outside influences can enter the country which results in the emergence of problems in the local



Figure 1. Indonesian Sea Border
 Source: batasnegeri.com

Considering the area of the Indonesian state which is approximately 1.9 million km², more than 17 thousand islands, more than 5 million km², and more than 3 million km² of them or 2/3 of Indonesia's territory consists of oceans. Because it has a large area, Indonesia has regional borders with many countries. Indonesia has three territorial boundaries where within these territorial boundaries, Indonesia and all its citizens are free to carry out activities as long as they do not violate applicable laws. For foreign countries passing through the Indonesian territory, it is necessary to make a report to the head of the relevant service if they want to pass through, carry out activities and enter the Indonesian territory, but violations by some foreign countries are still common and this situation can be a threat to the sustainability of the State in the future come.

The condition of the border area mentioned above is a gateway for economic activity that binds the welfare of the people between countries at the border, in this case between Indonesia and Malaysia. Research on defense management at the border between Indonesia and Malaysia conducted by Roisah et., al. (2018) illustrates that every policy implemented in each country will have an impact on sectoral conditions, both in terms of diction and attitudes among people in border areas. One example of a defense policy is overcoming illegal logging, illegal fishing, human trafficking, smuggling of drugs, sugar, necessities and so on that have a detrimental impact on each country, thereby weakening the sovereignty of a country.

Djafar (2020) asserts that "there is an agricultural cycle, in which the market for agricultural products spreads to areas outside Sarawak, as well as establishing economic relations with the Malaysian border areas, but with the lack of attention to border areas, marketing of agricultural products is even greater

economic and socio-cultural sector which then also affects the stability and security and integrity of a country. , (RD Dhiskit, 1982:101-102).

State borders are defined as the outermost boundaries of a country in the form of an imaginary line that separates the territory of a country from one another either on land, sea, or air where the border can be categorized in two terms, namely "Border Zone" (border zone) and "Customs Free Zone. (customs-free zone). Because the border area is in direct contact with the territory of another country, this certainly makes the border area play an important role in relations outside a country, but also has an equally important role in internal relations (own domestic affairs).

The state border area is the main manifestation of the regional sovereignty of a country. The border area of a country has an important role in determining the territorial boundaries of sovereignty, utilization of natural resources, as well as security, and territorial integrity. In the 1945 Constitution of the Republic of Indonesia concerning the territory of the State, it can be interpreted that the Republic of Indonesia is very important for the establishment of a State. the area has good protection to be developed, this is to article 2-49 of UNCLOS 1982, the territory of a country consists of airspace, land, and water/archipelagic areas (archipelological water).

A. Government Policy in Cross-Border Regional Development

In managing border areas, the Government has established the National Border Management Agency (BNPP) on January 28, 2010, through Presidential Regulation (Perpres) no. 12 of 2010, and followed up with the Regulation of the Minister of Home Affairs (Permendagri) No. 31 of 2010 concerning the Organization and Work Procedure of BNPP. This is a follow-up to Law Number 43 of 2008 concerning State Territory which mandates that to manage state boundaries and manage border areas at the central and regional levels, the national government and local governments establish the National Management Agency and Regional Management Agency (bnpp.go.id).

The strategies of the National Border Management Agency (BNPP) in the development of border areas both land and sea include namely, a) alignment of programs or activities of the Central Government and regional governments through sectoral and regional development budgets, which are directed to the development of growth areas and the development of integrated areas of border areas. b) greater partisanship and attention from Ministries or Institutions in setting policies and strategies for managing border areas between countries. c) providing support and facilities for developing border areas by central agencies, BUMN, the private sector, and domestic and foreign investors. (bnpp.go.id)

Through Presidential Instruction No. 1 of 2021, the government is accelerating economic development at three borders, namely Aruk (West Kalimantan), Motaain (NTT), and Skouw (Papua) by renovating or constructing State Border Posts (PLBN) to strengthen state boundaries including law enforcement with the presence of cross-border services in

the form of cross-border posts and border security posts, with the construction of the PLBN to be much better and more magnificent, it will certainly create a sense of pride as an Indonesian nation in the people of the border. Along with the growing sense of pride, of course, the spirit of nationalism that exists in the people in the border areas will remain strong (Inpres No.1 2021 bpk.go.id). In addition to the construction of the National Border Post (PLBN) facility in the Presidential Instruction, it also aims to develop new centers of economic growth in national border areas. and improve the welfare of the people in the border areas and absorb labor, especially residents. The development of the border area economy needs to be carried out simultaneously with the management of security and defense aspects which often pose a threat to national defense. Illegal exploitation of natural resources by foreign parties, such as illegal logging and illegal fishing, is still rife and causes environmental degradation (Makahingide, 2018).

Defense Management Policy requires the existence of law as an instrument of government, both related to the State apparatus, as well as the management of public resources. Public policy is an action that is not carried out or carried out by the government and has a subject of study in the form of the state. Public policy is always followed up with the policy implementation process (Makahingide, 2018). As well as development policies that have been implicated in a country as a policy that has been formed and is ready to be implemented.

1. Basic Government Policy

In Law 43/2008 articles 10-12 are referenced in regulating the territory of the State and border areas. Considering that the border area is an area that still receives less attention from the government, it has not been managed optimally (Widiartana, 2021). According to Stephen B. (1945) in Widiartana (2021) states that the management of defense in border areas must cover:

a. Allocation

The scope of the territory is determined based on national law and international law. In Indonesia, the territory of Indonesia uses the principle of *uti possidetis Juris* which was inherited by the Dutch.

b. Delimitation

After the scope is determined, identification of overlapping areas or boundaries must be determined with neighboring countries.

c. Demarcation

This stage is carried out by placing boundary markers along the boundary line that has been agreed with neighboring countries.

d. Administration

At this stage, builders are carried out in border areas by involving multi-sector and reintegration planning from various fields, such as politics, social, defense and security, economy, culture, environment, and others. Thus the border area can be developed as a

densely populated area such as in the district/provincial capital.

Therefore, when referring to Stephen B., Indonesia is still experiencing many problems in terms of managing border areas with neighboring countries, especially Malaysia.

Through Law 43/2008, the management of border areas has a basis in its development. So, assisted by BNPP, there is a need for cooperation and in its duties, BNPP has a special role, including the attachments to BNPP regulation No. 1 of 2015, namely:

- a) facilitate the formulation of development policies, master plans, and action plans for the management and utilization of state boundaries and border areas;
- b) coordinate and facilitate the preparation of activity plans and budgets for the development and management of state boundaries and border areas;
- c) coordinate and facilitate the implementation of cross-sectoral development, control, and supervision as well as evaluation and reporting on the management of state boundaries and border areas;
- d) carry out general administration services, personnel, finance, housekeeping, and administration.

The legal basis for the establishment of a border management agency at the provincial level based on the Regulation of the Minister of Home Affairs of the Republic of Indonesia Number 140 of 2017 concerning the Establishment of a Border Management Agency in the Regions is Article 2 paragraph (2) which states that the establishment of a Provincial BPP is stipulated by a Regional Regulation. Based on PerPres 44/2017, it is stated that the Regional Border Management Agency has a coordinating function with BNPP with a working relationship regulated by the head of BNPP. In BNPP Regulation No. 2 of 2011, BNPP, represented by the Bureau of Planning, Cooperation, and Law, carries out several coordination functions with the regions. Bureau of Planning, Cooperation, and Law in carrying out the task of carrying out the functions of preparing and implementing cross-sectoral cooperation and central and regional cooperation. BNPP and Provincial BPPD cooperation chart. From the relevant provincial governors, the task of managing the border in the regions is handed down to the regional border management agency.

The territory of the state is one of the elements of the establishment of a country where each country occupies a certain place on earth and has certain borders. The management of state territory and border areas has been regulated in Law 43/2008 which mandates the central government, provincial government, and district administrations to maintain and manage the state and border areas. Handling border areas of course cannot only be done by one agency or related agency. There must be cooperation between various parties and

supported by a strong political commitment from all parties at various levels of government and stakeholders. In addition, a comprehensive master plan is needed so that the handling of border areas can produce something extraordinary. In Indonesia, the management of border areas is carried out by establishing the National Border Management Agency (BNPP) as mandated by Article 14 Paragraph (1) of Law 43/2008. The establishment of the BNPP is not only at the center, but also in the provinces and regencies/cities.

According to Widiartama (2021) To manage state boundaries and manage border areas at the central and regional levels, the government and local governments establish a National Management Agency and Regional Management Agency. The management body is led by a head of the agency who is responsible to the President or regional head by his authority. The existence of BNPP will not take over the main tasks and main functions of Ministries/Institutions that are members of BNPP. Technical implementation of development and program implementation is carried out synergistically between sectors, between ministries/agencies, and between Central and Regional under the coordination of BNPP. When compared with other National Bodies which have representatives up to the regions as well as analysis of Presidential Regulations, BNPP's authority is more or less as a coordinator and policymaker.

This coordinating pattern of border area management is a big challenge for BNPP because the effectiveness of BNPP's work depends on the commitment of Ministries/Agencies and local governments as technical implementers of development by their main tasks and functions. However, if the pattern of working relations between BNPP and related Ministries/technical institutions is maintained only as a coordinating relationship, it will be very difficult for BNPP to obtain maximum results from efforts to manage state boundaries and border areas. BNPP should be given greater authority to regulate and control all development activities and management of state boundaries and border areas because development in border areas and nationalism are very important, if there is road construction, it can certainly unite isolated border communities with regional communities. On the other hand, good education will open up national insight into the existence of the state and love for the homeland. The greater the development at the border, the greater the sense of pride in Indonesia, because development is a symbol of the presence of the state that can increase the community's sense of nationalism towards the state and the manifestation of the sovereignty of the Republic of Indonesia (Widiartama, 2021).

2. Problems in the Border Area

A study conducted by Raharjo (2013) identified several problems in the land border area of Indonesia and Malaysia, namely in the Entikong sub-district. The first problem is the problem of infrastructure, namely

the aspect of the Malindo (Malaysia-Indonesia) road area which has poor quality and uneven distribution, this was conveyed by PPLB Entikong that "in general it is good, but village roads are still not handled." The second problem is that the electricity supply is not evenly distributed.

According to Noveria et., al. (2017) Indonesia-Malaysia border area is one of the front lines of defense of the Republic of Indonesia. As a strategic area, this border area has the potential to be vulnerable to security threats, both military and non-military. Therefore, efforts are needed including a set of policies and strategies to maintain the integrity of state sovereignty in the region. Related to this, in this reform era, the government has shown a new spirit in border management, which was previously a "forgotten land". The government's political awareness and commitment to paying more attention to this area can be seen in the development of government policies in recent years which are contained in various forms of formal and institutional law.

Defense policy for border areas is not only based on the development of military strength and capabilities but also synergizes with the empowerment of non-military border areas. This policy underscores the acknowledgment of the importance of improving the quality of life and welfare of border communities to strengthen national defense to ensure national stability and the integrity of the Republic of Indonesia, and vice versa (Roisah, et. al. 2018).

In other words, in addition to social and economic problems with a power base that does not only rely on military strength, there are also non-military problems related to human development. This is to prevent terrorism, drug smuggling, illegal logging, illegal fishing, human trafficking, and so on. Therefore, the distribution of social policies in the Peruvian border area is improved and developed. This is in line with the research above. That Roisah, et., al (2018) mention that the main problem at the border is the issue of partiality. Overlapping policies or weak policies have taken can affect conflicts that will arise at the border.

B. Efforts to Face Military Threats

Integrated defense management that supports aspects of welfare and aspects of defense and security is expected to create border areas that have high deterrence against all forms of threats and disturbances. This policy is in line with the new paradigm built by the post-reform government, namely the development of border areas through a prosperity and security approach (KASAD, 2013). The security of the border areas is part of the task of the Indonesian National Army (TNI) as mandated by Law Number 34 of 2004 concerning the Indonesian National Army. This law regulates in detail the following matters: first, Article 7 paragraph (2) concerning Military Operations Other Than War (OMSP), where point four emphasizes that the task of securing border areas is the main task of the TNI. Second, Articles 8, 9, and 10 letter b detail in detail the implementation of border area

security, as follows: The Indonesian Army (TNI) is tasked with maintaining the security of land areas with other countries. The Navy (TNI) is tasked with enforcing the law and maintaining security in the marine area of national jurisdiction by the provisions of national law and ratified international law, while the Indonesian Air Force (AU) enforces the law and maintains security in the airspace of national jurisdiction by legal provisions. national and international ratifications (Noveria et. al. 2017).

Several policy steps taken in developing national defense at the border, both through military and non-military forces, are a representation of the defense system adopted by Indonesia, namely the Universal People's Security Defense System (Sishankamrata). According to Noveria et., al. (in, Rida, 2019) the state defense and security that are built are universal by using and integrating all national potentials and forces that work totally by using military force in defending the independence and sovereignty of the Unitary Republic of Indonesia and involving community participation in national security defense efforts. This military power is the main force, while the community is the supporting force. So one of the keys to the development of the above supporting power is through the territory. The basis for consideration is that the people do not have the capability of the main tool of the defense system (defense equipment). This territorial development, especially in border areas, is very important, as a result of the reality of the limited defense equipment owned by the TNI, the limited personnel assigned to the area, and the difficult border conditions in terms of transportation and communication. As with the implementation of land defense, the state also seeks to secure sea defense, including securing the territorial waters at the Indonesian border. This is carried out as a mandate from Law Number 34 of 2004 concerning the Indonesian National Army. The Navy, as part of the Indonesian National Armed Forces responsible for maritime operations, not only develops the strength of the marine dimension in the defense sector but also empowers the marine defense area.

C. Supporting the Defense Economy

From the description of the policy and management of the defense area above, the main point is support for national defense. Where current national defense is not only tested by various problems as described above, it also affects the national defense economy. Research conducted by Wanto et. al (2021) related the impact of closing tourist access in border areas, where tourism is one of the supports for economic development which will be directly related to social-economic defense and the pace of regional development.

Therefore, rooted in Noveria et., al. (2017) that policies on the management of defense areas require alignment and hard efforts so that equity and solutions to social, economic, and educational problems are also evenly distributed. Thus, the government's efforts or policies will become a stimulus for economic development in border areas so that it has a significant impact on the defense economy both in border areas and throughout Indonesia.

IV. CONCLUSION

1. Variety of policies and implementation of legislation no. 43/2008, 13/2017, and 11/2020 are the performance of policies that build and carry out equity in all regions of Indonesia, especially border areas. Where rooted in problems that arise both in the form of military and non-military threats
2. The role of the BNPP and the TNI-Polri is also an effort to guard the border areas that have an impact on security and welfare. So that solutions to problems related to maritime, territorial boundaries, and socio-economic problems. As well as encouraging the economic growth that supports national defense.
3. Policies taken in border areas require partisanship and hard efforts. Because of the importance of equity and solutions to social problems.

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REFERENCES

- [1] Djafar, Fariastuti, 2020. Dampak covid-19 Terhadap Pedagang Produk Pertanian di Perbatasan Kalimantan Barat-Serawak. Prosiding Seminar Akademika Tahunan 978-602-53460-5-7
- [2] Hadiwijoyo, Suryo Sakti. 2011. Perbatasan Negara dalam Dimensi Hukum Internasional. Yogyakarta: Graha Ilmu
- [3] Instruksi Presiden Republik Indonesia Nomor 1 Tahun 2021 tentang Percepatan Pembangunan Ekonomi pada Kawasan Perbatasan Negara di Aruk, Motaain dan Skouw. Diakses di Bpk.go.id pada 3 Maret 2021.
- [4] John Bernando Seran. 2012. Perbatasan Wilayah Menurut Hukum Internasional. Tersedia di: <http://kupang.tribunnews.com/m/index.php/2012/03/07/perbatasan-wilayah-menurut-hukum-internasional>. [diakses tanggal 01 Januari 2022].
- [5] Kecamatan Entikong. 2010. Laporan Pemerintahan Kecamatan Entikong 2009. Sanggau: Pemerintah Kecamatan Entikong.
- [6] Makahingide, Randy (2018) Upaya Pemerintah Indonesia dalam Menangani Persoalan di Wilayah Perbatasan Antara Pulau Morare dan Phipina Selatan, Paper, 2018 UNSRAT.
- [7] Margaretha Hanita. 2006. "Strategi Pertahanan di Wilayah Perbatasan, Studi di Tiga Wilayah Perbatasan: Papua, Timor dan Kalimantan". Jurnal Aplikasi Stratejik, 1 (1): 77-94. Riwanto Tirtosudarmo. 2002. "Tentang Perbatasan dan Studi Perbatasan: Suatu Pengantar". Jurnal Antropologi Indonesia, 67 (XXVI): iv-vi.
- [8] Muhammad, Abdulkadir. 2004. Hukum dan Penelitian Hukum. Bandung: Citra Aditya Bakti.
- [9] Muradi. 2015. Pengelolaan Pengamanan Perbatasan Indonesia. Jurnal Ilmu Pemerintahan CosmoGov, 1(1).
- [10] Noveria, M. (Ed.). (2017). Kedaulatan Indonesia Di Wilayah Perbatasan Perspektif Multidimensi. Jakarta: Yayasan Pustaka Obor Indonesia.
- [11] Peraturan Presiden Nomor 44 Tahun 2017 Perubahan atas Peraturan Presiden Nomor 12 Tahun 2010 tentang Badan Nasional Pengelola Perbatasan.

- [12] Ridha, Amrullah Muhd. Kabid Faslak Monev Asdep Infrastruktur Fisik, Deputi III BNPP dalam kegiatan yang diselenggarakan BNPP dan bertemakan Kebijakan Pembangunan Infrastruktur Di Kawasan Perbatasan (Kabupaten Mahakam Ulu Provinsi Kalimantan Timur), oleh Badan Nasional Pengelola Perbatasan Republik Indonesia, di Bandung, 21 November 2019.
- [13] Roisah, et., al. 2018. Kebijakan pengelolaan pertahanan dan dampak kebijakannya di perbatasan Indonesia Malaysia. JMHU. UNUD 7(4) 2018.
- [14] Seran, John Bernando, 2012 "Perbatasan Wilayah Menurut Hukum Internasional." <http://kupang.tribunnews.com/2012/03/07/perbatasan-wilayah-menurut-hukum-internasional> >, diakses pada 09 jan 2022.
- [15] Sudika Mangku, Dewa Gede, Peran Badan Nasional Pengelolaan Perbatasan (BNPP) Dalam Menjaga Kedaulatan Wilayah Negara Kesatuan Republik Indonesia, Jurusan Ilmu Hukum, Universitas Pendidikan Ganesha, Singaraja, Indonesia, Jurnal Ilmiah Ilmu Sosial, Vol. 4, No. 2, Desember 2018.
- [16] Undang-Undang Nomor 30 Tahun 2014 Tentang Administrasi Pemerintahan, Lembaran Negara Republik Indonesia Tahun 2014 Nomor 292.
- [17] Undang-Undang Nomor 43 Tahun 2008 tentang Wilayah Negara, Lembaran Negara Republik Indonesia Tahun 2008 Nomor 177, Tambahan Lembaran Negara Republik Indonesia Nomor 4925.
- [18] Widiartana, Putu Wahyu, 2021. Kedudukan dan Kewenangan Badan Nasional Pengelola Perbatasan Di Indonesia. Jurnal Hukum dan Pembangunan 1(51) 2021 124-145.
- [19] E. H. Miller, "A note on reflector arrays (Periodical style—Accepted for publication)," IEEE Trans. Antennas Propagat., to be published.
- [20] J. Wang, "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," IEEE J. Quantum Electron., submitted for publication.

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Promotion Of Cycling In Secondary Cities In Ghana

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Abstract- In pursuit of transport policies toward sustainable mobility, the promotion of cycling as a better alternative is very crucial. Conversely, the share of cycling is dwindling in some cities. By virtue of this, studies are being conducted to understand measures to promote cycling. However, in Ghana, many of these studies are mainly conducted in mega (primary) cities. Therefore the study investigated measures to promote cycling in secondary cities in Ghana using Wa Municipal as a case study. The study also ascertained the level of cycling experience and cycling frequency of the respondents as well as the challenges of cycling in the Municipality. This is to establish a policy direction within which cycling can be promoted in Wa Municipal.

400 participants were selected from the Municipality as the unit of enquiry. With the use of a questionnaire, 70 participants were interviewed online while the remaining 330 respondents were interviewed by trained field officers. The responded questionnaires were analyzed using Statistical Package for Social Sciences (SPSS).

The results indicated that 76.8% of the respondents ever used a bicycle. Out of the 76.8% of the respondents who had cycling experience, 58.3% are non regular cyclists. Lack of cycling lanes, disregard of cyclists by motorists, Weather conditions, low social status of cyclists, Topography, streets animals, placement of construction materials on roadways and street sellers were identified as barriers to cycling in the Municipality. The survey participants proposed the provision of cycling infrastructure, respect of cyclists as legitimate road users, cycling programs, public educations, controlling of road obstacles such as construction materials; domestic animals and street sellers on roadways as measures to motivate the use of bicycle in the Municipality. The policy proposition in this study is the provision of cohesive cycling infrastructure with a corresponding attitudinal change to encourage people to take advantage of this intervention. The findings of this study could be of guide for effective planning for increasing bicycle usage.

Index Terms- Ghana, Secondary Cities, Cycling, Wa Municipal

I. INTRODUCTION

The promotion of cycling as a daily activity is a win-win approach; it promotes good health as well as positive environmental effects, particularly if cycling replaces short

automobile trips (WHO, 2011). Studies have been conducted on the environmental, health as well as the economic benefits of cycling (Gotschi et al., 2016; Oja et al., 2011; Whyte & Crawford, 2014; Zander et al., 2013).

Economically, it is an affordable means of mobility, and it is also found to create more local jobs as well as jobs for lower skilled labors in some developing economies (Blondiau et al., 2016). In terms of environment, cycling does not produce environmental pollutants such as carbon dioxide and noise thus decreasing cases of cardio-vascular and upper respiratory diseases, and sleeping disorders (Hook, 2003). Moreover, a study conducted using Health Impact Assessment Framework found that, a changed from motorized modes to cycling led to health gains for people and cities (Stevenson et al., 2016).

Notwithstanding these apparent merits of cycling, its mode share continues to dwindle in some countries (Mullan, 2013; Nielsen et al., 2016). In recent years, studies have been conducted to understand the challenges of cycling as well as measures to promote bicycle usage in both developed and developing countries (Aldred et al., 2019; Berger et al., 2018; Wang, 2018).

In pursuit of measures to promote cycling in Ghana, the ministry of transport in collaboration with the United Nations Environment Institute for Transportation and Development Policy carried out an assessment of the existing mobility situation and challenges of NMT in the mega-cities of Ghana (Accra, Kumasi, Tamale and Tema metropolises). This was undertaken to prepare a non-motorized transport (cycling) promotion Strategy (UNEP, 2020). While studies have been carried out in the mega-cities of Ghana, not much has been done in secondary and smaller cities. Therefore this study seeks to examine the state and challenges of cycling as well as strategies for promoting cycling in secondary cities in Ghana using Wa Municipal in the Upper West Region as a case study.

The findings of studies of this nature could be a guide for effective planning in cycling promotion. It is also expected to build on existing knowledge about cycling in secondary cities.

II. PROMOTION OF CYCLING IN SECONDARY CITIES – A THEORETICAL PERSPECTIVE.

2.1. Description of a Secondary City

There is no obvious description of what exactly a secondary city or town is (UN-Habitat, 1996). However, Robert & Hohmann,

(2014) opined that a Secondary city is a term that is primarily used to explain the second level, or tier, in the classification of cities beneath the primary level and some nationalities have several levels or orders of cities.

A primary city is described as the leading city, disproportionately larger than any other urban hierarchy in its country or region (Goodall, 1987). However the concept of secondary city is contextual. It may relate to the size of the population, the administrative area, the political, economic and historical importance of a system of cities within a country or geographic region below the primary order of cities (Robert & Hohmann, 2014). The concept "secondary town" has been popularized by Rondinelli in the 1970s. In his classification, he defined secondary towns as urban settlements with a population not less than 100,000 but not including the country's mega-city. His study was initially aimed to help design and implement policies to spur the development of rural economies surrounding secondary settlements (Rondinelli 1983 cited by Robert & Hohmann, 2014)

Moreover, UN-Habitat (1996) defines a secondary city as an urban center with a population of 100,000 to 500,000. A secondary town today, however, can have a population of several million people. Some secondary towns in China have populations in excess of five million.

For the purpose of this study, secondary cities are towns with a population of 100,000 to 250,000 of whom at least 60% are urban residents (World Bank, 2018b).

2.2. *Cycling in Cities*

The role of cycling in most European countries as a mode of transportation has been increasing in the last years, especially in urban areas (Hook, 2003). European cities perceived an efficient cycling as providing a competitive advantage over other cities in attracting tourists and key workers, and therefore, have integrated non-motorized transport (cycling) in mainstream planning. Cycling portrays a picture of prosperity and health and has substituted the motorized transport as the engine of public health and economic prosperity (Oldenziel et al., 2016). However, among European cities, variations exist in terms of mode share of cycling and trips generated by cyclists. The urban centers of Copenhagen and Amsterdam are perceived as classical models of world-leading cycling cities, and many other rural centers have significant share of regular cyclists. In Zwolle and Copenhagen over 30% of all travels are made by cyclists (EPOMMA, 2016).

In developing countries, cycling is often perceived as a preferred mode for the poor and vulnerable groups such as women, the elderly and children; however, it has a positive impact on social equity, job creation, and the economy; it has an important role in the urban freight system; is environmentally sustainable; and it eases movement in narrow and congested roads in underdeveloped cities (Rahman et al., 2010).

On average, about 37% of trips in developing cities are generated by cycling (UNEP, 2016). Approximately, half of the

trips are made entirely by cycling in Nairobi and Dares Salaam, while 10 percent rely on private motorized transport and the remaining share is made on public transport (Servaas, 2000).

2.3 *challenges of NMT*

Studies have investigated challenges to cycling as a modal choice using cities and countries as case studies (Berger et al., 2018; Cheyne et al., 2007; Shaaban, 2020; Wang, 2018) In one of the studies, (Shaaban, 2020) using Qatar as a case study, the male respondents identified unfavorable conditions of weather, lack of cycling amenities, and motorist's behavior as important barriers to cycling. Whereas the female respondents in the survey cited dressing, consent of guardian and cultural norms as far more important. Also a study carried out in Hamburg discovered the following barriers to cycling: lack of dedicated cycling infrastructure, lack of political will and parking of cars on cycling paths (Wang, 2018). Furthermore, a survey in Toronto found the following barriers to cycling: Weather conditions, fear of accidents, inadequate cycling infrastructure and reckless driving (Bidordinova, n.d.).

2.4. *Initiatives/Measure to Increase Cycling*

Some studies have been undertaken to understand how bicycle ridership can be promoted in cities (Hull & O'Holleran, 2014; Rissel et al., 2010; Savan et al., 2017). Some of the studies established that the provision of dedicated cycling infrastructure can encourage more cycling culture (Shaaban, 2020). The design of cycling infrastructure should include: spacious cycling lanes, Direct lanes linking all land uses, speed barriers and clear signage that are visible at night and do not make the cyclist dismount, straight lights and bicycle parking amenities (Hull & O'Holleran, 2014). This is mutually reinforced the assertion that the presence of bicycle infrastructure enhances cyclists' safety. (Reynolds et al., 2009)

Furthermore, it was discovered that social psychological behavior change was particularly successful in enhancing cycling (Savan et al., 2017). Because attitudes are a more direct way to increase bicycle use, the promotion of the bicycle as a practical, environmentally friendly, inexpensive, and healthy mode of transport may help to foster more positive attitudes, which may lead to stronger intentions and more frequent bicycle use (Milković & Štambuk, 2015). Other interventions include: Bicycle inclusive Urban infrastructure design, Bicycle inclusive Planning, Strong Political will, and Public awareness campaigns to overcome negative perceptions about cycling (Wang, 2018).

III. MATERIALS AND METHODS

3.1. *Study area,*

The study area is Wa Municipal in the Upper West Region of Ghana. The Municipality is one of the secondary cities in Ghana by virtue of its population (World Bank, 2018a). It has a population of 107,214 (Ghana Statistical Service, 2014). And 2018 projected population of 126,609 (World Bank, 2018a). Approximately 54.8% of the population is economically active and 45.2% are economically inactive. While 91.5% of the economically active population are employed, 8.5% are unemployed. Majority of the economically inactive population

(66.6%) is students (Ghana Statistical Service, 2014). The Municipality and some peri-urban communities are shown in figure 3.1

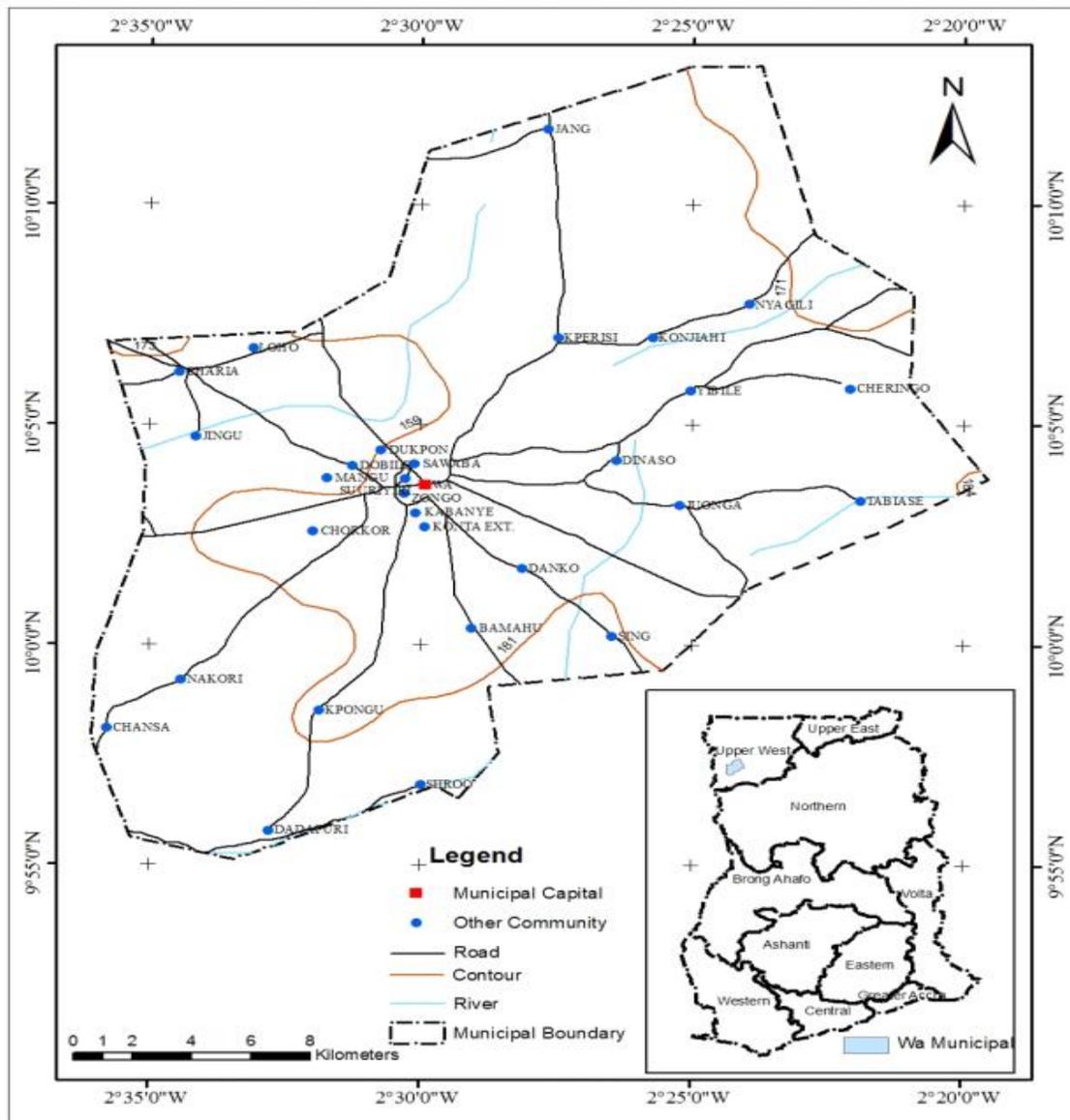


Figure 3.1: Wa Municipal with some of the Peri-urban Communities
 Source: (Aduah & Aabeyir, 2012)

3.2. Unit of Enquiry

The units of inquiry for the study were residents of Wa Municipality in Ghana. The residents consist of people in the Municipality at the time of the survey irrespective of their ethnicity, educational level and employment. However, a respondent has to be at least 18 years of age due to legal challenges in Ghana. This unit was the source of primary data on demographic characteristics of respondents, cycling experience, challenges and strategies to promote cycling.

3.3. Sample size and sampling techniques

The study employed probability sampling. In the probability sampling each variable in the population has the same chance of getting into the sample; and all choices are independent of one

another (Kathori, 2014). Under the probability sampling, the simple random sampling without replacement was employed, in it; each resident once selected can't be chosen again. The result obtained from this has a high validity and accuracy (Showkat & Parveen, 2017). Of this, 400 residents of the Municipality were selected and each respondent was interviewed once. The purposive sampling was also used under the non-probability sampling, by this; the Municipality was selected as it is one of the secondary cities in Ghana.

3.4. Research instruments design, Methods of Data Collection and data processing

The research started with a pilot survey, 70 people in the municipality were randomly recruited and interviewed. The goal

of the pilot study was to understand the challenges of cycling and ways to increase cycle ridership in the municipality. To that purpose, an open-ended questionnaire was created in which study participants were requested to provide information about their cycling experience, obstacles, and ideas for increasing cycling. The primary study instrument was designed using the results of the pilot survey, as well as insights gained from the existing literature on cycling, to find out how to promote cycling in secondary towns.

A structured questionnaire was the main tool used to collect the data. The questionnaire was built on closed ended questions. Closed-ended questions were used to solicit data on how to promote cycling in secondary cities. In all, the survey participants responded to four set of questions. The first question solicited the demographic characteristics such as age, gender and level of education of the respondents. Besides, respondents were also asked to indicate their cycling experience out of two options namely; (i) Yes; (ii) No, in furtherance to this, participants who indicated “Yes” to the previous question were also required to indicate their cycling frequency by choosing (i) “Yes” or (ii) “No” to the question; did you cycle three or more times a week?

In addition, the survey participants were asked about the challenges they face in using the bicycle or what might have prevented them from cycling. Under this, respondents were requested to select one or more of five barriers namely; (i) “Lack of cycling lanes” (ii) “Disregard of cyclists by motorists” (iii) “Low social status of cyclists” (iv) “Weather conditions” (iv) “Topography”. In order to allow the participants to express their opinion regarding the barriers beyond the items provided in the questionnaire, their feedback was obtained through the “others” option on the questionnaire

Finally, in the light of the challenges, the participants were asked to suggest what could be done to curtail the barriers and

eventually promote cycling in the municipality. To this, they chose one or more of predefined solutions namely; (i) ‘Provision of cycling infrastructure’ (ii) ‘Respect of cyclists by motorists’ (iii) ‘public campaigns and programs’. Their opinions beyond these were elicited through the “others” option on the questionnaire.

Data was obtained using a variety of techniques, bearing in mind all the elements that were predetermined as units of enquiries. The survey was conducted on both weekdays and weekends. Study respondents who could not read and write were interviewed face-to-face by trained field enumerators and those who could read and write completed the questionnaire with the assistance of an enumerator. Besides, some of the participants who were familiar with the use of social media were interviewed via whatsapp with the use of google structured questionnaire. In all, 70 participants were interviewed online while the remaining 330 respondents were interviewed by trained field enumerators.

Results from the responded questionnaires were inputted into the Statistical Package for Social Sciences (SPSS) version 16 for display and analysis. The data were then analyzed using the SPSS 16.0. The software created frequencies and tables to illustrate the result of the data analysis

4. Results

4.1. Demographic Characteristics of Sample Population

A total of 400 questionnaires were administered and the same number of responses was received. This was due to the mixed approach (face-to-face and online) administration of questionnaires to respondents. As shown in Table 4.1, out of the 400 responses, 45.8% were males and 54.2% were females. The survey respondents were aged between 18 and 60 > years. In terms of level of education, 14.0% attained tertiary education, 16.5% had senior high school education, and 35.8% had basic education while the remaining 33.5% had not been to school.

Table 4.1. Demographic Characteristics of Survey Respondents

Characteristics	Frequency	Percentage (%)
Age Brackets		
18-35	156	39.0
36-59	137	34.2
60 and above	107	26.8
Gender		
Male	183	45.8
Female	217	54.2
Educational Attainment		
Tertiary	56	14.0
Senior High	66	16.5
Basic Education	143	35.8
Illiterate	134	33.5

Source: Field Survey (2021)

4.2. Cycling Characteristics of Sampled Population

Respondents were asked to describe their cycling experience and frequency as part of the study. As shown in table 4.2, (76.8%) of the respondents had previously cycled, while the remaining (23.2%) had never used a bicycle in their entire lives. However, majority (58.3%) of those who had cycling experience are irregular cyclists while (41.7%) were regular cyclists.

4.2 Cycling Characteristics of Study Population

Characteristics	Frequency	Percentage
Cycling Experience		
Had cycling Experience	307	76.8%
Had no cycling Experience	93	23.2%
Cycling Frequency		
Cycled Frequently	128	41.7%
Cycled Infrequently	179	58.3%

Source: field survey (2021)

4.3. Challenges of Cycling In Wa Municipal

The purpose of this section was to identify what the survey participants perceived as barriers to cycling in the Municipality. Of this, the study participants were requested to select one or more of five barriers. Each barrier and the frequency that it was mentioned by interviewees are summarized in table 4.3. From the table, the more pronounced challenge was Lack of cycling lanes (70.8%), followed by disregard of cyclists by motorists (58.4%), Weather conditions (43.4%) low social status of cyclists (38.8%) and Topography (13.1%). Others (7.1%) such as animals on the streets, placement of construction materials on roadways and street sellers were also identified as barriers to cycling in the Municipality.

4.3 Challenges of cycling in Wa Municipal

Challenge	Yes (%)	No (%)
Lack of cycling lanes	70.8	29.2
Disregard of cyclist by motorists	58.4	41.6
Weather conditions	43.4	56.6
Low social status	38.8	61.2
Topography	13.1	86.9
Others	7.1	92.9

Source: Field Survey (2021)

4.4 Interventions to overcome barriers and Increase cycling in the Municipality

A number of measures to tackle the barriers and increase cycle ridership were proposed by the respondents. Under this, the study participants were requested to select one or more of four predefined measures. Each measure and the frequency that it was mentioned by interviewees are summarized in table 4.4. As shown in the table, the survey respondents proposed the provision of cycling infrastructure (85.1%), respect of cyclists as legitimate road users (47.2%), cycling programs (42.8%), public campaigns and educations (40.3%) and others (8.1%) such as provision of speed ramps and controlling construction materials, sellers and domestic animals on roadways

Table 4.4: Measures to Promote Cycling in Wa Municipal

Measure	Yes (%)	No (%)
provision of cycling infrastructure	85.1	14.9
respect of cyclist as road users	47.2	52.8 57.2
Cycling programs	42.8	
Public campaigns and education	59.7	40.3
Others	91.9	8.1

Source: Field Survey (2021)

IV. DISCUSSIONS

Majority of the survey respondents were females 54.2%. This underlines female dominance in the Municipality hence empowering cyclists and improving cycling culture through the adoption of appropriate measures will indirectly lead to gender empowerment/equality within the Municipality. The results also revealed a youthful population of 39.0% in the municipality. This finding is consistent with previous findings, where the population of the municipality was found to depict a youthful based population of 35% (Ghana Statistical Service, 2014). The youthful population can be a potential for promoting cycling since there is a positive correlation between regular cycling and youthful population (Sallis et al., 2013). Illiteracy was high in the municipality with 33.5% of the respondents being illiterates. This finding is in conformity with results of previous research findings (Ghana Statistical Service, 2014).

In generally, cycling is more famous in the municipality compared to megacities in Ghana such as Kumasi; about 76.8% of the respondents had cycling experienced as against Kumasi metropolis which had a cycling experienced of 70% (Acheampong, 2016). These findings are peculiar to secondary

cities as similar studies have shown bicycle usage to be more common in smaller and secondary towns (Karanikola et al., 2018; UN-Habitat, 2013).

Notwithstanding the high cycling experience, the absence of cycling lanes in the Municipality was expressed as a challenge to cycling by the respondents. The absence of cycling paths in Wa municipal is a common finding in similar studies (Damsere-Derry & Bawa, 2018). Cyclists therefore share the roadway with motorized traffic, a situation which may not only reduce bicycle usage but can endanger the safety of cyclists. The absence of dedicated cycling lanes is a common barrier that discourages bicycle usage (Nelson & Allen, 1997). Moreover, the study participants perceived the constant hounding and disregard of motorists as legitimate road users as a barrier to cycling in the municipality. This is mostly caused by the lack of cycling infrastructure to separate cyclists from motorists. The perception of motorists of cyclists being irritants and nuisances on the road is a common finding in similar studies (Basford et al., 2002). Besides, the low social status of cyclists was itemed by respondents as a challenge to cycling in the municipality. Social barriers concerned with the problem of acceptability or change in perception of a program (Banister cited by Wang, 2020). Social norms governing transport behavior tended to favor motorized travel in terms of prestige over active transport (cycling), even for short journeys that can be completed by bicycle (Bauman et al., 2008). In Wa municipal, the bicycle was regarded as mode of the poor and people with low social standing. In effect, it was perceived as an index of poverty. The low social status of cycling is a common phenomenon in other cities in Ghana (Acheampong, 2016). In the survey, bad weather conditions were mentioned as a challenge to cycling. This was in response to the Harmattan season and the hot weather condition which precedes the Harmattan. Participants indicated that when cycling in Harmattan, they are exposed to dust and the scorching sun in the hot season. In similar studies in Qatari, hot weather condition was found out to be the number one barrier to cycling (Shaaban, 2020). Furthermore, the presence of construction materials on roadways was indicated by respondents as a challenge to cycling in the Municipality. The placement of materials such as sand and waste construction materials narrows existing roadways used by both motorists and non-motorists (cyclists). In some situations, double lanes are narrowed to single lanes thus forcing both motorists and cyclists to ply a single lane, a situation that exposes cyclists to road traffic accidents. Finally, the presence of livestock and sellers on streets are some of the identified obstacles to cycling in the Municipality. In Ghana, street selling is a common road traffic obstacle facing both cyclists and motorists (Agyapong & Ojo, 2018).

In order to overcome these challenges and to promote cycling, the provision of cycling lanes could spur bicycle ridership in the municipality, given the fact that over 81.5% of the respondents perceived the provision of cycling lanes to be the surest way of promoting cycling. Bicycle lanes and parking lots should be included when new roads are planned, constructed, or as conditions permit, when existing facilities are rehabilitated. Studies highlighted the role of cycling infrastructure in increasing cycle ridership (Fishman et al., 2015; Hull & O'Holleran, 2014). Respect of cyclists as road users by motorists was one of the proposed means of promoting cycling by survey respondents. In

the case of the Wa Municipality, both cyclists and motorists ply the same roadway, a situation which appears to have aggravated cyclist-motorists road conflict in the Municipality (Damsere-Derry & Bawa, 2018). Such conflict can be addressed by rerouting motorized transport, restricting parking in zones or streets, and traffic calming measures. Moreover, bicycle ridership could be promoted in the city by rolling out public educations and cycling programs. Such programs may include: Bike or walk to Work Day, campuses and schools cycling competitions, and bicycle Commuter Week. These programs encourage more people to use bicycle and dispel the negative perception about cycling. It has been documented in previous studies that such initiatives create more positive attitudes that could contribute to stronger intention and more frequent use of the bicycle (Milković & Štambuk, 2015). Besides, other measures such as getting construction materials, domestic animals and street sellers off roadways can make the road more safe and convenient for cyclists to ply thus motivating the use of bicycle in the Municipality.

V. POLICY IMPLICATIONS

The findings of the study have a number of policy implications. Firstly, cycling promotion programs could be anchored on the fact that the majority of the study populations are potential cyclists. However, such interventions would have to dedicate extensive effort in providing cycling infrastructure. In ensuring an efficient and effective cycling infrastructure in the municipality, a cohesive network is paramount because cyclists' trips are generated at various points and ends at many destinations. From the literature, it is evident that a cohesive infrastructure helps cyclists to move from an origin to many destinations; and is also regarded as an effective way of fully integrating cycling into mainstream planning (Deffner et al., 2012). This argument is supported by Pucher & Buehler (2010) who opined that visible cycling infrastructure encourage and sanction the use of a bicycle.

Although a cohesive cycling infrastructure would be necessary for a successful cycling promotion, planners and policy makers should be attentive to the fact that attitudinal change is needed to convince and encourage people to take advantage of this intervention. Public educations, campaigns and promotional programs such as Bike or walk to Work Day; campuses and schools cycling competitions; bicycle Commuter Week and "bic-to-city" project could build positive perceptions about cycling. Moreover, people's own experience of a behavior or habit will give them their strongest perceptions of that behavior. Providing a good cycling experience to an individual is an effective way to efficiently and convincingly give that person positive perceptions towards cycling. These positive expectancies and values increase goal commitment (Azjen, 1972).

Albeit the insight gained from this study, it has some limitations. The study did not capture potentials of cycling in the Municipality. Given that cycling potentials could provide detailed knowledge to local authorities on conditions of the Municipality to take up cycling. Therefore future research is necessary on the potentials to guide effective planning for increasing bicycle usage.

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REFERENCES

- [1] Acheampong, R. A. (2016). Cycling for Sustainable Transportation in Urban Ghana: Exploring Attitudes and Perceptions among Adults with Different Cycling Experience. *Journal of Sustainable Development*, 9(1), 110. <https://doi.org/10.5539/jsd.v9n1p110>
- [2] Aduah, M. S., & Aabeyir, R. (2012). Land Cover Dynamics in Wa Municipality, Upper West Region of Ghana. 8.
- [3] Agyapong, F., & Ojo, T. K. (2018). Managing traffic congestion in the Accra Central Market, Ghana. *Journal of Urban Management*, 7(2), 85–96. <https://doi.org/10.1016/j.jum.2018.04.002>
- [4] Aldred, R., Watson, T., Lovelace, R., & Woodcock, J. (2019). Barriers to investing in cycling: Stakeholder views from England. *Transportation Research Part A: Policy and Practice*, 128, 149–159. <https://doi.org/10.1016/j.tra.2017.11.003>
- [5] Basford, L., Reid, S., Lester, T., Thomson, J., & Tolmie, A. (2002). Drivers' perceptions of cyclists. 42.
- [6] Bauman, A., Rissel, C., Garrard, J., Fishman, E., Ker, I., & Ms Rosemarie. (2008). Cycling: Getting Australia Moving: Barriers, Facilitators and Interventions to Get More Australian Physically Active Through Cycling (p. 43). https://www.researchgate.net/publication/235356404_Cycling_Getting_Australia_Moving_Barriers_Facilitators_and_Interventions_to_Get_More_Australian_Physically_Active_Through_Cycling/link/004635361255ede7bd00000/download
- [7] Berger, B., Reback, M., & Palmatier, S. M. (2018). Addressing the Barriers to Bicycling: A Bike Access Program in Lewiston and Auburn, ME. 49.
- [8] Bidordinova, A. (n.d.). MOTIVATORS AND BARRIERS TO UTILITARIAN CYCLING IN DOWNTOWN TORONTO. 15.
- [9] Blondiau, T., van Zeebroeck, B., & Haubold, H. (2016). Economic Benefits of Increased Cycling. *Transportation Research Procedia*, 14, 2306–2313. <https://doi.org/10.1016/j.trpro.2016.05.247>
- [10] Cheyne, C., Imran, M., Ahmed, W., & Potroz, C. (2007). BARRIERS TO ACTIVE TRANSPORT IN PALMERSTON NORTH: School of People, Environment and Planning Massey University, 44.
- [11] Damsere-Derry, J., & Bawa, S. (2018). Bicyclists' accident pattern in Northern Ghana. *IATSS Research*, 42(3), 138–142. <https://doi.org/10.1016/j.iatssr.2017.10.002>
- [12] Deffner, B., Jutta, H., Tomas, H., Rudolph, K., Christian, Z., & Torben, E. (2012). Handbook on cycling inclusive planning and promotion. Capacity development material for the multiplier training within the mobile project. Federal Ministry for Economic Cooperation Germany.
- [13] EPOMMA. (2016). Managing Mobility for a Better Future [Government]. <http://www.epomm.eu/>
- [14] Fishman, E., Schepers, P., & Kamphuis, C. B. M. (2015). Dutch Cycling: Quantifying the Health and Related Economic Benefits. *American Journal of Public Health*, 105(8), e13–e15. <https://doi.org/10.2105/AJPH.2015.302724>
- [15] Ghana Statistical Service. (2014). 2010 population and housing census: District analytical report. Wa municipal (p. 13). http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Upper%20West/WA%20MUNICIPAL.pdf
- [16] Goodall, B. (1987). Penguin dictionary of human geography (illustrated ed., p. 509). Penguin Books.
- [17] Götschi, T., Garrard, J., & Giles-Corti, B. (2016). Cycling as a Part of Daily Life: A Review of Health Perspectives. *Transport Reviews*, 36(1), 45–71. <https://doi.org/10.1080/01441647.2015.1057877>
- [18] Hook, W. (2003). Preserving and Expanding the Role of Non-motorised Transport: A Sourcebook for Policy-makers in Developing Cities (44th ed.). GTZ Transport and Mobility Group.
- [19] Hull, A., & O'Holleran, C. (2014). Bicycle infrastructure: Can good design encourage cycling? *Urban, Planning and Transport Research*, 2(1), 369–406. <https://doi.org/10.1080/21650020.2014.955210>
- [20] Karanikola, P., Panagopoulos, T., Tampakis, S., & Tsantopoulos, G. (2018). Cycling as a Smart and Green Mode of Transport in Small Touristic Cities. *Sustainability*, 10(1), 268. <https://doi.org/10.3390/su10010268>
- [21] Kothari, C. K. (2014). *Research Methodology: Methods And Techniques* (Second Revised Edition). New Age International Publishers.
- [22] Milković, M., & Štambuk, M. (2015). To Bike or not to Bike? Application of the Theory of Planned Behavior in Predicting Bicycle Commuting Among Students in Zagreb. 21.
- [23] Mullan, E. (2013). Exercise, Weather, Safety, and Public Attitudes: A Qualitative Exploration of Leisure Cyclists' Views on Cycling for Transport. *SAGE Open*, 3(3), 215824401349703. <https://doi.org/10.1177/2158244013497030>
- [24] Nelson, A. C., & Allen, D. (1997). If you build them, commuters will use them: Association between bicycle facilities and bicycle commuting. *Transport Research Record*, 1578(970132), 79–83.
- [25] Nielsen, T. A. S., Mulalic, I., & Christiansen, H. (2016). Drivers of Cycling Mode-share: Analysis of Danes Travel Behavior 1996-2013. *Transportation Research Procedia*, 14, 2284–2288. <https://doi.org/10.1016/j.trpro.2016.05.244>
- [26] Oja, P., Titz, S., Bauman, A., de Geus, B., Krenn, P., Reger-Nash, B., & Kohlberger, T. (2011). Health benefits of cycling: A systematic review: Cycling and health. *Scandinavian Journal of Medicine & Science in Sports*, 21(4), 496–509. <https://doi.org/10.1111/j.1600-0838.2011.01299.x>
- [27] Oldenziel, R., Emanuel, M., de la Bruheze, A. A., & Veraart, F. (2016). Cycling cities: The European experience: Hundred years of policy and practice. *Foundation for the History of Technology and Rachel Carson Center for Environment and Society*, 7–16.
- [28] Pucher, J., & Buehler, R. (2010). Walking and Cycling for Healthy Cities. *Built Environment*, 4, 36. <https://doi.org/10.2148/benv.36.4.391>
- [29] Rahman, M. M., Deste, G., & Bunker, J. (2010). Non-motorized public transport: A global review and analysis of trends and issues. The 12th World Conference on Transport Research , 11-15 July 2010, Lisboa Congress Center, Lisbon.
- [30] Reynolds, C. C., Harris, M. A., Teschke, K., Cripton, P. A., & Winters, M. (2009). The impact of transportation infrastructure on bicycling injuries and crashes: A review of the literature. *Environmental Health*, 8(1), 47. <https://doi.org/10.1186/1476-069X-8-47>
- [31] Rissel, C. E., New, C., Wen, L., Merom, D., Bauman, A. E., & Garrard, J. (2010). The effectiveness of community-based cycling promotion: Findings from the Cycling Connecting Communities project in Sydney, Australia. *International Journal of Behavioral Nutrition and Physical Activity*, 7(1), 8. <https://doi.org/10.1186/1479-5868-7-8>
- [32] Robert, B., & Hohmann, P. (2014). The Systems of Secondary Cities: The neglected drivers of urbanising economies. CIVIS, sharing knowledge and learning from cities.
- [33] Sallis, J. F., Conway, T. L., Dillon, L. I., Frank, L. D., Adams, M. A., Cain, K. L., & Saelens, B. E. (2013). Environmental and demographic correlates of bicycling. *Preventive Medicine*, 57(5), 456–460. <https://doi.org/10.1016/j.ypmed.2013.06.014>
- [34] Savan, B., Cohlmeier, E., & Ledsham, T. (2017). Integrated strategies to accelerate the adoption of cycling for transportation. *Transportation Research Part F: Traffic Psychology and Behaviour*, 46, 236–249. <https://doi.org/10.1016/j.trf.2017.03.002>
- [35] Servaas, M. (2000). The Significance Of Non-Motorised Transport For Developing Countries: Strategies For Policy Development. I-Ce, Interface for Cycling Expertise, Utrecht, the Netherlands.
- [36] Shaaban, K. (2020). Why Don't People Ride Bicycles in High-Income Developing Countries, and Can Bike-Sharing Be the Solution? The Case of Qatar. *Sustainability*, 12(4), 1693. <https://doi.org/10.3390/su12041693>
- [37] Showkat, N., & Parveen, H. (2017). Non-Probability and Probability Sampling. In *Media and Communications Studies*. e-PG Pathshala. www.researchgate.net/publication/319066480
- [38] Stevenson, M., Thompson, J., de Sá, T. H., Ewing, R., Mohan, D., McClure, R., Roberts, I., Tiwari, G., Giles-Corti, B., Sun, X., Wallace, M., & Woodcock, J. (2016). Land use, transport, and population health: Estimating the health benefits of compact cities. *The Lancet*, 388(10062), 2925–2935. [https://doi.org/10.1016/S0140-6736\(16\)30067-8](https://doi.org/10.1016/S0140-6736(16)30067-8)

- [39] UNEP. (2016). Global outlook on Walking and Cycling. United Nations Environment Programme, Nairobi.
- [40] UNEP. (2020). GHANA Non Motorised Transport STRATEGY 2019-2028 case study. United Nations Environment Programme. <https://www.unep.org/resources/case-study/ghana-non-motorized-transport-case-study>
- [41] UN-Habitat. (1996). The Management of Secondary Cities in Southeast Asia. United Nations Centre for Human Settlements (Habitat). <https://books.google.com.gh/books?id=P-3155j7FLkC>
- [42] UN-Habitat. (2013). Planning And Design For Sustainable Urban Mobility: Global Report On Human Settlements 2013. United Nations Habitat for Human Development.
- [43] Wang, L. (2018). Barriers to Implementing Pro-Cycling Policies: A Case Study of Hamburg. Sustainability, 10(11), 4196. <https://doi.org/10.3390/su10114196>
- [44] WHO. (2011). Health economic assessment tools (HEAT) for walking and for cycling: Methods and user guide, 2014 updates. World Health Organisation.
- [45] Whyte, B., & Crawford, F. (2014). Assessing the health and economic benefits of cycling in Glasgow. European Journal of Public Health, 24(suppl_2). <https://doi.org/10.1093/eurpub/cku162.066>
- [46] World Bank. (2018a). Ghana Secondary Cities Support Program (Program Appraisal Document No. Pad2798; P. 20).
- [47] World Bank. (2018b). Ghana Secondary Cities Support Program technical Assessment [Draft 1.2 for discussion]. worldbank.org/curated/en/107671536083152882/pdf/Final-Technical-Assessment-Ghana-Secondary-Cities-Support-Program-P164451.pdf
- [48] Zander, A., Passmore, E., Mason, C., & Rissel, C. (2013). Joy, Exercise, Enjoyment, Getting out: A Qualitative Study of Older People's Experience of Cycling in Sydney, Australia. Journal of Environmental and Public Health, 2013, 1–6. <https://doi.org/10.1155/2013/547453>

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Maternal Mortality in Cheras District Health Office (PKC) Kuala Lumpur, Malaysia: Analysis Data from 2014 to 2021

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Abstract-

Introduction: The maternal mortality in Malaysia in 2020 was 24.9 maternal deaths per 100.000 live births. In view of the alarming trend of the maternal mortality ratio in Malaysia in 2020 compared to 2019, it is crucial to explore the factors associated with maternal deaths to reduce the maternal death. Hence, this study is aimed to determine the sociodemographic characteristics and the associated factors of MMR in Cheras District Health Office (PKC), Kuala Lumpur. **Methodology:** A cross-sectional using all maternal death reports retrieved from PKC from 2014 to 2021 was conducted. The sociodemographic data and the maternal factors were analysed descriptively. Fisher's Exact Test was performed to determine the significance of associated factors of maternal mortality in the study. **Results:** Out of 18 maternal deaths reported, the majority were aged below 35 years and multiparous. There were 16.7% of mothers who received the tertiary education level. The median household income was RM3250 (USD 770.15). Indirect causes dominated maternal death cases by 66.7%. All the direct causes of death under the PKC are preventable in this study. The eventful antenatal period contributed to 72.2% of cases. However, there was no significant association between the sociodemographic factors and the death category of the maternal death cases. **Conclusion:** Despite no significant associated factors found in the study; we should not ignore the eventful antenatal factors. Therefore, a continuous effort for health promotion and health education among pregnant women remains vital. Further exploration of the perception and awareness of maternal health risk factors and maternal behaviour is necessary to address the gap in maternal mortality cases.

Index Terms- Maternal Mortality; Associated Factors; Cheras District Health Office Malaysia; Analysis Data

I. INTRODUCTION

Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from unintentional or incidental causes [1]. Based on this definition, the identification of a maternal death based on the cause of the death is recorded as either direct or indirect maternal death cause. Direct maternal death refers to death related to obstetric complications. Whereas, indirect maternal death refers to the death due to the existing diseases [2]. The measurement of maternal mortality only considers the maternal death occurring up to 42 days postpartum and do not involve late maternal death beyond 42 days postpartum for international reporting and the calculation of maternal mortality ratios and rates. The measure of the number of maternal deaths in a population reflects the risk of mortality associated with a single pregnancy or a single birth and the fertility level in the population [2].

The maternal mortality ratio in Malaysia in 2020 was 24.9 maternal deaths per 100.000 live births, increasing in trend from 21.1 maternal deaths per 100,000 live births in 2019 [3]. Most maternal deaths were preventable. Hence, it is crucial to explore the factors associated with maternal deaths to reduce the maternal mortality in Malaysia [4]. This is also in line with the sustainable development goal (SDG) number 3, related to maternal health, i.e., ensuring healthy lives and promoting well-being for all ages. The aim is to end the global

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preventable maternal mortality by reducing it to less than 70 per 100000 live births by 2030 [5]. The indicators set to achieve this target were maternal mortality and the proportion of births attended by skilled health personnel [5].

Identifying the factors that contribute to severe maternal morbidity allows for a better understanding of the problem and the development of an effective prevention approach. This refers to primary prevention by screening or prevention at the institutional, provider, and client levels, to prevent death or severe morbidity from a disorder [6]. Based on the literature, there are several contributing variables for maternal morbidity have been identified. This includes employment status [7], low household income [7], a previous history of abortion [7], multiple births [8], and limited antenatal care [7]. Age, race, educational level, co-existing medical conditions, parity, gestational period, mode of birth, previous cesarean section, and pre-pregnancy body mass index all yielded mixed results [7, 8].

Pregnancy-related death can be classified into preventable and non-preventable deaths during the maternal mortality meeting at the District, State and National Health Office level [9]. Preventable death is divided into two components i.e., preventable deaths with medical factors and preventable deaths with non-medical factors. Preventable death with medical factors refers to the deaths with the presence of modifiable medical factors (clinical or non-clinical factors) such as failure to diagnose, failure to appreciate severity, delayed referral, treatment, inadequate treatment etc. While preventable deaths with non-medical factors refer to deaths with the presence of non-medical factors (patient/family or socio-political). The shortfalls will be identified from the potentially preventable deaths for the remedial measures. This is important to facilitate the prevention of other maternal death in the future. This may include public health policies or interventions encompassing social, patient and family factors [9]. On the other hand, no remedial measures may be done following non-preventable deaths such as amniotic fluid embolisms etc [9].

Many efforts have been made by the Ministry of Health (MOH) Malaysia to tackle the issue of maternal mortality. However, it has been challenging to reduce maternal mortality. One of the said efforts is the meticulous auditing of maternal deaths using the confidential enquiry into maternal deaths (CEMD) [10]. This effort has been initiated in 1991, which allowed for the improvement in healthcare services based on the remedial factors identified in the audit. Besides, it provides evidence-based information to support the MOH budget requests for services that need improvements, such as the provision of communication systems, provision of equipment for hemoglobin estimation for effective management of anemia in pregnancy, provision of health education and many more others. Moreover, CEMD has improved maternal death reporting by encouraging active capture of maternal deaths through health clinics, district health offices, and state health offices [11].

This study was conducted to determine the sociodemographic characteristics and the associated factors of maternal mortality during antenatal, intrapartum and postpartum the maternal death cases in Cheras District Health Office (PKC), Kuala Lumpur Malaysia.

II. MATERIAL AND METHODS

Underlying Data and Study Design

A cross-sectional study was conducted using secondary data from The Maternal Death Report retrieved from Cheras District Health Office, Kuala Lumpur from 2014 and 2021.

Study population, Sampling Method, Inclusion and Exclusion criteria

The study was carried out at the Family Health Unit, Cheras District Health Office. Universal sampling was used whereby all the maternal deaths cases resulting from any conditions/ issues related to abortions, during pregnancies, labour, and puerperium from 2014 to 2021 reported to Cheras District Health Office were included in the analysis.

The inclusion criteria for the study were maternal mortality cases according to WHO definition; maternal mortality cases under Cheras District Health Office; maternal mortality caused by any conditions or problems associated with the termination of pregnancy or abortions, during pregnancies or its management, during labour or its management and puerperium (within 42 days post-partum) and maternal mortality cases reported under Cheras District Health Office from 2014 to 2021. The exclusion criteria from the study were maternal mortality cases with incomplete reports, and maternal death caused by a road traffic accident. The final cause of death for each case was decided during the maternal mortality meeting at the district level.

Variables

Variables included in this study were sociodemographic (age, nationality, ethnicity, marital status, education level, employment status, household income), pregnancy status (gravida/parity, period of gestation, past obstetric history, current antenatal history, current intrapartum history, current postpartum history, latest antenatal colour code, mode of delivery, fetal outcome) past medical and surgical history, Death status (year of death, place of death, cause of death, phase of death, category of death, preventability) and shortfalls of the case.

The death category is classified into direct, indirect and fortuitous death. Direct maternal death is defined as death due to obstetric haemorrhage or hypertensive disorders in pregnancy. For example, those due to anaesthesia or caesarean section complications are classified as direct maternal deaths [1, 2]. Indirect maternal death is defined as those maternal deaths “resulting from previous existing disease or disease that developed during pregnancy and not due to direct obstetric causes but were aggravated by the physiologic effects of pregnancy”. For example, deaths due to aggravation (by pregnancy) of an existing cardiac or renal disease are indirect maternal deaths [3]. Fortuitous maternal deaths occur from causes unrelated to the pregnancy and include violent deaths and suicide [4].

The latest antenatal colour code refers to the last colour code given to the patient before death based on the severity of the risk factors. There are four colours used: red, yellow, green, and white. Red code signifies a life-threatening condition, and the patient requires immediate hospital referral and admission. A yellow code indicates that the patient requires antenatal monitoring by a doctor. Green code suggests that complications may develop in these patients and hence requires monitoring by a senior nurse. White code indicates that patients are at no or low risk and can be monitored by the community nurse or midwife [5].

Data management

All data were entered, coded and recoded into Microsoft Excel Sheet before being kept in the researcher's Google Drive with a password protected. Any incomplete data was checked with the original patient report record.

Ethical consideration

Ethical approval for this research was obtained from the Malaysian Research Ethics Committee (MREC) with the ethics reference number NMRR ID-22-00484-PYX (IIR).

Statistical analysis

Data were managed in Microsoft Excel and were analysed using statistical software IBM SPSS Version 26.0. Demographic data and other categorical data were presented in frequencies and percentages. Numerical data, normally distributed, were presented as mean and standard deviation (SD), while median and Interquartile Range (IQR) were presented for numerical data, which was not normally distributed. The association between two categorical data was analyzed using Pearson's Chi-square. In addition, Fisher's exact test was used when the assumptions of Pearson's Chi-square test were not met. The probability value of less than 0.05 (p-value <0.05) was considered statistically significant.

III. RESULTS

The trend of maternal mortality under Cheras District Health Office from 2014 to 2021 is shown in Figure 1. The trend of maternal mortality was fluctuated within this study period. There was no mortality in year 2015. However, it was a sudden increase in MMR from 47.7 to 179.8 per 100,00 live births from year 2020 to 2021.

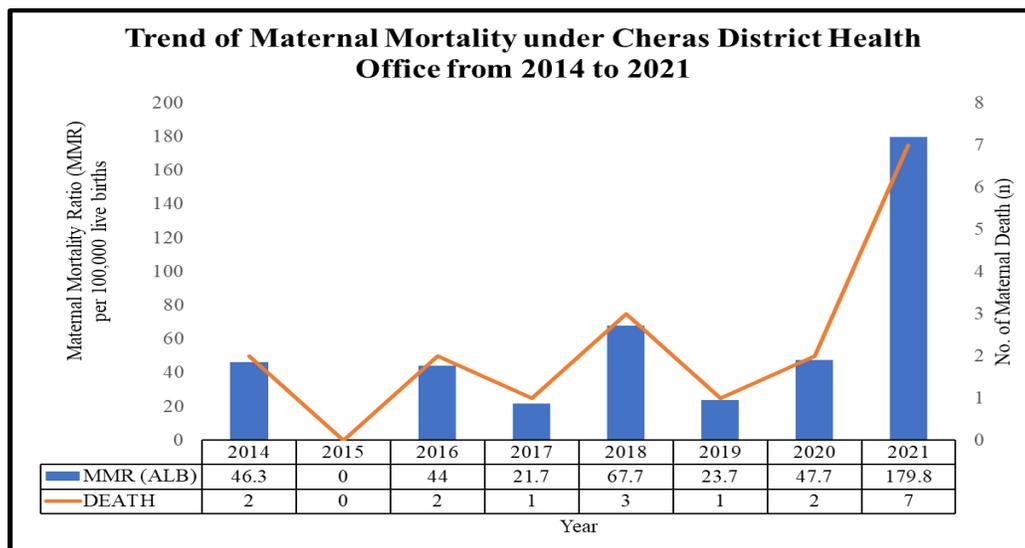


Figure 1: Trend of the maternal mortality cases under Cheras District Health Office from 2014 to 2021

A total of 18 maternal deaths cases under this nine-year review from 2014 to 2021. 6 (33.3%) was from direct cause and 12 (66.7%) was from an indirect cause. The majority of the maternal death cases aged below 35 years old with a mean age of 30.7 ± 5.56 . The nationality was equally distributed. Seventy-two per cent of mothers were multiparous and only 16.7% of mothers have received the tertiary education level. The median household income was RM 3250 (IQR: RM 3225). Twelve cases (66.7%) of maternal death cases under Cheras District Health Office were due to indirect cause of death.

Table 1 shows the sociodemographic of maternal death. It is shown that there was no significant association between the sociodemographic factors and the death category of the maternal death cases.

Table 1: Sociodemographic of the maternal death cases

Sociodemographic Factors	Total (N=18)	Death Category (cause)		p-value ^a
		Direct (N=6)	Indirect (N=12)	
Age Group:				
Maternal Age ≥ 35	7 (38.9%)	4 (66.7%)	3 (25.0%)	0.117
Maternal Age < 35	11 (61.1%)	2 (33.3%)	9 (75.0%)	
Nationality:				
Malaysian	9 (50.0%)	3 (50.0%)	6 (50.0%)	1.000
Non-Malaysian	9 (50.0%)	3 (50.0%)	6 (50.0%)	
Ethnicity:				
Malay	7 (38.9%)	1 (16.7%)	6 (50.0%)	0.880
Chinese	2 (11.1%)	2 (33.3%)	0 (0.0%)	
Indian and Others	9 (50.0%)	3 (50.0%)	6 (50.0%)	
Marital Status:				
Married	14 (77.8%)	4 (66.7%)	10 (83.3%)	0.806
Not Married	4 (22.2%)	2 (33.3%)	2 (16.7%)	
Parity:				
Primigravida	5 (27.8%)	2 (33.3%)	3 (25.0%)	0.561
Multipara	13 (72.2%)	4 (66.7%)	9 (75.0%)	
Education Level:				
Primary education	2 (11.1%)	1 (16.7%)	1 (8.3%)	0.570
Secondary education	6 (33.3%)	3 (50.0%)	3 (25.0%)	
Tertiary education	3 (16.7%)	0 (0.0%)	3 (25.0%)	
Others/Unknown	7 (38.9%)	2 (33.3%)	5 (41.7%)	
Employment Status:				
Employed	9 (50.0%)	4 (66.7%)	5 (41.7%)	0.310
Unemployed/Unknown	9 (50.0%)	2 (33.3%)	7 (58.3%)	
Household Income:				
Income equal or less RM2500	5 (27.8%)	3 (50.0%)	2 (16.7%)	0.453
Income more than RM2500	8 (44.4%)	2 (33.3%)	6 (50.0%)	
Unknown	5 (27.8%)	1 (16.7%)	4 (33.3%)	

^aFisher Exact Test, statistical significance difference at $p < 0.05$

Table 2 shows the preventability of pregnancy-related factors and death categories. The majority of the pregnancy-related factor was preventable (88.9%). However, there was no association between the cause of death category and the preventability ($p = 0.431$)

Table 2: Preventability of the maternal death cases following death category from 2014 to 2021

Pregnancy-related factor	Total (N=18), n(%)	Death Category		p-value ^a
		Direct (N=6), n(%)	Indirect (N=12), n(%)	
Preventability:				
Preventable	16 (88.9%)	6 (100.0%)	10 (83.3%)	0.431
Unpreventable	2 (11.1%)	0 (0.0%)	2 (16.7%)	

^aFisher Exact Test, statistical significance difference at p<0.05

Table 3 shows the factors associated with maternal death following the phase of pregnancy. The majority of the maternal death cases (72.2%) were eventful during their antenatal period. Those eventful cases contributed most to the indirect cause of maternal death. 50% of maternal death happened in a government hospital with a specialist. However, overall, there is no significant association between the pregnancy-related factor and the death category of the maternal death cases.

The study also found the eventful antenatal factors which contributed to the direct death include gestational diabetes mellitus, maternal obesity, primigravida, uncontrolled hypertension and default follow up. On the other hand, the most common factor that contributed to the indirect maternal death was unbooked pregnancy followed by the advanced maternal age and COVID-19 infection. During intrapartum, eclampsia was shown to be related the direct maternal death while delay in seeking health care facilities contributed to indirect maternal death. During the postpartum period, postpartum haemorrhage contributed to the direct cause of maternal death while infection, intracranial haemorrhage and heart problem contributed to the indirect cause of maternal death.

Table 3: Association between Phases of Pregnancy and Death category from 2014 to 2021

Pregnancy-related factor	Death Category			p-value ^a
	Total (N=18), n(%)	Direct (N=6), n(%)	Indirect (N=12), n(%)	
Antenatal Factors:				
Eventful	13 (72.2%)	5 (83.3%)	8 (66.7%)	0.439
Uneventful	5 (27.8%)	1 (16.7%)	4 (33.3%)	
Intrapartum Factors:				
Eventful	2 (11.1%)	1 (16.7%)	1 (8.3%)	0.569
Uneventful	16 (88.9%)	5 (83.3%)	11 (91.7%)	
Postpartum Factors:				
Eventful	7 (38.9%)	1 (16.7%)	6 (50.0%)	0.199
Uneventful	11 (61.1%)	5 (83.3%)	6 (50.0%)	
Antenatal Colour Coding:				
White	1 (5.6%)	1 (16.7%)	0 (0.0%)	0.320
Green	5 (27.8%)	1 (16.7%)	4 (33.3%)	
Yellow	1 (5.6%)	1 (16.7%)	0 (0.0%)	
Red	1 (5.6%)	0 (0.0%)	1 (8.3%)	
Not applicable (private hospital)	6 (33.3%)	3 (50.0%)	3 (25.0%)	
Unbooked/Unknown	4 (22.1%)	0 (0.0%)	4 (33.3%)	
Place of delivery:				
Government hospital with specialist	9 (50.0%)	2 (33.3%)	7 (58.3%)	0.509
Private hospital with O&G specialist	2 (11.1%)	2 (33.3%)	0 (0.0%)	
Not applicable	5 (27.8%)	1 (16.7%)	4 (33.3%)	
Others	2 (11.1%)	1 (16.7%)	1 (8.3%)	

^aFisher Exact Test, statistical significance difference at p<0.05

The causes of maternal mortality in Cheras District Health Office from 2014 to 2021 are shown in Table 4. Sepsis indirectly due to other diseases accounted for 75% of the total indirect cause or 50.0% of the all-maternal mortality.

Table 4: Causes of maternal death cases from 2014 to 2021

Type of causes	Causes	No. of maternal mortality
Direct (n=6)	Haemorrhage (n=3)	3
	- Postpartum haemorrhage	
	Hypertensive disease in pregnancy (n=3)	2
	- Massive Intracranial bleed secondary to eclampsia	
	- Disseminated intravascular coagulation (DICC) secondary to eclampsia	1
Indirect	Acute Coronary Syndrome	1
	Sepsis due to (n=9):	

(n=12)	- Pneumonia	3
	- COVID-19	3
	- Group A Streptococcal Toxic Shock Liked Syndrome Secondary to Extensive Bullous Cellulitis	1
	- Septicemia	1
	- Multiple organ failure secondary to mixed septic and cardiogenic shock with underlying hyperthyroidism precipitated by ruptured left ectopic pregnancy	1
Asphyxia		
- Airway obstruction secondary to massive bleeding post-operation for necrotising fasciitis	1	
Unknown cause		1
TOTAL		18

IV. DISCUSSION

From 2000 to 2017, there was a 38% reduction in the global MMR or from 342 deaths to 211 deaths per 100,00 population where 94% of all maternal deaths occur in low- and middle-income countries [1]. The trends of maternal mortality were almost the same in Malaysia from 2014 to 2020 [6]. However, during the COVID-19 pandemic, the increase in maternal deaths was not unexpected in the US [7]. It was the same in this study where the increase in maternal deaths from 47.7 to 179.8 per 100,00 live births from the year 2020 to 2021.

An increase the number of maternal mortality, Clark [7] concluded is due to limited access to prenatal care, lack of support and an increase in stress before and after birth. In resource-poor nations, maternal mortality has been attributed to “3 delays”: delay in deciding to seek care, delay in reaching care in time and delay in receiving adequate treatment [8]. Therefore, action and policy are needed to be taken at every level in making widespread, structural improvements in health coverage that can create greater access to women's care.

The average age of maternal death in this study was 30.7 ± 5.56 which was almost comparable with a study by Sageer, Kongnyuy [9] where the average age of maternal death was 30.8 ± 5.7 years in Ogun State, Nigeria in a two-year study (2015 and 2016). Half of the cases (50.0%) were non-Malaysian. This group prefers to have antenatal follow up at private health facilities, whereby there is no proper documentation and scheduled visit given to them [10]. In addition, their low socioeconomic status, poor health literacy, poor social support and the legal issue among undocumented foreigners and their negative perception of being caught if they seek treatment in government health facilities, aggravated the risk of maternal death among the population [10].

For the target of intervention [11], the classification into direct and indirect deaths was introduced in the ICD-9 revision in 1975. However, in ICD-10, the classification of maternal death is classified into four [12] which are the direct cause, indirect death, coincidental (fortuitous) death and unspecified maternal death. The importance of the classification is to focus on the quality of obstetric care for health-related conditions in previously healthy women [13]. A study by Ngonzi, Tornes [14] found that direct causes of mortality accounted for 77.7 % while indirect causes contributed 22.3 % in a study at Tertiary University Teaching Hospital in Uganda. A systematic review done by Say, Chou [15] found about 73% of all maternal deaths between 2003 and 2009 were due to direct causes and 27.5% were accounted for by the indirect cause. In this study, there was no difference in the characteristics of the direct and indirect causes of maternal death. This is attributed to the small sample size.

In UK and Ireland, thrombosis and thromboembolism are the leading cause of direct maternal death during and up to six weeks after the end of pregnancy [16]. In this study, postpartum hemorrhage (PPH) contributed to 50% of direct causes and 16.7% of all cases. maternal mortality. There were two cases of massive intracranial bleeding and one case of disseminated intravascular coagulation (DIVC) secondary due to eclampsia. A study by Sageer, Kongnyuy [9] found hemorrhage and pre-eclampsia contributed to 43.4% and 36.9% of maternal deaths in Nigeria, respectively. It was contributed by inadequate human resources for health, delay in seeking care, inadequate equipment, lack of ambulance transportation and delay in referral services. Ngonzi, Tornes [14] found 21.6% of maternal death was due to obstetric haemorrhage and 14.4% due to hypertensive disorders in pregnancy

In this study, sepsis due to infection contributed 75% of the indirect causes or 50% of maternal death. A study by Ngonzi, Tornes [14] in Uganda found that 8.92% of the most common indirect cause of mortality was due to malaria. There were three cases of maternal mortality due to COVID-19 in this study. It is estimated using the Lives Saved Tool (LiST), that an additional 8.3% to 38.6% of maternal mortality during COVID-19 pandemic per month in low-and middle-income countries [17]. These findings are in line with the current trend of maternal death worldwide, in which there is a change in the trend of maternal deaths from direct obstetric causes to the indirect cause. This indicates that the remedial actions and efforts that have been done, such as strengthening health services, healthcare worker training, quality of care improvement, and continuous CEMD, have shown a positive impact [18, 19]. The audit of maternal deaths via the CEMD appears to be very effective and has been improved from year to year. The CEMD can identify the remedial actions systematically to which the district health organisation and ministry of health will respond accordingly. The pre-pregnancy care services need to be strengthened to minimise unsafe pregnancy among mothers with underlying medical illnesses

Indirect deaths received less attention from health policy. The number of direct cause of death is more in high-income countries and are on the rise in many low- and middle-income countries [20]. However, the incidence of indirect deaths mostly under-reporting and misclassification [20]. Therefore, van den Akker, Nair [13] argue that the classification between direct and indirect has become less meaningful and in some cases it was misleading. Therefore, improving an access to quality maternal healthcare and efforts to decrease unintended pregnancies through family planning is necessary to further reduce the global maternal mortality [21].

Challenges

This study also showed that the maternal mortality cases during the recent two years have risen significantly compared to the years before the pandemic [22]. The COVID-19 infection contributed to the risk of maternal death due to unsafe deliveries and avoidance of healthcare facilities visits due to the fear of contracting the disease. Besides that, there is also an issue with limited resources (staffing and transportation) at the provider level in contrast to the higher number of COVID-19 cases that need to be managed.

Recommendation

Proper training of the staff in the data collection is needed to ensure the reliability of the data is protected and provide meaningful data for future analysis. Other than that, the stakeholder collaboration between government and private healthcare facilities should be enhanced in terms of giving health education and promotion to the mothers, especially among the foreigners who seek antenatal care at the private clinics, to increase their awareness of the importance of safe deliveries to prevent maternal death. In addition, continuous health education and health promotion during antenatal follow up in the government health care facilities should be continued. Since indirect maternal death causes dominate the trend of maternal mortality, it gives an insight that pre-pregnancy care services also should be enhanced for all women to ensure a safe pregnancy in the future.

Further study on the knowledge, attitude, practice and awareness of maternal health risk factors can be conducted to determine the gap in the maternal behaviour towards pregnancy safety.

Limitation

This study used a small sample size as the data only covered maternal death from the Cheras District Health Office. Hence, to improve the power and generalisability of the study, more sample sizes should be recruited by extending the study coverage and time in the future. Despite this, the results still give an insight into the performance of the maternal death prevention programme under the Cheras District Health Office. All data collected were classified as secondary data collected by the allied health personnel from the health clinics in charge. Thus, there is a lack of competency in the data collection, which cause the exclusion of maternal death case due to incomplete data. Other than that, since the study only compared the maternal death stratified by the death category, we can further analyse comparing the maternal death following the preventability status.

V. CONCLUSION

Continuous effort for health promotion and health education to pregnant women is vital to enhance women's empowerment in ensuring their good health, especially concerning pregnancy. On the health provider perspective, the findings strengthen the importance of continues preventive measures and remedial actions to be taken in reducing the maternal mortality in particularly in our locality. Future study to explore on the knowledge, attitude, practice and awareness of maternal health risk factor and maternal behavior is necessary in order to address the gap in maternal mortality cases.

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REFERENCES

- [1] World Health Organisation *Maternal Deaths 2022*. 2019.
- [2] World Health Organisation *ICD-10: International Statistical Classification of Diseases and Related-health Problems*. 2004.
- [3] Hirschmann R. *Maternal mortality ratio in Malaysia from 2011 to 2020 (per 100,000 live births) 2022* 2012.
- [4] Malaysian Healthcare Performance Unit, *Malaysian Health at a Glance: 2018*. 2000.
- [5] World Health Organization, *Maternal Health: fact sheet on Sustainable Development Goals* ((SDGsReport No.: WHO/EURO:2017-2363-42118-58039. 2017.

- [6] Geller, S.E., S.M. Cox, and S.J. Kilpatrick, *A descriptive model of preventability in maternal morbidity and mortality*. Journal of perinatology, 2006. **26**(2): p. 79-84.
- [7] van Hanegem N, et al., *Severe acute maternal morbidity in asylum seekers: A two-year nationwide cohort study in the Netherlands*. Acta Obstet Gynecol Scand, 2011. **90**(9): p. 1010-1016.
- [8] Lindquist A, Knight M, and Kurinczuk J. J., *Variation in severe maternal morbidity according to socioeconomic position: A UK national case-control study*. BMJ Open, 2013. **3**(6): p. e002742.
- [9] Ministry of Health Malaysia *National Technical Committee Confidential Enquiry into Maternal Death, Malaysia (2019). Guidelines on Classification of Pregnancy Related Into Preventable and Non-Preventable Deaths*. 2019.
- [10] Ravichandran J. and Ravindran J., *Lessons from the confidential enquiry into maternal deaths, Malaysia*. BJOG, 2014. **121**(Suppl 4): p. 47-52.
- [11] Jaafar, S., et al., *Good Practices on Maternal & Child Healths in ASEAN: Confidential Enquiry into Maternal Deaths in Malaysia - reviewing maternal deaths to make motherhood safer*, in *e-Health Bulletin*. 2015.
- [12] Payne, J. and J. Cox *Maternal Mortality*. 2016.
- [13] de Moraes A. P, et al., *Severe maternal morbidity: A case-control study in Maranhao, Brazil*. BMC Reprod Health, 2013. **10**: p. 11.
- [14] Howarth G., *Fortuitous-ambiguously inappropriate to describe maternal death?* BMJ, 2000. **320**(7240): p. 986.
- [15] Ministry of Health Malaysia, *Operation Policy In Obstetrics and Gynaecology Services*. 2010.
- [16] Clark, M. *Increase in Maternal Mortality During COVID Underscores Need for Policy Changes*. 2022.
- [17] UNFPA *Maternal Mortality Update 2002: A Focus on Emergency Obstetric Care*. Maternal United Nations Population Fund, 2003.
- [18] Sageer, R., et al., *Causes and contributory factors of maternal mortality: evidence from maternal and perinatal death surveillance and response in Ogun state, Southwest Nigeria*. BMC Pregnancy and Childbirth, 2019. **19**: p. 63.
- [19] Loganathan T., et al., *Migrant Women's Access to Sexual and Reproductive Health Services in Malaysia: A Qualitative Study*. International journal of environmental research and public health, 2020. **17**(15): p. 5376.
- [20] Cross, S., J.S. Bell, and W.J. Graham, *What you can count it what you target: The implication of maternal death classification for tracking progress towards reducing maternal mortality in developing countries*. Bull World Health Organ, 2010. **88**: p. 147-153.
- [21] World Health Organisation, *The WHO application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-Maternal Mortality (ICD-MM)*. 2012.
- [22] van den Akker, T., et al., *Maternal mortality: Direct or Indirect has become irrelevant*. The Lancet Global Health., 2017. **5**(12): p. e1181-e1182.
- [23] Ngonzi, J., et al., *Puerperal sepsis, the leading cause of maternal deaths at a Tertiary University Teaching Hospital in Uganda*. BMC Pregnancy and Childbirth, 2016. **16**: p. 207.
- [24] Say, L., et al., *Global causes of maternal death: a WHO systematic analysis*. The Lancet Global Health., 2014. **2**: p. e323-333.
- [25] HQIP, *Maternal, newborn and infant programme: Saving lives, improving mothers' care 2020 report*. 2021.
- [26] Robertson, T., et al., *Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study*. The Lancet Global Health., 2020. **8**: p. e901-e908.
- [27] van den Akker, T., *Indirect causes of maternal mortality*. Pregnancy Hypertension, 2018. **1**(Suppl 1): p. S14-S15.
- [28] Zureick-Brown S, et al., *Understanding Global Trends in Maternal Mortality*. Int Perspect Sex Reprod Health, 2013. **39**(1): p. 32-41.
- [29] Chmielewska B., et al., *Effects of the COVID-19 pandemic on maternal and perinatal outcomes: a systematic review and meta-analysis*. The Lancet Global Health. , 2021. **9**(6): p. e759-e72.

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Exploring a Peer-support group model of mental health for Indian college students

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Abstract- Aim: The COVID-19 pandemic has severely affected the mental health of students in India. Since most educational institutions do not always have trained counsellors the use of peer-support groups is suggested as a stop-gap measure. The present research explores one such peer-support group through its development and functioning as a model for mental health interventions. **Method:** A group of fifteen participants were selected through purposive sampling. All of them were students pursuing the Applied Psychology Honours programme as their undergraduate degree, in a college in Delhi. They were trained in active listening skills and the WHO Quality Rights (WHO,2017) guidelines. A facilitator was selected from amongst them to oversee the smooth functioning of the group. **Data:** Detailed unstructured interviews were conducted to understand the reasons for joining and the benefits of the peer-support group. **Results:** The Reflexive Thematic Analysis (RTA) by Clark and Braun(2019) was done on the interview data. Some of the themes that emerged are “sharing”, “impact of the group” etc. **Implications:** Peer Support Volunteers who are fellow students trained to provide peer-to-peer resources can be designated to help other students deal with the stresses of the pandemic and other mental health issues by forming support groups in colleges. These groups are the first steps toward dealing with problems of mental health.

Index Terms- COVID-19 pandemic, mental health, students, peer support groups, Reflexive Thematic Analysis

I. INTRODUCTION

Research suggests that the mental well-being of Indian students has been adversely impacted due to the COVID-19 pandemic. A recent study (Moghe, Kotecha, Patil,2020) found students presenting feelings of uncertainty, helplessness, and depression. In addition, there was an increase in anxiety due to lowered productivity, deferring of planned activities, and uneasiness about access to healthcare facilities. Virtual learning due to the pandemic has not always been effective due to the economic constraints of students and poor connectivity issues, negatively impacting students' career aspirations (Agha,2020).

Covid-19 has affected at least two-fifth of the Indian population with anxiety and depression being major illnesses (Grover, et.al

2020). The National Mental Health Survey(NMHS) conducted in 2016(Gautham et. al,2016) found the treatment gap was 73.6% for those with severe mental illnesses but rose even higher to 85.0% for common mental illnesses. This survey also indicates the impending paucity of trained mental health resources, further finding that the availability of psychiatrists in the NMHS states varies from the 0.05 per lakh population in Madhya Pradesh to 1.2 per 100,000 population in Kerala (Garg, Kumar, & Chandra, 2019). Not much has changed since the NMHS, contributing to most students being unable to access these inadequate resources thus further impacting their mental health during the pandemic.

There is substantial evidence suggesting that basic mental healthcare can be provided by trained non-physician health workers. As stated above, since in India there is a glaring shortage of trained professionals, the alternative of community health care can be actively considered. Mental health programs, involving peer educators, have proved useful in addressing issues of distress and well-being like suicide prevention even in Indian schools (Patel, et.al.,2011; Zachariah et. al,2018). This is especially true now in the aftermath of the COVID- 19 pandemic in India, to enable increased access to a basic standard of informed mental healthcare support for students.

Peer Support Volunteers (PSVs) who are fellow students trained to provide peer-to-peer resources over the telephone or virtually, have been recommended as a cost-effective method by which schools and universities can complement their traditional health resources. The well-being of these peer supporters' does not diminish while working as a mental health peer support worker; rather, some aspects of their well-being improve (Johnson & Riley,2021). People who have lived experiences of mental health issues serve as peer volunteers to support those with similar experiences in their healing processes (Pathare, Kalha, & Krishnamoorthy,2018). Trained peer support students not necessarily having a lived experience have also been used as PSVs successfully since research suggests that peers are an essential source of support for young people experiencing mental health issues. (Lubman et. al,2017). This can also be successfully leveraged in the Indian context where the mental health resources for students are limited.

The World Health Organization (WHO) has also identified the significance of peer support, a form of social support, in

nourishing mental health. In India, the *Atmiyata* programme, (Joag et al, 2020) a community-based mental health intervention dedicated to promoting wellness through community volunteers or PSVs in Maharashtra (India) was found to be successful. The lived experiences of the mental illnesses of the PSVs helped other members through their recovery journey during the meetings held by the *Maitri* groups. By reviewing international best practices of peer-support groups including *Maitri*, WHO QualityRights (WHO, 2017) developed, the “Creating Peer Support Groups in Mental Health and Related Areas” guidelines. This provides comprehensive guidance and training tools to develop peer support groups in mental health and can be adopted for Indian college students.

Shalaby, & Agyapong, (2020) have reviewed peer support in mental health. They have stated that the gap between people with mental issues and health care professionals, in recent years has been closed to some extent, through the acceptance of peer support services (PSSs) in the developed countries but not in India. The authors have further defined peer support as the extension of help by those individuals who have a lived experience of mental illness.

The present study was done to understand the efficacy of a peer-support group of volunteers trained by the author (in the role of Supervisor) in peer-support and active listening skills. The author piloted one such small group in her college by training a Facilitator based on the WHO QualityRights (WHO, 2017) guidelines.

II. METHOD

Participants: A group of volunteers who were all students of Applied Psychology Honours studying in a University of Delhi college for their undergraduate degree. They were selected through purposive sampling. The size of the group was 15, to begin with, but during the pandemic, the membership was reduced to 6. This was an exploratory qualitative research study.

Procedure: The first step was to identify through need assessment, the requirements for such a support group. Voluntary membership was extended to all the students pursuing Psychology in their under graduation. Most students who showed interest were new and experiencing issues in adjusting to college life. All of the members that were a part of the support group till the membership stabilised had lived experiences with mental health. A Facilitator was selected who was a final year Psychology student. She had already been trained in basic counselling skills. The Supervisor ensured that the members felt secure with the Facilitator’s abilities to lead the group. The Supervisor was also present for the initial meetings during group formation to train the members in non-judgemental communication and other core aspects of support group functioning as per the WHO Quality Rights (WHO, 2017) guidelines. A code of ethics and governing rules were established where emphasis on confidentiality, having empathy, sharing responsibility, etc. was established. Meetings were initially organised by the Facilitator until the membership stabilised, post which any member could initiate a meeting. This group was established before the COVID-19 pandemic and the members

were required to physically conduct one meeting per week. The meetings continued virtually at the onset of the pandemic.

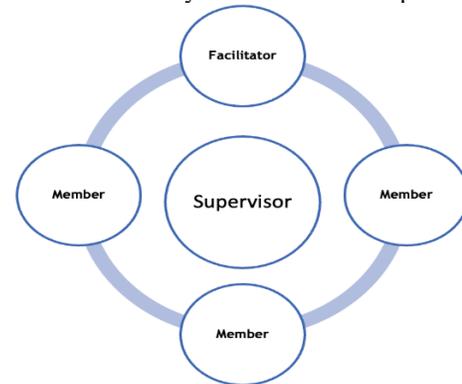


Figure 1: Building a Peer-support model for students

III. DATA

A detailed interview of four members was carried out by the author to understand the impact of the support group on the mental health of these members. This was an exploratory study. The researcher was trying to understand the reasons for the membership as well as the benefits of membership. This group had been active during the pandemic and the members continue to meet.

IV. ANALYSIS

Reflexive thematic analysis (RTA) (Braun & Clark, 2019) was done on the interview data that was relevant to the objectives of this study. RTA was used since this was an exploratory study and was relying on data gathered through detailed interviews. The thematic map is presented below in Figure 2.

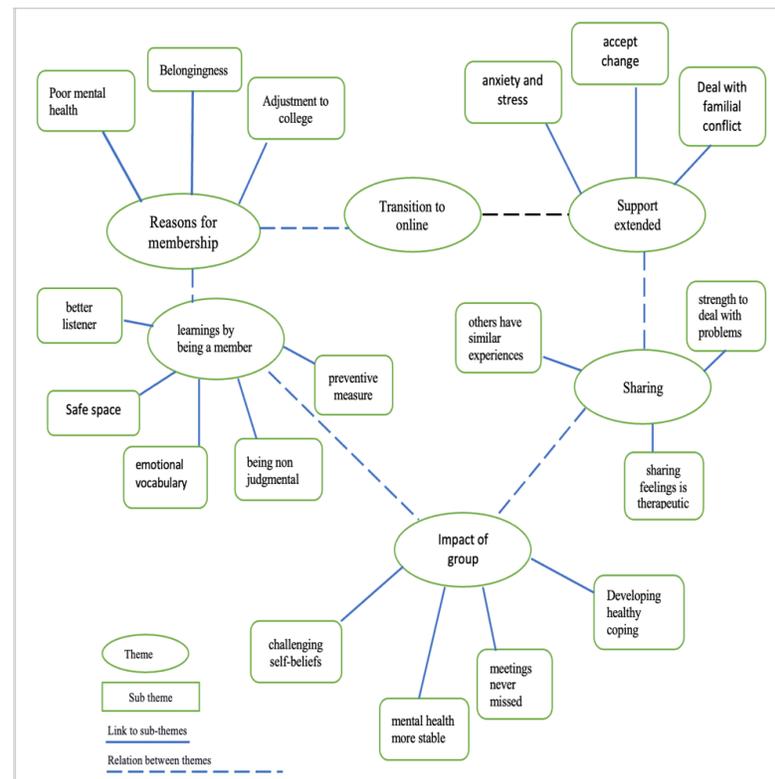


Figure 2. Thematic map of student interviews

V. DISCUSSION

College life often is the cause of many academic, social, transitional and cultural challenges for countless students (Beiter, et. al,2015). Peer support is not a novel idea and it is used globally in most higher educational institutions. This is not so in the Indian context where it is not utilised at all, despite its known benefits for student mental health issues. The present research is a small effort to try and understand the needs and impact of a peer-support group.

The interviews were analysed using RTA. The themes that emerged focused on the need to form a support group and the benefits the members obtained from regular meetings before and during the pandemic. All the members cited poor personal mental health as an important reason for forming the support group. The basis of peer support is the lived experiences of mental health. All the members of the present support group had mental health issues and hence were the appropriate candidates to start the support group. Schlichthorst, Ozols, Reifels, & Morgan, (2020) have defined peer support in the form of a personal and situation based association, the premise for which is lived experience, involvement in common life experiences, conditions, and beliefs. It is perceived as a “system of giving and receiving help, founded on key principles of respect, shared responsibility and mutual agreement of what is helpful” (Davidson, & Guy,2012). In the words of one of the members *“I joined the support group because I saw it as a group where I would learn more about mental health and will be able to provide as well as seek mental health support to and from my peers. Another reason was that most of the students in the group were from my batch so I thought I’d be more comfortable sharing my experiences/issues with them and also I will be able to resonate more with their experiences/ issues.”*

The present group had the Facilitator as a third-year student as she has already trained in counselling skills and the rest of the members were her juniors. Having peer support programmes in institutions provides additional support, reciprocally, to the junior students along with concurrently advancing the senior student’s confidence (Cust, & Guest, 2019). In the Facilitator’s words, *“I tried to share more, bring up topics that would be relatable to the group because of the common area that we have- college. I brought up concerns that I used to have when I entered college. When the members would share similar concerns, I talked about how I dealt with them, and we discussed what they would be willing to try if they thought it would help.”*

Research suggests that all students can benefit from these peer-support groups - the junior students can build their confidence through their peers and the senior students can gain a multifaceted understanding of their role (Dennison, 2010).

Chinman, et al (2006) stated that the genuineness found in peer-support relationships could lead to greater feelings of empathy and connectedness and this was expressed in the themes that emerged from the present study. In the theme *“learnings by being a member”* codes like *safe space, non-judgemental listener* etc indicate connectedness. Further in the words of a member, *“I know that I am not alone, I have someone to talk to if I need to, I know that I do not have to go through the worst times of my life alone. Each time I am at a low point in my life, I am provided with comfort and strength from the support group. Even small things like hearing “thank you for sharing” “I hear you,*

this is a difficult experience” “I am here for you”, help me to gain strength and support. There are also times when I gain confidence and a better sense of self-worth because of the group”.

The continuance of the virtual meetings had greatly benefited the mental health of all the participants by providing them empathetic support to share the anxiety and alleviate stress created by the pandemic. *“The support group has helped in the absence of access to formal counselling sessions. It has made its members less anxious, less alone or, isolated and has also helped to get rid of negative thoughts. It helps a lot in venting, getting a different perspective knowing that one is not being judged”* (personal communication). This peer-support group provides a safe space for students to share their mental health experiences in an enabled setting, virtually as well, with student peers who may have their own lived experiences of mental health. Peer support programs have been shown to propose alternative support options during crisis and care, and an effective strategy to engage with people that traditional health services fail to reach as was the case during the lock-down and social distancing during the pandemic (Sokol, & Fisher,2016). Further Viswanathan, Myers, & Fanous, (2020) state that offering virtual peer support groups is a useful model for others to adapt to so as to help students and others in this ongoing worldwide pandemic.

VI. CONCLUSION

There are many benefits to both the junior and senior students, hence more students should be provided with this practice of peer support. This role can have the possibilities of improving leadership, self-esteem, personal knowledge as well as confidence while, positively impacting students’ mental health. Student mental health peer support groups represent an opportunity to localise mental health services. Institutionalizing mental well-being through economical campus wellness services will engage students in active listening, educate peers about self-care and healthy coping strategies and can also help attenuate the stigma around mental health.

As clearly specified by Suresh et al,(2021) peer-support groups can never replace traditional forms of treatments rather only complement them. In India, when there is limited access to professional treatment these peer-support groups can be a ray of hope for the students.

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REFERENCES

- [1] Agha, E. (2020). Learning rebooted: Online education during Covid-19 lockdown puts spotlight on India’s digital divide. Retrieved from news18: <https://www.news18.com/news/india/learning-rebooted-online-education-during-covid-19-lockdown-puts-spotlight-on-indias-digital-divide-2563265.html>.
- [2] Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of affective disorders*, 173, 90-96.
- [3] Braun, V., Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport Exercise Health* 11(4), 589–597 <https://doi.org/10.1080/2159676X.2019.1628806>

- [4] Chinman, M., Young, A. S., Hassell, J., & Davidson, L. (2006). Toward the implementation of mental health consumer provider services. *The Journal of Behavioral Health Services & Research*, 33(2), 176-195.
- [5] Cust, F., & Guest, K. (2019). Peer support for undergraduate children's nursing students. *Journal of Nursing Education and Practice*, 10(4).
- [6] Davidson, L., & Guy, K. (2012). Peer support among persons with severe mental illnesses: a review of evidence and experience. *World Psychiatry*, 11(2), 123-128.
- [7] Dennison, S. (2010). Peer mentoring: Untapped potential. *Journal of Nursing Education*, 49(6), 340-342.
- [8] Garg, K., Kumar, C. N., & Chandra, P. S. (2019). Number of psychiatrists in India: Baby steps forward, but a long way to go. *Indian journal of psychiatry*, 61(1), 104.
- [9] Gautham, M. S., Gururaj, G., Varghese, M., Benegal, V., Rao, G. N., Kokane, A., ... & Shibukumar, T. M. (2020). The National Mental Health Survey of India (2016): Prevalence, socio-demographic correlates and treatment gap of mental morbidity. *International Journal of Social Psychiatry*, 66(4), 361-372.
- [10] Grover, S., Sahoo, S., Mehra, A., Avasthi, A., Tripathi, A., Subramanian, A., ... & Reddy, Y. J. (2020). Psychological impact of COVID-19 lockdown: An online survey from India. *Indian Journal of Psychiatry*, 62(4), 354.
- [11] Joag, K., Shields-Zeeman, L., Kapadia-Kundu, N., Kawade, R., Balaji, M., & Pathare, S. (2020). Feasibility and acceptability of a novel community-based mental health intervention delivered by community volunteers in Maharashtra, India: the Atmiyata programme. *BMC psychiatry*, 20(1), 1-14.
- [12] Johnson, B. A., & Riley, J. B. (2021). Psychosocial impacts on college students providing mental health peer support. *Journal of American college health*, 69(2), 232-236.
- [13] Lubman, D. I., Cheetham, A., Jorm, A. F., Berridge, B. J., Wilson, C., Blee, F., ... & Proimos, J. (2017). Australian adolescents' beliefs and help-seeking intentions towards peers experiencing symptoms of depression and alcohol misuse. *BMC public health*, 17(1), 1-12.
- [14] Moghe, K., Kotecha, D., & Patil, M. (2021). COVID-19 and mental health: A study of its impact on students. *MedRxiv*, 2020-08.
- [15] Patel, V., Weiss, H. A., Chowdhary, N., Naik, S., Pednekar, S., Chatterjee, S., ... & Kirkwood, B. R. (2011). Lay health worker led intervention for depressive and anxiety disorders in India: impact on clinical and disability outcomes over 12 months. *The British Journal of Psychiatry*, 199(6), 459-466.
- [16] Pathare, S., Kalha, J., & Krishnamoorthy, S. (2018). Peer support for mental illness in India: an underutilised resource. *Epidemiology and Psychiatric Sciences*, 27(5), 415-419.
- [17] Shalaby, R. A. H., & Agyapong, V. I. (2020). Peer support in mental health: literature review. *JMIR Mental Health*, 7(6), e15572.
- [18] Schlichthorst, M., Ozols, I., Reifels, L., & Morgan, A. (2020). Lived experience peer support programs for suicide prevention: a systematic scoping review. *International journal of mental health systems*, 14(1), 1-12.
- [19] Sokol, R., & Fisher, E. (2016). Peer support for the hardly reached: a systematic review. *American journal of public health*, 106(7), e1-e8.
- [20] Viswanathan, R., Myers, M. F., & Fanous, A. H. (2020). Support groups and individual mental health care via video conferencing for frontline clinicians during the COVID-19 pandemic. *Psychosomatics*, 61(5), 538-543.
- [21] World Health Organization. (2017.) Creating peer support groups in mental health and related areas: WHO QualityRights training to act, unite and empower for mental health (pilot version). World Health Organization.

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Utilization of Digital Technology in conduction of Clinical Trials in India: Issues and Perspectives

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Abstract- The conventional clinical trial system demands a change of evaluating new drugs, treatments, devices and health system intercession. Digital technologies have the ability to alter the whole clinical trial procedure through automatic mechanism, better data analysis and storage and better bond and relationship with patients. The year 2020 has schooled India as well as the world that an active functioning healthcare structure and healthy people are crucial to the economic and social welfare of a country.

The paper discusses about the role and importance of digital technologies which are used in clinical trials. It discusses about the key elements of digitizing the clinical trial process. It also focusses on the barriers of digitizing the clinical trial process. The paper concludes by throwing light in the concern area which needs to be overcome in order to enhance the efficiency and efficacy of digital clinical trial in India.

Index Terms- Digital clinical trials, Digital Recruitment, Digital Health Data Collection, Digital Analytics.

I. INTRODUCTION

On March 11, 2020, the World Health organization (WHO) announced the coronavirus disease 2019 outburst as a pandemic. The Covid-19 pandemic has significantly changed the society, economies of the countries, and consequently a vital need

arises for new inventions and innovations in the field of medicines, medical devices and development technology to provide high-quality patient-care following the Covid-19 protocols. Thus, it is very important to link the digital technology to medical software applications to grab health related information of the patients. Similarly digital technology should be used in the process of clinical trials as well so that the recruitment process can be raced up and the process of data analysis and recording and monitoring activities can also be done at a faster pace.¹

As per the Symposium organized by Parexel, Global Clinical Research Organization (CRO) in association with ET Health World, 2022, only 1.2% of the population participate in clinical trials in India. Large number of people's medical need are still unmet in India, which shows a strong necessity of clinical trials in India so that all new therapies and medicines are accessible to all the patients.²

According to the Accenture Digital Health Technology Vision 2020 report, 90% of health executives believes that for competing in the market, smooth and harmonious relations of organization with their customers is a primary requirement and this task is made easy with the help of digital technology. In 2000, only 8 clinical trials used digital health technologies which increased to 1100 trials by 2017. It is estimated that 70% of clinical trials will be backed by digital sensors and technology by 2025. Relationship of the technology and clinical research has given an opportunity to enter the Global clinical research market.³

¹ Anthony Jnr. Bokolo, 'Exploring The Adoption Of Telemedicine And Virtual Software For Care Of Outpatients During And After COVID-19 Pandemic' (2020) 190 Irish Journal of Medical Science (1971 -).

² 'India's Clinical Research Advancements: Trends Witnessed across Technology and Patient-Centricity - ET Healthworld' (ETHealthworld.com, 2022)
<<https://health.economictimes.indiatimes.com/news/industry/india-as-clinical-research-advancements-trends-witnessed-across->

[technology-and-patient-centricity/89790819](https://health.economictimes.indiatimes.com/news/industry/india-as-clinical-research-advancements-trends-witnessed-across-technology-and-patient-centricity/89790819)> accessed 11 April 2022.

³ Nikita Rana, 'Technology Is Going to Play a Key Role in India's Roadmap for Health Infrastructure: ETILC Members' (*The Economic Times*, 2022)
<<https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/technology-is-going-to-play-a-key-role-in-indias-roadmap-for-health-infrastructure-etilc-members/articleshow/81683674.cms>> accessed 5 January 2022.

II. DEFINITION OF CLINICAL TRIAL

A Clinical Trial is defined as a systematic study of new drugs in human subjects to generate data for discovering and/or verifying the clinical, pharmacological (including pharmacodynamics and pharmacokinetic), and/or adverse effects with the objective of determining safety and/or efficacy of the new drugs.⁴

Clinical trials form a link between preclinical testing and actual medical practice. With the help of clinical trial the efficacy and safety of a drug or treatment is tested which is a primary requirement for market authorization. Clinical trials are the only key through which lock of new medicines including drugs, therapeutic treatments, vaccines, medical devices are open for the public at large which helps in curing their diseases.⁵

III. CONCEPT OF DIGITAL CLINICAL TRIAL

A digital trial is defined by the procedure, methods and techniques that are used to obtain the clinical trial data. A digital clinical trial is the one where all types of data which are required for the study is collected through the use of digital technology and utilization of paper forms are to the minimum.⁶

The concept of digital clinical trials is useful to accelerate the process and improve the recruitment, data collection and data analysis which are available during the clinical trial procedure. Digital technology is very beneficial for speeding up the regulatory approval process which ultimately results in cost effective and less burdensome clinical trials. Various experts, professionals, and officials have accepted the potential of using digital technology to accelerate the pace at which various data and results is being obtained through clinical trials.⁷

IV. KEY ELEMENTS OF DIGITAL CLINICAL TRIAL

A digital trial is one that uses technology to improve recruitment process, pacing up the data collection procedure and help in the analysis of the data. So the key elements of a digital clinical trial are Digital Recruitment, Digital Health Data Collection and Data Analytics.⁸

V. DIGITAL RECRUITMENT

Recruitment and informed consent of participants for the clinical trial is a major hurdle because of which the clinical trials are not completed in time. Many a times the enrollment procedure are so complex that the participants hesitate in enrolling for the trial. Other reasons like the travelling expenses, financial constraints, lack of knowledge regarding the clinical trial of the drug may also hinder the recruitment process.⁹

The solution to such problems is the use of digital technology in the recruitment process of the participants which will make their work easy, quick, and economical and less time consuming. Recruitment of participants by using internet, certain software or social media applications, smartphones, laptops or such other virtual gadgets becomes quite easy, fast and cost efficient. Digital marketing with the help of online advertising can be useful in targeting the appropriate patient group which are required for the trial.¹⁰

VI. DIGITAL HEALTH DATA COLLECTION:

The second step after the recruitment of participants is the collection of data which are necessary in the clinical trial process. The data may include medical or demographic data, physiological

⁴ Sec. 122DAA of Drugs and Cosmetics Rules, 1945.

⁵ M Flather, Hazel Aston and Rod Stables, *Handbook of Clinical Trials* (ReMEDICA Pub 2001).

⁶ 'Decentralized Vs Digital Clinical Trials: There Is a Difference | Concertai' (*ConcertAI*, 2022) <<https://www.concertai.com/news/2021/11/decentralized-vs-digital-clinical-trials-there-is-a-difference/>> accessed 12 April 2022.

⁷ 'Accelerating Momentum: Digital Innovation in Clinical Trials' (*Accenture.com*, 2022) <[https://www.accenture.com/_acnmedia/PDF-171/Accenture-](https://www.accenture.com/_acnmedia/PDF-171/Accenture-90976792-Infographic-Accelerating-Momentum.pdf)

[90976792-Infographic-Accelerating-Momentum.pdf](https://www.accenture.com/_acnmedia/PDF-171/Accenture-90976792-Infographic-Accelerating-Momentum.pdf)> accessed 12 April 2022.

⁸ 'Accelerating Momentum: Digital Innovation in Clinical Trials' (*Accenture.com*, 2022) <https://www.accenture.com/_acnmedia/PDF-171/Accenture-90976792-Infographic-Accelerating-Momentum.pdf> accessed 12 April 2022.

⁹ Geoff K. Frampton and others, 'Digital Tools for the Recruitment and Retention of Participants in Randomised Controlled Trials: A Systematic Map' (2020) 21 *Trials*.

¹⁰ ClinEdge (en-US), 'Digital Recruitment: Changing the Face of Clinical Trials' (*Clin-edge.com*, 2022) <<https://clin-edge.com/news/digital-recruitment-changing-face-clinical-trials>> accessed 13 April 2022.

data or certain types of activity details which a patient or trial subject may be performing as a part of their routine, data regarding the patient reported outcomes and images etc. are required in a clinical trial process. These types of health data of a patient can be obtained with the help of wearable devices, digital biomarkers and by the use of smart phones and digital watches etc.¹¹

The digital biomarker can be used to collect information about the physiological, behavioral, pathological and overall bodily function of the patients. Some of the examples of digital bio markers are pocket ECG, fitness trackers, step counters, glucometer, blood pressure measuring device, oximeter etc. can provide with immense amount of data about the patients and even the outcome of a medicine or drug or any kind of treatment which is administered on them. As these data are collected continuously, a regular watch can be done on the patients and in case of any unfavorable events treatment can be given at the earliest and as a result it will also increase the reporting process of clinical trials.¹²

VII. DATA ANALYTICS

The digital transformation of health related data gives amazing opportunities to improve clinical trials, from trial complementing to collection of data, using medical instruments, internet facilities, using the real world data stored in EHR (Electronic Health Record) as well as other sources. A flexible, adaptable and measurable clinical trial infrastructure which employs the EHR is now possible. For example, The Substitutable Medical Application, Reusable Technologies known as SMART or The Fast Health Interoperability Resources i.e. FHIR enable the researchers, clinical technicians, doctors and patients to connect digital apps with the health system across the Electronic Health Record centers.¹³

The new Artificial Intelligence (AI) tools has become a boon to the healthcare industries. It transforms clinical trial and drug discovery process. AI intends to understand human

intelligence which includes human skills of understanding things, speaking, listening, performing social and cultural activities or creative work, so that it can reproduce this intelligence in machines. AI technique can combine treatment data, personal data, lab testing data etc. to identify any undesirable situation, or any particular pattern which will help in prediction of treatment and behavior of the patients.¹⁴

Thus data related to clinical trial can be analyzed quickly, cost efficiently and with less time consumption by digitizing the process of clinical trial and favorable outcome of the trial can also be obtained. But the pivotal point that needs to be remembered while analyzing the data digitally is to be extra cautious and extraordinarily vigilant in matter of the quality of the data as well as maintaining the privacy of the trial participants.¹⁵

VIII. IMPORTANCE/BENEFITS OF DIGITIZING CLINICAL TRIAL PROCESS

With advancement and development in technology various pharmaceutical companies and clinical research industries started using digital technology in the clinical trial process. The vast data which are produced during the process of clinical trials, analyzation of these data, compilation and recording of the data becomes a challenging task. Digitization helps in analyzing the data effectively, obtaining more understanding and knowledge from available data, developing and analyzing the data in product's safety and efficacy. It minimizes the risk related to the subject and also are cost effective.¹⁶

Digital technology is also useful in converting the raw data into smart data. The use of algorithms is a new milestone which have created a positive impact on clinical trial. With the adoption of technology the production cost of a drug will reduce tremendously and it will positively affect the value-based health care system. Some of the benefits are:

¹¹ 'Better Data Collection And Convenience For Remote Monitoring Of Patients The Main Benefits Of Using Digital Health Technologies In Clinical Trials: Poll' (*Clinical Trials Arena*, 2022) <<https://www.clinicaltrialsarena.com/news/better-data-collection-main-benefit-of-digital-technologies-in-clinical-trials/>> accessed 13 April 2022.

¹² Andrea Coravos, Sean Khozin and Kenneth D. Mandl, 'Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes' (2019) 2 npj Digital Medicine.

¹³ O. T. Inan and others, 'Digitizing Clinical Trials' (2020) 3 npj Digital Medicine.

¹⁴ 'The Future of Advanced Analytics in Clinical Trials | Medidata Solutions' (*Medidata Solutions*, 2022)

<<https://www.medidata.com/en/life-science-resources/medidata-blog/the-future-of-advanced-analytics-in-clinical-research>> accessed 14 April 2022.

¹⁵ Roundtable Care and Institute Medicine, 'Digital Health Data Uses: Leveraging Data for Better Health' (*Ncbi.nlm.nih.gov*, 2022) <<https://www.ncbi.nlm.nih.gov/books/NBK207330/>> accessed 14 April 2022.

¹⁶ 'Better Data Collection And Convenience For Remote Monitoring Of Patients The Main Benefits Of Using Digital Health Technologies In Clinical Trials: Poll' (*Clinical Trials Arena*, 2022) <<https://www.clinicaltrialsarena.com/news/better-data-collection-main-benefit-of-digital-technologies-in-clinical-trials/>> accessed 13 April 2022.

- It will improve the results in commercial area related to the clinical trial.
- It will provide a new dimension in the clinical research industries.
- It will ameliorate patient's recruitment and retention. It will improve the patient's privacy and data protection.
- Digital clinical trials will lead to patient centric trials.
- Use of digital and smart analytics helps in making decision better and desired patient outcomes can be achieved easily.
- It also makes collaboration easy with big pharma companies through virtual platforms.
- Cost-effective and less time consuming.
- Focus will be more on individual care.¹⁷

IX. BARRIERS OF USING DIGITAL TECHNOLOGIES IN CLINICAL TRIAL PROCESS

The Covid-19 pandemic has forced the life science industries for adopting digital technologies in their medical operating systems. As a result many companies changed their traditional method of clinical trials to digital clinical trials using digital health technologies. But as it is rightly said that every coin has two sides, along with the entrance of digital technology in clinical trials, barriers and hindrances are also in its path.¹⁸ These are some of the hurdles in digitizing clinical trials.

- Ensuring genuineness, honorableness and confidentiality of the data becomes the greatest challenge.
- Selection of suitable technique to be applied in the clinical trial is also an area of concern.
- Reliability of the data, from where it is collected either from the internet or through social media is also a hindrance of the digital technology.
- Accessing the data from Electronic Health Records (EHR) and other data related to genetics can raise question on the security and privacy of the patients.
- Data collection by using the digital technologies can create uncertainty in matters of the regulatory requirement as the laws, regulations and rules are different from one country to another.

- Another challenge is in the process of recruiting the participants, whether the sample selected is a representative sample and the selection of the sample is conducted without any kind of biasness.¹⁹

X. CONCLUSION

Digital technology is very useful in making the clinical trial cost-effective, speedy and less vexatious. Digitizing clinical trial helps in improving the recruitment and sustainability of the trial participants taking part in the clinical trial. It also increase the pace of data collection and recording as well as through the use of digital tools like digital biomarkers, wearables, smartphones etc. analysis of data can be done easily and quickly. Though using of digital technology in all the fields have now become a necessity and specially in times of the pandemic, digital technology have played a vital role in the process of clinical trial but there are some challenges also in the path of digitizing clinical trials which need to be fixed. The problem of a representative sample, issue of privacy and confidentiality of health information of the participants, regulatory requirements for conducting a clinical trial, knowledge and understanding of the digital technology etc. are the barriers in the path of digitizing clinical trials and proper check and attention is required to be made in these areas in order to overcome these challenges.

The clinical research teams in the future should be well equipped with technological and data science knowledge so that they can implement digital clinical trials successfully. There is also a requirement of creating such software where the private and confidential data of the trial participants are absolutely secured and there are no chances of any cheating or tampering with the private information of the trial subject. Recruitment of trial participant should be done with great caution and free from biasness so that a representative sample may be selected for the trial and as a result the desired outcome of the trial can be achieved. Thus challenges may come in the way as the digital technology will enter in the clinical research stream but learning about the numerous benefits it will provide to the clinical research area there is a need to enforce digital technology which will enhance the efficiency of the clinical trials in India.

¹⁷ Dr. Ganesh Divekar, 'Technology's Role in Re-Shaping India's Clinical Research Sector' (*Healthcare Radius*, 2022)
<<https://www.healthcareradius.in/features/technology/27716-technologies-role-in-reshaping-indias-clinical-research-sector>>
accessed 19 January 2022.

¹⁸ 'Ensuring Data Authenticity, Integrity, And Confidentiality Biggest Barrier to Using Digital Technologies in Clinical Trials:

Poll' (*Clinical Trials Arena*, 2022)

<<https://www.clinicaltrialsarena.com/news/ensuring-data-authenticity-integrity-and-confidentiality-barrier-to-digital-technologies-in-clinical-trials/>> accessed 1 February 2022.

¹⁹ Carmen Rosa and others, 'Using Digital Technologies in Clinical Trials: Current and Future Applications' (2021) 100 *Contemporary Clinical Trials*.

REFERENCES

- [1] Anthony Jnr. Bokolo, 'Exploring The Adoption Of Telemedicine And Virtual Software For Care Of Outpatients During And After COVID-19 Pandemic' (2020) 190 Irish Journal of Medical Science (1971 -).
- [2] 'India's Clinical Research Advancements: Trends Witnessed across Technology and Patient-Centricity - ET Healthworld' (ETHealthworld.com, 2022) <<https://health.economicstimes.indiatimes.com/news/industry/indias-clinical-research-advancements-trends-witnessed-across-technology-and-patient-centricity/89790819>> accessed 11 April 2022.
- [3] Nikita Rana, 'Technology Is Going to Play a Key Role in India's Roadmap for Health Infrastructure: ETILC Members' (The Economic Times, 2022) <<https://economicstimes.indiatimes.com/industry/healthcare/biotech/healthcare/technology-is-going-to-play-a-key-role-in-indias-roadmap-for-health-infrastructure-etilc-members/articleshow/81683674.cms>> accessed 5 January 2022.
- [4] 4. Sec. 122DAA of Drugs and Cosmetics Rules, 1945.
- [5] 5. M Flather, Hazel Aston and Rod Stables, Handbook of Clinical Trials (ReMEDICA Pub 2001).
- [6] 6. 'Decentralized Vs Digital Clinical Trials: There Is a Difference | ConcertAI' (ConcertAI, 2022) <<https://www.concertai.com/news/2021/11/decentralized-vs-digital-clinical-trials-there-is-a-difference/>> accessed 12 April 2022.
- [7] 7. 'Accelerating Momentum: Digital Innovation in Clinical Trials' (Accenture.com, 2022) <https://www.accenture.com/_acnmedia/PDF-171/Accenture-90976792-Infographic-Accelerating-Momentum.pdf> accessed 12 April 2022.
- [8] 8. Geoff K. Frampton and others, 'Digital Tools for the Recruitment and Retention of Participants in Randomised Controlled Trials: A Systematic Map' (2020) 21 Trials.
- [9] 9. ClinEdge (en-US), 'Digital Recruitment: Changing the Face of Clinical Trials' (Clin-edge.com, 2022) <<https://clin-edge.com/news/digital-recruitment-changing-face-clinical-trials>> accessed 13 April 2022.
- [10] 10. 'Better Data Collection And Convenience For Remote Monitoring Of Patients The Main Benefits Of Using Digital Health Technologies In Clinical Trials: Poll' (Clinical Trials Arena, 2022) <<https://www.clinicaltrialsarena.com/news/better-data-collection-main-benefit-of-digital-technologies-in-clinical-trials/>> accessed 13 April 2022.
- [11] 11. Andrea Coravos, Sean Khozin and Kenneth D. Mandl, 'Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes' (2019) 2 npj Digital Medicine.
- [12] 12. O. T. Inan and others, 'Digitizing Clinical Trials' (2020) 3 npj Digital Medicine.
- [13] 13. 'The Future of Advanced Analytics in Clinical Trials | Medidata Solutions' (Medidata Solutions, 2022) <<https://www.medidata.com/en/life-science-resources/medidata-blog/the-future-of-advanced-analytics-in-clinical-research>> accessed 14 April 2022.
- [14] 14. Roundtable Care and Institute Medicine, 'Digital Health Data Uses: Leveraging Data for Better Health' (Ncbi.nlm.nih.gov, 2022) <<https://www.ncbi.nlm.nih.gov/books/NBK207330/>> accessed 14 April 2022.
- [15] 15. 'Better Data Collection And Convenience For Remote Monitoring Of Patients The Main Benefits Of Using Digital Health Technologies In Clinical Trials: Poll' (Clinical Trials Arena, 2022) <<https://www.clinicaltrialsarena.com/news/better-data-collection-main-benefit-of-digital-technologies-in-clinical-trials/>> accessed 13 April 2022.
- [16] 16. Dr. Ganesh Divekar, 'Technology's Role in Re-Shaping India's Clinical Research Sector' (Healthcare Radius, 2022) <<https://www.healthcareradius.in/features/technology/27716-technologys-role-in-reshaping-indias-clinical-research-sector>> accessed 19 January 2022.
- [17] 17. 'Ensuring Data Authenticity, Integrity, And Confidentiality Biggest Barrier to Using Digital Technologies in Clinical Trials: Poll' (Clinical Trials Arena, 2022) <<https://www.clinicaltrialsarena.com/news/ensuring-data-authenticity-integrity-and-confidentiality-barrier-to-digital-technologies-in-clinical-trials/>> accessed 1 February 2022.
- [18] 18. Carmen Rosa and others, 'Using Digital Technologies in Clinical Trials: Current and Future Applications' (2021) 100 Contemporary Clinical Trials.

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Anaesthetic Management Of A Patient With Atrio-Ventricular Discordance And Single Ventricle Physiology Posted For Liposuction- A Case Report.

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Abstract- Congenital heart disease is the most common congenital abnormality, accounting for 4-10 cases per 1000 live births. It is approximately one third of all congenital defects. The incidence of congenital heart disease in children has remained constant over the last few decades. However because the therapeutic options have improved the number of adults with congenital heart disease has steadily increased. And these patients presenting for non cardiac surgery has increased over the years.¹ Here we report the anaesthetic management of a 23year old male with atrio-ventricular (AV) discordance and single ventricle who had undergone palliative treatment for congenital heart problem has come for liposuction.

Index Terms- AV discordance, Single Ventricle physiology, Bidirectional Glenn shunt, Fontan physiology, Fenestrated Fontan

I. INTRODUCTION

Patients with AV discordance and single ventricle physiology pose a unique challenge for the anaesthetist as it involves a complex physiology and these patients are constantly at risk of developing cardiac complications like ventricular dysfunction, arrhythmias, protein losing enteropathy and plastic bronchitis.² These patients undergo palliative treatment during childhood for correcting the single ventricle deformity by creating a cavopulmonary shunt and thereby allowing single ventricle for systemic circulation. These patients present for non cardiac surgery and poses challenge for anaesthetist as understanding the physiology behind this deformity is complex. According to ACC/AHA 2008 guidelines treatment of patients should be carried out in regional adult cardiac center and cardiologist consultation prior to surgery is important.³ A clear understanding of the anatomy and physiology in these patients are important in peri-operative management of these patients.

II. CASE REPORT

A 23 year old male coming from Salempur had come to the hospital for liposuction of bilateral gynaecomastia. Patient was diagnosed to have congenital heart disease of AV discordance with single ventricle since birth. He had history of frequent cyanotic spells after birth during crying, feeding and was relieved when the baby was placed in knee chest position. He underwent Bidirectional Glenn procedure when he was 7 year old and Fenestrated Fontan surgery when he was 10 year old. He underwent device closure of Fontan fenestration and coil closure of decompressing vein when he was 11 year old. He had been followed up regularly. Patient was on tablet Warfarin 2.5mg once daily and INR was maintained at 2.5. Medications were stopped 3 years back.

He had history of presyncope for 4months since April 2019 and the episodes were not related to exertion, not associated with palpitations and lasted for few seconds. Patient was investigated with 24 hours Holter monitoring and was found to have sinus tachycardia which settled down without medications.

Preoperatively patient was assessed for his general physical condition and cardiopulmonary status since patient had history of congenital heart disease. Patient gave a history of ability to climb more than two flight of stairs with no discomfort. Airway examination revealed Modified Mallampati Grade II, adequate mouth opening of more than two fingers, no restriction of neck movements and normal thyromental distance. Weight of the patient was 91kgs and height was 179cm with BMI of 28kg/m². Systemic examination revealed Cardiovascular system – S1-normal, single S2 and no murmurs. Respiratory system revealed bilateral air entry was present with no crepitations or wheeze. Room air saturation was 95%, Heart rate – 83/Min, Bloodpressure – 135/71mmHg. On investigation complete blood count, Renal function test, Liver function test and coagulation profile were within normal limits.

ECG showed sinus rhythm with rate of 83/min and T wave inversion in V1, V2, V3, V4 and T wave flattening in V5, V6. ECHO showed Post device closure of fenestration in Fontan, Extra

cardiac conduit from IVC to RPA, well functioning Fontan circuit. No residual fenestration flow, Confluent good sized branch Pulmonary arteries, no AV regurgitation and good ventricular function. 6minute walk test was done which showed %prediction of 76% and Borg scale of 0-0.5 which is no breathlessness to very slight breathlessness.

Anaesthetic consideration for this patient were AV discordance with single ventricle physiology, Pressure dependent pulmonary circulation and intraoperative hypoxia, hypercarbia and acidosis.

III. CONDUCT OF ANAESTHESIA

Patient was kept nil by mouth for 6hours. After receiving the patient in operating room, Infective endocarditis prophylaxis of Inj.Ampicillin2g Iv stat was given 30minutes before the procedure. Standard anaesthetic monitors are connected and baseline readings are measured. Heart rate was 88/min, Blood pressure was 132/63mmhg, Spo2 without oxygen was 98%. Inj.Midazolam 1mg Iv was given 20minutes before induction as a premedicant. Patient was then intubated with Inj.Morphine 10mg, Inj.Propofol 160mg and Inj.Vecuronium 8mg and Preoxygenated with 100% oxygen for 3minutes. Patient was then intubated with 8.5 portex endotracheal tube.

Anaesthesia was maintained with oxygen/ Air/ and TIVA with Propofol at 4-12mg/kg/hr infusion titrated to the effect. IV fluid is maintained with Ringer lactate at 2ml/kg/hr. The surgery was completed in 2hours with minimal blood loss. Patient was extubated when fully awake and responding to commands and was observed in 30min in the recovery room. Postoperatively patient was kept in Post anaesthesia care unit. Patient complained of mild-moderate pain during POD-0 and he was discharged to ward on POD-3 with stable hemodynamics.

IV. DISCUSSION

PHYSIOLOGY OF SINGLE VENTRICLE

Patients with single ventricle and AV discordance is associated with complex physiology and these patients require palliative procedures to have a better chance of living and with the advances in the treatment modalities these patients survive till adulthood and there is a high probability of these patients coming for non cardiac surgery. Patients with single ventricle usually have a parallel pulmonary and systemic circulation instead of being a series circulation. This leads to significant cyanosis and ventricular volume overload.⁴

This congenital heart disease is not compliant for a full anatomical correction, which is biventricular repair. Therefore these patients will be palliated by creating a circulation based on single ventricle. The palliative surgery is done to make the parallel circulation into series circulation and to reduce the cyanosis and ventricular volume overload thereby reducing the chance for ventricular failure and death. These procedures are done in a staged manner for better survival of the baby. These patients require a complete cavo-pulmonary anastomosis, so the single ventricle pumps oxygenated blood to the body while blood flows passively to lungs down the pressure gradient from pulmonary artery to left atrium.

Stage I is the Norwood procedure where an aorto-pulmonary shunt is created to connect aorta to main pulmonary artery to provide pulmonary blood flow.⁴ The balance between the systemic and pulmonary blood flow is very weak that makes non cardiac surgeries hazardous. The non cardiac surgeries should be restricted to urgent or emergent conditions. Stage II of palliation involves formation of bidirectional (supplying both right and left lungs) cardiopulmonary shunt that connects superior vena cava to right pulmonary artery and is usually done at 3-5 months of age. Even after this procedure the child remains cyanosed with oxygen saturation of 75-85%.

Stage III is the formation of total cavo pulmonary circulation or Fontan circulation. In this inferior vena cava is being connected to right pulmonary artery and with this procedure the pulmonary circulation is separated from Systemic circulation. This is usually done by 3-5 years of age and it normalise the arterial oxygen saturation. The sole determinant for pulmonary blood flow is the pressure gradient from pulmonary artery to the left atrium.⁵

The factors that determine the outcome of anaesthesia are pulmonary vascular resistance, intrathoracic pressure, positive end expiratory pressure (PEEP), peak inspiratory pressure (PIP), inspiratory time. Spontaneous ventilation increases pulmonary blood flow by negative intrathoracic pressure but the disadvantage is the difficult to maintain normocapnia. Peak inspiratory pressure should be minimized to facilitate pulmonary blood flow.⁵

BIDIRECTIONAL GLENN PROCEDURE

Bidirectional Glenn procedure involves formation of shunt between Superior vena cava and right pulmonary artery and it is a partial cardiopulmonary shunt as only partial venous circulation is diverted to pulmonary circulation. Generally neonates with single ventricle physiology require initial palliation with systemic pulmonary shunt called Blalock Taussig shunt before initiating cavo pulmonary circulation. But this Blalock Taussig shunt has no growth potential and is liable to thrombose which can lead to cyanosis and sudden death.⁶

Though Glenn procedure provides a source of pulmonary blood flow and reduces the severity of shunt dependent circulation and ventricular volume overload it is also associated with mortality and it was found that the cause of death were inadequate pulmonary blood flow and in some cases superior vena cava syndrome.⁶

FONTAN PHYSIOLOGY

In 1971, Fontan and Baudet described a palliative surgery in patients with complex congenital heart disease with single functioning ventricle.⁷ Before the development of Fontan procedure the pulmonary blood flow is usually established by systemic to pulmonary shunts. This improves the life expectancy but the survival rate without cavopulmonary shunt is very less.⁸ In Fontan physiology the systemic venous blood is drained directly into the pulmonary circulation and from there the oxygenated blood drains into the left atrium and then to single ventricle and now single ventricle is solely for the systemic circulation. There are two important physiological considerations. One is the presence of single ventricle and the other is entire systemic venous return enters the pulmonary circulation passively. Pulmonary blood flow is important in maintaining the systemic circulation because the cardiac output is dependent on pulmonary

circulation.⁹ The main determinants are the systemic venous pressure and volume, pulmonary vascular resistance, cardiac rhythm and left ventricular function. Any disturbance in any of these factors can affect the cardiac output and can prove detrimental.¹⁰ Generally these patients have increased central venous pressure and reduced cardiac output and oxygen saturation and so they have adaptations like increased arterial vascular resistance, cardiac output being redistributed to the vital organs and polycythemia.¹¹ Pulmonary vascular resistance is determined by mechanical and biochemical factors like positive pressure ventilation cause decreases pulmonary blood flow and atelectasis causes increase in pulmonary vascular resistance.

For induction of these patients coming for non cardiac surgery, drugs that depress the myocardial contractility like thiopentone and volatile agents should be avoided. Propofol with transient vasodilatation is usually less problematic if normovolemia is maintained. Avoid hypoxia, hypercarbia and inadequate analgesia as these factors increase the pulmonary vascular resistance and it will reduce the pulmonary blood flow and can cause cyanosis, hypoxia, sudden cardiac arrest and death.

V. CONCLUSION

Children with congenital heart diseases are more common and with the advancement in treatment modalities these patients surviving and reaching adulthood and such patients coming for non cardiac surgeries are increasing. Patient with AV discordance and single ventricle is complex and these patients would have undergone multiple palliative procedures. It requires thorough understanding of this complex physiology as there is increased risk of perioperative complications and thorough preoperative assessment of these patients which involves liaison between the surgeon, anaesthetist, paediatrician and cardiologist for successfully outcome in these patients is essential.

These patients coming for non cardiac surgery, the outcome depends on the type of surgery, physiological status of single ventricle post palliative procedures, physical status of the patient, anaesthesia technique and management. Preserving pulmonary blood flow is the priority in patients with Fontan physiology which means avoiding hypoxemia, high airway pressures and avoiding increased pulmonary vascular resistance. In this case, patient has come for liposuction with good physical status and with no complication post palliative procedures. Patient was induced with iv propofol and was maintained with total intravenous anaesthesia (TIVA) with propofol with no significant fluctuations in blood pressure. Volatile agents was avoided in view of myocardial depression and inhibition of protective hypoxic pulmonary vasoconstriction. Ventilation was maintained by controlled mode of ventilation to maintain normocapnia. Post operatively patient was stable and was discharged from post anaesthesia care unit on post operative day 2 with stable hemodynamics and maintaining room air saturation of >96%.

AUTHOR'S CONTRIBUTIONS

Collection of current admission information and previous cardiac surgery informations- G.K.

Review of literature and supervising the final year resident in writing the manuscript- N.M.

Overall supervision of writing the manuscript- K.S.

REFERENCES

- [1] 1) Roberta LH, Katherine EM. Congenital heart disease: Stoelting's Anaesthesia and co-existing disease, 7th ed. Philadelphia: Elsevier; 2018:P.129.
- [2] 2) Yuki K, Casta A, Uezono S. Anesthetic management of noncardiac surgery for patients with single ventricle physiology. *Journal of anesthesia*. 2011 Apr 1;25(2):247-56.
- [3] 3) Warnes CA, Williams RG, Bashore TM, Child JS, Connolly HM, Dearani JA, del Nido P, Fasules JW, Graham TP, Hijazi ZM, Hunt SA. ACC/AHA 2008 guidelines for the management of adults with congenital heart disease: a report of the American college of cardiology/American heart association task force on practice guidelines (writing committee to develop guidelines on the management of adults with congenital heart disease) developed in collaboration with the american society of echocardiography, heart rhythm society, international society for adult congenital heart disease, society for cardiovascular angiography and interventions, and *Journal of the American College of Cardiology*. 2008 Dec 2;52(23):e143-263.
- [4] 4) Walker SG, Stuth EA. Single Ventricle physiology: Perioperative implication. *Semin Pediatr surg*.2004 Aug;13(3):188-202.
- [5] 5) White MC, Peyton JM. Anaesthetic management of children with congenital heart disease for non-cardiac surgery. *Continuing Education in Anaesthesia, Critical Care & Pain*. 2012 Feb 1;12(1):17-22.
- [6] 6) Esmaily-Moghadam M, Hsia TY, Marsden AL, Modeling of Congenital Hearts Alliance (MOCHA) Investigators. The assisted bidirectional Glenn: a novel surgical approach for first-stage single-ventricle heart palliation. *The Journal of thoracic and cardiovascular surgery*. 2015 Mar 1;149(3):699-705.
- [7] 7) D'souza S, Satarkar B, Bhanu SS. Anaesthesia for a minor procedure in a patient with fontan physiology. *Indian journal of anaesthesia*. 2012 Nov;56(6):572.
- [8] 8) Dick M, Fyler DC, Nadas AS. Tricuspid atresia: clinical course in 101 patients. *The American journal of cardiology*. 1975 Sep 1;36(3):327-37.
- [9] 9) Rychik J, Kim Y. The Adolescent and Adult With a Fontan Circulation: "Unnatural" Selection and Survival of the Fittest. *Journal of the American College of Cardiology*. 2018 Mar 6;71(9):1018.
- [10] 10) Piran S, Veldtman G, Siu S, Webb GD, Liu PP. Heart failure and ventricular dysfunction in patients with single or systemic right ventricles. *Circulation*. 2002 Mar 12;105(10):1189-94.
- [11] 11) Ohuchi H. Where is the "optimal" Fontan hemodynamics?. *Korean circulation journal*. 2017 Nov 1;47(6):842-57.

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Promoting Motivation For Employee Performance: A Case Of Nigeria Public Sector

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ABSTRACT

The aim of promoting employee motivation is to enhance the level of commitment, increase the level of display of skills, and intelligence of the employees for competitive performances. Therefore motivation is an indispensable arsenal that can be used to unleash the best out of employees of an organization. Based on this, the study was carried out to critically analyze the effect of promoting motivation on the performance level of employees in the Nigerian public sector. Having linked the research work to several theories, the research work was anchored on the two broad theories of process theory and content theory of motivation. The essence of this anchor was because there are peculiarities between the postulations of the theories and the assertion of this study. The research work was given quantitative analysis with the help of data got through primary sources. The primary source of data was via questionnaire instrumentation. The data obtained from these respondents were analyzed descriptively and sub-divided into two sections. The results of the findings revealed that the financial rewards in the Nigerian public sector do not significantly motivate or improve employee performances; it was also revealed that satisfaction of physical needs does not significantly lead to improved performance and lastly it was revealed that public relation does significantly have an impact on employee performance in the public sector. Therefore it was recommended that the government of Nigeria should make financial rewards in the public sector substantial to be able to motivate employees to greater performances. Also, the government should continue to opt for sophisticated public relations channels to continue to evolve and improve the performance level of employees in the public sector.

Keywords: ...motivation, employee performance ,rewards

INTRODUCTION

1.1 Background of the Study

The current dynamic business environments which demand constant improvement in the performance of organizations (whether public or private), has occasioned various policy measures channeled to addressing the organizational needs. Okeke-Ezeanyanyu (2017) noted that the need for improved performance at least-cost to the organization had led organizations into adopting measures such as downsizing of the workforce, employing non-permanent workers through outsourcing, among others.

The government needs to engage in the motivation of its employees who are faced with the challenges of the reduction in the value of their pay because of the impact of inflation and recession, the reduction in the government commitment to financing public services, and the general increase in the demand for public service as a result of the state of the economy (Varma (2017). According to Okeke-Ezeanyanyu (2017), these conditions have demoralizing effects on the performance of the employees, who are of the view that their organization can dismiss them at will.

The above situation has led to the need for promoting employee motivation. Njoroge, Ongeti, Kinuu & Kasomi (2016) noted the need for changes that will tackle the dynamic external environmental pressures on organizations which demands that organizations adopt the best strategy that will motivate the employees into competitive performance. The aim of promoting employee motivation is to enhance the level of commitment, increase the level of display of skills, and intelligence of the employees for competitive performance. Adedeji & Ugwumadu (2018) argued that modern organizations are faced with the challenges of keeping their loyal and performing employees; therefore, they plan to achieve employee retention through adopting motivation as a business strategy that improves employee performance.

Arief, Tatang & Zarah (2018) conceptualized motivation as a positive emotional condition emanating from the evaluation of one's service experience in his organization. Blaskova, *et al.* (2018) argued that motivation is a cognitive decision making targeted at ensuring that employees' behaviors are channeled towards achieving an identified objective through initiation and monitoring. Badubi (2017), identified that motivation can be applied in different ways but the driving force is the target to achieve an identified objective. From the above viewpoints, it is observed that these authors are drawing attention to the psychological condition of the employee(s) at the workplace and deliberate need for evaluating the employees' performance by the employer to ascertain the factors which hinder improved performance.

The role employees play in achieving the objectives of the organization, and the complex nature of human beings has made motivation a challenging task to the managers, directors, and heads of agencies and also demands that all managers should promote motivation which will make the employees perform optimally. It is noteworthy that the employee performance in the organization determines the success or failure of the organization. According to Pradhan and Jena (2016), employee job performance entails the quality and quantity expected of every employee or the employees from their service to the organization. Siddiqi & Qureshi (2016) submitted that high performance of the employees is necessary because the innovative ability

and creative intelligence of the organization reside with the employees; therefore, employee performance is the physical manifestation of the willingness, openness, and commitment to achieve new aspects of the job leading to higher productivity of the organization.

The importance of motivation on the performance of public sector organizations has necessitated the need to pay attention to both the intrinsic and extrinsic factors that drive employees' performance. Almas (2017) submitted that motivation can be carried out through the following ways: performance recognition, ensuring employees' job satisfaction, listening to the complaints of the employees and attending to the needs, having a team of skilled managers, maintaining good communication flow, and giving the employees opportunity for career advancement.

According to the author, the motivational factors aim to create a conducive environment that will boost the enthusiasm, inspire the initiative of the employees with the group and individual satisfaction, and enhance their commitments targeted at achieving the organizational and individual goals. Ashveen (2018) warned that because of the unique perception of individuals, which varies from person to person, there is no motivational factor that is considered as the best.

However, Kjeldsen & Hansen (2016), on his analysis of the public sector motivation theory, submitted that the behavior and motivation of the public employees defer from that of the private sector because they are driven more by intrinsic than extrinsic motivation such as a financial reward. The diversity in individual perceptions and different reactions of the employees of the public and private sector to the concept of motivation as noted by Kjeldsen and Hansen has called for the need to examine the various ways through which motivation can be promoted in a public sector organization to ensure that the needed impact is made in the performance of the employees.

1.2 Statement of the Problem

According to Okeke, Nwele & Achilike (2017), the state of Nigerian civil service operation, characterized by a lack of goal setting and measurability, coupled with poor salary, incentives, and lack of due promotion, has impacted negatively on the performance of the Nigeria public sector workers. The negative effects have manifested in lack of commitment to service, individual participation, increasing level of corruption, a feeling of inequity, and lack of motivation among the employees. Obasa (2015) noted that the cost of running the bureaucratic government offices in Nigeria plunges the government in huge expenditure such that the money that would have been used in the motivation of employees by increasing their salary and implementing effective reward system is wasted on programs that only serve a political purpose without any significant impact that leads to higher productivity.

The author noted that the practice of politics in Nigeria by both the military juntas and the political class have demotivated the employees of the public sector because of the level of poverty they bring on the employees, the level of mediocrity, fraud, and the corruption they practice. The inefficient reward system in Nigeria public which manifests in the salary and wages that cannot sustain the livelihood of the employees serves as the major driver of lack of commitment to service and low productivity in the sector because of the poor motivation of the employees associated with these practices. On the other hand, a research carried out by Orumwense, & Mwakipsile, (2017); Abah & Nwokwu (2016) revealed a high-level of a positive relationship between employee motivation and organizational performance in public offices in Nigeria.

Nigeria's public sector employees are often faced with lots of physical needs challenges that often hamper their performance level hence effective public service delivery. As was rightly pointed out by Nwokorie (2017), the Nigerian public sector is devoid of enticing physical needs packages to their employees. It is a common experience that the costs of foods, clothing, and shelter in Nigeria are unevenly distributed and unnecessarily high. This situation makes the stipends of public sector employees too meager and insufficient to take care of their ever-increasing needs. No employee will be happy working without getting a commensurate reward to take care of their needs and still puts all his or her best to practice hence, resulting in gross demoralization and discouragement. This in essence is one of the problems and prospects discovered that need to be addressed and this study will aim to do justice to this ugly trend in the Nigerian public sector.

In the same vein, the importance of public relations to the performance of the Nigerian public sector cannot be overemphasized. Due to the inherent usefulness of public relations made the colonial administration to opt for it as one of the channels of achieving their targets. Being a weapon of journalism, public relations emerged to be crucial instruments of public communication from the days of the colonial masters down to the present day Nigeria (Abiola, 2019). Based on this glance into the importance of public relations, it is of interest to this study to evaluate its impacts on the performance level of the Nigerian public sector. On a more summative note, this research aims at establishing the impact of promoting motivation on the performance of employees of the public sector, using the office of the accountant general of the federation as a case study.

1.3 Research Objectives

1.3.1 General Research Objectives

The general objective or aim of this study is to examine ways of promoting motivation for employee performance: A study of Nigeria public sector

1.3.2 Specific Research Objective

The specific objectives that guide this study include:

- i. To critically examine how financial rewards, affect employee's performance in the public sector.
- ii. To critically examine how the satisfaction of physical needs motivate employees into higher performance in the public sector.
- iii. To evaluate the impact of public relations on the performance of the public sector.

1.4. Research Question

1.4.1 The General Research Question

The general research question for this study is "what are the ways of promoting motivation for the performance of employees of the public sector in Nigeria"?

1.4.2 The Specific Research Questions

- i. What are the financial rewards plans being implemented in the public sector as a motivational strategy using the office of the accountant general of the federation as a case?
- ii. How does the satisfaction of the physical needs of the employees lead to motivation in the public sector?
- iii. What is the impact of public relations on the performance of the employees of the

organization?

1.5 The Relevance of the Study

The need for this study was gathered from its wide-ranging implications in both private and public sectors of human endeavors and the critical sectors of the economy. For instance, to secure the commitment of the employees in both the public and private organization such that improved performance will be achieved and sustained, this study will serve as a guide for leaders of organizations on their policy actions and initiatives. The policy-makers in various organizations will use it in determining their human resource needs and policies. On the other hand, the stakeholders of both the public and private sectors will use the findings of this study in ascertaining the cost-reducing effect of motivation in the operations of their organizations and also identify the motivation promotion options available for adoption in order to achieve improved organizational performance.

1.6 The Organization of the Proposal

The remaining part of this study will contain the following:

Chapter two of this study will contain the literature review. This involves the review of previous works done on the topic. Chapter three will contain the methodology, which is all the activities carried out by the researcher and the strategies employed to achieve the research objective. Chapter four will contain the presentation, analysis, and discussion of the results. The research summary, conclusion, and recommendations will be written in chapter 5 of this study.

LITERATURE REVIEW

2.1 Overview

This section of the study will present the literature review of the concepts involved in the research topic. It will discuss the theories that guide the practice of motivation and the empirical finding of previous works done in the field. In this chapter, all the information to be utilized here will dwell solely on secondary data sources.

2.2 Conceptual Definition

As human character changes from person to person and the reaction to issues of similar nature in a workplace situation varies across individuals, the survival of every organization and its ability to constantly achieve its purpose of existence depends on the output of its workforce (Khan et al 2017). This calls for the need to ensure that the morale of the employees is at their best at all times. This can be achieved through the adoption and implementation of the concept of motivation. Singh (2017) submitted that motivation is a process that occasions and controls certain behaviors in an individual or group of persons. In the view of the author, motivation psychologically sets a person ready for achieving a certain goal, and through effective adoption and execution, the employees are made to willingly commit themselves to achieve the goals of the organization.

Nurun et al (2017) noted that though motivation is an internal resolution to achieve a goal. The authors noted that motivation alone cannot be sufficient enough for effective performance when there is no skill and knowledge of the expected task by the employees. Khan et al (2017) on reacting to this submitted that training is part of the motivation to employees, the authors also noted that motivation is enhanced when employees that transfer knowledge and skills are effectively rewarded.

Employee performance, on the other hand, refers to employee's productivity on non-productive behavior in the workplace. It is the expressed ability of an employee on the task that was assigned to him or her (Ashley 2019). The performance of the employee(s) is determined by the target set by the employer as duties. According to Rabindra and Lalatendu (2016) to effectively carry out a task requires a large extent of the cognitive ability of workers which depends on his knowledge of the work assigned to him. Performance depends on an employee's technical competence, and the ability to handle the task in all of its ramifications. According to the author, task performance involves a contractual understanding between the employer, or the manager and the subordinate or the employee with regards to the assigned duties.

2.3 Critical review of Supporting Theories or Theoretical Analysis

The role of motivation in the performance of the employees in the contemporary organization has led to the increasing interest of many theorists on the concept of motivation. According to Badubi (2017), the existing varied theories of motivation in their categories and types lead to employee's job satisfaction. According to the author, the theories of employee motivation include Maslow's hierarchy of needs, Alderfer's Existence, Herzberg's motivator-hygiene (or two-factor) theory, Relatedness, and Growth theory, and McClelland's needs theory. The author further identified that the motivation theories that deal with employee satisfaction are categorized under process theory which includes Porter-Law's model and the Vroom expectancy theory, while content theory stresses the importance of the determinants of the factors of motivation. In other words, the content theory tries to identify the needs and relates to fulfilling the needs with

motivation. The theories under content theory classification are Maslow's Hierarchy of Needs, Theory X and Theory Y (otherwise called management assumption), ERG Theory, McClelland's Need for Achievement, Affiliation, and Power, Herzberg's Two Factor Theory. Zafarullah & Pertti (2017) argued that the theories of employee's motivation at their duty post include the theories under the content and process categories.

According to Abhijeet (2017), content theories are concerned with the intrapersonal factors that cause, sustain, or stop the behavior in person. The theory pays attention to the needs that trigger individual motivation and how those needs should be satisfied to ensure effective performance. On the other hand, the process classification emphasizes how individual behavior is the cause, sustained, and stopped through motivational factors. Though various authors have written works on the theories of motivation and the two major classifications of the theories. The theories and the classification have not been confirmed in practical terms or through a workplace experiment to ascertain their effectiveness (Haekyung 2019).

However, the study carried out by the author revealed that content theories classification is applied more in a workplace situation than the process classification. The textbook applicability of the theories other than a confirmed real-life validation of their usefulness calls for the total review of the classification to make sure that the study and the analysis make a meaningful impact at the workplace as they should. In a bid to give critical analyses of the theories of motivation, debates have been going on concerning the postulations of both content and process theories of motivation. Both the content and process theories of motivation deal with individuals' internal motivation system, hence, the prediction is always difficult to make therefore, there will be difficulties during the designation of training programs. In the same vein, the two theories do not put external factors capable of influencing the need as well as the decision making processes such as culture, organizational system, and nature of the job (McKenna, 2000).

In a further analysis, it is worthy to note that the two theories do not consider factors that are capable of affecting the success or the failure of the process of motivation thereby not accounting for variables such as culture, norms as well as social influences (Freedheim et al., 2003). In a likewise stance, the theories of motivation were found wanting on the note that it failed to discuss the resistance that is likely to take place in practice when the implementation of a planned change is in force. This is especially since the programs for change is mostly dependent on the perception of the manager concerning the needs of the employees.

According to the opinion of Locks & Latham (2004), if these perceived lapses are not carefully addressed can in essence result in a waste of time, money as well as effort. In another critique of the theory of motivation, Lock & Lotham (2004) pointed out that a very big question needs to be availed answer about how the knowledge of different personality traits can fit into the theories of motivation. Having intensively and extensively reviewed the theories of motivation, this study points out that the theories reviewed have some bearings with the content of this research work, hence this study is anchored on the content and process theory of motivation.

2.4 Empirical Literature

Different studies have investigated the relationship between motivation and employee performance. De Juana-Espinosa & Rakowska (2018) researched public sector motivational practices and their effect on job satisfaction: country differences. The main aim of this study is to explore the effects of job satisfaction practices for public sector employees through a cross-

national approach. The research design and methodology is a multi-group analysis carried out with the help of SmartPLS3 among non-teaching employees of public universities in Poland and Spain. The findings of the data analysis revealed that a positive relationship exists between motivational factors and job satisfaction; however, there is no evidence that the variable “country” introduced significant differences. Therefore, it was recommended that public managers should learn and adapt to other PSOs’ practices to increase their performance level.

Nzewi et al (2018) investigated the relationship between physical work environment and employee performance in some selected breweries in Anambra state. The study revealed a correlation between ergonomic and employee job satisfaction. The research recommended that the physical needs of the employees such as equipment and machinery should be provided and put in good working conditions for the employees’ easy use. It was also recommended that health consideration in locating machinery lowers the rate of work hazards and errors thereby improving the performance of the employees.

Njunwa (2017) studied employee’s motivation in rural local government in Tanzania. The research aimed at doing an empirical analysis of employee motivation using the Morogoro District Council as a case. 55 employees of the council were selected as study samples from the lower, middle, and management level of the council area. The collected data was analyzed by the regression techniques using SPSS as a tool. After the analysis, it was found out that employees of the rural local government council are neither motivated financially nor in non-financial terms. According to the study, poor salary, lack of career development, poor training, partiality, political manipulation, poor working condition, and lack of effective communication are the major drivers of a lack of motivation among the staff of the local council. The study recommended that addressing these challenges will effectively improve the commitment of the employees in the rural council.

Abah (2016) investigated the impact of motivation on the performance of employees using South Eastern Federal Radio Corporation of Nigeria. Content analysis was employed on the review of earlier works of authors on the topic. The research revealed that employee productivity is enhanced through motivation and recommended adequate techniques for employee need’s satisfaction. Elifelet and Adam (2016) carried out a comparative study of motivation and performance of teachers of public and private secondary schools in the Kilimanjaro region in Tanzania. The study revealed that the motivation of the teachers can be promoted through improved salary structure, timely promotion, employee training, and provision of transport services.

According to the study, there is no significant difference between how a public-school teacher is motivated and how a private school teacher is motivated. In line with Njunwa (2017), the study recommended that the education ministry should address the shortfall in the identified motivational factors that will act as the driving force in employee’s performance at the duty post. Iman and Behbood (2015) studied the role of public relations practices in improving the performance of employees. The study revealed a positive correlation between public relations activities of the petrochemical firm used for the study and the productivity of the employees. The study also showed that exhibitions, advertising, artistic activities among others have a significant impact on the productivity of the employees.

Ali and Akram (2012) studied the impact of financial reward on the motivation and satisfaction of employees in the pharmaceutical industry in Pakistan, the study revealed that employees are more motivated and satisfied when they are rewarded handsomely by their employers and this improves their performance. Simon, Frederic, David & Adrian (2010) investigated the topic “motivating employees of the public sector: does public service motivation matter?” The study aims to ascertain the extent to which public service motivation (PSM) construct has an added value to explain work motivation in the public sector.

In a bid to attain this aim, the theoretical postulates try to compare PSM with two other explanatory factors: material incentives, such as performance-related pay, and team relations and support, such as recognition by superiors. This theoretical model was put to test with data from a national survey made up of 3,754 civil servants at the Swiss municipal level. The result of the structural equation model revealed the relative importance of the model providing evidence for the pertinence of the socio-relational motivating factors, whereas material incentives play an anecdotal role. Based on this, it was recommended that further comparative research should be made with administrative services that have implemented such approaches, and, as control cases, traditional administrative services might provide further evidence on the debate.

1.5 Research Gap

From the review of the empirical study, theoretical study, and conceptual framework on the topic under study, it was revealed that the motivation of employees is of paramount importance for employee’s improved performance in their workplaces. However, there are few research works on the tools for promoting motivation for employee’s performance and this study aims at contributing to the studies carried out on motivation with the unique feature of showcasing how employees’ financial rewards, the satisfaction of physical needs, and public relation (as identified in the objectives of this study) serves as a tool for promoting motivation for employee performance at the public sector to complement the earlier research made (Ndulue and Ekechukwu 2016).

On a further note, as can be observed from the scholarly works reviewed, it was seen that most of the empirical works earlier done was more focused on specific sectors and varied geographical locations as can be evidenced from the works of Ali & Akram (2012) who studied the impact of financial reward on the motivation and satisfaction of employees in the pharmaceutical industry in Pakistan. Likewise, the works of Nzewi et al. (2018) investigated the relationship between the physical work environment and employee performance in some selected breweries in Anambra state. In the same vein, the works of Njunwa (2017) were focused on employee’s motivation in rural local government in Tanzania. From these few scholars pinpointed it could be seen that all dealt with different sectors in Pakistan, Anambra state Nigeria, and Tanzania respectively. But this study is primarily focused on promoting motivation for employee performances in the public sector of the Nigerian economy in a dynamic framework to unleash the best way through which motivation can be promoted in the Nigerian public sectors. Based on this, the main gap this study wants to fill is hinged on ascertaining the best way motivation can be promoted among employees in the Nigerian public sector instead of focusing on the individual sector as the earlier works did.

2.6 Conceptual Framework

To achieve the purpose of this research in line with the objectives of the study, the conceptual framework of this study will revolve around the variables such as financial rewards, physical needs, and public relation, identifying how they can be used in promoting motivation for employee's performance in Nigeria public sector.

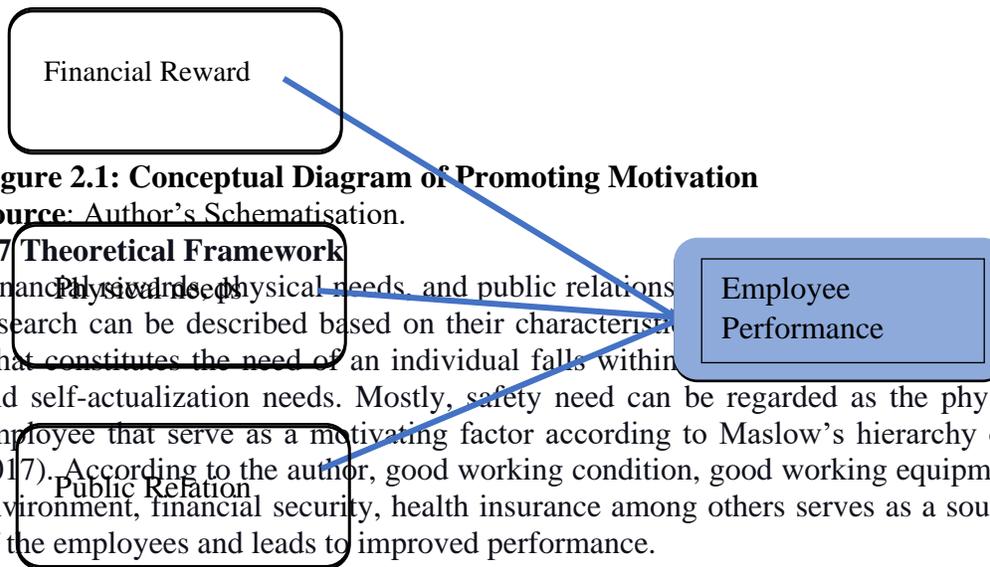


Figure 2.1: Conceptual Diagram of Promoting Motivation

Source: Author's Schematisation.

2.7 Theoretical Framework

Financial rewards, physical needs, and public relations variables of this research can be described based on their characteristics. According to Maslow's theory, what constitutes the need of an individual falls within physical, social, esteem, and self-actualization needs. Mostly, safety need can be regarded as the physical needs of an employee that serve as a motivating factor according to Maslow's hierarchy of needs (Badubi 2017). According to the author, good working condition, good working equipment, accident-free environment, financial security, health insurance among others serves as a source of motivation of the employees and leads to improved performance.

Though the physiological needs of persons are influenced by his/her biological nature, it requires a physical material for its satisfaction. Needs that relate to water, food, shelter, and clothing requires the provision of physical material for their satisfaction. Adnan et al (2016) opined that a need is a requirement that has an internal motive and the internal motive serves as a driver to an action that manifests through an individual's behavior. This means that the satisfaction of these needs influences the employees into positive performance in their organization.

Financial reward is one of the expectations of an employee which when fulfilled motivates the individual into positive performance. According to Aithal and Suresh (2016), the theory X and Y proposed by Douglas McGregor in the 1960s posits that the theory X means that an average employee would not want to work, is selfish, and self-centered, unambitious, and desire to be ordered around or supervised before something could be done. According to the authors, average workers under the theory x are only motivated by external rewards which include financial and non-financial rewards. According to Achie and Kurah (2016), the essence of financial reward is to improve the performance of the employees, and the employers of labor use financial incentives to manipulate the decisions of the workers. Due to the complexity of human nature, it is difficult to assemble the actual financial package that will motivate an employee whose nature is lazy and unambitious as posits by the theory, such that when the incentive is combined with effective supervision the behavior of the employee will change for good.

However, constant communication with the employees will help identify their needs and leads the employer into coming up with the best reward incentive that will affect the required motivation and change the behavior of the employee into higher performance. Randall (1993)

while commenting on exchange theory noted that there are masculine and feminine responses to financial rewards. The author noted that the interests of people in the masculine culture are in acquiring material gains which influence their performance either negatively or positively. On the other hand, female culture emphasizes welfare, care and empathy, relationship, and quality of life. This means that individuals in the feminine culture value nonfinancial rewards such as social recognition and working condition.

The public relation variable that serves as a motivation to the employees can be defined with the acceptance theory propounded by Chester Bernard (1968). The author argued that authority flows from the leaders to the followers but its effect depends on the degree of acceptance by the subordinates. This suggests that strategic plans should be put in place which will enable the understanding of the communications of the superiors by the subordinates. The legitimacy of the leader's directive and the extent of its acceptance determines the level of motivation that would come from the directives of the superior.

2.8 Statement of the Hypotheses

The hypotheses for the study are

Ho1 Financial reward does not motivate or improve employee performance.

Ho2 Satisfaction of physical needs does not lead to improved performance.

Ho3 Public relation does not impact on employee performance in the public sector.

2.9 Summary of Literature

The role of motivation in the performance of the employees has induced the attention of many researchers and theorists who developed the concepts and theories that guide the practice of employee motivation. Though the adoption of one or two of these theories in the real-life situation may be difficult, it serves as a guide to policy makers in drawing the roadmap for manipulating the decisions and changing the behaviors of the employees towards achieving the desired goal of the organization.

RESEARCH METHODOLOGY

3.1 Overview

This chapter discusses all the activities carried out by the researcher to make these study a reality. The section shows the research strategy and study method adopted, the population of the study and the research variable and measurement, the sampling design, method of data collection, and analysis among other activities adopted by the researcher during the study.

3.2 Research Strategies

The descriptive research approach that serves as a driver for the identification of the appropriate themes of the topic, and the inherent issues in their current state will be adopted. The descriptive approach will also give a solution to the identified problems. Based on the research question and the questionnaire intended to be used as a research instrument, this study will adopt a quantitative research method. According to Fekede (2010), quantitative research allows the phenomenon to be explained by utilizing numerical models, mathematics, and statistics in the collection and analysis of research data.

3.2.1 Survey Population

The participant in this study will be selected from the staff of the office of the accountant general of the federation of Nigeria located at Treasury House, Plot 273, Samuel Akintola Boulevard Central Business District Garki-Abuja. The respondents are educated male and female employees working with the federal government of Nigeria.

3.2.2 Area of the Survey

The study will take place across the 16 departments in the Accountant General's office at Garki-Abuja. The choice for this office is because it is an office of the Nigerian public sector and the researcher can assess the offices with ease.

3.3 Sampling Design and Procedure

This study will adopt the purposive sampling technique. This is a non-probability sampling that allows the research to apply her judgment in selecting the respondents to the research question. This sampling technique is adopted because of the characteristics of the workers in the office, the ability of the method to save time and money (Black 2010). Samples of 10 employees will be selected from each of the 16 departments. Each sample will represent the entire members of each department used in the survey.

3.4 Research Variables and Measurement Procedures

This research will use primary data collected from the employees of the office of the accountant general of the federation. The questionnaire will be used as a data collection instrument. The variables that will be used in data collection will include age, level of education, gender, and years of work experience. This will also include the dependent variables in this study namely financial reward, physical needs, public relations, and the independent variable of employee performance. The Likert scale will be used to measure the degree of agreement of the respondents to the research questions. Through this, 1 point will be allocated to strongly disagree and 5 points given to strongly agree. This study will adopt the basic research procedure which includes 1. Identify and develop the research topic, 2. Conduct a preliminary search for information, 3. Search for sources of relevant information, 4. Evaluate the sources of information, 5. Make a draft of the research work, 6. Write the final version, 7. Do the referencing of the sources, 8. Proofread the work.

3.5 Method of Data Collection

The primary data will be collected through the use of a questionnaire administered by hand to the staff of the office of the accountant general of the federation of Nigeria. The secondary data will be collected from journals, textbooks, online articles, and publications. Through the secondary data, existing knowledge on the topic under research will be obtained, and the research gap that needed to be filled through this study will be identified.

3.6 Technique of Data Analysis

The researcher will employ the deductive research approach which will allow the analysis of the variables to be drawn from the general view to a specific view. Through the outcome, the research 'will bridge the research gap identified in the literature review. The chi-square was adopted as the data analytical model in testing the hypothesis for this study. A 5% level of significance was used as a standard to accept or to reject a given hypothesis. On the other hand, the formulated null hypotheses were tested by the use of Chi-square. The decision rule allows the rejection of a hypothesis if the calculated value is less than the critical value and to accept the hypothesis if the calculated value is greater than the critical value.

Chi-square is calculated with the help of the following formula.

$$X^2 = \frac{\sum (O - E)^2}{E}$$

Where O = represents Observed frequency

E = Represents Expected frequency

E= Number of questionnaires

Number of responses

3.7 Expected Result of the Research

This study is expected to establish how the variable of financial rewards, physical needs, and public relations can be used in promoting motivation in an organization for employee performance using the Nigerian public sector as a case.

3.8 Work plan

This work plan was done using MS Excel, it projects the period within which it is assumed all work on this business research could be completed, however, given the current global pandemic, the period could be altered in case of any unforeseen circumstances. (Below is the Gantt chart adapted to the business research using MS Excel



Table 3.1: Work Plan for Research

S/NO	TASKS	START DATE	DAYS TO COMPLETE
1	CHAPTER 1	15-Apr	10
2	CHAPTER 2	26-Apr-20	14
3	CHAPTER 3	20-May-20	13
4	CHAPTER 4	12-Jun-20	9
5	CHAPTER 5	14-Jun-20	15
6	CHAPTER 6	27-Jun-20	12

Source: researcher, 2020

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The concentration of this chapter is majorly on the analysis of data and presentation of results. The results of the data analyses are presented with the use of frequency distribution, percentages as well as graphical representations. Data from 92 respondents are used for the analysis of this study. The statistical software package (SPSS Version 21.0) was used in the analysis.

4.2 Presentation of Demographic Characteristics of Respondents

The description of the biographic features and classification of the respondents sampled for the study are given in table 4.1

Table 1.1: Gender Distribution of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	51	55.4	55.4	55.4
	FEMALE	41	44.6	44.6	100.0
	Total	92	100.0	100.0	

Source: Online Survey (2020)

Table 1.1 reveals that 51 and 41 respondents are male and female with valid percent of 55.4 and 44.6 respectively. Hence the implication of this is that greater proportions of the respondents are male gender. This is further illustrated with the aid of a diagrammatic bar chart. The longer bar represents the male gender while the shorter one represents the female.

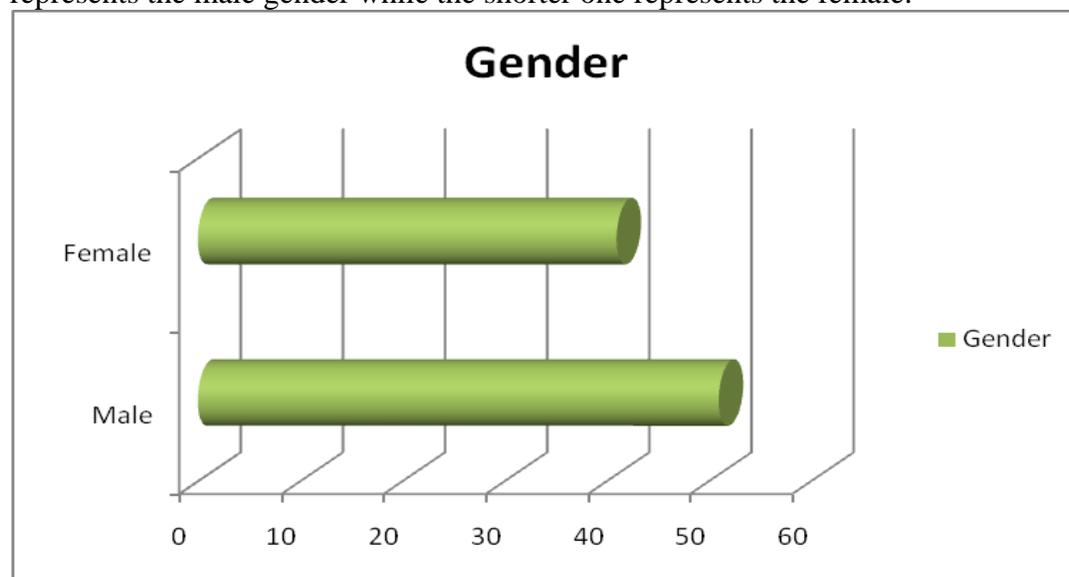


Figure 4.1: Gender Distribution of Respondents

Source: Field Survey (2020)

Table 1.2: Age Distribution of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Below 20 Years	1	1	1	1
	20- 29 Years	10	10.9	10.9	11.9
	30 -39 Years	17	18.5	18.5	30.4
	40 – 49 Years	37	40.2	40.2	70.6
	50 years & Above	27	29.4	29.4	100
	Total	92	100.0	100.0	

Source: Field Survey (2020)

From table 4.2 and the bar figure 4.2, it can be seen that respondents with below 20 years of age has a frequency value of 1 (1%), 20-29 years has 10 (10.9%), 30-39 has 17 (18.5%), 40-49 years has 37 (40.2%) and 50 years and above has a frequency value of 27 with 29.3. From both the table and the bar chart it could be seen that age 40-49 years has the highest participatory rate.

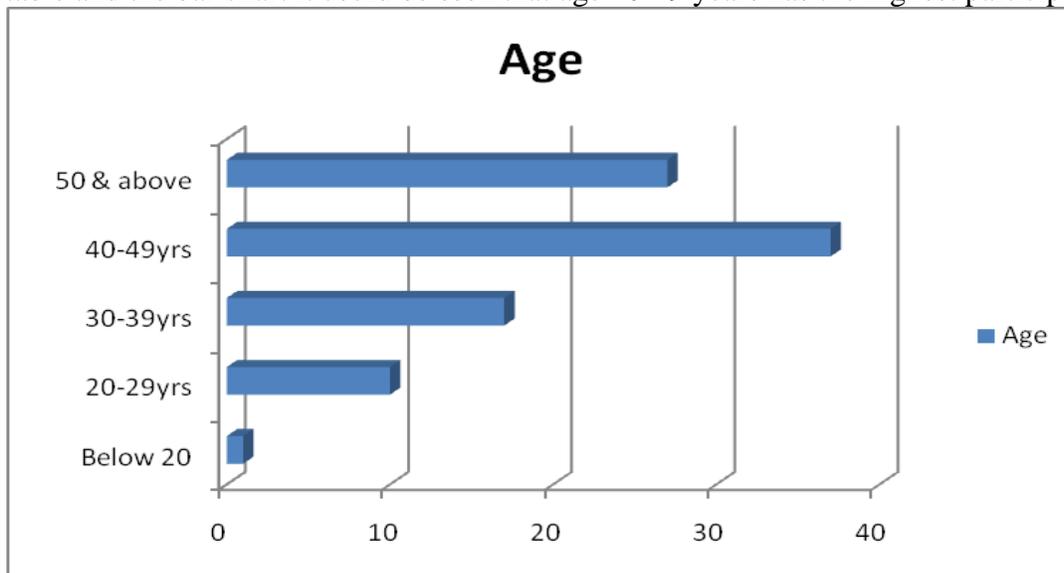


Figure 4.2: Age Distribution of Respondents

Source: SPSS Version 21.0

Table 4.3: Years of Experience Distribution of Respondents

Years	Frequency	Percent	Valid Percent	Cumulative Percent
Below 10 years	17	18.5	18.5	18.5
10- 20 Years	35	38	38	56.5
21 Years & above	40	43.5	43.5	100
Total	92	100	100	

Source: Field Survey (2020)

From the table 4.3 and the cone figure 4.3, it can be observed that respondents with below 10 years experience has a frequency value of 17 (18.5%), 10-20 years has a frequency value of 35 (38%) and 21 years and above has a frequency value of 40 (43.5%). From both the table and the bar chart it could be seen that respondents with the highest level of participation are those between the years' experience bracket of 21 years and above.

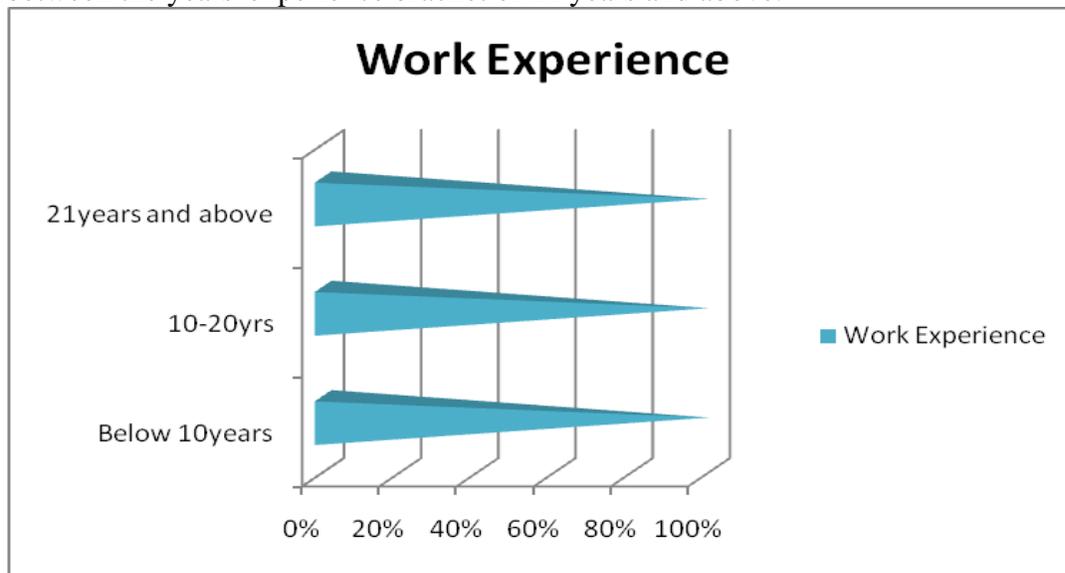


Figure 4.3: Work Experience of Respondents

Source: SPSS Version 21.0

Table 4.3: Educational Qualification of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
valid FSLC/SSCE	4	4.3	4.3	4.3
OND/NCE	5	5.4	5.4	9.7
B.Sc/B,Ed/HND	39	42.4	42.4	52.1
M.Sc/MBA	42	45.7	45.7	97.8
PhD	2	2.2	2.2	100
Total	92	100	100	

Source: Field Survey (2020)

From table 4.4 and bar chart presented in figure 4.3 it can be seen that respondents with FSLC/SSCE have a frequency value of 4 (4.3%), OND/NCE has 5 (5.4%), MSC/MBA has 42 (45.7%), B.Sc. /B, Ed/HND has 39 (42%) and Ph.D. has 2 (2.2%). The percent figures in the brackets represent the proportion of individual frequency value to the whole.

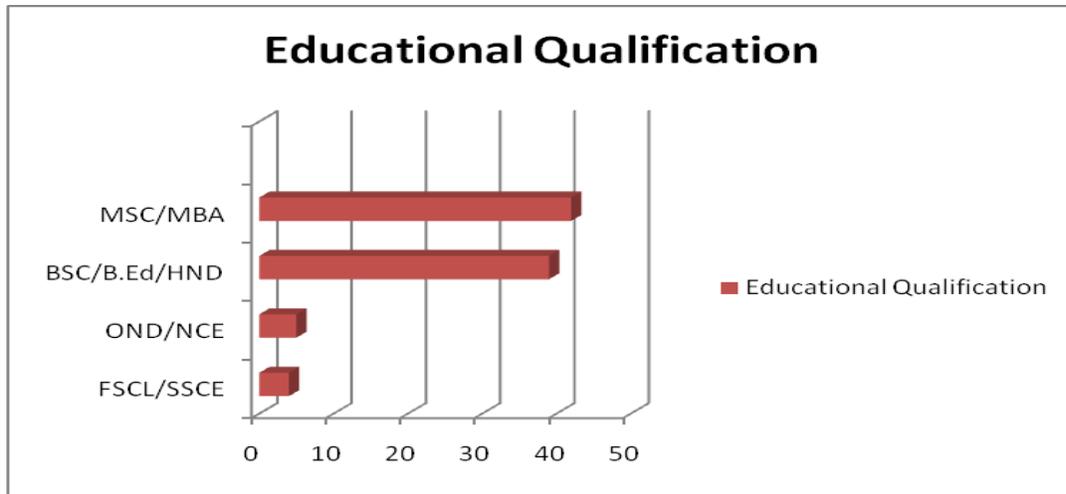


Figure 4.4: Educational Qualification of Respondents

Source: SPSS Version 21.0

4.3 Section B

Table 4.5: Does your Organization reward high Performance as an Incentive to Motivate Employees?

Responses	
Yes	60
No	24
Don't Know	8

Source: Field Survey (2020)

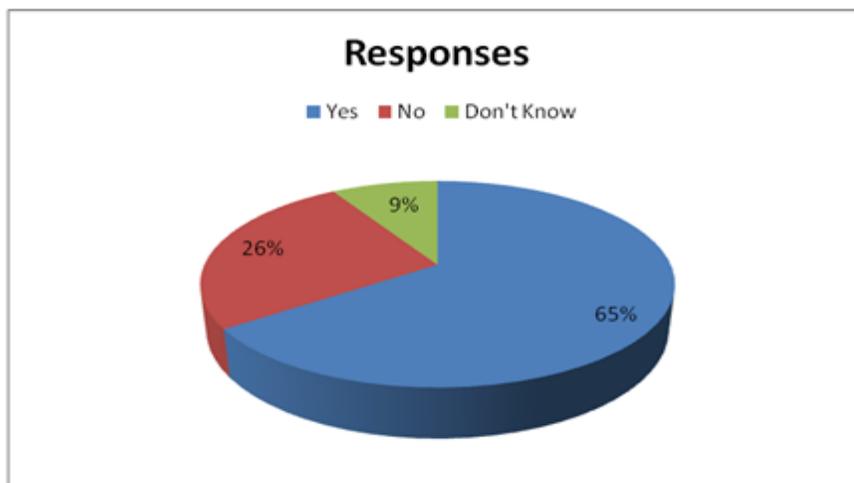


Figure 4.5: Incentive to Motivate Employees

Source: SPSS Version 21.0

Table 4.

5 as well as the pie chart represents the responses with respect to the first question which bothers on incentives due to high performance to motivate employees. The table represents responses while the pie chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that the organization rewards employees for hard work and high performances.

Table 4.6: Does rewards from your Organization on good Performance satisfy your Physical Needs?

Responses	
Yes	36
No	44
Don't Know	12

Source: Field Survey (2020)

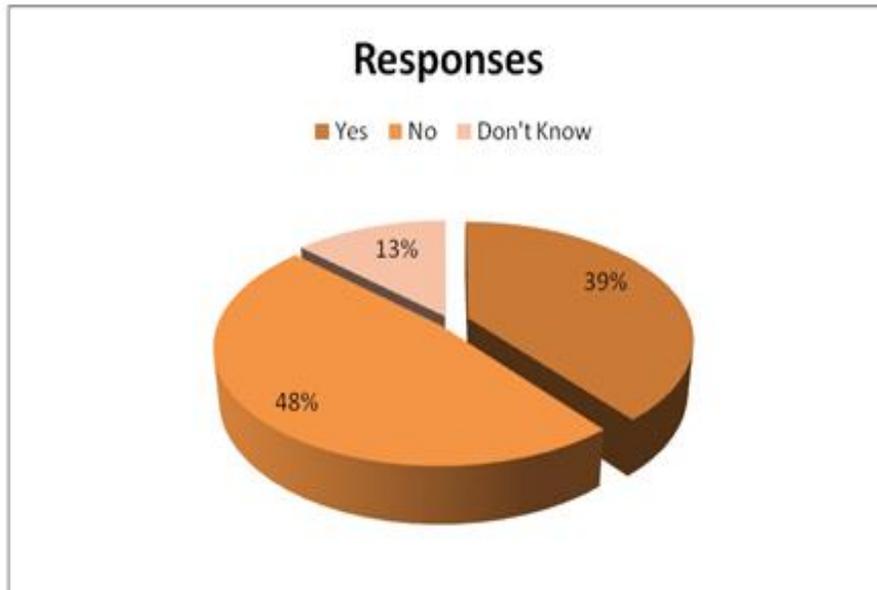


Figure 4.6: Does rewards from your Organization on good Performance Satisfy your Physical Needs?

Source: SPSS Version 21.0

Table 4.6 as well as the pie chart represents the responses with respect to the second question which bothers on whether rewards from the organization on good performance satisfy employees' physical needs. The table represents responses while the pie chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that close to half of the respondents (48%) responded that the rewards does not satisfy their physical needs.

Table 4.7: Does your Organization Satisfy the Needs at the Workplace as an Incentive to Motivate Employees?

Responses	
Yes	47
No	37
Don't Know	8

Source: Field Survey (2020)

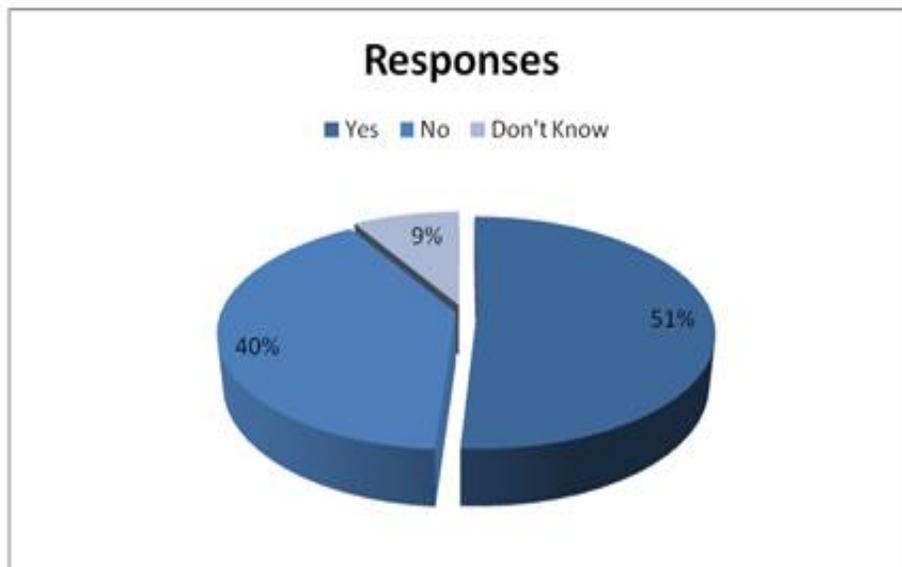


Figure 4.7: Does your Organization Satisfy the Needs at the Workplace as an Incentive to Motivate Employees?

Source: SPSS Version 21.0

Table 4.7 as well as the pie chart represents the responses concerning the third question which bothers on whether the organization satisfies the needs at the workplace as an incentive to motivate employees. The table represents responses while the pie chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that more than half of the respondents (51%) responded that the organization satisfy the needs at workplace as an incentive to motivate employees.

Table 4.8: Does the Financial reward Motivational measures of your Organization influence your Performance in your Organization?

Responses	
Yes	49
No	31
Don't Know	12

Source: Field Survey (2020)

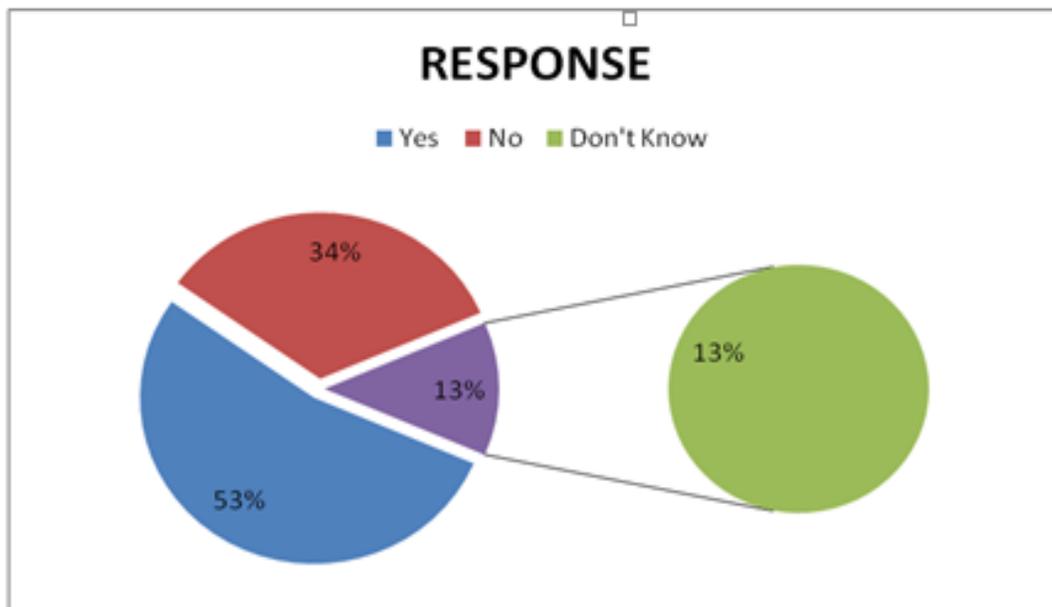


Figure 4.8: Does the Financial reward Motivational measures of your Organization influence your Performance in your Organization?

Source: SPSS Version 21.0

Table 4.8 as well as the pie chart represents the responses concerning the fourth question which bothers on whether the financial reward motivational measures of the organization influences employees performances in the organization. The table represents responses while the pie chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that more than half of the respondents (53%) responded that the financial reward motivational measures influences employees performance in the organization.

Table 4.9 in your view, has your performance or that of your junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of these motivational packages?

Table 4.9: Positive Feedback from Clients/Visitors

Responses	
Yes	61
No	20
Don't Know	11

Source: Field Survey (2020)

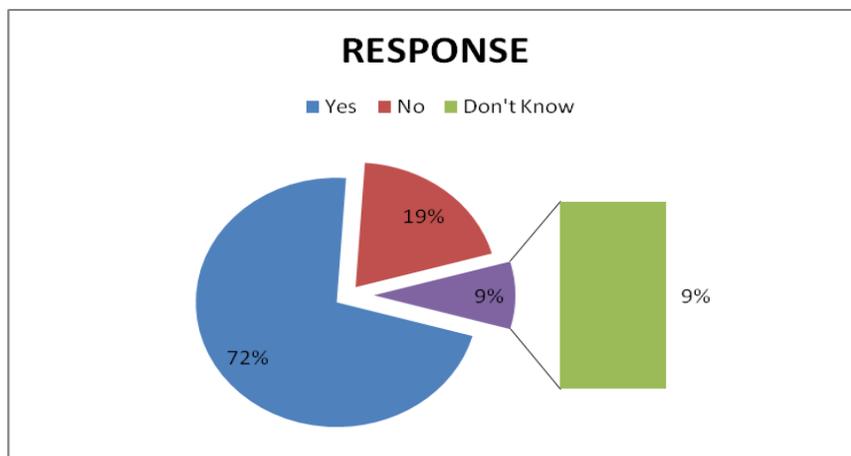


Figure 4.9: Positive Feedback from Clients/Visitors

Source: SPSS Version 21.0

Table 4.9 as well as the pie chart represents the responses concerning the sixth question which bothers on whether the employees performance or that of the junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages. The table represents responses while the pie chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that more than half of the respondents (66%) responded that the employees performance or that of the junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages of the organization.

Table 4.10: Which of the following needs of the Employee does your Organization offer as a Motivational measure for improving the Performance of the Employees?

S/N	Questionnaire Item	SA	%	A	/%	Don't Know	%	DA	%	SD	%
E1	Provision of the Required Training	21	24.7	39	45.88	6	7.06	15	17.65	4	4.71
E2	Working tools for improved performance	17	23.94	34	47.89	2	2.82	16	22.54	2	2.82
E3	Growth Parts for Career Advancement	30	35.71	32	38.1	3	3.57	15	17.86	4	4.76
E4	Good Working Condition	19	24.36	38	45.24	4	4.76	14	16.67	3	3.57
E5	E5. Participation in decision making	14	19.18	29	39.73	11	15.07	14	19.18	5	6.85
E6	Organizational culture that supports teamwork	14	15.38	41	45.05	15	16.48	17	18.68	4	4.4

Source: Field Survey (2020)

In table 4.10, item 1 (Provision of the Required Training) has total responses of 85 persons. Out of the 85 respondents, 21 (24.7%) strongly agreed that the provision of required training was a motivational measure offered by the organization to improve employees' performance. Other statistics are as follows; Agreed has 39 responses which is 45.88%, Don't know has 6 responses which is 7.06%, Disagreed has 15 responses which are 17.65%, and lastly, Strongly Disagreed has 4 responses which are 4.71%.

Item 2 (Working tools for improved performance) has total responses of 71 persons Out of the 71 respondents, 17 (23.94%) strongly agreed that working tools for improved performance were a motivational measure offered by the organization to improve employees' performance. Other statistics are as follows; Agreed has 34 responses which is 47.89%, Don't know has 2 responses which is 2.82%, Disagreed has 16 responses which is 22.54% and lastly, Strongly Disagreed has 2 responses which is 2.82%.

Item 3, (Growth Parts for Career Advancement) has total responses of 84 persons. Out of the 84 respondents, 30 (35.71%) strongly agreed that growth Parts for Career Advancement was a motivational measure offered by the organization to improve employees' performance. Other statistics are as follows; Agreed has 32 responses which is 38.1%, Don't know has 3 responses which is 3.57%, Disagreed has 15 responses which is 17.86% and lastly, Strongly Disagreed has 4 responses which is 4.76%.

Item 4, (Good Working Condition) has total responses of 78 persons. Out of the 78 respondents, 19 (24.36%) strongly agreed that good working condition was a motivational measure provided by the organization to improve employees performance. Other statistics are as follows; Agreed has 38 responses which is 45.24%, Don't know has 4 responses which is 4.76%, Disagreed has 14 responses which is 16.67% and lastly, Strongly Disagreed has 3 responses which is 3.57%.

Item 5, (Participation in decision making) has total responses of 73 persons. Out of the 73 respondents, 14 (19.18%) strongly agreed that participation in decision making was a motivational measure offered by the organization to improve employees' performance. Other statistics are as follows; Agreed has 29 responses which is 39.73%, Don't know has 11 responses which is 15.07%, Disagreed has 14 responses which is 19.18 % and lastly, Strongly Disagreed has 5 responses which is 6.85%.

Item 6, (Organizational culture that supports teamwork) has total responses of 91 persons. Out of the 91 respondents, 14 (15.38%) strongly agreed that organizational culture that supports teamwork was a motivational measure provided by the organization to improve employees' performance. Other statistics are as follows; Agreed has 41 responses which is 45.05%, Don't know has 15 responses which is 16.48%, Disagreed has 17 responses which is 18.68 % and lastly, Strongly Disagreed has 4 responses which is 4.4%.

Table 4.11 Did the Level of Satisfaction you drive from your Organization's Incentives to Employee needs Motivate you into improved Performance

Responses	
Yes	66
No	18
Don't Know	8

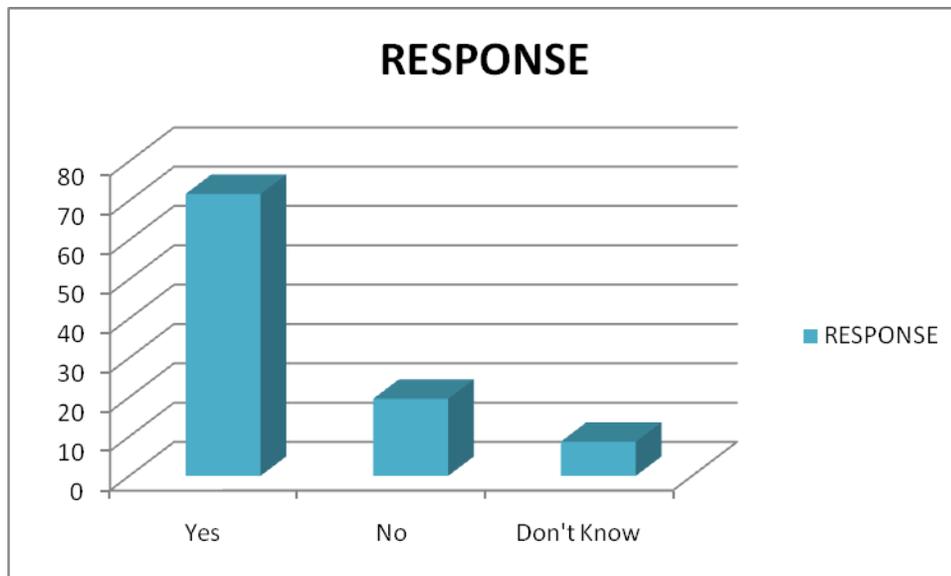


Figure 4.11: Level of Satisfaction

Source: SPSS Version 21.0

Table 4.11 as well as the bar chart represents the responses with respect to the tenth question which bothers on whether the level of satisfaction employees derive from their organization's incentives with respect to their needs motivates them into improved performance. The table represents responses while the bar chart represents the responses percent as a proportion of the whole. From the responses got from the question it can be concluded that more than two-thirds of the respondents (71.7%) responded that the level of satisfaction they derive from their organization's incentives to employee needs motivates them into improved performances.

From table 4.12, Item 1, (Financial Reward) has total responses of 82 persons. Out of the 82 respondents, 28 (34.15%) strongly agreed that financial reward was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. Other statistics are as follows; Agreed has 35 responses which is 42.68%, Don't know has 3 responses which is 3.66%, Disagreed has 14 responses which is 17.07% and lastly, Strongly Disagreed has 2 responses which is 2.44%.

Table 4.12: Which of the under-listed Variables (Financial reward, Physical need Satisfaction, and Public Relation), Motivate you to perform more effectively and efficiently in the last 18 Months?

S/N	Questionnaire Item	SA	%	A	/%	Don't Know	%	DA	%	SD	%
1	Financial Reward	28	34.15	35	42.68	3	3.66	14	17.07	2	2.44
2	Physical Needs satisfaction	13	16.25	43	53.75	9	11.25	13	16.25	2	2.5
3	Public Relation	11	15.07	35	47.95	11	15.07	16	21.92	0	0

Source: Online Survey

Item 2, (physical needs satisfaction) has total responses of 80 persons. Out of the 80 respondents, 13 (16.25%) strongly agreed that physical needs satisfaction was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. Other statistics are as follows; Agreed has 43 responses which is 53.75%, Don't know has 9 responses which is 11.25%, Disagreed has 13 responses which is 16.25% and lastly, Strongly Disagreed has 2 responses which is 2.5%.

Item 3, (public relation) has total responses of 73 persons. Out of the 73 respondents, 11 (15.07%) strongly agreed that public relations was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. Other statistics are as follows; Agreed has 35 responses which is 47.95%, Don't know has 11 responses which is 15.07%, Disagreed has 16 responses which is 21.92% and lastly, Strongly Disagreed has 0 responses and 0 percent.

4.4 Test of Hypothesis

Decision Rule

Reject H_0 if X^2 calculated is greater than X^2 tabulated, otherwise accept it.

Hypothesis One

H_{01} : Financial reward does not significantly motivate or improve employee performance

H_{A1} : Financial reward does significantly motivate or improve employee performance

Code	O	E	O-E	(O-E) ²	{(O-E) ² /E
B1	43	43.6	-0.6	0.36	0.0082569
B2	51	43.6	7.4	54.76	1.2559633
B3	52	43.6	8.4	70.56	1.6183486
B4	43	43.6	-0.6	0.36	0.0082569
B5	29	43.6	-14.6	213.16	4.8889908
B1	7	7.6	-0.6	0.36	0.0473684
B2	5	7.6	-2.6	6.76	0.8894737
B3	6	7.6	-1.6	2.56	0.3368421
B4	7	7.6	-0.6	0.36	0.0473684
B5	13	7.6	5.4	29.16	3.8368421
B1	29	25.6	3.4	11.56	0.4515625
B2	24	25.6	-1.6	2.56	0.1
B3	21	25.6	-4.6	21.16	0.8265625
B4	25	25.6	-0.6	0.36	0.0140625
B5	29	25.6	3.4	11.56	0.4515625
Total					14.781461

The degree of freedom was obtained by subtracting one from the number of rows and columns.

(C-1)(R-1): The number of rows is 5 and number of columns are 3.

$$= (3-1) (5-1)$$

$$= (2) (4)$$

= 8 degrees of freedom.

$$X^2 \text{ tab} = 15.51$$

The calculated value of chi-square was 14.781, and the table value of chi-square at 8 degrees of freedom and a 5% significance level stood at 15.51. Since the calculated chi-square value is lower than its table value, the null hypothesis is accepted. It can be concluded from the result that there is no significant financial reward does not significantly motivate or improve employee performance.

Hypothesis Two

H₀₂: Satisfaction of physical needs does not significantly lead to improved performance

H_{A2}: Satisfaction of physical needs does significantly lead to improved performance

Code	O	E	O-E	(O-E) ²	{(O-E) ² }/E
DI	48	53.875	-5.875	34.51563	0.64066125
D2	51	53.875	-2.875	8.265625	0.15342227
D3	45	53.875	-8.875	78.76563	1.46200696
D4	49	53.875	-4.875	23.76563	0.44112529
D5	61	53.875	7.125	50.76563	0.94228538
D6	49	53.875	-4.875	23.76563	0.44112529
D7	70	53.875	16.125	260.0156	4.8262761
D8	58	53.875	4.125	17.01563	0.31583527
DI	6	6	0	0	0
D2	7	6	1	1	1
D3	8	6	2	4	0.66666667
D4	8	6	2	4	0.66666667
D5	3	6	-3	9	1.5
D6	8	6	2	4	0.66666667
D7	4	6	-2	4	0.66666667
D8	4	6	-2	4	0.66666667
DI	23	17.25	5.75	33.0625	1.91666667
D2	21	17.25	3.75	14.0625	0.81521739
D3	14	17.25	-3.25	10.5625	0.61231884
D4	14	17.25	-3.25	10.5625	0.61231884
D5	20	17.25	2.75	7.5625	0.4384058
D6	17	17.25	-0.25	0.0625	0.00362319
D7	13	17.25	-4.25	18.0625	1.04710145
D8	16	17.25	-1.25	1.5625	0.09057971
TOTAL					20.592303

The degree of freedom was obtained by subtracting one from the number of rows and columns.

(C-1)(R-1): The number of rows 8 and number of columns are 3.

= (3-1) (8-1)

= (2) (7)

= 14 degrees of freedom.

X² tab = 23.68

The calculated value of chi-square was 20.592, and the table value of chi-square at 14 degrees of freedom and 5% significance level stood at 23.68. Since the calculated chi-square value is lower than its table value, the null hypothesis is accepted. It can be concluded from the result that satisfaction of physical needs does not significantly

Hypothesis Three

H₀₃: Public relation does not significantly impact on employee performance in the public sector

H_{A3}: Public relation does significantly impact on employee performance in the public sector

Code	O	E	O-E	(O-E) ²	{(O-E) ² /E
C1	34	39	-5	25	0.641025641
C2	58	39	19	361	9.256410256
C3	28	39	-11	121	3.102564103
C4	37	39	-2	4	0.102564103
C5	38	39	-1	1	0.025641026
C1	18	13.6	4.4	19.36	1.423529412
C2	7	13.6	-6.6	43.56	3.202941176
C3	13	13.6	-0.6	0.36	0.026470588
C4	15	13.6	1.4	1.96	0.144117647
C5	15	13.6	1.4	1.96	0.144117647
C1	24	22	2	4	0.181818182
C2	20	22	-2	4	0.181818182
C3	23	22	1	1	0.045454545
C4	22	22	0	0	0
C5	21	22	-1	1	0.045454545
TOTAL					18.52392705

The degree of freedom was obtained by subtracting one from the number of rows and columns.

(C-1)(R-1): The number of rows is 5 and number of columns are 3.

$$= (3-1) (5-1)$$

$$= (2) (4)$$

= 8 degrees of freedom.

$$X^2 \text{ tab} = 15.51$$

The calculated value of chi-square was 18.524, and the table value of chi-square at 8 degrees of freedom and a 5% significance level stood at 15.51. Since the calculated chi-square value is higher than its table value, the null hypothesis is rejected. It can be concluded from the result that public relations do significantly impact on employee performance in the public sector.

SUMMARY OF FINDINGS, RECOMMENDATIONS, AND CONCLUSION

5.1 Summary of Findings

The focus of the research work centered on promoting motivation for employee performance: a case of Nigeria public sector. During the research work, an online survey exercise was resorted to as a source through which data was got for the analysis of the variables. The data used for the analysis of the variables were limited to the 92 respondents who participated in the online exercise. The statistical software package (SPSS Version 21.0) was used in the analysis.

In the data presentation and analysis, it was revealed in the demographic characteristics of respondents that the male gender who participated in the survey exercise was 51 persons which were 55.4% of the respondents. The remaining 41 respondents were female gender and represent 44.6% of the respondents. The relevance of these statistics is that it has been able to show that male workers of the Nigerian public sector had a higher participatory rate in the survey exercise.

The age distribution of respondents had the following groupings: below 20 years with a frequency of 1 person, 20 to 29 years had a frequency of 10 persons, 30 to 39 years had a frequency of 17 persons, 40 to 49 years had a frequency of 37 persons while 50 years and above had a frequency of 27 persons which totaled 92 persons. From these statistics, it was observed that the age range of 40 to 49 years had the highest participatory rate with a whopping 40.2%. From this analysis, it can be concluded that the respondents that participated in the survey exercise are mid-aged people with a good mixture of on the job experience.

The years of experience distribution of respondents grouped the respondents into the following headings: below 10 years have 17 persons as the number of participants accounting for 18.5%, 10 to 20 years have 35 persons as the number of participants accounting for 38%, 21 years and above have 40 persons as the number of participants, all of them totaled 92 respondents. From this analysis, it was concluded that respondents that were mostly utilized for the study have on the job experience from 21 years and above which accounted for 43.5% of the total respondents. This figure is closely followed by respondents between the year's brackets of 10 to 20 years.

The conclusion that can be made from these statistics is that the greater percent of the respondents have a good level of experience on the job as very few people (18.5%) had experienced less than 10 years while the rest had experiences from 10 years and above. The educational qualifications of respondents showed that participants with FSLC/SSCE were 4 persons which accounted for 4.3% of the total respondents; OND/NCE were 5 persons which accounted for 5.4%, respondents with B.Sc/B, Ed/HND educational qualification were 39 persons which accounted for 42.4%, respondents with M.Sc/MBA educational qualification were 42 persons which accounted for 45.7% and finally, respondents with Ph.D. educational qualification were 2 persons which accounted for 2.2% of the total respondents.

From this analysis, it can be concluded that respondents who possess M.Sc/MBA academic qualification were the people that had the highest participatory rate while respondents with Ph.D. educational qualification were the fewest with just 2.2% participatory rate. In all, it is easy to say that all the respondents are educated and have all passed through the four walls of tertiary institutions except for the meager 4.3% who possess FSLC/SSCE academic qualification. Having critically analyzed the demographic information of the respondents, the study made progress by analyzing the descriptive responses of the respondents with the help of tables, bar

charts, column charts, and pie charts. The brief summation of the analysis is subsequently given below;

In table 5 on the data presentation and analysis chapter, it was discovered that 65% of the respondents confirmed that their organization rewards high performance as an incentive to motivate employees. The respondents who opined that their organizations did not reward high performance as an incentive to motivate employees were 26% and those respondents who were indifferent in their opinion regarding whether their organization rewards high performance as an incentive to motivate employees were 9% of the total respondents. Based on this, the study accepted the fact that their organization reward high performance as an incentive to motivate employees stemming from the opinions of the majority of the respondents.

In table 6 on the data presentation and analysis chapter, it was discovered that 39% of the respondents confirmed that the rewards from their organization on good performance satisfy their physical needs. The respondents who opined that the rewards from their organization on good performance did not satisfy their physical needs were 48% and those respondents who were indifferent in their opinion regarding whether the rewards from their organization on good performance satisfy their physical needs were 13% of the total respondents. Based on this, the study accepted the fact that the rewards from their organization on good performance did not satisfy their physical needs stemming from the opinions of the majority of the respondents.

In table 7 on the data presentation and analysis chapter, it was discovered that 51% of the respondents confirmed that their organization satisfies their needs at the workplace as an incentive to motivate employees. The respondents who opined that their organizations did not satisfy their needs at the workplace as an incentive to motivate employees were 40% and those respondents who were indifferent in their opinion regarding whether their organization satisfies their needs at the workplace as an incentive to motivate employees were 9% of the total respondents. Based on this, the study accepted the fact that their organizations did satisfy their needs at the workplace as an incentive to motivate employees stemming from the opinions of the majority of the respondents.

In table 8 on the data presentation and analysis chapter, it was discovered that 53% of the respondents confirmed that the financial reward motivational measures of their organization influence their performance in their organization. The respondents who opined that the financial reward motivational measures of their organization did not influence their performance in their organization were 34% and those respondents who were indifferent in their opinion regarding whether the financial reward motivational measures of their organization influence their performance in their organization were 13% of the total respondents. Based on this, the study accepted the fact that the financial reward motivational measures of their organization influence workers' performance in their organization stemming from the opinions of the majority of the respondents.

In table 4.9 on the data presentation and analysis chapter, it was discovered that 66% of the respondents confirmed that the employees' performance or that of the junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages of the organization. The respondents who negate the opinion that the employees' performance or that of the junior workers improved in the last one year in the areas of quality of

service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages of the organization were 22%

Respondents who were indifferent employees opinion regarding whether the employees performance or that of the junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages of the organization were 12% of the total respondents. Based on this, the study accepted the fact that the employees' performance or that of the junior workers improved in the last one year in the areas of quality of service delivery, positive feedback from clients/visitors, punctuality to work, and timely arrival to duty as a result of motivational packages of the organization stemming from the opinions of the majority of the respondents.

In table 4.10 on the data presentation and analysis chapter, it was discovered that the following needs of the employees were offered by the Nigerian public sector as motivational measures for improving the performance of the employees. They are Provision of the Required Training; Working tools for improved performance; Growth Parts for Career Advancement; Good Working Condition; Participation in decision making; Organizational culture that supports teamwork. Based on the responses of the respondents it was concluded that all the items mentioned above were offered by the Nigerian public sector as motivational measures for improvement in the performance level of the employees.

In table 4.11 on the data presentation and analysis chapter, it was discovered that 71% of the respondents confirmed that the level of satisfaction they derive from their organization's incentives to employees' needs motivate them into improved performances. The respondents who negate the opinion that the level of satisfaction they derive from their organization's incentives to employees' needs motivate them into improved performances were 19% and those respondents who were indifferent in their opinion regarding whether the level of satisfaction they derive from their organization's incentives to employee needs motivate them into improved performances were 9% of the total respondents. Based on this, the study accepted the fact that the level of satisfaction they derive from their organization's incentives to employee needs motivate them into improved performances stemming from the opinions of the majority of the respondents.

In table 4.12 on the data presentation and analysis chapter, it was discovered that 76.83% of the respondents confirmed that financial reward was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. About 3.66% were indifferent as to whether the financial reward was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months while about 19.51% of the respondents disagreed that financial reward was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months.

It was also discovered that 70% of the respondents confirmed that physical needs satisfaction was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. About 11.25% were indifferent as to whether physical needs satisfaction was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months while about 18.75% of the respondents disagreed that physical needs satisfaction was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months.

Lastly, it was discovered that 63.02% of the respondents confirmed that public relations were one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. About 15.07% were indifferent as to whether public relation was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months while about 21.92% of the respondents disagreed that public relation was one of the variables that motivate them to perform more effectively and efficiently in the last 18 months. On a more summative note, financial reward, physical need satisfaction, and public relations were confirmed to be variables that motivate employees to perform more effectively and efficiently in the last 18 months.

The Chi-square statistical instrument was used in the test of the hypotheses of the study. In the first hypothesis, it was discovered that financial reward does not significantly motivate or improve employee performances. This result is quite unusual because it is against the theoretical expectation. It is expected that financial rewards will motivate employees into enhanced performances.

The outcome of this result may be attributed to the fact that the financial rewards are too insignificant to spur workers into greater performances. This result has a close relationship with the finding of Njunwa (2017) where it was found out that employees of the rural local government council in Morogoro, Tanzania are neither motivated financially nor in non-financial terms as a result of poor salary, lack of career development, poor training, partiality, political manipulation, poor working condition, and lack of effective communication are the major drivers of a lack of motivation among the staff of the local council. In the second hypothesis, it was discovered that the satisfaction of physical needs does not significantly lead to improved performance. This result is against the theoretical expectation since it was expected that satisfaction of physical needs will significantly lead to improved performances of employees.

The outcome of this result is in negation with the findings of Nzewi et al. (2018) when they investigated the relationship between physical work environment and employee performance in some selected breweries in Anambra state. In their work, it was revealed that correlation between ergonomic and employee job satisfaction exists. In the third hypothesis, it was discovered that public relations do significantly have an impact on employee performance in the public sector. The outcome of this result is in line with the theoretical expectation. It is expected that improved public relations will have a positive and significant effect on the performance level of employees in the Nigerian public sector.

5.2 Recommendations

Based on the findings of this study the following recommendations are made:

- i. In one of the findings of the research work it was revealed that the financial rewards in the Nigerian public sector do not significantly motivate or improve employee performances, this may be due to the insignificant impact of the financial rewards on the lives of the employees therefore, it is recommended that the government of Nigeria should make financial rewards in the public sector substantial so as to be able to motivate employees
- ii. In the same vein, the findings of the study revealed that satisfaction of physical needs does not significantly lead to improved performance, the outcome of this result may be traced to the uneven distribution of the physical needs across the public sector therefore it is recommended that the government of Nigeria should make the provision of physical needs

of employees even across all public sectors so as to get an increased level of satisfaction among employees.

- iii. Also the findings of the study showed that public relation does significantly have an impact on employee performance in the public sector, the outcome of this result shows the importance of public relations in the Nigerian public sector, therefore, it is recommended that the government should continue to opt for sophisticated public relations channels so as to continue to evolve and improve the performance level of employees in the public sector.

5.3 Conclusion

The research work is centered on promoting motivation for employee performance in the Nigerian public sector. During the course of the research work, lots of scholarly opinions were resorted to in a bid to give enthralling justification to the topic under consideration. Among the scholars is Varma (2017), who asserted that government needs to engage in the motivation of its employees who are faced with the challenges of the reduction in the value of their pay because of the impact of inflation and recession, the reduction in the government commitment to financing public services and the general increase in the demand for public service as a result of the state of the economy. In the same vein,

Adedeji & Ugwumadu (2018) argued that modern organizations are faced with the challenges of keeping their loyal and performing employees; therefore, they plan to achieve employee retention through adopting motivation as a business strategy that improves employee performance. Therefore, Arief, Tatang & Zarah (2018) conceptualized motivation as a positive emotional condition emanating from the evaluation of one's service experience in his organization. Blaskova et al. (2018) argued that motivation is a cognitive decision making targeted at ensuring that employees' behaviors are channeled towards achieving an identified objective through initiation and monitoring.

After the introduction of the pertinent concepts in the topic, some important questions were stated out to be addressed which bothers on financial rewards plans being implemented in the public sector as a motivational strategy; how satisfaction of the physical needs of the employees lead to motivation in the public sector and the impact of public relations on the performance of the employees of the organization. These questions were subjected to empirical investigation and the result was clearly presented in chapter four of this study. The study opted for a quantitative research method. The choice of quantitative methods is premised on the fact that it makes provisions for objective assessment of the phenomena under consideration and as such makes possible the proffering of focused recommendations.

The adoption of a quantitative research methodology made it possible for the utilization of questionnaires as a data collection instrument and as such this study adopted an online questionnaire as the data collection instrument. The data obtained from this means was used for the analysis of the study. With regard to the review of literature, the research work made effort to capture a series of theories that have a direct bearing with the tenets of the topic under consideration. Some of the theories are as given below; Maslow's hierarchy of needs, Alderfer's Existence, Herzberg's motivator-hygiene (or two-factor) theory, Relatedness, and Growth theory, and McClelland's needs theory.

The study further identified that the motivation theories that deal with employee satisfaction are categorized under process theory which includes Porter-Law's model and the Vroom expectancy theory, while content theory stresses the importance of the determinants of the factors of motivation. In other words, the content theory tries to identify the needs and relates to fulfilling the needs with motivation. The theories under content theory classification are Maslow's Hierarchy of Needs, Theory X and Theory Y (otherwise called management assumption), ERG Theory, McClellands Need for Achievement, Affiliation, and Power, Herzberg's Two Factor Theory. Zafarullah & Pertti (2017) argued that the theories of employee's motivation at their duty post include the theories under the content and process categories.

Under the empirical jurisprudence, some scholarly journals were reviewed. Ali and Akram (2012) studied the impact of financial rewards on the motivation and satisfaction of employees in the pharmaceutical industry in Pakistan where it was revealed that employees are more motivated and satisfied when induced through handsome financial rewards and they tend to improve their performance level. Also, Nzewi et al (2018) investigated the relationship between physical work environment and employee performance in some selected breweries in Anambra state where it was revealed that there was a correlation between ergonomic and employee job satisfaction.

In the same vein, Iman and Behbood (2015) investigated the role of public relations practices in improving the performance of employees and it was revealed that there exists a positive correlation between public relations activities of the petrochemical firm used for the study and the productivity of the employees. There are other scholarly articles reviewed during the course of the empirical analysis but due to lack of space, the three given above are just glimpses. On a whole, this study has been able to comprehensively given a good deal of conceptual literature, theoretical literature, and empirical literature, and the gap in knowledge was as well identified.

In a nutshell, the research work has been able to give a significant contribution to the existing body of knowledge with respect to this topic considered. Based on this, this work and its findings will serve as a framework for further research to be carried out where if possible will address any lapses that may have been showcased during the course of the study and for improvements as the test of time continue to take its course. In conclusion, the recommendations of the findings of this study reveal the volume of the relevance of this study to academia, the government especially the management of Nigerian public sectors.

REFERENCES

- Abah, E. O. & Nwokwu, P. M. (2016). Workplace motivation and employee productivity in the Nigerian public organizations: The Federal Radio Corporation of Nigeria (FRCN) experience. *Journal of Resource Development and Management*, 20, 30-41.
- Abah, E. O. (2016). Work Place Motivation and Employee Productivity in the Nigerian Public Organizations: The Federal Radio Corporation of Nigeria (FRCN) Experience. *Journal of Resources Development and Management: An International Peer-reviewed Journal Vol.20*, 30-41.
- Abhijeet, P. (2017). Content and process theories: The Distinction between Content and Process Theories of Motivation. Retrieved from: <https://notesmatic.com/2016/10/content-process-theories/>. (Accessed 6th May 2020)
- Abiola, I. (2019). Impact of public relation on Nigerian economy. <http://projectgist.com.ng/2019/02/22/impact-of-public-relation-on-nigerian-economy/>
- Adedeji, A. & Ugwumadu, O. (2018). Factors motivating employee loyalty and employee retention in deposit money banks in Nigeria. *International Journal of Human Resource Studies*, 8(3), 300-304.
- Adnan, C., Sebahattin, K. & Hande, U. Y. (2016). A study on basic needs in organizations: The relationship between physiologic-social and motivational needs of security forces personnel. *Advances in Economics and Business Management*, 3(2), 151-157.
- Aithal, P.S. & Suresh, K.P.M. (2016). Comparative analysis of theory X, theory Y and theory Z and theory A for managing people and performance. *International Journal of Scientific research and Modern Education*, 1(1), 803-811
- Ali, A. & Akram, N. M. (2012). Impact of financial rewards on employee's motivation and satisfaction in the Pharmaceutical Industry. *Global Journal of Management and Business Research*, 12(17), 45-50
- Almas, S. (2017). Motivation: Outstanding way to promote productivity in employees. *American Journal of Management Science and Engineering*, 2(3), 35-40.
- Arief, T. H., Tatang, A. G. S. & Zarah, P. (2018). The mediating role of emotional intelligence in the employee's performance. *Problems and perspectives in management*, 16(1), 145-154.
- Ashley, D. (2019). Employee Performance Definition. Retrieved from: <https://bizfluent.com/facts-7218608-employee-performance-definition.html>. (Accessed 6th May 2020)
- Ashveen, N. (2018). The Effect of Personality on Motivation and Organisational Behaviour. *International Journal of Psychology and Behavioral Science*, 9(3), 1-5
- Badubi, R. (2017). Theories of motivation and their application in organizations: A risk analysis. *International Journal of Innovation and Economic Development*, 3(3), 44-51.
- Bernard, C. (1968). *The functions of the executive*. London: Harvard University Press.
- Black, K. (2010) "Business Statistics: Contemporary Decision Making" 6th edition, John Wiley & Sons.
- Blaskova, M., Figurska, I., Adamoniene, R., Polackova, K. & Blasko, R. (2018). Responsible decision making for sustainable motivation. *Sustainability* 10, 1- 23. Retrieved from: doi:10.3390/su10103393. (Accessed 21st February 2020).
- De Juana-Espinosa, S. & Rakowska, A. (2018). Public sector motivational practices and their effect on job satisfaction: country differences. *European Journal of Management and Business Economics*, 27(2), 141-154.

- Elifelet, A. A. & Adam, C. (2016). A Comparative Study of Teachers' Motivation on Work Performance in Selected Public and Private Secondary Schools in Kilimanjaro Region, Tanzania. *International Journal of Education and Research*, 4(6), 583-597
- Fekede, T. (2010). Quantitative research in social science: Reflection on ontological, epistemological, and methodological perspectives. *Ethiopian Journal of Education & Sciences* 6(1). Retrieved from: <http://dx.doi.org/10.4314/ejesc.v6i1.65384>. (Accessed 1st February 2020).
- Freedheim, D., Weiner, I., Vellcer, W., Schinka, J. & Lerner, R. (2003). "Handbook of psychology" John Wiley & Sons, New Jersey.
- Haekyung, R. (2019). Comparison of process theories to content theories in motivating workforces. *International Journal of Human Resource Studies*, 9(4), 267-272
- Iman, K., and Behbood, K. (2015). The role of public relations activities in increasing the productivity of petrochemical employees. *Indian Journal of Fundamental and Applied Life Sciences*. Retrieved from: www.cibtech.org/sp.ed/jls/2015/01/jls.htm. (Accessed 25th April 2020).
- Khan, A. S., Ali, M., Hussain, H. F., Safdar, B. (2015). Impact of Employee Training and Motivation on Business Development in Banking Sector: Study Conducted in Pakistan. *American Journal of Business, Economics and Management*. Vol. 3(5), 241-249.
- Kjeldsen, A. M. & Hansen, J. R. (2016). Sector differences in the public service motivation–job satisfaction relationship: Exploring the role of organizational characteristics. Retrieved from: <https://doi.org/10.1177/0734371X16631605>. (Accessed 24th February 2020).
- Locke, A. & Latham, G. (2004). What should we do about Motivation Theory? Six recommendations for the twenty first century. *Academy of Management Review*, 29(3), 388–403.
- McKenna, E. (2000). "Business psychology and organizational Behaviour: A student's Handbook" Psychology Press, New York.
- Ndulue, T. I. & Ekechukwu, H. C. (2016). Impact of job satisfaction on employee's performance: a study of Nigerian Breweries Plc Kaduna state branch. *Nigeria, Kuwait Chapter of Arabian Journal of Business and Management Review*, 5(11), 13-23
- Njoroge, J. K., Ongeti, W. J., Kinuu D. & Kasomi, F. M. (2016). Does external environment influence organizational performance? The case of Kenyan State Corporations. *Management and Organizational Studies*, 3(3). Retrieve from: DOI: <https://doi.org/10.5430/mos.v3n3p41>.
- Njunwa, K. (2017). Employee's motivation in rural local governments in Tanzania: Empirical evidence from Morogoro District Council. Retrieved from: DOI: 10.5296/jpag.v7i4.12240. (Accessed 6th May 2020)
- Nurun, N., Monirul, I., Tanvir, M. D. Abdullah, A. (2017). The impact of motivation on employee performances: A case study of Karmasangsthan Bank Limited, Bangladesh. *International Journal of Business and Management Review*, 5(4), 57-78.
- Nwokorie, E. (2017). Challenges to effective management of public sector organizations in an institutionally corrupt society. https://www.univaasa.fi/materiaali/pdf/isbn_978-952-476-747-7.pdf
- Nzewi, H. N., Arachie, A., Ibrahim, M. & Okoli, G. (2018). Physical work environment and employee performance in selected brewing firms in Anambra State, Nigeria. *Journal of Good Governance and Sustainable Development in Africa*, 4(2), 131-145
- Obasa, O. (2015). Low Income and Diminishing Productivity in Nigerian Public Sector. *Arts and*

- Social Sciences Journal*. Retrieved from: DOI: 10.4172/2151-6200.1000113. (Accessed 21st May 2020).
- Okeke, P. A., Nwele, J. O. & Achilike, N. (2017). Impact of effective wages and salary administration on civil service productivity in Nigeria: A study of Anambra State. *Asian Journal of Applied Science and Technology (AJAST) (Open Access Quarterly International Journal)*, 1(9), 421-438.
- Okeke-Ezeanyanwu, J. A. (2017). Impact of outsourcing on organizational productivity in private and public sector organizations in Anambra State. *Journal of education, Science and technology*, 3(4), 112-116.
- Orumwense, J. O. & Mwakipsile, G. (2017). Employees motivation and work performance in various universities in Nigeria. *International Journal of Geology, Agriculture and Environmental Sciences Volume*, 5(4), 1-8
- Pradhan, R. K. & Jena, L.K. (2016). Employee performance at workplace: Conceptual model and empirical validation. Retrieved from: Doi: 10.1177/2278533716671630. (Accessed 25th February 2020).
- Rabindra, K. P. & Lalatendu, K.J. (2016). Employee Performance at Workplace: Conceptual Model and Empirical Validation. Retrieved from: <https://doi.org/10.1177/2278533716671630>. (Accessed 7th May 2020)
- Randall, D. M. (1993). 'Cross-cultural research on organizational commitment: A review and application of Hofstede's value survey module'. *Journal of Business Research*, 26, 91–110.
- Siddiqi, H. & Qureshi, M. (2016). The impact of employees' creativity on the performance of the firm. *Research issues in social sciences* 1, 1-12. Retrieved from: https://www.researchgate.net/publication/303896400_The_Impact_of_Employees'_Creativity_on_the_Performance_of_the_Firm. (Accessed 25th February 2020).
- Simon, A., Federic, V., David, G. & Adrian, R. (2010). Motivating employees of the public sector: Does public service motivation matter? *International Public Management Journal*, 13(3), 213-246.
- Varma, C. (2017). Importance of employee motivation & job satisfaction for organizational performance. *International Journal of Social Science & Interdisciplinary Research*, 6 (2), 10-20

Exploring Anti-Diabetes Potential of Yacon Powder in Elderly Subjects

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Abstract- Yacon is a traditional herb originating from South America, well-positioned as a nutraceutical food product because of the increased presence of dietary fiber (fructooligosaccharide) content in it. The objective of this research is to explore the ameliorative benefit of elevated blood sugar levels in elders. Obese, hypoglycemic elders were selected and divided evenly into two groups (G0 and G1), having 10 subjects. G1 was given 20g of yacon powder twice a day. HbA1c test was performed before initiation and after the termination of the trial. Results obtained (at p-value <0.05) showed that the given dose of yacon powder was statistically significant in reducing the serum glucose levels in the elderly

Index Terms- yacon, fructooligosaccharide, diabetes, herb, functional food, antioxidant, fiber phenolic compound, hyperlipidemia, obesity.

I. INTRODUCTION

Non-communicable diseases (NCDs) are the world's leading cause of morbidity and death. NCDs were responsible for 70.1 percent of worldwide fatalities in 2015. Obesity and overweight are major national issues and emerging diseases across the world. Obesity-related illnesses have been increased as a result of the increased dietary shift such as stroke, dyslipidemia, hypertension, heart disease, diabetes, cancer, and respiratory diseases.¹

Diabetes mellitus also referred as hyperglycemia caused by a defect in action and secretion of insulin or both produced by the pancreas inside the body. It results from reduced responsiveness to insulin by peripheral tissues and reduction in the release of insulin in reaction to normal physiological stimuli.²

It has long been known that persons with metabolic syndrome have a higher chance of developing type 2 diabetes. A diet rich in antioxidants and dietary fiber is exclusively studied for neutralizing free radicals and reducing oxidative stress. Free radicals are responsible for many diseases as these are produced in human bodies in normal physiological conditions and can be of great harm if they are not eliminated and metabolized from the body. Dietary treatments, in addition to pharmacological therapy, have been demonstrated to be useful in preventing or treating insulin sensitivity and hyperglycemia. The recommended intake for dietary fiber is 25-38g/day. In order to combat these issues; herbal medicines are of great interest due to the fact that they are natural, safe, and harmless.³

Yacon (*Smallanthus sonchifolius*) has traditional medicinal properties due to which it is also known as a healing plant, a family of Asteraceae grows in a cluster of 420 large subterranean tubers weighing between 100 and 500g.⁴ Yacon retains glucose in the shape of fructooligosaccharide, unlike other edible roots (FOS). Food containing prebiotic components has been shown to have beneficial effects on energy homeostasis, sensory control, and regulation of metabolic pathways linked to metabolic syndromes, such as diabetes and obesity, in human studies. Long-term yacon syrup use has been developed to increase insulin resistance and body weight loss in premenopausal women.⁵

Yacon has a number of health advantages, including the capacity to control blood sugar levels, enhance lipid metabolism, aid weight reduction, improve liver health, and improve digestive health. Yacon stimulates the Beta pancreatic cells, which increases insulin release, resists hormones that accelerate the amount of glucose release,

maximize the amount and responsiveness of insulin receptors, decrease release glycogen degradation, increases the uptake of glucose by tissue and organs, and reduce intestinal glucose absorption, among other things.⁶ In addition to prebiotics, yacon includes antioxidants, anti-diuretic, anti-diabetic, anti-inflammatory, anti-obesity, antibacterial, and anticancer flavonoids, phenolic acids, and tryptophan. It aids mineral absorption, lowers cholesterol and triglyceride levels, and has hypoglycaemic properties. It aids absorption of nutrients, lowers cholesterol and triglycerides, and has hypoglycaemic properties. The flavonoids in yacon protect biomolecules like Genetic material, fatty acids, and peptides from oxidative stress.⁷

Yacon's regular consumption help in the inhibition of potential pathogens, promotion of useful microbiota, frequent intake of yacon aids in the suppression of possible infections, the development of beneficial microbiota, the enhancement of pathogen susceptibility, and the elimination of gastrointestinal allergens.⁸ In addition, the study investigated the gonadotropins' impact of yacon in the suppression of the testosterone degradation. Yacon has been shown to be a safe treatment for infertility caused by testicular shortage and LOH condition (low testosterone).⁹

Prior studies has shown that yacon administration lowers postprandial serum triglycerides in normal rats without causing toxicity or dietary consequences. Because of its elevated FOS concentration, 10 Yacon powder might be positioned as a nutraceutical product. The study's goal was to look at the health advantages of yacon powder and its tolerance in patients with obesity and diabetes for a period of 8 weeks.

II. MATERIALS AND METHODS

2.1 Collection and preparation of sample

Yacon powder was prepared in the laboratory under normal conditions. To make Yacon powder, the yacon roots were washed, sliced, dried, crushed, and grounded. There were no chemicals required in the production of the experimental product that might influence the biologically active chemical ingredients of Yacon powder. Yacon powder is a unique product made from the grinding of yacon roots (which contain 40-50 percent FOS). Because of its naturally high FOS concentration, yacon roots are ideally positioned as a nutraceutical product. Individual sachets of 20 g of Yacon powder with 8 g of FOS were prepared.

2.2 Subjects

From January 2020 to February 2020, twenty out of total twenty-four elderly subjects completed this study with good compliance. Elderly people with severe chronic diseases such as digestive diseases and those with poor eating habits that might interfere with the evaluation of the research were eliminated. The consort flow diagram is shown in Figure 1. For the study, twenty persons were assessed. Due to illness or personal reasons, four individuals did not finish the examination. The Yacon powder was given to 10 old persons, whereas the usual diet was given to the other ten senior people.

2.3 Human Study Paradigms

The bio-evaluation was carried out to determine the nutraceutical value of yacon powder in the fight against diabetes. Human volunteers were chosen from THQ Hospital Pindi Bhattian before the study began based on their health information, current medicines, and lifestyle habits. The human experiment had two groups who were given 20g of yacon powder twice a day, between meals, for eight weeks. To determine the effect of yacon powder on blood glucose levels in diabetes control and experimental groups, blood samples were taken one day before the trial began and one day after it ended.

2.4 Anthropometric measurements

Trained employees to acquire anthropometric parameters. Using established methodologies, body weight, height, and waist circumference (WC) were measured. Obesity risk was assessed using the body mass index (BMI) and dietary screening. At the start and end of the study, all anthropometric measures were taken.

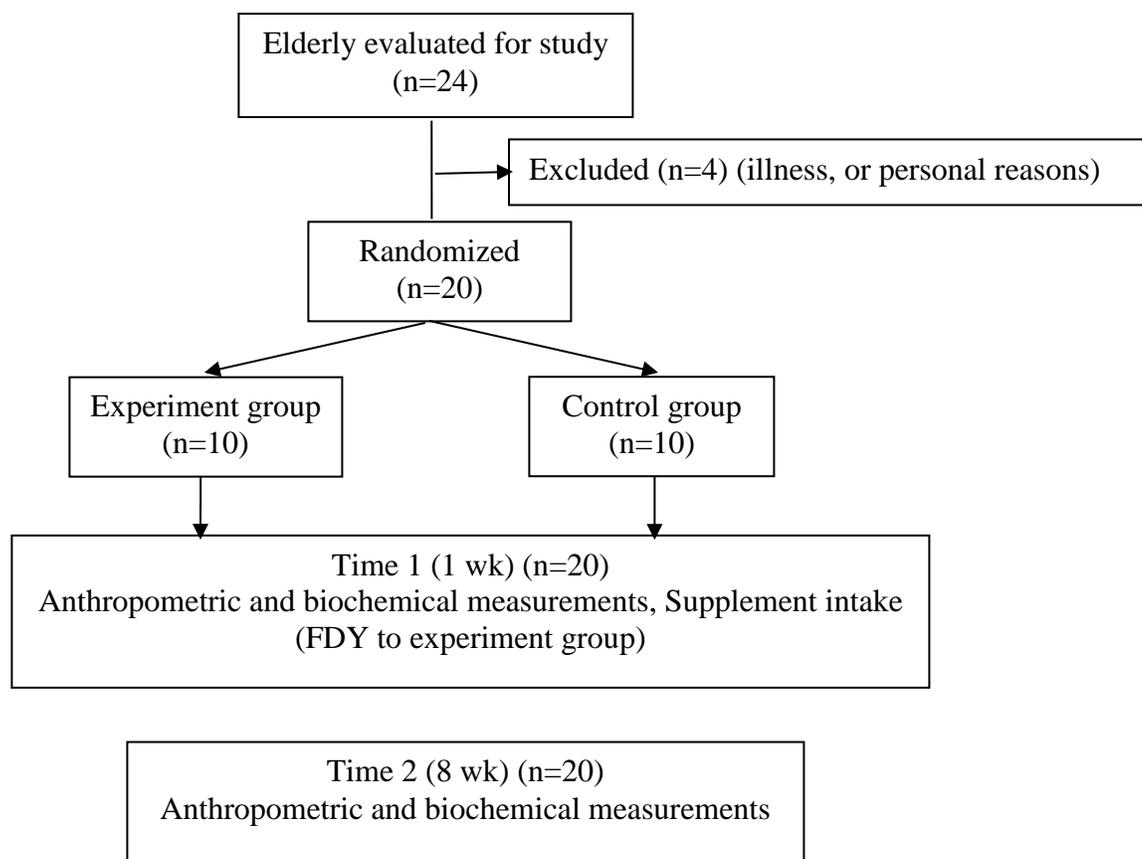
2.5 Blood glucose levels

Fasting (12h) blood samples and HbA1C test was also performed to analyze blood glucose levels in diabetic patient at the beginning and end of trial.

2.6 Statistical analysis

The means and standard deviations were used to describe the descriptive data. Analysis of variance (ANOVA) was performed to compare numeric factors before and after 8 weeks of supplementation to see whether there were any significant alterations. Statistical significance was set at $p < 0.05$.

(Fig. 1)



III. RESULTS

A total of twenty aged people who have diabetes were chosen and equally divided into two groups (Go, G1), each with 10 individuals. G 1 received a 20g dosage of Yacon powder and was able to complete the entire trial without difficulty. The purpose of the current study is to see how yacon powder affects HbA1c levels in elderly people. The association impact of research durations and treatment doses on Hba1c and fasting blood glucose level is explained as shown in Table 1. Long-term yacon powder use resulted in a considerable decrease in body weight, as well as a significant reduction in waist circumference (Table 2). The treated group's BMI, which is a measure of total body fat, also showed a significant reduction. The control group did not show any of these impacts. Daily bowel motions, no painless defecation, no stomach discomfort, no aid for elimination, and effective evacuation attempts per 24 hours were reported by all yacon supplemented subjects. Subjects did not experience any side effects such as indigestion or gas.

Table 1. Mean values of Hba1c, Fbs by different treatments levels and after different study periods

Study period	Experimental		Control	
	Baseline	8 weeks	Baseline	8 weeks
Hba1c	10.21±0.25 a	8.09±0.30ab	8.06±0.24 c	8.40±0.37 b
Fbs	196.40±0.20 a	138.31±0.45 c	178.60±0.17 b	179.10±0.27

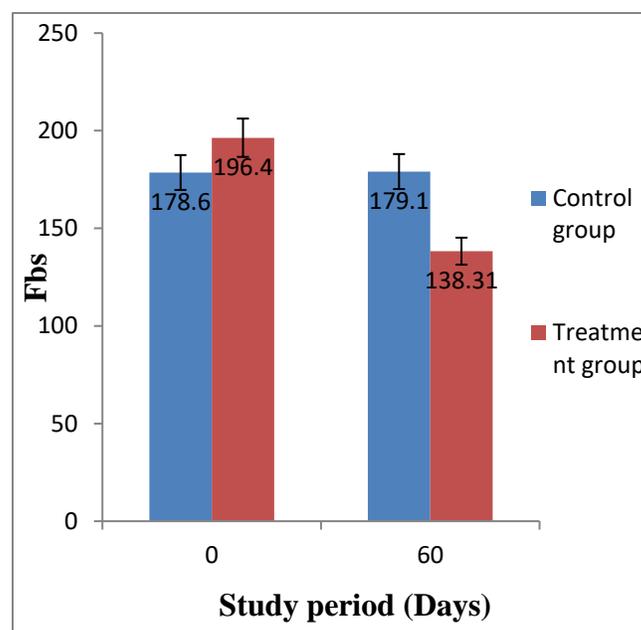
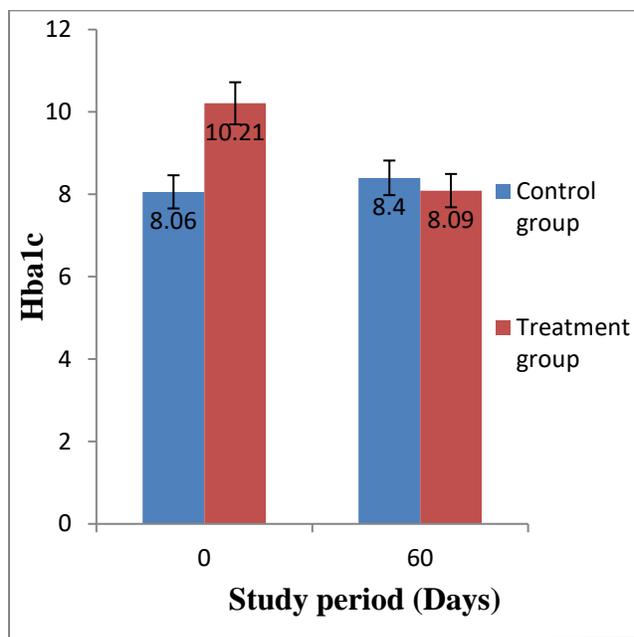


Table 2. Means values of weight loss (Kg) by different treatments levels and after different study periods against (Interaction effect)

Study period (Days)	Experimental groups	
	Control group	Treatment group
0	75.40±2.32 b	85.60±2.80 a
60	81.50±1.37 ab	73.80±0.30 b

The interaction effect was least effective at the shortest storage period (0 days), with a patient's mean initial weight of 85.60kg compared to 73.80kg after a study period of 60days in the treatment group. In the control group, however, the mean weight increased from 75.40 (kg) to 81.50kg. Overall, the treatment group was shown to be more successful than the control group.

IV. DISCUSSION

The current investigation found that daily supplementation with yacon powder containing 8g FOS is sufficient to lower blood glucose levels in the elderly while causing minimal digestive pain. Our findings demonstrate that an 8g FOS daily consumption amount may be handled without side effects.

Yacon is a stemmed plant that has been utilized as a main meal by the Andean people from ancient times and has subsequently migrated to Europe, the United States, and Japan. Yacon is high in FOS, which are called prebiotics because they encourage the formation of the colonic microbiota, improve some biological activities, and improve appetite and gastrointestinal function when

consumed daily. Yacon and manufactured yacon products tend to provide health advantages, are well accepted, and do not cause gastrointestinal problems when consumed.¹¹

Freeze-dried yacon powder is a unique product made by freeze-drying tuberous fresh yacon stems that yield around 41% FOS. It's useful, as well as simple to use and store. Nutritional FOS has been demonstrated to lower weight, insulin, and cholesterol blood concentrations¹². Another research looked at the impact of yacon on clinical indicators in diabetic patients. For 30 days, an aqueous extract of yacon tuberous roots (YRAE; 0.76g fructan/kg body weight) was produced and administered at seven-day intervals. In diabetic rats, the extract showed yacon lowered glycemia, lipid profile, VLDL-c, and LDL-c (p0.05) (YRAE).¹³ A longitudinal study showed that 0.14g FOS yacon syrup has a longer effect on lowering blood insulin, increasing evacuation frequency, and improving fullness.⁵

Yacon granules are a soluble fiber-rich product that would be a nice addition to the list of prebiotic foods. Because of its probable natural bifidogenic activity, it aids in the growth of colonic microbiota. It has been recommended to lower glycemia because it ferments in the colon and creates substantial levels of SCFAs. 14 Another investigation found that yacon has hypoglycemic action in diabetic patients after a lengthy time of dosing.¹⁵

The goal of this animal study was to see if yacon leaves might help diabetic rats who had been given streptozotocin. In diabetic rats, a 10% water decoction of Yacon leaves (70mg dry extract/kg body weight) effectively lowers diabetes and increases insulin production. 10 Yacon roots containing FOS are also beneficial in treating colon cancer, lowering glycemic levels, body mass, and body lipids, according to the study.¹⁶ A diet high in yacon FOS stimulated the proliferation of bifido bacteria and lactobacilli, resulting in high amounts of short chain fatty acids (SCFAs) in the cecal material and increased cell density, both of which are signs of improved colorectal health.¹⁷ Nephrotoxicity, urinary irritation, hepatitis, hypertension, nephritis, and urinary stones were all found to have a protective impact in this study, as well as an increase in urine output. It has been used as a food additive and flavoring agent in some areas of the world.¹⁸

In summary, in the study group, a daily supplement dose of 8 g of FOS in yacon powder for 8 weeks was related to a reduction in mean blood glucose. Furthermore, the yacon powder dosage did not result in bloating, gas, or digestive discomfort. FOS and insulin, like dietary fiber, may affect the physiology of the colon by boosting bowel movements, decreasing intestinal transit time, and enhancing water retention in stools (similar to the osmotic action of laxatives). These benefits, when combined, can help regulate and minimize the risk of constipation. Yacon is a natural substance that is high in FOS and may be classified as a prebiotic. The current findings show that it has a positive impact on blood sugar in the elderly. Our findings support further research into the composition of the chemicals that cause the effect and the precise mode of action of yacon powder.

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CONFLICTS OF INTEREST AND SOURCES OF FUNDING

The author has declared that he or she has no substantial financial interest in any of the commercial firms mentioned in this article.

REFERENCES

- [1] Damian, D. J., Kimaro, K., Mselle, G., Kaaya, R., & Lyaruu, I. (2017). Prevalence of overweight and obesity among type 2 diabetic patients attending diabetes clinics in northern Tanzania. *BMC Research Notes*, 10(1).
- [2] Asmat, U., Abad, K., & Ismail, K. (2016). Diabetes mellitus and oxidative stress—A concise review. *Saudi Pharmaceutical Journal*, 24(5), 547–553.
- [3] McRae, M. P. (2018). Dietary Fiber Intake and Type 2 Diabetes Mellitus: An Umbrella Review of Meta-analyses. *Journal of Chiropractic Medicine*, 17(1), 44–53.
- [4] Satoh, H., Audrey Nguyen, M. T., Kudoh, A., & Watanabe, T. (2013). Yacon diet (*Smilaxnthus sonchifolius*, Asteraceae) improves hepatic insulin resistance via reducing Trb3 expression in Zucker fa/fa rats. *Nutrition & Diabetes*, 3, e70.
- [5] Genta, S., Cabrera, W., Habib, N., Pons, J., Carillo, I. M., Grau, A. & Sanchez, S. 2009. Yacon syrup: beneficial effects on obesity and insulin resistance in humans. *Clinical nutrition*, 28, 182-187.
- [6] Scheid, M. M. A., Genaro, P. S., Moreno, Y. M. F., & Pastore, G. M. (2014). Freeze-dried powdered yacon: effects of FOS on serum glucose, lipids and intestinal transit in the elderly. *European Journal of Nutrition*, 53, 1457–1464.
- [7] Caetano, B., de Moura, N., Almeida, A., Dias, M., Sivieri, K., & Barbisan, L. (2016). Yacon (*Smilaxnthus sonchifolius*) as a Food Supplement: Health-Promoting Benefits of Fructooligosaccharides. *Nutrients*, 8, 436.
- [8] Kellow, N. J., Coughlan, M. T., & Reid, C. M. (2013). Metabolic benefits of dietary prebiotics in human subjects: a systematic review of randomised controlled trials. *British Journal of Nutrition*, 111(07), 1147–1161.
- [9] Park, J. S., & Han, K. (2013). The Spermatogenic Effect of Yacon Extract and Its Constituents and Their Inhibition Effect of Testosterone Metabolism. *Biomolecules and Therapeutics*, 21, 153–160.
- [10] Honore, S. M., Grande, M. V., Gomez Rojas, J., & Sanchez, S. S. (2018). *Smilaxnthus sonchifolius* (Yacon) Flour Improves Visceral Adiposity and Metabolic Parameters in High-Fat-Diet-Fed Rats. *Journal of Obesity*, 2018, 1–15.
- [11] Choque Delgado, G. T., da Silva Cunha Tamashiro, W. M., Maróstica Junior, M. R., & Pastore, G. M. (2013). Yacon (*Smilaxnthus sonchifolius*): A Functional Food. *Plant Foods for Human Nutrition*, 68(3), 222–228.

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<http://dx.doi.org/10.29322/IJSRP.12.05.2022.p12517>

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- [12] Habib, N. C., Honore, S. M., Genta, S. B., & Sanchez, S. S. (2011). Hypolipidemic effect of *Smalanthus sonchifolius* (yacon) roots on diabetic rats: Biochemical approach. *Chemico-Biological Interactions*, 194, 31–39.
- [13] Oliveira, G. O., Braga, C. P., & Fernandes, A. A. H. (2013). Improvement of biochemical parameters in type 1 diabetic rats after the roots aqueous extract of yacon [*Smalanthus sonchifolius* (Poepp. & Endl.)] treatment. *Food and Chemical Toxicology*, 59, 256–260.
- [14] Neyrinck, A. M., & Delzenne, N. M. (2010). Potential interest of gut microbial changes induced by non-digestible carbohydrates of wheat in the management of obesity and related disorders. *Current Opinion in Clinical Nutrition and Metabolic Care*, 13(6), 722–728.
- [15] Kim, I.-S., Lee, J., Lee, J.-S., Shin, D.-Y., Kim, M.-J. & Lee, M.-K. (2010). Effect of fermented yacon (*Smalanthus sonchifolius*) leaves tea on blood glucose levels and glucose metabolism in high-fat diet and streptozotocin-induced type 2 diabetic mice. *Korean Journal of Nutrition*, 43,333-341.
- [16] Caetano, B., de Moura, N., Almeida, A., Dias, M., Sivieri, K., & Barbisan, L. (2016). Yacon (*Smalanthus sonchifolius*) as a Food Supplement: Health-Promoting Benefits of Fructooligosaccharide. *Nutrients*, 8, 436.
- [17] Campos, D., Betalleluz-Pallardel, I., Chirinos, R., Aguilar-Galvez, A., Noratto, G., & Pedreschi, R. (2012). Prebiotic effects of yacon (*Smalanthus sonchifolius* Poepp. & Endl), a source of fructooligosaccharide and phenolic compounds with antioxidant activity. *Food Chemistry*, 135, 1592–1599.
- [18] Wang, S., Nie, S., & Zhu, F. (2016). Chemical constituents and health effects of sweet potato. *Food Research International*, 89, 90–116.
- [19] Miyaguchi, Y., Tomatsuri, T., Toyoda, A., Inoue, E., & Ogawa, Y. (2015). Effect of Yacon Tuber (*Smalanthus sonchifolius*)-derived Fructooligosaccharide on the Intestinal Flora and Immune System of OVA-sensitized BALB/c Mice. *Food Science and Technology Research*, 21, 255–262.
- [20] Sugahara, S., Ueda, Y., Fukuhara, K., Kamamuta, Y., Matsuda, Y., Murata, T., Yasuda, S. (2015). Antioxidant Effects of Herbal Tea Leaves from Yacon (*Smalanthus sonchifolius*) on Multiple Free Radical and Reducing Power Assays, Especially on Different Superoxide Anion Radical Generation Systems. *Journal of Food Science*, 80, C2420–C2429.

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Effect of heat and solar radiation on photovoltaic cells

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Abstract- Most of us think that sunlight falling on panels or solar cells when they are stronger and hotter will increase the electrical energy that these panels generate. The temperature and solar radiation falling on the ground are among the most important factors that affect the amount of electrical energy we get from solar cells. Although temperature does not affect the amount of sunlight a photovoltaic cell receives, it does affect the amount of energy produced. Solar cells are made of semiconductor materials such as crystalline silicon, which are the most commonly used in the manufacture of these panels. The paper aims to study the availability of solar radiation in the city of Tajoura for three months, and the effect of temperature on solar cells and their efficiency.

Index Terms- Electrical,Energy,Radiation,Panel,Soral.

I. INTRODUCTION

Human is always looking for new sources of energy to cover their increasing needs in life applications in the developed environment in which we live, and the disadvantage of many energy sources is their depletion and the high cost of exploitation, and the negative impact of their use on the environment, and man has alerted in the modern era to the possibility of benefiting from the sun's rays, which is characterized as renewable and permanent energy that is inexhaustible, he was well aware of the great danger posed by the use of other and common sources of energy (especially oil and natural gas) contribute to environmental pollution and destruction, making solar energy the best option. That is why solar energy has become in our time a national income for some countries even in the Arab Gulf countries[1], which are considered one of the most oil-rich countries in the world, Solar energy mainly and effectively Solar energy has been used to generate electricity in many applications, including power plants electricity and water desalination, operation of traffic lights and street lighting, and operation of some devices Electrical devices such as watches, calculators, and satellite and vehicle operation and space stations. The sun is the main source of the Earth's energy and has great importance, from it we derive warmth despite the reflections, scattering, and absorption of solar radiation before it reaches the Earth through the Earth's atmosphere, so almost all ultraviolet rays disappear and a certain part of the infrared rays disappear, but the solar energy that It reaches the Earth within one year, exceeding the world's energy needs by ten thousand times [2].

II. FUTURE OF RENEWABLE ENERGY IN LIBYA

Libya is located in the center of North Africa in the high sunny belt. It has a long beach on the Mediterranean Sea of about 1900 km, with an area of 1,750,000 km², and a population of 6,700,000, most of whom live in the Sahel region and 88% of the area of Libya is desert. The daily average of solar radiation on a horizontal plane is 7.1 kWh/day in the coastal region, and 8.1kwh/m²/day in the southern region, with an average sun duration of more than 3500 hours per year [3].

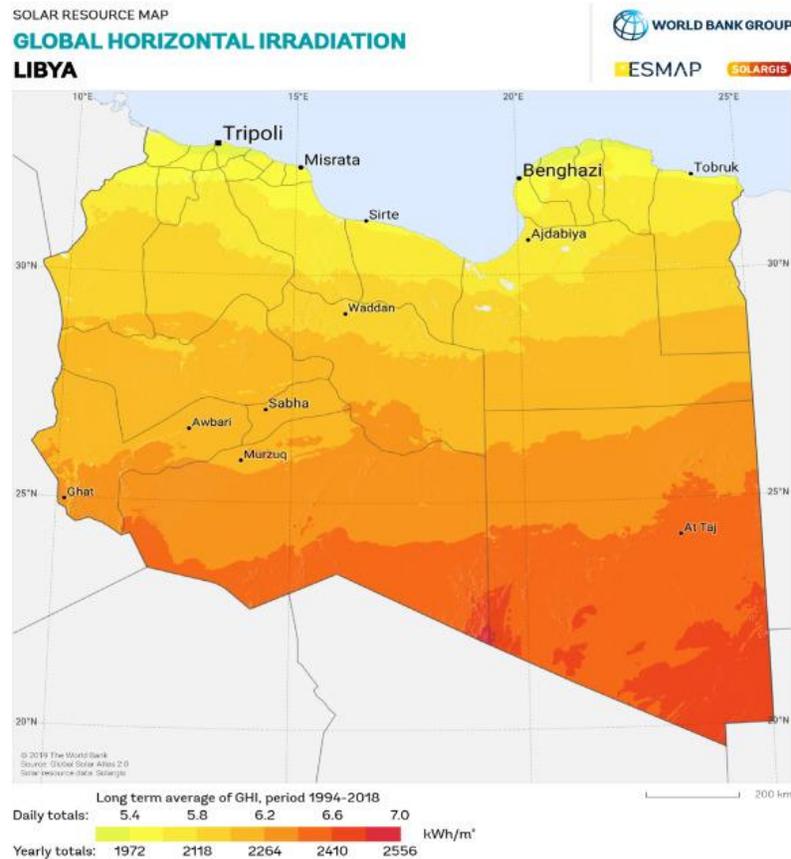


Figure 1: Libya's map of horizontal Irradiation

However, solar energy has not been utilized to meet the country’s energy needs. The total installed capacity of electricity in Libya is entirely dependent on fossil fuels, as it consumes about 20% of oil production, which reached one million barrels in 2021. However, domestic demand for the electricity supply exceeds the expansion in capacity, which leads to increased power outages. Electricity production in Libya is about 5,000 megawatts, while the electricity deficit is 2,000 megawatts. In 2019[4], about 68.5% of the population of Libya had access to electricity, down from 100% in 2000, according to estimates by the World Bank. Libya is working to diversify its energy mix and harness the country's potential from solar and wind energy, as it aims for 22% to come from Generating electricity from renewable energy by 2030. Shortly, it is possible to benefit from solar energy by making a project that will make Libya one of the largest exporters of electric energy produced from solar energy to Europe and transfer it through submarine cables and then distribute it to all parts of Europe and thus contribute to reducing carbon dioxide emissions.

III. METHODOLOGY, AND RESULTS.

The study was conducted in the city of Tajoura, which lies east of the Libyan capital, Tripoli, 21 km from the center of Tripoli.[5] This paper used a set of research methods represented in fieldwork and data collection for the rate of solar radiation in this city for three months May, June, and July. Interviews were conducted with experts and engineers working in the field of solar energy.

IV. SOLAR RADIATION IN THE CITY OF TAJOURA

Solar radiation is defined as the amount of solar radiation falling on a certain area and capable of generating electrical power. It only affects the earth about one part in two thousand million parts of the sun’s rays, which is estimated at 130 megawatts /m² of the surface of the sun, and this small amount is responsible for all thermal energy on Earth's surface and atmosphere [6]. A set of data was collected through the readings of the climate data station at the solar power station at Tajoura Research Center during the period from 1st May to 31 of July, From 8:00 a.m. to 7:00 p.m. [7] as shown in the following table

Average time of May	Average of DNI w/m ²
8:00 AM	507
9:00 AM	668
10:00 AM	778
11:00 AM	800
12:00 PM	814
1:00 PM	820
2:00 PM	744
3:00 PM	735
4:00 PM	637
5:00 PM	509
6:00 PM	439
7:00 PM	222

Table (1): Monthly average of solar radiation in May

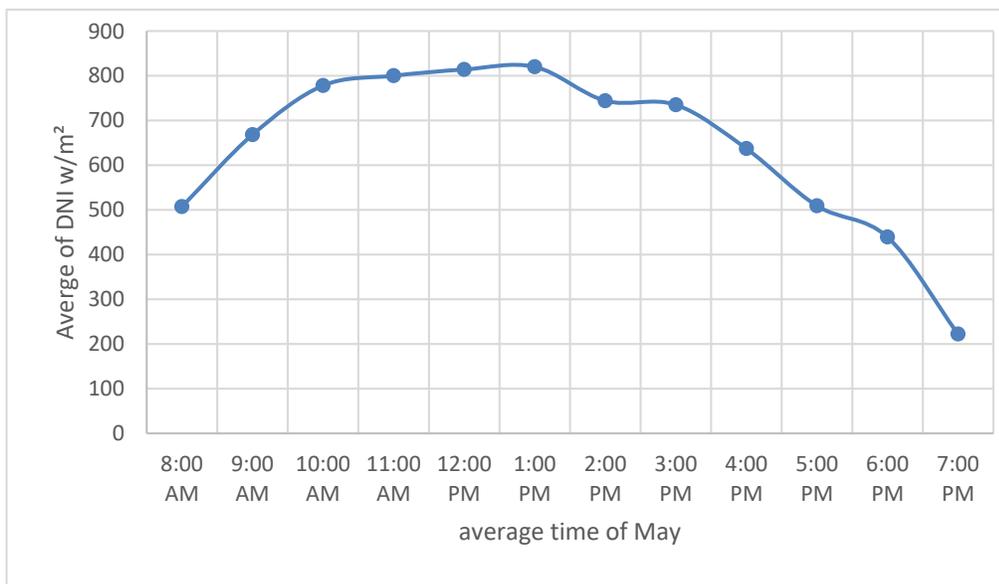


Figure (2) Average solar radiation for May

Figure (2),(3), and(4) shows the relationship between the average daily time for three months May, Jun, and July which starts from 8:00 am until 7:00p.m, and the intensity of direct solar radiation(DNI), where we note that the intensity of solar radiation begins to increase from 8:00 a.m after sunrise and reaches its peak at 1:00 p.m and then begins to decline after 2:00 pm, and the radiation decreases after this hour until it reaches its lowest level at 7:00 p.m We note from the data we obtained that the maximum value of radiation was in June, reaching 875 watts/m².

Average time of Jun	Average of DNI w/m ²
8:00 AM	658
9:00 AM	769
10:00 AM	826
11:00 AM	812
12:00 PM	825
1:00 PM	875
2:00 PM	863
3:00 PM	841
4:00 PM	703
5:00 PM	630
6:00 PM	577
7:00 PM	404

Table (2): Monthly average of solar radiation in Jun

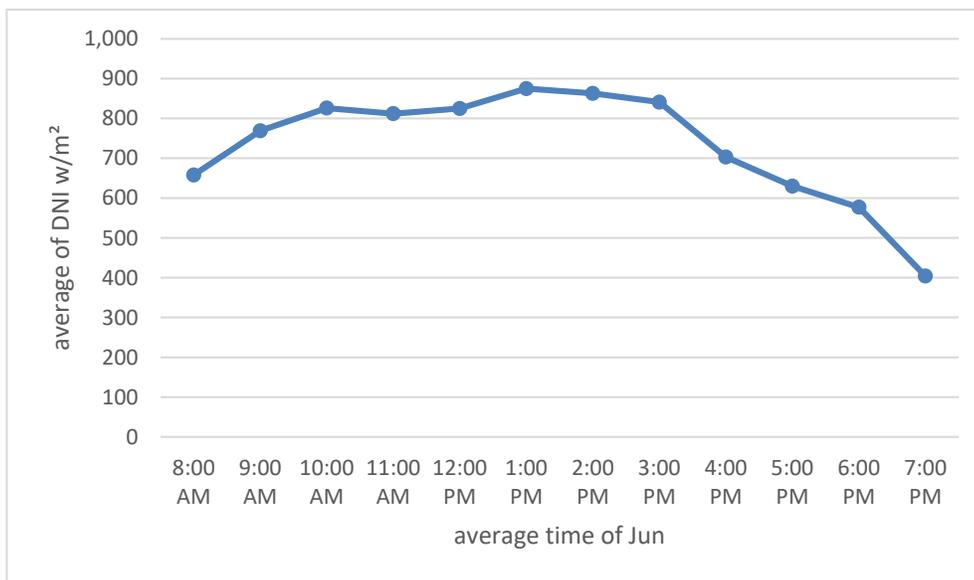


Figure (3) Average solar radiation for Jun

Averag of July	Average of DNI w/m ²
8:00 AM	518
9:00 AM	635
10:00 AM	731
11:00 AM	742
12:00 PM	778
1:00 PM	817
2:00 PM	828
3:00 PM	827
4:00 PM	789
5:00 PM	710
6:00 PM	585
7:00 PM	407

Table (3): Monthly average of solar radiation in July

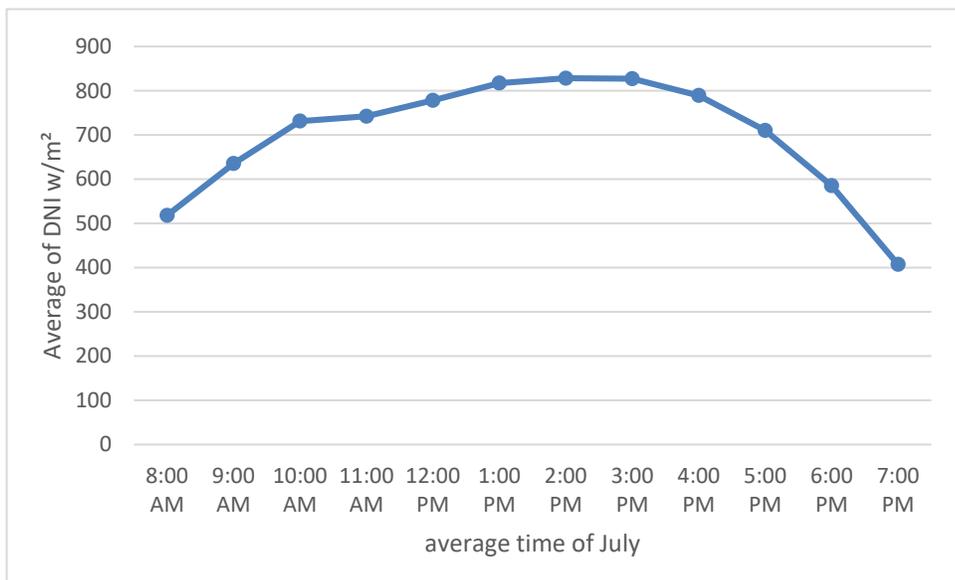


Figure (4) Average solar radiation for July

Figure (2),(3), and(4) shows the relationship between the average daily time for three months May, Jun, and July which starts from 8:00 am until 7:00p.m, and the intensity of direct solar radiation(DNI), where we note that the intensity of solar radiation begins to increase from 8:00 a.m after sunrise and reaches its peak at 1:00 p.m and then begins to decline after 2:00 pm, and the radiation decreases after this hour until it reaches its lowest level at 7:00 p.m We note from the data we obtained that the maximum value of radiation was in June, reaching 875 watts/m².

V. THE EFFECT OF HEAT ON SOLAR CELLS

Solar cells produce electricity from sunlight, not the heat generated by it. Solar panels are negatively affected by high temperatures, contrary to what some expect. And you may be surprised when you know that all satellites operate with high efficiency with solar energy, even though the temperature in space is 10°C[8], with permanent solar brightness and a complete absence of clouds and rain. If you look at the datasheet provided by the cell manufacturer there is a paragraph called pMax temperature parameter. This value is given in the form of a negative percentage and reveals the effect of heat on cells Panels are tested at 25°C pMax is the change in efficiency down or up when the change in cell temperature is one degree Celsius. For example, if the pMax is -0.5%, and the cell temperature is 35, this means that the solar panel is less efficient by 5% when the cell temperature is 35.It is noted here that pMax depends on the cell temperature and not the air temperature. We always find that the cell temperature is higher than the air temperature as a result of the

cell's exposure to direct sunlight, and the program here has already taken into account this element and calculated the loss or addition in the productivity of the panel based on the cell temperature and not the air temperature.

Steps for calculating cell temperature:

The Homer equation is used to calculate the cell temperature[9]

1- Solar radiation is calculated in kilowatts per square meter at noon:

The equation of the ellipse plane = daily solar radiation x 4 / number of hours per day x 3.14

For example, if the average daily radiation = 660watts /m²

The number of hours of the day from sunrise to sunset = 12.5hours.

Radiation through the noon = $0.66 \times 4 / 12.5 \times 3.14 = 0.663 \text{ kWh/m}^2$

2- To get the cell temperature we have to calculate two variables from 2 equations .."A" and "B

$A = (\text{NOCT} - 20) / 0.8$

where NOCT is a constant value present in the cell specification[10].

If we have NOCT = 45

$A = (45 - 20) / 0.80 = 31.25$

where 20 is the ambient temperature.

0.8the amount of solar radiation to which the cell is exposed.

$B = 1 - \text{cell efficiency}/0.9$

Where cell efficiency It is the efficiency of the cell and its value is in the specifications

Example: cell efficiency = 17%

$B = 1 - (0.017/0.90) = 0.81111$

Solar cell temperature = Ambient temperature + Solar radiation at Midday x A x B

Example: Air temperature = 40°C

Solar cell temperature = $40 + 0.663 \times 0.811 \times 31.25 = 56.8^\circ\text{C}$

Calculating the loss due to the increase in cell temperature:

Calculation of ΔT is the difference between the cell temperature and the temperature of 25°C the cell temperature under [standard test conditions](#)

$\Delta T = \text{cell temperature} - 25$

Example: cell temperature = 56.8°C

$\Delta T = 56.8^\circ\text{C} - 25 = 31.8^\circ\text{C}$

The lost = $\Delta T \times p_{\text{Max}}$

$p_{\text{Max}} = -0.4\%$ (this is a fixed number written on the back of the solar pane).

The lost = $31.8 \times 0.4 = 12.72 \%$

We conclude from the previous equations that the power generated by solar cells is affected by the temperature of the cell. If the cell temperature increases, the efficiency decreases.

VI. CONCLUSION

Libya is characterized by high solar radiation throughout the year, with average solar radiation ranging from 3000 to 3500 hours per year. Solar energy technology in Libya is still very low, although Libya's location is considered optimal for the exploitation of this energy and makes it a great source of oil and gas. The solar radiation was studied in the city of Tajoura for a pe three months, and the results showed that this city enjoys high solar radiation, especially in the afternoon, where the average radiation was about 870 watts The effect of temperature on the efficiency of the solar cell was also studied, and the results showed that the power generated by the solar cells is affected by the increase in the temperature of the solar cell If the cell temperature increases, the generating capacity of the cells decreases, and this depends on the cell temperature coefficient written on the back of the cell p_{Max} .

REFERENCES

- [1] Lamia Al-Qallab, "The UAE aims to produce 24% of its electricity needs from clean sources" Ministry of Energy, United Arab Emirates, July 27, 2014. Website: <http://www.zawya.com/ar/story/ZAWYA20140727192313/>
- [2] Mahfouz M and Muhammed Bin Saleem 1996, Solar Radiation Journal of Science and Technology, Issue 34
- [3] NASA Atmospheric Science Data Centre, NASA Surface Meteorology and Solar Energy: Available from: <http://eosweb.larc.nasa.gov/>, Last Accessed 5th March 2013.
- [4] General Electric Company Of Libya GECOL, Annual Report 2019.
- [5] "Shabiyat of Great Jamahiria" General People's Committee of Libya accessed 5 September 2009.
- [6] Antonio Luque, & Steven Hegedus, "Handbook of Photovoltaic Science and Engineering", John Wiley & Sons Ltd, (2003). https://ara.timgenie.com/latitude_longitude/country/ly
- [7] The climatic data station at the solar research center in Tajoura city during 1st of May to 31 of July 2020.
- [8] A Day in the life aboard the International Space Station / NASA <http://www.nasa.gov/au>

- [9] Duffie JA, Beckman WA (1991), Solar Engineering of Thermal Processes 2nd edition, Wiley, New York, NY
[10] PV normal operating cell temperature Homer pro 3.11

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Machine Learning Approach in Stock Market Prediction: A Case of Colombo Stock Exchange

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Abstract- The profitability of the stock market investment depends on the investor's decisions and is based on a mix of dynamic environmental factors. Stock price trends are repeatedly forecasted to extract useful patterns and predict their movements. There are different approaches to stock price prediction and different forecasting methods are used by stock market analysts. As a replica of many scientific endeavors, several methods have been found to accurately predict stock prices. Most researchers have been used technical analysis to get more accurate results, while limited researchers used fundamental analysis. However, there is no evidence that compares these two analyzes. Ceylon Tobacco Company PLC, Dialog Axiata PLC, and John Keells Holdings PLC were selected as the sample for this study by employing a simple random sampling method and market capitalization. The technical analysis was performed using five different classifiers and the results were evaluated using the mean absolute error (MAE), root mean square error (RMSE), relative absolute error (RAE), and root-relative square error (RRSE). Sequential Minimum Optimization regression (SMOreg) has yielded more accurate results. The fundamental analysis was conducted by employing natural language processing mechanisms and the Random Trees classifier presented the best results. The outcome of this study shows that a comprehensive model can be built with a combination of technical and fundamental analysis. The findings facilitate to predict the share price of the Colombo Stock Exchange using machine learning techniques. This model was able to predict the stock price with 65% accuracy and would benefit all individual investors in the local stock market.

Index Terms- Colombo Stock Exchange, Fundamental Analysis, Machine Learning, Random Trees, Sequential Minimum Optimization, Stock Price Prediction, Technical Analysis.

I. INTRODUCTION

The Colombo Stock Exchange (CSE) is the leading stock exchange in Sri Lanka that offers investors buy and sell shares. It is one of the major exchanges providing an e-commerce platform in South Asia [1]. The stock market is the bone of fast-emerging economies like Sri Lanka. Therefore, the growth of our country is strongly associated with the performance of the Colombo Stock Exchange. Most of the investors and brokers nowadays use intelligent trading systems that help them to predict stock prices based on various situations and conditions, thereby helping them in making direct investment decisions. Many researchers believe that fundamental analysis is only good in the long term. However, it is not suitable for the medium to short term. Some other researchers used technical analysis, and they suppose history repeats itself. Similarly, there is a paucity of research on stock price forecasting using machine learning in the context of Sri Lanka. Therefore, it is important to research to measure the variance between the results of fundamental and technical analysis of stock price forecasting using machine learning in the context of Sri Lanka.

II. LITERATURE REVIEW

Predicting stock price volatility is a difficult task, as price movements are randomly walked and change over time. Since the last decade, stockbrokers and prospects have relied on a variety of intelligent systems to make trading decisions. Machine learning methods for stock price predictions are becoming popular. Through various experiments, it is possible to test machine-learning techniques and select the most suitable one for predicting stock prices[2].

One area of limited success in stock market forecasting is the use of text data and news articles for price forecasts. Chan, Chui, & Kwok [3], confirm the response to news articles. They have shown that economic news always has a positive or negative impact on the number of shares traded. In their research, Nagar & Hahsler[4] proposed an automated text-based approach to gathering news from various sources and forming a news corporation. Corpus is filtered into relevant sentences and analyzed using natural language processing (NLP) techniques.

This research paper [5] studies how the results of financial forecasting can be improved when multiple levels of relevant news articles are used simultaneously for the target stock. They used multi-kernel learning methods to segment information extracted from five different news categories based on sectors, sub-sectors, industries, and so on.

On the other hand, Technical Analysis is used for price forecasting using historical stock prices such as open price, high price, low price, close price and volume. Many researchers have had successful results. In addition, many researchers have used this method rather than the Fundamental Analysis. However, this analysis is not suitable for long-term prediction.

The TA ultimately relies on human interpretation and, due to its subjective nature, technicians can often predict the same data and explain it in BE theory. While TA is generally a controversial target for scientific statements, some studies support it [6], [7], [8], others point out that less predictive problems are Ability to do Power [9] and [10].

Recently, data mining techniques and artificial intelligence (AI) systems such as decision trees and artificial neural networks (ANN) have been applied to this area [11]. Stock market data mining has been used to forecast trends and prices to achieve maximum profits [12]. Data mining techniques have been successfully shown to generate high predictive accuracy of the stock price movement [13].

III. GENERAL FRAMEWORK

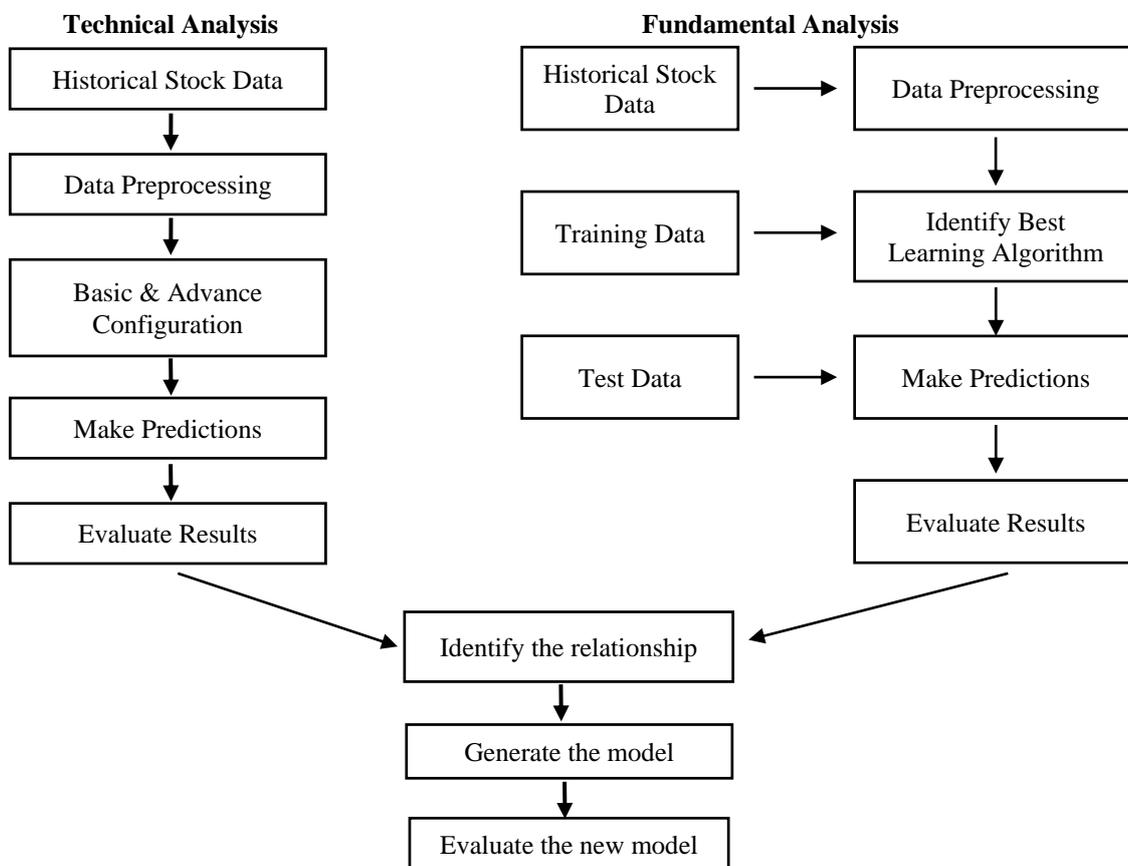


Fig1 General Framework

A. Technical analysis

Step 01: Historical Stock Data

Data collection is a very basic module and is the starting point of a project. It usually deals with gathering the right data set. Historical data on Open, Close, High, Low and Volume share prices have been collected by the researcher at the Colombo Stock Exchange. Each attribute has its own value and time. All values are numeric values.

Step 02: Data Preprocessing

Data processing can measure data quality in terms of accuracy, completeness, consistency, timeliness, reliability, and interpretation. Data preprocessing consists of data cleaning, data integration, data transformation, and data reduction.

Step 03: Basic & Advance Configuration

Researcher used the WEKA "Forecast" tab to predict closing price. The version 3.7.3 and above WEKA has a dedicated time series environment.

This environment can be used for developing, visualizing and evaluating forecasting models.

Step 04: Make Predictions

After basic and advanced configuration, the close price can be predicted. Other properties, such as open, high, or low price, and volume can be predicted if needed. Figure 3.8 shows the sample prediction.

Step 5: Evaluate Results

The accuracy of the model can be estimated by comparing the actual results with the predicted results. Similarly, the Mean Absolute Error (MAE), the Root Mean Square Error (RMSE), the Relative Absolute Error (RAE), and the Root-Relative Square Error (RRSE) can be evaluated and select the most relevant classification.

B. Fundamental analysis

Step 01: Historical Stock Data

Data in fundamental analysis both qualitative and quantitative data such as financial statements, newspaper articles, and announcements. In this research, only announcements published by the cse.lk website was considered. The total data for the past five years is collected.

Step 02: Data Preprocessing

Most of the data collected in cse.lk are scanned files and some are text files. Text files (.txt) can be directly converted to ARFF files. However, the scanned files (.pdf) cannot be converted to ARFF. Scanned files must first be converted to txt files and converted to ARFF files.

Step 03: Learning Algorithm (Learn Rules)

This is about the first step, called training data. It is assumed that each tuple/sample belongs to a predefined class as determined by the class label attribute. In the fundamental analysis, the class attribute was the "Negative", "Positive" or "Not Change". The model is represented as a classification rule, decision trees, or mathematical formulas. For the training data, the researcher used a classify tab of WEKA.

Step 04: Make Predictions

There are two steps to the classification process. The first is to build a classification model using training data. Second, the model generated in the previous step is tested using the test dataset. This step discusses how to predict values using the model. It assesses the accuracy of the model. The known label of the test sample is compared with the classification result of the model.

Step 5: Evaluate Results

The accuracy of the model can be estimated by comparing the actual results with the predicted results. Similarly, the Accuracy, Precision, Recall, F-Measure and ROC Area can be evaluated and select the most relevant classification.

IV. DATA ANALYSIS & PRESENTATION

A. Technical analysis

In processing the data, the researcher considered JKH, CTC and, DIAL daily data for five years. Minimum price, maximum price, mean, standard deviation, distinct and unique percentage were found. Table 1 and Figure 3 show Statistical values of CTC.

Analysis of results

The table 2 shows the comparison between the predicted results using linear regression and the actual results. The difference is expressed as a percentage and is the minimum. To compare the accuracy of the results predicted by the researcher, the actual price considered for 10 days in January 2020. The predicted values shown in four decimal places. However, the stock market considers only at one decimal place. For an example, 2.10, 2.20, 2.30 ..., etc. Therefore, the predicted values rounded to one decimal place.

The table 3 shows that the SMO regression classifier enables the prediction of share prices more accurately than other classifiers.

Table 2 Statistical Value of CTC

Attributes	Min	Max	Mean	Std Dev	Distinct	Unique (100%)
Open	800.2	1496.7	1064.204	168.745	434	24
High	808.0	1500.0	1069.663	168.859	395	21
Low	797.0	1500.0	1057.069	167.274	388	20
Close	800.2	1496.7	1063.622	168.113	481	27

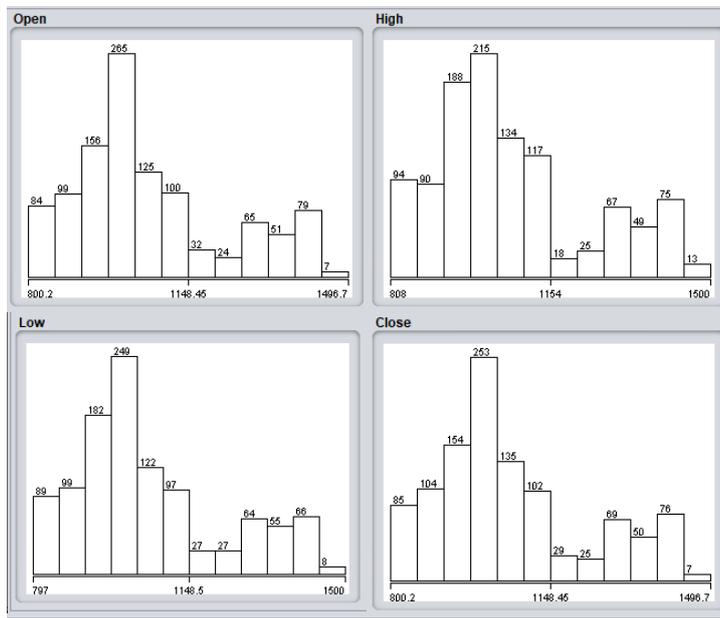


Fig 2 Statistical Value of CTC

Table 2 Comparison Forecast Values and Actual Values

Linear Regression – CTC												
Day	Forecast				Actual				Difference in Percentage			
	Open	High	Low	Close	Open	High	Low	Close	Open	High	Low	Close
1	1110.60	1110.60	1099.20	1096.10	1110.00	1120.00	1100.00	1100.00	0.05	-0.84	-0.07	-0.35
2	1099.90	1106.40	1082.10	1096.80	1110.00	1120.00	1095.00	1095.00	-0.91	-1.21	-1.18	0.16
3	1099.60	1110.40	1097.20	1097.90	1095.00	1095.00	1093.00	1095.00	0.42	1.41	0.38	0.26
4	1105.00	1111.10	1093.60	1091.80	1100.00	1100.00	1095.00	1099.80	0.45	1.01	-0.13	-0.73
5	1103.00	1107.30	1081.00	1085.70	1096.00	1096.00	1091.00	1095.00	0.64	1.03	-0.92	-0.85
6	1096.70	1100.60	1089.70	1088.30	1090.10	1100.00	1085.00	1100.00	0.61	0.05	0.43	-1.06
7	1100.20	1109.00	1089.00	1088.70	1080.00	1139.90	1080.00	1100.00	1.87	-2.71	0.83	-1.03

8	1094.50	1100.70	1083.00	1082.00	1090.00	1090.00	1070.20	1079.90	0.41	0.98	1.20	0.19
9	1089.20	1097.70	1078.20	1079.50	1070.20	1090.00	1070.00	1070.10	1.78	0.71	0.77	0.88
10	1089.10	1096.30	1075.70	1076.50	1089.90	1089.90	1060.00	1076.80	-0.07	0.59	1.48	-0.03

Table 3 Classifier Comparison – CTC

Measurement	Gaussian Processes	Linear Regression	Multilayer Perceptron	SMOreg	M5P
MAE	7.3477	4.4815	5.3450	4.3357	4.4399
RMSE	125.8979	99.3761	100.3510	99.6994	96.8065
RAE	176.1047	107.2517	127.9906	103.7592	106.2517
RRSE	11.3965	9.0023	9.0883	9.0314	8.7702

B. Fundamental analysis

The training dataset looks at the past five years and the test dataset looks at this year's announcements. Table 4 shows how to split the training and test dataset.

Table 4 Text Data Set

Company	Train	Test
CTC	43	3
DIAL	71	7
JHK	90	7

In the case of CTC, the total number of instances is 43, it contains 17 positive instances, 12 negative instances, and 14 not change instances. The 14 announcements do not affect the stock price. However, 29 announcements affect the company's share price. That is 67% of the total instances. In terms of DIAL, the total number of cases is 71, which includes 33 positives, 18 negatives, and 20 not change cases. The 20 announcements do not affect the stock price. However, 51 announcements affect the company's share price. That is 72% of the total chances. In the case of JKH, there are 90 positive cases, 42 positive, 44 negatives, and four not change. Announcements 4 do not affect the stock price. However, 86 announcements affect the company's share price. That is 95.6% of the total chances. This shows that investors should be very careful about announcements when buying and selling JKH shares.

Analysis of results

Table 5 Classifier Evaluation - CTC

Measurement	Naïve Bayes	SMO	J48	Random Forest	Random Tree
Accuracy (%)	90.7	100	83.72	100	100
Precision	0.919	1.000	0.835	1.000	1.000
Recall	0.907	1.000	0.837	1.000	1.000
ROC	0.975	1.000	0.939	1.000	1.000
F – Measure	0.902	1.000	0.834	1.000	1.000
AUC	0.975	1.000	0.940	1.000	1.000
MAE	0.0628	0.2222	0.1597	0.1524	0
RMSE	0.2464	0.2722	0.2826	0.1803	0
RAE (%)	14.27	50.48	36.28	34.62	0
RRSE (%)	52.55	58.03	60.25	38.45	0

When the look at the table 5 SMO, Random Forest, and Random Tree classifiers show 100% accuracy and 1.0 Precision, Recall, ROC, AUC, and F-measure. The random tree shows the best results. Its accuracy is 100% and the error is zero. Therefore, this is

the best classification for stock price prediction using text analysis. The tables below (Table 6, Table 7, and Table 8) show a comparison between the predicted results and the actual results. All predictions conducted using "Random Tree".

Table 6 Results Comparison - CTC

Instance	Predicted Results	Actual Results
1	Positive	Not Change
2	Positive	Positive
3	Positive	Negative

Table 7 Results Comparison - DIAL

Instance	Predicted Results	Actual Results
1	Positive	Not Change
2	Positive	Negative
3	Positive	Positive
4	Positive	Positive
5	Positive	Positive
6	Positive	Not Change
7	Not Change	Not Change

Table 8 Results Comparison - JKH

Instance	Predicted Results	Actual Results
1	Negative	Positive
2	Negative	Positive
3	Negative	Negative
4	Negative	Negative
5	Negative	Negative
6	Positive	Negative
7	Negative	Positive

C. The relation between fundamental and technical analysis.

Most researchers have performed fundamental and technical analysis separately, but they have not analyzed the correlation between them. This study fills that gap in the literature. This relationship can be understood by studying the following tables (Table 9, Table 10, and Table 11).

Table 9 Evaluation Results - CTC

Date	Technical	Fundamental	Actual
27 Feb 2020	1119.30	Positive	1123
28 Feb 2020	1121.90	Positive	1110
14 Mar 2020	998.70	Positive	1000

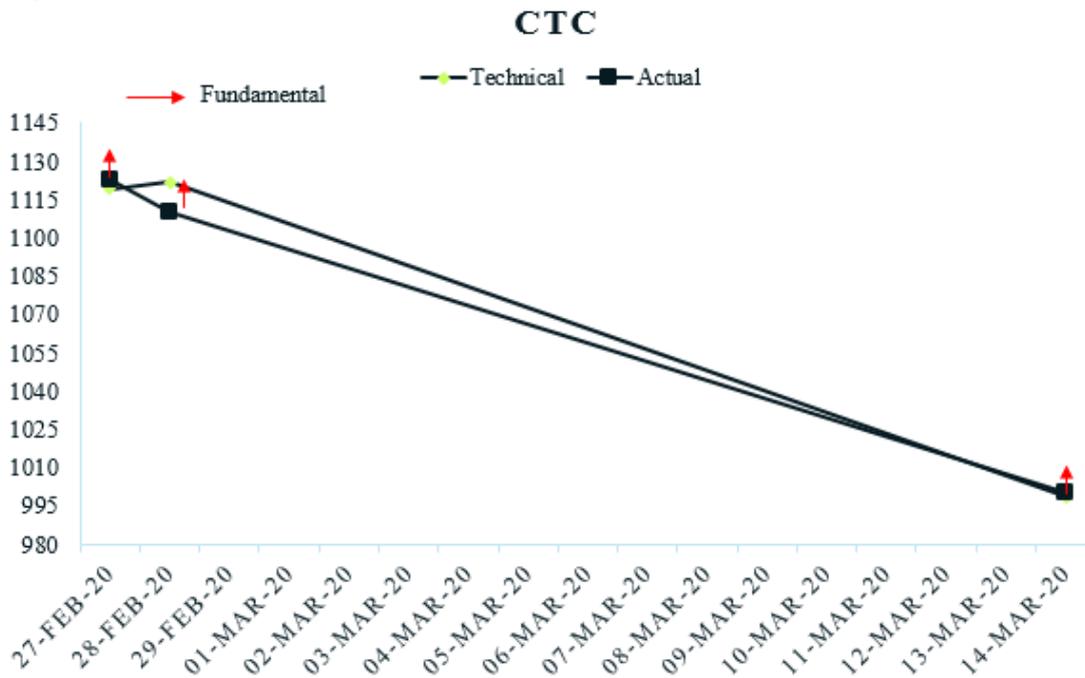


Fig 3 Evaluation Results – CTC

Table 10 Evaluation Results - DIAL

Date	Technical	Fundamental	Actual
16 Jan 2020	12.50	Positive	12.50
17 Feb 2020	12.60	Positive	12.70
20 Feb 2020	12.60	Positive	12.60
02 Mar 2020	11.80	Positive	11.80
02 Mar 2020	11.80	Not Change	11.80
11 Mar 2020	10.40	Positive	10.40
12 Mar 2020	10.40	Positive	10.20

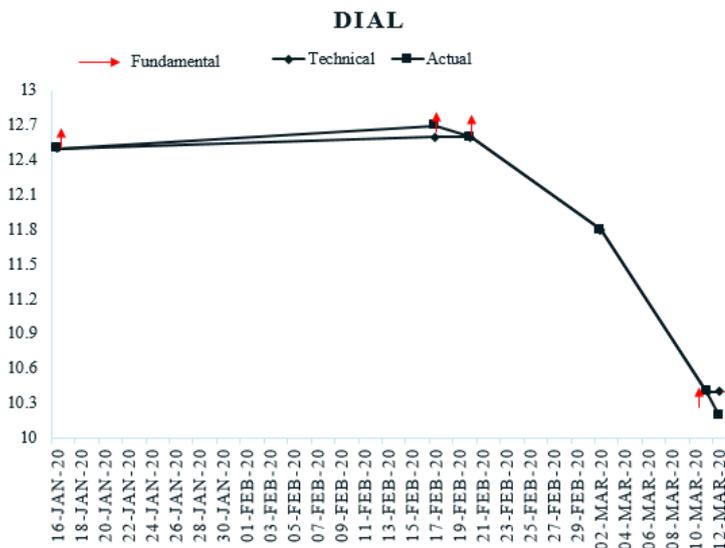


Fig 4 Evaluation Results - DIAL

Table 11 Evaluation Results - JKH

Date	Technical	Fundamental	Actual
09 Jan 2020	160.80	Negative	162.80
13 Jan 2020	163.20	Negative	163.50
16 Jan 2020	166.70	Negative	164.00
17 Jan 2020	163.90	Negative	163.10
17 Jan 2020	163.90	Positive	163.10
30 Jan 2020	160.70	Negative	162.10
11 Feb 2020	160.00	Negative	157.60

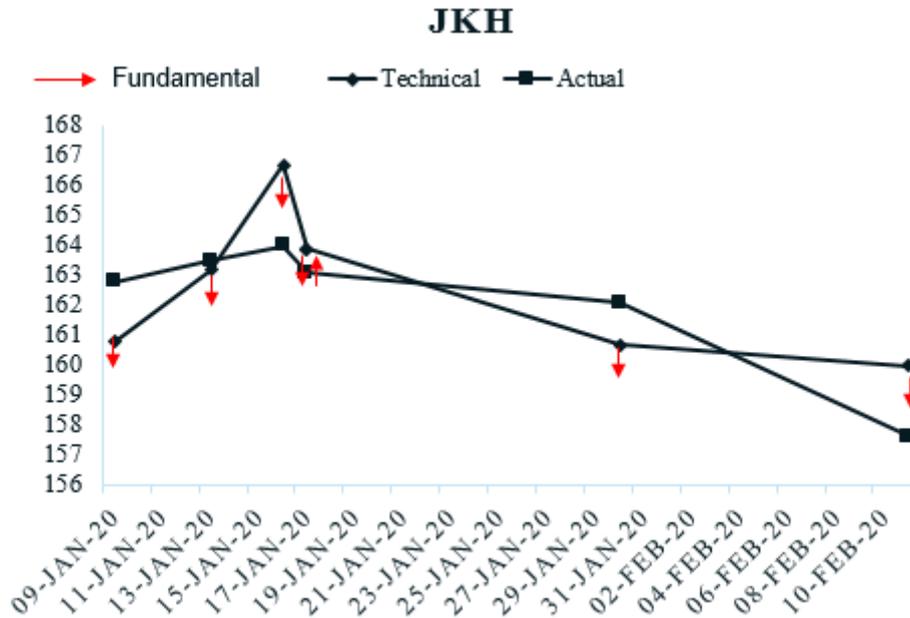


Fig 5 Evaluation Results - JKH

There are 17 instances in the above tables (Table 9, Table 10, and Table 11). There are eight instances, similar results compared to the actual results of the fundamental analysis. That is 47 percent. In technical analysis, five instances show the same values with actual values. That is 29 percent. In this case, the fundamental analysis results in better results than the technical analysis. However, there is a problem with the fundamental analysis; it does not predict numerical value.

The combination of the two analyzes appears to yield better results than the results of the fundamental and technical analyses performed separately. Accordingly, the researcher can make the following formula:

$$CP = VTA \pm RFA \tag{1}$$

Where,

CP – Closing Price

VTA – Value of Technical Analysis

RFA – Results of Fundamental Analysis

In this model, 11 cases show the correct results. It is 65 percent. However, there is an assumption that positive news will keep the close price running smoothly.

Technical analysis generates numeric value. However, predict news has a negative or positive effect. If there is a negative effect, it reduces the TA value. In addition, if it is positive it increases TA value.

V. CONCLUSION & RECOMMENDATIONS

In technical analysis, the SMO regression function provides the ability to predict CSE's share price more accurately than other functions such as Gaussian processes, linear regression, and multi-layer perception. In the fundamental analysis, its accuracy is

more than 80% of all models. Similarly, SMO, Random Forest, and Random Tree classifiers show 100% accuracy and 1.0 Precision, Recall, ROC, and F-measure. The random tree shows the best results. Its accuracy is 100% and the error is zero. Therefore, this is the best classification for stock price prediction using text analysis.

Financial news affects the closing price of CTC 67%, Dial 72%, and JKH 95.6 percentage. It can be a positive or a negative impact. If it is, a positive impact closing price will be increased. Otherwise, is negative impact closing price will be decreased. Thus, the researcher was able to achieve all the objectives that he had hoped to achieve. Finally, the researcher suggests that technical and fundamental analysis should be combined, rather than separately. It gets more accuracy than other models.

In the fundamental analysis, the researcher considers only the announcements posted on the CSE website. Newspaper articles, Twitter, FB posts, and financial reporting can also be considered in the fundamental analysis. The most important thing for further research is to identify the value of fundamental analysis. That is to say how much the value of the shares will increase or decrease by the fundamental analysis.

REFERENCES

- [1] "Colombo Stock Exchange - Wikipedia." https://en.wikipedia.org/wiki/Colombo_Stock_Exchange (accessed Jul. 11, 2020).
- [2] V. H. Shah, "Machine Learning Techniques for Stock Prediction," pp. 1–19, 2007.
- [3] Y. C. Chan, A. C. W. Chui, and C. C. Y. Kwok, "The impact of salient political and economic news on the trading activity," *Pacific Basin Financ. J.*, vol. 9, no. 3, pp. 195–217, Jun. 2001, doi: 10.1016/S0927-538X(01)00015-4.
- [4] A. Nagar and M. Hahsler, "Using Text and Data Mining Techniques to extract Stock Market Sentiment from Live News Streams," *Int. Proc. Comput.*, vol. 47, no. Iccts, pp. 91–95, 2012, doi: 10.7763/IPCSIT.2012.V47.18.
- [5] Y. Shynkevich, T. M. McGinnity, S. Coleman, and A. Belatreche, "Predicting stock price movements based on different categories of news articles," *Proc. - 2015 IEEE Symp. Ser. Comput. Intell. SSCI 2015*, no. December, pp. 703–710, 2015, doi: 10.1109/SSCI.2015.107.
- [6] D. R. Aronson, *Evidence-Based Technical Analysis: Applying the Scientific Method and Statistical Inference to Trading Signals*. John Wiley and Sons, 2011.
- [7] University of Cambridge, "Finance Technical Analysis," *TA - B.*, pp. 103–105, 2011, [Online]. Available: http://www.mrao.cam.ac.uk/~mph/Technical_Analysis.pdf.
- [8] C. H. Park and S. H. Irwin, "What do we know about the profitability of technical analysis?," *Journal of Economic Surveys*, vol. 21, no. 4, pp. 786–826, Sep. 2007, doi: 10.1111/j.1467-6419.2007.00519.x.
- [9] G. A. W. Griffioen, "Technical Analysis in Financial Markets," *SSRN Electron. J.*, p. 322, 2003, doi: 10.2139/ssrn.566882.
- [10] H. Yu, G. V. Nartea, C. Gan, and L. J. Yao, "Predictive ability and profitability of simple technical trading rules: Recent evidence from Southeast Asian stock markets," *Int. Rev. Econ. Financ.*, vol. 25, pp. 356–371, Jan. 2013, doi: 10.1016/j.iref.2012.07.016.
- [11] Q. A. Al-Radaideh, A. A. Assaf, and E. Alnagi, "PREDICTING STOCK PRICES USING DATA MINING TECHNIQUES," *Int. Arab Conf. Inf. Technol.*, 2013.
- [12] A. Chelawat, R. Agarwal, and A. Das, "Application of Data Mining in Equity Market," *Int. J. Eng. Tech.*, vol. 3, no. 3, pp. 42–49, 2017, [Online]. Available: <http://www.ijetjournal.org>.
- [13] P. Ou and H. Wang, "Prediction of Stock Market Index Movement by Ten Data Mining Techniques," *Mod. Appl. Sci.*, vol. 3, no. 12, Nov. 2009, doi: 10.5539/mas.v3n12p28.

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An Analysis of Imperative Sentence on the Crown Movie and Its Subtitling

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Abstract- This research aimed to find out the subtitle strategies of imperative sentence in *The Crown* (2020) movie that had been translated from English subtitle into Indonesian subtitle. This research focused on subtitling strategies using Gottlieb's theory which consists of 10 strategies, such as Expansion, Paraphrase, Transfer, Imitation, Dislocation, Condensation, transcription, decimation, deletion, and resignation. Research data is collected from transcripts English and Indonesian subtitles from the dialogue of Subscene which is analyzed using descriptive qualitative method. The results showed that there were only six strategies out of ten strategies in translating imperative sentence subtitles in *The Crown* (2020) Movie, they were: 31 data of paraphrase (22%), 45 data of transfer (31%), 11 data of imitation (8%), 3 data of expansion (2%), 41 data of condensation (29%), and 12 data of deletion (8%). The researcher concluded that transfer with 45 data (31%) was frequently used in *The Crown* movie.

Index Terms- Imperative Sentence, Subtitling. Translation Strategies

I. INTRODUCTION

Translation is the process of transferring thoughts and ideas from one language to another, both in written and spoken form, or it can be said that translation is a subjective and dynamic activity. It is called subjective because each translator is able to produce different translations of the same text. As we know, translation involves complex language and linguistic systems that are constantly evolving and different from one another. Differences in linguistic systems require a translator to have good language skills, master good reading and writing skills and are knowledgeable. In translating text, a translator always uses certain translation strategies so that the translation results are natural and easily understood by the reader.

Various experts in the field of translation and linguistics have given their opinions on the meaning of translation. Mariam (as cited in Pamungkas, M.I & Akmaliah, 2019) stated that translation is not only transferring meaning from one language to another, but rather the process faced by the translator when he writes his interpretation and understanding of a source language text into the target language in his own language. According to

Bell (1991:10) translation also involves the linguistic fields of the two languages, namely the source language and the target language, which includes the theory of meaning (semantics), methods, procedures, and translation techniques, and the field of knowledge of the translated text. Moentaha (2006), stated that the translation process is the transformation of text from one language to another without changing the content of the original text. Thus, when a source language wants to transform the text of another language, then the message contained in the source language must be maintained and must not be lost in the target language.

Currently, the movie translation is very well known and the results are widely enjoyed by movie lover. Especially with subtitles, the challenge of movie translation is the limited time and number of characters to display the text on the screen. Arbogast (2005) stated that the subtitle is the mostly condensed rendering (written translation) of a movie dialog which as written text appears synchronously with the corresponding spoken dialog on the screen. In other words, subtitling is a translation of the movie's dialogue written at the bottom of the film in which the purpose of subtitles is to help viewers enjoy a movie

One of the interesting objects of subtitling translation is the imperative sentence. The use of imperative sentences when communicating will determine the success in conveying the aims to be achieved by the speaker. Imperative sentence is a sentence ended by exclamation point to give a command for other people. Rahardi (2005: 79) stated that imperative sentences contain the intention of ordering or asking the speech partner to do something as the speaker wants. Aarts & Aarts (1982) stated that imperative sentence contains a verb in the imperative mood (the mood imperative expresses a direct command or request for a person or persons).

There are some studies regarding the translation strategies conducted on the areal of subtitling. Harahap, N.J (2015) this research aims to examine the translation strategy of Indonesian subtitles in the film *Good Will Hunting* in which used the strategy was proposed by Molina & Albir (2002). The research problem is the translation strategy that is most often used in the translation of English-Indonesian subtitles in the film *Good Will Hunting*, and the accuracy of the Borrowing Strategy translated into Indonesian. Haq, Z (2017) this research aims to examine the translation strategy of the *ContraBand* movie subtitles. The object of the

research itself is the subtitle of the *ContraBand* movie which is in English and translated into Indonesian. This research uses content analysis techniques. The findings of this study are equivalence between source language and target language, eleven translation strategies and some deviations in translation. Then, Agustina, N & Jhoni (2019) this research aims to explore the subtitling strategies used in Indonesian movie. The approach employed was qualitative with content analysis as a research design. The data used was English subtitling of *A Man Called Ahok* movie. The result showed that the dominant subtitling strategies used were repetition indicating the literal translation and addition strategy showing more information given. Respectively, transmutation and detraction strategies are also employed

The translation strategy is expected to be produced is certainly the one that has the closest equivalent meaning in the target language. Of course, this is an interesting phenomenon when translators are expected to use simple language in producing accurate translations. The movie used as research data is the *The Crown* (2020) movie. *The Crown* (2020) movie was chosen because the movie is rich in data needed in research, also it contains histories during the British rule by Queen Elizabeth II. A lot of stories about romance, family, and also government. This research discusses the translation strategy of the *The Crown* (2020) movie with the theory of Gottlieb (1992), namely ten translation strategies, there are: expansion, paraphrase, transfer, imitation, transcription, dislocation, condensation, decimation, deletion, and resignation. Then, The Usage of Swan's theory (1982) about imperative sentence there are 4 types of imperative sentences based on their function: as command, as request, as direction, as prohibition.

II. METHODS

This research focuses on the subtitling analysis of imperative sentence *The Crown* (2020) movie by Peter Morgan using Swan's theory about imperative sentence and Gottlieb's theory about translation strategies. This type of this research is descriptive qualitative. The object of this research is *The Crown* movie script. The researcher uses documentation technique to collect the data. The researcher uses triangulation to prove the validity of the research where the data sources from movie. In analysing data had been collected, the researcher applies some procedures such as watching the movie, reading *The Crown* script by comparing the English script and Indonesian script, classifying the imperative sentence by the type, analysing the translation strategies of imperative sentence, drawing conclusion about type of imperative sentence and translation strategies found in *The Crown* (2020) movie season 4 from episodes 1-5.

III. RESULTS AND DISCUSSION

Regarding Gottlieb's theory of the subtitling strategies from Swan's theory of the imperative sentences used in *The Crown* (2020) season 4 from episodes 1-5, the writer found 6 out of 10 strategies in a total of 120 pieces of data. They are: 31 data of paraphrase (22%), 45 data of transfer (31%), 11 data of imitation (8%), 3 data of expansion (2%), 41 data of condensation (29%), and 12 data of deletion (8%). From the results found, the strategy

most applied in this series is a transfer strategy with a total of 45 data (31%). Here are the data analysis in this research.

Paraphrase

Paraphrase is when the original text cannot be reconstructed in the target language in the same syntactic way.

Data. 1 (Command)

Source Language	Target Language
Eyes right!	Hormat kanan!

In this scene, a leader commands his armies to salute while giving way to Queen Elizabeth II who is on the right side in the crowd. Eyes right is a military command which means turn head to the right. Therefore, instead of using the literal translation *Mata kanan!*. This script of the source language *Eyes right* is paraphrased into *Hormat kanan!* to fit the scene situation and the target language of military command in Indonesia without changing the meaning. The data is categorized into imperative as a command because the exclamation mark (!) means a strong intonation and a firm command, also, the text is spoken by a leader who has a higher level so that he has the right to give orders.

Data. 2 (Command)

Source Language	Target Language
Out! Get out!	Pergi! Keluar!

This utterance is spoken by Queen Elizabeth II when someone broke into her bedroom while she was sleeping. The source language *Out!* if translated literally, it would be *Keluar!*. But to avoid repetition in the target language, the source language *Get Out!* is paraphrased into *Pergi!* in the target language. The data is categorized into imperative as a command because there is an exclamation mark (!) which means a firm command, also she has a higher level, so she has the right to give a command. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's paraphrase subtitling strategies theory and Swan's imperative sentence as a command theory.

Transfer

Transfer is when the strategy completely and accurately translates the source text.

Data. 3 (Request)

Source Language	Target Language
Please carry on.	Silakan teruskan.

This utterance is said by an old woman (the trainer from the palace) who was training Diana to speak well in public, she tied Diana's hands before she continued her practice so that her hands didn't move too much when talking. It can be seen from the data above, result of subtitle used the transfer strategy. Because the source language is translated literally from, *Please carry on* into *Silakan teruskan*. Without changing, adding, or deleting some parts of the text. The data is categorized into imperative as a request because the form is more respectful, there is a mark *please*.

Data.4 (Request)

Source Language	Target Language
Stop where you are, sir. Get back, please.	Berhenti, Pak. Tolong mundur.

This utterance is said by the guard to journalists who pushed forward when Diana came out from her flat to get into the car to head for the palace. The bolded words in the data above are a transfer strategy. The source language is translated literally without changing, adding, or deleting some parts of the text from *Get back, please* into *Tolong mundur* in the target language. The bolded data is categorized into imperative as a request. Because in the text, there is a mark *please* to add politeness. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's transfer subtitling strategies theory and Swan's imperative sentence as a request theory.

Imitation

Imitation uses the same forms as the original, usually with the addition of names of people and places.

Data. 5 (Prohibition)

Source Language	Target Language
Don't get all...Shakespearean with me.	Jangan kutip... Shakespeare padaku.

This utterance is said by Prince Philip to his wife (Queen Elizabeth II) when she said a few words from Shakespeare. It can be seen from the data above, result of the subtitle used the imitation strategy because there is a name *Shakespeare* that is translated with the same form in the target language. The source language *Don't get all...Shakespearean with me* is translated into *Jangan kutip...Shakespeare padauk* in the target language. *-an* in Shakespearean in the source language is not included in the name, it indicates his works. That is why it didn't include in the target language. The data is categorized into imperative as a prohibition because there is a mark *don't*.

Data. 6 (Command)

Source Language	Target Language
Get the wine, Carol.	Ambil anggurnya, Carol.

This was said by Mark to his sister (Carol). It can be seen clearly that the subtitle result used the imitation strategy. The source language *Carol* is translated as *Carol* in the target language because it is a name. Therefore, the English subtitle script is translated the same form in target language. The data is categorized into imperative as a command because there are no additional words to complete politeness. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's imitation subtitling strategies theory and Swan's imperative sentence as a command theory.

Expansion

Expansion is where the original text needs more explanation due to a cultural nuance that is not retrievable in the target language.

Data.7 (Prohibition)

Source Language	Target Language
Don't look like that.	Jangan melihatku begitu.

This utterance is said by Prince Charles to Diana who suspected him that he would meet Camilla when Prince Charles said he was going to Highgrove. Based on the data above, the source language *Don't look like that* is translated as *Jangan melihatku begitu* in the target language. It should be *Jangan melihat begitu*, but there is addition of the word "*ku*" so that the source language can be conveyed better and clearly in the target language. The data is categorized into imperative as a prohibition because there is a mark *don't*.

Data. 8 (Command)

Source Language	Target Language
Stay here.	Kau di sini saja.

This utterance is said by a woman to her new boyfriend who accidentally met her problematic ex-husband at the bar. It can be seen from the data above used an expansion strategy; the source language *Stay here* is translated as *Kau di sini saja* in the target language. There is addition of the word *Kau* to make it clearer for the readers. The data is categorized into imperative as a command because there are no additional words to complete politeness. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's expansion subtitling strategies theory and Swan's imperative sentence as a command theory.

Condensation

Condensation, or shortening the text in the least obtrusive way possible, appears to be the most common technique employed.

Data. 9 (Direction)

Source Language	Target Language
Follow the road round.	Ikuti jalannya.

This utterance is said by a man who directed the cars out of the parking lot at the Olympic horse race. The source language *Follow the road round* is translated as *Ikuti jalannya* in the target language. It can be seen that the subtitle result used a condensation strategy because the unnecessary word *round* which means *putaran* is not translated in the target language. That word *putaran* is eliminated because the speaker's hand moved when saying the sentence (understandable enough for the readers). The data is categorized into imperative as a direction because the speaker instructed the listener to do something and followed by the listener.

Data. 10 (Command)

Source Language	Target Language
Now go.	Pergilah.

This utterance is said by a woman who accidentally met her problematic ex-husband who wanted to make a scene because he saw her with her new boyfriend at the bar. It can be seen clearly that the subtitle result used the condensation strategy in this data. The source language *Now go*, if translated literally it would be *Pergilah sekarang* in the target language. But the word *Now* is eliminated which means *Sekarang* in the translation of the target language because even though eliminated, it can be still understood because of the situation in the scene. The data is categorized into imperative as a command because there are no additional words to complete politeness. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's condensation subtitling strategies theory and Swan's imperative sentence as a command theory.

Deletion

Deletion refers to deals with the total elimination of the parts of a text, such as repetition, filler words and question tags.

Data.11 (Command)

Source Language	Target Language
Oh. Well, go on. Take it anyway.	Ambil saja. Kurahasiakan.

This utterance is said by Mr. Thatcher when he wanted to give a tip to a staff where the rules are that a tip can only be accepted when the stay is over. In the data above, the subtitle result used a deletion strategy. Because in the following source language *Oh. Well, go on. Take it anyway.* there are two filler words, namely *Oh* and *Well* which are deleted in the target language because they are unnecessary and have no certain meaning that affected the meaning conveyed in the source language. The data is categorized into imperative as a command because there are no additional words to complete politeness.

Data.12 (Command)

Source Language	Target Language
Gosh, listen to that.	Dengarkan itu.

This utterance is said by Queen Elizabeth II during a visit to the residence of Prince Charles and Princess Diana (Kensington Palace) which was very quiet, even there are no sounds of insects and bird songs. The translation result used a deletion strategy in the data above. Because in the source language *Gosh, listen to that* has a filler word *Gosh* which is an unnecessary word. The filler word is not translated in the target language, because it has no meaning. The omitted word would not affect the meaning conveyed in the source language. The data is categorized into imperative as a command because there are no additional words to complete politeness. It can be concluded that this data is in accordance with the applied theory based on Gottlieb's deletion subtitling strategies theory and Swan's imperative sentence as a command theory.

IV. CONCLUSION

In this research, the researcher found types of strategies in English-Indonesian subtitles based on imperative sentences used in the series *The Crown* (2020) season 4 from episodes 1-5. To narrow the data, the researcher only focused on its imperative sentences based on Swan's theory (command, request, direction, and prohibition) and used subtitling strategies based on Gottlieb's theory to analyse the data. The researcher concluded that in the series *The Crown* season 4 from episodes 1-5, there are 6 out of 10 strategies with a total of 120 data. These are the following results: 31 data of paraphrase (22%), 45 data of transfer (31%), 11 data of imitation (8%), 3 data of expansion (2%), 41 data of condensation (29%), and 12 data of deletion (8%). From the results found, it can also be concluded that the strategy most applied in this series is a transfer strategy with a total of 45 data (31%). The data in this series can mostly be understood with the literal translation from source language to target language, without adding or deleting some words in the text.

REFERENCES

- [1] Aarts, F & Aarts, J. (1982). *English Syntactic Structure: Function and Categories in Sentences Analysis*. Oxford: Pergamon Press.
- [2] Agustina, N & Joni. (2019). *The Subtitling Strategies Used in Indonesian Film*. *Journal of English Language Teaching in Indonesia*. 7(II). 54-59.
- [3] DOI: <https://doi.org/10.22460/elitin.v7i2.p54-59>
- [4] Arbogast, H.G. (2005). *Introduction to Multidimensional Translation Research*. MuTra. *Challenges of Multidimensional Translation: Conference Proceedings*
- [5] Bell, T. R. (1991). *Translation and Translating: theory and practice*. Longman: London.
- [6] Gottlieb, H. (1992). *Subtitling. A New University Discipline*. in Dollerup & Loddegaard (eds). *Teaching Translation and Interpreting: Training, talent and experience*. Philadelphia: John Benjamins Publishing Company.
- [7] Haq, Z. (2017). *Penerjemahan Subtitle Dari Bahasa Inggris Ke Dalam Bahasa Indonesia (Penelitian Analisis Isi Pada Subtitle Film Contraband)*. *Deiksis*, 9(1), 100 – 108. DOI: <http://dx.doi.org/10.30998/deiksis.v9i01.931>
- [8] Harahap, N, J. (2015). *Analisis Strategi Penerjemahan Pada Film 'Good Will Hunting' Ke dalam Bahasa Indonesia*. *Jurnal Ecobisma*. 2(2). 117-133. DOI: <https://doi.org/10.36987/ecobi.v2i2.714>
- [9] Moentaha, S. (2006). *Bahasa dan Terjemahan*. Jakarta: Kesaint Blanc.
- [10] Pamungkas, M.I & Akmalyah. (2019). *Analisis Strategi Penerjemahan Dalam Terjemahan Dalam Terjemahan Diwan Al-Imam Al-Syafi'i*. *Jurnal Bahasa dan Sastra*. III (1). 74-95. DOI: <https://doi.org/10.14421/ajbs.2019.03104>
- [11] Rahardi, K. (2010). *Pragmatik: Kesantunan Imperatif Bahasa Indonesia*. Jakarta: Erlangga.
- [12] Swan, M. (1996). *Practical English Usage*. Oxford: Oxford University press.

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A Review: The Relationship between Daily Temperature with Non-Accidental Mortality and its Spatial Pattern in Peninsular Malaysia

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Abstract-

Climate change is not only a future problem and an urgent identification of the population, assessing the health risk, and planning appropriate adaptation and mitigation policies is a must to protect human health. Malaysia experienced extreme hot temperatures with 40.1°C in Chuping Perlis in 1998, while the lowest temperature was 15.7°C in 2014. The Ministry of Health reported about 200 cases of heat-related illness with two cases of mortality in Johor and Kedah as a result of El-Nino in 2016. Furthermore, due to the high heat, the government temporarily closed more than 250 schools during that period. Besides that, the year 2019 also saw a lot of heat waves because of the El-Nino phenomenon. On March 5th to 8th, 2019, Chuping, Perlis had a heatwave with a high temperature of between 37.1°C and 37.7°C. The spatial pattern of temperature-related mortality is explored using Time Series of mortality analysis concerning the exposure over a period of time. It describes the variable that is subjected to a recurring periodic observation which can be at the individual (such as blood pressure monitoring) or aggregate levels (such as hospital admission rates) Additionally, it can be used to discover a pattern of behaviour that occurs in the natural environment, evaluate the variable's changes across the continuous spectrum, and forecast the future direction of the time series due to the variable's autocorrelation characteristic. Determining the relationship between daily temperature with non-accidental mortality provides an evidence-based medicine (EBM) on the temperature-mortality relationship. In the clinical and public health practice, this would guide the top management in the public health setting for the improvement of healthcare system preparedness and action plan, especially among vulnerable groups population. In the relation to Sustainable Development Goal (SDG) 2030 and the 12th Malaysian Plan, will focus on increasing energy efficiency and urban resilience and the government can plans toward a low carbon state as one of the mitigation strategies and to improve endurance against climate change and disaster.

Index Terms - Daily Temperature, Non-Accidental Mortality, Spatial Pattern, Peninsular Malaysia

I. INTRODUCTION

Climate change is not only a future problem but also a current problem. Urgent identification of the population, assessing the health risk, and planning appropriate adaptation and mitigation policies are a must to protect human health. Climate change, especially heat waves, has recently become a significant concern among scientists, researchers, and politicians. It has been recognized as one of the most significant challenges of the 21st century and has been recognized as a diver for climate-sensitive health hazards Further researchers found that at the beginning of the second half of the 20th century, human activities such as the burning of fossil fuels, deforestation, and vehicle emissions were identified as contributing factors to an increase in a worldwide average temperature between 0.8°C and 1.2°C [1]. Four types of hazards related to climate-sensitive which are hydrological (e.g., flood, rainfall-induced landslide, ice caps melting, increasing sea level), climatological (e.g., drought and wildfire), biological (e.g., vector-borne diseases; and food and water-borne diseases) as well as meteorological hazards (e.g., temperature extremes, severe storms) [2].

According to a special report by the IPCC [1], the global mean surface temperature (GMST) increased by 0.87°C (0.20°C) between 2006 and 2015 compared to the pre-industrial levels (1850-1900), with recent warming averaging 0.2°C (0.10°C) per decade [1]. Another projection of GMST by IPCC showed that the global warming of 1.5°C could be reached in the 2030s, 2.0°C in 2050s, and even 4.0°C at

the end of this century [3]. As a result, the Paris Agreement was signed in December 2015 to limit global average temperature increases to less than 2°C, preferably to less than 1.5°C above pre-industrial levels [4].

Previous studies demonstrated a significant association between temperature, particularly extreme heat conditions with health impacts [5]. Even a 1°C increase in temperature above a city-specific threshold would increase mortality and hospital admission [6, 7]. Nevertheless, the actual figure for heat-related mortality might be underestimated as the extreme temperature is rarely identified as purely the cause of death [8]. Therefore, the world must limit the increment of temperature beyond 1.5°C to avoid catastrophic health effects including mortality [1]. Examining the effects of temperature on mortality in Malaysia setting could help and strengthen the current public health actions to prevent the negative impacts of extreme temperature on health among Malaysian populations.

II. SITUATIONAL ANALYSIS OF THE TEMPERATURE IN MALAYSIA

Malaysia is one of the Southeast Asian Countries with an estimated population size of 32.6 million with a total land area of 30,803 sq km [9]. The country is characterized by high temperatures, high humidity, and plentiful rainfall throughout the year, with two climate variations, the Southwest Monsoons and the Northeast Monsoons, which occur in April-September and October-March, respectively. Malaysia is experiencing an equatorial climate with temperatures ranging from 26°C to 28°C and sometimes can reach up to 31°C in significant cities [10, 11].

Previous research has highlighted the relationship between extreme heatwaves events with human activities, especially in the case of unabated greenhouse emissions [12]. Besides the effect of global warming, Malaysia also experiences phenomena like EL-Nino- Southern Oscillation [13], Indian Ocean Dipole (IOD), and Madden-Julian Oscillation (MJO) [14]. Extreme heatwaves in Malaysia occurred in 1997, 1998, and 2016, characterized by extremely long dry spells that affected the quality of life and as well as crop production in Malaysia [15]. Not only that, the atmospheric blocking could lead to a rise in temperature with a dry and hot spell, which was reported in Malaysia in 2014 in the absence of El Nino [11].

In 2016, Southeast Asia including Malaysia, Northern Eurasia, and Southern India was affected by extreme heatwaves event due to the El-Nino phenomena [16]. In fact, the Ministry of Health reported about 200 cases of heat-related illness with two cases of mortality in Johor and Kedah as a result of El-Nino in 2016 [11]. Furthermore, due to the high heat, the government temporarily closed more than 250 schools during that period. It was reported that the temperature soared by 5°C over usual [17]. Throughout history, Malaysia experienced extreme hot temperatures with 40.1°C in Chuping Perlis in 1998, while the lowest temperature was 15.7°C in 2014 [18]. Besides that, the year 2019 also saw a lot of heat waves because of the El-Nino phenomenon. On March 5th to 8th, 2019, Chuping, Perlis had a heatwave with a high temperature of between 37.1°C and 37.7°C. Subsequently, in the same month; from 18th to 22nd March 2019, Chuping, Perlis had another episode of a high temperature of between 37.2°C and 38°C [19].

Even though Malaysia is not among the top ten Asian countries plagued by extreme heat events, the risk exists. The average temperature in Malaysia has risen significantly over the past decade. More than a decade ago, Wai, Camerlengo [20] already highlighted that Malaysia has significant warming, evidenced by increased mean annual temperature ranging from 0.99°C to 3.44°C per 100 years. Tangang et al. (2007) supported this study, which examined the surface air temperature from 1961 to 2002 and found an increment in temperatures between 2.7°C to 4.0°C/100 years. A more recent study done by Jamaludin and Yusop [17] using meteorological data from 1980 to 2011 demonstrated an increase in temperature between 2.0°C to 5.0°C/100 years.

III. THE RELATIONSHIP BETWEEN TEMPERATURE AND MORTALITY

Minimum mortality temperature (MMT) is the value of temperature in which the mortality risk is the lowest. However, the mortality will gradually increase once the temperature is below or above the MMT value [21]. The significance of determining the MMT value is it allows to estimate of access mortality [22]. MMT varies according to population, region, and climate condition [23]. For example, MMT was observed at 34.7°C (66th percentile) in Kuwait, 28.2°C (68th percentile) in Klang Malaysia and 21°C in seven cities in China [24].

This variation will ultimately produce different types of mortality-temperature relationships, such as V-shaped, U-shaped or J-shaped. J-pattern indicates the risk of mortality is higher during high temperatures, U-shaped described the risk of mortality is higher during low and high temperatures [25]. Recently, the L-shaped pattern was identified in tropical and subtropical cities, which indicates the risk of mortality is higher during low temperatures, as compared to higher temperatures [26]. For instance, Kuwait signifies a V-shaped curve, and Hanoi and Vietnam had an L-shaped curve [25]. Governments need to understand the pattern of temperature-related mortality in their respective countries so that policies can be tailored to both low and high temperatures [25]

The impact of environmental stressors including the effect of temperature on health is not restricted to the period during which they are observed but rather is often delayed [27]. Furthermore, the duration of temperature effects appears to vary throughout the specific causes of mortality, age and sex. Exposure to high temperature is usually associated with acute effects (immediate and could last for 7 days); meanwhile, exposure to low temperature is usually associated with more delay effect (range from 9 days to 14 days) [28]. A systematic

review and meta-analysis of studies conducted in South Asia found that the temperature thresholds above which mortality began to increase ranged from 19 to 30° C with lags 0–13 and 0–14 (cold effects), and that the temperature thresholds above which mortality began to increase ranged from 20 to 31°C with lags 0 –1 day (heat effects) [29].

IV. IMPACT OF TEMPERATURE ON MORTALITY

Climate change and global warming resulted in more frequent and intense extreme weather events such as heatwaves, cold spells and droughts. Besides being an environmental concern, climate change has also become a major public health concern [1]. Previous research has shown that exposure to ambient high and low temperatures is connected with increased morbidity and mortality [26]. Additionally, Anenberg, Haines [30] stated that even a slight increase in the daily mean or maximum temperature increases the risk of premature mortality. This number of mortality would further increase from 4.0% to 5.0% at the end of the century in the Representative Concentration Pathway (RCP) scenario of 8.5 [31]

Temperatures can impact human health, either directly or indirectly [32]. It is illustrated in Figure 1. Among the direct impacts of exposure to heatwaves include heat cramps, heat stress, heatstroke, exacerbation of other chronic diseases such as asthma, chronic obstructive pulmonary disease (COPD), mental health and increased rate of emergency visits and hospitalization, and accelerated and premature mortality from cardiovascular, respiratory disease [33, 34]. Moreover, extreme heat events also have been reported to be significantly associated with acute mortality from exacerbation of chronic kidney disease due to dehydration and volume loss [35]. As for the indirect effect, heatwaves cause crop yield changes which increase the risk of vector-borne and water-borne disease, population displacement, food insecurity, disruption of the infrastructure, conflict as well as economic and nutritional impacts following crop failure [34].

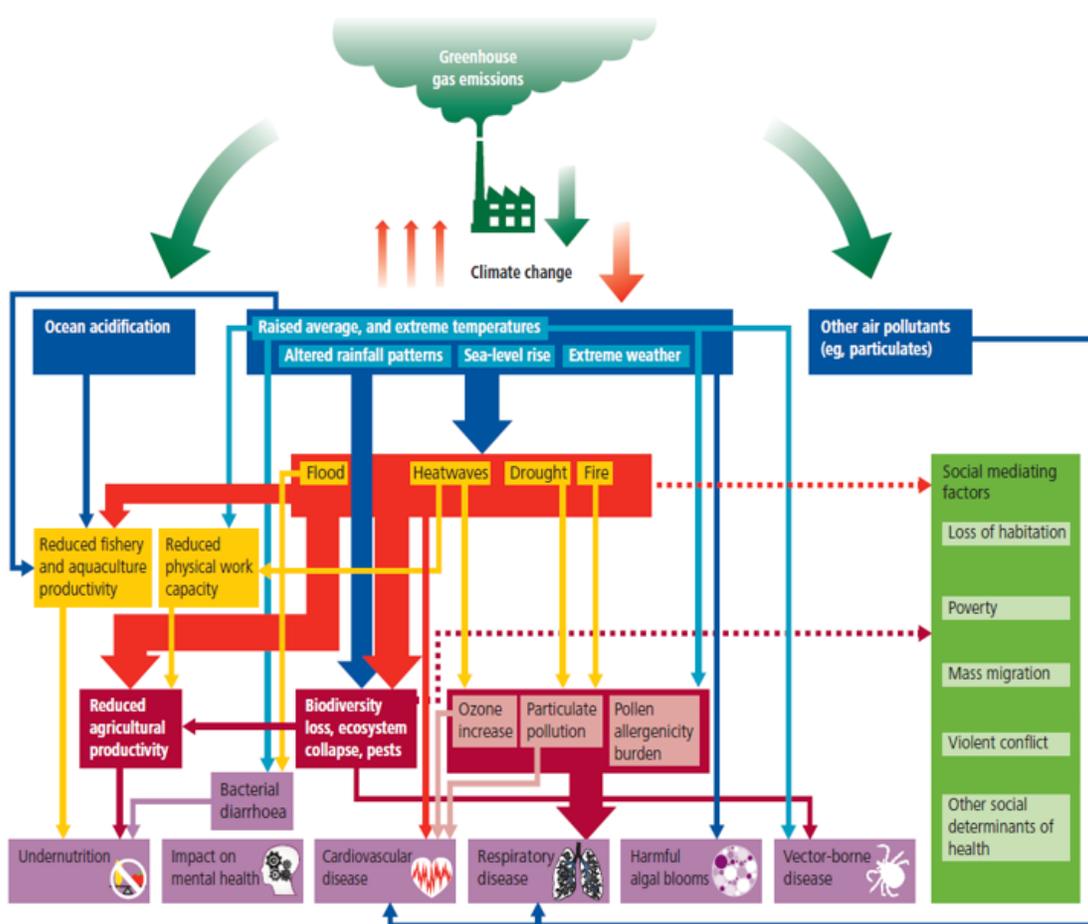


Figure 2: Health risk of climate change. Adopted from Watts et al., (2018). The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. *The Lancet*, 391(10120), 581-630.

Nevertheless, due to the wide physiological impacts of extreme temperature on humans, exploring the relationship between mortality and ambient temperature can be challenging due to the possibility of incorrect classification of the causes of mortality [36]. Other challenges

include lack of official surveillance, misreporting, and not capturing the impact of moderate non-extreme temperature, which occurs more frequently [26, 29]. Because of the tendency of underestimated mortalities related to temperature, many previous epidemiological studies use non-accidental causes to overcome the problem [28].

V. MORTALITY, METEOROLOGICAL AND AIR POLLUTANT DATA IN MALAYSIA

The non-accidental mortality data is obtained from the Department of Statistics Malaysia (DOSM). The information gathered includes cause of mortality, identification number, date of death, district and postcode, age, gender, race, nationality, and the status of location, either rural or urban. In addition, the longitude and latitude of each deceased are captured using Google Map for the mapping process.

Meteorological data is obtained from the Malaysian Meteorological Department (MetMalaysia) [18]. MetMalaysia is an agency under the Ministry of Environment and Water (KASA) and provides meteorological, climate and geophysical services. It collects and stores yearly, monthly, and hourly meteorological data such as temperature, humidity, rainfall, wind speed, and other meteorological data from all Malaysian stations [37].

Air pollutant data is obtained from the Department of Environment, Malaysia (DOE). In Malaysia, air quality monitoring is under the supervision and control of a private company since 1995 Alam Sekitar Malaysia Sdn.Bhd (ASMA) on behalf of the Department of Environment Malaysia. ASMA will be responsible for collecting, processing, analysing, and distributing air pollutants measurements [38]. Eight types of air pollutants are monitored which are Sulphur Dioxide, Nitrogen Oxide, Carbon Monoxide, ozone, hydrocarbon, PM₁₀ and PM_{2.5}, and UV. All these values (excluding UV and hydrocarbon) will be collected hourly and sent to the Department of Environment to calculate the Air Pollution Index [39]. The data will subsequently be reported on the Department of Environment (DOE) website in its Air Pollutant Index Management System [40]. Each continuous air monitoring station is capable to read the air pollutants value within a 15km radius [41].

V. SPATIAL PATTERN OF TEMPERATURE-RELATED MORTALITY DETERMINATION IN PENINSULAR MALAYSIA

The spatial pattern of temperature-related mortality is explored using Time Series of mortality analysis (outcome) in relation to the exposure (air pollutants, relative humidity and temperature) over a period of time. Time series analysis describes the variable that is subjected to a recurring periodic observation (range from days to a century) or measurement, which can be at the individual (such as blood pressure monitoring) or aggregate levels (such as hospital admission rates) [42]. Additionally, it can be used to discover a pattern of behaviour that occurs in the natural environment, evaluate the variable's changes across the continuous spectrum, and forecast the future direction of the time series due to the variable's autocorrelation characteristic [43].

Time series quasi-poisson regression in Generalized Linear Model (GLM) is used and coupled with the Distributed Lag-Non-Linear model (DLNM) to examine the relationship between daily temperature and mortality [26, 44]. Then, the Quasi-poisson regression analysis is used to adjust the overdispersion of daily death count (Y_t) due to its character that fits better to the overall variance-mean relationship as compared to negative binomial regression [27, 45, 46]. The general regression model used as below:

$$\text{LogE}(Y_t) = \alpha + \beta T_{t,l} + \text{DOW}_t + \text{ns}(\text{time}, df = i/\text{year}) + \text{ns}(RH_t, df = 3) + \text{ns}(PM_{10t}, df = 3) + \text{ns}(O_{3t}, df = 3) \quad (\text{Equation (1)})$$

Where:

- t : the day of observation.
- Y_t : the number of daily deaths on day t .
- α : the intercept.
- β : the vector of regression coefficients for $T_{t,l}$.
- $T_{t,l}$: the matrix is obtained by applying the 'cross-basis' DLNM functions to temperatures
 l refers to the lag days.
- DOW_t : is a day of the week on day t that is used to control the effect of day of the week on daily mortality (eg. the number of mortalities tend to be higher on weekend compared to weekdays)
- ns : It indicates the smoothing parameter set to the natural cubic spline.
 - Based on previous research, natural cubic spline act as a smoothing parameter in DLNM functions to control long-term trend and seasonality as well as the confounders such as air pollutants; which also affect mortality [24, 25, 47].
- time : is a continuous variable starting from the initial day of observation in this study until the last day of observations.
- RH_t : Is relative humidity.

- df : is a degree of freedom.
- PM₁₀ : is a particulate matter 10.
- O_{3t} : is ozone.

Several covariates are incorporated in this model:

- i. a natural cubic spline smooth function for *time* variable with *I* degree of freedom (df) per year was used to control long-term trend and seasonality,
- ii. a natural cubic spline smooth function for air pollutants (Ozone (O₃) and PM₁₀) and relative humidity,
- iii. indicator variables for 'day of the week (DOW_t)'.

The Akaike Information Criterion (AIC) is used to measure the goodness of fit [24, 25, 46, 48]. It is extensively used in environmental epidemiology time series regression analysis.

The following three steps are used to derive the ultimate model. The smallest value of AIC is selected for the df for temperature and lag [27]

Step 1: Goodness of fit for seasonal and long-term control for temperature-mortality model

A simpler model from Equation (1) that only consists of weekday and time variables:

$$\text{Log}(Y_t) = \alpha + \text{DOW}_t + \text{ns}(\text{time}, \text{df} = i/\text{year}) \quad (\text{Equation (2)})$$

In which, the df per year (i.e I value) from 1 to 14 is tested and the smallest AIC value is chosen for the model. This value is selected based on a previous study by Yatim, Latif [24]

Step 2: Determine the best combination of df between temperature-mortality and lag-mortality dimensions via a cross-basis function in the DLNM

The maximum lag values at 7, 14, 21 and 28 are chosen based on previous studies [24, 25]. Then, cross-basis functions to the temperature variable (T_{t,i}) and varied the df from natural cubic spline from 3 to 10 in both temperature and lag dimensions are performed. Spline knots of temperature and lags are placed at equal spaces and intervals in the log scale. It is to ensure the flexibility of the temperature distribution and lag effects at shorter delays is allowed [27].

Subsequently, the Equation 2 is updated with the temperature variable and the df per year controlling for seasonality and long-term trend to produce Equation 3, as below

$$\text{Log}(Y_t) = \alpha + \beta T_{t,i} + \text{DOW}_t + \text{ns}(\text{time}, \text{df} = i/\text{year}) \quad (\text{Equation (3)})$$

Step 3: Determine the relationship between temperature indicator and mortality categories

Then the mean, maximum and minimum temperature are compared for all categories of mortality. The temperature with the smallest value of AIC is chosen as the best predictor for mortality. In many studies, the daily mean temperature is the best indicator to investigate the relationship between temperature and mortality [49, 50]

Subsequently, the overall cumulative effect of daily mean temperature on all categories of mortalities over lag days will be plotted in the DLNM package to determine the Minimum Mortality Temperature (MMT). Later, the relative risk of mortality in all categories over the lags period is calculated by comparing it with the MMT value. The relative risk and confidence interval (CI) is calculated for both extremely low and extremely high temperatures. P-value < 0.05 is considered as statistically significant. Extremely hot temperature and extremely low temperature are determined from previous literature, which is set at the 99th percentile and 1st percentile of temperature respectively [24]. Spearman's correlation coefficients are used to summarize the correlation between daily temperature and air pollutants in each state of Peninsular Malaysia.

Finally, the sensitivity analysis is performed to determine the robustness of the result. The model is examined with the inclusion of air pollutants (PM₁₀ and O₃) and relative humidity at different lags period (0-3, 0-7 and 0-14 days). Besides that, residuals are examined to determine the adequacy of the model developed.

VI. CONCLUSION

There are many contributions to determining the relationship between daily temperature with non-accidental mortality. It provides an evidence-based medicine (EBM) on a temperature-mortality relationship. To the clinical and public health practice, this would guide the top management in the public health setting for the improvement of healthcare system preparedness and action plan, especially among vulnerable groups population. Besides that, the top management could also use this finding to improve monitoring and surveillance of temperature-related mortality. This is because the surveillance data related to temperature-related illness is usually lacking and under-reported.

In the relation to Sustainable Development Goal (SDG) 2030 and the 12th Malaysian Plan, it prioritises as part of Chapter 6's plan B6, which focuses on increasing energy efficiency and urban resilience. In Chapter 8, strategy A1, the government plans toward a low carbon state as one of the mitigation strategies. In strategy A4, the government plan to improve its endurance against climate change and disaster. Strategy A4 also highlighted the use of an integrated approach to climate change adaptation and disaster risk reduction; as well as improving the early warning system and active response to a disaster. Lastly, referring to SDG 13.1 and 13.3, the finding from this study also could assist the Ministry of Health and public health division in developing a guideline to increase the resilience and adaptive capacity toward the climate-related hazard (i.e. heatwaves).

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REFERENCES

- [1] IPCC, *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, V. Masson-Delmotte, P. Zhai, H.O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (Eds). Editor. 2018, IPCC.
- [2] Banwell, N., et al., *Commonalities between Disaster and Climate Change Risks for Health: A Theoretical Framework*. International journal of environmental research and public health, 2018. **15**.
- [3] IPCC, "Climate Change 2007" *Assessment Report*, T.W.G. II, Editor. 2007.
- [4] UNFCCC. *The Paris Agreement*. 2015; Available from: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- [5] CDC, *CLIMATE CHANGE and EXTREME HEAT What You Can Do to Prepare*, C.U.S. EPA, Editor. 2016.
- [6] Wichmann, J., *Heat effects of ambient apparent temperature on all-cause mortality in Cape Town, Durban and Johannesburg, South Africa: 2006–2010*. Science of The Total Environment, 2017. **587-588**: p. 266-272.
- [7] Son, J.-Y., M. Bell, and J.-T. Lee, *The impact of heat, cold, and heat waves on hospital admissions in eight cities in Korea*. International journal of biometeorology, 2014. **58**.
- [8] Health, t.I.W.G.o.C.C.a., *A Human Health Perspective On Climate Change*. 2010.
- [9] DOSM. *My Local Stats 2020 Publication (internet)*. 2020 october 2021; Available from: https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=450&bul_id=MXNGUKhiMUEzU0tnUXZzM0k4RFFZZz09&menu_id=WjJGK0Z5bTk1ZE1VT09yUW1tRG41Zz09.
- [10] Ministry of Foreign Affairs. *Country Profile*. 2019 15 nov 2021 [cited 2021 15 november]; Available from: https://www.kln.gov.my/web/gha_accra/history.
- [11] Ahmad Kamal, N.I., Z. Ashaari, and A. Abdullah, *Spatio-temporal Variability of Heat Exposure in Peninsular Malaysia using Land Surface Temperature*. Disaster Advances, 2019. **12**: p. 1-9.
- [12] Asian Development Bank, *A Region At Risk. The Human Dimensions of Climate Change in Asia and the Pacific*. 2017: Manila, Philippines.
- [13] Costello, A., et al., *Managing the health effects of climate change*. The Lancet, 2009. **373**(9676): p. 1693-1733.
- [14] Malaysia, A.o.S., *El Nino. A Review of Scientific Understanding and Impacts of 1997/98 Event in Malaysia*, A.o.S. Malaysia, Editor. 2018: Kuala Lumpur.
- [15] Tangang, F.T., L. Juneng, and S. Ahmad, *Trend and interannual variability of temperature in Malaysia: 1961–2002*. Theoretical and Applied Climatology, 2007. **89**(3): p. 127-141.
- [16] Imada, Y., et al., *Climate Change Increased the Likelihood of the 2016 Heat Extremes in Asia*. Bulletin of the American Meteorological Society, 2018. **99**(1): p. S97-S101.
- [17] Jamaludin, S. and Z. Yusop, *Trend analysis and change point detection of annual and seasonal temperature series in Peninsular Malaysia*. Meteorology and Atmospheric Physics, 2018. **130**: p. 1-17.
- [18] MetMalaysia. *Climate Information*. 2021 [cited 2022 2 Jan]; Available from: <https://www.met.gov.my/iklim/laporanringkasan/maklumatiklim>.
- [19] Meteorological Department, M., *Annual Report*, M.K. Ramlan Ab. Rahman, Norain Farah Aida binti Ismail, Editor. 2019: Malaysia.
- [20] Wai, N.G., A. Camerlengo, and A. Wahab, *A study of global warming in Malaysia*. 2005. **42**.
- [21] Chung, Y., et al., *Mortality related to extreme temperature for 15 cities in northeast Asia*. Epidemiology, 2015. **26**(2): p. 255-62.
- [22] Honda, Y. and D. Onozuka, *Heat-Related Mortality/Morbidity in East Asia, in Extreme Weather Events and Human Health: International Case Studies*, R. Akhtar, Editor. 2020, Springer International Publishing: Cham. p. 131-144.
- [23] WHO, *Quantitative Risk Assessment of The Effect of Climate Change on Selected Causes of Death, 2030s and 2050s.*, in *Heat Related Mortality*. 2014.
- [24] Yatim, A.N.M., et al., *The association between temperature and cause-specific mortality in the Klang Valley, Malaysia*. Environmental Science and Pollution Research, 2021. **28**(42): p. 60209-60220.
- [25] Dang, T.N., et al., *Characterizing the relationship between temperature and mortality in tropical and subtropical cities: a distributed lag non-linear model analysis in Hue, Viet Nam, 2009-2013*. Glob Health Action, 2016. **9**: p. 28738.
- [26] Gasparrini, A., et al., *Mortality risk attributable to high and low ambient temperature: a multicountry observational study*. The Lancet, 2015. **386**(9991): p. 369-375.
- [27] Gasparrini, A., B. Armstrong, and M.G. Kenward, *Distributed lag non-linear models*. Statistics in Medicine, 2010. **29**(21): p. 2224-2234.
- [28] Zeng, Q., et al., *Estimating Temperature-Mortality Exposure-Response Relationships and Optimum Ambient Temperature at the Multi-City Level of China*. International journal of environmental research and public health, 2016. **13**(3): p. 279.
- [29] Dimitrova, A., et al., *Association between ambient temperature and heat waves with mortality in South Asia: Systematic review and meta-analysis*. Environ Int, 2021. **146**: p. 106170.

- [30] Anenberg, S.C., et al., *Synergistic health effects of air pollution, temperature, and pollen exposure: a systematic review of epidemiological evidence*. Environmental Health, 2020. **19**(1): p. 130.
- [31] Bressler, R.D., et al., *Estimates of country level temperature-related mortality damage functions*. Scientific Reports, 2021. **11**(1): p. 20282.
- [32] WHO. *Climate change and Health*. 2021 [cited 2021 18 November]; Available from: <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>.
- [33] Watts, N., et al., *The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health*. The Lancet, 2018. **391**(10120): p. 581-630.
- [34] WHO. *heat and health*. 2018; Available from: <https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health#:~:text=Temperature%20extremes%20can%20also%20worsen%20chronic%20conditions%2C%20including.conditions.%20Heat%20also%20has%20important%20indirect%20health%20effects.>
- [35] Glaser, J., et al., *Climate Change and the Emergent Epidemic of CKD from Heat Stress in Rural Communities: The Case for Heat Stress Nephropathy*. Clin J Am Soc Nephrol, 2016. **11**(8): p. 1472-83.
- [36] Hajat, S. and T. Kosatky, *Heat-related mortality: a review and exploration of heterogeneity*. J Epidemiol Community Health, 2010. **64**(9): p. 753-60.
- [37] Yau, Y.H., et al., *Application of the bin weather data for building energy analysis in the tropics*. Energy Efficiency, 2020. **13**(5): p. 935-953.
- [38] Usmani, R.S.A., et al., *Air pollution and its health impacts in Malaysia: a review*. Air Quality, Atmosphere & Health, 2020. **13**(9): p. 1093-1118.
- [39] ASMA. *Air Quality Management*. 2021 [cited 2022 2 January]; Available from: <https://enviromalaysia.com.my/services/air-quality-management/>.
- [40] DOE, *Environmental Quality Report*. 2020: Kuala Lumpur.
- [41] Kamarul Zaman, N. and K. Kanniah, *Spatio-temporal assessment of Aerosol Optical Depth from Himawari-8 satellite data over Malaysia*. IOP Conference Series: Earth and Environmental Science, 2020. **540**: p. 012053.
- [42] Kouis, P., et al., *The effect of ambient air temperature on cardiovascular and respiratory mortality in Thessaloniki, Greece*. Sci Total Environ, 2019. **647**: p. 1351-1358.
- [43] Linden, A., J. Adams, and N. Roberts, *Evaluating Disease Management Program Effectiveness: An Introduction to Time-Series Analysis*. Disease management : DM, 2003. **6**: p. 243-55.
- [44] Guo, Y., et al., *Heat Wave and Mortality: A Multicountry, Multicommunity Study*. Environ Health Perspect, 2017. **125**(8): p. 087006.
- [45] Ver Hoef, J.M. and P.L. Boveng, *Quasi-Poisson vs. negative binomial regression: how should we model overdispersed count data?* Ecology, 2007. **88**(11): p. 2766-2772.
- [46] Zhang, Y., et al., *The Short-Term Effect of Ambient Temperature on Mortality in Wuhan, China: A Time-Series Study Using a Distributed Lag Non-Linear Model*. International Journal of Environmental Research and Public Health, 2016. **13**: p. 722-734.
- [47] Cheng, J., et al., *Heatwave and elderly mortality: An evaluation of death burden and health costs considering short-term mortality displacement*. Environ Int, 2018. **115**: p. 334-342.
- [48] Armstrong, B., *Models for the relationship between ambient temperature and daily mortality*. Epidemiology, 2006. **17**(6): p. 624-31.
- [49] Gasparrini, A., et al., *Projections of temperature-related excess mortality under climate change scenarios*. Lancet Planet Health, 2017. **1**(9): p. e360-e367.
- [50] López-Bueno, J.A., J. Díaz, and C. Linares, *Differences in the impact of heat waves according to urban and peri-urban factors in Madrid*. International Journal of Biometeorology, 2019. **63**(3): p. 371-380.

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Research on the Relationship Between Perceived Brand Globalness and Brand Credibility: Evidences from Senegal.

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Abstract- In the current study, we have analyzed the influence of perceived brand globalness on brand attitude, while considering the mediating role of brand credibility between these variables. Furthermore, we also considered the moderating rules of country of origin and product type in between perceived brand globalness and brand credibility so that the accumulative impacts of these variables can be observed on brand attitude. In order to achieve these objectives, the population of the consumers in Senegal were considered, and the sample is selected with the help of chain referral sampling method. We indeed considered a self-administered questionnaire-based survey, to collect the data from 419 respondents. The data are collected, analyzed and presented with the help of quantitative tools and techniques. After the analysis of the data with the application of SPSS and Amos, the outcomes present with the fact that the impact of perceived brand globalness on brand attitude is significant, and the mediation of Brand credibility in between these variables is significant as well. The moderation role of country of origin has been found to be significant whereas, the moderation of product type is insignificant in the relationship between perceived brand globalness and brand credibility. The research has theoretical contributions for considering a significant variable mix in the model in order to analyze the overall influences on brand attitude, moreover, the study has significant practical contributions which can be implemented to enhance the brand attitude of the organizations positively. However, the study is limited in the context of its geographical and sector-based scope.

Index Terms- Perceived Brand Globalness, Brand Attitude, Product Type, Country of Origin

I. INTRODUCTION

Increasing globalization represents the enhancing interdependence of the west African countries like Senegal with other countries all around the globe in order to consistently regulate the flow of people, ideas, information, goods and capital for profitable outcomes (Akçay, Kooli, & Gaber, 2020; S. W. Wang, Kao, & Ngamsiriudom, 2017; S. W. Wang & Scheinbaum, 2018). These factors have significantly and fundamentally shaped positive social, economic and political landscape in the west African country Senegal. However, after various decades of steadily increasing globalization, it can now be observed that it has halted and specifically for the west African countries like Senegal it is slowed down (Akram, Merunka, & Akram, 2011; Bourdin, Halkias, & Makri, 2021). In the globalized markets like Senegal and other west African countries, it has been observed that consumers are adopting critical attitude increasingly when it comes to globalization, which is significantly evident from the growing support for the political parties that every now and then support ethnocentrism in the country as well (Bourdin et al., 2021).

The country is growing rapidly in terms of its GDP growth and it is also representing the rapid growth in the economic growth, positively, the GDP growth has accelerated after the year 2015 towards 6.7%, however, it has been found out that the country is the fastest growing economy present in the West Africa only because of its trades majorly (Akçay et al., 2020).

It is believed that global brands in circle of globalization yield a larger scaled economy for a country along with manufacturing and marketing scopes (Yip, 1995). It is also significantly affecting the strategic appeal by increasing its consumption in the world development claimed by Hassan and Katsanis (1994). Neff (1999) also reported that brand globalization is imperatively affiliated with the time-consuming local modifications. Another believe is established through an observation stating that product categories are not

significantly impacted by the consumer evaluations regarding the branding strategies although the quality regarding the brand is significantly associated with the globalization perception as functionality and prestige of any brand gets enhanced by the perceived global brand modalities (Punytoya, Sath & Mishra, 2014). It is being reportedly said that global perceptions enhance brand credibility which lead to further influence over purchase intentions of consumers' therefore, the brand credibility research are viably need for the research domain (Wand & Yang, 2010).

Referring towards a brief introduction of brand means the combination of sign symbol etc. that indicates the benefit that brand can provide to consumers (Kotler, 1997). Similarly, enhancing the broader definitions regarding credibility includes the trustworthiness, expertise and attractiveness associated with it (Erdem & Swait, 2004), moreover, the brand awareness and brand image also contribute in brand credibility perceived by consumers' (Keller, 2008). Enlightening the reference of brand attitude, human mind is integration of oriented information and associations regarding several things which turn out to be an attitude for a special element. This attitude affects the reaction towards object (Bettman, 1979). These are associate constructs that reflect the object significance in the market (Lutz, 1991). The need to consider the brand attitude and brand credibility under the perceived globalness is clearly inflicting over the filters and perceptions to perceive brand qualities, trustworthiness and all other affiliated factors. Previously it is documented that brand equity are highly influenced by the brand attitude and image of their consumers' and need of broad explanations over the global perspectives needed in research domain. Highlighting the facts of psychology of globalization in the marketing field, the global movements are always into the capital, labor and production for long term basis (Townsend et al. 2009). Taylor (2005) suggested that a comprehensive and detail-oriented need of investigation is still needed to attain the holistic approach over the perceived globalness, the global advertisements and brand credibility along with their product categories.

Objectives of the study

The objectives of the current research are as following:

- To assess the impact of perceived brand globalness on brand attitude.
- To find out the mediating impact of brand credibility between perceived brand globalness and brand attitude.
- To analyze the moderating impact of product category (high/low involvement) between perceived brand globalness and brand credibility.
- To analyze the moderating impact of brand's origin country (domestic/foreign) between perceived brand globalness and brand credibility.

II. LITERATURE REVIEW

2.1 Perceived Brand Globalness

According to Ozsomer & Altaras. (2008), a "global brand" is considered to be formed in different ways. According to them, a brand i.e., perceived globally and is marketed in foreign markets as well as in local markets, is termed as the globally perceived brand. However, according to Dimofte, Johansson, & Bagozzi (2010), a brand i.e., standardized as well as recognized and available globally in different countries and whose real reach is in the practitioner's perspectives; is known as the "global brand". Whereas the "perceived brand globalness" has been defined as the "construct from consumer perceptions" by Alden, Steenkamp, & Batra, (2006) and Steenkamp, Batra, & Alden (2003), a brand is perceived globally when it is available around different countries of the world with the same name and offered characteristics. According to Yip & Cliffs (1995), the globally perceived brand is the brand that can be found by the consumers in different countries under the same brand name as well as same and well-coordinated "marketing strategies". It has been observed that the costs of different departments of the company can be reduced if the brand is perceived globally. This is due the benefit of the scale's economies(K. L Keller, 2008).

The "identity signaling" is represented by "perceived brand globalness" during the research of such brands. According to Holt, Quelch, and Taylor (2004), the point of views of the consumers plays an important role in the preference of the global brand. These brands are also stated as "identity currency" by Strizhakova et al. (2008). The use of these brands by the consumers, help them to be identified as cosmopolitans to their groups of reference. According to Davvetas and Diamantopoulos (2016), the "identity signaling" of the global brands is more significant as compared to the "social signaling" of the local brands as this helps in increasing the market of the global brands thus gaining more customers. Some of the motivations of the consumers are also satisfied nostalgically due to the cultural capital of the global brand. This also helps in having a good customer relationship around the world thus indulging with the consumers emotionally.

It has been observed that the demand of the global brands depends on the perception of these brand as global or local. The "perceived brand globalness (PBG)" is observed when that brand is identified, needed and available in a number of countries around the world(Heinberg et al., 2020). However, different global brands have maintained their standardized operations throughout the world without making any changings or shifts (e.g., Apple) whereas; many other global brands have made different shifts in different countries depending on the culture of the country (e.g. Mc Donalds in European and Asian countries). Such brands are also appreciated who have maintained the culture of their home countries as well as merged with the local markets of the host

countries(Heinberg, Martin, Erkan Ozkaya, & Taube, 2017). Such brands are successful internationally as they gain more popularity with the passage of time and are accepted more easily.

2.2 Brand Credibility

According to “signaling theory”, the brand credibility is defined as the equity of the brand i.e., consumer-based. The product’s believability of maintaining the standards by delivering the standards and quality that has been promised by the brand is known as brand credibility. The two most important components of “brand credibility” are known as: “trustworthiness” and “expertise”(Meyer & Allen, 2017b). Here trustworthiness is considered to be “the willingness of the company or organization to deliver what they have promised”. Whereas expertise shows “the ability of the company or organization to deliver what they have promised”. The market strategies that are conducted for the brand in the past are considered to have an impact on the brand credibility cumulatively. Thus, the market mix remains constant in case of brand credibility. Such case can be examined by the advertising of such products(Meyer & Allen, 2017a). Brand credibility antecedents include: “consistency”, “brand investments”, and “clarity”. According to Roberts and Urban (1998), the variability of the product level is low in case of consistent quality of the product. The commitment of the brand is found to be long-term if the brand is found to be investing in its products for its consumers. Whereas, the clarity shows the clear picture of the product without any doubt or conspiracy(J. C. Anderson & Gerbing, 2017). However, all such factors help in determining the brand credibility of the product. The advertising of these products also helps in brand credibility. Different measures are also taken to improve the brand credibility. The higher the sales promotion and advertising, the higher is the brand credibility as it promises its consumers to enjoy the quality of the products(Allen & Meyer, 2018).

According to Erdem and Swait (1998), the brand credibility results in improving “perceived quality of the product”; “decreasing the risk related to the product”; “decreasing cost of information”; and the “utility of the consumers also increases”. The judgment of the consumer about the brand whether it is positive or negative, shows the perception of the consumers about the brand(E. W. Anderson & Sullivan, 2019). The brands with higher brand credibility, are considered to have higher quality whereas, the brand with lower brand credibility is perceived to have low quality and people are less drawn towards them. In case of uncertainty, the information of the products is obtained by the consumers and the quality is verified before taking any decisions(Armstrong & Overton, 2017). This helps in maintaining the credibility of the brand also. In case of high “perceived risk”, more information is gathered by different customers to obtain the required data for making the required decision in order to achieve the required benefits. According to Aaker (1991), the costs of the information for the products is lowered in case of higher quality. The evaluation of brand credibility is also improved in case of lower perceived risks. The purchase intention of the brand is also highly effected by brand credibility(Bagozzi, 2018). Thus, brand credibility is considered to have a very important impact on the image of the brand as well as different products of the brand are consumed by the customers on the basis of its increasing popularity i.e., due to the brand credibility of the product. Customer relationship is also improved if the brand credibility is higher. This helps in the image building of the brand as well positively(Bagozzi & Heatherton, 2018).

This also showed significant effects on the advertisement of the brands i.e., found to be more effective for the brand image. If a celebrity is used for endorsing the product, it helps in building up brand credibility as well as improving brand’s image. The celebrity who is trusted by the costumers should be used for this model in order to have a positive impact on the audience of the product(Nisar, Shaheen, & Bhatti, 2018). Thus, it is also known that the credibility of the advertisement should be considered and valued more to improve the target market opinions and to gain their trust that will help in obtaining a better brand image as well as credibility. The trust of the celebrity also has a direct impact on brand credulity, credibility of advertisement and credibility of corporate as well. Such a relationship between the trust and credibility of the product helps in obtaining better results and profits from the customers. Thus having a better brand credibility leads to better brand image and improved quality of the products(Ohanian, 2017).

III. RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

In the current study, we have used positivist philosophy. this philosophy has been selected due to the fact that it usually deals with the development of hypotheses based on already existing theories and literature (Y. S. Park, Konge, & Artino, 2020; Ryan, 2018) which is the case in the present study. the efforts are concentrated on increasing the applicability of the statistical and empirical results obtained by increasing their generalizability and objectivity (Tashakkori & Teddlie, 2010), which is the crux of positivism. in addition to these facts, positivism facilitates the application and utilization of a highly structured methodology and collection of large sample sizes without any interference with the researcher’s personal beliefs (Alharahsheh & Pius, 2020; Arghode, 2012). therefore it can be stated that positivism enables the representation of apprehensive and quantifiable realities and truths in society (Alharahsheh & Pius, 2020; Fios & Gea, 2016; Kincheloe & Tobin, 2015). The current study uses the numerical methods approach to satisfy the objectives of the study by the collection of primary data and analyzing the evidence collected from the respondents upon the perceived brand globalness, brand attitude, brand credibility, country of origin, and product type to test the hypotheses. The positivist philosophical point of view is, therefore, being applied as it supports the notion of a quantitative approach of evaluation (Tharenou, Donohue, & Cooper, 2007; Veal, 2005; Williams, 2007). Research does not sum up with only identifying a research problem and structuring research questions. Appropriate methodology and a sound research strategy are very important in order to collect right information from the right people to find answers to the research questions and solution for the problems identified (Veal, 2005). We used the

deductive approach in the present case. In the deductive approach, hypotheses are developed based on a review of the literature and theoretical evidence found in the past research, and the developed hypotheses are tested to obtain their acceptance or rejection status. The direction of reasoning in deductive reasoning is from general to specific. The objective in the present case is to find out the impact of perceived brand globalness on the credibility and attitude towards a brand under moderations of brand origin country and product type that it is offering. Following this objective, the researcher has developed various hypotheses based on the review of the past literature and theoretical evidence using the signaling theory from the past research and has testified them through analysis of the collected data. This procedure coincides with the deductive approach as the direction of reasoning is from general to specific (Azungah, 2018). In the past researches on similar topics, the researchers have considered the deductive research approach as well (Huber, 2017; Kennedy, Thornberg, & Flick, 2018).

3.1 Product Category

According to Davvetas, Vasileios, Adamantios, Halkias, & Georgios (2016), the global brands' preferences may be shaped by the product category. The superiority of the global brands to the local brands was specified by the "global brand superiority category". This is observed in case of specific product category of the brand. Almost four characteristics of such product category, are considered to be the antecedents. The product category is considered to be valuable for the global brand due to "social signaling of product category"; "utilitarian category value"; "category consumption visibility" and "product category risk". This leads to the satisfaction of the consumers in different ways and this makes the product to be easily available in the market for the consumers (C. Min Han, 2020). Different aspects of the product category also plays an important role in its conspicuousness that is done to explain that whether the product is luxurious or not. It also need to explain the cultural aspects of the product that whether it is bounded to the culture or free from the cultural aspects. This automatically leads to the consumption of the products by private as well as local means depending on the demand and use of the customers (Sichtmann et al., 2019). However, it has been observed that many of the costumers who consume the luxury products, are just intended towards showing off their wealth and money and have nothing to do with the promotion of the products by considering its characteristics that whether they are standardized or not (Sreejesh, Sarkar, Abhigyan, Roy, & Subhadip, 2016). Thus, the social-signalling of the "product category" is found to be effective for the global brand as it increases the sense of nationalism among the consumers and also help in improving the "local identity" of the brand and it becomes more common among the people of host countries(Pino et al., 2019).

The characteristics of the "product category" plays an important role in naming of the product as well. It has been observed that some of products require "foreign language brand names" such as in case of electronics whereas, some of the products can also be addressed by "local language brand names". Goals of various dimensions are applied by the consumers depending on their needs and considerations about the prodcut(Rodrigo, Khan, & Ekinici, 2019). Such dissimilarities related to the goals helped in determining different methods of evaluation of the products for every prodyct category by the consumers. Brands play an important role in the brand value as well as success of the company. However, such cases vary from product category to product category. However, different attributes of the product category include: brand name, price, cost, taste and other important features of the product category(J. B. E. Steenkamp, 2019). Such characteristics of the product category play an important role in the evaluation of the brands and determining their significance in the market depending on the wants and needs of the customers. Thus, the "product category" leads to a number of products for the global brands as well promoting the diversification strategy around the globe. This could result in the profit of the company as well both internationally as well as domestically(Farías, 2019).

3.2 Brand's Origin Country

Brand's origin country is defined as the country to which the brand is linked to. It is the country where the headquarters of the brand are located and where the owner is available. However, the manufacturing of the products could be done in another country or outsourced. Whereas, in case of a foreign origin, the quality of the brand is considered to be increased. According to Winit et al. (2014), the correlation between the brand quality and the PBG increases if the origin of the brand is domestic. The product type also describes the brand's origin country. For example, Japan is considered to be the origin of automobiles and many other technologies whereas, for beverages, America is considered to be the brand's origin country(Thorelli, Lim, & Ye, 2017). The quality of the product as well as consumer perception about the product can also be perceived by the origin of the brand. It has been observed that if a brand has a bad image of its origin country, then it has a negative impact on the brand's name as well as the revenues are decreased. However, the mixed effect is not considered in case of the "brand's origin country" as it has different influences as compared to made-in-country of the product. If the made-in-country is different from the brand's origin country, then the bad or good image of the made-in-country plays a very important role on the image of the brand's origin country. This also has an impact on the perception of the products by the consumers(Thakor & Kohli, 2018).

However different pricing strategies related to the brand, also has an impact on the consumer's perception in case of the brand's origin country. In case of higher price and well developed brand's origin company, the perception of the products by the consumers is improved and the value of the brand also increases(R.T. Rust, Lemon, & Zeithalm, 2018). Such factors also have an influence on the brand's image which help in increasing the number of the customers thus resulting in the acceptance of the brand by different consumers. This is considered to be very effective both for the made-in-country as well as brand's origin country. According to Phau and Prendergast (2000), a brand is mostly associated with its origin country by the consumers even if they are well aware that the

product is being manufactured in another country. An example of this can be taken by Honda as it is made in China but is considered to be a Japanese brand and later on as an American brand. However, according to Batra et al. (2000), most of the consumers from the developing countries like India, prefer to use western brands. This is not because of the quality purposes but to show off their wealth and being in the circle of high class people(K.L. Keller, 2018).

The exported products are considered to be more constant and are highly recommended as well as accepted by the consumers especially in the local market depending on the culture of the country. The products that are exported, are considered to be “integral contributor” to the brand’s origin country. This is considered to be a well source of income for the country as well as for the company on the individual level(J.C. Usunier, 2018).

3.3 Brand Attitude

The confidence of the consumer/customer on the brand is related to the brand attitude. Although the “purchase intention” of the brand is the behavioral attitude of the consumer. The brand attitude is found to have a very important impact in this case. According to Macdonald and Sharp (2000), the customers are more likely to buy the products which are more credible as well as authentic. The awareness of the brands is found to play an important role in this process. It has been observed that the generation of awareness of a specific brand helps in improving the brand attitude as people become more aware about the brand and less questions arise in the mind of the purchasers/consumers thus improving the purchase intention of the customers. The brand attitude is found to have three important components. These components include:

However, the “brand trust” and the “advertising attitude” are found to be the significant antecedents of the brand attitude(Petty & Cacioppo, 2017). According to Kim and Han (2014), the brand attitude plays an important role in the purchasing of the product the customers as such attitude effects the thoughts and perceptions of the customers about the brand. This helps in the effectiveness of the purchase intention of the customers. Thus, the brand attitude is considered to be a very important attribute for the company to obtain profit in the form of increasing number of customers(Tsang, Ho, & Liang, 2018).

The brand attitude is found to have three important components. These include: “cognitive component”; “affective component” and “conation component”. These components help in developing a better image for the brand attitude. The credibility of the source also effects the brand attitude of the product(H., 2018). This is found to be very effective in this case as it helps in building a better brand image. Positive brand attitude also helps in attracting new customers thus improving the number of consumers which in return improves the sales of the product as well. The popularity of the brand also helps in having a positive brand attitude around the world. The “expectancy-value model” and the “cognitive response model” both plays an important role in determining the brand attitude based on the attributes of the brand(Belch & E., 2019). According to Shimp (1981), the brand attitude can be of two types i.e., favorable or unfavorable. Thus, positive attitude is considered to be most important for the success of the brands. Multiple sources are found to have a very important impact on the brand attitude. The non-attributable and attributable both aspects have an impact on the brand attitude during advertising of the product(Cohen & B, 2018). Visual as well as imaginary aspects both have an important impact on the brand attitude. Thus, as the digital world is growing, the commercials and the advertisement of the brands are becoming more important. Thus, all the attributes should be considered while promoting these products. This shows to have a significant impact on the brand attitude thus improving the brand quality and image as well(M. Gardner, 2019).

3.4 The Signaling Theory

Despite the globalization and the change in the overall looks of the markets, markets are imperfect and the information that exists between the firm and customers is of prime importance. Firms signal the production of products with certain credibility that satisfy the needs of the customers. Signaling theory suggests that brand is foremost channel of quality assessment between the firm and the customers. This is because efficient signaling between these two foremost factors of a market is very important. The theory is very helpful in explaining the behavior of the two important parties of the market and evaluate different levels of information between them. The signaling theory suggests that customers use an array of clue and information regarding the product they have intentions to purchase in order to reduce the risk. Signals are also represented by the product which are product related attributes like price, brand name and its origin. Consumers use these signals to assess the quality of the products and then mold their purchase behavior accordingly.

Conceptual Framework of the Study

Country of Origin

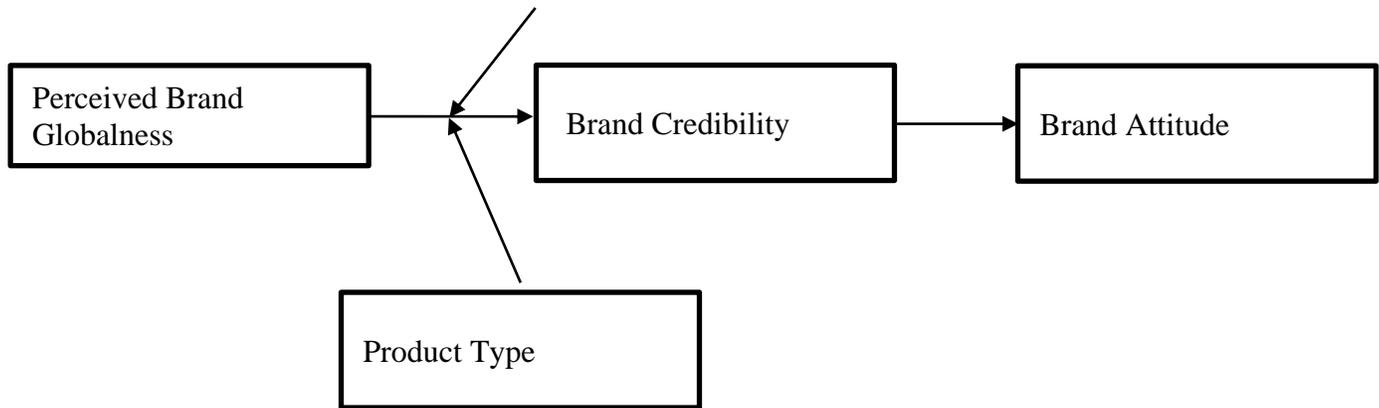


Figure 1: Research Model

The following hypothesis can be deduced for this research model:

- H1: The impact of perceived brand globalness on brand attitude is significant.
- H2: The mediating role of brand credibility in between perceived brand globalness and brand attitude is significant.
- H3: The moderating role of country of origin between perceived brand globalness and brand credibility is significant.
- H4: The moderating role of product type between perceived brand globalness and brand credibility is significant.

IV. RESEARCH METHODOLOGY

4.1 Nature of Research

The overall nature of the research is described by the research philosophy methods and approach that has been selected. The nature of research can be termed explanatory, exploratory, or descriptive. Exploratory research is usually based on the exploration of a new topic on which prior knowledge is limited, descriptive research involves the explanation and description of new information found in a field that has already been initiated, and the explanatory research is based on investigation of issues in active research fields based on a problem that had not been defined priorly in a new context. The current study mainly focuses on the investigation of the brand attitude and grand credibility behavior of consumers based on perceived rank globalness which is a domain that has been explored quite well in the past literature, but a particular problem identified by the research in that area is yet to be recognized i.e. the moderation of country of origin and the product type. Therefore, the nature of the current research can be considered to be explanatory (Lertxundi, Barrutia, & Landeta, 2019).

4.2 Data Collection

In the current study, a cross-sectional design of research has been used. Cross-sectional research design requires the collection of data at the same time from the respondents to pool the data including demographics and opinions regarding research variables on which the study (Olsen & St George, 2004). Furthermore, as this study does not require comparison in terms of cause and effect, therefore, there is no need for conducting a data collection on multiple stages in the study. Moreover, the researcher has a limited time for conducting this study and cross-sectional data collection is most suitable in such cases.

The data collecting approach is a self-administered questionnaire-based survey, in which the researcher directly collected data from the research's intended population. Quantitative research methods are highly associated with studies which based on survey, close end questionnaire, and numeric data. The quantitative research method is the systematic plan of collecting data and information through numeric form. The questionnaire will be written in Microsoft Word, and the information were collected in a self-administered format. In order to collect primary data, we will design survey that encompasses survey questions on each variable of a conceptual framework. Following the scope and need of this study, we develop the latent construct to get primary data of variables by conducting survey. The nature of this research is cross-sectional. The survey is self-administered, which reduces the likelihood of any faulty responses or carelessness on the part of the responder. A structured questionnaire was used to collect data. The researcher will create a structured questionnaire in which respondents were required to respond to a certain set of questions with a specific range of replies or responses.

The useable responses were sorted in Microsoft Excel after the data has been collected, while the responses that are unclear, the questionnaires that have been filled with Inattentiveness, and cannot be evaluated will be discarded.

4.3 Measurement model

The constructs in this study were measured by the usage of multiple-scale items. Demographic and construct-based items are both included in the survey. First of all, three demographic-related variables are collected. Using the five dimensions (Perceived Brand Globalness, Brand Attitude, Brand Credibility, Country of Origin, Product Type) with 25 measurements items for the variables. Perceived Brand Globalness is the independent variable in this study and its constructs have been adopted from the study by J.-B. E. Steenkamp et al. (2003). Three items are used for this variable. Brand attitude is the dependent variable in this study and its constructs have been adopted from previous studies (Paul & Bhakar, 2018; Sheinin, Varki, & Ashley, 2011). Three items are used for this variable. Brand credibility is the mediator in this study and its constructs have been adopted from the study by Erdem and Swait (2004). Four items are used for this variable. Product type is the first moderator in this study and its constructs have been adopted from the study by Arora, Prashar, Parsad, and Vijay (2020). Eight items are used for this variable. Country of Origin is the second moderator in this study and its constructs have been adopted from the study by Hien, Phuong, Tran, and Thang (2020). Seven items are used for this variable. Five-point Likert scale were used for all the variables with (1 = strongly disagree, 2 =disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

V. DATA ANALYSIS

In this study, the Smart PLS software package is used for the application of Structural Equation Modeling (SEM). The analysis will include descriptive tests for the respondent profile, model validity, reliability, and hypotheses testing procedures will be included in the data analyses. The construct validity, convergent and discriminant validity is tested through the Smart Partial Least Squares (PLS) 3.2.9. Once, the validity of the model has been established, the researcher will construct the structural model using Smart PLS and use it to test the relationships between the independent, dependent, mediation, and Moderation variables.

The major objective of the study was to find out the impacts of perceived brand globalness on brand attitude, furthermore, the study has analyzed the mediating role of brand credibility in the relationship between perceived brand globalness and brand attitude as well. Moreover, the study has also considered the moderation of country of origin as a significant variable in between perceived brand globalness and brand credibility, in order to analyze that how these variables accumulatively impact the brand attitude. Furthermore, in the study product type has also been considered as a moderator in the relationship between perceived brand globalness and brand credibility, in order to analyze that how these variables accumulatively impact the overall brand attitude. In total a data of 419 participants has been considered in this research, as a result of which, the received data has been analyzed and interpreted in this section of data analysis and interpretation. On the selected data we have applied demographical analysis, descriptive analysis, confirmatory factor analysis, correlation analysis, structural equation modeling, KMO and Bartlett’s test, principal component analysis and the convergent and discriminant validity. Furthermore, for the analysis of reliability, we also applied the test of Cronbach alpha. For the purpose of analysis of the data, the software utilized include SPSS and Amos.

5.1 Demographical details

The demographical details present with the personal information and demographical characteristics of the participants of the study, in total there are 419 participants of the study, and for these participants, the age, the level of experience, and the gender of the participants has been provided in the table below (Andrew, Arora, Bilmes, & Livescu, 2013). The table presents with the frequency and the percentage of the outcomes related to all of the dimensions of the demographical details of the participants.

First of all, the data regarding the age of the participants has been provided, according to the table 1 below, it can be observed that 20% of the participants are between 20 to 25 years of age, 19.3% of the participants are between 26 to 30 years of age, 21% of the participants are between 31 to 35 years of age, 22% of the participants are between 36 to 40 years of age whereas, 16.9% of the participants are above 40 years of age. From the data, it can be observed that the highest percentage of the participants lie in between the range of 36 to 40 years, which is 22% of the participants.

Furthermore, the data regarding the experience of the participants has been provided, it can be observed that 26.5% of the participants have experience above them two years, 24.6% of the participants have experience above than four years whereas, 48.9% of the participants have experienced less than or equal to two years. Furthermore, as far as the genders of the participants are considered, 59.7% of the participants are males whereas, 40.3% of the participants are females, which means that a higher percentage of males have participated in this study, and the females participated in the study at a lower percentage.

Table 1: Demographical details

Dimensions	Frequency	Percent
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Age	20-25	87	20.8
	26-30	81	19.3
	31-35	88	21.0
	36-40	92	22.0
	40+	71	16.9
	Total	419	100
Experience	2 years or less	205	48.9
	Above 2 years	111	26.5
	Above 4 years	103	24.6
	Total	419	100
Gender	Male	250	59.7
	Female	169	40.3
	Total	419	100

5.2 Descriptive statistics

The following table 2 below is representing the outcomes for the descriptive statistics, these are representing with the total number of the observations, the minimum obtained value, the maximum obtained value, the standard deviation and mean values, the skewness values and the values of kurtosis. The values of kurtosis are representing the statistic and standard error value as well (Bowen & Guo, 2011).

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PBG	419	3.00	15.00	9.8401	3.14342	-.339	.119	-.774	.238
BAT	419	3.00	15.00	9.8496	3.16210	-.309	.119	-.881	.238
PTYPE	419	8.00	40.00	25.9427	7.12376	-.382	.119	-.697	.238
COR	419	7.00	35.00	24.1002	6.05236	-.513	.119	-.466	.238
BCR	419	4.00	20.00	12.8926	3.52848	-.185	.119	-.447	.238
Valid N (listwise)	419								

Note: Construct legend: Perceived Brand Globalness (PBG); Brand Attitude (BAT); Brand Credibility (BCR); Country of Origin (COR); Product Type (PTYPE)

N is representing the values, will show the total number of observations that have been obtained by the researcher against every factor, moreover, this is also representing the total number of valid responses by the participants. The minimum values are presenting the minimum extent of values that have been obtained by the researcher in the collected data whereas; the maximum values are representing the extent of maximum values that have been obtained by the researcher in the data collected. The mean values are supposed to be lying in between the minimum and maximum values, and this case is representing that all of the mean values lie in between the minimum and maximum values. It means that no value is extremely high or extremely low, all of the values lie around the mean values at a significant range, which represents the normality of the data and also represents that the data is normally distributed (Bro & Smilde, 2014). Furthermore, the lower standard deviation values represent with the fact that the data has the lowest extent of deviation from the mean values the values of the data are not significantly dispersed and most of the use lie around the mean values. Furthermore, the lower level of skewness is also representing that the data is not significantly skewed, and most of the data lies around the mean values, which means that the data is normal, and it is good to go for further testing and analysis as well (Brown, 2015).

5.3 Frequencies

In the table3 below, the frequencies related to the variables, and the missing values have been presented, the table is presenting the values for the total obtained responses, the standard error values, the standard deviation values, the skewness values and the values for the standard error of skewness (Brown & Moore, 2012).

Table 3: Frequencies

Statistics

		PBGL	BATT	PTYPE	COR	BCR
N	Valid	419	419	419	419	419
	Missing	0	0	0	0	0
	Std. Error of Mean	.15357	.15448	.34802	.29568	.17238
	Std. Deviation	3.14342	3.16210	7.12376	6.05236	3.52848
	Skewness	-.339	-.309	-.382	-.513	-.185
	Std. Error of Skewness	.119	.119	.119	.119	.119

The table above is presenting with the fact that there is total 419 valid obtained values by the researcher as a result of collecting the data against each factor; furthermore, there are zero missing values against each factor, which means that all of the obtained values are valid and complete. Furthermore, low level of standard deviation and skewness are representing with the fact that most of the values lie around the mean values and there is least dispersion and skewness in the data. The data is valid and normal, so the normal distribution is suggesting that the data is good to go for further testing and analysis.

5.4 KMO and Bartlett's Test

The outcomes of the KMO and Bartlett's Test are provided in the table below, this test is representing the values for Kaiser-Meyer-Olkin Measure of Sampling Adequacy and also for Bartlett's Test of Sphericity, the value for Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be equal to or more than 0.8 according to the standards whereas, the significance value should be less than 0.05 for the Bartlett's Test of Sphericity to be significant (P. Cohen, West, & Aiken, 2014).

According to the table 4 below, the values for Bartlett's Test of Sphericity can be observed, it can be seen that the value of significance is less than 0.05, which means that the model and the data is significant, and the data is good to go for further testing and analysis. Furthermore, in the case of Kaiser-Meyer-Olkin Measure of Sampling Adequacy, it can be observed that the value is equal to 0.855, and this value is also above 0.8, which means that the values are significant and are also good to go for further testing and analysis

Table 4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.855
Bartlett's Test of Sphericity	Approx. Chi-Square	9401.618
	Df	300
	Sig.	.000

5.5 Rotated component matrix

The table 5 below represents with the results for the rotated component matrix, which represents the relationships that are present among the different components and items of the study. Like, against the first component, it can be seen that there is significant association between the first component and the three items related to PBG. According to the standard, the value should be equal to 0.7 or more than 0.7, so the researcher is interpreting all of the values present below in accordance with this standard (George & Mallery, 2018).

The items of BA and PT are also significantly related with the first component whereas, if all of the other components and items are analyzed as well, it can be observed that all of the items and components have a significant association. It means that both the model and the items are valid, and the data and model are good to go for further testing and analysis. All of the items and components have an association of 0.7 or more than 0.7, so, these values are right according to the standard (Hadi, Abdullah, & Sentosa, 2016).

Table 5: Rotated Component Matrix^a

	Component				
	1	2	3	4	5
PBG1	.758				
PBG2	.721				
PBG3	.673				
BAT1		.777			
BAT2		.806			
BAT3		.719			
PTYPE1			.767		
PTYPE2			.635		

PTYPE3	.746	
PTYPE4	.813	
PTYPE5	.713	
PTYPE6	.751	
PTYPE7	.776	
PTYPE8	.822	
COR1		.787
COR2		.745
COR3		.809
COR4		.828
COR5		.837
COR6		.811
COR7		.732
BCR1		.787
BCR2		.737
BCR3		.894
BCR4		.907

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
A. Rotation converged in 6 iterations.

5.6 Convergent and Discriminant Validity

The assessment of validity and reliability is very significant before moving towards complex analysis tests and techniques, so, for this purpose, the researcher has applied the convergent and discriminant validity tests. The convergent validity represents the extent to which the new scales are related to each other and to the variables and other measures related to the same construct. Whereas discriminant validity represents the extent to which a specific test or measure is diverging from another measure, having underline construct which is conceptually unrelated to it (Hancock & Mueller, 2013).

So, in this way both of these constructs and measures are measuring the extent of validity however, according to the standard, the value of CR should be equal to or more than 0.8 whereas, on the other hand, the value of AVE is supposed to be equal to or more than 0.5. According to the table above, it can be observed that all of the values of CR are significantly equal to 0.8 or more than 0.8 whereas, all of the values of AVE are equal to or more than 0.5, which means that both the data and the model are significant and good to go for further testing and analysis.

Table 6: Convergent and Discriminant Validity

	CR	AVE	MSV	PBG	BATT	BCR	CO	PTYPE
PBG	0.833	0.689	0.494	0.847				
BAT	0.803	0.689	0.650	0.616	0.844			
BCR	0.906	0.656	0.650	0.629	0.800	0.820		
COR	0.757	0.654	0.249	0.434	0.489	0.482	0.816	
PTYPE	0.868	0.603	0.274	0.444	0.471	0.505	0.388	0.865

Note: Diagonal values (in bold) represent the square root of the average variance extracted (AVE) of the specific construct.

Furthermore, according to the standard, the values for MSV should be lower than the values of AVE, and it can be seen from all of the values above that the values of MSV are significantly lower than the values of AVE. So, it also represents the significance and validity of the model and the data as well (Hoyle, 2012). Furthermore, according to the standard, the values for discriminant validity should be more than 0.8, and in case of all of the factors, it can be observed that the values are more than 0.8 like in the case of PBG the value is equal to 0.847, and same case can be observed in the scenario of other variables and factors as well. Furthermore, below is the figure of confirmatory factor analysis as well, which is taken as a screenshot from the analysis that has been done on the software Amos.

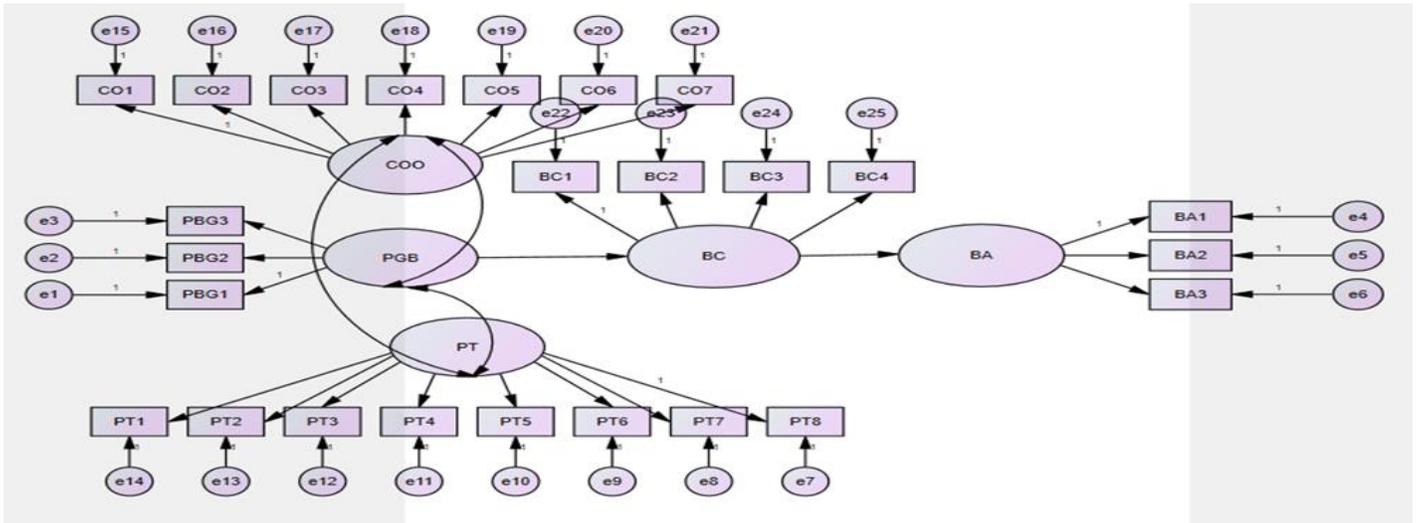


Figure 2: Confirmatory factor analysis

The figure 2 above represents the Screenshot for confirmatory factor analysis, which has been taken by the researcher from the analysis that has been done on the software Amos (Senthilnathan, 2019). The figure is representing the relationship that is present among the variables and the different constructs and items, the path diagram is formulated with the help of the software, in order to understand the direction of the effects.

6.7 Structural equation modeling

The results for structural equation modeling are presented in the table below; the table is representing the impacts of the variables on each other along with the estimated extent of impact and the direction of the relationship as well. The effect size and effect direction has been elaborated with the help of structural equation modeling, and below is the discussion regarding the impacts of the variables on each other (Shlens, 2014). According to the table above, the impact of perceived brand globalness on the brand attitude is significant and positive as the value of significance or the P value is less than 0.05, which is representing that there is significant influence of the perceived brand globalness on the overall brand attitude (Ullman & Bentler, 2012). Furthermore, the estimated extent of the impact is equal to 12.8%, which means that with every 1% increase in the perceived brand globalness there will be 12.8% of increase in the brand attitude. Hence, it approves the proposed hypothesis, “Perceived brand globalness has a significant impact on brand attitude”. Furthermore, this impact has been observed to be significant and positive as well.

Table 7: Structural equation modelling

Effects			Estimate	S.E.	C.R.	P	Hypothesis	Decision
PBG	→	BAT	.128	.055	5.557	.000	H1	Accepted
BCR	→	BAT	.270	.029	11.157	.000	-	Accepted
Mediation			Estimate	S.E.	C.R.	P	Hypothesis	Decision
PBG*BCR	→	BAT	.120	.041	5.440	.000	H2	Accepted
Moderation			Estimate	S.E.	C.R.	P	Hypothesis	Decision
PBG*COR	→	BCR	.128	.051	5.550	.000	H3	Accepted
PBG*PTYPE	→	BCR	.269	.043	4.189	.512	H4	Rejected

secondly, it can be observed that the mediation of brand credibility in between perceived brand globalness and brand attitude is significant and positive as well, which means that with the enhancement of brand credibility, perceived brand globalness increases as well, which positively influences the brand attitude accumulatively (Temel, Şen, & Özcan, 2018). With every 1% increase in the brand credibility, there will be 12% enhanced impact of perceived brand globalness on the brand attitude accumulatively. It means that the mediation of brand credibility will positively influence brand attitude as well and will enhance the impact of brand credibility on brand attitude. Hence, the mediation is significant and positive. So, it approves the proposed hypothesis, “Brand credibility has a significant mediating role between perceived brand globalness and brand attitude”. Furthermore, the moderation of product type and country of origin has also been assessed in between perceived brand globalness and the factor of brand credibility first of all, the moderation of

country of origin has been observed. According to the table above, it can be observed that there is a significant moderation of country of origin in between perceived brand globalness and brand credibility. The value of significance is less than 0.05, and the estimated extent of impact is equal to 12.8%, which means that the moderation is equal to a value of 12.8%. However, the impact is observed to be positive and significant, so, the third statement of hypothesis is accepted as well, which proposed that, "Country of origin has a significant moderating role between perceived brand globalness and brand attitude". Moreover, according to the table above, there is a significant influence of country of origin on both the brand credibility and brand attitude as well, as it has been observed already that brand credibility positively and significantly influences the overall brand attitude, so, if through the impact of Country of origin, brand credibility enhances positively, the brand attitude is also going to be enhanced positively and significantly (Ullman & Bentler, 2012). Lastly, the analysis has analyzed the moderating role of product type in between the factors perceived brand globalness and brand credibility, it has been found out that the influence of this moderating variable is insignificant as the value of significance is more than 0.05 and is equal to 0.512. This makes the impact insignificant so, it can be proposed that there is no significant moderation of product type in the relationship between perceived brand globalness and brand attitude, moreover, eventually it also does not significantly influence the factor brand attitude. So, according to the presented results in the table, the statement of hypothesis is rejected which proposes, "Product type has a significant moderating role between perceived brand globalness and brand attitude".

VI. DISCUSSION

The continuous increase in globalization has played a significant role in opening doors for the success of different countries while letting down many barriers. This has encouraged the trading between different countries promoting the concept of perceived brand globalness. Different markets have been globalized around the world in order to fit in as well as to earn profit and success. Senegal being one of such markets in West Africa has adopted the global structure very effectively. This has led to economic growth of Senegal. However, the consumers in Senegal, are found to have a critical attitude towards globalization. Such behavior of the consumers also shows the perceived brand globalness. Thus, different local as well as global brand positioning strategies are manifested in the country in order to determine the perception of the consumers. So, this research study was conducted to determine the impact of perceived brand globalness on the brand attitude by considering the mediating role of brand credibility and the moderating role of country of origin and the product type. This research was conducted in context of Senegal by considering its globalized market. It was a quantitative study. For this study, online survey was conducted on a large scale. It was a cross-section research study. Different hypotheses were also formulated for this research study which were analyzed by SEM. Four main results were obtained from the findings of this research study.

First result obtained from this study showed that perceived brand globalness has a significant impact on the brand attitude. Many research studies conducted in the past also supported this result. According to Alhabeeb (2002), the value of the product is estimated by the consumers depending on the "perceived brand quality" (PBQ) and "perceived brand prestige" (PBP). This is due to the buying behavior of the consumers. The second result obtained from this research study showed that the brand credibility has a significant mediating role in relation between perceived brand globalness and the brand attitude. A set of conducted studies also supported this finding. Three constructs were considered to be important for establishing the brand credibility. These included: "brand investments", "clarity", and "consistency" (Erdem, Swait, & Valenzuela, 2006). These constructs were found to have an impact on the perceived brand globalness that influences the brand attitude. According to T.-Y. Chen et al. (2013), the relationship between the perceived brand globalness and brand credibility was found to be positive as the products marketed globally were more sensitive towards authenticity and quality in order to maintain the image of the brand in the world. According to Nayeem, Murshed, and Dwivedi (2019), the brand credibility is considered two important components which include: "expertise" and "trustworthiness". These components were highly considered during the initial marketing strategies. However, even now many marketing strategic consider brand credibility as a crucial factor as it helps in brand imaging as well as positioning in the minds of the people. Such strategies help in gaining the trust of the people more easily by help them in decision making processes and lowering the level of risk that they might experience (Martín-Consuegra, Faraoni, Díaz, & Ranfagni, 2018). Thus, the "level of risk" is found to be decreased by brand credibility and it helped in developing a good image of the brand thus increasing the perceived quality of the product.

It is also found to have a great influence on the minds of the people resulting in their positive brand attitude (Ladeira, Santini & Jardim, 2020). According to K. Chen, Luo, and Wang (2017), a positive word of mouth is considered to be important to increase its demand by the people. However, if a positive word of mouth is not available for a brand, its negative image starts to get the hype. In order to prevent this, the companies design specific strategies to promote the positive word of mouth for their products. This was supported by (An, Do, Ngo, & Quan, 2019) that the brand credibility has a positive impact on the word of mouth of the product that helps in improving the positive brand attitude as well. This encourages the people to go for more global products in order to experience their quality. According to Jeng (2016), the brand credibility is judged by its delivery that it promises. The views of the consumers of the products also play a vital role in determining the brand credibility.

The increased globalization in the past few years has also increased the significance of brand credibility in the marketing strategies. The brand i.e., able to fulfill its commitments with its consumers, is considered to be a positive brand and automatically the credibility of such brand is increased as the consumers are satisfied with it. According to "signaling theory", the brand acts as a "signal" while the consumer acts as a "receiver". If the consumer trusted the brand, he/she will start signaling through the brand by offering it to others as well. They will be comfortable enough to use the products in to reflect their own identities. Such consumers acknowledge

their “self-concept” when relying on a credible brand (Black & Veloutsou, 2017). The brand credibility also helps in creating a connection with the brand. Thus, the increasing globalization has encouraged the brands to develop the quality of their products rather than categorizing them to increase the product categories.

This study helped in determining the need of hour. Due to increasing no. of global markets, the competition has become difficult and different brands need to up their games to survive in such an era of globalization. This study also emphasizes on the social responsibility of the global brands. As these brands develop an identity for themselves, they are considered by many consumers around the globe. The country of origin of such brands also impacts the perceptions of the consumers about the perceived brand globalness of their products that has an impact on the brand attitude that influences the buying behavior of the consumers. Thus, it has also been observed that a positive word of mouth about the brand helps in positive publicity of the brand encouraging more people to buy it. This ultimately increases the brand credibility thus promoting the trust of the consumers who start to signal the brands of their trust.

VII. CONCLUSION

The present world is considered to be a globalized village as the increased globalization is helping in decreasing barriers between the countries and promoting the exchange of thoughts, beliefs, goods, human resources etc. between the countries. Initially many of the West African countries like Senegal has shown a lot of changings in order to convert itself into a global market. However, with the increasing competition, the country is facing different difficulties in keeping up with the globalized world. The people of Senegal, however, has developed a critical thinking behavior about the globalization in the past few years. Different political factors were also found to have an impact on the perceived brand globalness in Senegal. Even though Senegal also manages to be one of the growing global markets in the world. It has been of the view that the image of the country is also found to have an impact on the brand image. This research study was conducted to determine the impact of perceived brand globalness on the brand attitude by considering the mediating role of brand credibility and the moderating role of country of origin and the product type. It was a quantitative study conducted in Senegal through an online survey.

The results obtained from this research study showed that the perceived brand globalness has a significant impact on the brand attitude. This encourages the brands of Senegal to work towards the perceived brand globalness in order to have a better reach to the consumers in different parts of the world. Such attitude helps them to be more productive in engaging more consumers being a part of the global market. For this purpose, most of the brand in Senegal prefer to export their products in different global markets thus effecting the critical analysis of the brands. For this purpose, the positive word of mouth about the brand is also considered to be very important by the Senegal brands (Wu & Wang, 2011). This study also showed the positive mediating role of brand credibility in relationship between the perceived brand globalness and the brand attitude. Different market strategies are designed by such brands considering the significance of brand credibility. This study also showed a positive moderating impact of country of origin in relation with the perceived brand globalness and the brand attitude. The domestic brands in Senegal use better marketing strategies as well as positioning strategies. So, other global brands have to face quite a competition in developing a place in the minds of the consumers. However, the prestige of the local as well as the foreign brands also has an impact on the brand attitude. However, the foreign market has to face a lot of pressure due to the positioning of locally available brands in Senegal. The role of marketers is considered to be important in this regard as they are considered to be the ones to design the strategies for positioning of their products in the minds of local consumers as well as globally. However, different brands offer different product types. Even though the product type is not considered to have a significant impact on the perceived brand globalness. Whereas, in case of high involvement of product category in the marketing strategy, it might have an impact on the perceived brand globalness. The global brands in Senegal have even introduced different product categories but still no effective positing is observed in the mind of domestic people in Senegal. However, the cultural values in Senegal, are also considered to have an important impact on the brand attitude. That’s why the positioning of the domestic brands in Senegal is highly accepted by the consumers.

This research study also helped in determining the impact of perceived brand globalness on brand attitude in context of Senegal. Senegal is a West African country with a growing global market. The brand attitude is also impacted by the brand credibility as well the country of origin and product type. Thus, it has been concluded from this research study, that the brand credibility has a strong influence on the relationship between the perceived brand globalness and the brand attitude. Different brands in Senegal have used positive WOM to promote their brands by means of electronic means, social media etc. This has helped the domestic brand in Senegal to be highly accepted by the consumers as compared to foreign brands. However, such marketing strategies are also being used by the brands of Senegal to operate in the foreign countries improving their reach globally.

VIII. LIMITATIONS AND FUTURE RESEARCH INDICATIONS

For this research study, the online survey was conducted, and 50 key informants were selected to forward the link of the questionnaire to 500 respondents. However, only 325 of these respondents responded. Even 27 of these responses were also not included in the final study. The main reason for this was incomplete answers. Thus, this led to a small sample size. This method of collecting data did not consider to be effective as the respondents did not take their duty seriously. In order to prevent such issues for the future research

studies, the questionnaires should be self-administered without involving the third party and the completion of data should be made necessary for every respondent in order to have complete and effective data for analysis.

For this research study, the cross-sectional time horizon was used due to limited time. This only helped in obtaining the data for a limited time frame that was not applicable in many of the areas of perceived brand globalness. However, for future research studies, more longitudinal studies should be conducted in order to collect data over an extended period in order to determine the impact of different macro as well as micro elements on the perceived brand globalness as well as the brand attitude. This will help in obtaining a better understanding of the needed reforms in order to improve brand attitude.

For this research study the impact of few variables is considered to determine the brand attitude. These variables included: perceived brand globalness, brand credibility, country of origin and product type. This helped in providing a little literature review for brand attitude. However, many other studies also focus on the influence of other variables on the brand attitude. For future research studies, the impact of other variables such as brand prestige, brand loyalty, brand awareness and brand quality (Choi, Ok, & Hyun, 2011) should also be considered. As these variables are considered to have a substantial influence on brand attitude. However, many studies have been conducted regarding the proposed variables, but no such study has been conducted in context of Senegal. So, such study conducted in the future will help the global market of Senegal to consider these factors also to improve the brand attitude. This will be highly effective in case of positioning of domestic products in Senegal.

REFERENCES

- [1] Ahmed, Z. U., Johnson, J. P., Ling, C. P., Fang, T. W., & Hui, A. K. (2002). Country-of-origin and brand effects on consumers' evaluations of cruise lines. *International Marketing Review*.
- [2] Aiello, G., & Donvito, R. (2016). *Global branding and country of origin: Creativity and passion*: Routledge.
- [3] Ainslie, A., & Rossi, P. E. (1998). Similarities in choice behavior across product categories. *Marketing Science*, 17(2), 91-106.
- [4] Akcay, E. E., Kooli, K., & Gaber, H. R. (2020). Does perceived social responsibility affect consumer attitudes towards global brands? Lessons from the Nescafé Case in Turkey. *Journal of Customer Behaviour*, 19(3), 226-251.
- [5] Akram, A., Merunka, D., & Akram, M. S. (2011). Perceived brand globalness in emerging markets and the moderating role of consumer ethnocentrism. *International Journal of Emerging Markets*.
- [6] Alhabeeb, M. (2002). Perceived product quality, purchase value, and price. Paper presented at the Allied Academies International Conference. Academy of Marketing Studies. Proceedings.
- [7] Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2(3), 39-43.
- [8] Allen, N. J., & Meyer, J. P. (2018). The measurement of and antecedents of affective, continuance, and normative commitment to the organization. *Journal of Occupational Psychology*, 1-18.
- [9] Almalki, S. (2016). Integrating Quantitative and Qualitative Data in Mixed Methods Research--Challenges and Benefits. *Journal of education and learning*, 5(3), 288-296.
- [10] Ampuero, O., & Vila, N. (2006). Consumer perceptions of product packaging. *Journal of consumer marketing*.
- [11] An, J., Do, D. K. X., Ngo, L. V., & Quan, T. H. M. (2019). Turning brand credibility into positive word-of-mouth: integrating the signaling and social identity perspectives. *Journal of Brand Management*, 26(2), 157-175.
- [12] Anderson, E. W., & Sullivan, M. W. (1919). The antecedents and consequences of customer satisfaction for firms. *Marketing Science*.
- [13] Anderson, J. C., & Gerbing, D. W. (2017). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*.
- [14] Andrew, G., Arora, R., Bilmes, J., & Livescu, K. (2013). Deep canonical correlation analysis. Paper presented at the International conference on machine learning.
- [15] Antwi, S. K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European journal of business and management*, 7(3), 217-225.
- [16] Arghode, V. (2012). Qualitative and Quantitative Research: Paradigmatic Differences. *Global Education Journal*, 2012(4).
- [17] Armstrong, J. S., & Overton, T. S. J. (2017). Estimating non-response bias in mail surveys. *Journal of Marketing Research*.
- [18] Arora, N., Prashar, S., Parsad, C., & Vijay, T. (2020). Mediating role of consumer involvement between celebrity endorsement and consumer evaluation: Comparative study of high and low involvement product. *Asian Academy of Management Journal*, 24, 113-142. doi: 10.21315/aamj2019.24.2.6
- [19] Azungah, T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qualitative Research Journal*.
- [20] Baek, T. H., Kim, J., & Yu, J. H. (2010). The differential roles of brand credibility and brand prestige in consumer brand choice. *Psychology & Marketing*, 27(7), 662-678.
- [21] Bagozzi, R. (2018). The self regulation of attitudes, intentions and behavior. *Social Psychology Quarterly*, 178-204.
- [22] Bagozzi, R., & Heatherton, T. F. (2018). A general approach to representing multifaceted personality constructs: application to state self-esteem. *Structural Equation Modeling*, 35-67.
- [23] Batra, R., Ramaswamy, V., Alden, D. L., Steenkamp, J.-B. E. M., & Ramachander, S. (2000). Effects of Brand Local and Nonlocal Origin on Consumer Attitudes in Developing Countries. *Journal of Consumer Psychology*, 9(2), 83-95. doi: https://doi.org/10.1207/S15327663JCP0902_3
- [24] Beatty, S. E., & Smith, S. M. (1987). External search effort: An investigation across several product categories. *Journal of consumer research*, 14(1), 83-95.
- [25] Belch, & E., G. (2019). An Examination of Comparative and Non-Comparative Television Commercials: The Effects of Claim Variation and Repetition on Cognitive Response and Message Acceptance. *Journal of Marketing Research*, 332-349.
- [26] Bhamjee, Z. (2019). *Global branding and country of origin: creativity and passion*: Taylor & Francis.
- [27] Black, I., & Veloutsou, C. (2017). Working consumers: Co-creation of brand identity, consumer identity and brand community identity. *Journal of business research*, 70, 416-429.

- [28] Blerkom, M. L. V. (2019). Measurement and Statistics for Teachers.
- [29] Bourdin, D., Halkias, G., & Makri, K. (2021). The compensatory influences of country stereotypes and the global/local nature of brands: An extended framework. *Journal of business research*, 137, 28-38.
- [30] <https://doi.org/10.1016/j.jbusres.2006.11.003>
- [31] Chen, K., Luo, P., & Wang, H. (2017). An influence framework on product word-of-mouth (WoM) measurement. *Information & Management*, 54(2), 228-240.
- [32] Hussain, S., Melewar, T., Priporas, C.-V., Foroudi, P., & Dennis, C. (2020). Examining the effects of celebrity trust on advertising credibility, brand credibility and corporate credibility. *Journal of Business Research*, 109, 472-488.
- [33] Ismail, Z., Masood, S., & Tawab, Z. M. (2012). Factors affecting consumer preference of international brands over local brands. Paper presented at the 2nd international conference on social science and humanity.
- [34] Jeng, S.-P. (2016). The influences of airline brand credibility on consumer purchase intentions. *Journal of Air Transport Management*, 55, 1-8.
- [35] Jin, N., Lee, S., & Jun, J.-H. (2015). The role of brand credibility in predicting consumers' behavioural intentions in luxury restaurants. *Anatolia*, 26(3), 384-396.
- [36] Josefy, M., Dean, T. J., Albert, L. S., & Fitza, M. A. (2017). The Role of Community in Crowdfunding Success: Evidence on Cultural Attributes in Funding Campaigns to 'Save the Local Theater'. *Entrepreneurship Theory and Practice*, 161-182.
- [37] Kabir, S. (2016). Basic Guidelines for Research. Dhaka
- [38] Kao, G. H.-Y., Wang, S. W., & Farquhar, J. D. (2020). Modeling airline crisis management capability: brand attitude, brand credibility and intention. *Journal of Air Transport Management*, 89, 101894.
- [39] Kaur, P., Stoltzfus, J., & Yellapu, V. (2018). Descriptive statistics. *International Journal of Academic Medicine*, 4(1), 60.
- [40] Keane, Marta, Morschett, & Dirk. (2016). Reducing the Negative Effect of Consumer Ethnocentrism on Patronage Behaviour at Foreign Retailers. *ZFP-Journal of Research and Management*, 228-242.
- [41] Keller, K. L. (2008). *strategic brand management: Building, measuring, and managing Brand equity*. Upper Saddle River, NJ: Prentice Hall.
- [42] Keller, K. L. (2018). Conceptualizing, measuring and managing customer-based brand equity. *Journal of Marketing*.
- [43] Kemp, E. (2011). Healthy brands: establishing brand credibility, commitment and connection among consumers. *Journal of Consumer Marketing*.
- [44] Kennedy, B. L., Thornberg, R., & Flick, U. (2018). Deduction, induction, and abduction. *The SAGE handbook of qualitative data collection*, 49-64.
- [45] Kim, Moon-Yong, Moon, Sangkil, Iacobucci, & Dawn. (2019). The Influence of Global Brand Distribution on Brand Popularity on Social Media. *Journal of International Marketing*, 22-38.
- [46] Kim, E., Ham, S., Yang, I. S., & Choi, J. G. (2013). The roles of attitude, subjective norm, and perceived behavioral control in the formation of consumers' behavioral intentions to read menu labels in the restaurant industry. *International Journal of Hospitality Management*, 35, 203-213.
- [47] Kim, K., & Hann, I. H. (2015). Does Crowdfunding Democratize Access to Finance? A Geographical Analysis of Technology Projects. School Research Paper.
- [48] Kincheloe, J. L., & Tobin, K. (2015). The much exaggerated death of positivism Doing educational research (pp. 15-32): Brill Sense.
- [49] Kline, R. (2013). Exploratory and confirmatory factor analysis. *Applied quantitative analysis in the social sciences*, 171-207.
- [50] Kolbl, Ziva, Arslanagic-Kalajdzic, & Maja. (2019). Stereotyping Global Brands: Is Warmth More Important Than Competence? *journal of Business Research*, 614-621.
- [51] Kolbl, Ž., Arslanagic-Kalajdzic, M., & Diamantopoulos, A. (2019). Stereotyping global brands: Is warmth more important than competence? *Journal of business research*, 104, 614-621.
- [52] Koubaa, Y. (2008). Country of origin, brand image perception, and brand image structure. *Asia pacific journal of marketing and logistics*.
- [53] Laroche, M., & Sadokierski, R. (1994). Role of confidence in a multi-brand model of intentions for a high-involvement service. *Journal of Business Research*, 29(1), 1-12.
- [54] Lee, H., Chae, M.-S., & Lew, Y. K. (2020). The application of categorization and stereotype content theories to country of origin image: Vietnamese perceptions towards Korean wave brands. *Asia Pacific Business Review*, 26(3), 336-361. doi: 10.1080/13602381.2019.1630199
- [55] Lertxundi, A., Barrutia, J., & Landeta, J. (2019). Relationship between innovation, HRM and work organisation. An exploratory study in innovative companies. *International Journal of Human Resources Development and Management*, 19(2), 183-207.
- [56] Li, Y., Wang, X., & Yang, Z. (2011). The effects of corporate-brand credibility, perceived corporate-brand origin, and self-image congruence on purchase intention: Evidence from China's auto industry. *Journal of Global Marketing*, 24(1), 58-68.
- [57] Lim, K., & O'Cass, A. (2001). Consumer brand classifications: an assessment of culture-of-origin versus country-of-origin. *Journal of Product & brand management*.
- [58] Liu, H., Schoefer, K., Fastoso, F., & Tzou, E. (2021). Perceived brand globalness/localness: a systematic review of the literature and directions for further research. *Journal of International Marketing*, 29(1), 77-94.
- [59] Mandler, T. (2019). Beyond reach: an extended model of global brand effects. *International Marketing Review*.

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Challenges in Teaching and Learning in an Online set-up: Exploring the abilities and constraints of the 21st-century Learners

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Abstract- Learners need skills such as critical thinking, decision making, innovation, the ability to communicate new knowledge, and the ability to solve complex problems. This study explores the learners' abilities and constraints to describe completely the learner's challenges to the online learning environment. The study utilized a sequential explanatory mixed-methods approach utilizing survey and focus group discussion to address the research question. The population included 59 students enrolled in nursing education in the selected school. Respondents were determined utilizing the set inclusion and exclusion criteria. The study utilized a self-report questionnaire and a focused group discussion (FGD) guide questionnaire. Using a self-report survey tell more than what the participants know or do, and this delimit the findings. This challenge was addressed by explaining to them in detail each of the indicators and the use of methodological triangulation through the qualitative part using FGD. Results shows that the abilities of learners are to a great extent while the constraints of learners are to some extent. Eight themes were generated in the study: Difficult online learning, confusing learning materials, not same as face to face, organizing things, connected to others online, accessible to all, lagging in connection and limited time. The 21st century learners have abilities in online learning however, the use of the internet and the connection online does not guarantee that learners can cope up with the online learning set up. Learners prefer still the traditional way of learning, and that is face to face classes. Continuous improvement of the online learning set-up is recommended so learners can adopt to the challenges.

Index Terms – online learning, teaching, learning process, 21st century learning challenges, learning materials

I. INTRODUCTION

The fourth industrial revolution calls for a new model of learning for twenty-first-century learners. The nature of the problems that learners must solve in science courses must be transformed to tackle complex global challenges. Learners need skills such as critical thinking, decision making, innovation, the ability to communicate new knowledge, and the ability to solve complex problems.

The 21st-century learners must not only have acquired knowledge but rather must apply the information and solve complex tasks. This must be the focus of the higher educational institutions to create a learning environment that promotes students interaction that will facilitate the creation of effective lifelong learners.

Recently, COVID 19 has greatly affected our education. All educational institutions have transformed into online learning. With this development, the learners are the most affected and there have been many reports on the learner's challenges. The restrictions in movements and protocol could further aggravate the challenges experienced by the learners. The following studies have investigated this area with a focus on students' mental health (Copeland et al., 2021; Fawaz et al., 2021), home learning (Suryaman et al., 2020), self-regulation (Carter et al., 2020), virtual learning environment (Almaiah et al., 2020; Hew et al., 2020; Tang et al., 2020), and students' overall learning experience (e.g., Adarkwah, 2021; Day et al., 2021; Khalil et al., 2020; Singh et al., 2020, Caballes, & Delos Reyes, 2022), Development of multimedia and technology based instructions (Caballes, & Delos Reyes, 2020, Caballes & Montalbo, 2019, Caballes & Montellano, 2019, Caballes, & Tiria, 2020).

This study explores the learners' abilities and constraints to describe completely the learner's challenges to the online learning environment. These previous studies are concerned with different aspects of the online learning environment, thus this study is of unique to consider. Addressing this area is vital to describe the learner's challenges especially in this time of the pandemic.

Research Objectives

To determine the challenges of the 21st-century learners of science education in an online set-up.

Specific objectives

1. To describe the profile of the learners enrolled in science education according to:

- 1.1 age,
- 1.2 gender,
- 1.3 year level
- 1.4 online learning mode and platforms
- 1.5 length of engagement in online classes

2. To identify the abilities of the learners according to the five domains:

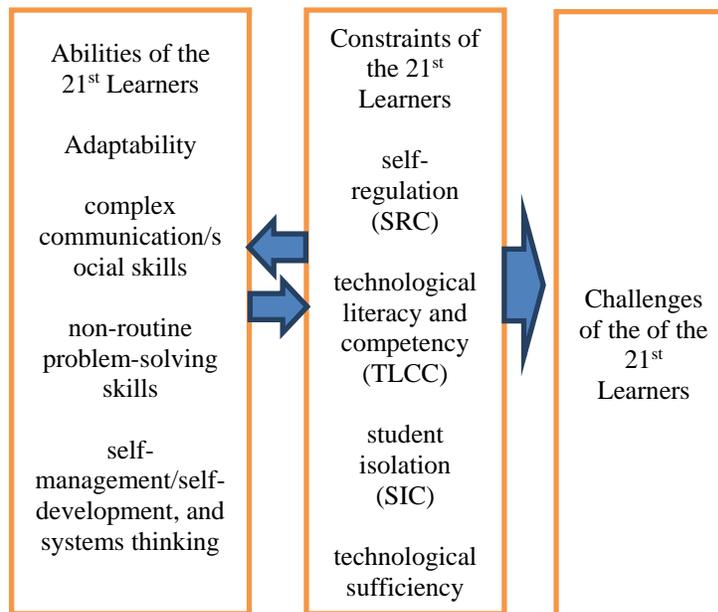
- 2.1 Adaptability
- 2.2 complex communication/social skills
- 2.3 non-routine problem-solving skills
- 2.4 self-management/self-development, and
- 2.5 systems thinking

3. To recount the constraints of the learners in an online set up according to:

- 3.1 self-regulation (SRC)
- 3.2 technological literacy and competency (TLCC)
- 3.3 student isolation (SIC)
- 3.4 technological sufficiency (TSC), and
- 3.5 technological complexity (TCC)

4. To determine themes in the students' responses on their constraints and abilities

Conceptual Framework



Rasheed et al.'s (2020) study of students' experience in an online learning environment will be the framework of this study. These challenges are grouped into five that included self-regulation (SRC), technological literacy and competency (TLCC), student isolation (SIC), technological sufficiency (TSC), and technological complexity (TCC) challenges (Rasheed et al., 2020). SRC is a group of students' behaviors that controls their emotions and thoughts to achieve learning objectives. On the other hand, TLCC is concerned about the ability of students to effectively use technology for learning purposes. The emotional discomfort that the students experience which resulted from separation from their peers is explained in SIC. Accessing available resources in online learning technologies is described as TSC. Further, TCC is the student's experience when they are exposed to complex and over-sufficient technologies (Rasheed, 2020).

While the learner's abilities were based on the cognitive skills domain according to the study of Doyle (2016) which enumerated the abilities of the learners in 5 cognitive domains namely adaptability, complex communication/social skills, non-routine problem-solving skills, self-management/self-development, and systems thinking. The study will describe the learner's abilities and constraints and will determine the relationship between these two variables to describe the challenges of 21st-century learners. The researchers hypothesized that the two variables (abilities and constraints) are related have an effect on each other.

The identification of the learners' abilities is important for the learners to address their constraints and challenges in online learning education. The results of the study will also be beneficial to educators teaching in science education because they can identify the learners' abilities and constraints and address this by improving the online learning environment. Further, administrators of science education can use the results of the study to plan for the improvement of teaching and learning strategies for 21st-century learners.

II. RESEARCH ELABORATIONS

Education and the COVID 19 pandemic

The World Health Organization (WHO) classified the rapidly growing coronavirus outbreak as a pandemic in March 2020. Since then, the number of those infected around the world has risen at an alarming rate. As of this writing, there are roughly 181.5 million confirmed cases of CoViD-19 worldwide, with 3.93 million deaths reported to WHO (2021). Certainly, the CoViD-19 pandemic has dramatically altered the lives of everyone. Strict enforcement of social distancing, mask-wearing, travel bans, and skeletal work schedules are just a few of the national governments' responses to mitigating the virus's spread (Ferrel, 2020, as cited by Agarwall & Kaushik, 2020).

The Educational Sector, like many other aspects of our daily lives, is severely impacted by the CoViD-19. Most of its ramifications specifically impacted students, educators, and educational organizations all around the world. According to Toquero (2020), who was cited by Adnan and Anwar (2020), the pandemic forced several schools, colleges, and even universities around the world to close for students, faculty members, and staff to effectively follow social distancing measures. Many universities have switched from a traditional classroom setup to a fully digitalized mode of pedagogy, recognizing the critical need of this current situation (Dhawan, 2020).

According to McBrien et al. (2009), as cited in Dhawan's (2020) study, the vast advancement of various technologies has made distance learning easy. Dhawan (2020) defined online learning as any tool that can make the teaching-learning process more flexible and innovative. It is widely recognized as a learning experience in both synchronous and asynchronous environments using various devices with internet access (e.g., smartphones, laptops, televisions, etc.). According to a World Bank report (2020), learning platforms such as Moodle and Learning Management System (LMS), as well as Microsoft and Google Applications, are the most popular in countries such as Austria. Furthermore, the national Ministry of Education has made additional efforts to improve the effectiveness of online learning in a variety of settings. At the same time, the Ministry of Education (MoE) in Bhutan launched the "Bhutan e-Learning Program," which allows different schools in the country to access lessons via various technologies. Various telecommunications companies in the country, including Bhutan TelCom (BT) and TashiCell, are collaborating with the government to provide additional data to students. Teachers frequently use applications such as Google Classroom, WeChat, and WhatsApp to assign various tasks to their students, such as specific chapters to read and a set of questions to answer (The World Bank, 2020).

In addition, teachers in China are required to receive guidance on teaching methods using online tutorials viewed via live streams. On top of that, approximately 22 validated course platforms were mobilized to provide free online courses to primary and secondary schools, as well as more than 24, 000 online courses made available to university students nationwide (UNESCO, 2020).

The transition on the modality of learning was also implemented in the Philippines, where the first CoViD-19 death outside of China was recorded. Each learning sector in the country proposed a plethora of innovative programs. According to a statement released by the Department of Education (2020), not only was the start of the school year delayed but certain policies and practices were also modified to fully adapt to the very "new normal." The department emphasized that different modalities are used, so teachers and students are not required to go to school and learn traditionally. Primarily among higher education institutions, virtual classrooms are part of the "new normal". The enhancement of online platforms such as Google Classroom, Messenger, Zoom, Edmodo, Facebook, and Youtube are strongly suggested by the Commission on Higher Education (CHED, 2020 as cited by Tria, 2020). In either case, both will make changes to each academic calendar and deploy multiple learning delivery methods such as face-to-face blended learning, distance learning, homeschooling, and other modes of delivery (CHED, 2020; DepEd, 2020).

Abilities of the 21st Century Learners

The abilities of the 21st-century learners in this study are focused only on cognitive abilities. However, the different studies and literacy abilities of students are not only focused on cognitive but also interpersonal and intrapersonal competencies.

The basic skills that 21st-century learners must include are math and literacy according to Doyle (2016). Doyle further discussed that the school must teach the learners the skills to use this knowledge as active citizens. The following skills according to Doyle are necessary to build and develop communicate effectively and listen actively and use evidence to check for information, the use of one

language, critical thinking ability to analyze things around them, enable to overcome challenges, and discover opportunities, reason logically, and interpret clearly and become and remain digitally literate. Anderman (2020) explained the abilities of the students in terms of adaptability, complex communication/social skills, non-routine problem-solving skills, self-management/self-development, and systems thinking. Further, he explains that students should be involved in critical thinking skills to deliver their points of view. Adaptability requires the student's willingness to engage in the thinking process. In the 21st century, most of the students work in teams together and contribute knowledge. Communication skills are vital in the field of science, and this is evident in research results.

Challenges of the learners in the online set-up

The start of the new normal brought changes in the education sector and this greatly affect the educators and as well as learners. Studies on the challenges of learners in online learning are explained in different published journals. Learners reported concerns about learning and evaluation methods, overwhelming task loads, technical difficulties, and confinement (Fawaz et al. 2021).

Learners were dissatisfied with online learning in general, especially in the aspect of communication and question-and-answer modes according to Tang et al (2020). This study was conducted among engineering students. Transformation of conventional flipped classrooms into fully online flipped classes using a cloud-based video conferencing app was done in this study of Hew et al (2020). The study findings revealed that the two types of environments were equally effective. In contrast to the two studies a study by Suryaman et al, (2020) studied how learning occurred at home during the pandemic. The findings revealed that students faced many obstacles in a home learning environment, such as lack of mastery of technology, high Internet cost, and limited interaction/ socialization between and among students. (Caballes & Chua, 2020) discussed the challenges of students during the Enhanced community quarantine, with those challenges teaching-learning process must continue. Multimedia is an important factor in an online learning set-up (Caballes & Del Mundo ,2022). Teachers' digital skills is an important factor the teaching learning process (Caballes & Dapitan, 2019, Caballes & Doblada, 2021 Caballes & Abenes, 2020, Caballes et al.2020). Teachers should be aware on his digital skills to manipulate multimedia set-ups that are highly utilized in an online learning environment

The study of Adarkwah (2021) and Day et al. (2021), reveals that the pandemic brought up many inequities in the educational systems. Families from the lower socioeconomic groups have limited learning space at home, access to quality Internet service, and online learning resource. However, the students experienced the least challenge on technological literacy and competency. This is not surprising since the students comprise of GenZ generation (born in 1996) high technological and digital literacy (Barrot, 2018; Ng, 2012; Roblek et al., 2019).

III. METHODOLOGY

The present study utilized a sequential explanatory mixed-methods approach utilizing survey and focus group discussion to address the research questions. This approach will allow the researcher to collect complex data about learners' abilities and constraints in an online setting learning environment.

Study population and sampling technique

The population included all students enrolled in nursing education in the selected schools. Respondents were determined utilizing the set inclusion and exclusion criteria

Inclusion criteria:

1. Students must be a regular student
2. Must be enrolled in nursing course
3. Consented to participate in the study

Exclusion criteria:

1. Irregular students
2. Enrolled in other courses
3. Refused to participate in the study

The total sample included 59 students from the School of Nursing. The total respondents do not represent most of the students in CEU but only representative of the population. Because of the of the limitation of time, the pandemic, and the online set up the researchers had difficulty obtaining majority of the responses from the students online. Respondents who refused to participate in the study or withdraw their participation in the study was excluded from the total respondents of the study.

Ethical Considerations

The research proposal was submitted and approved in the chosen school for the conduct of research for human subjects. Participation in the study was voluntary and the respondents did not receive any financial benefit. The participants have the right to refuse participation or withdraw anytime during the conduct of the study without fear of retribution in terms of money or their employment. For the protection of participants' data privacy, all data was stored in the cloud (Gmail accounts) and accessed only by the researchers involved in the study. The principle of confidentiality and anonymity were safeguarded during the conduct of the study. Students' information was

coded to ensure the anonymity of data. Further, the researcher ensured that none of the participants' names or personal details was included in the report of the study findings.

Site of the study

The study was conducted in the School of Nursing, Centro Escolar University, Manila campus. The school was chosen as the setting of the study because it caters to learners enrolled in nursing education. Nursing is one of the science educations and this is chosen because the researcher is a nurse and reports of this study was according to her specialization. The accessibility of the setting and the respondents were also considered. The school is also where the researcher is enrolled as a graduate student.

Research Instruments

The study utilized a self-report questionnaire and a focused group discussion (FGD) guide questionnaire. Using a self-report survey tell more than what the participants know or do, and this delimit the findings. This challenge was addressed by explaining to them in detail each of the indicators and the use of methodological triangulation through the qualitative part using FGD.

The questionnaire was divided into three parts: (1) participant's demographic profile section, (2) rating scales for the learner's abilities; and (3) rating scales for the online learner's constraints, The demographic profile section asked about the learner's profile (age, gender, course, year in science education), as well as the online learning mode and platforms used in class, and students' length of engagement in online classes.

The instrument to describe the learner's abilities is a self-made questionnaire that was based on related literature and studies. This included items that relate to the five domains of learners' cognitive abilities: Adaptability, complex communication/social skills, non-routine problem-solving skills, self-management/self-development, and systems thinking. The Likert scale uses six scores (i.e., 5—to a very great extent, 4—to a great extent, 3—to a moderate extent, 2—to some extent, 1—to a small extent, and 0—not at all/negligible).

The instrument to describe the learner's challenges was adopted from the study of Barrot and colleagues in 2021. The rating scale section contained 37 items that relate to SRC (6 items), TLCC (10 items), SIC (4 items), TSC (6 items), TCC (3 items), LRC (4 items), and LEC (4 items). The Likert scale uses six scores (i.e., 5—to a very great extent, 4—to a great extent, 3—to a moderate extent, 2—to some extent, 1—to a small extent, and 0—not at all/negligible) assigned to each of the 37 items.

An open-ended questionnaire was utilized in the conduct of FGD. This contained questions on the abilities and challenges of learners in the online set-up.

Validation of Instrument

The instrument was reviewed by two experienced educators for clarity, accuracy, and content, and face validity. The instruments undergone reliability tests to determine internal consistency using Cronbach Alpha statistics.

Data Collection Process

The data collection process was conducted online via Google survey and zoom. The Google survey was utilized for the questionnaire while Zoom was used in the conduct of FGD. Students was allowed to ask for questions and additional explanations related to the questionnaire contents. Online surveys and interviews were used because of the pandemic and heightened restrictions. For triangulation, an FGD was conducted. Ten randomly selected students were invited to participate in the FGD. The FGD was done by the researcher and assisted by an expert researcher. This is done because the researcher is not very well verse in the Filipino language which the participants used during the FGD. The researcher ensured that the participants was comfortable and open to talk freely during the FGD. These was done by informing the participants that there are no wrong responses and that their identity and responses would be handled with the utmost confidentiality. The FGD was recorded with the permission of the participants to ensure that all relevant information was accurately captured for transcription and analysis.

Data Analysis

To analyze the research variables, the study used both quantitative and qualitative analyses. Mean scores (M) and standard deviations (SD) to determine the abilities and level of challenges experienced by students during online learning were used as quantitative analysis, The mean score for each descriptor was interpreted using the following scales: 4.18 to 5.00 (to a very great extent), 3.34 to 4.17 (to a great extent), 2.51 to 3.33 (to a moderate extent), 1.68 to 2.50 (to some extent), 0.84 to 1.67 (to a small extent), and 0 to 0.83 (not at all/negligible).

For the qualitative data, the student's responses in the open-ended questions and the transcribed FGD was analyzed. Specifically, they used multilevel coding in classifying the codes from the transcripts (Birks & Mills, 2011). The relevant codes from the responses of the participants were categorized into codes based on the similarities or relatedness of their properties and dimensions. Comparison and continuous analysis were done to allow subcategories to emerge.

To ensure the reliability of the analysis, two coders independently analyze the qualitative data. The researchers sought the help of an expert researcher to act as the second coder. Both coders must be knowledgeable on the research questions, research method, and codes and coding scheme of the study. Both coders assessed and discussed how they both analyze the qualitative data. A satisfactory agreement between two coders is necessary to prevent bias. The participants' responses were coded in three layers that includes: structural coding,

pattern coding and triangulation. Structural coding is the first round of coding is the first coding where the data are coded according to the research questions. While the pattern coding is a way of grouping summaries into a small number of themes. Lastly, triangulation is the cross examination of results. Themes are presented in three general themes according to the research focus of challenges, abilities and constraints of the 21st century learners.

VI. RESULT & DISCUSSIONS

The study utilized a mixed method technique to effectively capture the challenges of the 21st century learners in an online set-up. Further, constraints and abilities were assessed through survey and FGD.

Quantitative results

Profile of the Respondents

Table 1: Profile of the Respondents (N=59)

Profile	Frequency	Percentage
Age		
18-20 years old	21	35.59
21-25 years old	38	64.40
Gender		
Male	11	18.64
Female	48	81.35
Year Level		
Level 1-	24	40.67
Level 2-	12	20.33
Level 3-	12	20.33
Level 4-	11	18.64
Secondary online learning		
Gmeet	30	50.84
Gmeet and FB messenger	16	27.11
Gmeet, FB messenger and zoom	13	22.03
Length of engagement in class		
>5 months		
6 mos- 1yr	8	13.55
1-2 yrs	4	6.77
	47	79.66

The profile of the respondents is presented in Table 1. Majority of the respondents are 21-25 years old (N=38, P=64.40%), female (N=48, P=81.35%), level 1 students (N= 24, P=40.67%), Used Google meet as secondary online learning (N=30, P=50.84%) and have 1-2 years (N=47, P=79.66%) length of engagement in class.

Abilities of learners

Table 2 Abilities of Learners

Criteria	Mean	SD	Verbal Interpretation
Adaptability			To a moderate extent
1. When an obstacle arises, I was be able to overcome it smoothly and this could require changing my entire plan for the day on-the-spot.	3.14	1.07	
2. I can keep up with and understand the new innovations which could be beneficial to me in the online set-up	3.49	0.83	To a moderate extent
3. I can adapt easily to technological change brought about by the online set-up	3.59	0.87	To a great extent
4. I can easily collaborate and communicate with another s(interpersonal) in an online set up	3.27	1.00	To a moderate extent
5. I can respond to different work situations and make decisions and adjustment of my roles to the new online set-up	3.54	0.82	To a great extent

Average Mean	3.39	0.91	To a great extent
Complex communication/social skills			To a great extent
1. I can articulate thoughts effectively using all forms of communication in a variety of contexts	3.51	0.82	To a great extent
2. I can listen to others to understand meaning, attitude, and intention	4.08	0.84	To a great extent
3. I can communicate for a variety of purposes and audiences	3.54	0.92	To a great extent
4. I can use media and technology to communicate with impact	3.80	0.91	To a great extent
Average Mean	3.73	0.87	To a great extent
Non-routine problem-solving skills			To a great extent
1. I can collect data, understanding and interpreting the meaning of the information	3.80	0.78	To a great extent
2. I can do conceptualization, logical reasoning, applying strategy, analytical thinking, decision making and synthesizing to solve any problem.	3.66	0.82	To a great extent
Average Mean	3.73	0.8	To a great extent
Self-management/self-development			To a moderate extent
1. I can adjust easily to the online set-up and my education life	3.25	0.86	To a moderate extent
2. I have effective and efficient learning strategies to access and use knowledge that I gain	3.41	0.77	To a great extent
3. I can motivate myself, and can monitor and change my behaviors when learning does not occur	3.34	1.11	To a great extent
Average Mean	3.33	0.91	To a moderate extent
Systems thinking			To a moderate extent
1. I can easily solve problems and come up with multiple solutions	3.24	0.80	To a moderate extent
2. I can respond to open-ended questions and formulate solutions to problems	3.46	0.79	To a great extent
3. I can choose and engage in solving authentic problems in a variety of learning activities	3.36	0.78	To a great extent
Average Mean	3.35	0.79	To a great extent

Table 2 presents the abilities of the 21st century learners. Based on the table the learner abilities are divided according to adaptability, complex communication/ social skills, problem solving skills, self-management development and systems thinking.

The adaptability of learners is described as to a great extent with a mean of 3.39 and SD of 0.91. The highest among these criteria is criterion #3 “I can adapt easily to technological change brought about by the online set-up” with a mean of 3.59 and SD of 0.87 which is verbally interpreted as to a great extent. While the lowest among these criteria is criterion # 1 “When an obstacle arises, I was be able to overcome it smoothly and this could require changing my entire plan for the day on-the-spot.” With the mean of 3.14 and SD of 1.07 and verbally interpreted as to a moderate extent.

In terms of complex communication/ social skills, the learners described it as to a great extent with a mean of 3.73 and SD of 0.87. The highest among these criteria is criterion # 2 “I can listen to others to understand meaning, attitude, and intention with a mean of 4.08 and SD of 0.84. The lowest among the criteria is criterion # 1 “I can articulate thoughts effectively using all forms of communication in a variety of contexts” with a mean of 3.51 and SD of 0.82 which is verbally interpreted as to a great extent.

The third abilities of learners is the ability to do non routine problem solving skills. The average mean is 3.73 with the SD of 0.80 and verbally interpreted as to a great extent. The highest among these criteria is criterion # 1 “I can collect data, understanding and interpreting the meaning of the information” with a mean of 3.80 and SD of 0.78 and verbally interpreted as to a great extent.

Self-management or self-development abilities of learners are described as to a moderate extent with a mean of 3.33 and SD of 0.91. The highest among these criteria is “I have effective and efficient learning strategies to access and use knowledge that I gain with a

mean 3.41 and SD of 0.77 and verbally interpreted as to a great extent. While the lowest is criterion # 1 I can adjust easily to the online set-up and my education life with a mean of 3.25 and SD of 0.86 verbally interpreted as to a moderate extent.

Last of the criteria for the abilities is systems thinking. This ability is described by the respondents as to a great extent with a mean of 3.35 and SD of 0.79. The highest among these criteria is criterion # 2 “I can respond to open-ended questions and formulate solutions to problems” described as also to a great extent with a mean of 3.46 and SD of 0.79.

Constraints of the Learners in in online set-up

Table 3 Constraints of the Learners

Criteria	Mean	SD	Verbal Interpretation
Self-regulation (SRC)			To a small extent
1. I delay tasks related to my studies so that they are either not fully completed by their deadline or had to be rushed to be completed.	1.58	1.50	
2. I fail to get appropriate help during online classes.	1.71	1.41	To some extent
3. I lack the ability to control my own thoughts, emotions, and actions during online classes	1.91	1.48	To some extent
4. I have limited preparation before an online class.	2.05	1.41	To some extent
5. I have poor time management skills during online classes.	2.10	1.31	To some extent
6. I fail to properly use online peer learning strategies (i.e., learning from one another to better facilitate learning such as peer tutoring, group discussion, and peer feedback).	1.02	1.58	To a small extent
Average Mean	1.72	1.44	To some extent
Technological literacy and competency (TLCC)			To a small extent
1. I lack competence and proficiency in using various interfaces or systems that allow me to control a computer or another embedded system for studying.	1.31	1.28	
2. I resist learning technology.	0.81	1.14	Not at all
3. I am distracted by an overly complex technology.	1.73	1.51	To some extent
4. I have difficulties in learning a new technology.	1.19	1.11	To a small extent
5. I lack the ability to effectively use technology to facilitate learning.	1.14	1.12	To a small extent
6. I lack knowledge and training in the use of technology	0.88	1.00	To a small extent
7. I am intimidated by the technologies used for learning.	1.12	1.30	To a small extent
8. I resist and/or am confused when getting appropriate help during online classes.	1.47	1.42	To a small extent
9. I have poor understanding of directions and expectations during online learning.	1.24	1.19	To a small extent
10. I perceive technology as a barrier to getting help from others during online classes.	1.24	1.32	To a small extent
Average Mean	1.21	1.23	To a small extent
Student isolation (SIC)			To a moderate extent
1. I feel emotionally disconnected or isolated during online classes.	2.64	1.51	
2. I feel disinterested during online class.	2.05	1.47	To some extent

3. I feel unease and uncomfortable in using video projection, microphones, and speakers.	2.36	1.76	To some extent
4. I feel uncomfortable being the center of attention during online classes.	3.05	1.60	To a moderate extent
Average Mean	2.52	1.58	To a moderate extent
Technological sufficiency (TSC)			To a small extent
1. I have an insufficient access to learning technology.	1.39	1.39	
2. I experience inequalities about access to and use of technologies during online classes because of my socioeconomic, physical, and psychological condition.	1.39	1.44	To a small extent
3. I have an outdated technology.	1.41	1.60	To a small extent
4. I do not have Internet access during online classes.	0.73	1.10	Not at all
5. I have low bandwidth and slow processing speeds.	1.76	1.56	To some extent
6. I experience technical difficulties in completing my assignments.	1.93	1.53	To some extent
Average Mean	1.43	1.43	To a small extent
Technological complexity (TCC)			To a small extent
1. I am distracted by the complexity of the technology during online classes.	1.47	1.28	
2. I experience difficulties in using complex technology.	1.58	1.35	To a small extent
3. I experience difficulties when using longer videos for learning.	2.22	1.31	To some extent
Average Mean	1.75	1.31	To some extent
Learning resource challenges (LRC)			To some extent
1. I have an insufficient access to library resources.	2.24	1.59	
2. I have an insufficient access to laboratory equipment and materials.	3.07	1.62	To a great extent
3. I have limited access to textbooks, worksheets, and other instructional materials.	2.36	1.45	To some extent
4. I experience financial challenges when accessing learning resources and technology.	2.47	1.86	To some extent
5. I experience online distractions such as social media during online classes.	3.15	1.54	To a moderate extent
6. I experience distractions at home as a learning environment.	3.53	1.50	To a great extent
7. I have difficulties in selecting the best time and area for learning at home.	2.96	1.66	To a moderate extent
8. Home set-up limits the completion of certain requirements for my subject (e.g., laboratory and physical activities).	3.37	1.35	To a great extent
Average Mean	3.55	1.57	To a great extent

Table 3 presents the constraints of the 21st century learners in an online set-up. This is described in six criteria which includes self-regulation (SRC), technological literacy and competency (TLCC), student isolation (SIC), technological sufficiency (TSC), technological complexity (TCC), and learning resource challenge (LRC).

The self-regulation challenge is described by the participants as to some extent with an average mean of 1.72 and SD of 1.44. Among the criteria's criterion # 5 is the highest I" have poor time management skills during online classes" with a mean of 1.72 and SD of 1.44

and verbally interpreted as to some extent. The lowest criteria is rated is criterion # 6 “I fail to properly use online peer learning strategies (i.e., learning from one another to better facilitate learning such as peer tutoring, group discussion, and peer feedback)”. with a mean of 1.02 and SD of 1.58 and verbally interpreted as to a small extent.

The second constraints are technological literacy and competency. This is described by the respondents as to a small extent with a mean of 1.21 and SD of 1.23. The highest rated in the criteria’s is I am distracted by an overly complex technology” with a mean of 1.73 and SD of 1.51 and verbally interpreted as to some extent. While the lowest rated is criterion # 2 I resist learning technology” with a mean of 0.81 and SD of 1.14 verbally interpreted as not at all.

The constraints of learners in terms of student isolation is described as to a moderate extent with an average mean of 2.52 and SD of 1.58. The highest among the criteria is I feel uncomfortable being the center of attention during online classes” with a mean of 3.05 and SD of 1.60 verbally interpreted as top a moderate extent. The lowest rated is criterion # 2 “I feel disinterested during online class” with a mean of 2.05 and SD of 1.51 verbally interpreted as to some extent.

The next constraints are technological sufficiency. This is described as to a small extent with a mean of 1.43 and SD of 1.43. The highest in the criteria is criterion # 6 I experience technical difficulties in completing my assignments” with a mean of 1.93 and Sd of 1.53. verbally interpreted as to a small extent. The lowest is criterion # 4 I do not have Internet access during online classes” with a mean of 0.73 and SD of 1.10 verbally interpreted as not at all.

Technological complexity is described as to some extent by the learners with an average mean of 1.75 and SD of 1.31. The highest criteria rated by participants is criterion # 3 I experience difficulties when using longer videos for learning” with a mean of 2.22 and SD of 1.31 verbally interpreted as to some extent. While lowest rated is criterion # 1 I am distracted by the complexity of the technology during online classes” with a mean of 1.47 and SD of 1.25 verbally interpreted as to a small extent.

The last constraints described by the participants is learning resource challenges with an average mean of 3.55 and Sd of 1.57 verbally interpreted as to a great extent. The highest among these criteria’s is criterion # 6 I experience distractions at home as a learning environment” with a mean of 3.53 and SD of 1.50 verbally interpreted as to a great extent. The lowest is criterion # 1 I experience distractions at home as a learning environment” with a mean of 2.24 and SD of 1.59 verbally interpreted as too some extent.

Qualitative results

The FGD results is analyzed using thematic analysis. In this type of analysis, the responses are coded according to three layers of coding that includes: structural coding, pattern coding and triangulation. The following themes are presented below.

General Themes	Sub themes
Challenges of 21 st century learners	Difficult online learning Confusing learning materials Not the same as face to face
Abilities of 21 st century learners	Organizing things Connected to others online Accessible to all
Constraints of 21 st century learners	Lagging in connection Limited Time

Challenges of 21st Century Learners

The challenges of the 21st century learners are described by the participants as “*difficult online learning*”, “*confusing learning materials*”, and “*not the same as face to face*”

Difficult online learning

The participants expressed in the FGD that the online learning are difficult, they cannot cope up, and they struggle in technology. Although they are considered technology savvy and born with computers, the participants still express adjusting in the online learning set up during this pandemic.

S1- “*Its tiring, because we are always on screen in our computers, ahmmm because in Fae to face we have our peers with us we can cope up easily with stress, but now we only have our laptop then you will talk to your firmid still in front of the laptop Then you will*

just inhale and exhale then cry, but I still need to do it. I feel , though not to all professors that they dont have all the time because we cannot ask our professors for support all the time. We are really drained in this online set up because it is hard for us to understand especially for critical analysis, not all professors are available. we have something to ask and clarify but we cannot do it because they may be busy or he will be disturbed”

Confusing learning materials

Participants verbalized that the materials in their online learning are confusing and hard to understand,. Although instructions are posted in their modules online and explained to them by their teachers, still the difficulty of understanding the materials and self- learning is very difficult for them . Most of the time, they received different instructions coming from their teachers.

S1- No mam its confusing hehehe.. I cannot understand the instructions sometimes. Then sometimes the prof needs to ask another prof, then it takes time before it can get back to us. It's just like the connections between CI but there are CIs that doesn't know what to do

Not the same as face to face

The online learning set up for them are not comparable to the face to face classes that they usually have. For them they want to have the Face to Face classes because they have difficulty and cannot understand the learning process. If given a chance they still want to have the face to face classes. But this is not a reality today, where most of the classes are given in the online set-up because of the pandemic.

S2- Not easy mam because its better if hands on rather than watching YouTube videos that we need to perform for ret dem. It's much better if face to face, we can appreciate much better rather than basing on videos that we are not sure if that's the right thing to do in that scene

S5- No mam because sometimes they still see the Face to face contact. Face to face classes is still different

Organizing things

For them to cope up with the tasks and submissions of assignments, they participants need to organize things. According to the FGD they delay answering or search for materials and other resources in the internet. They delay task without deadlines and prioritize task that needs immediate submissions.

S1- Yes mam , if we answer earlier the instructions maybe altered. That's why it is unfair for those students who answers earlier. That's why related to my answer earlier, I delay answering questions.

S2- I make sure I perform first easy tasks like pre task, post task. Because I alot more time for check-in activities so it's easy for us to accomplish

S1- We delay task without deadlines, we wait for the prof to set deadlines it's just like our adrenalin

Connected to others online

One of the perks of the online learning is the connection with each other online. During this time, students can talk to each other and collaborate online to perform tasks. They share things and materials to each other and rely on their peers for support. Collaboration work is also very common to the 21st century learners.

S1- I think it depends on the person, I have a feeling that we are connected but most of the time I am disconnected. Because sometimes I am still craving for the physical presence of my peers. Because it is really different if we are with our peers. because we cannot really coped up with this situation.

S2- There are time we have that, like in oral revalida in our groups we separate the disease then we did the pathophysiology part then share to each other, There are like discord group or study streams that can help us, like we are discussing lessons

S1- Additional to that mam, it will help if we are with our peers because we have the same level of stress and we can relate to each other

Accessible to all

Aside for connected to each persons, all the learning materials are easily accessible online. The internet has a vast of learning materials where students can easily access. And for them this is one of their abilities is to looked into the internet.

S2- It easy mam since the internet is accessible, it is easy to look for journals that we can look for resources

S1- For me mam ahmmm.. it's easy for us if we already understand what we need to search because it is accessible in the Google

Lagging in connection

One of the requirements of online learning is to have a stable internet access. The problem in the internet is always the connection. Students who are situated in the provinces or rural areas are the most affected. Because most of the time internet access is not stable.

S5- We have mam, since I am located in the province I have slow internet connection then most of the time no electricity

S7- In my case in our house in Cavite, our place is the only one with no signal. So the internet connection is the problem in Cavite. Because the subdivision prohibit other internet providers. So there are many instances that I will be at the coffee shop during online class because we have no signal in our house and too slow internet.

S6- Same with ____ brownout is my problem because in our place we really don't have signal. I still need to go to other place to have signal.

Limited Time

The limitations of time is one of the concerns of online learning and the learners have difficulty performing multiple tasks at the same time. The learners expressed there difficulty in time performing and accomplishing all tasks online.

S4-It is just like me There are times that I need to answer because there are a lot of things to do. It's just like I need to guess the answer, I'll take the luck, I have that thinking

V. Conclusions

The 21st century learners have abilities in online learning however, the use of the internet and the connection online does not guarantee that learners can cope up with the online learning set up. Learners prefer still the traditional way of learning, and that is face to face classes. Continuous improvement of the online learning set-up is recommended so learners can adopt to the challenges.

REFERENCES

References

- Adarkwah, M. A. (2021). "I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. *Education and Information Technologies*, 26(2), 1665–1685.
- Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. Retrieved July 1, 2021, from <http://www.doi.org/10.33902/JPSP.2020261309>
- Agarwal, S., & Kaushik, J. S. (2020). Student's Perception of Online Learning during COVID Pandemic. *The Indian Journal of Pediatrics*, 87(7), 554-554. doi:10.1007/s12098-020-03327-7
- Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, 25, 5261–5280.
- Anderman, E. (2020). The Challenges of Teaching and Learning about Science in the 21st Century: Exploring the Abilities and Constraints of Adolescent Learners
- Barrot, J. S. (2016). Using Facebook-based e-portfolio in ESL writing classrooms: Impact and challenges. *Language, Culture and Curriculum*, 29(3), 286–301.
- Bergen, N., & Labonté, R. (2020). "Everything is perfect, and we have no problems": Detecting and limiting social desirability bias in qualitative research. *Qualitative Health Research*, 30(5), 783–792.
- Birks, M., & Mills, J. (2011). *Grounded theory: A practical guide*. Sage
- Carter, R. A., Jr., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning in online learning environments: Strategies for remote learning. *Information and Learning Sciences*, 121(5/6), 321–329.
- Copeland, W. E., McGinnis, E., Bai, Y., Adams, Z., Nardone, H., Devadanam, V., & Hudziak, J. J. (2021). Impact of COVID-19 pandemic on college student mental health and wellness. *Journal of the American Academy of Child & Adolescent Psychiatry*, 60(1), 134–141.

- Caballes, D. G., & Abenes, F. M. D. (2020). Technological knowledge and technological pedagogical knowledge of science teachers: basis for faculty development. *CiiT International Journal of Data Mining and Knowledge Engineering*, 12(3), 41-47.
- Caballes, D. G., & Chua, K. M. (2020). Challenges and opportunities in emergency remote teaching on secondary biological science during ECQ implementation due to COVID-19 pandemic. *CiiT International Journal of Software Engineering and Technology*, 12(4), 63-68.
- Caballes, D. G., & Dapitan, D. A. (2019). Determining the level of ICT skills of junior high school faculty of Tagumpay National High School. *CiiT International Journal of Wireless Communication*, 11(5), 80-85.
- Caballes, D. G., & Doblada, J. C. L. (2021). Relationship of teachers' technology skills and selected profile: basis for redesigning training for online distance learning modality. *Instabright International Journal of Multidisciplinary Research*, 3(1), 17-22.
- Caballes, D. G., & Del Mundo, D. C. (2022). Measuring cognitive load level in a multimedia learning environment towards the development of I-SIM. *Sapienza: International Journal of Interdisciplinary Studies*, 3(1), 268-283.
- Caballes, D. G., & Delos Reyes, F. J. F. (2022). A narrative on students' satisfaction in Fully online and modular learning. *International Journal of Scientific and Research Publications*, 12(1), 235-239.
- Caballes, D. G., & Delos Reyes, F. J. F. (2020). Development of instructional video in teaching science: a teacher's perspective. *CiiT International Journal of Data Mining and Knowledge Engineering*, 12(5), 96-101.
- Caballes, D. G., & Delos Reyes, F. J. F. (2020). Digital technology as a mode of instruction: an analysis. *CiiT International Journal of Software Engineering and Technology*, 12(3), 25-32.
- Caballes, D. G., & Montalbo, S. M. (2019). The effect of mobile technology on face-to-face interaction among teachers. *CiiT International Journal of Wireless Communication*, 11(5), 73-79.
- Caballes, D. G., & Montellano, A. A. (2019). Technology-based supplementary instructional materials as remediation activity in physical science for grade 12. *CiiT International Journal of Artificial Intelligent Systems and Machine Learning*, 11(4), 66-71.
- Caballes, D. G., Panol, R. F., & Vasquez, A. G. (2020). Teachers' readiness level on teaching: embracing distance learning modality. *CiiT International Journal of Software Engineering and Technology*, 12(4), 75-81.
- Caballes, D. G., & Tiria, R. A. (2020). Implementation of education 4.0 in the senior high school in the sixth district of Manila. *CiiT International Journal of Automation and Autonomous System*, 12(1), 12-16.
- Day, T., Chang, I. C. C., Chung, C. K. L., Doolittle, W. E., Housel, J., & McDaniel, P. N. (2021). The immediate impact of COVID-19 on postsecondary teaching and learning. *The Professional Geographer*, 73(1), 1-13.
- Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, 004723952093401. doi:10.1177/0047239520934018
- Doyle, HB. (2016). How to thrive in the 21st century. Accessed in <https://www.gse.harvard.edu/news/uk/16/11/how-thrive-21st-century> on October 15, 2021.
- Fawaz, M., Al Nakhal, M., & Itani, M. (2021). COVID-19 quarantine stressors and management among Lebanese students: A qualitative study. *Current Psychology*, 1-8.
- Hew, K. F., Jia, C., Gonda, D. E., & Bai, S. (2020). Transitioning to the "new normal" of learning in unpredictable times: Pedagogical practices and learning performance in fully online flipped classrooms. *International Journal of Educational Technology in Higher Education*, 17(1), 1-22.
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065-1078.
- Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeabi, M., & Bamanger, E. (2020). Efficiency of flipped classroom with online-based teaching under COVID-19. *Interactive Learning Environments*, 1-12.
- Suryaman, M., Cahyono, Y., Muliansyah, D., Bustani, O., Suryani, P., Fahlevi, M., & Munthe, A. P. (2020). COVID-19 pandemic and home online learning system: Does it affect the quality of pharmacy school learning? *Systematic Reviews in Pharmacy*, 11, 524-530.
- WHO Coronavirus (COVID-19) Dashboard. (2021). Retrieved 1 July 2021, from <https://covid19.who.int/>

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Clinico-Demographic Profile of Orthopedic Trauma in a Tertiary Hospital from 2015 - 2019

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Abstract- The present descriptive-quantitative study described the Orthopedic trauma incidence in Western Visayas State Medical Center from 2015-2019. This study was conducted to determine the clinic-demographic profile of orthopedic trauma locally which would be a basis for the data for the community. There were 4299 orthopedic qualified patients for this study. Checklist for the demographic profile of the patients was used to gather the data. Descriptive statistics was used for data analysis that includes frequency count and percentage. As described in the results of Orthopedic trauma, fractures, dislocations and amputations were most often caused by vehicular accidents and fall. Other causes of trauma include machinery, gunshot, assault, and others. Results also revealed that most of the patients were male and unemployed. These outcomes contributed to the overall mortality and morbidity which caused a major burden on the health system and economy of the country. In this study, it is recommended for a better understanding of the epidemiology of trauma cases should be considered in formulating better road safety as well as post trauma care. However, due to poor documentation, the epidemiology of trauma was not well understood and it was also suggested in this study to use the AO/OTA classification of fractures used in the face chart for the better and easier data interpretation. Furthermore, these data will be available for the sectors that can find it useful especially the health sector which identifies those who are at risk and can then develop preventive measure to decrease the incidence of orthopedic trauma.

Index Terms- Age, Diagnostics, Disposition, Location of injury, Management

I. INTRODUCTION

Trauma is defined as injury caused by an external blunt or penetrating force that results to concussion, cuts or fractured bones.²¹ In orthopedic medicine, orthopedic trauma includes severe injury to the musculoskeletal system (muscles, joints, ligaments, bones, and soft tissue).²² These trauma injuries include fractures², dislocations³⁸ and amputations³⁶. Most trauma which often result from vehicular accidents include collision with another vehicle, pedestrian, animal, geographical

and architectural obstacles.⁴⁵ According to the study of Consunji et al. (2011),¹⁰ 28.6% of the admitted patients in the Trauma Division of Philippine General Hospital are due to vehicular accident. The top 3 common vehicles involved in road traffic accidents in the Philippines are the automobiles, motorcycles, and jeepneys which contributed 27%, 21% and 19%, respectively.⁴⁵

Most of the developing countries, including the Philippines, are undergoing rapid modernization and industrialization, which has led to significant increase in the number of automobiles. In fact, in the year 2016, 3,921,795 vehicles were registered; a 2.2% increase from the previous year's 3,834,542.¹⁸ This has led to rise in number of trauma cases due to road traffic accidents (MVA's), thereby making it a major health hazard. In the year 2016, there were 12,560 reported cases of vehicular accidents in Western Visayas.²³ Previously, it was mainly a problem of the developed countries; but now, developing countries are also undergoing "epidemiology of transition" and hence facing similar challenge. Trauma is one of the leading health problems worldwide wherein 50% of all deaths occur within minutes of injury.²⁶ Trauma due to other causes such as injuries at work place¹⁵, home¹¹, fall¹², assault⁸, and gunshot injuries⁵ also contribute significantly to the overall mortality and morbidity. Since such a large number of trauma cases cause a major burden on the health system and economy of the country, a better understanding of the epidemiology of trauma cases can be very helpful in formulating better road safety as well as post trauma care. Due to poor documentation, the epidemiology of trauma is not well understood.

II. PROBLEM, METHODOLOGY, AND COLLECTION OF DATA

Locally, there is a lack of study with regards to the epidemiology of patients with orthopedic trauma. This is the first study to determine the clinico-demographic profile of orthopedic trauma locally which will be used as basis of data for the WVSU - MC department of Orthopedics.

This is a descriptive cross-sectional study (medical records review) which aims to determine the clinico-demographic profile

of patients with orthopedic trauma in West Visayas State University Medical Center.

Sex	2015	2016	2017	2018	2019	Total	%
Male	522	609	586	610	630	2957	68.78
Female	249	243	282	281	287	1342	31.22
Total	771	852	868	891	917	4299	100

The study analyzed all patients who satisfied the inclusion criteria that consulted at the Emergency Room of West Visayas State University from January 1, 2015 to December 31, 2019.

Inclusion Criteria

- All patients eighteen-year-old and above with orthopedic trauma who consulted at the Emergency Room of West Visayas State University Medical Center from January 1, 2015 to December 31, 2019.

Exclusion Criteria

- Pathologic fractures and fragility fractures
- Patients with established deformity or previously injured limb at the site of injury

III. RESULTS AND FINDINGS

Year	Frequency
2015	771
2016	852
2017	868
2018	891
2019	917
Total	4299

A total of 4299 patients were and West State Center in the

The trend in incidence is shown in Figure 1.

Table 1: Total number of Orthopedic Patients

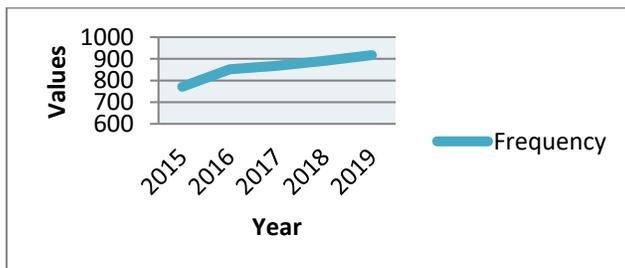


Figure 1: Incidence of Orthopedic trauma injuries per year

Of the 4299 cases with orthopedic incidence as respondents for the study, the largest group was 18-25 (23.45%) with a mean age

of 21.5 years, followed by the 26-35 (21.89%) age group with a mean age of 30.5 years old.

Table 2. Age of patients with Orthopedic Injury

Age	2015	2016	2017	2018	2019	Total	(%)
18-25	183	211	193	209	212	1008	23.45
26-35	175	196	184	184	202	941	21.89
36-45	111	138	151	157	131	688	16.004
46-55	111	95	95	123	120	544	12.65
56-65	83	88	97	96	103	467	10.86
66-75	48	70	61	59	66	304	7.07
75 above	60	54	87	63	83	347	8.07
Total	771	852	868	891	917	4299	100

In terms of sex, 68.78% of the 4299 qualified patients were males and only 31.22% were females.

Table 3. Sex of patients with Orthopedic Injury

As shown in the study, 45.78% of the patients were single, 45.20% were married and 9.03% was neither single nor married.

Table 4. Marital Status of patients with Orthopedic Injury

Marital Status	2015	2016	2017	2018	2019	Total	%
Single	345	378	396	418	431	1968	45.78
Married	354	409	376	397	407	1943	45.20
Others	72	65	96	76	79	388	9.02
Total	771	852	868	891	917	4299	100

The results of the study showed that majority of the patients who suffered from traumatic spinal injury were unemployed (36.89%), followed by 27.19% who were laborers, 16.77% did not answer in this section which means due to poor data gathering where the respondents were not able to answer this section, 11.19% were others, 4.21% were government employees, and the remaining 3.75% were farmers.

Table 5. Occupation of patients with Orthopedic Injury

Occupation	2015	2016	2017	2018	2019	Total	%
Unemployed	211	334	268	362	411	1586	36.89
Laborers	122	217	264	276	290	1169	27.19
Farmers	24	42	18	33	44	161	3.75
Gov't Employees	43	32	35	37	34	181	4.21
Others	124	100	104	78	75	481	11.19
Did not answer	247	127	179	105	63	721	16.77
Total	771	852	868	891	917	4299	100

Motor vehicular accidents (31.80%) and Fall (24.61%) were the most common causes of orthopedic trauma injuries. In this report, there were 37 patients who sustained gunshot injury (0.86%). Others (13.38%) and 25.28% had no records due to poor data gathering were reported in this study.

Table 5. Mechanism of injury of Orthopedic trauma per year

Mechanism	2015	2016	2017	2018	2019	Total	%
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MVA	232	291	226	277	341	1367	31.80
MVA (unspecified)	195	244	156	228	296	1119	26.03
MVA - Driver	21	29	44	24	28	146	3.40
MVA - Pedestrian	11	14	11	11	7	54	1.26
MVA- Passenger	5	4	15	14	10	48	1.12
Fall	148	191	225	237	257	1058	24.61
Machinery	11	15	19	12	8	65	1.51
Gunshot	10	5	11	9	2	37	0.86
Assault	21	32	22	22	13	110	2.56
Others	65	82	105	139	184	575	13.38
No record	284	236	260	195	112	1087	25.28
Total	771	852	868	891	917	4299	100

TABLE 6: LOCATION OF ORTHOPEDIC TRAUMA PER YEAR

Lower Extremity	2015			2016			2017			2018			2019		
	Open	Close	Total												
Pelvis	0	8	8	1	7	8	0	13	13	2	19	21	0	9	9
Hip	2	54	56	1	48	49	0	61	61	0	44	44	3	67	70
Thigh	5	19	24	2	10	12	4	39	43	7	38	13	36	49	49
knee	5	42	47	9	24	33	9	48	57	11	62	73	56	76	76
leg	16	56	72	27	44	71	28	49	77	18	50	68	33	61	95
ankle	6	56	62	6	16	22	7	32	39	17	53	70	63	83	83
foot	8	31	39	16	17	33	17	71	88	8	52	60	53	85	85
Total	39	241	280	62	195	257	65	257	322	83	318	401	271	346	467

Upper extremity	2015			2016			2017			2018			2019		
	Open	Close	Total												
Shoulder	2	89	91	3	89	92	5	82	87	1	138	139	5	126	131
Arm, humerus	4	19	23	6	15	21	1	9	10	1	18	19	2	13	15
Elbow	3	49	52	4	48	52	7	44	51	0	57	57	9	59	68
Forearm (radius/ulna)	6	50	56	65	9	74	15	36	51	7	72	79	13	73	86
Wrist (distal radius)	2	73	75	94	6	100	9	41	50	2	131	133	10	130	140
Hand	58	162	220	57	216	273	39	230	269	51	239	290	54	205	259
Total	75	442	517	229	383	612	76	442	518	62	655	717	93	606	699

Hip	6 (2.14)	274 (97.86)	280 (16.21)
Thigh	31 (17.92)	142 (82.08)	173 (10.02)
knee	54 (18.88)	232 (81.12)	286 (16.56)
leg	122 (31.69)	263 (68.31)	385 (22.29)
ankle	53 (20.62)	204 (79.38)	257 (14.88)
foot	101 (35.19)	186 (64.81)	287 (16.62)
Total	370 (21.42)	1357 (78.58)	1727 (100)

Table 7. Severity of Orthopedic trauma

As shown in the table 7 above, most of the orthopedic trauma injuries were mild since most of the injuries were close 82.53% and 78.58% in the upper and lower extremities, respectively. Only 17.47% for upper extremity and 21.42% lower extremity are open.

Table 8. Associated injuries of Orthopedic trauma

Associated injuries	Frequency	%
head	53	1.23
chest	30	0.70

abdomen	10	0.23
spine	12	0.29
genitourinary	3	0.07

Diagnostics	2015	2016	2017	2018	2019	Total	%
xray	525	582	547	578	510	2742	60.64
CT	15	18	25	20	20	98	2.17
MRI	0	0	0	1	2	3	0.06
Total	781	864	884	935	1058	4522	100

N=4299

Among the 4299 patients in the orthopedic department, there were identified associated injuries which include: head (53 patients), chest (30 patients), abdomen (10 patients), spine (12 patients) and genitourinary (3 patients)

Table 9. Diagnostics of Orthopedic trauma per year

Out of the 4299 patients with orthopaedic trauma injuries, most were diagnosed clinically using the x-ray (60.64%). Only 2.17% and .06% of the cases were able to undergo CT scan and MRI, respectively, mostly for pre-operative planning prior to doing surgery.

Table 10. Management of Orthopedic trauma per year

Management	2015	2016	2017	2018	2019	Total	%
surgical	253	277	330	350	529	1739	39.33
nonsurgical	516	576	536	564	491	2683	60.67
Total	769	853	866	914	1020	4422	100

Based on the cases of 4299 patients with orthopaedic trauma injuries, 60.67% were nonsurgical while 39.33% undergone the surgical process.

Table 11. Disposition of Orthopedic trauma per year

Disposition	2015	2016	2017	2018	2019	Total	%
Admitted	258	303	332	351	435	1679	39.06
Discharged	500	536	529	531	478	2574	59.88
Transferred	13	12	6	8	4	43	1.0002
Expired	0	1	1	1	0	3	0.07
Total	771	852	868	891	917	4299	100

The results showed that most patients were discharged (59.88%), followed by 39.06% who were admitted and only 1.0002% and 0.07% who were transferred and expired, respectively.

IV. DISCUSSION AND RECOMMENDATIONS

Discussion

Orthopedic trauma injury is one of the most serious injuries, which do not only affect the individual, but the entire family and community as well. The results of this study can be used as basis for WVSU - MC department of Orthopedics to decrease the orthopedic injuries and for the better implementation of strategies to better cater the patients. Based on the results of this study, the cases of orthopedic injuries during 2015-2019 increased rapidly from 771 to 917.

In this study, the 18-25 age group was the most commonly affected and 68.78% of the population were males. The most common mechanism of injury was motor vehicle accidents and

followed by accidental fall. The results of this study was the same with the study of (Rohilla, et al, 2019)³⁴ which states that the rise in number of trauma cases due to road traffic accidents (RTAs), thereby making it a major health hazard. In addition, all studies mentioned, motor vehicular accident and fall are the most common cause of injury, with male as the most commonly affected sex.

In a study by Hong-yong, et al. (2011)¹⁴, occupation was mentioned, in contrast to other studies that it was rarely mentioned. He reported that most of the population affected were unemployed individuals, followed by peasants and workers. In this study, it is noted that majority of affected individuals are unemployed, followed by laborers and other group of occupations.

The population mostly affected in this study were unemployed, and this could be one of the factors why only 28% and 27.4% of the cases were able to undergo CT scan and MRI, respectively. One possible factor for the diagnostics is that the institution only acquired an MRI unit later in the study and most cannot afford to pay out of pocket for MRI in other institutions. Those who consented for operation are the ones with complete radiographs, CT scan and MRI to be used for pre-operative planning.

In terms of the management, majority of the cases were managed non-surgically (60.67%) with Gardner-Wells tong application, rigid cervical collar and bracing. Economic status was one of the limiting factors why patients were not able to undergo surgical procedures for better stability of the orthopedic trauma injuries because of the high cost of spine implants and most of the injuries were close; therefore, they were not advised to undergo the surgical process and only 39.33% of the patients undergone the surgical process. Most of the patients were discharged (59.87%) after the treatment in emergency room and there were only 3 patients who did not sustain the injuries and eventually expired (0.07%).

Recommendations

Since this study is only limited by its population coming only from one institution and for only 5 years, it is suggested for future studies to have a topic regarding the Clinico-Demographic orthopedic trauma injuries in a wider scope and longer time.

The data gathering tools in this study did not anchor legibly on the variables of this study; thus, it is also recommended to the future researchers to use the AO/OTA classification of fractures used in the face chart for better and easier data interpretation. Lastly, the same study can be innovated and conducted in other institutions to make it a multicenter study.

It is also recommended that data from this study be used as basis to increase awareness of the population at risk, the debilitating effects of orthopedic trauma injuries to the family and increase awareness of the government and non-government offices, especially in the health sector, to better address the problems identified.

REFERENCES

[1] R. Alizadeh, F. Panahi, M. Saghafinia, K. Alizadeh, N. Barakati, M. Khaje-Dalooe, *Impact of trauma dispatch algorithm software on the rate of missions of emergency medical services*. Trauma Mon. 17(3), 2012, pp. 319–22.

[2] Z. Altuntaş, M. Ismayilzade, F. Baştürk, *Comparison of Maxillofacial Fractures Between Pedestrians and Passengers in Road Traffic Accidents*, Journal of Oral and Maxillofacial Surgery. 79, 2021, pp. 1098-1103.

[3] C. Mock, C.N. Lojero-Wheatly, L. de la Cruz, O. Garcia C, et al. *Low-cost improvements in prehospital trauma care in a Latin American city*. J. Trauma 48(1), 2000, pp.119–24.

[4] ASEAN Statistics Leaflet. *Macroeconomic, Trade and Investment*. Jakarta, Indonesia. 2014.

[5] Berryman, H.E. *A systematic approach to the interpretation of gunshot wound trauma to the cranium*, Forensic Science International. 2019, pp.301, 306-317.

[6] M.J. Bertol, R. Van den Bergh, M.T. Centurion, D.H.K. Ralph, Basimuoneye Kahutsi, J-P, et al. *Saving life and limb: limb salvage using external fixation*, a multi-centre review of orthopaedic surgical activities in Medecins Sans Frontières. Int. Orthop. 38(8), 2014. pp. 1555–15561.

[7] C. Borrell, A. Plasència, M. Huisman, G. Costa, A. Kunst, O. Andersen, M. Bopp, J. K. Borgan, P. Deboosere, M. Glickman, S. Gadeyne, C. Minder, E. Regidor, T. Spadea, T. Valkonen, & J. P Mackenbach. *Education level inequalities and transportation injury mortality in the middle aged and elderly in European settings*. Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention, 11(3), 2005, pp.138–142.

[8] N. Bounoua, R. Miglin, J. M. Spielberg, & N. Sadeh, *Childhood assaultive trauma and physical aggression: Links with cortical thickness in prefrontal and occipital cortices*. NeuroImage: Clinical, 27, 102321, 2020.

[9] A.J. Brooks, M. Phipson, A. Potgieter, H. Koertzen, and, K.D Boffard, *Education of the trauma team: video evaluation of the compliance with universal barrier precautions in resuscitation*. Eur. J. Surg. 165(12), 1999, pp. 1125–1128.

[10] R.J. Consunji, A.J.L. Larona, A.C. III. Jumangit, S.N. Ameratunga, *Motorcycle-related Trauma in the Philippines Resulting in Hospital Admission: The Epidemiology of Cases at the Philippine General Hospital*. ACTA MEDICA PHILIPPINA. 47 (3), 2013, pp. 11-14.

[11] A. Diop, and M. Faye, *Penetrating brain trauma through a metal bar extracted at home: An unusual case*. Neurochirurgie. 2021.

[12] E. Godard, A. Farrugia, J. Charton, J.S Raul, *Transorbital penetrating trauma caused by a fall on the antenna of a radio receiver: Case report and review*, La Revue de Médecine Légale. 10(3), 2019, pp. 113-117.

[13] T.P. Hanche-Olsen, L. Alemu, A. Viste, T. Wisborg, K.S. Hansen, *Evaluation of training program for surgical trauma teams in Botswana*. World J. Surg. 39(3), 2015, pp. 658–668.

[14] Hong-Yong, et. Al. *Epidemiological profile of 239 traumatic spinal cord injury cases over a period of 12 years in Tianjin, China*. J Spinal Cord Med. 2011.

[15] M. Hours, E. Fort, B. Charbotel, & M. Chiron, *Jobs at risk of work-related road crashes: An analysis of the casualties from the Rhône Road Trauma Registry (France)*. Safety Science, 49(8-9), 2011, pp. 1270–1276.

[16] https://lawphil.net/statutes/repacts/ra2010/ra_10054_2010.html, Accessed June 13, 2021.

[17] <https://www.cdc.gov/injury/wisqars/animated-leading-causes.html>, Accessed June, 13, 2021.

[18] <https://www.ceicdata.com/en/indicator/philippines/number-of-registered-vehicles>, Accessed June 10, 2021.

[19] <https://www.crashstats.nhtsa.dot.gov>, Accessed June 10, 2021.

[20] <https://www.congress.gov/bill/102nd-congress/house-bill/2950>, Accessed June 13, 2021.

[21] <https://www.nigms.nih.gov/education/fact-sheets/Pages/physical-trauma.aspx>, accessed June 10, 2021

[22] <https://www.oaidocs.com/2018/04/13/constitutes-orthopedic-trauma/>, Accessed June 15, 2021.

- [23] <https://www.pna.gov.ph/articles/1089250>, accessed June 10, 2021.
- [24] M. Joshipura, *Guidelines for Essential Trauma Care: Progress in India*. World Journal of Surgery, 30(6), 2006, pp. 930–933.
- [25] M. K. Joshipura, *Trauma Care in India: Current Scenario*. World Journal of Surgery, 32(8), 2008, pp.1613–1617.
- [26] M.F. Jucá-Moscardi, J. Meizoso, R Rattan. *Trauma Epidemiology. In: Nasr A., Saavedra Tomasich F., Collaço I., Abreu P., Namias N., Marttos A. (eds) The Trauma Golden Hour*. Springer, Cham. 2020.
- [27] R. Kalediene, S. Starkuviene, J. Petrauskiene, Social dimensions of mortality from external causes in Lithuania: do education and place of residence matter? *Soz Praventiv Med.* 51(4), 2006, pp.232-239.
- [28] J. Kumphong, T. Satiennam, and W. Satiennam, *Correlations among motorcycle-related deaths, helmet law enforcement and helmet usage for ASEAN countries*. International Journal of GEOMATE. 15(49), 2018, pp. 72–77.
- [29] Metro Manila Accident Recording and Analysis System-Traffic Engineering Center-Road Safety Unit Annual Report of 2019. Makati City, Philippines.
- [30] V.M. Nantulya, M.R. Reich, *The neglected epidemic: road traffic injuries in developing countries*, *BMJ* 324, 2002, 1139–41.
- [31] Philippine Health Statistics. Epidemiology Bureau, Department of Health, Philippines, 2016.
- [32] T. Rakhshani, M. Kashfi, I. Amirian, M. Ebrahimi, S. Hashemi Nazari, *Epidemiology of Fatal Road Traffic Accidents in Iran, Yasouj*, 2014-2015. *Journal of Health Sciences & Surveillance System*, 6(1), 2018, pp. 29-35.
- [33] T. A. Reynolds, B. Stewart, I. Drewett, S. Salerno, H. R. Sawe, T. Toroyan, and C. Mock, *The Impact of Trauma Care Systems in Low- and Middle-Income Countries*. *Annual Review of Public Health*, 38(1), 2017, pp. 507–532, doi:10.1146/annurev-publhealth-032315-021412.
- [34] R. K. Rohilla, S. Kumar, R. Singh, A. Devgan, H. S. Meena, & V. Arora, *Demographic Study of Orthopedic Trauma among Patients Attending the Accident and Emergency Department in a Tertiary Care Hospital*. *Indian journal of orthopaedics*, 53(6), 2019, pp. 751–757, https://doi.org/10.4103/ortho.IJOrtho_161_19
- [35] C. Rush, *Guidelines for Essential Trauma Care*: C. Mock, J.D. Lormand, J. Goosen, M. Joshipura, M. Peden, Geneva Switzerland: World Health Organization (WHO). 2004.
- [36] U.C. Saini, A. Hooda, S. Aggarwal, M.S. Dhillon, *Patient profiles of below knee-amputation following road traffic accidents – An observational study from a level 1 trauma centre in India*, *Journal of Clinical Orthopaedics and Trauma*. 12 (1), 2021, pp.83-87.
- [37] A. Sami, G. Moafian, A. Najafi, M. RezaAghabeigi, N. Yamini, S.T. Heydari, K.B. Lankarani, *Educational level and age as contributing factors to road traffic accidents*. *Chinese Journal of Traumatology*. 16(5), 2013, pp. 281-285.
- [38] S. Sanders, N.C. Tejwani, *Asymmetric bilateral hip dislocation after motor vehicle accident - a case study and review of the literature*, *Bull NYU Hosp Jt Dis.* 66(4), 2008, pp. 320- 326.
- [39] A. Sauaia, F.A. Moore, E.E. Moore, K.S. Moser, R. Brennan, R.A. Read, P.T. Pons, *Epidemiology of Trauma Deaths, The Journal of Trauma: Injury, Infection, and Critical Care*, 38 (2), 1995, pp.185-193.
- [40] S.R. Shackford, R.C. Mackersie, T.L. Holbrook, J.W. Davis, P. Hollingsworth-Fridlund, D.B. Hoyt, P.L. Wolf, *The Epidemiology of Traumatic Death: A Population-Based Analysis*. *Analysis. Arch Surg.* 128(5), 1993, pp. 571–575.
- [41] S.K. Singh, and A. Mishra, “Road Accident Analysis: A Case Study of Patna City”. *Urban Transport Journal* 2(2): 2004, pp. 60-75.
- [42] R. G. Sise, R. Y. Calvo, D. A. Spain, T. G. Weiser, & K. L. Staudenmayer, *The epidemiology of trauma-related mortality in the United States from 2002 to 2010*. *Journal of Trauma and Acute Care Surgery*, 2014, 76(4), pp. 913-920.
- [43] N. T. Son, and C. Mock, *Improvements in trauma care capabilities in Vietnam through use of the WHO-IATSI Guidelines for Essential Trauma Care*. *International Journal of Injury Control and Safety Promotion*, 13(2), 2006, pp. 125–127.
- [44] Stewart, T.C., Girotti, M.J., Nikore, V. and Williamson, J. Effect of Airbag Deployment on Head Injuries in Severe Passenger Motor Vehicle Crashes in Ontario, Canada. *J. Trauma*. 54, 266–272. 2003.
- [45] A. Tamayo, *Occurrence of Traffic Accidents in the Philippines: An Application of Poisson Regression Analysis*, 2009.
- [46] P. Tornetta 3rd., H. Mostafavi, J. Riina, C. Turen, B. Reimer, R. Levine, F. Behrens, J. Geller, C. Ritter, P. Homel, *Morbidity and mortality in elderly trauma patients*, *J Trauma*, 46(4), 1999, pp. 702-706.
- [47] H. Trentzsch, U. Nienaber, M. Behnke, R. Lefering, S. Piltz, *Female sex protects from organ failure and sepsis after major trauma hemorrhage*, *Injury*, 45(3), S20-S28, 2014.
- [48] P. F. Waller, and R.G. Hall, “Literacy-A Human Factor in Driving Performance.” *SAE Transactions*. vol. 89, 1980, pp. 1499–1509.
- [49] M.L. Winstead, D.J. Clegg, R.E. Heidel, N.J. Ledderhof, J.E. Gotcher, *Fall-Related Facial Trauma: A Retrospective Review of Fracture Patterns and Medical Comorbidity*. *Journal of Oral and Maxillofacial Surgery*. 79 (4), 2021, pp. 864-870.
- [50] *World Health Organization. Injuries and Violence: The Facts*. CH-1211 Geneva 27 Switzerland. 2014.

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Strategic Direction and Financial Sustainability of Faith-based Organizations

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Abstract- Faith-based organizations have a long history of meeting important community needs. However, despite their important role in providing social services and meeting key community needs, these organizations have been prone to financial instability. Determination of strategic direction in an organization is an important strategic leadership practice since the leader of an organization is mostly charged with long and short-term decisions of the organization. This study sought to evaluate the effect of strategic direction on the financial sustainability of faith-based organizations. The study was based on the positivism research paradigm, and it adopted explanatory research design. Primary data was collected from 198 leaders working as directors, heads of departments, and heads of units in a faith-based organization. Descriptive analysis revealed that strategic direction is practiced at a moderately high level by faith-based organizations affiliated to Wycliffe Global Alliance as shown by an aggregate mean of 4.41 and a standard deviation of 0.711. It also revealed that financial sustainability was at a moderate level as shown by an aggregate mean of 4.33 and a standard deviation of 0.753. The study established through multiple regression analysis that determining strategic direction has a significant and positive effect on the financial sustainability of faith-based organizations. The study concluded that, if supported and fully utilized, strategic direction could strengthen faith-based organizations' financial sustainability. The researcher recommends that faith-based organization leaders should provide an environment that is favourable for strategic direction to be practiced effectively as part of the effort to strengthen financial sustainability.

Index Terms- Vision, Mission, Strategic Intent, Strategic Objectives, Strategic Direction, Financial Sustainability, Faith-based Organizations

I. INTRODUCTION

The role of faith-based organizations in the provision of social services and meeting key societal needs has led to the transformation of society (Mawudor, 2016). Despite their important role, these organizations particularly in Africa, struggle to sustain the financial resources required to effectively realize

their mission (Garcia-Rodriguez & Romero-Merino, 2020). This situation has been attributed to a new and unstable operating environment that affects both profit-making and non-profit organizations (Currie et al., 2012; Hughes & Beatty, 2011). The strategic response of a leader, therefore, becomes crucial to the survival of an organization (Franklin, 2016). This situation, also calls for more people in organizations to be engaged in strategic leadership (Hughes & Beatty, 2011, p. 2) since "strategic leadership practices can help organizations enhance performance while competing in turbulent and unpredictable environments" (Ireland & Hitt, 2005, p. 63).

Various authors have described specific strategic leadership practices in an organizational setting. According to Jooste and Fourie (2009) "strategic leadership practice is a leader's ability to anticipate, envision, maintain flexibility, think strategically, and work with followers to commence changes that create a viable future for the organization." (p. 351). According to Hitt, Ireland, et al. (2016) strategic direction is one of the key strategic leadership practices that makes strategic leadership effective in a turbulent and constantly changing operating environment.

Determining the organization's strategic direction entails articulating a realistic and clear statement on the reason for the organization's existence and what is distinctive about it (Hitt, Ireland, et al., 2016). Strategic direction helps organizational leaders to be strategic and orderly in the daily leadership of their organizations (Olaka et al., 2017). When that happens, the vision or purpose statement then empowers the organizational members to craft and execute strategies aligned to the vision of the organization (Slawinski, 2007). Strategic direction in an organization is evidenced by strategic intent, vision and mission, and strategic objectives (Ireland et al., 2013).

The mission describes the reason for an organization's existence while the vision is a statement that sets direction and shows what the organization desires to be in the future (Pearce & Robinson, 2011). Clarity and effective communication of strategic statements to all the members of the organization is important for the organization's success. The responsibility of ensuring accurate crafting, articulation, and communication of vision and mission to all the members of the organization lies with the top-level leaders (Hitt, Ireland, et al., 2016). The leadership also ensures that all the

members of the organization are inspired toward the accomplishment of the vision by undertaking what is stipulated in the organization's mission (Galperin et al., 2019). The mission can be achieved only if the leadership is dedicated to it as demonstrated by their actions leading in the direction of the vision stated (Senaji et al., 2014).

II. STATEMENT OF THE PROBLEM

Faith-based organizations in Africa have been significant and active contributors to the welfare of society through the provision of social services and programs that improve community wellbeing (Mitchell, 2017). However, many faith-based organizations in Africa continue to struggle in developing and maintaining the financial resources required to undertake their mission (Renoir & Guttentag, 2018). This is evidenced by their inability to continue offering services to their target population whenever there is a shakeup in their usual sources of income (Omeri, 2015).

Faith-based organizations in various parts of the world offer diverse key services to society that is aimed at the overall enhancement of the welfare of humanity (Ahmed, 2013). These faith-based organizations face a diverse and complex range of issues. Faith-based organizations, however, are challenged by internal as well as external management challenges which they must overcome to realize their goals (Kitonga, 2016).

For most faith-based organizations the financial instability challenges they face arise from their operating environment and include declining donations, reduced funding from their partners, low economic levels, increased needs of their target groups, and increased scrutiny of their charitable role from governments

III. CONCEPTUAL AND EMPIRICAL REVIEW

A. Strategic Direction

The determination of strategic direction in an organization is an important practice in strategic leadership. It refers to the development of a longer-term vision for the organization (Ireland & Hitt, 2005). Strategic leaders bear the responsibility to ensure everyone in the organization understands the overall direction of the organization (Kitonga, 2017). According to Lear (2012) "determining strategic direction is focusing on the organization on a long-term vision with a view to at least five years in the future" (p. 170). Determining the organization's vision or purpose entails articulating a realistic and clear statement on the reason for the organization's existence and what is distinctive about it. When that happens, the vision or purpose statement then empowers the organizational members to craft and execute strategies that align with the organization's vision (Slawinski, 2007). As such, the leader needs to work with stakeholders to determine what purpose it is pursuing (Ireland & Hitt, 2005).

A study by Omoro (2016) showed the important role of strategic direction in the effective strategy implementation at GDC. Additionally, the strategic direction was seen by Olaka et al. (2017) as a facet that aids organizational leaders to be strategic and orderly in the day-to-day leadership of their organizations. The establishment of strategic direction in an organization is

(Arhin, Kumi, & Adam, 2018; Curry, 2011). Heist and Cnaan (2016) noted that giving to international non-governmental organizations gradually declined between 2008 and 2015 by \$22.26 billion which consequently affected the provision of services by non-governmental organizations. Statistics indicate that of the 60% of the USA-based international development organizations, are faith-based organizations of which the majority operate in sub-Saharan Africa (Green, 2020). This is also in line with Van Wees and Jennings (2021) finding that faith-based organizations in sub-Saharan Africa provide approximately 50% of health and educational services.

Owing to changes in their income streams, some faith-based organizations have suspended, stopped, or continued their operations at a minimal scale. Since faith-based organizations in Africa rely mostly on external funding for the continuity of their missions, funding cuts have often resulted in reduced or no services to the intended beneficiaries (Mawudor, 2016). Because of these setbacks and the diversified range of services offered by faith-based organizations, it is important that strategic leaders establish the strategic direction for the organizations they lead.

Even though faith-based organizations existed for a long time in Africa, very few researchers studied the direct relationship between strategic direction and financial sustainability in these organizations (Grandy, 2013). Furthermore, the leadership models, which are dominant in most faith-based organizations, are servant leadership, charismatic leadership, and transformational leadership, and it calls for further research to establish if strategic direction being one of the key practices of strategic leadership can add value to faith-based organizations in their efforts for financial sustainability (Worden, 2005).

evidenced by strategic intent, the vision, and mission, and determining strategic objectives (Ireland et al., 2013).

Strategic direction comprises the development of a longer-term vision of the organization's intent. A long-term vision characteristically considers a duration of 5 to 10 years ahead. The purpose and vision of an organization align with what is done by people across the organization. It is important for the leader to create continuous tension between what is desired in the future and the present elements that could hamper progress. Leaders are therefore expected to create burning platforms on a continuous basis to make it impossible to maintain the status quo in the organization. Thompson et al. (2013) highlighted improved financial performance and strong bottom-line performance as the key importance of strategy in organizations. Effective formulation of strategy and its implementation has a positive and significant effect on earnings, return on investment, and revenue growth (Tapera, 2014).

Strategic Intent

According to Hamel and Prahalad (1989), there is a need for an organization to combine mission and vision statements to form a strategic intent. This is a statement that is both inspirational and concrete, to empower people and teams to know exactly what they were trying to do and what they were not trying to do. Hamel and Prahalad (2005) defined strategic intent as more than simply unfettered ambition. While many things have changed, people still need stability, and strategic intent is a useful concept in the

alignment of everyone's beliefs and actions in the organization towards goals that are challenging (Kola, 2020).

Faith-based organizations should therefore align their capabilities and strategic actions for the attainment of the desired performance (Hanafizadeh & Ravasan, 2011). The strategic intent concept allows the introduction of important core competencies that further stimulate the attainment of higher performance. Strategic intent assures an organization's strategic performance through the provision of focus, motivation, and direction for the whole organization (Brand, 2010).

Vision and Mission

A vision is a "picture of what the organization wants to be and, in broad terms, what it wants to ultimately achieve" (Hanson et al., 2016, p. 18). It is a statement intended to focus the resources and energies of the organization on attaining the desired future (Pearce & Robinson, 2011). To begin with, the organization conceptualizes its vision by brainstorming ideas, and generating value statements, among other ways. The conceptualization of a vision is a process that can be done by a leader, a committee, or the whole organization. The vision describes the route an organization intends to take in developing and strengthening its activities and lays out the organization's strategic course in preparing for the future. The vision has recently changed from a compelling description of the state and function of the organization to become more of a motivational tool (Bowen, 2018).

The mission is a "unique purpose that sets an organization apart from others of its type and identifies the scope of operations" (Pearce & Robinson, 2007, p. 12). The mission is an expansion of the vision statement and reveals what needs to be done now or needs to be done to attain that vision. A clear mission is essential for the effective establishment of objectives. An organization's mission can be broad or narrow. A good mission provides a unifying force for the whole organization, provides a sense of direction, provides a guide to decision-making for all levels of management, and bridges all stakeholders with the organization and the environment (Bowen, 2018).

Strategic Objectives

The efficient and effective attainment of the objectives of an organization should lead to the accomplishment of the mission. Thompson et al. (2013) define the objectives as targets of an organization's performance. These objectives function as standards against which organizational performance may be measured (Tapera, 2014). These performance targets as noted by Pearce and Robinson (2011) serve as yardsticks for measuring how well the organization is doing. Because long-term objectives are significant measures of performance, they have to be established at the corporate, divisional, and functional levels of the organization (Pearce & Robinson, 2011).

Strategic objectives give the organization a broad set of goals in scope and size to assure the achievement of the mission and ensure its sustainability. To attain these goals, the organization formulates strategies to utilize the resources that are available to attain desired goals within the expected time. Selecting the right ones is critical to the success and survival of all organizations. As the strategic objectives are integrated in organizational plans and

used by leaders in operations decision-making, the results are felt in the entire organization (Uraidi & Kumar, 2016).

B. Financial Sustainability

The financial sustainability of a faith-based organization refers to the capability of an organization to maintain resources or funds that give the capability to secure opportunities and respond to uncertain situations while progressing with normal operations (Bowman, 2011b).

Faith-based organizations are "statutorily created to serve a specific purpose and achieve specific policy goals, unrelated to profit" (Williams, 2014, p. 14). Measuring the financial sustainability of a faith-based organization "then becomes a matter of measuring its ability to efficiently and effectively deliver on its mandate, successfully raise funds, and expertly control costs" (Williams, 2014, p. 14). Similar to this finding, research by Milelu (2018) explored the factors affecting financial sustainability for Non-Governmental Organizations (NGOs) located in Nairobi, Kenya. The findings of the study were that there is a substantial positive correlation between the diversification of income, good management of relationship with donors, financial management systems, and financial sustainability of non-profit organizations in Nairobi, Kenya (Milelu, 2018).

Income diversification has to do with an organization's need to create multiple income sources to finance its activities adequately, given its set objectives (Mitlin et al., 2007). Income diversification is needed for the continuity of the organization's structure and the provision of services to intended beneficiaries even after financial support from donors ceases (Renz, 2016). A faith-based organization is seen to be financially sustainable when its capacity to progress with its work is not to be harmed whenever one or more funding sources are not there (Pratt et al., 2012). According to Saungweme (2014), income diversification is demonstrated in the organization's capability to increase the sources of income to incorporate more local and internal donor sources. To build a sustainable non-profit organization, therefore, both internal and external dimensions have to be considered since there is a key correlation between diversity in income and the financial sustainability of non-profit organizations (Omeri, 2015; Saungweme, 2014).

Donor relationship management entails undertaking deliberate efforts to constructively engage the donors in the activities of the organization (Mitlin et al., 2007), "resource mobilization through designing a comprehensive resource mobilization strategy, and building capacity to develop and market successful projects to attract new donors" (Omeri, 2015, p. 705). After establishing the first connection between a faith-based organization and the donor, maintaining a good relationship going forward is an important aspect (Omeri, 2015).

Financial management systems entail having in place accounting systems that aid in the effective planning, controlling, and administering of organization funds (Mitlin et al., 2007). The development of financial management involves having in place systems that provide financial information which makes it possible to attain sound financial and program decisions by managers (Omeri, 2015).

V. RESEARCH METHODOLOGY

This research relied on structured data and was built on the positivist research approach. The study used explanatory research design which helped to examine and explain the relationships between strategic direction and financial sustainability (Saunders et al., 2016). The primary data for the study was collected from 198 top-level leaders comprising directors, heads of departments, and heads of units from faith-based organizations affiliated to Wycliffe Global Alliance in Africa. The researcher did a census of the target population. A structured questionnaire was used in this research for the collection of primary data. The research tool had a five-point likert scale with strongly agree on one end of the continuum and strongly disagree on the other end. In this study, the data collected was checked by the researcher to ensure all expected responses reflected expectations and also to check for any inconsistent or false information (Nanda et al., 2013). The data was then coded and tabulated, then using Statistical Package for Social Sciences (SPSS) version 27, descriptive and inferential statistics were worked out.

VI. RESEARCH FINDINGS

Response Rate

The rate of respondent response for this study was 75.8%. Primary data was received from 150 questionnaires out of the expected 198 responses.

Strategic Direction in Faith-based Organizations

The respondents were asked to choose whether they strongly disagreed, disagreed, were undecided or neutral, agreed or strongly agreed that strategic direction was being exercised in their organizations. The response results are summarized in Table 1 below.

Table 1: Descriptive Analysis for Determining Strategic Direction

	SD	D	N	A	SA	Total	
	Freq.	Freq.	Freq.	Freq.	Freq.	Mean	SD
	%	%	%	%	%		
Vision and Mission:							
Vision and mission clearly defined in strategic documents	2	0	2	30	116	4.72	0.625
	1.3%	0.0%	1.3%	20.0%	77.3%		
Periodical review of vision and mission statements when necessary	3	7	15	58	67	4.19	0.939
	2.0%	4.7%	10.0%	38.7%	44.7%		
Clear and well-known vision and mission	3	4	11	80	52	4.16	0.828
	2.0%	2.7%	7.3%	53.3%	34.7%		
Vision and mission that inform the organization's focus and priorities	0	1	3	46	100	4.63	0.561
	0.0%	0.7%	2.0%	30.7%	66.7%		
Sub variable aggregate: Mean/Standard deviation						4.42	0.753
Strategic Intent:							
Formal and a robust process followed in establishing strategic direction	1	3	14	69	63	4.27	0.766
	0.7%	2.0%	9.3%	46.0%	42.0%		

Strategies consistent and supportive of organization mission and vision	1	2	6	55	86	4.49	0.702
	0.7%	1.3%	4.0%	36.7%	57.3%		
Program objectives and activities that are in line with mission statement	0	0	5	44	101	4.64	0.547
	0.0%	0.0%	3.3%	29.3%	67.3%		
Sub variable aggregate: Mean/Standard deviation						4.46	0.677
Strategic Objectives:							
Approved plans and budgets supportive and consistent with mission	0	2	11	69	68	4.35	0.677
	0.0%	1.3%	7.3%	46.0%	45.3%		
Decisions and actions show those involved understand the mission	0	3	10	82	55	4.26	0.670
	0.0%	2.0%	6.7%	54.7%	36.7%		
Sub variable aggregate: Mean/Standard deviation						4.30	0.673
Aggregate: Mean/Standard deviation						4.41	0.711

Source: Research Data (2021)

The above results show an aggregate mean response of 4.42 for vision and mission, 4.46 for strategic intent, and 4.30 for strategic objectives. The aggregate mean score for strategic direction was 4.41. This signified that a greater proportion of the respondents agreed that strategic direction was being practiced among organizations affiliated to Wycliffe Global Alliance in Africa. This is a similar finding to the one of a study by Jonjo (2018) who found out that the majority of the respondents agreed that defining strategic direction was being practiced in private universities in Kenya. Kitonga (2017) also established that respondents agreed that determining strategic direction was being practiced by non-profit organizations in Nairobi County.

The highest mean was recorded in the statements, "My organization's vision and mission are clearly defined in strategic documents" with a mean of 4.72 and "My organization's program objectives and activities are in line with the organization's mission statement" with a mean of 4.64. The lowest mean was recorded in the statements; "The vision and mission of my organization are clear and well known by all the staff" with a mean of 4.16, "My organization periodically reviews its vision and mission statements and revises it whenever it is necessary" with a mean of 4.19 and "The decisions and actions in the organization show that those involved understand the organization's mission" with a mean of 4.26.

Financial Sustainability of Faith-based Organizations

The respondents were asked to rate the level of financial sustainability in their organizations by choosing either strongly disagreed, disagreed, undecided, neutral, agreed, or strongly agreed to various measures of financial sustainability in a non-profit organization. The results of the responses are presented in table 2 below.

Table 2 Descriptive Analysis for Financial Sustainability

	SD	D	N	A	SA	Total	
	Freq.	Freq.	Freq.	Freq.	Freq.	Mean	SD
	%	%	%	%	%		
The financial sustainability level of the organization							
Income Diversification:							
Mobilizes funds from different sources	2	1	9	65	73	4.37	0.747
	1.3%	0.7%	6.0%	43.3%	48.7%		

Funding is at least obtained from five different sources	2	17	43	47	41	3.72	1.031
	1.3%	11.3%	28.7%	31.3%	27.3%		
Procedures and mechanisms followed to access resources	0	0	6	49	95	4.59	0.569
	0.0%	0.0%	4.0%	32.7%	63.3%		
There is a plan for fundraising and development	3	5	12	60	70	4.26	0.893
	2.0%	3.3%	8.0%	40.0%	46.7%		
Mobilize income from sources that are within the values of the organization	4	7	13	59	67	4.19	0.965
	2.7%	4.7%	8.7%	39.3%	44.7%		
Able to attract funding by use of good funding proposals	2	2	16	62	68	4.28	0.812
	1.3%	1.3%	10.7%	41.3%	45.3%		
Sub variable aggregate: Mean/Standard deviation						4.23	0.849
Donor Relationship Management:							
Receives subsidies from the government and donors	17	31	53	40	9	2.95	1.083
	11.3%	20.7%	35.3%	26.7%	6.0%		
Maintains regular, meaningful communications with its donors	0	1	0	52	97	4.63	0.523
	0.0%	0.7%	0.0%	34.7%	64.7%		
Actively implements vision building activities	0	5	12	66	67	4.30	0.758
	0.0%	3.3%	8.0%	44.0%	44.7%		
Accounts for the funding it receives through regular expenditure reports	1	0	4	35	110	4.69	0.592
	0.7%	0.0%	2.7%	23.3%	73.3%		
Complies with donor guidelines in donor sponsored activities	1	0	5	43	101	4.62	0.620
	0.7%	0.0%	3.3%	28.7%	67.3%		
Stronger relationship with its donors	0	2	9	55	84	4.47	0.673
	0.0%	1.3%	6.0%	36.7%	56.0%		
Ensures accurate and timely accounting of funding from donors	0	0	4	48	98	4.63	0.538
	0.0%	0.0%	2.7%	32.0%	65.3%		
Established constructive alliances and networks with donors	1	0	19	64	66	4.29	0.738
	0.7%	0.0%	12.7%	42.7%	44.0%		
Sub variable aggregate: Mean/Standard deviation						4.32	0.710
Financial Management Systems:							
Regularly does financial plans and budget reviews	0	5	7	56	82	4.43	0.737
	0.0%	3.3%	4.7%	37.3%	54.7%		
Financial reporting structures that ensure good accountability	0	1	8	61	80	4.47	0.631
	0.0%	0.7%	5.3%	40.7%	53.3%		
Financial reporting is efficient and effective	1	2	13	56	78	4.39	0.758
	0.7%	1.3%	8.7%	37.3%	52.0%		
Operations are done according to budgetary allocations	0	0	12	60	78	4.44	0.640
	0.0%	0.0%	8.0%	40.0%	52.0%		

Maintains an updated assets list	0	1	25	61	63	4.24	0.748
	0.0%	0.7%	16.7%	40.7%	42.0%		
Controls financial expenditure through operational policies	0	0	7	63	80	4.49	0.588
	0.0%	0.0%	4.7%	42.0%	53.3%		
Competent board which give oversight for all financial dealings	1	3	13	49	84	4.41	0.787
	0.7%	2.0%	8.7%	32.7%	56.0%		
Audited every year by a qualified external auditor	0	5	16	31	98	4.48	0.817
	0.0%	3.3%	10.7%	20.7%	65.3%		
Sub variable aggregate: Mean/Standard deviation						4.42	0.717
Aggregate: Mean/Standard deviation						4.33	0.753
Source: Research Data (2021).							

The above results show a mean average response of 4.33 for financial sustainability. The highest mean was recorded in the statement, "My organization accounts for the funding it receives by providing regular reports on its expenditure" with a mean of 4.69, and "My organization complies with donor guidelines in donor sponsored activities" with a mean of 4.62. The lowest mean was recorded in the following statements; "My organization receives subsidies from the government and donors" with a mean of 2.95, "My organization's funding is at least obtained from five different sources" with a mean of 3.72, "My organizations funding is at least obtained from five different sources" with a mean of 3.72, "My organization only mobilize income from sources that are within the values of the organization" with a mean of 4.19, "There is a plan for fundraising and development in my organization" with a mean of 4.26 and "My organization can attract funding by use of good funding proposals" with a mean of 4.28.

Some of the key elements of financial sustainability which were rated lower included; lower level of subsidies from the government and donors, organization funding obtained from less than five different sources, organizations failing to mobilize income only from sources that are within their values, lack of planning for fundraising and development and organizations unable to attract funding by use of good funding proposals (Bowman, 2011a; Ebenezer et al., 2020; Mawudor, 2016; Mitlin et al., 2007). The standard deviations for financial sustainability ranged between 0.523 and 1.083 implying there was a low variation from the mean values obtained (Lee et al., 2015). An aggregate standard deviation value of 0.753 implied low variation in the responses of the top-level leaders about the level of financial sustainability in faith-based organizations affiliated to Wycliffe Global Alliance in Africa.

Effect of Strategic Direction on Financial Sustainability

In order to determine the effect of strategic direction on financial sustainability, multiple regression analysis was done. The analysis results are shown in the table below. Table 3 Multiple Regression Coefficients for Strategic Direction and Financial Sustainability.

Model Summary:						
Model	R	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F	Sig.
1	.737	.640	1.031	.424	10.312	.002

1	.537 ^a	0.288	0.285	0.33603	0.288	88.880	3	657	0.001
a. Predictors: (Constant), Strategic Intent, Vision and Mission, Strategic Objectives									
ANOVA:									
Model	Sum of Squares	df	Mean Square	F	Sig.				
1	Regression	30.108	3	10.036	88.880	.001 ^b			
	Residual	74.287	658	0.113					
	Total	104.395	661						

a. Dependent Variable: Financial Sustainability
b. Predictors: (Constant), Strategic Intent, Vision and Mission, Strategic Objectives

Coefficients:				
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	
(Constant)	2.287	0.118		19.439
Vision and Mission	0.080	0.028	0.124	2.832
Strategic Intent	0.104	0.034	0.145	3.098
Strategic Objectives	0.244	0.030	0.350	8.271

a. Dependent Variable: Financial Sustainability

Source: Research Data (2021)

An R-value of 0.537 in the model reveals a strong positive correlation between strategic direction and financial sustainability (Cooper & Schindler, 2014). The adjusted R² value of 0.285 indicates that 28.5% of the variation in financial sustainability (dependent variable) was explained by strategic direction (vision and mission, strategic intent, and strategic objectives) which are the independent variables for the study. The remaining 71.5% of the variation in financial sustainability was due to other variables not covered by the study.

The ANOVA results indicate a p-value of 0.001. Since it is lower than 0.05 it means that the regression relationship was significant in predicting how strategic direction (vision and mission, strategic intent, and strategic objectives) affect the financial sustainability of organizations that are affiliated with the Wycliffe Global Alliance in Africa. Since the F statistic of 88.880 is more than the critical F value (3,658) of 2.66 it shows that the overall regression model was adequate and a significant predictor of financial sustainability (Hair et al., 2019).

The beta coefficients in table 3 above describe the mathematical relationship between the dependent variable and each independent variable. The p-values for the coefficients indicate whether these relationships are statistically significant (Kumari & Yadav, 2018). Taking all factors (vision and mission, strategic intent, and strategic objectives) constant at zero, financial sustainability is 2.287. The results also show there will be a 0.124 change in financial sustainability when there is a unit change in the mission and vision when all other factors are held constant. Similarly, with all other factors held constant, an increase in strategic intent by one unit would produce a 0.145 increase in financial sustainability. In the same way, a unit increase in

strategic objectives produces a 0.350 increase in financial sustainability when all other factors are held constant.

The three variables, vision and mission, strategic intent, and strategic objectives were found to be significant in predicting the financial sustainability of organizations that are affiliated to Wycliffe Global Alliance in Africa since they had p-values higher than 0.05. In the same way, all the three variables' t-statistics were higher than the critical t-value of 1.65 implying that they were significant in predicting financial sustainability (Sekaran & Bougie, 2016).

The study, therefore concluded that vision and mission, strategic intent, and strategic objectives have a significant positive effect on the financial sustainability of faith-based organizations.

VII. DISCUSSION

This study sought to assess the effect of strategic direction on the financial sustainability of faith-based organizations affiliated to Wycliffe Global Alliance in Africa.

The descriptive analysis of the strategic direction variables revealed an average mean score of 4.42 which indicated a high level of practice and emphasis on strategic direction among faith-based organizations. However, there were strategic direction elements that on average had a lower rating by respondents. The elements of the strategic direction that were rated low included; ensuring there is a clear and well-known vision and mission, periodical reviews of vision and mission statements and revision when necessary, and ensuring those involved in decision making understand the organization's mission. Correlation results also indicated a moderate positive relationship existed between strategic direction and financial sustainability as shown by a Pearson correlation coefficient of 0.484. This indicates that financial sustainability increases in direct proportion to strategic direction in faith-based organizations affiliated to Wycliffe Global Alliance in Africa. The multiple regression results showed that the effect of strategic direction on the financial sustainability of faith-based organizations affiliated with Wycliffe Global Alliance was positive and significant.

From the perspective of organizational theory, the findings of the study supported the propositions of the Upper Echelon theory. According to this theory "strategic choices and performance are dependent on the characteristics of dominant actors within an organization and, in particular, the top management team" (Hambrick & Mason, 1984, p. 193). A higher level of emphasis and practice of strategic direction shown by descriptive statistics indicate that the leaders of faith-based organizations involved in this study were actively involved in setting strategic direction for their organizations.

From the empirical review, the findings of the study were consistent with existing literature which indicates that strategic direction has a role in boosting the performance of an organization. Strategic direction however had not been linked directly to the financial sustainability of faith-based organizations. This study established that strategic direction has a significant effect on the financial sustainability of faith-based organizations affiliated to Wycliffe Global Alliance in Africa.

VIII. CONCLUSION

This study established that strategic direction has a significant effect on the financial sustainability of faith-based organizations affiliated to Wycliffe Global Alliance in Africa. In a faith-based organization, strategic direction can be attained through; a clearly defined vision and mission in strategic documents, periodical reviews of the vision and mission whenever it is necessary, ensuring that mission and vision are clear and well known by all the staff, ensuring that vision and mission informs the organization's focus and priorities, ensuring a formal and a robust process followed in establishing the organizations' strategic direction, strategies are consistent and supportive of its mission and vision, program objectives and activities are in line with the organization's mission statement, approved plans and budgets are supportive and consistent with the mission of the organization and that the decisions and actions in the organization show that those involved understand the organization's mission.

IX. RECOMMENDATIONS

To improve on strategic direction, faith-based organizations affiliated to Wycliffe Global Alliance in Africa can focus their efforts on strategic direction indicators that were rated the lowest and the specific lowly rated items namely; having a clear and well-known vision and mission, doing periodic reviews of vision and mission statements, and ensuring those involved in decision-making understand the organization's mission (Ireland et al., 2013; Pearce & Robinson, 2011).

AREAS FOR FURTHER STUDY

This study used qualitative financial measures for financial sustainability identified by Mitlin et al. (2007) and Milelu (2018) namely income diversification, donor relationship management, and financial management practices. This study proposes that further research be done using quantitative financial measures for financial sustainability.

REFERENCES

Ashoka, J., & Mango, K. (2015). *An Assessment of NGO's Institutional Performance*: South-Western Publishing.

Bickle, J. T. (2017). Developing Remote Training Consultants as Leaders—Dialogic/network application of Path-goal Leadership Theory in Leadership Development. *Performance Improvement*, 56(9), 32-39. doi:https://doi.org/10.21632/irjbs.13.1.27-32

Boal, K. B., & Hooijberg, R. (2000). Strategic Leadership Research: Moving on. *The leadership quarterly*, 11(4), 515-549.

Bowen, S. A. (2018). Mission and Vision. *The international encyclopedia of strategic communication*, 1-9.

Bowman, W. (2011a). *Finance Fundamentals for Nonprofits: Building Capacity and Sustainability* (2 ed.): John Wiley & Sons.

Bowman, W. (2011b). Financial Capacity and Sustainability of Ordinary Nonprofits. *Nonprofit management and leadership*, 22(1), 37-51.

Brand, C. (2010). A Model for the Formulation of Strategic Intent Based. In. University of South Africa: ProQuest

Bryman, A. (2016). *Social Research Methods* (5 ed.): Oxford university press.

Carter, S. M., & Greer, C. R. (2013). Strategic Leadership: Values, Styles, and Organizational Performance. *Journal of Leadership & Organizational Studies*, 20(4), 375-393.

Cohen, L., Manion, L., & Morrison, K. (2011). Planning Educational Research. In *Research methods in education*: Routledge Editors.

Cooper, D. R., & Schindler, P. S. (2014). *Business Research Methods* (12 ed.): McGraw-Hill.

Creswell, J. W. (2014). Research Design: International Student Edition. In (4 ed.): SAGE Publications.

Creswell, J. W. (2015). *A Concise Introduction to Mixed Methods Research*: SAGE publications.

Currie, K., Conway, J., Johnson, S., Landry, B., & Lowther, A. (2012). *Air Force Leadership Study: The Need for Deliberate Development*.

Dalati, S. (2018). Measurement and Measurement Scales. In *Modernizing the Academic Teaching and Research Environment* (pp. 79-96): Springer.

Ebenezer, A. A., Musah, A., & Ahmed, I. A. (2020). Determinants of Financial Sustainability of Non-Governmental Organizations in Ghana. *The Journal of Accounting and Management*, 10(1).

Evans, M. G. (1970). Leadership and motivation: A core concept. *Academy of Management Journal*, 13(1), 91-102.

Franklin, K. J. (2016). *A Paradigm for Global Mission Leadership: The Journey of the Wycliffe Global Alliance*. University of Pretoria,

Galperin, B. L., Michaud, J., Senaji, T. A., & Taleb, A. (2019). Perceptions of Leadership Effectiveness among the African diaspora in Canada and USA. *Journal of African Business*, 20(1), 20-40.

Garcia-Rodriguez, I., & Romero-Merino, M. E. (2020). *Financing nonprofit organizations*: Routledge.

Grandy, G. (2013). An Exploratory Study of Strategic Leadership in Churches. *Leadership & Organization Development Journal*, 34(7), 616-638.

Green, J. (2020). Faith-Based Organizations in Sub-Saharan Africa: Negatives, Positives, and Recommendations for Effective Promotion of Human Rights. *International Human Rights Internship Program*, 8(1).

Hair, J. F., Page, M., & Brunsveld, N. (2019). *Essentials of Business Research Methods*: Routledge.

Hambrick, D. C. (2007). Upper Echelons Theory: An Update. *Academy of Management*, 32(2).

Hambrick, D. C., & Mason, P. A. (1984). Upper Echelons: The Organization as a Reflection of its Top Managers. *Academy of management review*, 9(2), 193-206.

Hamel, G., & Prahalad, C. (1989). Strategic Intent. *Harvard business review*, 1-101.

Hanafizadeh, P., & Ravasan, A. Z. (2011). A McKinsey 7S Model-based Framework for ERP Readiness Assessment. *International Journal of Enterprise Information Systems*, 7(4), 23-63.

Hanson, D., Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2016). *Strategic Management: Competitiveness and Globalisation*: Cengage AU.

Heist, D., & Cnaan, R. A. (2016). Faith-based International Development Work: A Review. *Religions*, 7(3), 19.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2014). *Strategic management: Concepts: Competitiveness and globalization*: Nelson Education.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2016). *Strategic Management Competitiveness and Globalization: Concept and Cases* (12 ed.): Cengage Learning.

Hitt, M. A., Ireland, R. D., & Robert, E. (2016). *Strategic Management: Concepts and Cases: Competitiveness and Globalization* (12th ed.): South-Western College Publishers.

House, R., & Mitchell, T. (1971). Path-goal to Leadership. *Administrative science quarterly*, 16(3), 321-339.

- Hughes, R. L., & Beatty, K. C. (2011). *Becoming a strategic leader: Your role in your Organization's Enduring Success*. San Francisco: Jossey-Bass.
- Ireland, R. D., & Hitt, M. A. (2005). Achieving and Maintaining Strategic Competitiveness in the 21st century: The role of Strategic Leadership. *Academy of Management Executives*, 13(1), 63-77.
- Ireland, R. D., Hoskisson, R. E., & Hitt, M. A. (2013). *The Management of Strategy Concepts and Cases* (10 ed.): Cengage Learning.
- Jonyo, B. (2018). *Effects of Strategic Leadership on Organizational Performance within Private Universities in Kenya*. United States International University-Africa,
- Jooste, C., & Fourie, B. (2009). *The Role of Strategic Leadership in Effective Strategy Implementation*. Paper presented at the Perceptions of South African Strategic Leaders," Southern African Business Review.
- Kabir, S. M. (2016). Methods of Data Collection. In *Basic Guidelines for Research: An Introductory Approach for All Disciplines* (pp. 201-275): Book Zone Publication.
- Katee, E. N. (2013). *Effect of Strategic Leadership on the Performance of Commercial and Financial State Corporations in Kenya*. University of Nairobi.
- Kitonga, D. M. (2016). The role of Determining Strategic Direction on Not-for-profit Organizational Performance in Nairobi County in Kenya. *International Journal of Scientific & Technology Reserach*, 5(5).
- Kitonga, D. M. (2017). *Strategic Leadership and Organizational Performance in Not-for-Profit Organizations in Nairobi County in Kenya*. JKUAT.
- Kola, S. (2020). Enhancing the Concept of Strategic Intent. .
- Kumari, K., & Yadav, S. (2018). Linear Regression Analysis Study. *Journal of the practice of Cardiovascular Sciences*, 4(1), 33.
- Lear, L. W. (2012). *The Relationship between Strategic Leadership and Strategic Alignment in High-performance Companies in South Africa*. University of South Africa.
- Lee, D. K., In, J., & Lee, S. (2015). Standard Deviation and Standard Error of the Mean. *Korean journal of anesthesiology*, 68(3), 220.
- Mau, T. A. (2005). Strategic Planning for Public and Non-Profit Organizations: A Guide to Strengthening and Sustaining Organizational Achievement. *Canadian Public Administration*, 48(3), 444-447.
- Mawudor, B. G. (2016). *Financial Sustainability of Church related Organizations: An Empirical Study on Kenya*. University of Basel.
- Milelu, E. (2018). *Factors Affecting Financial Sustainability for Non-governmental Organizations in Nairobi, Kenya*. United States International University-Africa,
- Mitchell, B. (2017). *Faith-based development : how Christian organizations can make a difference*: Orbis Books.
- Mitlin, D., Hickey, S., & Bebbington, A. (2007). Reclaiming Development? NGOs and the Challenge of Alternatives. *World development*, 35(10), 1699-1720.
- Nanda, T., Gupta, H., Kharub, M., & Singh, N. (2013). Diagnostics for Pretesting Questionnaires: A Comparative Analysis. *International Journal of Technology, Policy and Management*, 13(1), 67-79.
- Nganga, U. M. (2013). *Strategic Leadership and Performance of Manufacturing Firms in Kenya*. University of Nairobi.
- Northouse, P. (2010). *Leadership: Theory and practice* (5 ed.): SAGE Publications.
- Olaka, H., Lewa, P., & Kiriri, P. (2017). Strategic Leadership and Implementation of Strategy in Commercial Banks in Kenya: A Case Study of Strategic Direction. *American Journal of Leadership and Governance*, 1(4), 82-95.
- Omeri, K. L. (2015). Factors Influencing Financial Sustainability of Non-governmental Organizations: A survey of NGOs in Nakuru County, Kenya. *International Journal of Economics, Commerce and Management*, 3(9), 704-743.
- Omoro, G. O. (2016). *Role of Strategic Leadership in Strategy Implementation in the Geothermal Development Company in Kenya*. University of Nairobi.
- Pearce, J. A., & Robinson, R. B. J. (2011). *Strategic Management: Formulation, Implementation, and Control* McGraw-Hill Irwin.
- Pratt, B., Hailey, J., Gallo, M., Shadwick, R., & Hayman, R. (2012). Understanding Private Donors in International Development.
- Rana, R., K'aol, G., & Kirubi, M. (2019). Influence of Supportive and Participative Path-goal Leadership Styles and the Moderating role of Task Structure on Employee Performance. *International Journal of Research in Business and Social Science*, 8(5), 76-87.
- Renoir, M., & Guttentag, M. (2018). *Facilitating Financial Sustainability: Understanding the Drivers of CSO Financial Sustainability*. Retrieved from
- Renz, D. O. (2016). *The Jossey-Bass Handbook of Nonprofit Leadership and Management* (4 ed.): John Wiley & Sons.
- Saunders, M., Lewis, P., & Thornhill, A. (2014). *Research Methods for Business Students* (5 ed.): Prentice Hall.
- Saunders, M., Lewis, P., & Thornhill, A. (2016). Understanding Research Philosophy and Approaches to Theory Development. In *Research Methods for Business Students* (8 ed., pp. 128-171): Pearson Education.
- Saungweme, M. (2014). *Factors Influencing Financial Sustainability of Local NGOs: The case of Zimbabwe*. Stellenbosch University.
- Sekaran, U., & Bougie, R. (2016). *Research Methods for Business: A Skill Building Approach*: John Wiley & Sons.
- Senaji, T. A., Metwally, E., Sejjaka, S., Pupilamp, B. B., Michaud, J., & Adedoyin-Rasaq, H. (2014). Lead-leadership Effectiveness, Motivation, and Culture in Africa: Lessons from Egypt, Ghana, Kenya, Nigeria, and Uganda. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, 31(4), 228-244.
- Slawinski, N. (2007). Strategic Leadership. In *Cases in Leadership*: Sage Publications.
- Tapera, J. (2014). The Importance of Strategic Management to Business Organizations. *Research Journal of Social Science and Management*, 3, 122-131.
- Thompson, A., Peteraf, M., Gamble, J., Strickland III, A. J., & Jain, A. K. (2013). *Crafting & Executing Strategy: The Quest for Competitive Advantage: Concepts and Cases*: McGraw-Hill Education.
- Van Wees, S. H., & Jennings, M. (2021). The Challenges of Donor Engagement with Faith-based Organizations in Cameroon's Health Sector: A Qualitative Study. *Health Policy and Planning*, 36(4), 464-472.
- Williams, K. S. (2014). *Non-profit Financial Sustainability*: Royal Roads University.
- Worden, S. (2005). Religion in strategic leadership: A positivistic, normative/theological, and strategic analysis. *Journal of Business ethics*, 57(3), 221-239.

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Industrial Impact On Physico-Chemical Properties In Soil Samples Of Nnewi-North Local Government Area, Anambra State, Southeast Nigeria.

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Abstract- This study determined the Industrial impact on physico-chemical properties in soil samples of Nnewi-North, Anambra State, Nigeria. Soil samples were collected quarterly from four villages and used to conduct the physical and chemical properties. Analytical methods were employed for the determination of these physico-chemical properties. The pH value ranged from 6.64-7.11 and 6.00-6.46 during the raining and dry season respectively. The soil pH increased with increase in rainfall being more acidic in the dry season than in the rainy season. The mean pH value was higher during raining season than in dry season with Uruagu soils (7.11) having the highest value. The mean EC value and OM content were higher in dry season than in raining season with the highest value of EC found in Umudim soils (1.30 dScm-1) and OM found in Nnewichi soils (1.51%). The mean sand and silt content were also higher during the raining season than in dry season with the highest value of sand content found in Uruagu soils (68.11%) and silt content (30.12%) in Umudim soils. Whereas mean clay content was highest during the dry season than in raining season with the highest value found in Uruagu soils (11.58%). The soils pH, EC and OC/OM were all affected by industrial activities in the area because most of these values were higher than the values obtained from control sites. Soil amendments should therefore be encouraged to ensure soil fertility by application of recommended inorganic fertilizers and organic matter so as to further support growth of crops such as cocoyam, yam, cassava and so on.

I. INTRODUCTION

Industrialization is essential for economic growth of any nation as it acts as a vehicle for development. Modern life style with increasing population and industrial growth has (led to serious impacts of human activity) impacted negatively on the environment at global scale [1]. To fulfil the basic requirements of increasing population, different types of industries have been set up in different regions of our country. These include pulp and paper, textile, cement, petrochemical, metal processing, food processing, fertilizer, sugar, pharmaceutical, distilleries among others. Heavy metals are in various raw materials, such as fossil fuels and metal ores, as well as in industrial products. Some trace metals are emitted entirely or partially from raw materials during

the high-temperature production of industrial goods, combustion of fuels, and incineration of municipal and industrial wastes, entering the ambient air with exhaust gases [2]. Atmospheric emissions from industrial complexes are considered as the main source of the environmental pollution. These emissions travel along vast areas by the effect of the meteorological factors and be accumulated in soil, plant, animal and may reach the food chain [3].

Plants, like all other living things, need food for their growth and development. Plants require 16 essential elements. Carbon, hydrogen, and oxygen are derived from the atmosphere and soil water.

The remaining 13 essential elements (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, zinc, manganese, copper, boron, molybdenum, and chlorine) are supplied either from soil minerals and soil organic matter or by organic or inorganic fertilizers. For plants to utilize these nutrients efficiently, light, heat, and water must be adequately supplied [4]. Agriculture alters the natural cycling of nutrients in soil. Intensive cultivation and harvesting of crops for human or animal consumption can effectively mine the soil of plant nutrients. In order to maintain soil fertility for sufficient crop yields, soil amendments are typically required. Early humans soon learned to amend their fields with animal manure, charcoal, ash, and lime (CaCO₃) to improve soil fertility. Today, farmers add numerous soil amendments to enhance soil fertility, including inorganic chemical fertilizers and organic sources of nutrients, such as manure or compost, often resulting in surplus quantities of primary macronutrients. The efficiency of fertilizer application and use by crops is not always optimized, and excess nutrients, especially N and P, can be transported via surface runoff or leaching from agricultural fields and pollute surface and groundwater [5,6]. The study of metal concentration in soils and plants are used not only to determine pollution levels but also for risk assessment and implication on human and animal health. Studies have shown that different plants have varying abilities and preferences for metals in soil. This is influenced by various factors including types of plants, nature of soils, climate and agricultural practices [7].

Cultural practices and control of diseases and insects also play important roles in crop production. Each type of plant is

unique and has an optimum nutrient range as well as a minimum requirement level. Below this minimum level, plants start to show nutrient deficiency symptoms. Excessive nutrient uptake can also cause poor growth because of toxicity. Therefore, the proper amount of application and the placement of nutrients is important. In addition to the levels of plant-available nutrients in soils, the soil pH plays an important role in nutrient availability and elemental toxicity [4]. However, there has not been work carried out to holistically evaluate the impact of industries on physico-chemical properties in soil samples of Nnewi-North. It was against this backdrop that this work was carried out. The aim of this study was to assess the impact of industries on physico-chemical properties in soil samples of Nnewi-North Local Government Area.

II. MATERIALS AND METHODS

Study Area

Nnewi is the second largest city in Anambra state, southeastern Nigeria shown in. Nnewi-North Local Government Area is commonly referred to as Nnewi central, and comprises four autonomous quarters: Otololo, Uruagu, Umudim, and Nnewichi [8]. Its geographical coordinates are 6°01'0" North and 6°55'0" East. The city is located east of the Niger River, and about 22 kilometers south east of Onitsha in Anambra state, Nigeria [9]. Nnewi is home to many major indigenous manufacturing industries. Nnewi is part of eastern Nigeria's industrial axis and acts as sophisticated networks expanded to include an international dimension through trading relations with exporters from Asia [8]. Over the last decades, the town of Nnewi has experienced relatively rapid industrialization. In excess of twenty medium-to-large scale industries have been established across a variety of sectors. The Nnewi-North LGA is associated with several industrial processes such as lead batteries, paint and several manufacturing industries which are known to release heavy metals into the environment. Infact, Nnewi is usually

referred to as the Japan of Nigeria because of its high industrialization and has about thirty giant manufacturing plants and over a hundred cottage industries [10].

Since 1970, Nnewi residents have controlled approximately 80 to 90 percent of the motor parts trade in Nigeria. Nkwo Nnewi Market is the major import and wholesale point for motor spare parts in Nigeria [8]. There are also many informal manufacturing activities in the production of motorcycle parts in Nnewi [8]. The first indigenous wholly Made-in-Nigeria motorcycle was manufactured in Nnewi by the National Agency for Science and Engineering Infrastructure (NASeni) [8]. By 1940, Nnewi residents were at the center of an international trading network that dominated the supply of motor parts in Nigeria. The town subsequently became a center for commerce and industry, and is known to have one of the largest automotive parts markets in Africa [11].

III. SAMPLE COLLECTION AND PRESERVATION

Soil samples were collected from four areas in Nnewi-North Local Government Area. The four areas include Otololo, Uruagu, Umudim, and Nnewichi. Control soil samples were collected from Ebonato. Triplicate samples (15-20cm depth), from each study site and control site were collected ten meters apart in a straight form using a stainless steel knife and pooled into polythene bags labelled with site locations. The soil samples were collected twice in rainy and dry seasons. In the laboratory, the soil samples were mixed thoroughly to obtain a composite sample for each site. The composite samples were air-dried for seventy-two hours at room temperature, ground in a mortar with pestle and passed through 2.0mm sieve, further pulverized to a fine powder and passed through 0.5mm sieve for the physico-chemical properties analysis [12]. This ensured that the analyte is not lost and good results were achieved. A description of the sampling sites is listed in Table 1.

Table 1 Description/Identification of Sampling Sites

S/N	Areas	Code	Sample site address	The Coordinates	Number of samples
1	Otololo	OTN	Otololo North	05°59.282 ¹ N/06°57.656 ¹ E	9
2	Otololo	OTS	Otololo South	06°00.342 ¹ N/06°55.264 ¹ E	9
3	Otololo	OTE	Otololo East	05°59.768 ¹ N/06°56.716 ¹ E	9
4	Otololo	OTW	Otololo West	06°01.258 ¹ N/06°55.958 ¹ E	9
5	Uruagu	URN	Uruagu North	06°02.512 ¹ N/06°52.800 ¹ E	9
6	Uruagu	URS	Uruagu South	06°01.059 ¹ N/06°54.175 ¹ E	9
7	Uruagu	URE	Uruagu East	06°02.225 ¹ N/06°54.038 ¹ E	9
8	Uruagu	URW	Uruagu West	06°01.575 ¹ N/06°56.032 ¹ E	9
9	Umudim	UMN	Umudim North	05°59.009 ¹ N/06°54.209 ¹ E	9
10	Umudim	UMS	Umudim South	06°00.860 ¹ N/06°54.927 ¹ E	9
11	Umudim	UME	Umudim East	05°59.662 ¹ N/06°53.915 ¹ E	9
12	Umudim	UMW	Umudim West	05°59.928 ¹ N/06°54.594 ¹ E	9
13	Nnewichi	NNN	Nnewichi North	06°01.647 ¹ N/06°55.738 ¹ E	9
14	Nnewichi	NNS	Nnewichi South	06°02.462 ¹ N/06°55.530 ¹ E	9
15	Nnewichi	NNE	Nnewichi East	06°01.654 ¹ N/06°55.165 ¹ E	9
16	Nnewichi	NNW	Nnewichi West	06°02.210 ¹ N/06°55.823 ¹ E	9

17	Ebenato	EBN	Ebenato North	05°57.440 ¹ N/06°57.446 ¹ E	9
18	Ebenato	EBS	Ebenato South	05°55.675 ¹ N/06°57.318 ¹ E	9
19	Ebenato	EBE	Ebenato East	05°56.962 ¹ N/06°57.446 ¹ E	9
20	Ebenato	EBW	Ebenato West	05°56.886 ¹ N/06°57.305 ¹ E	9

Determination of Moisture Content.

The moisture content was determined according to the method described by [13]. 10.0g of a representative sample of the soil was placed in a clean dry crucible of known weight. The crucible was placed in an oven maintained at 110±5⁰C for two hours until a constant weight (W₃) was obtained. The loss in weight was determined and the % Moisture was calculated as follows:

$$\% \text{ Moisture} = \frac{(W_2 - W_3)}{(W_3 - W_1)}$$

Where W₂=weight of crucible with sample before oven drying, W₃= weight of crucible with sample after oven drying, W₁=weight of empty crucible.

Determination of pH in Soil (H₂O)

The pH of soil samples was determined according to [14] at a ratio of 1:2.5. Ten grams (10.0g) of the air dried sample were weighed into 100ml beaker and 25ml of distilled water was added and stirred. The suspension was allowed to stand for 30mins with occasional stirring with glass rod. The pH of the soil supernatant suspension soil was then determined using a pH meter.

Determination of Electrical Conductivity

The electrical conductivity was determined according to the method of [15]. Ten grams (10.0g) of the air dried sample were weighed into 100ml beaker and 20ml of distilled water was added and stirred. The suspension was allowed to stand for 30mins with occasional stirring with glass rod to dissolve the soluble salts. The conductivity meter was calibrated with 0.01M Potassium Chloride Reference Solution to obtain the cell constant of 1.413dScm⁻¹. Then the electrode was gently lowered into soil suspension and reading was taken.

Determination of Particle Size.

Particle size analysis was determined according to the method of [16]. 50.0g of the soil sample was weighed into a 1000ml measuring cylinder and 3ml of 1M NaOH measured into each cylinder. The cylinder was made up to the mark with distilled water. The mixture was shaken and left for 40 seconds before dipping the hydrometer into it to determine the sandy content while the clay and silt was determined after 3 hours' interval (for the mixture to settle down) through the same process. The temperatures were then recorded simultaneously. % sand, % clay and % silt were calculated as follows.

$$S = \frac{R - RL \pm T \times 100}{W}$$

Where, R=Hydrometer reading, RL=Calibration correction, T=Temperature correction for 40 seconds and 3 hours respectively at corresponding temperature readings T₁ and T₂, W=air dry weight of soil sample.

Determination of Organic Carbon

The Organic carbon content of soils was determined by the [17] method. About 1.0g of soil sample containing organic carbon was placed in a 250ml conical flask and 10ml of 1M potassium dichromate solution was added and the content swirled gently. Later it was swirled rapidly and 20ml of concentrated sulphuric acid was added directing the steam into the suspension. The flask was immediately swirled gently until the soil and the reagent were mixed. Then more vigorously for 1 minute. The flask was kept on a head table for 30 minutes. 150ml of distilled water was added and 10ml of phosphoric acid and 10 drops of diphenylamine indicator were also added. The content was titrated with 0.5N ferrous sulphate solution with end point indicating a change from greenish to turbid blue then to deep green.

$$\% \text{ Carbon} = \frac{(B - T) \times (F \times 0.03 \times 1.33 \times 100)}{W}$$

Where, B = Volume of FeSO₄ used in titration of the blank
T = Volume of FeSO₄ used in titration of soil sample
F = Strength of FeSO₄ which is given by
S₂ = $\frac{V_1 S_1}{V_2}$
S₂ = F
V₂ = Blank
S₁ = Strength of K₂CrO₇
V₁ = Volume of K₂CrO₇
W = Weight of soil

IV. RESULTS AND DISCUSSIONS

Soil pH

Tables 2-5 summarize the physicochemical properties of the soil during the raining and dry season as well as the combined seasonal data for the studied area. The pH of the soil ranged from 6.00-7.11 with the mean value of 6.52±0.39, moving from moderately acidic to neutral (Table 5). Generally, the soil pH during the dry season were slightly acidic with the soil pH of Uruagu being the highest with a value of 6.46±0.64 (Table 3). Ebenato had the highest soil pH of 8.43±0.74 during the raining season. The soil pH of the studied area was more acidic in the dry season than in the rainy season. Nnewichi had the lowest soil pH of 6.64±0.84 during the raining season (Table 2) compared to Otolo with a soil pH of 6.00±0.50 which was the lowest during the dry season. The result of soil reaction indicated that the soil pH was moderately acidic to neutral across the study area. The trend in this result showed that acidity increases with decrease in soil moisture. The soils were acidic during the dry season and as the rainy season increases, pH values also increase even reaching to moderately alkaline. This trend can be attributed to the fact that increased moisture in the soil dissolves more soluble salts for instance, exchangeable Ca²⁺ and Mg²⁺ which has the potential to increase pH to a neutral value (6.00-7.11) thus, reducing acidity [18].

Table 2 Mean Physicochemical Properties of Soils during the Raining Season

Parameter	Location				Mean±sd	Ebenato
	Otolo	Uruagu	Umudim	Nnewichi		
pH (1:2.5)	6.77±0.41	7.11±0.90	6.70±0.50	6.64±0.86	6.80±0.20	8.43±0.74
EC (dScm⁻¹)	1.11±0.12	1.12±0.10	1.13±0.14	1.12±0.10	1.12±0.006	1.02±0.03
OM (%)	0.98±0.16	1.20±0.20	1.22±0.19	1.24±0.21	1.16±0.12	0.72±0.03
MC (%)	13.27±2.71	10.58±0.60	12.56±2.35	12.44±4.99	12.21±1.14	9.70±3.33
Sand (%)	66.29±4.11	68.11±6.94	60.45±2.92	66.31±1.06	65.29±3.33	67.21±0.43
Silt (%)	28.91±2.98	28.62±6.36	30.12±2.12	27.26±1.86	28.73±1.17	29.43±2.36
Clay (%)	4.8±1.13	3.27±0.57	9.43±5.04	6.43±0.80	5.98±2.63	3.36±1.92
Textural Class	SL	SL	SL	SL	SL	SL

NB: EC = Electrical conductivity, OM = Organic matter, MC = Moisture content, SL = Sandy loam

Table 3 Mean Physicochemical Properties of Soils during the Dry Season

Parameter	Location				Mean±sd	Ebenato
	Otolo	Uruagu	Umudim	Nnewichi		
pH (1:2.5)	6.00±0.50	6.46±0.64	6.18±0.66	6.33±1.03	6.24±0.19	6.62±0.26
EC (dScm⁻¹)	1.26±0.09	1.24±0.05	1.30±0.21	1.28±0.11	1.27±0.02	1.05±0.14
OM (%)	1.44±0.19	1.35±0.12	1.45±0.05	1.51±0.04	1.43±0.06	1.18±0.09
MC (%)	5.37±1.20	5.02±1.44	4.77±1.20	5.05±0.86	5.05±0.24	5.06±1.33
Sand (%)	62.54±4.72	66.28±4.37	59.85±1.19	66.86±1.64	63.88±3.29	68.24±1.41
Silt (%)	29.58±1.15	22.14±10.33	30.03±2.25	25.85±2.70	26.90±3.68	26.76±1.41
Clay (%)	7.88±3.56	11.58±5.96	10.12±1.06	7.29±1.06	9.22±1.99	5.00±0.00
Textural Class	SL	SL	SL	SL	SL	SL

NB: EC = Electrical conductivity, OM = Organic matter, MC = Moisture content, SL = Sandy loam

Table 4 Statistics for Physicochemical Properties of Soils during the Seasons

Parameter	Rainy Season		Dry season	
	Mean±sd	Range	Mean±sd	Range
pH (1:2.5)	6.80±0.20	6.64-7.11	6.24±0.19	6.00-6.46
EC (dScm⁻¹)	1.12±0.006	1.11-1.13	1.27±0.02	1.24-1.30
OM (%)	1.16±0.12	0.98-1.24	1.43±0.06	1.35-1.51
MC (%)	12.21±1.14	10.58-13.27	5.05±0.24	4.77-5.37
Sand (%)	65.29±3.33	60.45-68.11	63.88±3.29	59.85-66.86

Silt (%)	28.73±1.17	27.26-30.12	26.90±3.68	22.13-30.02
Clay (%)	5.98±2.63	3.27-9.43	9.22±1.99	7.29-11.58
Textural Class	SL	-	SL	-

NB: EC = Electrical conductivity, OM = Organic matter, MC = Moisture content, SL = Sandy loam.

Table 5 Statistics for Combined Physico-chemical Properties of Soils in the Studied Area

Parameter	Mean±sd	Range
pH (1:2.5)	6.52±0.39	6.00-7.11
EC (dScm⁻¹)	1.19±0.10	1.11-1.30
OM (%)	1.29±0.19	0.98-1.51
MC (%)	8.63±5.06	4.77-13.27
Sand (%)	64.58±0.99	59.85-68.86
Silt (%)	27.80±1.29	22.13-30.12
Clay (%)	7.59±2.28	3.27-11.58
Textural Class	SL	-

NB: EC = Electrical conductivity, OM = Organic matter, MC = Moisture content, SL = Sandy loam

However, in the control site which had a lower moisture content, the high pH value could be attributed to low organic matter content in the soil which produce less carbonic acid thus leading to high pH value [18,19].

Ratio of mixing between soil and water has the potential of altering the soil reaction. When the soil exchange site is rich in basic cations, such as Ca, Mg and Na, the possibility of raising the soil pH is high especially under continuous or prolonged moist condition in the soil. This assertion is in consonance with [18] as well as [19]. Also, the porous nature of the soil texture being dominated by sand particles permits excessive leaching of basic cations beyond the rhizosphere, thus creating acidic soils that are dominated by acidic cations such as H⁺ and even Al³⁺. These findings agree with [20].

Seasonal variation is important in the distribution of elemental cations in the soil and this in turn influences changes in the soil reaction. Also, relatively lower pH values observed during the dry season especially from the industrial areas samples suggested the decomposition of organic matter that releases carbon (iv) oxide which reacts with soil water to form carbonic acid which eventually reduces soil pH [21]. This low pH enhances heavy metal solubility and mobility in the soil [21]. Heavy metal mobility decreases with increasing soil pH, hence all the industrial sites sampled had relatively lower pH values than the control site and had high concentration of heavy metals. This variability further suggests the effect of pH on the availability of heavy metals. It is noteworthy that pH is an important soil property, having great effects on solute concentration and sorption/desorption of contaminants in soils. The low pH enhances metals transportation and distribution in soils [22].

Electrical Conductivity (EC)

The distribution of electrical conductivity (EC) of the soil of the studied area ranged from 1.11-1.13dScm⁻¹ with a mean value of 1.12±0.006 for the raining season and a range of 1.24-1.30 dScm⁻¹ and a mean value of 1.27±0.02 for the dry season (Table 4). The soil of Umudim had the highest EC of 1.30±0.21 and a least level was found in the soil of Ebenato (1.05±0.14) during the dry season (Table 4.2). Generally, the soil EC were lower during the raining season (Table 2).

The result showed that EC was higher in the dry season samples than in the rainy season. This implied that seasonal variation caused some changes or fluctuation in the status of electrical conductivity of the soil leading to increased EC as the soil gets drier. Electrical conductivity is the rate at which a soil conducts electricity or allows electric current to flow through it [23]. It is in essence a measure of the amount or preponderance of soluble salts in the soil solution. The trend in the soil showed an increase in the concentration of EC in the soil with change in season from rainy to dry season. This can be attributed to fluctuating moisture status in the soils as is also being reported by [24]. In some instance, changing human activities or anthropogenic activities can cause changes in soil EC owing to deposition or indiscriminate disposal of industrial wastes that may contain soluble salts [24].

Organic Matter

Soil organic matter of the studied area ranged from 0.98-1.24% OM with a mean value of 1.16±0.12 (Table 4) during the raining season The values ranged from low to moderate. Ebenato had the least value of 0.72±0.03 whilst Nnewichi had the highest

value of 1.24 ± 0.21 during the raining season. The dry season levels were higher than the levels recorded in the raining seasons. Organic matter is the remains of plants and animals either decomposed or partially decomposed that is housed in the form of humus and measured as organic carbon. It is the store house of plants nutrients especially nitrogen, phosphorus and potassium as well as calcium and sulphur. Also it supplies some essential micronutrients required by plants for better growth and development. In the soil, it also serves as food for microbes and some meso organisms such as earthworms and some species of termites [19, 23]. The result showed generally that organic matter was more in the soils of Umudim and Nnewichi especially during the dry season. In all the sampling seasons, however, the control site Ebenato had the least in terms of organic matter content. It can be noted that organic matter was generally moderate in all the locations. In the lower slope position, materials are washed from upper slope and adjacent lands are being deposited and consequently increasing organic matter level. This assertion agrees with [23,25].

It can be seen that the content of organic matter in the soils across the four locations increased with change in season with the dry season producing highest content of organic matter in the soils in all the locations. This can be attributed to relative dryness in the soil that reduces the rate of mineralization and losses to leaching that is obvious during the rainy season [25]. In the rainy season, organic matter is easily taken up by plants roots and also lost to leaching and surface erosion which may be relatively slower in the dry season [25]. This could account for the reduced organic matter content of the soils during the rainy season.

The increase in organic matter content could also explain the reduction in pH values of the soils during the dry season. This is because presence of high amount of organic matter in the soil could lead to the formation of organic acids in the soil thus reducing the pH values of the soil. This assertion agrees with [25,26]. It is important to note that soil organic matter influences many physical and chemical conditions in the soil such as increased soil aggregation, increased moisture and nutrient holding potential of the soil and a general decrease in soil bulk density thus improving aeration status of the soil [18,20]. Also, organic matter in the soil could result in the formation of important compounds with some metal oxides in the soil. This is important in remediating heavy metals pollution or contamination in the soil since organic matter can bind the heavy metals and reduce its mobility in the soil as well as restrict or localize the contamination [26,27].

Soil Moisture Content (MC)

The moisture content of the soil of the studied ranged from 4.77-13.27% with a mean value of 8.63 ± 5.06 , moving from low to moderates (Table 5). Generally, the soil moisture during the raining season were higher, ranging from 10.58-13.27% with a mean value of 12.21 ± 1.14 whilst the dry season ranged from 4.77-5.37% with a mean value of 12.21 ± 1.14 (Table 4). Otolo had the highest soil moisture content of 13.27 ± 2.71 during the raining season (Table 2) compared to Umudim with a soil MC of 4.77 ± 1.20 during the dry season (Table 3). Seasonal variation in soil moisture content indicate that soil moisture content was higher in the soils during the rainy season than in the dry season. These findings were similar to the report of [28]. The soil moisture values

were rated low to moderate [26] and this may be attributed to low clay content in the soil as reported by [29]. Soil moisture content is the amount of water that is available in the soil and occupies the macro pores of the soils depending on the level of availability [30]. This is expected as rainfall is an important source of soil water under natural setting except where irrigation is practiced. Also, the low moisture content of 5.05% during the dry season in the soil can be attributed to the sandy nature of the soils which makes it porous and prone to excessive loss of moisture to evaporation, deep percolation which recharges the ground water table and aquifers as well as absorption by plants roots. This result agrees with [19,23].

in the dry season as a security against inevitable moisture shortage in the soil, especially for crop production.

Soil Texture

The textural distribution of the soils showed that the soils of the area were generally determined as Sandy loam during the raining season having a sand proportion that ranged from 60.45-68.11% with a mean sand content of 65.29 ± 3.33 . Silt in the soils of the area ranged from 27.26-30.12 % with a mean value of 28.72 ± 1.17 while clay content ranged from 3.27-9.43 % with a mean value of 4.8 ± 1.13 % (Table 2). In the dry season also, soil texture was uniformly sandy loam with a high proportion of sand particles, moderate silt and low clay content. The sand content of the soils ranged from 59.85-66.86% with a mean value of 63.88 ± 3.29 . Silt in the soils of the area ranged from 22.13-30.02 % with a mean value of 26.90 ± 3.68 while clay content ranged from 7.29-11.58% with a mean value of 9.22 ± 1.99 during the dry season. There were no changes in the texture of the soils between the dry and raining season. Sand and silt particles were observed to be high while clay was very low in all the soils across the different locations and seasons. This finding agrees with [31] when he reported on the soils of the south eastern Nigeria as being predominantly sandy. Again, the soil textural class was generally sandy loam in both seasons. Soil texture being the relative proportion of sand, silt and clay in a soil sample is a permanent property that changes little or not at all regardless of time and land use types. Hence the soil texture remained the same in both seasons. This assertion agrees with [19,23] who noted that soil texture is a physical property of the soil that is relatively permanent and does not change with time. The slight change observed in Uruagu during the third quarter of the year where the texture changed from sandy loam to loamy sand can be attributed to possible sampling error due to season which are common possibilities, as exact spots sampled previously may not be easily established with precise accuracy. This assertion agrees with [32]. Soil texture plays an important role in mobility of metals in soils. As a result of the non-significant variations in the particle distribution it is expected that the concentrations of elements of interest, Cu, Zn, Mn, Ni, Co and Cd may increase with depth, possibly due to leaching from the surface [33].

V. CONCLUSIONS

An effluent is an inevitable product of industrial process. Effluent of different industries may vary in composition depending upon the source of production. Effluent may contain essential nutrients and some toxic substances. The available

macronutrients and micronutrients of effluents can increase soil fertility. On the other hand, the heavy metals and toxic components can accumulate in soil. The process of metal uptake, accumulation and distribution in plants is strongly influenced by the soil characteristics including pH, cation exchange capacity (CEC), organic matter, metals content, solubility sequences and plant species [34]. The soils of the studied area were generally sandy loamy in texture with high sand content, moderate silt and very low clay content. This makes the soils porous and susceptible to leaching, erosion and loss of nutrients. The soil pH varied from moderately acidic to neutral (6.00-7.11) from the various locations and these are considered as normal for agricultural production. The organic matter contents were generally low to moderate in all the soils of the studied area whereas the electrical conductivity of the soils increased as the dry season increased. The soils pH, EC, and OC/OM were all affected by industrial activities in the area because most of these values were higher than the values obtained from control sites.

VI. RECOMMENDATIONS

There would be need for;

- Monitoring, educating and training of farmers on the levels of application of agrochemicals such as fertilizers, pesticides and herbicides since the effects of agrochemicals are often a result of improper use or improper choice of products in relation to the local conditions.
- There should be an increase in the public awareness with regard to the risk of the adverse health effects that could possibly arise from the environmental pollution by heavy metals.
- Since no industry is established in Nigeria without an Environmental Impact Assessment (EIA) study report, so there is need for the regulatory agency to monitor regularly the probable levels of wastes/effluents discharged by these industries after establishment to know whether the companies are keeping to terms.

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REFERENCES

- [1] Agbede, O.O. (2009). Understanding soil and plant nutrition. Salman Press Limited, Keffi, Nasarawa State, Nigeria.
- [2] Akan, J.C., Mohmoud, S., Yikala B.S. and Ogugbuaja, V.O., (2012). Bioaccumulation of some heavy metals in fish sample from River Benue in Vinikilang, Adamawa State, Nigeria, *Am.J. Anal. Chem.*, 3, 727-736.
- [3] Amune, C.O.C. and Kakulu, S.E., (2012). Heavy metals pollution in Agricultural soil of Adogo in Ajaokuta Local Govt Area of Kogi State, *Academia Journal of Environmental Sciences*, 1(2), 031-035.
- [4] Anderson, S.E. and Ingram, J.S.I., (1989). Tropical soil biology and fertility: A handbook of methods. C.A.B. International, Aberystwyth.
- [5] Bamgbose, O., Odukoya, O. and Arowolo, T.O.A., (2000). Earthworms as bio-indicator of metal pollution in dumpsites of Abeokuta city, Nigeria, *International Journal of Tropical Biology and Conservation* 48, 229-234.
- [6] Bouyoucos, G. H., (1962). A Recalibration of the hydrometer for making mechanical analysis of soils, *Agron J.*, 43, 434-438.
- [7] Brady, N.C. and Weil, R.W., (2005). The nature and properties of soils. 13th Ed., Pearson Education, Inc. New Jersey, USA.
- [8] Barnabas, I.M. and Nwaka, G.I.C., (2014). Characterization of soils of Jiwa in the Federal Capital Territory Abuja, Nigeria Proceedings of the 38th Annual Conference of the soil science society of Nigeria.
- [9] Barnabas, I.M., Wapa, J.M. and Okogi, L.O., (2017). Effects of pH variation on the physical and chemical properties of soil and growth and development of maize (*Zea mays*), *Kaduna Journal of Agricultural and Natural Resources*, 2(1), 81-90.
- [10] Erosion, (2009). A case study of some locations of Anambra State, Southeastern Nigeria.
- [11] Esu E.I, (2010). Soil characterization, classification and survey HEBN publishers, PLC1 Ighodaro road Jericho, Ibadan Nigeria.
- [12] Ezeaku, P.I. (2011). Methodologies for Agricultural Land Use Planning. Sustainable Soil Management and Productivity. Great AP Express Publishers Nsukka- Nigeria, pp 248.
- [13] FAO/WHO (2001) Food Standards Program. Codex Alimentarius Commission (FAO/WHO) Food additives and contaminants, Geneva, Switzerland, ALINORM 01/12A, 1-289.
- [14] Gebeyaw, T.Y., (2007). Assessment of soil fertility variation in different land uses and management practices in Maybar watershed, South Wollo zone, North Ethiopia, *International Journal of Environmental Bioremediation and Biodegradation* 3(1), 15 – 22.
- [15] Hillel, D., (2008). Introduction to soil physics. Academic press, Inc. New York.
- [16] Idoga S. and Azagaku, D.E., (2005). Characterization and classification of soils of Janta Area, Plateau State of Nigeria, *Nigeria Journal of Soil Science*, 15, 116 – 122.
- [17] Moss, B., (2008). Water pollution by agriculture, *Philosophical Transactions of the Royal Society B-Biological Sciences*, 363, 659-666.
- [18] Mohamed, A.K.M. (2006). Pollution and environmental control, Assiut University Book, Publishing Unit.
- [19] Nnaji, G.U. and Onwuchekwa, C.F., (2018). Influence of municipal refuse dump effluent on soil properties. Book of abstracts. 42nd Annual Conference of the Soil Science Society of Nigeria (SSSN), Ibadan, 2018. pp77.
- [20] NCCIMA., (2015). Compendium of Commercial and Industrial Activities in Nnewi, Anambra, State, Nigeria. By Nnewi Chamber of Commerce, Industry, Mines and Agriculture, supported by Technology Incubation Center, 79-90.
- [21] Obi, M.E., (2011). Soil Physics. A compendium of lectures on soil physics. Atlanta Publishers, Nsukka, Nigeria.
- [22] Odueze, J.C., Nwakonobi, T.U. and Itodo, I.N. (2017). Influence of physico-chemical characteristics of soils on heavy metal contamination in Makurdi, Benue State, *Journal of Environmental Science, Toxicology and Food Technology*, 11 (5), 84 – 92.
- [23] Ogbodo, E.N., (2011). Assessment of soil fertility characteristics of Abakaliki Urban plains of South-East Nigeria for sustainable crop production, *World Journal of Agricultural Sciences*, 7(4), 489-415.
- [24]

- [25] Oku, E.E., Odoh, N.C., Barnabas, I.M. and Sarafina, E., (2020). Infiltration characteristics of soils of south eastern Nigeria, *Nigeria Journal of Soil Science*, 21 (2), 248-256.
- [26] Onwutalobi, A.C., (2015). Nnewi Industrialization overview- The official Nnewi City Portal.
- [27] Pacyna, J.M. and Pacyna, E.G., (2011). An assessment of global and regional emissions of trace metals to the atmosphere from anthropogenic sources worldwide, *Environment Research*, 9, 269-298.
- [28] Quartacci, M.F., Argilla, A., Baker, A.J.M., Navari-Izzo, A., (2006). Phytoextraction of metals from a multiply contaminated soil by Indian mustard, *Chemosphere*, 63, 918–925.
- [29] Rose, A., Orisakwe, O.E., Afonne, O.J., Ejeatuluchukwu, O., Nduka, J.C. and Dioka, C.E., (2005). Impact of effluents from Cable Manufacturing plant on Food, Water and Soil Qualities in Nnewi, Nigeria, *Pakistan Journal of Biological Sciences* 8(5), 744-747.
- [30] Rhodes, J. D., (1982). Soluble salts. In *method of soil analysis*. Page et al., (eds). *Agronomy* 9, Part 2 Ameni SOC, Agron., 171-173.
- [31] Sharpley, A. N., Haygarth, P. M. and Jarvis, S. C., (2002). Introduction: Agriculture as a potential Source of water pollution, *Agriculture, hydrology and water quality*, 4 (5).
- [32] Uchida, R., (2000). Essential Nutrients for Plant Growth: Nutrient Functions and Deficiency Symptoms in: J. A. Silva and R. Uchida, (eds.), *Plant Nutrient Management in Hawaii's Soils, Approaches for Tropical and Subtropical Agriculture* College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa.
- [33] Wakene, N., (2001). Assessment of important physicochemical properties of Dystric Udalf (Dystric Nitosols) under different management systems in Bako area, western Ethiopia. M.Sc. Thesis Submitted to School of Graduate Studies, Alemaya University, Ethiopia
- [34] Walklay, A. and Black, I. A., (1934). An examination of the degtjareff method for determining soil organic matter and the proposed modification of the chronic acid titration method, *Soil Sci.* 37, 29-38.
- [35] Wapa, J. M., Barnabas, I. M. and Ochiwu, E.A., (2017). Physico-Chemical Properties of Termite Mounds in the Southern Guinea Savanna Agro-ecological Zone of Nigeria. *Kaduna Journal of Agriculture and Natural Resources (KJANR)*, Vol. 1 (1), 1 – 16.

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Process Optimization and Characterization of Bioethanol from Yam (*Dioscorea rotundata*) Peels

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Abstract- Today, fossil fuels are been used for both domestic and commercial energy needs in the World. Environmental effects, coupled with the depletion issue of these fossil fuels has led to the search for alternative energy sources. Bioenergy is one of these alternative energy resources. It represents the production of sustainable chemicals and fuels by utilizing biomass as starting raw material. Bioethanol and biogas are the common fuels that are obtained from biomass. The present study is aimed at optimizing the production process and characterizing bioethanol produced from yam peels. Different hydrolysis temperatures and times were used to determine the temperature and time that could give an optimal yield of glucose. The results revealed that hydrolysis temperature of 110 °C and hydrolysis time 180 minutes gave the optimal yield of glucose. This temperature and time were then used for the production of bioethanol. Results obtained revealed that two hundred grams of the sample gave yields of 180 mL after fermentation for 5 days. The bioethanol produced from yam peel was characterized to determine its density, specific gravity, refractive index, sulphur content, flash point and cloud point. Results obtained revealed that the properties of the bioethanol produced correspond to the properties of bioethanol recommended by the American society for testing and materials (ASTM).

Index Terms- bioethanol, biomass waste, hydrolysis, fermentation.

I. INTRODUCTION

Today, fossil fuels are been used for both domestic and commercial energy needs in the World¹. Environmental effects, coupled with depletion issue of these fossil fuels has led to the search of alternative energy sources². There has been changes in the sources of energy in the globe for more than two decades. The utilization of wood as biomass resources dated back to when mankind used wood to either keep themselves warm or for cooking food. It was reported by Demirbas (2006)³ that transition from nuclear energy led to oil, from oil to natural gas and from wood biomass led to coal. Frauke and Mitchell (2011)⁴ reported that due to the continuous utilization of fossil-based resources, there is increase in the daily amount of carbon dioxide that is produced and emitted into the environment⁵. Over a lengthy period of time, carbon dioxide that is emitted to the earth's atmosphere accumulates and increase on the warmth of the planet and global warming effect is because of the increase in carbon dioxide deposition. Renewable energy technologies that does not emit carbon dioxide and other gases, that is comparable or that perform better than the current fossil-based energy technologies were proposed as a solution to the current global warming. Abdulkareem *et al.* (2012)⁵ made it clear that in other to minimized emission level, maximized recyclability, and increased functionality to get rid of hazardous emissions in our environment there is need for the search for an alternative energy resource. Bioenergy is one of this alternative energy resources. It represents the production of sustainable chemicals and fuels by utilizing biomass as starting raw material. Bioethanol and biogas are the common fuels that are obtained from biomass.

The conversion of huge organic wastes of biomass generated by food processing sector and other human endeavours into useful products such as ethanol is now growing interest in both Nigeria and many developing countries.

In the present years, considerable attention has been given to bioethanol produced from renewable biomass. The development of an eco-friendly and economical ethanol production process was the focus of most research in the last decade. Bioethanol produced from forestry and agricultural residues and other forms of lignocellulosic biomass were given more attention⁶. The disposal and burning of agricultural products residues in the past were an accepted practice, however, due to concern over health effects from burning fields, it is now being challenged. This waste and residue contain a reasonable amount of cellulose which is a good source of fermentable sugars. Production of bioethanol is made environmentally friendly and also renewable through bioconversion of cellulosic biomass into fermentable sugar using microorganisms⁷.

II. Materials and Methods

Biomass Sample Pretreatment

In the present study, yam peels (*Dioscorea rotundata*) as residue from agricultural crops were used as biomass sources. The Yam peels samples was sources locally in Kaduna State. In the conversion of lignocellulosic biomass such as sugarcane bagasse into bioethanol; four major unit operations are employed. These include: pre-treatment, hydrolysis, fermentation and product recovery/distillation. Pre-treatment is the first stage in the production of bioethanol. The peels was washed under running tap to remove sand and other impurities, and was sun-dried for three days before milling into a powder (flour) and it was then sieved to standardize the particle size. The sieved biomass sample was then stored in plastic jars at ambient temperature. Figure 1 shows the processed waste biomass used in this study.



Figure 1. Biomass Sample

Acid Hydrolysis of Yam Peels

The acid hydrolysis was carried out as described by Oyeleke and Manga (2009)⁷. The effect of temperature and time of hydrolysis process was investigated to ascertain the optimal experimental conditions for the production of sugar from yam peels (cellulosic feedstock) for bioethanol production. The effect of temperature on the hydrolysis process was investigated by varying the temperature between 60.00 - 110.00 °C with step increment of 10.00 °C. Hydrolysis time was also varied between 30.00 - 180.00 min with step increment of 30.00 min. A quantity (30.00 gram) each of Yam peels sample was weighed into 6 separate conical flasks, and 50.00 mL of 1.00 M of HCl was added to each conical flask respectively. The flask was covered with cotton wool, wrapped in aluminum foil and was heated in a water bath. The hydrolysed sample was autoclaved for 15.00 min at 121.00 °C. The flask was allowed to cool, then followed by filtration using No 1 Whatman filter paper and the sugar yield measured and recorded.

The optimum hydrolysis temperature and time was then used to hydrolyse 200.00 grams of yam peels in 1000.00 mL of 1.00 M HCl, the sugar of the filtrate was measured and the pH of the filtrate sample was adjusted to pH of 5.00 using 20.00 % NaOH and was subjected to fermentation process.

Determination of Sugar Content of the Filtrate

The Abbe 60 direct reading refractometer was used to determine the sugar content of the filtrate. The sugar was determined using the standard procedure of the American Society for Testing and Materials (ASTM D1218). Few (3 – 4) drops of the sample were transferred into the glass slide of the refractometer. Water at 30.00 °C was circulated round the glass slide to keep its temperature uniform. Through the eyepiece of the refractometer, the dark portion viewed was adjusted to be in line with the intersection of the cross. At no parallax error, the pointer on the scale pointed to the refractive index above and sugar level below. This was repeated and the mean value noted and recorded as the sugar level.

Fermentation of Hydrolysed Samples

The fermentation was carried out as described by Kroumov *et al.* (2006)⁸ and Oghgren *et al.* (2006)⁹. After adjusting the pH of the hydrolysed sample, 20.00 grams of *Saccharomyces cerevisiae* (yeast) was added and was shaken for about 5 min to activate the yeast. The sample was then allowed to undergo fermentation for 5 days.

Distillation of Fermented Samples

After fermentation for 5 days, the sample was then removed. The fermented broth was then dispensed into round-bottom flasks fixed to a distillation. A conical flask was fixed to the other end of the distillation column to collect the distillate. A heating mantle with the temperature adjusted to 78.00 °C was used to heat the round-bottomed flask containing the fermented broth⁷. The volume of the distillate was measured using measuring cylinder.

Confirmatory Test for Bioethanol Produced

The sample of bioethanol produced was analyzed using Shimadzu FTIR-8400S Fourier Transform Infrared Spectrophotometer, at NARICT Zaria, Kaduna State, Nigeria, to confirm or otherwise if ethanol was actually produced.

Characterization of Bioethanol Produced

Based on reported method Ademiluyi and Mepba (2013)¹⁰, the bioethanol produced from yam peels was characterized to determine its properties and was compared with standard values of bioethanol.

Density

As described by Ademiluyi and Mepba (2013). The density was measured using pycnometer. Empty pycnometer was weighed. The pycnometer was then filled with the sample (ethanol), the excess was wiped off, the weight was recorded, and the density was calculated using the formula:

$$\text{Density (g/mL)} = \frac{\text{mass}}{\text{volume}} \quad [1]$$

Specific gravity

As described by Ademiluyi and Mepba (2013). The specific gravity was measured using pycnometer. Distilled water was filled into the pycnometer, weighed and recorded. The specific gravity was then calculated using the formula:

$$\text{Specific gravity (spg)} = \frac{\text{Density of Ethanol}}{\text{Density of Water}} \quad [2]$$

Refractive index

In accordance with the standard procedure of the American Society for Testing and Materials (ASTM D1218), Abbe 60 direct reading refractometer was used to determine the refractive index. Few drops of the sample were transferred into the glass slide of the refractometer. Water at 30.00 °C was circulated round the glass slide to keep its temperature uniform. Through the eyepiece of the refractometer, the dark portion viewed was adjusted to be in line with the intersection of the cross. At no parallax error, the pointer on the scale pointed to the refractive index above and brix level below. This was repeated and the mean value noted and recorded as the refractive index.

Flash point

The American Society for Testing and Materials (ASTMD92) method was used to determine the flash point of the bioethanol. A quantity (10.00 mL) of the sample was introduced into a (50.00 mL) beaker and then a thermometer was inserted. The beaker was placed on a bunsen burner. A flame source was brought at intervals to determine the temperature at which a flash appeared on the surface of the sample while the sample in the beaker was heated.

III. RESULT AND DISCUSSIONS

Optimization of Hydrolysis Temperature

Yam peels was utilized as a feedstock for the conversion of bioethanol. The hydrolysis time and temperature were first optimized and the bioethanol was produced using the optimum hydrolysis temperature and time.

As reported in literature, increase in hydrolysis temperature positively favoured the sugar yield¹¹. In this present study, hydrolysis temperature was varied between 60.00 °C to 110.00 °C, while hydrolysis time was fixed at 20.00 min with acid concentration of 1.00 M. The results obtained as presented in Table 1.0 indicated that, increase in hydrolysis temperature positively favoured the sugar yield with optimum yield of 12.00 % at 110.00 °C. When compared to the work of Egbosiuba *et al.* (2014)¹² in Table 2.0, the optimum sugar yield of 12.00 % at 110.00 °C obtained in this study contradicted the result which reported a decreased in sugar yield when temperature was increased to 110.00 °C. The variation in the temperatures could be attributed to the variation in the variety of feedstock utilized and other operating parameters.

Table 1.0: Effect of Hydrolysis Temperature on the Yield of Sugar

Temperature (°C)	Sugar Yield (%)
60.00	2.50
70.00	3.00
80.00	4.00
90.00	5.00
100.00	11.00
110.00	12.00

Table 2.0: Comparison between the Effect of Hydrolysis Temperature on the Yield of Sugar on Yam Peels and Cassava Peels

Temperature (°C)	Present Work Sugar Yield (%)	¹ Reported Sugar Yield of Cassava Peels (%)
60.00	2.50	3.50
70.00	3.00	4.00
80.00	4.00	4.50
90.00	5.00	5.00
100.00	11.00	6.00
110.00	12.00	5.50

¹(Egbosiuba *et al.*, 2014)¹².

Optimization of Hydrolysis Time

Also investigated in this study was the influence of time on hydrolysis. For this purpose, hydrolysis time was varied between 30.00 min to 180.00 min, while hydrolysis temperature was fixed at 50.00 °C with acid concentration of 1.00 M.

Results obtained as depicted in Table 3.0 shows that hydrolysis time of 120.00 min gave the maximum sugar yield of 8.60 %. The sugar yield from hydrolysis of the yam peels increases with increase in hydrolysis time from 30.00 min to 120.00 min. Whereas, further increment of hydrolysis time resulted in decrease sugar yield. Compared to literature, this pattern of results closely agrees to the result reported by Egbosiuba *et al.* (2014)¹² (Table 4.0), who work on the “Production and Characterization of Bioethanol from Cassava Peel: Alternative Energy Source”. The decrease in sugar yield when the hydrolysis time was increased may be due to degradation of sugar.

Table 3.0: Effect of Hydrolysis Time on the Yield of Sugar

Time (min)	Sugar Yield (%)
30.00	2.00
60.00	3.00
90.00	5.50
120.00	8.60
150.00	3.40
180.00	3.40

Table 4.0: Comparison between the Effect of Hydrolysis Time on the Yield of Sugar on Yam Peels and Cassava Peels

Time (min)	Present Work Sugar Yield (%)	Reported Hydrolysis Time (min) Used for Cassava Peels	¹ Reported Sugar Yield of Cassava Peels (%)
30.00	2.00	30.00	6.00
60.00	3.00	35.00	7.00
90.00	5.50	40.00	7.50
120.00	8.60	45.00	7.80
150.00	3.40	50.00	7.30
180.00	3.40		

¹(Egbosiuba *et al.*, 2014)¹².

Volume of Bioethanol Produced

The optimum hydrolysis temperature and time was used to produce bioethanol. The result as shown in Table 5.0 revealed that two hundred grams (200.00 grams) of the yam peels gave bioethanol yield of 180.00 mL after fermentation for 5 days. The results revealed the possibilities of producing bioethanol from yam peels which may serve as cheap alternative source of fuel and energy generation.

Table 5.0: Volume of Bioethanol Produced

Yam Peels	Hydrolysis Temperature	Hydrolysis Time	Fermentation Time	Volume of Bioethanol
200.00 grams	110.00 °C	120.00 min	5 days	180 mL

Fourier Transform Infrared (FTIR) Results for Bioethanol

Figure 2.0 shows the FTIR result of the sample. The peak around 3419.90 cm^{-1} represents O–H stretching¹³. The peaks at 2924.18 cm^{-1} and 2853.78 cm^{-1} is ascribed to C–H stretch¹⁴, while that observed around 1640.51 cm^{-1} as is between 1680 cm^{-1} – 1600 cm^{-1} represent C=C¹⁵. Also, absorption bands at 1300 – 1600 cm^{-1} related to lignin has also being reported earlier by Kumar *et al.* (2009)¹⁶. The peak at 1440 – 1220 cm^{-1} represent C–O–H bending as it appears as broad and weak¹⁵, while the peak around 1153.47 cm^{-1} as is between 1260 – 1000 cm^{-1} represent C–O stretching which can be used to assigned primary, secondary, or tertiary structure to an alcohol¹⁵.

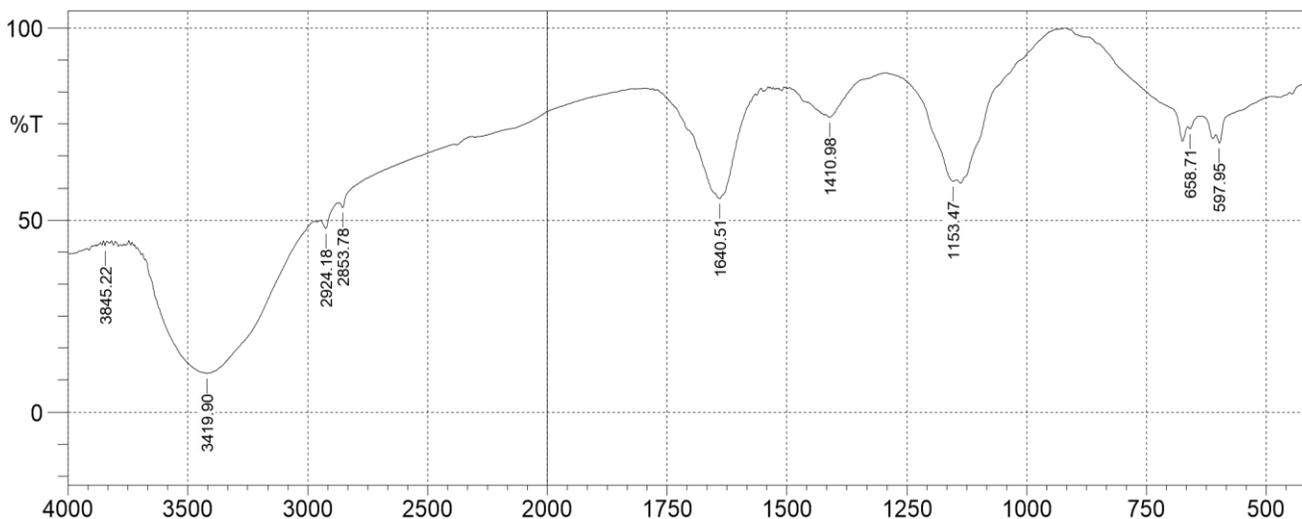


Figure 2.0: FTIR Result of the Bioethanol

Characterization of Bioethanol

The results of the properties of produced bioethanol is presented in Table 6.0. Density is an important parameter for ethanol fuel injection systems. The value of density must be maintained within the tolerable limits to allow optimal air to fuel ratios for complete combustion. High density bioethanol can lead to incomplete combustion and particulate matter emission^{17,18}. The density of bioethanol produced was determined to be 0.784 gcm^{-3} which is less than ASTM standard value 0.790 gcm^{-3} . This value shows slight deviation from 0.789 gcm^{-3} reported in the work of Bilyaminu *et al.* (2016)¹⁹ who worked on the characterization of bioethanol produced from sugarcane juice. The slight deviation in density observed in the result can be strongly attributed to differences in feedstock used, fermentation process employed and presence of impurities.

Also tested was the specific gravity of the produced bioethanol. The results as presented in Table 6.0 also indicated that the specific gravity of the produced bioethanol was 0.802 conform to the recommended ASTM standard value. Specific gravity is the ratio of the density of an observed substance to the density of a reference substance (mostly water) at the same conditions²⁰. Compared to reported literature, the specific gravity in the present study is higher than that reported by Egbosiuba *et al.* (2014)¹² and Bilyaminu *et al.* (2016)¹⁹, the deviation in the specific gravity might be the distillation process employed. It is a very important property of bioethanol which has relevance in blending with gasoline. This property also impacts positively on the efficient performance of engine.

Refractive index is another fuel property tested for which is used for the identification and the determination of the purity of bioethanol. Refractive index of the produced bioethanol in this study is 1.329 as presented in Table 6.0 which is lighter than the set ASTM value. Compared to the refractive index of 1.362 reported by Egbosiuba *et al.* (2014)¹², the refractive index in this study is higher. It can be deduced from the results obtained that the bioethanol produced is pure.

Flash point described is a physical parameter that measures the potential of fuels to catch fire and explosion hazards in liquids and is also utilized for the classification and labelling of dangerous liquids²¹. Liquids with flash points which are less than 37.80 °C are referred to as flammable and combustible liquids (ASTM, 2011). The flashpoint of the bioethanol produced was 17.5 °C which in close proximity to 16.60 °C reported in literature¹⁹, but lower than the ASTM minimum value of 18.60 °C. The result obtained showed that the bioethanol produced do not pose a hazard at low temperature during storage. The higher the flash point the safer the fuel in terms of handling, storage, and transportation²².

It can be inferred from the various analysis conducted on the bioethanol produced that the properties of the bioethanol compared favourably with some of the properties of bioethanol. The variation in some of the properties can be attributed to the nature of the feedstock (yam peel) used in this study and on the experimental error.

Table 6.0: Comparison between the Properties of the Produced Bioethanol and Cassava Peels and Sugar Cane

S/N	Properties	Units	Present Results	¹ Cassava Peels	² Sugar Cane	ASTM Standard
1.	Density	gcm ⁻³	0.784	-	0.789	0.790
2.	Specific Gravity	-	0.802	0.785	0.789	0.750-0.850
3.	Refractive Index	-	1.329	1.362	-	1.360-1.364
4.	Flash Point	°C	17.500	14.2	17	10.000-18.500

¹(Egbosiuba *et al.*, 2014); ²(Bilyaminu *et al.*, 2016)¹⁹.

IV. CONCLUSION

The production of bioethanol from yam peels was reported in this study through an optimized process of hydrolysis. Also, it can be concluded based on the results obtained that hydrolysis temperature and hydrolysis time affects the optimal yield of glucose during hydrolysis of yam peel. The results revealed that hydrolysis temperature of 110 °C and hydrolysis time 180 minutes gave the optimal yield of glucose and two hundred grams of the sample gave bioethanol yield of 180 mL after fermentation for 5 days. The properties of the bioethanol produced from the yam peels also conform to the set limit by ASTM. Despite the ability to use yam peels for bioethanol production, the yield can be influenced by several factors especially temperature, time and fermentation time. If the bioethanol is produced under the stipulated experiment conditions with *Saccharomyces cerevisiae* (baker's yeast), a substantial amount of bioethanol, which is used as a chemical feedstock, will be produced. Thus, the importation of ethanol can be reduced if substantial energy is devoted to the production of bioethanol from biomass.

REFERENCES

- (1) Lin, Y.; Tanaka, S. Ethanol Fermentation from Biomass Resources: Current State and Prospects. *Appl Microbiol Biotechnol* **2006**, 69 (6), 627–642. <https://doi.org/10.1007/s00253-005-0229-x>.
- (2) Abba, A. Study on Production of Biogas and Bioethanol from Millet Husk. *ARRB* **2014**, 4 (5), 817–827. <https://doi.org/10.9734/ARRB/2014/4375>.
- (3) Demirbas, A. Hazardous Emissions, Global Climate Change and Environmental Precautions. *Energy Sources, Part B: Economics, Planning, and Policy* **2006**, 1 (1), 75–84. <https://doi.org/10.1080/009083190881472>.
- (4) 10.1.1.825.4966.Pdf.
- (5) Jimoh, A.; Abdulkareem, A. S.; Afolabi, A. S.; Odigure, J. O.; Odili, U. C. Production and Characterization of Biofuel from Refined Groundnut Oil. In *Energy Conservation*; Zain Ahmed, A., Ed.; InTech, 2012. <https://doi.org/10.5772/52443>.
- (6) Kadam, K. L.; Forrest, L. H.; Jacobson, W. A. Rice Straw as a Lignocellulosic Resource: Collection, Processing, Transportation, and Environmental Aspects. *Biomass and Bioenergy* **2000**, 21.
- (7) Oyeleke, S.; Ibrahim, A.; Manga, S.; Rabah, A.; Auta, H.; Ladan, F. Production of Bacterial Amylase by *Bacillus* Species Isolated from Rice Husk Dumpsites in Sokoto Metropolis, Nigeria. *International Journal of Biological and Chemical Sciences* **2011**, 5 (1). <https://doi.org/10.4314/ijbcs.v5i1.68118>.
- (8) Kroumov, A. D.; Módenes, A. N.; Tait, M. C. de A. Development of New Unstructured Model for Simultaneous Saccharification and Fermentation of Starch to Ethanol by Recombinant Strain. *Biochemical Engineering Journal* **2006**, 28 (3), 243–255. <https://doi.org/10.1016/j.bej.2005.11.008>.
- (9) Öhgren, K.; Bengtsson, O.; Gorwa-Grauslund, M. F.; Galbe, M.; Hahn-Hägerdal, B.; Zacchi, G. Simultaneous Saccharification and Co-Fermentation of Glucose and Xylose in Steam-Pretreated Corn Stover at High Fiber Content with *Saccharomyces Cerevisiae* TMB3400. *Journal of Biotechnology* **2006**, 126 (4), 488–498. <https://doi.org/10.1016/j.jbiotec.2006.05.001>.
- (10) Ademiluyi, F. T.; Mepba, H. D. Yield and Properties of Ethanol Biofuel Produced from Different Whole Cassava Flours. *ISRN Biotechnology* **2013**, 2013, 1–6. <https://doi.org/10.5402/2013/916481>.

- (11) Akpan, U. G.; Kovo, A. S.; Abdullahi, M.; Ijah, J. J. The Production of Ethanol from Maize Cobs and Groundnut Shells. **2005**, 6.
- (12) 1403262212_71 (2014) 25097-25105.Pdf.
- (13) Kaur, R. Bio-Ethanol Production from Rice Husk Using Simultaneous Saccharification and Fermentation and Optimization of Pretreatment Methods. **2017**, 7.
- (14) Coates, J. Interpretation of Infrared Spectra, A Practical Approach. In *Encyclopedia of Analytical Chemistry*; Meyers, R. A., Ed.; John Wiley & Sons, Ltd: Chichester, UK, 2006; p a5606. <https://doi.org/10.1002/9780470027318.a5606>.
- (15) Pavia, D. L.; Lampman, G. M.; Kriz, G. S.; Vyvyan, J. R. Introduction to Spectroscopy. **2013**, 786.
- (16) Kumar, P.; Barrett, D. M.; Delwiche, M. J.; Stroeve, P. Methods for Pretreatment of Lignocellulosic Biomass for Efficient Hydrolysis and Biofuel Production. *Ind. Eng. Chem. Res.* **2009**, 48 (8), 3713–3729. <https://doi.org/10.1021/ie801542g>.
- (17) Limtong, S.; Sringiew, C.; Yongmanitchai, W. Production of Fuel Ethanol at High Temperature from Sugar Cane Juice by a Newly Isolated *Kluyveromyces Marxianus*. *Bioresource Technology* **2007**, 98 (17), 3367–3374. <https://doi.org/10.1016/j.biortech.2006.10.044>.
- (18) Balat, M.; Balat, H. Recent Trends in Global Production and Utilization of Bio-Ethanol Fuel. *Applied Energy* **2009**, 86 (11), 2273–2282. <https://doi.org/10.1016/j.apenergy.2009.03.015>.
- (19) Suleiman, Bilyaminu; Abdulkareem, Saka A.; Afolabi, Emmanuel A.; Musa, Umaru; Mohammed, Ibrahim A.; Eyikanmi, Tope A. Optimization of Bioethanol Production from Nigerian Sugarcane Juice Using Factorial Design. *Advances in Energy Research* **2016**, 4 (1), 69–86. <https://doi.org/10.12989/ERI.2016.4.1.069>.
- (20) EE 01 003.Pdf.
- (21) Hristova, M.; Damgaliev, D.; Popova, D. ESTIMATION OF WATER-ALCOHOL MIXTURE FLASH POINT. **2010**, 6.
- (22) Van Gerpen, J.; Shanks, B.; Pruszko, R.; Clements, D.; Knothe, G. *Biodiesel Production Technology: August 2002--January 2004*; NREL/SR-510-36244, 15008801; 2004; p NREL/SR-510-36244, 15008801. <https://doi.org/10.2172/15008801>.

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Disaster Plans, Preparedness And Response: A Case Study Of The Mutare City Council Clinics And Hospitals In 2020

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Abstract- Objective: To examine the Mutare City Council Clinics and Hospitals' level of disaster preparedness. This was done by exploring: the availability of disaster plans, frequency of disaster preparedness workshops, trainings and drills, staff knowledge and experience on disaster preparedness and response and the adequacy of material resources needed for disaster response. **Design:** The mixed methods approach was used in this research. Both quantitative and qualitative data was collected in this investigation. The descriptive research design was used and the study was based on the positivism philosophy. **Setting:** The target population were all the 108 healthcare staff working in the City of Mutare Council clinics and hospitals at the time of study. The researcher aimed at collecting data from all the staff in 8 clinics and one hospital. **Methods:** Questionnaires with closed ended questions and key informant interviews were used to collect data. Data was collected from January to March 2020. The quantitative data was analyzed using the Statistical Package for Social Sciences. **Results:** Among the clinic/hospital respondents: 99% considered disaster plans as important, 55% indicated that their clinic/hospital had disaster plans; 31% were of the opinion that their clinics and hospitals were fully prepared for emergencies and disasters. Thirty percent had attended disaster preparedness training/workshop; 47% had past disaster response experience, 78% had never participated in disaster preparedness drills organised by Mutare City Council. Seventy-five percent felt that they did not have enough staff and 70% felt that they did not have enough essential material resources for disaster response. Some respondents from the same clinic/hospital indicated that they had disaster plans whilst others indicated that they had no disaster plans. In all clinics/hospitals, no copies of disaster plans were found displayed on the walls, or were easily accessible. **Conclusion:** The absence of and insufficiency of disaster preparedness trainings, workshops and drills could have been responsible for the City of Mutare clinic and hospital poor state of disaster preparedness.

Index Terms- emergency, disaster, disaster plans, drills.

I. BACKGROUND

Given the increasing frequency and intensity of disasters worldwide, clinics, hospitals, and their staff need to be more prepared for emergencies and disasters. Disasters are a global concern and it is not possible to entirely control and eliminate them and their consequences. Abbasabadi, Khankeh, Mosadeghrad and Farrokhi (2019) reported that 315 natural disasters occurred in 2018. Between 2001 and 2010, about 700 natural and technological emergencies occurred globally every year (WHO, 2013:9). About 25 per cent of these emergencies, and 44 per cent of the deaths, occurred in less developed countries (WHO, 2013:9). Zimbabwe, among other developing nations should be more concerned about these statistics. Disasters are a persistent and recurring serious public health issue (Nomani et al., 2017).

All institutions including hospitals may need to find ways of empowering their staff for effective disaster preparedness and response. The recent serious natural disasters have made disaster preparedness a public priority (Bistaraki, Waddington, and Galanis, 2011:p.341). Disaster preparedness is increasingly becoming a great need at individual, organisational, community, national and international levels (Glarum et al., 2010:1). This study strives to investigate if disaster preparedness workshops, trainings and drills have a relationship with the healthcare staff and clinic/hospital's state of disaster preparedness.

Hospitals are the backbone of the healthcare response to common disasters. Health institutions were expected to be fully prepared to detect and respond to public health emergencies like acute outbreaks (WHO, 2014). Therefore, hospitals need to be highly alert and continuously improve their state of preparedness to match the ever-increasing frequency and complexity of emergencies and disasters.

Even well developed and well-financed hospitals can be overwhelmed in times of emergencies and disasters. Hospitals in New York City, which were generally considered to be well prepared for disasters, were overwhelmed by Hurricane Sandy (Powell et al. 2012). This has shown that, management of disasters does not follow automatically from having a disaster plan in a file in the hospital. The WHO (2014) reported that higher proportion

of deaths and injuries resulting from road traffic accidents are from low-income and middle-income countries. There has been a significant loss of lives and property in Zimbabwe due to poor disaster preparedness (Ministry of Local Government, 2009:120). The City of Mutare has a higher risk of road traffic accidents. This is partly because of the rugged terrain around the Christmas Pass area.

The frequency of road traffic accidents in Zimbabwe increased from 2015 to 2016. The country recorded 45701 accidents in 2015 and 46681 in 2016 (Zimstat, 2017:17). The number of deaths and injuries caused by these accidents also increased (Zimstat, 2017:17). Road traffic accidents among other emergencies call for swift emergence response.

Possible hazards and disasters that could affect the City of Mutare

Both natural and human-made hazards could affect the City of Mutare, which can result in disasters. According to the City of Mutare Rescue Services disaster plan, the City of Mutare was exposed to various hazards, which have differing chances of occurrence (City of Mutare, 2019). The disasters that might occur in the City of Mutare include road traffic accidents, train collisions, floods, industrial accidents, house and forestry fires, structural collapse, earthquakes and epidemics. These possible disasters were listed in the City of Mutare Fire and Rescue Services disaster plan. Clinics and hospitals staff may have to treat victims of such disasters and the staff health institutions themselves may also be affected directly by the same disasters. Seismologists have warned that earthquake disasters are now a real threat to Zimbabwe (Machamire, 2016). Pembere (2017) reported that Zimbabwe experienced an earth tremor in April 2017, which lasted for about one minute. Chikoto et al. (2009) also reported that in 2009, the City of Mutare felt the quake caused by the 7.5 magnitude earthquake, which occurred in northern Mozambique. Although the City of Mutare has not had a serious earthquake disaster, it is prudent to be prepared for such a disaster through trainings, workshops and drills.

Flash floods affected the City of Mutare on 17 December 2014, and some people suffered serious injuries (Zimbabwe Red Cross Society, 2014). The flash floods increased the risk of disease outbreaks. The City of Mutare was declared a Malaria zone in February 2017, following a sudden increase in malaria deaths from one in 2016 to thirty-one in 2017 (Mambondiyani, 2018). There has been some persistent problems of bursting sewer pipes in some of the City of Mutare suburbs, which flow into Sakubva River and its tributaries, which pass through the City of Mutare (Chiketo, 2013:1). Consequently, Sakubva River water was declared unsafe for domestic, agricultural, recreational and fishing uses (Chiketo, 2013:1). Cases of diarrheal and skin diseases caused by the polluted water have been reported in some of the suburbs in the City of Mutare. Further, there are critical shortages of clean water. This made the City of Mutare vulnerable to cholera outbreak and the state of disaster preparedness of clinics and hospitals was critical. Zimbabwe health institutions were not spared by the severe economic challenges characterised by hyperinflation because some health institutions were failing to buy gloves and basic medicines for patients.

II. METHODS

III. RESEARCH DESIGN OF THE STUDY

The mixed methods approach was used in this research. Mixed methods research methodology advances the planned and logical integration of quantitative and qualitative data within a single investigation (Wisdom and Creswell, 2013). The integration permits a more complete gathering and use of data than when quantitative and qualitative data collection approaches are used separately. Mixed methods can be an ideal technique to analyse issues that cannot be satisfactorily assessed using either a qualitative or a quantitative approach in isolation (Wisdom and Creswell, 2013:3). Both quantitative and qualitative components were executed almost simultaneously and not one after the other. The implementation of the qualitative component did not depend on the results of the data analysis of the quantitative component. Therefore, this was a convergent parallel design, where the quantitative and qualitative strands of the research were performed concurrently but independently, and their results were brought together in the overall interpretation (Schoonenboom and Johnson, 2017). The findings from the quantitative and qualitative approaches reinforce each other.

Target population: The target population were all (108) healthcare workers working in the 8 City of Mutare Council clinics and one hospital at the time of the study. The researcher did a census to collect data since the research was dealing with a small population (Blanche et al, 2006:134). Not all the subjects were readily available in each hospital on one particular visit. Therefore, the researchers had to make several visits to each clinic on different days to issue out questionnaires, collect filled questionnaires and do the key informant interviews. Despite all the effort to reach and interview all the staff working in the City of Mutare clinics and hospitals, some were never reached. Seventy-seven respondents (71%) out of the targeted population participated in the research.

Data Collection Tools: The data collection tools that were used in this research were questionnaires, key informant interviews, participant observation and a hospital disaster preparedness checklist. The researchers participated in a one-day workshop on disaster preparedness with a focus on cholera preparedness and response and were involved in all the workshop activities. Workshop participants were from different City of Mutare Departments and the workshop was organised and facilitated by the City of Mutare Health Services Director. Qualitative data was collected using key informant interviews. These were done with hospital administrators in charge of hospitals and Sisters in Charge of clinics. The mass casualty disaster plan checklist used by the researchers was adapted from the Association for Professionals in Infection Control and Epidemiology (2011). Data was collected from January to March 2020.

Analysis

The Statistical Package for Social Sciences (SPSS) software was used to analyse quantitative data. The researchers aimed to come up with detailed information that would produce tables, charts, figures, texts, narratives and visual displays (Blanche et al. 2006:287). The data analysis was expected to discover patterns,

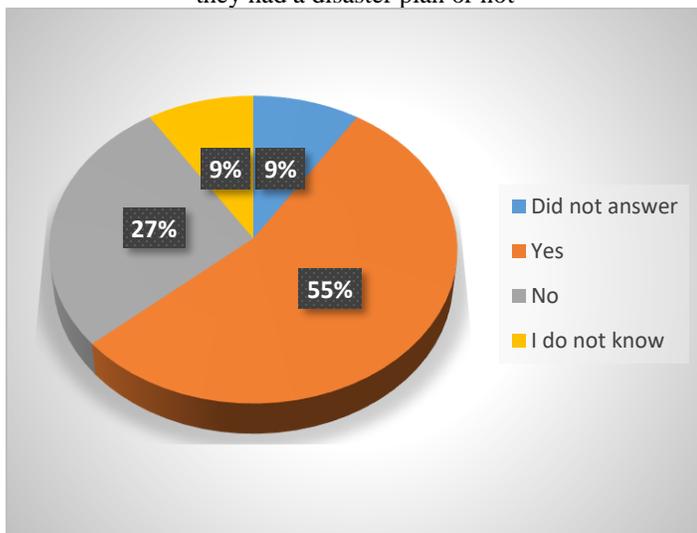
coherent themes, meaningful categories, and new ideas (Blanche et al, 2006:344). Qualitative data analysis involved organizing, accounting for and explaining the data in order to make sense out of it (Cohen et al. 2011). The outcome of the analysis complemented the quantitative data analysis. The major themes were hospital disaster plans, disaster preparedness trainings, workshops and drills and the clinic or hospital's general state of disaster preparedness.

IV. RESULTS

Disaster Plans

The clinic and hospital respondents were asked if they had a disaster plan in their particular clinic or hospital. Respondents were expected to know if they had a disaster plan or not and probably, where it was located so that it would be shown to the researchers.

Figure 1: Clinic and hospital respondents' responses on whether they had a disaster plan or not



As shown in Figure 1, the majority of the respondents (55%) indicated that they had a disaster plan. Those who said had no disaster plan were 27%. Other respondents (9%) did not know if they had a disaster plan or not and another 9% did not indicate their opinions on this question. During the key informant interviews with the Sisters in Charge or their representatives, they were asked for a hard copy if they had one, but the disaster plans were not displayed and could not be easily located in any of the clinics and hospitals. Therefore, it was difficult to confirm if the clinic or hospital had a disaster plan.

When the responses from the question whether a clinic or hospital had a disaster plan was further analysed according to the individual clinics or hospital, it was also realised that some respondents from the same institution indicated that they had a disaster plan whilst others indicated that they had no disaster plan. Therefore, some of the respondents did not have the correct basic knowledge, whether the institution had a disaster plan or not. There was some consistency in responses in only one institution out of all institutions (n=7) where all respondents indicated that

they had a disaster plan, but again the researcher was not shown a copy of the disaster plan. What the researcher observed in the clinics and hospitals were the cholera disaster preparedness plans, which were epidemic-specific sub-plans, which could have been part of the master or overall disaster plan covering all possible emergencies. The fact that hard copies of disaster plans or soft copies were not found could have meant that the clinics and hospitals did not have the disaster plans or if they had them, they could have been misplaced and could not be retrieved.

If disaster preparedness trainings, workshops and drills were being done in the different clinics and hospitals, the respondents could have had more and correct information on the existence of their clinic or hospital disaster plan. This is because the disaster plan is used during the disaster preparedness drills. Therefore, if the clinic or hospital staff members had not had disaster preparedness drills, they might not have been fully prepared to respond to emergencies because they might not have known where to retrieve their disaster plan from and how to use it as a tool to facilitate the disaster response.

The responses on whether there was a disaster plan in a clinic or hospital had a lot in common with findings from a research by Duong (2009:p.88) on *Disaster education and training of emergency nurses in South Australia*, in which although 87% of all respondents knew where their disaster plan was located, 42% had not read their departmental disaster plan. It is also interesting to note that Duong (2009:p.88) added that, it was possible that the majority of participants indicated that they had read their departmental disaster plan since they thought it was the appropriate and expected answer.

Almost all the respondents (99%) indicated that disaster plans were essential. Some considered them very important (88%) whilst others considered them important (11%). Acknowledging the pivotal role of disaster plans in disaster preparedness and response is an important starting point.

Chi-square test to determine whether the respondents' views on the importance of disaster plans was dependent on the presence of a disaster plan in their institution showed that the two variables were not dependent. The P-value was 0.105. Therefore, even if the clinic or hospital did not have a disaster plan, many respondents from the same institution indicated that disaster plans were either important or very important.

V. DRILLS

More than half (52%) of the respondents did not do hospital disaster prepared drills during their years of training or as students. Those who had done hospital disaster preparedness drills during their years of training or as students constituted 46% and 2% did not indicate if they had done any drills. Disaster preparedness drills are very important in the preparation for emergencies and disasters. However, this important topic could have been left out of the curriculum at the time of training of 52% of the respondents or might not have been adequately covered.

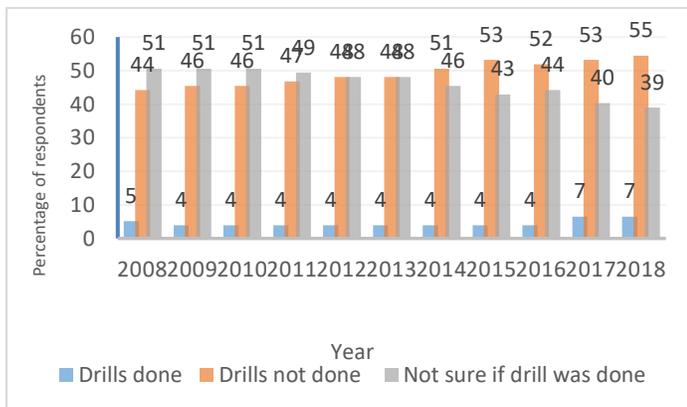
The findings that disaster preparedness drills might not have been included as part of nurse training was in consonance with findings from a research on: *Disaster content in Australian tertiary postgraduate emergency nursing courses: A survey*, where of all the topics that were supposed to be covered such as types of disasters, hospital response, nursing role in disaster, disaster

triage, pre-hospital response, disaster plans, health effects of disasters, and practical disaster exercises, the only topic not done by any of the training institutions was practical disaster exercises (Ranse, 2013:p.61). Disaster preparedness drills or practical disaster exercises were not done by most of the respondents during their training and yet they are very crucial in equipping healthcare staff with disaster response skills.

More than three quarters (78%) of the respondents indicated that they had never been involved in any disaster preparedness drills organised by the City of Mutare clinic or hospital or the clinics or hospitals they had worked in before. Only 20% had been involved in some disaster preparedness drills, some of which could have been done before the respondent joined City of Mutare. Therefore, there was a great need for disaster preparedness drills since 52% of the respondents never did disaster preparedness drills during training. Further, 78% of the respondents never did disaster preparedness drills from the time they started working in the clinics and hospitals.

Out of the 20% of the clinic and hospital respondents who had done some disaster preparedness drills, 16% did the drills within the previous 2 years, 1% did the drills 2 to 4 years ago, 3% did the drills 4 to 6 years ago, and 4% did the drills 6 to 8 years ago. This showed that only a small proportion of the staff (16%) had been involved in disaster preparedness drills within the previous two years.

Figure 2: Years in which the clinic or hospital did/ did not do disaster preparedness drills



For each of the years from 2008 to 2018, at least 90% of the respondents were either certain that no disaster preparedness drills were done or were not sure whether disaster preparedness drills were done or not. At most 7% of the respondents or even less indicated that some disaster preparedness drills were done in each of the years from 2008 to 2018. Some respondents might not have joined the clinic or hospital in some of the years indicated. It was established that 46% of the respondents had been in the clinic or hospital for at least six years or more. Therefore, these respondents could have been able to remember if any disaster preparedness drills were done as from 2012 up to 2018. All this, points to the fact that most of the respondents had not been involved in disaster preparedness drills.

Disaster preparedness training and workshops

Participation in disaster preparedness trainings or workshops is also very important in addition to participating in disaster

preparedness drills. The trainings and workshops go a long way in giving knowledge and skills that are very useful in responding to various emergencies and disasters. Only 30% of the respondents from clinics and hospitals had participated in some disaster preparedness training or workshop and 69% had never participated in any training or workshop on disaster preparedness or any related subject.

The frequency of disaster preparedness workshops, trainings and drills was low as compared to what some developed countries would do. For example in the study by Duong (2009:p.88) on, *Disaster education and training of emergency nurses in South Australia*, more than half (56%) did disaster training or disaster preparedness drills every 2 years or less, while 21% never did any or were unsure how often disaster training was done. Doing frequent disaster preparedness trainings and drills seem to be a problem for many clinics, hospitals and training schools, even in more developed countries.

The low frequency of disaster trainings, workshops, and drills was similar to the findings from the research by Hammad, Arbon and Gebbie (2010:p.90) on, *Emergency nurses and disaster response: An exploration of South Australian emergency nurses' knowledge and perceptions of their roles in disaster response*, where 42% of the nurses reported that they had not received any disaster training for one year or more, while 18% had not received any disaster training at all. Therefore, the City of Mutare Council clinics and hospitals' failure to do frequent disaster preparedness trainings, workshops and drills was a common problem in other health institutions in other countries.

Topics covered in disaster preparedness trainings and workshops

There are some topics that could have been covered in trainings and workshops, which could have helped the respondents to have some basic understanding of various aspects of disaster preparedness. The respondents were asked to tick the topics, which they had been taught in any disaster preparedness or related training or workshop. Figure 3 below shows the percentage of respondents who were taught and not taught the various possible disaster preparedness topics. The topics were presented in the graph in descending order of the percentage number of people taught.

Figure 3: Disaster preparedness topics covered during professional training or workshops



Figure 3 shows that very few respondents had been taught some of the basic topics on disaster preparedness. Only 27% of the respondents had been taught about the definition of a disaster and impact of disasters on health. These were the topics, which were done by the greatest number of respondents. This was followed by the role of health personnel in disasters topic, which had been taught to 26% of the respondents. Some of the very important topics, such as, disaster cycle, were only covered by 20% of the respondents. This was an indication that, the respondents had received very little training and workshops on disaster preparedness. Almost all the respondents (99%) agreed that all clinic and hospital staff should be trained in disaster planning, preparedness and response. This shows that although the respondents did not receive much training on disaster preparedness, they all knew that they were supposed to have received the training.

Disaster preparedness trainings and workshops could have been attended by the respondents, but many very important topics were not covered in the trainings and workshops. This might also indicate that if a respondent attended one training or one workshop, it might have been impossible to cover all the crucial topics. In order to cover more topics, there was need for a series of trainings or workshops.

An institution can have a schedule of disaster preparedness trainings, workshops and drills. There should be an agreed schedule of disaster preparedness drills in clinics and hospitals. Eighty-six percent of the respondents from clinics and hospitals agreed that clinics and hospitals were expected to have some disaster preparedness drills at least once every year. Only 3% did not agree and 8% were not sure. This affirmed that even though the respondents did not do disaster preparedness drills, they knew very well that they were supposed to do them frequently.

According to the findings from the disaster preparedness checklist, disaster training and education was not included in the clinic or hospital disaster plan. Schedules of formal disaster training or workshops were not considered as part of the disaster plan. There was no indication of a plan on how staff would be familiarised with their roles during a disaster. Consequently, staff responding to disasters were likely to attend to disasters without adequate training and familiarisation.

All the administrators and Sisters in Charge or their representatives of clinics and hospitals were of the opinion that their institutions were not fully prepared to deal with all emergencies and disasters. It emerged that the major reasons were limited financial resources, shortage of staff, poor and outdated equipment, inadequate trainings, workshops and drills. They also pointed out that most healthcare staff felt vulnerable, when they were expected to respond to emergencies without adequate essential resources.

The researcher made valuable observations during a cholera disaster preparedness workshop organised by the City of Mutare Health Department. An interesting observation was that during the self-introductions, all workshop participants from various departments were asked to introduce themselves and explain what they knew or thought was their role in responding to a cholera outbreak disaster. The different explanations on how each person was involved in responding to a cholera disaster was an elaboration of the fact that disaster preparedness and response is multifaceted. Therefore, the chairperson concluded that the City of Mutare was supposed to have a cholera disaster preparedness plan to avoid being taken by surprise by an unexpected outbreak. At that stage, the researchers observed that, although the City of Mutare Health Services department in collaboration with other departments had responded to cholera outbreaks in the past, they had no overall disaster preparedness plan. This observation was confirmed by the workshop objectives, which were given as: To identify issues around cholera, identify who does what during a cholera outbreak, come up with a cholera disaster preparedness plan, find out how prepared the City of Mutare is for a cholera outbreak, identify gaps and what has to be done, identify the legal issues around cholera, come up with an action plan and eliminate cholera in line with the global objective. Objective number 3 aimed to come up with a cholera disaster preparedness plan, which was an indication that there was no existing plan. Objectives 4 and 5 aimed at finding out how prepared the City of Mutare is for a cholera outbreak as well as to identify gaps and what has to be done. This pointed to the fact that there was a great concern that the City of Mutare was not fully prepared for a cholera outbreak disaster.

Relationship between disaster preparedness trainings, workshops, drills, and the state of disaster preparedness

Unsurprisingly, only 31% of respondents were of the view that their clinics or hospitals were fully prepared to deal with different hazards and emergencies. Therefore, the low frequency of disaster preparedness drills, workshops and trainings could have affected the clinics and hospitals' state of disaster preparedness. Doing disaster preparedness drills during training, as a student and the respondents' opinion on whether their clinic or hospital was fully prepared for emergencies were dependent as evidenced by a P-value of 0.004. Involvement in any disaster preparedness drills organised by the respondent's clinic or hospital and the respondent's opinion on the clinic or hospital's state of disaster preparedness were also dependent as evidenced by the P-value of 0.008. Respondent's participation in any disaster preparedness training or workshop and the respondent's opinion on the state of their clinic or hospital's state of disaster preparedness were dependent too, as shown by a P-value of zero. If the individual healthcare worker within a clinic or hospital was ill prepared for emergencies, it would be unlikely that they would see their clinic or hospital as fully prepared to respond to emergencies.

Disaster preparedness trainings, workshops and drills need financing. Given the harsh economic conditions in Zimbabwe at the time of the study and for the previous two decades, many health institutions were struggling to buy basic needs such as gloves and food for patients. However, investing in disaster preparedness saves lives and money. During the study, two major disasters occurred, Cyclone Idai in Chipinge and the Covid-19 pandemic, which forced or motivated many healthcare institutions and stakeholders to serious focus on matters of disaster preparedness.

VI. RESOURCES

Three quarters (75%) of the respondents were of the view that their clinics and hospitals were not adequately staffed to deal with any sudden influx of patients from disasters. The majority (70%) of the respondents were of the feeling that, clinics and hospitals did not have enough resources needed when responding to emergencies and disasters. However, in a research carried out in Nairobi County, Kenya, in 32 hospitals, 43.4% of the respondents were of the opinion that the hospitals did not have adequate resources for disaster preparedness and response (Simiyu, Odhiambo-Otieno and Okero, 2014). The hospitals in Kenya could have been better prepared for emergencies and disasters. The inadequacy of resources in Mutare City Council clinics and hospitals was further exposed during the onset of the Covid-19 pandemic.

One of the first hospitals that was designated an isolation centre for handling all Covid-19 cases in Manicaland province was one of the hospitals under this study. The hospital had already been operating as an Infectious Diseases Hospital. Data collected during this study from the hospital using the Clinic and hospital disaster preparedness checklist, key informant interviews and questionnaires showed that the hospital was least prepared for emergencies and disasters. There was no disaster plan and no functional disaster preparedness committee at the time. There was no ambulance designated specifically for the Infectious Disease Hospital, as a hospital handling infectious patients. The hospital

shared ambulances with other hospitals and clinics under Mutare City Council.

The general infrastructure and hospital environment were also in a very bad state. The Covid-19 outbreak started as the researchers were still collecting data. Some staff expressed great worry and concern although the pandemic had not reached alarming levels in Manicaland. They felt very vulnerable and unprepared to face the catastrophic disaster, which was wreaking havoc in developed countries, which had much better facilities and seemed to be more prepared for emergencies and disasters.

Soon after Mutare Infectious Disease Hospital was designated as a Covid-19 isolation centre, the state of unpreparedness that the researchers had discovered was confirmed immediately. The Infectious Disease Hospital had no capacity to do such a task because it was not prepared for such a disaster. The City of Mutare Mayor made an appeal to the international community and the business world to assist in raising funds to upgrade the hospital to meet the expected standards for a Covid-19 isolation centre (New Zimbabwe, 2020). Therefore, the Mutare Business community immediately raised more than ZW \$1.6 million to kick start the rehabilitation of the intensive care unit (Zinyuke, 2020a). It was also reported that USD\$2.4 million was needed to rehabilitate the whole hospital although the immediate focus was on the intensive care unit (New Zimbabwe, 2020). The rehabilitation process was a race against time because the disaster had already struck. Mutare City Council released ZW\$1.5 million towards the rehabilitation of the intensive care unit and the government through Ministry of Health and Child Care released ZW\$1.4 million towards the procurement of appropriate equipment needed for the Covid 19 patients (Zunyuke, 2020c). Further, the government continued to release more funds towards the upgrading of the Mutare Infectious Disease Hospital (New Zimbabwe, 2020b). Therefore, this was some evidence that the Infectious Disease Hospital was not prepared for a disease epidemic disaster of a respiratory and infectious type. The desperate and concerted effort from various stakeholders to upgrade the Mutare Infectious Diseases Hospital in response to the Covid 19 pandemic was a clear indication that its state of disaster preparedness was poor.

VII. CONCLUSION

Most of the City of Mutare clinic and hospital staff did not do disaster preparedness drills during their professional training and were not well prepared to respond to emergencies and disasters. The majority of the City of Mutare clinic and hospital staff had not participated in disaster preparedness trainings and workshops, and were not fully prepared to respond to different types of emergencies. Therefore, it could have been very helpful if training programs for all healthcare staff involved some disaster preparedness courses and drills. This might have helped to make disaster preparedness a key component of their competencies. Disaster preparedness trainings and workshops in the workplace or on the job could have helped healthcare staff and their institutions to be more confident and prepared to respond to different emergencies and disasters. The insufficient financial resources, staff, equipment, trainings, workshops and drills call for more investment in the City of Mutare Health Services Department. Disaster preparedness and response programs and activities ought to be budgeted for. Disaster plans need continuous

updating and continuous improvements to cater for emerging hazards. Embark on staff mindset transformation towards disaster preparedness issues and activities. There is need for Mutare City Council to be always proactive than reactive.

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REFERENCES

[1] [1] Abbasabadi, A. M., Khankeh H.R., Mosadeghrad A.M., & Farrokhi, M. (2019). Developing a Hospital Disaster Risk Management Evaluation Model. <https://www.dovepress.com/developing-a-hospital-disaster-risk-management-evaluation-model-peer-reviewed-fulltext-article-RMHP> (accessed on 24 July 2020).

[2] [2] Association for Professionals in Infection Control and Epidemiology (2011). Mass casualty disaster plan checklist. <http://bioterrorism.slu.edu/bt/quick/disasterplan.pdf> (accessed on 20 June 2020).

[3] [3] Bistaraki A, Waddington K, and Galanis P (2011) The effectiveness of a disaster training programme for healthcare workers in Greece. *International Nursing Review*: 341–346. Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1466-7657.2011.00898.x> (accessed on 8 May 2020).

[4] [4] Blanche T, Burrheim K, and Painter D (Eds) (2006) *Research in Practice. Applied methods for the social sciences*. 2nd ed. South Africa: University of Cape Town.

[5] [5] Chiketo B (2014) Mutare turns streams, rivers into sewers. *Daily News*. Available at: <https://www.dailynews.co.zw/articles/2013/01/08/mutare-turns-streams-rivers-into-sewers> (accessed on 20 April 2018).

[6] [6] Chikoto GL, and Sadiq A (2009) Zimbabwe's Emergency Management Systems: A promising Development. Available at: <https://training.fema.gov/.../comparative%20em%20book%20-%20chapter%20zimba>. (accessed on 21 April 2018).

[7] [7] City of Mutare (2019) *Fire and Ambulance Services Manual of Procedures*. Mutare. (Unpublished)

[8] [8] City of Mutare (2019) *Fire and Rescue Services Disaster plan*. Mutare. (Unpublished)

[9] [9] Cohen L, Manion L, and Morrison K (2011) *Research Methods in Education*. 7th ed. USA: Routledge.

[10] [10] Duong K (2009) Disaster education and training of emergency nurses in South Australia. 12. *Australasian Emergency Nursing Journal*: 86-92. DOI: 10.1016/j.aenj.2009.05.001. Available at: www.sciencedirect.com (accessed on 20 June 2020).

[11] [11] Glarum J, Birou D and Cetaruk E (2010) *Hospital Emergency Response Teams. Triage for Optimal Disaster Response*. USA: Elsevier.

[12] [12] Hammad KS, Arbon P, and Gebbie KM (2010) Emergency nurses and disaster response: An exploration of South Australian emergency nurses' knowledge and perceptions of their roles in disaster response. (2011) 14. *Australian Emergency Nursing Journal*: 87-94. DOI: doi:10.1016/j.aenj.2010.10.002. (Accessed on 11 May 2020).

[13] [13] Machamire F (2016) Zimbabwe no longer safe from earthquakes. *Daily News*. Available at:

<https://www.dailynews.co.zw/articles/2016/09/25/zim-no-longer-safe-from-earthquakes> (accessed on 21 April 2018).

[14] [14] Mambondiyani A (2018) Amid wet weather, Zimbabwe's Mutare sees hike in Malaria deaths. Thomas Reuters Foundation. Available at: <https://reliefweb.int/report/zimbabwe/amid-wet-weather-zimbabwe-s-mutare-sees-hike-malaria-deaths> (accessed on 25 April 2018).

[15] [15] Ministry of Local Government, Zimbabwe (2009) *Disaster Risk Management, A Resource Book for Educational Institutions in Zimbabwe*. Zimbabwe: Government printers.

[16] [16] Pembere K (2017). Zimbabwe Hit By A Minor Earthquake. April 2017 *Daily News*. Available at: <https://www.techomag.co.zw/2017/04/03/zimbabwe-hit-by-tremor/> (accessed on 21 April 2018).

[17] [17] Powell T, Hanfling D, Gostin L (2012) *Emergency Preparedness and Public Health The Lessons of Hurricane Sandy*. The Journal of the American Medical Association: 308(24).2569-70. Available at: https://www.researchgate.net/publication/234029535_Emergency_Preparedness_and_Public_Health_The_Lessons_of_Hurricane_Sandy (accessed on 29 June 2020).

[18] [18] Ranse J, Shaban RZ, Considine J, Hammad K, Arbon P, Mitchell B and Lenson S (2013) Disaster content in Australian tertiary postgraduate emergency nursing courses: A survey. (2013) 16. *Australasian Emergency Nursing Journal*: 58–63. Available at: <http://dx.doi.org/10.1016/j.aenj.2013.04.002> (accessed on 15 June 2020).

[19] [19] Schoonenboom J and Johnson B (2017) *How to Construct a Mixed Methods Research Design*. Springer. Available at: https://www.researchgate.net/publication/318228078_How_to_Construct_a_Mixed_Methods_Research_Design/download (accessed on 9 May 2019).

[20] [20] Wallis L A and Reynolds TA (2013) *AFEM Handbook of Acute and Emergency Care*. South Africa: Oxford University Press Southern Africa.

[21] [21] WHO (2013) *Emergency Response Framework*. Available at: www.who.int/erf (accessed on 25 November 2016).

[22] [22] WHO (2014) WHO issues roadmap to scale up international response to the Ebola outbreak in West Africa. Available at: <http://www.who.int/mediacentre/news/statements/2014/ebola-roadmap/en/> (accessed on 4 September 2019).

[23] [23] WHO (2014) *Hospital Preparedness for Epidemics*. Available at: file:///C:/Users/hp%20255/Downloads/9789241548939_eng.pdf (accessed on 8 May 2020).

[24] [24] Wisdom J and Creswell JW (2013) *Mixed Methods: Integrating Quantitative and Qualitative Data Collection and Analysis While Studying Patient-Centered Medical Home Models*. Rockville, MD: Agency for Healthcare Research and Quality. (2013) 13-0028-EF. Available at: <https://pcmh.hhrq.gov/page/mixed-methods-integrating-quantitative-and-qualitative-data-collection-and-analysis-while> (accessed on 7 May 2019).

[25] [25] World Health Organization (2014) *Country Cooperate Strategy at a glance*. Available at: <http://www.who.int/countries/en/zim> (accessed on 2 March 2016).

[26] [26] Zimbabwe National Statistics Agency (2013) *Compendium of Statistics 2012*. Available at: file:///C:/Users/hp%20255/Downloads/Compendium_of_Statistics_2012.pdf (accessed on 20 June 2020).

[27] [27] Zimbabwe Red Cross Society (2014) *Zimbabwe Red Cross responds to Mutare Flash Floods*. Reliefweb. Available at: <https://reliefweb.int/report/zimbabwe-red-cross-responds-mutare-flash-floods> (accessed on 3 April 2018).

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URL Based Phishing Website Detector

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Abstract:-

In the current scenario most popular cyber crime today is phishing, Phishing is a social engineering-based attack where the phisher targets to retrieve the user's legitimate confidential details to exploit and it is commonly done through sending mail or any other electronic communication in an automated fashion. In this paper a Machine Learning based approach on URLs of a website is done to detect phishing websites aiming to reduce the number of features for the model and improve the accuracy. The data-set contains numerous tested URLs which are labeled as good and bad. An URL is analyzed completely broken into tokens and with classified datasets, these tokens are pooled in two categories accordingly and aggregated. This model is strapped with a web application and web extension which gets input as URL and do a prediction test to give the result. The previous models which uses machine learning model doesn't utilize the patterns of URL in the structure instead other parametric data which produce high number of features increasing the computation process. The accuracy of those models come to 93%. Sometimes those data fail to be consistent. By targeting the structure of the URL to identify the pattern, the number of feature gets reduced which will not have the need of high computation. The prescribed model in this paper produces uses logistic regression which produced an accuracy up to 96% and contains fewer features compared to previous models. This model is strapped with a web application and web extension which acts as front-end interface and it has successfully defended an email-based phishing attack simulation in detecting a phishing website.

Keywords- Phishing, Phishing Detection, Detection Tool, Social Engineering, URL Synthesis, Machine Learning

1. INTRODUCTION

Nowadays with the ease of access to the Internet, people carry out so many activities like online shopping, online billpayment, etc. There are many cyber crimes, one among them is phishing. Phishing is a global threat that utilizes social engineering with website spoofing. This

threat not only causes tremendous financial losses to the users but also harms reputation and trust. Consequently, this affects the legitimate websites which are mimicked to carry out phishing attacks. An attacker uses social skills to obtain or compromise information about a target that an attacker tries to exploit, this is called social engineering.

A typical phishing attack is of three steps (i) Lure- Gaining user's attention to the manipulative message, (ii) Hook- Deceiving the user to make them respond to the request made by the attacker, (iii) Catch- After the user responds to the message extract all confidential details of the user. One of the major identifications of a phishing website that is modeled to deceive the user is the URL (Uniform Resource Locator). It is a global address for the documents and acts as an identification on the World Wide Web.

An attacker tries to model the URL in such a way that it is similar to URLs that a user comes across on a day-to-day basis, without raising any alarm the user uses the page whose main goal is to extract information from the user.

There are many methods to identify a phishing page with a URL and one such method is Machine Learning, which uses datasets of already existing phishing pages and extracts features to analyze patterns to identify if a particular URL is a phishing page or not. In this paper, we discuss a Machine Learning Model using Natural Language Processing on URLs and build a Web Application and Extension which integrates with the model so it can be used as a tool. The tool developed will also be tested and verified in an attack simulation to prove its testing.

Target-dependent and Target-independent are two main classifications done to extract key features which can be compared between a legitimate website and a potential phishing website[1]. The target-dependent method measures how different a phishing web page is from a suspected phishing web page. Offline information or information given by the search engine of the web page is collected. The Target-independent method uses generic features from the URL, visual appearance, servers, etc. By using these features a web page can be classified as a phishing page or not. URL contains lexical features like domain, directory, file, hostname, path, arguments, protocol, etc[3]. These are extracted and utilized in the Machine Learning model to give a prediction. Some of the popular techniques are

(i) Blacklist- The URL is stored in a database that contains

only phishing websites, if the current URL is found in the database it is flagged. The database needs to be updated from time to time, as new URLs are developed every time to overcome the current methodology of detection. (ii) Heuristic Based- It is an extension of blacklisting, where it examines every single URL which can spot specific characteristics to determine a web page phishing. (iii) Visual Similarity- It extracts images from legitimate websites to extract features to do a comparison to identify the phishing website. (iv) Machine Learning- It is a popular method as new variations are developed to address an issue every single time and also to improve the accuracy[3]. Supervised Learning options were to train the classifier features of both legitimate and phishing websites which are extracted and trained to give prediction[5]. Some of the classification techniques are Logistic Regression, Decision Tree, Random Forest, Support Vector Machine[2][5]. To address the reduction of the number of features where numerous features are utilized to produce a machine learning model so far, the structure of the URL will be synthesized and converted to tokens. These tokens will be categorized and analysed to find the pattern between legitimate websites and malicious websites. The model prescribed in this paper will try to reduce the number of features for the machine learning model and match the accuracy with the existing model which takes in numerous features. The model will also be supported with an interface like web application and web extension and will be tested in detecting phishing attacks, primarily email-based.

2. PROPOSED APPROACH

A machine learning model is developed around the features of URL. To make the computation complexity less, the approach revolves around a small number of features. The best solution is Natural Language Processing (NLP), where it is used for language processing, decomposing the URL to tokens, and analyzing it to obtain a pattern. The data set contains both malicious and secure websites URL tagged with them, they are decomposed to tokens and grouped to find specific and repeating patterns which will be helpful to detect if a website is malicious or not. It is tested with different classifiers and the one which

gives the highest accuracy is used.

The machine learning model which is built needs to be utilized as a tool therefore an interface is developed i.e., web application and web extension.

3. ALGORITHM FOR MACHINE LEARNING MODEL:

1. Start
2. Load the data set
3. Utilize regular expression to tokenize
4. Synthesize the data set and split it into tokens using snowball stemmer
5. Categories them according to label: good or bad
6. Split data to train, test



7. Use logistic regression as a classifier to train
8. Use a pipeline to automate all previous steps in an instant
9. Test the accuracy
10. Shift this model in pickle file to export
11. Enter URL input in a string variable
12. Use the variable to predict good or bad

The figure 3.1. shows the web application acts as a front runner where it fetches the prediction from the machine learning model by giving an input to trigger predict function. The input URL is entered manually and the value is submitted as a form, where the string value is carried to the machine learning model for prediction. The model predicts using the URL and labels it as '[GOOD]' for

secure websites and '[BAD]' for malicious websites.



Figure 3.1 . Shows the Web Application

The figure 3.2 . shows the web extension will be mounted in a web browser directly. It'll read the URL directly as input from the tab where users enter different websites. It uses built-in chrome developer function chrome.tabs.getSelected. The input URL is sent to the intermediary server with the help of AJAX which connects the browser extension to the machine learning model. The PHP server sends the input URL by passing it as an argument to the EXEC command which is used for calling the machine learning model. The machine learning model returns the predicted result which is sent back via the server and AJAX is used to render it without the need of reloading the web page. A phishing attack is designed and simulated in real life to get an understanding of a real-life attack and analyze the vulnerabilities present to take advantage of.

Figure 3.2. Shows the Web Extension

This is also done to understand the art of mimicking and deceiving people in the world of the internet through a simple influencing message to make people respond carelessly. Further, the tool which is developed to detect phishing websites like these used in a phishing attack is tested to see how precise it can detect.

Algorithm for a Phishing Attack Simulation:

1. Identify fields of interest to mimic
2. Survey interests of people to extract highlighting characteristics to target users using that and attain information about them
3. Gather all data collected and organize
4. Identify a suitable website to mimic
5. Build a website seeming close to the original one

6. Draft the range of users who can be associated with the website
7. Structure message to send which looks original and authentic
8. Prepare details to launch a phishing attack
9. Launch the attack and wait for a response
10. Collect all responses received and organize them
11. Use the response data to exploit further

Figure 3.3 Shows the Launch of a phishing attack.

Figure 3.3 shows the launch of a phishing attack. The area of interest which is opted to launch a phishing attack is e-learning, mainly targeting students who use these platforms to learn technologies, subjects, etc from any remote places at anytime.

3. RESULTS & DISCUSSION

The accuracy obtained from the machine learning model which uses language processing of the URLs to detect malicious websites is 96%. The machine learning model is integrated with the web application and web extension. The tools are tested extensively and deployed for use. The web application is hosted in Heroku which is cloud-based. The web application asks the user to enter the URL which they want to test to see if the website belonging to the URL is secure or not. The prediction value from the machine learning model is displayed. The web extension is mounted on the Google Chrome web browser. Whenever the user opens a web page, the extension reads the URL directly and sends it to the machine learning model to detect and give a response. The response is displayed by the web extension.

A phishing attack is launched for simulating a real-life phishing attack. The website chosen to mimic as an e-learning website is simplilearn.com. Details have been gathered and organized and used to launch an attack on targets. The medium used is electronic mail with help of gofish, an open-source phishing framework. The response which is received after launching the attack successively is stored in a database which can be used to exploit further. This website is tested with the detection tool and it detects it

as a malicious website.

4. CONCLUSION

A high accuracy machine learning model of 96% is built with a smaller number of features to work on. Completely tested to be reliable and solid. The machine learning model is further integrated with a web application and extension to use those functionalities as a tool. A phishing attack simulation is framed and launched successively and captured the data from targets. This model which is used in the phishing attack

First Name	Last Name	Email	Position	Status	Reported
Audrey	A	audrey@gofish.com	Student	Not Detected	0
Audrey	Lee	audrey@gofish.com	Student	Not Detected	0
Audrey	Smith	audrey@gofish.com	Student	Not Detected	0
Audrey	Nguyen	audrey@gofish.com	Student	Not Detected	0
Audrey	Chen	audrey@gofish.com	Student	Not Detected	0
Audrey	Patel	audrey@gofish.com	Student	Not Detected	0
Audrey	Kim	audrey@gofish.com	Student	Not Detected	0
Audrey	Johnson	audrey@gofish.com	Student	Not Detected	0
Audrey	Williams	audrey@gofish.com	Student	Not Detected	0
Audrey	Miller	audrey@gofish.com	Student	Not Detected	0
Audrey	Moore	audrey@gofish.com	Student	Not Detected	0
Audrey	Taylor	audrey@gofish.com	Student	Not Detected	0
Audrey	Anderson	audrey@gofish.com	Student	Not Detected	0

simulation is also tested with our tool and it detects precisely.

FUTURE SCOPE

The proposed system is implemented as a detection tool. This can further be improved and support blacklisting URLs that are malicious and record every input given to detect to use them and update the machine learning model with current datasets. This will keep up with evolved URLs which are modeled to escape detection and stay up to date with current attacks. The tool can also be polished to be utilized as a phishing framework.

REFERENCES.

1. Xiuwen Liu and Jianming Fu (2020); SPWalk: Similar Property Oriented Feature Learning for Phishing Detection, IEEE Access. doi:10.1109/ACCESS.2020.2992381.
2. Preeti, Rainu Nandal, and Kamaldeep Joshi, (2021); Phishing URL Detection Using Machine Learning, Advances in Communication and Computational Technology, Springer, vol. 668, pp 547-560,
3. Harshal Tupsamudre, Ajeet Kumar Singh and Sachin Lodha (2019). 'Everything Is in the Name - A URL Based

Approach for Phishing Detection', International Symposium on Cyber Security Cryptography and Machine Learning, Springer, pp 231–248.

4. Ankit Kumar Jain, and B. B. Gupta, (2019) 'A machine learning based approach for phishing detection using hyperlinks information, Journal of Ambient Intelligence and Humanized Computing, Springer, 10(12), doi:10.1007/s12652-018-0798-z.

5. Noor Faisal Abedin, Rosemary Bawm, Tawsif Sarwar, Mohammed Saifuddin, Mohammd Azizur Rahman and Sohrab Hossain, (2020) 'Phishing Attack Detection using Machine Learning Classification Techniques, International Conference on Intelligent Sustainable Systems (ICISS), IEEE Explore, doi: 10.1109/ICISS49785.2020

6. Ponnurangam Kumaraguru, Lorrie Faith Cranor, and Laura Mather, (2009), AntiPhishing Landing Page: Turning a 404 into a Teachable Moment for End Users. Sixth Conference on Email and Anti-Spam, pp- 16-17, Mountain View, California USA.

7. Chandrasekaran, M., Narayanan, M. and Upadhyaya, S. (2006) Phishing Email Detection Based on Structural Properties. Proceedings of 9th Annual NYS Cyber Security Conference, Albany, 14 June 2006, 2-8.

8. Dr. Radha Damodaram (2016). 'Study on phishing attacks and antiphishing tools' International Research Journal of Engineering and Technology (IRJET), Vol:03(01).

9. Kalaharshaa P., and Mehtre B. M., (2021) 'Detecting Phishing Sites - An Overview' arXiv:2103.12739v1 [cs.CR] 23 Mar 2021.

10. Edwin Donald Fraunstein, (2018) 'An Investigation Into Students Responses to Various Phishing Emails and Other Phishing-Related Behaviours' 17th International Information Security South Africa Conference At: Pretoria, South Africa.

11. Shrusthi Patil, and Sudhir Dhage (2019); A Methodical Overview on Phishing Detection along with an Organized Way to Construct an Anti-Phishing Framework, International Conference on Advanced Computing and Communication Systems (ICACCS), IEEE Explore, doi: 10.1109/ICACCS45965.2019.

Soft Skills For Effective Teaching – Learning: A Review Based Study

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Abstract- The main objective of this study was to explore essential soft skills required not only for effective teaching as well as personality development and professionalism. To achieve the objective, secondary data has been utilized. This paper also depicts that Soft Skills are utmost important in coming new generation teachers to achieve success in their profession. It was found that a majority of the researchers felt that soft skills are considered desirable for moving forward in the career and vocational advancement. Few soft skills were identified mandatory for the teachers to acquire in digital world through secondary data, were: Communication skills, Initiative skills, Technological skills, Leadership skills, Productivity, Team working Skills. The present century is the century of development of skills, therefore teachers require hard and soft both skills to be successful in their professional life. In short, the paper tries to state that soft skills are the basic skills for a teachers developed through rigorous training process. This paper also suggests certain soft skills as Communication skills, Initiateness skill, Technological skill and Leadership Skills in teachers, necessary to improve their teaching learning scenario.

Index Terms- Soft skills, Teaching-learning

I. INTRODUCTION

In present scenario, the developing countries like India need to adopt educational reforms inevitably. Among the basic factors of educational reforms, the educators, administrators must be trained about new era of curriculum and its transactional strategies because in the modern world, when we are going to the part of the third millennium of information communication technology, there are various skills to be developed and used. When we are discussing regarding “Soft Skill”, it is essential to investigate the new constructs of soft skill as foundation of teaching-learning. Because, this construct is not substantiated properly and systematically in previous researches till date. This

concept generally is changed time to time, place to place and job to job. Therefore, soft skill can only be understood in wide perspectives. Soft skills are cross-cutting across jobs and sectors and relate to personal competency (confidence, discipline, self-management) and social competencies (team work, communication, emotional intelligence).

I. Studies defining skill and soft skills

The literature review for this article has been derived from latest International Journals. National Journals published by NCERT on topics of relevance viz. Indian Journal of Education, Indian Education Review and Voice of Teacher; Teacher Educator and few other important researches done in the field. To explore the depth of given research topic, the literature of above-mentioned Journals of last ten years has been taken into account. The term “skill” is being used from 13th century (Merriam-Webster, 2019). Skill is considered as the “dexterity or coordination especially in the execution of learned physical tasks”, as the “ability to use one’s knowledge effectively and readily in execution and performance”, and as “learned power of doing something competently”. According to Ryle (1949) and Polanyi (1962), Skill is constructed as what knowledge sets in action (Know-how and Know-that, respectively), and therefore, the two (Knowledge and Skill) are seen as “reciprocally constitutive” (Orlikowski, 2002). Soft Skills is a term, coined in 1972 and became widespread after 1990. Its genesis can be traced as far back as 1972 in training documents of the US Army (Caudron,1999; Moss and Tilly, 2001). In 1997, the World Health Organization (WHO) outlined a core set of ten soft skill: Self Awareness,

empathy, critical thinking, creative thinking, problem solving, effective communication, interpersonal relationship skills, stress-coping techniques, and emotion-focused coping technique. Perrault (2004) defines “soft skills” as personal qualities, attributes or the level of commitment of a person that set him or her apart from other individuals who may have similar education and experience. James and James (2004) proposed that soft skills are a new way to describe a set of abilities or talents that an individual can bring to the workplace, including career attributes such as team skills, communication skills, leadership skills customer service skills and problem-solving skills. The term “Soft Skills” is used for unspecialized personal qualities, that ensure the success in different professions. Other names are also used for Soft Skills as: professional skills (Enviroics, 2014), generic skills (Badcock et al., 2010), basic skills, core skills, key skills, employability skills (Tran, 2013), functional skills (Brolin & Loyd, 2004), 21st Century skills, life skills, career skills, social-emotional skills (Kamenetz, 2015). The online Encyclopedia “Wikipedia” provides a comprehensive definition of Soft Skills as “Soft Skills refer to the cluster of personality traits, social graces and facility with language, personal habits, friendliness, and optimism that mark people to varying degrees. Soft skills complement hard skills, which are the technical requirements of a job”. Sutton (2002) noted that soft skills are so important that employers identify them as the number one differentiator for job applications in all types of industries, which is consistent across research in Canada, the USA, Australia and the European Union. This trend in employer needs has influenced several professional associations in Canada to include soft skills in their competency frameworks, which all members must meet the conditions of (Clapperton, 2015; CCHRA, 2014). Wagner (2008) stressed that students need seven survival skills to be prepared for twenty-first century life: Critical thinking and problem solving; Collaboration and leadership; Agility and adaptability; Initiative and entrepreneurialism; Effective oral and written communication; Accessing and analysing information and Curiosity and imagination. Pachauri and Yadav (2014) identified seven soft skills to be include in all institutions of teacher education institutions as: Communication skills; thinking

and problem-solving skills; team work force; life-long learning and information management; Entrepreneur skill; ethics, moral and professionalism; leadership skills. Engelberg (2015) identifies different types of personal and social skills, such as thinking skills, listening skills, communication skills, problem solving skills, decision making skills, negotiating skills, and others. A cause- effect correlation between Soft Skills and personal and professional achievements of people was studied. (Cinque, 2015). Actually, the term “Soft Skills” is touchy feely stuff. It is a combination of many attributes and this combination varies from time to time, culture to culture and situation to situation. In Indian Context, soft skills are used as 21st century skills nowadays. 21st Century Skills refer to the skills that are required to enable an individual to face the challenges of the 21st century world that is globally-active, digitally transforming, collaboratively moving forward, creatively progressing, seeking competent human-resource and quick in adopting changes.

In the previous researches, it is now a well-established fact that employers are increasingly putting more efforts to develop soft skills, it is equally important that teachers should also adequately appreciate the value of such skills and make deliberate efforts to acquire them. As a result, there is an awareness gap resulting insufficient knowledge of soft skill among teachers those entering in their work place. Consequently, there is now more pressure on academic institutions to enhance soft skills of newly appointed teachers. The literature review suggests that a majority of the studies on this topic have been done from employer’s perspective and very less studies have focused on the perception and attitude of teacher towards soft skills. In this paper, attention has been drawn on those soft skills, which is essentially required for teaching community, consequently effective teaching - learning atmosphere will be enhanced for future generation to achieve success in their career. In addition, a higher percentage of such studies were conducted in Western countries with different learning environment and work culture, not in Asian countries. It is therefore, worth exploring conceptual framework of soft skills on the basis of review of previous researches.

II. OBJECTIVES OF THE STUDY

The main objective of this study was to identify the key type of soft skills which are mandatory for making effective teachers and skills needed for further improvement, participation of teachers in skill development programs and the role of academic institutions in developing soft skills.

III. METHOD

In this study, researcher has taken secondary data (corresponding data) to sort out the major outcome regarding soft skills for effective teaching-learning.

IV. FINDINGS

SOFT SKILLS IDENTIFIED FROM LITERATURE REVIEW

Various researchers and authors describe Soft skills from different perspectives. When we go through the literature, a big picture of soft skill comes in front. Partnership for 21st Century Skills (P21), a coalition of business leaders and educators, proposed a Framework for 21st Century Learning, identified essential competencies and skills vital for success in twenty-first century work and life. These included 'The 4Cs'—communication, collaboration, critical thinking and creativity, which are to be taught within the context of core subject areas and twenty-first century themes. This framework is based on the assertion that twenty-first century challenges will demand a broad skill set emphasizing core subject skills, social and cross-cultural skills, proficiency in languages other than English, and an understanding of the economic and political forces that affect of societies. These days, this term has been expanded to different categories as given below:

(a) Qualities including adaptability, courtesy, integrity, professionalism, and effectiveness, and values such as trustworthiness and work ethics (Wats and Wats, 2009; Touloumakos, 2011; Robles,2012; Ballesteros-Sanchez et al; 2017);

(b) Problem solving, decision making, analytical thinking / thinking skills, creativity/ innovation, manipulation of knowledge, critical judgment (Cimatti, 2016; Succi, 2019; Succi and Canovi, 2019; Thompson, 2019);

(c) Leadership and managing skills (Crosbie,2005; Lazarus, 2013; Ballesteros-Sanchez et al, 2017), as well as self-awareness, managing oneself/coping skills (Cimatti, 2016; Cinque, 2017; Thompson, 2019);

(d) Communication skills (Wats and Wats, 2009; Mitchell et al., 2010; Stevenson and Starkweather, 2010; Robles, 2012; Cinque, 2017) including elements of negotiation, conflict resolution, persuasion skills, and diversity (Bancino and Zevalkink,2007; Majid et al.,2012; Cinque, 2017; Succi and Canovi, 2019) as well as articulation work – that is orchestrating simultaneous interaction with people, information, and technology (see Hampson and Junor, 2009).

(e) Other areas covered included cognitive ability or processes (Cimatti, 2016; Ballesteros- Sanchez et al., 2017; Thompson, 2019), ability to plan and achieve goals (Cimatti, 2016). The skills in using technology, in particular digital skills, will be fundamental in most jobs to perform many tasks (Cinque, 2015). Furthermore, digital resources can help students to develop and train their Soft Skills, then they can be considered at the same time aims to be reached and tools to train, to develop and increase competences and capabilities. Ramesh and Ramesh (2018) believe that soft skills essentially consist of three dimensions as Attitude, Communication and Etiquette. Attitude is about having the right mental make-up and a desire to interact with the people and environment. This also requires willingness and ability to fine-tune and blend oneself with the environment. Communication is the ability to express that attitude, conviction and technical skills in a form that can effectively reach the intended audience and persuade them to take the actions that one desires them to take. Etiquette are those commonly accepted protocols, norms and conventions that are needed to be followed to achieve effective communication. Based on literature review, a list of 6 skills were identified for training of teachers. By this way, various dimensions were identified in soft skills. Few important were taken here:

i. Communication Skill:

Communication process requires three things: Sender, receiver and the message. The basic skill for teaching learning is communication skill. Saunders and Mills (1999) defined

Communication skills as the transmission of a message that involves the shared understanding between the contexts in which the communication takes place. Communication skills are important for a teacher in delivery of education to students (McCarthy and Carter, 2001). Communication skills involve listening and speaking as well as reading and writing. For effective teaching, a teacher needs to be highly skilled in all these areas. Effective communication skills are really important for a teacher in transmitting of education, classroom management and interaction with students in the class. To teach in accordance with the ability and capability of the students, a teacher needs to adopt such skills of communication which motivate the students towards their learning process (Sng Bee, 2012). Good communication skills of teacher are the basic need of academics, success of students, and professional success of life. Teacher with poor communication skills may cause failure of students to learn and promote their academics. Students need to understand that what is right, and what is wrong while it totally depends upon the communication skills of teachers which he adopts in class-room (Sherwyn P. Morreale, Michael M. Osborn Judy c. Pearson, 2000). Communication process is successful when we deliver the message in clear and understandable way. A study conducted by Ehindero and Ajibade (2000) indicates that for effective teaching, teacher requires good communication skills such as good communication, good classroom management, updating knowledge and maintaining personality. No one can teach effectively until having these basic skills of teaching. Different researches evolve that there is significant co-relation between communication skills and supervisor perception of job performance (Maes, Weldy, & Icenogle, 1997). Teachers need good communication skills for facilitating the students and achieving professional goals. Effectiveness of teaching is not dependent on technicality but on the method adopted by the teacher while teaching to the students. Teachers need clear communication for the good understanding of students and avoiding the problems for students while learning from their lecture. It is also needed by the teachers to understand first himself before teaching to students (Loss, J. 2000). Performance of teachers in classroom totally depends upon the communication

skills. if the teacher has good communication skills, then he can easily convey his /her message or deliver the lecture in an understandable manner (Maes, Weldy & Icenogle, 1997).

ii. Initiativeness Skill

Initiative skill means that a person is ready to take action before another person. A teacher needs this skill for better performance in today's life when daily changes are going on and teacher is supposed to take initiatives in school/college for different curricular, co-curricular and community-based activities. When teacher uses initiative in his work, he obviously communicates this ability to his students in the form of many activities in the class. He starts with himself and then encourage students to take initiative in all the activities in school. Today in the age of development, if a teacher is equipped with initiative skill, he will develop initiative in students and they will develop the ability to ask questions, plan easily for any work, present anywhere. Taking initiative by student in the class is first step for learning actually. If a student does not show this behaviour, role of teacher becomes more important. Teachers' initiative is an important skill. Recently during COVID-19 outbreak, universities and other educational institutions around the world are able to continue the teaching activities only because of teachers' initiative skill. Teachers were not trained for any type of online teaching learning but they took initiatives for online teaching and whole time-table was followed from home in favour of students. This step of teachers made teaching-learning process that can be accessed anyplace anytime (Nedeva & Dimova, 2010). Online teaching learning made learning convenient accessible and customized. (Kimiloglu et al., 2017). When NEP 2020 is declared in July 2020, teachers are taking initiatives to attend webinars, conferences and faculty development programs to conceptualize it and implement it.

iii. Technological Skills

Technology is the powerful tool in the hands of teacher. If technology is used properly and effectively, students' achievement is enhanced. Teachers require ICT competencies to strengthen their own professional capacities and to effectively use ICTs in their teaching-learning. In present context, teachers should be expert in using technology as a tool to research,

organize and communication the information. Digital technology and social networking usage makes his/her teaching effective and accessible. Therefore, the teachers require technological skills as well digital skills to engage students in critical thinking and problem solving. Technology can be used to restructure and redesign the classroom to produce an environment that promotes the development of higher-order thinking skills (Kurt, 2010). Technology also increases student collaboration. Collaboration is a highly effective tool for learning. Students cooperatively works together to either create projects or they can learn from each other by reading the work of their peers (Keser, Huseyin, & Ozdamli, 2011). Researchers described technological skills in form of using internet, operating computer, e-mail writing, creating video and audio, using the software's, making presentations etc.

iv. Leadership Skills

Teacher organizes the students in class, receives their attention, inspire them for engagement in the class, confirm again and again that they are learning and performing well. Motivating and inspiring the students and providing the vision for the future is really an important job of a teacher. He acts as a mentor and implement a vision. But no program is conducted to develop leadership in teachers. There is lack of literature and empirical evidences about importance of leadership activities of teachers. Teachers are regularly engaged in activities of leadership as decision making, inspiring others to learn, solving the students' problems, organizing curricular activities and co-curricular activities in class. A teacher may perceive herself as a leader when he/she is given responsibility to organize cultural activities, NCC activities, school-community interaction activities, different competitions and other administrative responsibilities in school. Devlin and Samara Wickrema (2010) identified that criteria of effective teaching in a higher educational context are similar to dimensions of effective leadership. Avolio, Walumbwa, and Weber (2009) in their study concluded that leadership had been a complex and emergent process and that was distributed and shared in organizations. They advocated for mixed methods and the context of the study was related to business establishments. It was hardly possible to draw any inference about how far their

findings could help us to understand the relationship between leadership behaviour of teachers in schools and their possible outcomes. Barling, Slater, and Kelloway (2000) revealed that the individuals with higher emotional intelligence displayed more transformational leadership behaviors leading to better learning of the students. If so, the findings may be taken as imperatives to bring qualitative changes in the teachers' recruitment policies or strategies by schools. It may indicate that perhaps emotional intelligence is more important than formal educational qualification and subject knowledge to qualify someone as a teacher in a school. There are no similar studies available to provide any lead in that regard. Given the role of teachers as leaders of learning, there is logic in considering them as role models to their students. By acting as role models, teachers influence the morality, work ethic, citizenship, and character of their students (Lumpkin, 2008). Given that leadership is the process of influencing others, and that teaching is the process of influencing students; desire and engagement in learning, teachers are in positions of role models.

v. Productivity

Productivity is the ability to manage different projects and give results. Productivity and accountability are interconnected. The skills as setting and meeting goals, prioritizing, managing work to achieve the intended result. The teachers practice values, ethics and skills of professionalism, time management, punctuality, discipline, collaboration and receptiveness to give proper results. (CBSE, Delhi, 2020). In addition to the basic responsibilities, there are several accountabilities on the part of a teacher. Teacher is considered accountable for subject mastery in the specific subject. It is also expected that teachers should be well aware of the average required mental ability of their students. A teacher should develop good rapport with students, colleagues, parents and other community partners. He/she is accountable for effective teaching with help of various teaching methods and innovative approaches, technology usage, interactive environment. He/she is expected to be resourceful and professional in the sense of updating skills according to the present context. A teacher is role model for students and develops ethics and values in students. When a teacher is held accountable for above said works, obviously her productivity is

reflected in developing skills, values, personality abilities in students; maintaining the relationship with staff, parents and community members and producing quality education. Productivity of teacher has an essential and strategic role in realizing quality education. Sultana Mahbuba (2013) concluded that work productivity dramatically determines the success or failure of an organization. In Sutikno (2011), Gilmore states that work productivity is the power or ability of an individual to produce more creative, generative output that generates benefits. It means, accountability and productivity of teachers increase school productivity in terms of students' performance.

vi. Team working skills

Working in teams is essential for a teacher. can be an effective method for professional development. According to Garet, Porter, Desimone, Birman, and Yoon (2001), teachers collaborating with each other has several advantages: working together opens up opportunities to discuss problems, skills, and concepts; teachers can share common materials; teachers who share the same students can discuss student needs across classes or grade levels. Therefore, it can be said that working in groups creates a shared professional culture. In the literature review, areas such as the definition of soft skills, taxonomy of soft skills, importance of soft skills in latest scenario in education sector is discussed.

V. DISCUSSION AND CONCLUSION

Moreover, the essential soft skills required for a teacher in the modern era are also discussed widely. Using soft skills, teachers can make the class interesting, informative, and thought-provoking. To attract the students with innovative techniques, teachers should utilize all the soft skills like modulating the tone or pitch wherever needed, make charts spontaneously, and so on. By doing this teacher set the best example of genius. Many students can change their lives if a teacher can nurture the students to be successful in their life. It would also be easy for the teachers to interact with their students in an understanding level. Besides, the expertise of soft skills enables them to be good motivating and inspiring leaders. Teacher professional behaviour means mixture of knowledge, skill, attitudes, and personal characteristics. Today in 21st century, teacher requires a

skill set of behaviour for all round development of the students and maximum development of students.

Soft Skills are important for a teacher because a teacher is the person who is responsible for developing students' abilities to optimum level. As a teacher, she has to deal with students, her colleagues, administrator, other non-teaching staff, parents and other community members. Therefore, soft skills are the basic pre – requisite of the teachers. Soft Skills for teachers include communication both oral and written, for receiving and distributing information effectively. For effective teaching learning environment, a teacher performs different tasks in class to captive students during the lesson, to stimulate them intellectually and move them emotionally to install in them a love for the subject and a desire to learn more about it, to motivate them to work on their own, to see them satisfaction of assisting them to grow into a self-actualized individual. It is necessary to select and use appropriate teaching strategies because they play significant role in increasing the effectiveness and quality in teaching. Teaching Strategies helps the teacher to establish interaction between him and her students and the curriculum or subject matter. Soft skills, for a teacher will make a difference in quality of teaching and effective learning. The quality of teaching is a crucial factor in promoting effective learning in schools (Tang, 2013). Teaching is a complex act, requiring a wide range of knowledge and skills including hard and soft skills to successfully manage the demands of the classroom (Tang, Hashimah & Hashimah, 2015).

From the research study, the following outcomes can be driven effortlessly: The purpose of this study was to explore the soft skills which are required for making effective teachers. However, many studies reflect the fact that their actual soft skills were less than the desired levels. Thus, there is need to create awareness among the teacher about the importance of soft skills for career advancement and how to develop and practice such skills. However, academic institution should take action regarding training workshops to help teachers for further improvement their soft skills. It is equally important that teachers should also make efforts for improving their soft skills through self-directed readings and participation in appropriate soft skill development

programs and activities. It may be concluded that for successful teaching, the teachers should enhance their soft skills. A skilled educator creates a positive learning environment that would allow students to feel comfortable and confident with high achievement levels making it as a structured space for guided

learning. Hence, teacher education should focus on development of Soft Skills in future teachers or teacher educators to produce skilled teacher through professional training program.

REFERENCES

- [1] A.Hassan, M.Maharoff, N.Z.Abiddin, "The Readiness of Lecturers in Embedding Soft Skills in the Bachelor's Degree Program in Malaysian Institutes of Teacher Education", *Journal of Edu & Trg Std.*, Vol2, No.3, 2014, <https://files.eric.ed.gov/fulltext/EJ1055449.pdf>
- [2] A. Bartel, "Measuring the employer's returns on investments in training". *Industrial Relations*, 39(3), July 2000, pp. 502-524.
- [3] A. Lazarus, "Soften up: the importance of soft skills for job success", *Phys. Exec.* 2013, 39:40.
- [4] A. Lumpkin, "Teachers as role models: Teaching character and moral virtues" .*Journal of Physical Education, Recreation and Dance*, (JOPERD), 79(2), 2008, 45-49.
- [5] A.P. Ellis, B. S. Bell, R. E. Ployhart, J. R. Hollenbeck, & D. R. Ilgen, "An evaluation of generic teamwork skills training with action teams: effects on cognitive and skill- based outcomes" *Personnel psychology*, 2005, 58(3), 641- 672.
- [6] A. K. Touloumakos, "Now you see it, Now You Don't: The Gap Between the Characteristics of Soft Skills in policy and in Practice", Ph. D. thesis, Oxford University, Oxford, 2011.
- [7] A. K. Touloumakos, "Expanded Yet Restricted: A Mini Review of the Soft Skills Literature, *Frontiers in Psychology*, 11:2207, September 2020, www.frontiersin.org
- [8] A. Kamenetz, "Nonacademic skill are key to success. But what should be call them?" Retrieved from National Public Radio education website. www.pr.org/sections/ed/2015/05/28/404684712/non-academic-skills-are-key-to-success-but-what-should-we-call-them- [Accessed 08 December 2019].
- [9] A. Khan, S. Kha, S. Zia-Ul-Islam & M.Khan, "Communication Skills of a Teacher and Its Role in the Development of the Students' Academic Success", *Journal of Education and Practice*, www.iiste.org, Vol.8, No.1, 2017, p 18-21.
- [10] Ali. I. Alhouli & Abdul Kareem A. Al-Khayatt, Assessing the Soft Skills Needs of Teacher Education Students, *International Journal of Education and Practice*, Vol. 8, No. 3, 2020, pp. 416-431.
- [11] Anisah, Nurhizrah Gistituati and Rusdina, "Analysis of Factors Affecting Teachers' Productivity", *Advances in Social Science, Education and Humanities Research*, volume 504, Proceedings of the 2nd International Conference Innovation in Education (ICOIE 2020). <https://www.atlantispress.com/proceedings/icoie-20/125948044>
- [12] B. Gemme & Y. Gingras, "Les facteurs de satisfaction et d'insatisfaction aux cycles supérieurs dans les universités québécoises francophones", *The Canadian Journal of Higher Education*, (2006). 36(2), 23. Retrieved from <http://search.proquest.com/docview/221136342?pq-origsite=summon>
- [13] B.J. Avolio, Fred O. Walumbwa, & T.J. Weber, "Leadership: Current Theories, Research, and Future Directions", *Annual Review of Psychology*, 60 (2009), pp. 421-449; doi: 10.1146/annurev.psych.60.110707.163621, <http://psych.annualreviews.org>
- [14] B. Kingsley, "Self Awareness and Emotional Intelligence", Speech at 'Soft Skills and their role in employability – New perspectives in teaching, assessment and certification', (November 2015), workshop in Bertinoro, FC, Italy.
- [15] B. Hansson, "Company-based determinants of training and the impact of training on company performance", *Personnel Review*, 2007, 36(2), 311-331.
- [16] B. Sánchez, L. Ignacio and O. Marcos, Isabel and Rodríguez Rivero, Rocío and Juan Ruiz, Jesús. "Project Management Training: An Integrative Approach for Strengthening the Soft Skills of Engineering Students", *International Journal of Engineering Education*, Vol. 33 (n. 6(A)); 2017, pp. 1912-1926.
- [17] B. Cimatti, "Definition, development, assessment of soft skills and their role for the quality of organizations and enterprises", *International Journal of Quality Research* 10, 2016, 97-130. <http://www.ijqr.net/journal/v10-n1/5.pdf>
- [18] Conference Board of Canada, "The Skills Credentialing Tool for Organizations. Canada: The Conference Board of Canada" Retrieved from: [http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/Sept2010_SCTf_or_Organizations_revised_web.sflb_\(2013\)](http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/Sept2010_SCTf_or_Organizations_revised_web.sflb_(2013))
- [19] Canadian Council of Human Resources Associations (CCHRA., 2014, New CHRP Competency Framework. Retrieved from http://c.y.mcdn.com/sites/www.chrp.ca/resource/resmgr/FAQx_CHRP_Competency_Framework.pdf
- [20] Central Board of Secondary Education, 21st Century Skills: A Handbook, Delhi, https://cbseacademic.nic.in/web_material/Manuals/21st_Century_Skill_Han_dbook.pdf
- [21] C. Succi and M.Canovi, Soft skills to enhance graduate employability: comparing students and employer's perceptions. *Stud. High. Educ.* Doi:10.1504/ijhrdm. 2019.100638.
- [22] C. Joynes, S. Rossignoli, & E. Fenyiwa Amonoo-Kuofi, *21st Century Skills: Evidence of issues in definition, demand and delivery for development contexts*, 2019, (K4D Helpdesk Report). Brighton, UK: Institute of Development Studies.
- [23] D.Guglielmi, "Employability: Competences to manage boundaryless careers. Speech at 'Soft Skills and their role in employability-New perspectives in teaching, assessment and certification', workshop in Bertinoro, FC, Italy. (November 2015).
- [24] D. Pachauri & A. Yadav. Importance of soft skills in teacher education programme. *International Journal of Educational Research and Technology*, 5(1), 2014, pp 22-25.
- [25] D.E. Brolin & R.J. Loyd. Career development and transition services: A functional life skills approach (4th ed.). Upper Saddle River, NJ: Pearson Merrill Prentice-Hall. , 2004.
- [26] D.H. Stevenson & J.A.Starkweather, PM critical competency index: IT execs prefer soft skills. *Intern. J. Project Manag.* 28, 2010, 663–671. doi: 10.1016/j.ijproman.2009.11.008
- [27] Environics Research Group, Career Development in the Canadian Workplace: National Business Survey – CERIC, 2014, Retrieved on 5 July, 2019 from <http://ceric.ca/career-development-in-the-canadian-workplace-nationalbusinesssurvey>
- [28] G. W. Mitchell, , L. B. Skinner, and B. J. White, "Essential soft skills for success in the twenty- first century workforce as perceived by business educators", *Delta Pi Epsilon j.* 52, 2010, 43-53.
- [29] G. Ryle, *The concept of Mind*. London: Hutchinson, 1949.
- [30] G. Ramesh & M.Ramesh, *The Ace of Soft Skills: Attitude, Communication and Etiquette for success*, 2010, New Delhi, Dorling Kingley, Noida.
- [31] G. Serchielli, Conclusion speech at 'Soft Skills and their role in employability – New perspectives in teaching, assessment and certification', (November 2014), workshop in Bertinoro, FC, Italy.
- [32] H.Kimiloglu, M.Ozturan & B.Kutlu, "Perceptions about and attitude towards the usage of E-learning in corporate training, *Computers in Human Behaviour*, 2017. DOI:10.1016/j.chb.2017.02.062
- [33] H. Perreault, "Business educators can take a leadership role in character education. *Business Education Forum*", 59(1), 2004, pp23-24.
- [34] H. Keser, H.Uzunboylu, & F. Ozdamli, "The trends in technology supported collaborative learning studies in 21st century", *World Journal On Educational Technology*, 3(2), 2012, 103-119.

- [35] I. Hampson & A. Junor, Invisible work, invisible skills: interactive customer service as articulation work. *New Technol. Work Employ.* 20, 2005, 166–181. doi: 10.1177/0022185608099664
- [36] J. M. Beaubien & D. P. Baker, “The use of simulation for training teamwork skills in health care: how low can you go?” *Quality and safety in health care*, 13 (suppl 1), (2004), i51-i56.
- [37] J. Bishop, “What we know about employer-provided training: A review of the literature.” In S. Polachek (Ed.), *Research in Labor Economics*, 16. Greenwich, CT and London: JAI Press, 1997, pp 19-87.
- [38] J. Hautamaki, “The search for Non-Hard Skills-Learning to Learn as a key Competence- Finnish Framework and Empirical Data”, Speech at ‘Soft Skills and their role in employability- New perspectives in teaching, assessment and certification’, workshop in Bertinoro, FC, Italy. (2015).
- [39] J. Loss, The communications contract, *The Internal Auditor*, 57(6), 2000, p-88.
- [40] J.D. Maes, T.G. Weldy, & M.L. Icenogle, A managerial perspective: Oral communication competency is most important for business students in the workplace. *Journal of Business Communication*, 34(1), 1997, 67-80.
- [41] J. Barling, F. Slater, & E.K. Kelloway, “Transformational Leadership and Emotional Intelligence: An Explanatory Study”, *Leadership & Organization Development Journal*, 21, 2000 157-161. <http://dx.doi.org/10.1108/01437730010325040>
- [42] James & James, “Teaching career and technical skills in a "mini" business world” *Buisness Education Forum*, 2004, 59(2), pp39-41.
- [43] K.N.Tang, Teaching as collective work: What are the needs of novice teachers? *Procedia Social and Behavioral Sciences*, 93, 2013, 195-199.
- [44] K.N.Tang, H. Nor Hashimah, & M.Y.Hashimah, Novice teacher perceptions of soft skills needed in today’s workplace. *Procedia Social and Behavioral Sciences*, 2013.
- [45] K.C. Costley, “The Positive Effects of Technology on Teaching and Student Learning” Date of Publication: October 30, 2014, <https://files.eric.ed.gov/fulltext/ED554557.pdf>
- [46] L. Ballesteros-Sánchez, I. Ortiz-Marcos, R.R. Rivero, R. R. & J.J. Ruiz, Project management training: an integrative approach for strengthening the soft skills of engineering students. *Intern. J. Eng. Educ.* 33, 2017, 1912–1926.
- [47] M. Devlin & G. Samarawickrema, “The criteria of effective teaching in a changing higher education context”, *Higher Education Research & Development*, Vol. 29, No. 2, April 2010, 111–124.
- [48] M.R. McCarthy & R. Carter. Ten Criteria for a Spoken Grammar in E. Hinkel and S. Fotos (eds). *New Perspectives on Grammar Teaching in Second Language Classrooms*. 2001, Mahwah, NJ:Lawrence Erlbaum Associates.
- [49] Merriam-Webster, 2019. <https://www.merriam-webster.com/dictionary/skill>
- [50] M. Cinque, “MOOCs and soft skills: A comparison of different courses on creativity”. *Journal of E-Learning and Knowledge Society*, (2017), 13, 83-96.
- [51] M. Cinque, “Comparative analysis on the state of the art of Soft Skill identification and training in Europe and some Third Countries. Speech at ‘Soft Skills and their role in employability – New perspectives in teaching, assessment and certification’, workshop in Bertinoro, FC, Italy. (November 2015).
- [52] M. Clapperton, M. “L’implication sociale et personelle, un savoir-être essentiel en milieu de travail.” *La formation en science de l’information*, 61(2-3), 2015, 129-131. doi: 10.7202/1032821ar
- [53] M. Marcuccio, “The debate on teaching Soft Skills in higher education: some recent trends”. Speech at ‘Soft Skills and their role in employability – New perspectives in teaching, assessment and certification’, 2015, workshop in Bertinoro, FC, Italy.
- [54] M. M. Robles, Exicutive perceptions of the top 10 soft skills needed in today’s workplace. *Business Communication Quarterly*, 75, 2012, 453-465. doi:10.1177/1080569912460400.
- [55] M. Pellerey, Assessing Soft Skills: When, How, Who? Speech at ‘Soft Skills and their role in employability – New perspectives in teaching , assessment and certification’, November 2015, workshop in Bertioro, FC, Italy.
- [56] M. Polanyi, *Personal knowledge: Towards a Post- Critical Philosophy*. London: Routledge, 1962.
- [57] M. Sultana, “Impact of Training in Pharmaceutical Industry: An Assessment on Square Pharmaceuticals Ltd., Bangladesh”, *International Journal of Science and Research*, Vol. 2(2), 2013, pp. 576-587.
- [58] M.S. Garet, A.C.Porter, L.Desimone, B.F.Birman & K.S.Yoon, “What makes professional development effective? Results from a national sample of teachers”, *American Education Research Journal*, Winter 2001, Vol.38, No.4, pp 915-945.
- [59] M.Trpathy, Significance of Soft Skills in career development, in book : *Career Development and Job Satifaction*, 2015, IntechOpen, DOI: 10.5772/intechopen.89335.
- [60] M.Wats and R. K .Wats, “Developing soft skills in students” *Intern. Journal Learn.* 15, 2009, 1-10. doi: 10.4324/9780429276491-1.
- [61] N. Sutton, Why can’t we all just get along? *Computing Canada*, 28(16), 2002, p.20.
- [62] NCF, National Curriculum Framework. New Delhi. National Council of Education Research and Training, 2005.
- [63] OJ, Ehindero, & YA Ajibade. What our student say about how we teach. *Ife J. Educ. Studies.* 7(1), 2000, 1-9.
- [64] P21 Framework Definitions, Partnership for 21st century skills, <https://files.eric.ed.gov/fulltext/ED519462.pdf>
- [65] P. Cappelli, “Why do employers pay for college?”, *Journal of Econometrics*, 121(1-2), 2004, 213- 241.
- [66] P. Snape, “Enduring Learning: Integrating C21st soft skills through technology education” , *Design and Technology Education: An International Jornal*, University of Canterbury, New Zealand, <https://files.eric.ed.gov/fulltext/EJ1164214.pdf>
- [67] P. B. Badcock, P. E., Pattison & K. L. Harris, Developing generic skills through university study: a study of arts, science and engineering in Australia. *Higher Education*, 60(4), 2010, 441-458.
- [68] P. Moss and C. Tilly, “Stories Employers Tell: Race, Skill and Hiring in America”, New York, NY: Russell Sage Foundation, 2001.
- [69] P. Sherwyn, M. Michael Morreale, Judy c. Pearson Osborn, Why Communication is Important: A Rationale for the Centrality of the Study of Communication. *Journal of the Association for Communication Administration* , 2000, 1-15.
- [70] R. Bancino & C. Zevalkink, Soft skills: the new curriculum for hard-core technical professionals. *Techniq. Connect. Educ. Careers* 82, 2007, 20–22.
- [71] R. Bonomo, “Soft Skills and organizational citizenship: a duo to make the change” Speech at ‘Soft Skills and their role in employability – New perspectives in teaching, assessment and certification’, workshop in Bertinoro, FC, Italy. 2015
- [72] R. L. Lerman, “Should employer-led training be the framework for workforce development?” Atlantic Council and University of Maryland School of Public Policy. Retrieved from: http://www.industrystudies.pitt.edu/kansascity13/documents/Papers/5_1%20-%20Lerman%20%20Employer-Led%20Training%20in%20the%20US.pdf, (2013).
- [73] R. Crosbie, “Learning the soft skills of leadership”, *Industrial and Commercial Training* (2005), 37, 45-51. doi: 10.1108/00197850510576484
- [74] S. Kurt, “Technology use in elementary education in Turkey: A case study”, *New Horizons in Education*, 58(1), 2010, 65-76.
- [75] S. Saunders & M.A. Mill, The knowledge of communication skills of the relationship between communication skills and teaching. NZARE / AARE Conference Paper – Melbourne, 1999, Conference Paper Number MIL99660.
- [76] S. Engelberg, “A developmental Perspective on Soft Skills” Speech at “Soft Skills and their role in employability – New perspectives in teaching, assessment, and certification,” 2015, Workshop in Bertinoro, FC, Italy.
- [77] S. Caudron, “The hard case for soft skills”, *Workforce* ,789, 1999, 60-67.
- [78] S. Majid, Z. Liming, S. Tong & S. Raihana. Importance of soft skills for education and career success. *Intern. J. Cross Discipl. Subj. Educ.* 2, 2012, 1037–1042.
- [79] S. Thompson, The power of pragmatism: how project managers benefit from coaching practice through developing soft skills and self- confidence, *Intern. J. Evid. Based Coach.*, 17, 2019, 4-15.
- [80] Sng Bee Bee, The Impact of Teachers’ Communication Skills on Teaching: Reflections of Pre-service Teachers on their Communication Strengths and Weaknesses. *Humanising language teaching.*, 2012.

- [81] T.T.Tran, "Limitation on the development of skills in higher education in Vietnam", *Higher Education*, 65(5), 2013, 631-644 Available at: <https://doi.org/10.1007/s10734-012-9567-7>.
- [82] T. Wagner, "The global achievement gap: Why even our best schools don't teach the new survival skills our children need and what we can do about it", New York: Basic Books, 2008.
- [83] V.Nedeva, Em.Dimova, "Some Advantages of E-learning in English Language Training", *Trakia Journal of Sciences*, Vol.8, 2010, pp21-28.
- [84] [IFF]. Research and the Institute for Employment Research. 2008 (2012). Retrieved from: <http://www.apprenticeships.org.uk/About-Us/~media/Documents/NAS-12-813-evaluation-of-apprenticeships-employers.ashx>.
- [85] W.J. Orlikowski, "Knowing in practice: enacting a collective capability in distributed organizing", *Organization Science*, 2002, 13, 249-273. Doi:10.1287/orsc.13.3.249.2776
- [86] W.Cukier, J. Hodson & A. Omar, *Soft Skills are Hard: A Review of The Literature, supported by the Social Sciences and Humanities Research Council (SSHRC)*, Canada, Nov. 2015.
- [87] World Health Organization, "Life Skills education for children and adolescents in School Introduction and guidelines to facilitate the development and implementation of life skills programs", Geneva, Switzerland :World Health Organization, 1997.
- [88] https://en.wikipedia.org/wiki/Soft_skills

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Comparison of Commercially Imported Available Demulsifier on Crude Oil Emulsion Demulsification to Locally Formulated Demulsifier

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ABSTRACT

The most important objective of any oil production facility is the separation of water and other foreign materials from produced crude. Emulsions of oil and water are one of many problems directly associated with the petroleum industry, in both oil-field production and refinery environments. Several methods in use have suffered from drawbacks such as high costs of production and environmental concerns. The need to develop a cost effective and efficient demulsifier in treating crude oil emulsions without compromising quality and environmental safety is a major concern to the oil industry worldwide. Hence, this study aims at developing and formulating cheap and environmentally safe demulsifier from locally sourced raw materials thereby compare its effectiveness with that of commercially imported foreign demulsifier. Experimental investigation was carried out to ascertain its effectiveness in breaking crude oil emulsion. Materials used included locally made liquid soap, starch, camphor, alum, castor oil, and distilled water. Two different demulsifier formulations were made and tested on a crude oil emulsion sample from a Niger Delta field and subjected to a temperature of 60°F. A foreign demulsifier, Separol, of the same quantity and under the same experimental condition, served as a basis for comparison (control).

The result of the treatment was a successful separation of oil and water using formulated demulsifier. The separated water volume by the local demulsifier (CONK1) was 31ml, while that separated by Separol was 6ml. This showed the locally formulated demulsifier had high effect and better water separation capability than the commercially available imported demulsifier (Separol).

Keywords: Coalescence, Local Materials, Demulsifier, Emulsion, Flocculation, Niger Delta, Saparol.

1. Introduction

Emulsion is defined as a system in which one liquid is relatively distributed or dispersed, in the form of droplets, in another substantially immiscible liquid. Emulsions have long been of great practical interest due to their widespread occurrence in everyday life which occurs due to reliance of the behaviour of the emulsion on the magnitude and range of the surface interaction. They may be found in important areas such as food, cosmetics, pulp and paper, biological fluids, pharmaceutical, agricultural industry, and petroleum engineering. In production and flow assurance, the two commonly encountered emulsion types are water droplet dispersed in the oil phase and termed as water-in-oil emulsion (W/O) and if the oil is the dispersed phase, it is termed oil-in-water (O/W) emulsion (D. Langevin, S. Poteau, I. H'énaut, and J. F. Argillier, 2004). When there is dispersion (droplets) of one liquid in another immiscible liquid is called emulsion. The phase that is present in the form of droplets is the dispersed or internal phase, and the phase in which the droplets are suspended is called the continuous or external phase. For produced oilfield emulsions, one of the liquids is aqueous and the other is crude oil. The amount of water that emulsifies with crude oil varies widely from facility to facility. It can be less than 1% and sometimes greater than 80%.

In a true emulsion, either the drop size must be small enough that forces from thermal collisions with molecules of the continuous phase produce Brownian motion that prevents settling, or the characteristics of the interfacial surfaces must be modified by surfactants, suspended solids, or another semisoluble material that renders the surface free energy low enough to preclude its acting as a driving force for coalescence.

1.1 Appearance and Color

Color and appearance is an easy way to characterize an emulsion. The characterization becomes somewhat easy if the emulsion is transferred into a conical glass centrifuge tube. The color of the emulsion can vary widely depending on:

- Oil/water content
- Characteristics of the oil and water

The common colors of emulsions are dark reddish brown, gray, or blackish brown; however, any color can occur depending on the type of oil and water at a particular facility. Emulsion brightness is sometimes used to characterize an emulsion. An emulsion generally looks murky and opaque because of light scattering at the oil/water interface. When an emulsion has small diameter droplets (large surface area), it has a light color. When an emulsion has large diameter droplets (low total interfacial surface area), it generally looks dark and less bright. Understanding the characteristics of an emulsion by visual observation is an art that improves with experience.

1.2 Formation of Emulsions

Crude oil emulsions form when oil and water (brine) come into contact with each other, when there is sufficient mixing, and when an emulsifying agent or emulsifier is present. The amount of mixing and the presence of emulsifier are critical for the formation of an emulsion. During crude oil production, there are several sources of mixing, often referred to as the amount of shear, including: Flow through reservoir rock, Bottomhole perforations/pump, Flow through tubing, flow lines, and production headers, Valves, fittings, and chokes, Surface equipment, Gas bubbles released because of phase change. The amount of mixing depends on several factors and is difficult to avoid. In general, the greater the mixing, the smaller the droplets of water dispersed in the oil and the tighter the emulsion. Emulsion studies have shown that the water droplets can vary in size from less than 1 μm to more than 1000 μm . The second factor

important in emulsion formation is the presence of an emulsifier. The presence, amount, and nature of the emulsifier determines, to a large extent, the type and "tightness" of an emulsion. The natural emulsifiers in crude are resident in the heavy fraction. Because there are different types of crudes and because these crudes have different amounts of heavy components, the emulsifying tendencies vary widely. Crude with a small amount of emulsifier forms a less stable emulsion and separates relatively easily. Other crudes contain the right type and amount of emulsifier, which lead to very stable or tight emulsions. Emulsions may be encountered at all stages in the petroleum recovery and processing industry (drilling fluid, production, process plant, and transportation emulsions)

1.3 Objectives of Study

This research is focused primarily to drive comparison of commercially imported foreign available demulsifier effectiveness and water separation capability to locally formulated demulsifier from locally sourced raw materials on water-in-oil emulsion demulsification.

2.0 Demulsifiers Development, Formulation and Performance

2.1 Historical development

Rigorous attempts have been in trying to correlate between demulsifier performance and physical properties such as molecular structure, interfacial tension, Hydrophilic-Lipophilic balance (HLB), interfacial viscosity, partition viscosity, dynamic interfacial tension and relative solubility number. A quick look on the chemical demulsifiers history reveals that prior to the knowledge of polyether condensates synthesis, chemicals such as Turkey red oil, sulphuric acid, sulphated castor oil, mahogany soaps, polyamines and polyhydric alcohols were used directly as demulsifiers (Monson, 1969).

In early 1940's, the technology of alkylene oxide condensation started to evolve worldwide, and since then almost all demulsifier components were made up of condensation products of ethylene, propylene and butylenes oxide. Most of these are alkoxyated polymers that are mainly etoxyated and propoxyated and sometimes both. They are macromolecules held in chains, industrially synthesized from petroleum chemicals.

After World War II, the whole branch of chemistry was opened to companies involved in surfactant (surface-active agents) technology. With the beginning of condensed polyether made possible by large-scale production of ethylene and propylene oxides (Becker, 1997), a new class of nonionic detergents began to appear. The condensation products of the ethylene oxide were found to be water soluble and the high reactivity of the oxirane ring made it useful in a host of chemical reactions. It was found that the propylene oxide gave poly condensation products that tended to be oil soluble. The polymer most employed in the demulsification industry is surfactant that exhibits both hydrophilic and hydrophobic groups. The polymeric surfactant when added to the petroleum emulsion

located itself in the interface between the water and oil molecules. The hydrophilic groups orient themselves towards water whilst the hydrophobic ones orient themselves towards the oil.

The best polymeric surfactants used nowadays throughout the world are alkoxyated material derivatives. Because they are alkoxyated, they are considered as nonionic polymers. Sometimes mixtures of nonionic, cationic or anionic materials are used together, depending on the oil characteristics. Etoxyated nonionic surfactants are effective multi-purpose and versatile substances. Commercial products are obtained by reaction of ethylene oxide with a hydroprobe having an active hydrogen group (e.g. fatty acids, alkylphenols or fatty alcohols) in the presence of suitable catalysts.

Sjoblöm et al. (1990) stated that a similar destabilization sequence for model and authentic crude oil emulsions can be obtained when medium-chain alcohols and fatty amines are used as destabilizers. The commercial demulsifiers that used to break up water-in-oil emulsion are oil soluble and water soluble demulsifiers. Table 2.2 shows the comparison between those demulsifiers.

Table 2.1: The development and evaluation of chemical demulsifiers (Selvarajan et al., 2001)

Year	Demulsifiers
1920-1930	Soap, naphthenic acid salts and alkylaryl sulphonate, sulphated castor oil
1930-1940	Petroleum sulphonates, derivatives of sulpho-acid oxidized castor oil and sulphosuccinic acid ester
1940-1950	Fatty acids, fatty alcohols, alkylphenols
1950-1960	Ethylene oxide/propylene oxide copolymer, Alkoxyated cyclic alkylphenol formaldehyde resins
1960-1970	Amine alkoxyate
1970-1980	Alkoxyated cyclic p-alkylphenol formaldehyde resins
1980-1990	Polyesteramine and blends

Table 2.2: Comparison between oil soluble demulsifier and water soluble demulsifiers (Bhattacharyya, 1992)

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No/Type	Oil soluble demulsifiers	Water soluble demulsifiers
1	Moderately 2000-50,000 molecular weight (mw). High mw are the preference.	10,000-15,000 molecular weight. Lower mw are the preference.
2	Polydispersed interfacially active polymers.	Tetrapolymer or pentapolymer
3	Mostly non-ionic block polymer with hydrophilic and hydrophobic segments.	The polymer present hydrophilic (-COOH) and hydrophobic (alkyl) groups.
4	Dangerous and expensive chemicals like ethylene and propylene oxide.	Easy handling chemicals like methyl metachrylate, butyl acrylate, acrylic acid and methacrylic acid.

In water-in-oil emulsion cases, the most effective demulsifiers are oil-soluble or hydrophobic. This is because oil is the continuous phase while water is the dispersed phase. Thus, the surfactants will absorb straightly into the continuous phase without any resistance in optimum temperature.

Typically, these oil soluble demulsifiers are formulated in organic solvent alone such as toluene, xylene, tetrahydrofuran, dioxane, lower alcohols and light gasoline fractions having boiling limits of from 50 to 200°C, or in co-solvents comprising organic solvents and water where in the organic solvent are usually C3 to

C10 alkanols, ethylene diamine, diethylene triamine or ethanolamines including diethanolamine (Mercant et al., 1988).

Among the disadvantages of having organic solvents in a demulsifier formulation are increased cost, flammability, and toxicity. Therefore a demulsifier formulation, which does not include organic solvents, would represent an advance in the art of demulsification.

2.2 Formation and Stability of Emulsion

An emulsifying agent must be present to form stable water-in-crude oil emulsions (Sjöblom et al., 2002). Such agents include clay particles, added chemicals or the crude oil components like asphaltenes, waxes, resins and naphthenic acids (Sjöblom et al., 2002). In the late 1960's, Berridge and his co-workers were the first to measure several physical properties of emulsions (Fingas and Fieldhouse, 2003). They described the formation of emulsions due to the asphaltene and resin content of the oil (Fingas and Fieldhouse, 2003). Mackay and McAuliffe (1988) also stated that the main factors affecting the stability of the emulsion is the presence of substances like crude oil resins, asphaltenes, and natural wax. It was found that asphaltenes were a major factor in

emulsion stability (Fingas and Fieldhouse, 2003). Asphaltene fraction contains the highest percentage of hetero-atoms (O, S, and N) and organometallic constituents (Ni, V, Fe) in the crude oil (Sjöblom et al., 2002). These components combine with organic and/or inorganic solids producing emulsion-stabilizing films at oil-water interface, and contribute to the formation of stable emulsions (Cormack, 1999).

3.0 MATERIALS AND METHOD

3.1 Materials

The crude oil emulsion sample used in this research was obtained from an oil field located in Nigeria’s Niger Delta region (code 001) Three demulsifier, two laboratory made (CONK 1 and CONK 2) and a commercially available imported Separol were used in treating this emulsion. The Bottle Test method was used to determine the emulsifier most effective in breaking the emulsion. The result from the test also indicates the smallest amount of demulsifier needed to satisfactorily break the given volume of emulsion.

The materials used in formulating CONK1 and CONK2 are shown in Table 3.1.

Content	Function	Weight/Vol	
		CONK1	CONK2
Alum	To facilitate settling of sediments	5g	5g
Castor Oil	It acts as the lipophilic agent in the demulsifier	30ml	45ml
Starch	Coalescing of the tiny water droplets	5g	5g
Liquid Soap	Destabilization of emulsion film	50ml	25ml
Camphor	It improves the demulsifier performance	10ml	10ml
Xylene	It lightens the oil in the emulsion	-	10

Table 3.1: CONK1 and CONK2 Materials

3.2 Apparatus

- I. Digital Weigh balance
- II. Measuring Cylinder (50ml graduated)

- III. Beaker
- IV. Magnetic Heat-Stirring machine
- V. Filter paper
- VI. Prescription bottles (200ml graduated)
- VII. Thermostatic Water Bath
- VIII. Stop watch
- IX. Syringe
- X. Micro-pipette

3.3 Local demulsifier Formulation Procedure

3.3.1 CONK1 Formulation Process

- I. A solution of 10g of camphor dissolved in 30ml of castor oil was stirred and heated (150oF) in a Magnetic heating and stirring machine until homogeneity of solution is obtained.
- II. A mixture of 5g of starch (from cassava flour), 50ml of detergent, and 5ml of Alum solution was prepared in another beaker and added to the camphor- castor oil solution.
- III. The new mixture above was further stirred and heated for 2 hours, after which all precipitates or sediments were filtered off.

3.3.2 CONK2 Formulation process

- I. A solution of 10g of camphor, 10ml of Xylene and 45 ml of cator oil was prepared in a beaker.
- II. A second solution of 5g of starch, 5ml of alum solution, and 25ml of liquid soap was prepared also and stirred.
- III. Both solutions were combined and heat-stirred in the Hotplate Stirred machine for 2 hours, afterwards all remaining precipitates were filtered off.

3.4 Analytical Procedure

- I. Samples were heated in water bath to achieve fluid mobility before placing in the bottles.

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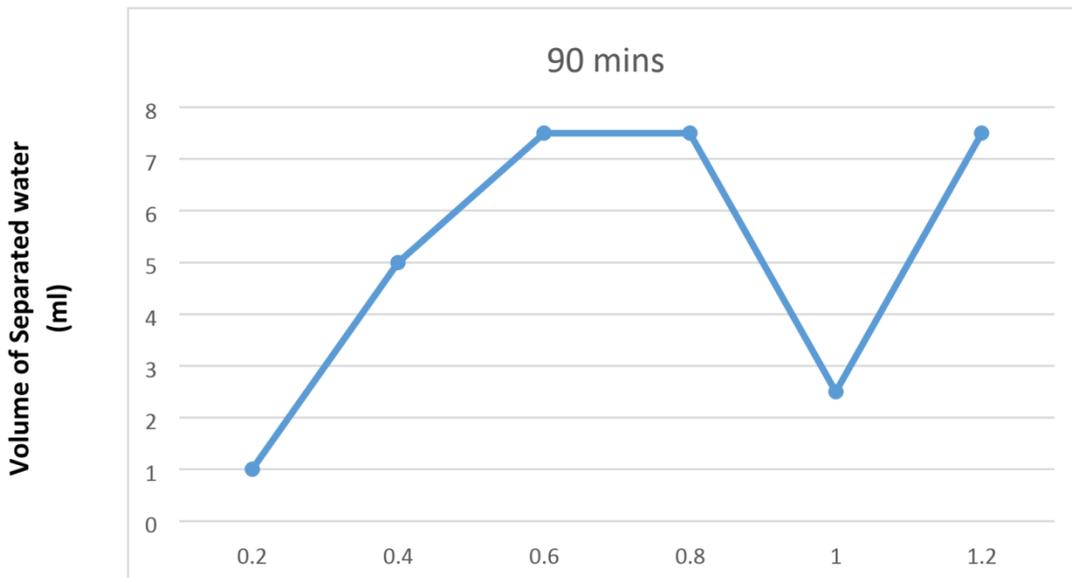
- II.** A 100ml of emulsion were poured into each of the 18 prescription bottles.
- III.** All prescription bottles were labeled according to the concentration of demulsifier to be used for the analysis. Six bottles for each demulsifier were used with concentrations of 0.2ml, 0.4ml, 0.6ml, 0.8ml, 1.0ml, and 1.2ml of demulsifier.
- IV.** All bottles containing samples with varying dose of demulsifier were agitated to achieve proper mixture.
- V.** The bottles were placed in the water bath, with level at the 100ml mark and heated to 60°C for 2 hours.

4.0 RESULTS AND DISCUSSION

The Bottle Test results using the three demulsifiers (CONK1, CONK2 and Separol) at a constant treatment temperature of 60°C and at time intervals of 20 minutes after heating for 2 hours are summarized in Table 4.1, 4.2 and 4.3 respectively. Before carrying out any analysis, all samples were drained of free water after aging for a week. This allowed the water to settle out by gravity. The Basic Sediment and Water (BS&W) and the API of a sample before and after treatment, are summarized in Tables 4.4.

Volume of Demulsifier (ml)	Seperated water Volume				
	1 min	30 mins	60 mins	90 mins	120 mins
0.2	-	-	1.0	1.0	1.0
0.4	2.5	5.0	5.0	5.0	5.0
0.6	2.5	5.0	7.5	7.5	7.5
0.8	7.5	7.5	7.5	7.5	7.5
1.0	2.5	2.5	2.5	2.5	2.5
1.2	7.5	7.5	7.5	7.5	7.5

Table 4.1: Results of Heat and Chemical Treatment using locally formulated demulsifiers CONK1

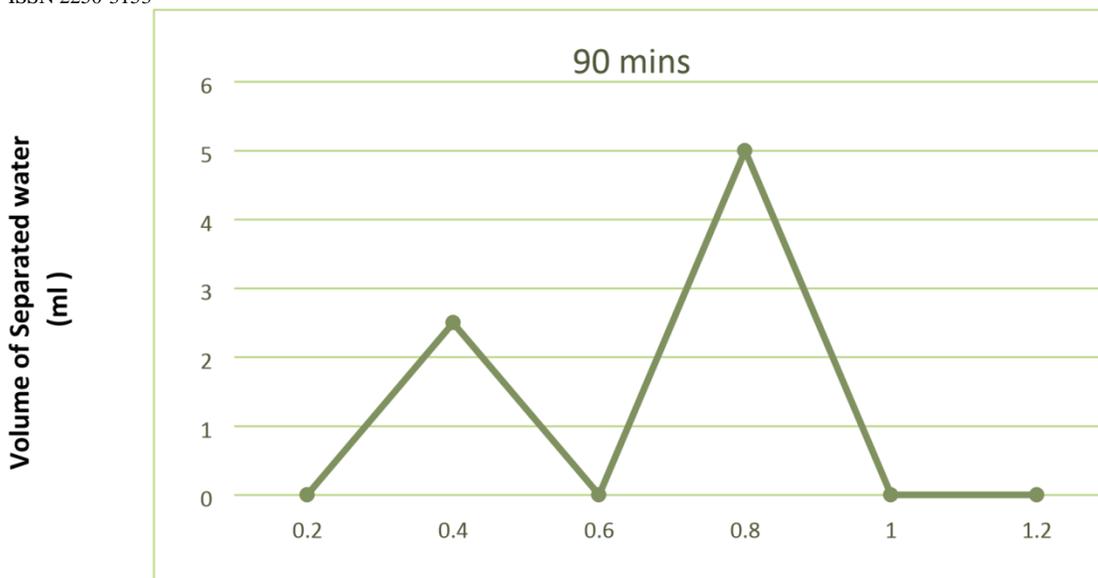


Volume of Demulsifier (ml)

Figure 4.1 showing the volume of separated water using locally formulated CONK1 demulsifier

Volume of Demulsifier (ml)	Seperated water Volume				
	1 min	30 mins	60 mins	90 mins	120 mins
0.2	-	-	-	-	-
0.4	2.5	2.5	2.5	2.5	2.5
0.6	-	-	-	-	-
0.8	5.0	5.0	5.0	5.0	5.0
1.0	-	-	-	-	-
1.2	-	-	-	-	-

Table 4.2: Results of Heat and Chemical Treatment using CONK2



Volume of Demulsifier (ml)

Figure 4.2 showing the volume of separated water using locally formulated CONK2 demulsifier

Volume of Demulsifier (ml)	Seperated water Volume				
	1 min	30 mins	60 mins	90 mins	120 mins
0.2	-	1.0	1.0	1.0	1.0
0.4	-	-	-	0.5	0.5
0.6	-	-	-	0.5	0.5
0.8	2.0	2.0	2.0	2.0	2.0
1.0	-	1.0	1.0	1.0	1.0
1.2	-	1.0	1.0	1.0	1.0

Table 4.3: Results of Heat and Chemical Treatment using Separol

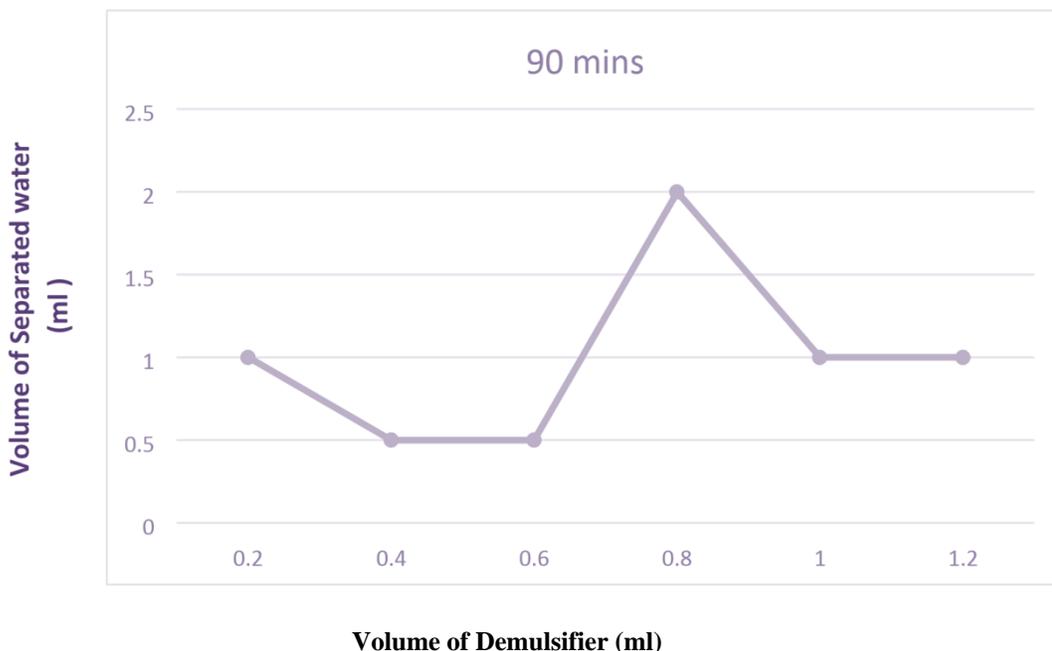


Figure 4.3 showing water separation using conventional demulsifier Separol

As shown in Table 4.1 and figure 4.1, CONK1 was the most effective demulsifier for treating this particular crude oil emulsion sample, despite the heavy nature of the crude and its pour point of 95°F. All samples were heated in the water bath for two hours before readings were taken.

At 1 minute, after heating for two hours, separated water in bottles containing the emulsion with concentrations 0.4ml, 0.6ml, 0.8ml, 1.0ml, and 1.2ml of formula 1 (CONK1), were 2.5m, 2.5m, 7.5m, 2.5m, and 7.5m respectively, at 60 minutes, 1.0m of separated water was observed for emulsion sample injected with 0.2m

Concentration of CONK1 but no further change was observed for the next 60 minutes.

A little deviation from normal was observed in the sample dosed with 1.0m of CONK1 at 1 minute of treatment. As volume of injected demulsifier increased, ideally the volume of separated water ought to increase or be maintained not decrease from 7.5m to 2.5m then back to 7.5m.

This may be due to sludge/sediment content in the emulsion sample. Samples treated with 0.4m and 0.8m of CONK2 (Table 4.2 figure 4.2) separated 2.5m and 5.0m water respectively after 120 minutes. Sediment containing traces of water were observed in other bottles containing CONK2 perhaps an adjustment of the proportion of materials used may have produced a better result after 120. On the other hand, the total separated water volume by Separol after 120 minutes was 6m. This proves that there is no demulsifier which can break all emulsions effectively, ideally for medium to light crude oil emulsions, the AP1 gravity ought to increase due to the

separation and extraction of water. However, for heavy crudes (in this case below 20° API) which normally are treated above 180°F, heat may have had a negative effect on difference in density. In special cases, increased heat may cause the density of water to be less than that of oil. Heating well fluids is expensive and can cause a significant loss of the lower boiling-point hydrocarbons. This results in loss of oil volume because the light ends are boiled off, and the remaining liquid has a lower API gravity and thus may have a lower value.

A manual centrifuge was used before and after treatment to determine the BS& W content of crude oil emulsion samples. Also due to the API gravity of the crude and pour point there was very little separated water from the emulsion hence requiring the addition of Xylene after treatment to the samples in order to reduce its pour point temperature to room temperature. Nevertheless, no free water was observed after treatment.

CONCLUSION

In this work, two demulsifiers were formulated from locally sourced raw material. They were tested on a crude oil emulsion sample from a Niger Delta Field and subjected to a temperature of 60° F. this rests of the treatment was the successful separation of the oil emulsion sample into oil and water. The separated water volume by the local emulsifier (CONK1) was 31m, while that separated by a foreign demulsifier (Separol) was 6m. this showed the locally formulated demulsifier had high effect and better water separation capability than the commercially available imported demulsifier (Separol).

The results clearly demonstrated that cheap locally chemicals with demulsification properties can be used to successfully break emulsions and enhance the quality and quantity of crude productivity.

The demulsifiers (CONK1 and CONK2) contained no organic chloride, bromides, iodides, or lead, hence will not cause any refining problems.

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REFERENCES

- Abdurahman N. H. and Mahmood W. K., (2012). "Stability of water-in-crude oil emulsions: effect of cocamide diethanolamine (DEA) and Span 83," *International Journal of Physical Sciences*, vol. 7, no. 41, pp. 5585–5597.
- A. Mosayebi, R. Abedini, Using demulsifiers for phase breaking of water/oil emulsion, *Pet. Coal* 55 (1) (2013) 26–30.
- Becker, J. R. (1997). *Crude Oil Waxes, Emulsions, and Asphaltenes*. PennWell Publishing Company. Oklahoma. 126-129.
- Bhattacharyya, B.R. (1992). Water Soluble Polymer as Water-in-Oil Demulsifiers. (US Patent 5,100,582).
- Binks, B.P. (1993). Surfactant Monolayers at the oil-water interface. *Chemistry and Industry* (July). 14: 537-541.
- C. Kritika, K. Smita, M.S. Chandra, Application of different groups of demulsifier in water-in-oil emulsion, *J. Appl. Sci. Agric.* 9 (8) (2014) 245–248.
- Christopher D., David A., Anne S., Alain G., and Patrick B., (2006). "Stability of water/crude oil emulsions based on interfacial dilatational rheology," *Journal of Colloid and Interface Science*, vol. 297, no. 2, pp. 785–791.
- Cormack, D., (1999). *Response to marine oil pollution – review and assessment*. Dordrecht, the Netherlands.
- Dorstewitz, F. and Mewes, D. (1992). "Thermodynamische Gleichgewichte beim Bilden von Hydraten aus R12 und RI34a", *Chem.-Ing.-Tech.*, Vol 64, No 5, pp 466 467.
- Scott S.L., Shoham O., and Brill J.P., (1987). "Modeling slug growth in large diameter pipes", *Proc. 1st Int. conf. on multiphase Flow*, Vol. 1, pp. 55-64.
- Schramm, L. L. (1992). *Petroleum Emulsion*. In.: Schramm, L.L. *Emulsions Fundamentals and Applications in the Petroleum Industry*. American Chemical Society, Washington DC. 1-45.
- Selvarajan Radhakrisnan, Ananthasubramaniam Sivakumar and Robert A. M. (2001). *Aqueous Soluble Demulsifier For Breaking Crude Oil Emulsions*. (US Patent No.6,294,093). Dispersion of An Oil
- Sharma, I.C., Haque, I. And Srivastava, S.N. (1982). *Coll. Poly. Sci.*. 260: 616-622.
- Sjöblom, J., Ming Yuan, L., Hoiland, H and Johansen, J.E. (1990). Water-in-Crude Oil Emulsions from the Norwegian Continental Shelf, Part III. A Comparative Destabilization of Model Systems. *Colloid and Surfaces*. 46:127-139.
- Sjöblom, J., Mingyuan, L., Christy, A.A., and Rønningsen, H.P. (1992). Water-in-Crude Oil Emulsions from the Norwegian Continental Shelf. – 7. Interfacial Pressure and Emulsion Stability. *Coll. Int. Sci.* 66: 55-62.
- Sjöblom, J., Aske, N., Auflem, I. H., Brandal, Ø., Havre, T. E., Saether, Ø, Westvik, A., Johnsen, E. E., Kallevik, H., (2002). Our current understanding of water in crude oil emulsions. Recent characterization techniques and high pressure performance. *Advances in Colloid and Interface Science* 100-102, 399-473.
- Sloan, E.D. (1990). "Natural gas hydrates phase equilibria and kinetics: understanding the state-of-the-art", *Revue De L'Institut Français Du Ptrole*, Vol 45, No 2, pp 245-266.
- Sunil K., Abdullah A., and Meeranpillal N. S., (2007). "An Investigative study of potential emulsion problems before field development," in *Proceedings of the SPE Annual Technical Conference and Exhibition, SanAntonio, Tex, USA, SPE paper 102856*.

- T.Nguyen D. and Sadeghi N., (2011). "Selection of the right demulsifier for chemical enhanced oil recovery," in International Symposium on Oilfield Chemistry, The Woodlands, Tex, USA.
- Taylor S. D., (1988). "Investigations into the Electrical and rheological Behaviour of W/O—emulsions in high voltage Gradients," Colloid & Surfaces, vol. 29, pp. 25–51.
- Tambe, D.E. and Sharma, M.K. (1993). Factor Controlling the Stability of Colloid- Stabilized Emulsions: I. An experimental investigation. J. Coll. Int. Sci. 157:244-253.
- Thompson D. G., Taylor A. S., and Graham D. E., (1987). "Emulsification and demulsification related to crude oil production," Colloid & Surfaces, vol. 15, pp. 175–189.
- Wei, Qu-Fu, Mather, R.R., Fotheringham, A.M., Yang, R.D., (2003). Characterization of water-in-crude oil emulsions in oil spill response. Journal of Environmental Sciences 15 (4), 506-509.

Strength Property Of Sandcrete Hollow Blocks Produced With Sludge As A Partial Replacement For River Sand

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Abstract- This work investigated on the strength properties of sandcrete hollow blocks produced with sludge as partial replacement for river sand. The properties considered were the compressive strength and water absorption. A total of 16 sandcrete blocks were produced with a single mix ratio of 1:6 (cement:sand) using a standard mould of 450mm x 225mm x 225mm having two hollow size of 131mm x 154.5mm x 225mm. The river sand used has a fineness modulus value of 2.93 and the percentage replacement of river sand with sludge was varied from 10% to 30%. The sandcrete blocks produced were cured and tested for their 28day compressive strength and water absorption. The test result shows that the compressive strength value at 10% replacement of river sand with sludge gave a highest value of 3.96N/mm², while it was observed that the water absorption value of the blocks increases with increase in the sludge replacement.

Index Terms- Sandcrete Block, River Sand, Sludge, Compressive Strength, Water Absorption.

I. INTRODUCTION

Sandcrete blocks are prismatic precast units made from a mixture of cement, sand and water. (Okpala, 2003). This mixture is at times described as cement stabilized sand. Thus, sandcrete block is the product of moulding the particulate plastic mixture into a desired block geometry under pressure or a combination of vibration and pressure for effective consolidation. It is sometimes referred to as a micro-concrete due to fine aggregate particles making up the material as compared to coarse aggregate and fine aggregate in concrete. This term has probably misled people to think of sandcrete blocks as having the same properties as concrete.

Traditionally, walls of houses have been constructed of mud but this practice is fast dwindling to obscurity since the advent of sandcrete blocks. The early history of its manufacture is not known but by 1960 it had established an important place in building industry in Nigeria. Sandcrete block manufacturing has over the years come to become one of the most important industries concerned with building construction in Nigeria. Early production of sandcrete blocks started with hand- moulding technique and natural curing but it is now made by semi-mechanised and fully automatic plants. Major development is seen mainly in the design and use of power operated machine for making blocks. Rosachometta vibrating machine is most popular for making Sandcrete blocks in Nigeria . Additives such as accelerators, workability aid pigments and water repellants compounds are not added to Sandcrete mixes. Sandcrete block is the principal wall unit in Nigeria as well as other African Countries. These blocks are intended for use in buildings, including walls, partitions, fences, balustrades or parts thereof.

The load bearing blocks are those which when incorporated in a wall or similar structure are capable of sustaining loadings from external sources in addition to the weight of the wall. On the other hand, non-load bearing blocks are not required to sustain any load other than their self- weight. Ideally, these strength grading should correspond to the strength of blocks produced in the

block factories but this is never so because they produce blocks without adherence to the specifications

A survey conducted on block-making practice in several African countries revealed that blocks were frequently produced without reference to any specification to suit the local building requirement and that there is a wide variation in the strength of blocks as manufactured (Tyler, 1996). Fifteen years later another survey of parts of Nigeria showed that this situation is still unchanged (Florek, 2005). Also, survey in eastern Nigeria still reflect the trend (Okolie, 2004). Recent studies in Imo state revealed that there is an absence of National Building Code and Regulations, and an absence of standards for the production of many building materials, including sandcrete blocks. This lack of standards and quality control results in production of sub-standard materials and the use of these materials have dangerous consequences for the building delivery process such consequences includes:

- Rampant building failure and/or collapse, which many instances involve, lie loss of human lives.
- High maintenance cost of building.

Thus, the block manufacturing industry has a very important role to play in a country such as Nigeria where the construction industry has been increasing rapidly. Many block factories have consequently sprung up in the last decade to meet with the high demand for this constructional unit. It is therefore important that their product should be of good quality so that our buildings of which these products form a part may continue to give satisfactory performance throughout their design life.

Owing to this, there is every need for the optimization and characterization of the materials used in the construction industry (while producing hollow blocks), also disposal of sludge which is the final waste product from a water treatment plant and quarry dust which is a waste product gotten from a quarry plants are problems to the environment. The quest to find the solution to this problem gave birth to this research topic **“Strength Property of Sandcrete Hollow Blocks Produced with Sludge as a Partial Replacement for River Sand”**

II. OBJECTIVES OF STUDY

The main objective of this work is to investigate the strength property of sandcrete hollow blocks produced with sludge as partial replacement for river sand. While, the objectives of this project are:

- a) To characterize the properties of the constituent materials of sandcrete hollow blocks, made with sludge as partial replacement for river sand.
- b) To determine experimentally the compressive and water absorption properties of the block.
- c) To determine the optimum percentage replacement of river sand with sludge.
- d) To make recommendations.

III. MATERIALS AND METHOD

2.1 Materials

In this work, the materials used includes; cement, river sand, water and sludge gotten from a water treatment plant in Enugu which was dried and grinded in order to get a smooth dry sludge particle.

2.2 Methods

Various tests were performed during this research and they includes;

- a) Sieve analysis
- b) Chemical composition and physical test on sludge
- c) Bulk density
- d) Compressive strength
- e) Water absorption test.

2.3 Sieve Analysis

The sieving method adopted was dry sieving and a sample size of about 300g was used for the river sand and quarry dust. This test was carried out on both aggregate to determine the particle size distribution. This test was done in the laboratory using sieve size of different diameter and were stacked according to the size of sieve, that is, the largest ones on top while the smaller at the bottom. The equipment used in carrying out this test are; sieves of different diameter, a scoop which was used to collect the sample, a weighing balance which was used to determine the mass of the aggregate and a brush which was used to remove dirt from the sieve. Sieving was done mechanically using a sieve shaker.

2.4 Laboratory test on Sludge

This physical and chemical analyses conducted on the sludge is to determine the physical and chemical compositions, to know if it is a suitable material for block production.

2.5 Bulk Density Test

Bulk density gives valuable information regarding the shape and grading of the aggregate. It refers to the mass of material per unit volume, including the voids between the particles. The dry method was adopted for the determination of the bulk densities of river sand and quarry dust this test was carried out in accordance with BS 812: Part 2 and Part 1 07, (1990 and 1995). The net weight of the aggregate in the container was determined and the bulk density was calculated in kg/m^3 .

2.6 Calculations/Materials proportioning by Weight

This refers to determining the quantity in weight of each constituent in the Sandcrete mix. All the materials are weighed using a weighing balance. The 225mm x 225mm x 450mm for hollow block of 40% void was used.

- i. Type of Hollow Block, 225mm x 225mm x 450mm.

Volume for a full mould: $225 \times 225 \times 450 = 22781250\text{mm}^3 = 0.02278125\text{m}^3$

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Volume of the void: $(131 \times 154.5 \times 225) \times 2 = 9107775\text{mm}^3 = 0.009107775\text{m}^3$

109

Therefore, volume of the full mould minus the void, $0.02278125 - 0.009107775 = 0.013673475\text{m}^3$

- ii. Density of sandcrete block, the density of sandcrete/concrete blocks is largely a function of the aggregate density, size and grading, degree of compaction or aeration and the block form. The typical range for dry density is 500 to 2200 kg/m^3 with aerated and solid dense aggregate concrete blocks being on the lighter and heavier end of the scale respectively and light weight and dense aggregate concrete blocks of cellular and hollow form falling in the middle of the range or sole. Therefore, density = 1860 kg/m^3

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Therefore, Mass = Density x Volume

Mass = 0.013673475 x 1860 = 25.4326635kg

Including a 10% waste, the weight of a mould would be 25.4326635 X 1.1 = 27.98kg Take weight = 28kg.

The water-cement ratio, cement-sand ratio, and mass of the constituents is shown in the Table 1 below.

Table 1 Mix Proportions for 225mm x 225mm x 450mm Sandcrete block for compressive strength test

Mix No	Mix Ratio W:C:RS:S	Water (kg)	Cement (kg)	Sand (kg)	Sludge (kg)
B0	0.55:1:6:0:0	2.2	4	24	—
B10	0.55:1:5.4:0.6	2.2	4	21.6	2.4
B20	0.55:1:4.8:1.2	2.2	4	19.2	4.8
B30	0.55:1:4.2:1.8	2.2	4	16.8	7.2

2.7 Production of Sandcrete Specimen

1. The floor surface was cleaned, wetted and dried to prevent loss of the water cement ratio and prevent excess water being added into the mix. Batching of the materials was done by weight using a weighing balance of 50kg capacity. The inside surface of the mould were coated lightly with medium viscosity oil and then placed on a clean, level and firm surface. The mould is made of metal.
2. Mixing of the constituents was done manually using shovels. The production process involved collection of sand which was left to dry, the sand which had been previously completely dried were mixed to a constant colour. The sludge which had been dried was weighed and added to the mix, Cement was then added and the whole process of mixing continued until a uniform colour was achieved. Water was finally added and the mixing continued until the colour of the paste was uniform. The mixture was then loaded into the moulds it was compacted manually and demoulded immediately.
3. 16 blocks was made, each mix had 4 specimens. Each blocks were inscribed for identification.
4. All the blocks were cured, under shade, for twenty-eight days by sprinkling them with water obtained from the laboratory daily.

2.9 Compressive strength

The blocks were crushed after twenty-eight days of curing using an electrical Universal Testing Machine (UTM). The machine has a testing range of 0KN – 1000KN. The blocks were placed in between two steel plates and the plates are wide enough as to cover the top and bottom of the blocks. The switch of the machine was turned on, then force was applied to the block until the block fails in compression. The strengths of the blocks were determined using equation 1. Four samples each were tested for a particular mix number and the average value taken as the compressive strength for the mix.

$$\text{Compressive strength} = \frac{\text{crushing load}}{\text{cross sectional area}} \quad (1)$$

2.9 Water absorption

The blocks for this test were dried in the oven, and then it were weighed. They were then immersed in water for 24 hours. On removal from water, they were reweighed within three minutes of removal to determine the quantity of water absorbed. Equation 2(3.2) was used to determine the water absorption of the blocks. Three blocks were tested for each mix number and the average taken as the water absorption of the mix.

$$\text{Absorption (\%)} = \frac{M_2 - M_1}{M_1} \times 100 \quad (2)$$

M_1

Where; M_1 = mass of dry sample and M_2 = mass of wet sample (after 24hrs in water).

IV. RESULTS AND ANALYSIS

3.1 Sieve analysis results

The results of sieve analysis test for river sand is presented in Tables 2. The gradation chart for the river sand is shown in Figure 1

Table 2: Grain size distribution of river sand

Sieve size (mm)	Mass of empty sieve (g)	Mass of sieve + soil (g)	Mass of soil retained (g)	Cumulative mass of soil retained (g)	Cumulative % passing	Cumulative % retained
4.75	373.29	382.13	8.84	8.84	99.47	0.53
2.36	353.09	443.71	90.62	99.46	94.04	5.96
1.18	398.21	896.28	498.07	597.53	64.17	35.83
0.60	372.63	880.22	507.59	1105.12	33.73	66.27
0.30	318.27	738.92	420.65	1525.77	8.50	91.50
0.15	298.38	325.56	27.18	1552.95	6.87	93.13
0.075	311.1	312.84	1.74	1554.69	0.10	
Pan	273.02	274.65	1.63	1556.32		
						$\Sigma = 293.24$
Fineness modulus = $293.24/100 = 2.93$						

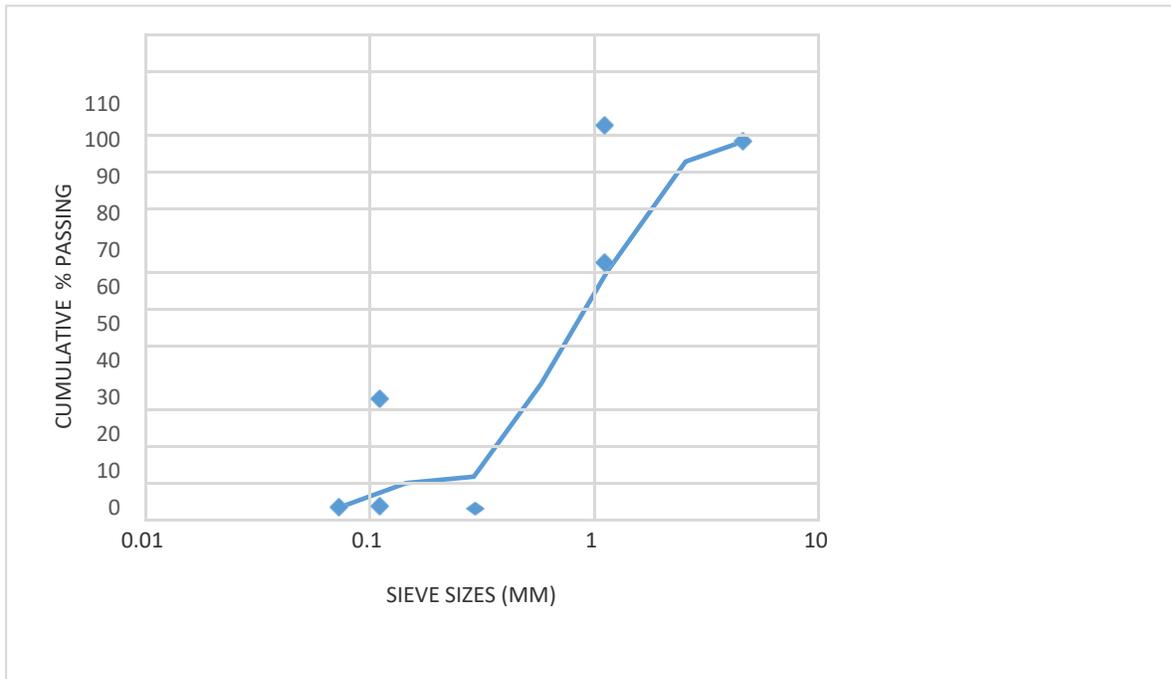


Figure 1: Gradation curve for river sand and quarry dust

From the Fig 1, the values of D10, D30, and D60 for river sand are gotten and computed to get values for Coefficient of uniformity, (Cu) and Coefficient of gradation, (Cc)

D10 = 0.32

D30 = 0.55

D60 = 1.2

Coefficient of uniformity, Cu = $\frac{D60}{D10} = 2.18$

Coefficient of gradation, Cc = $\frac{(D30)^2}{(D60 \times D10)} = 0.99$

3.2 Bulk Density

The results of the bulk density test of river sand is presented in Table 3.

Table 3: Bulk density of river sand

Trial run	Trial 1	Trial 2	Trial 3
Mass (kg)	6.35	6.34	6.34
Volume of bottle (m ³)	0.0042	0.0042	0.0042
Bulk density (kg/m ³)	1511.90	1509.52	1509.52
Average bulk density (kg/m ³)	1510.31		

3.3 Chemical and Physical test result on water treatment plant sludge

The chemical and physical properties of water treatment plant sludge are given in Table 4

Table 4: Test result of water treatment sludge

Chemical property	
Element	Result (%)
Silicon oxide, (SiO ₂)	20.4
Aluminum oxide, (Al ₂ O ₃)	29.6
Iron oxides, (Fe ₂ O ₃)	3.2
Calcium oxide, (CaO)	37.7
Magnesium oxide, (MgO)	2.7
Sodium oxide, (Na ₂ O)	0.4
Potassium oxide, (K ₂ O)	1.3
Sulphates, (SO ₄)	0.67
Physical property	
Property	Value
Bulk density	1270kg/m ³
Specific gravity	1.55

3.4 Compressive strength test results

The compressive strength of the sandcrete blocks are presented In Table 5 and Figure 2

Table 5: 28 day compressive strength test result on the Sandcrete block for 10%, 20% and 30% replacement with sludge and quarry dust at a ratio of 50:50

Water-Cement Ratio	Block No.	Mass (Kg)	Density (Kg/m³)	Av. Density (Kg/m³)	Failure Load (KN)	Comp. Strength (N/mm²)	Av. Comp. Strength (N/mm²)
0.55	B01	27.22	1990.72	1992.36	213	3.50	3.50
	B02	27.00	1974.63		214	3.52	
	B03	27.65	2022.16		209	3.44	
	B04	27.10	1981.94		214	3.52	
0.55	BQ101	27.80	2033.13	2018.51	242	3.98	3.96
	BQ102	27.80	2033.13		251	4.13	
	BQ103	27.20	1989.25		222	3.65	
	BQ104	27.60	2018.51		248	4.08	
0.55	B201	27.40	2003.88	1969.14	145	2.39	2.37
	B202	26.40	1930.75		155	2.55	
	B203	26.90	1967.31		144	2.37	
	B204	27.00	1974.63		132	2.17	
0.55	B301	27.20	1989.25	1912.46	102	1.69	2.01
	B302	26.20	1916.12		127	2.09	
	B303	25.40	1857.61		130	2.14	
	B304	25.80	1886.87		128	2.11	

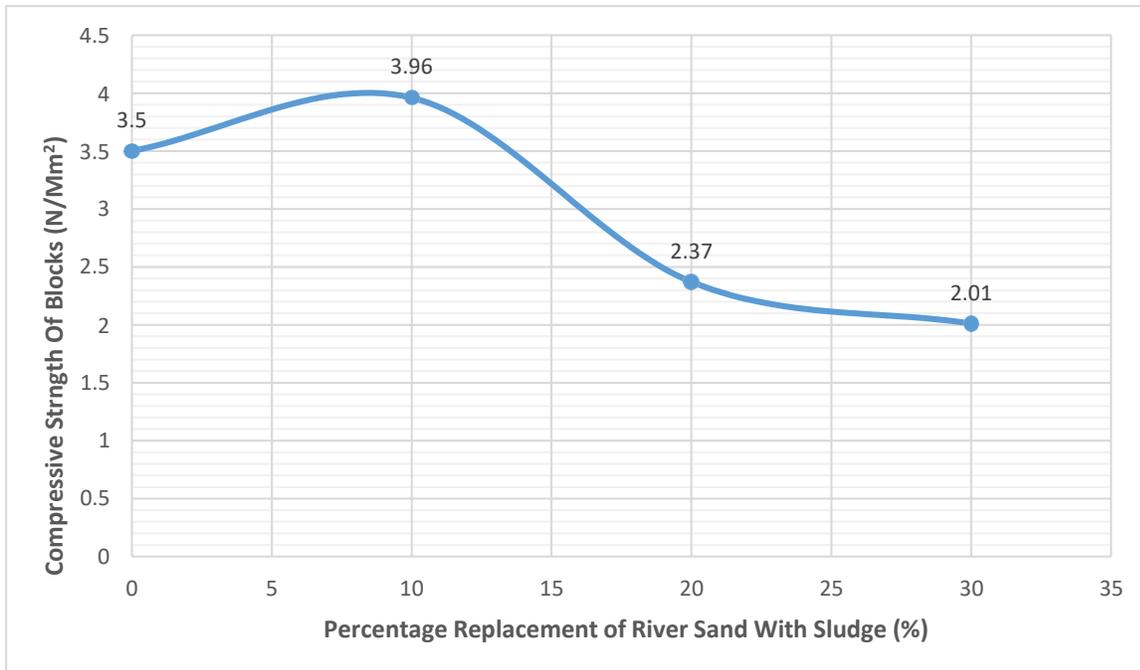


Figure 2: Line chart of the average compressive strengths

3.5 Water absorption result

The water absorption values of the sandcrete blocks are presented in Table 6 and Figure 3.

Table 6: 28 day water absorption test result on the Sandcrete block

Block No.	Mass of Dried Sample (Kg)	Mass of Wet Sample (Kg)	Water Absorption (%)	Average water absorption (%)
B01	0.56	0.60	7.14	7.21
B02	0.58	0.62	6.90	
B03	0.65	0.70	7.69	
B04	0.84	0.90	7.11	
B101	0.42	0.46	9.52	9.24
B102	0.60	0.64	6.67	
B103	0.65	0.72	10.77	
B104	0.60	0.66	10.00	
B201	0.50	0.58	16.00	11.95
B202	0.64	0.72	12.50	
B203	0.45	0.50	5.00	
B204	0.42	0.48	14.29	
B301	0.73	0.84	15.07	14.34
B302	0.42	0.48	14.29	
B303	0.75	0.86	14.67	
B304	0.60	0.68	13.33	

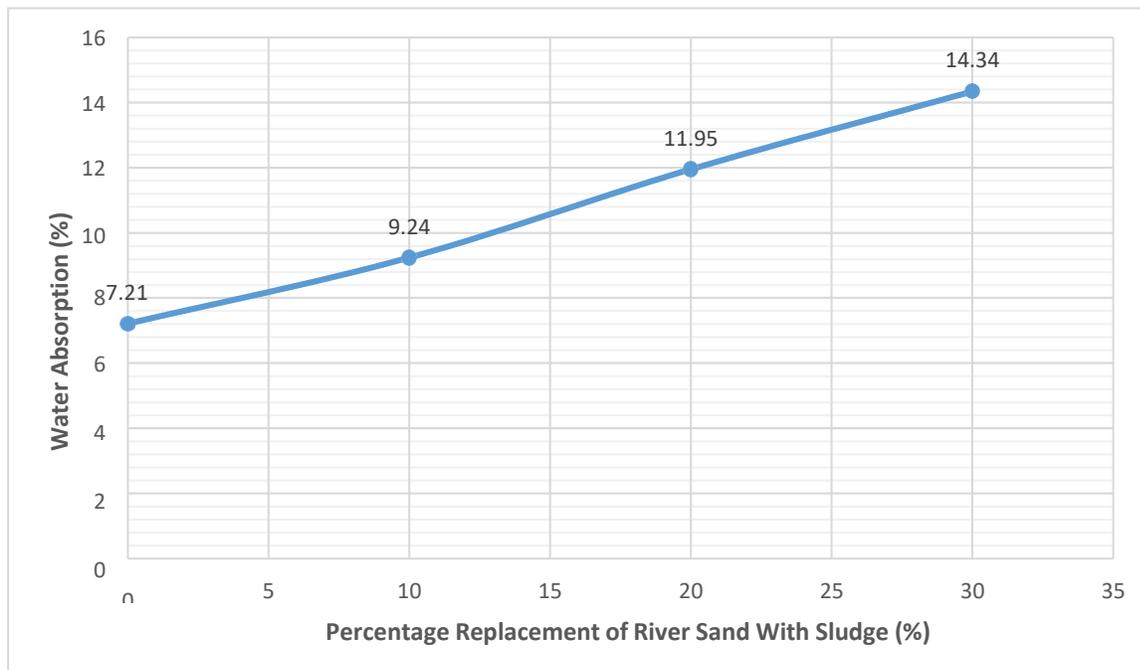


Figure 3: Chart of percentage water absorption against the percentage replacements

3.6 Analysis of Sieve analysis results

Results of sieve analysis show that both the river sand fall within Zone II of the grading of fine aggregates as given in BS-882, (1992). From Tables 4.1 the fineness modulus of river sand dust is 2.93 and this fall within the allowable range of 2.3 – 3.1, for fine aggregates in concrete work (ACI E701, 2007). The coefficient of uniformity (Cu) and coefficient of gradation (Cc) for river sand were calculated as 2.18 and 0.99 respectively. This result shows that the river sand is almost uniformly graded as stated in BS-882, (1992).

3.7 Analysis of Bulk Density Test Results

The values for bulk density of river sand shown in table 4.3 is within the range for the respective materials. The values for the bulk densities for river sand was found to be 1510kg/m³ and this value can be compared favourably with the values in the exiting literatures. Values of the bulk density of the materials obtained may vary, however, owing to the nature and properties of the parent materials.

3.8 Analysis of Water Treatment Sludge Test Result

From table 4.5, the result of the chemical properties of the sludge gotten from a water treatment plant shows similar properties with one of the known pozzolan (fly ash) shown in table 2.1, so sludge from a water treatment plant could be considered to be used as a constituent of sandcrete and concrete.

3.9 Analysis of Compressive Strength Results

Table 5 and Figure 2 presents the results of the compressive strength test carried out on the sandcrete blocks. Blocks produced with sludge as partial replacement to river sand for a mix ratio of 1:6 have its 28th day strength falling below the strength of pure river sand and cement except for those of the 10% replacement which had an average strength value of 3.96N/mm² and which falls above the minimum required strength for load bearing block for manually compacted blocks as shown in table 2.8.

3.10 Water Absorption Test Result

From Table 6 Figure 3 it was observed that the water absorption value of the sandcrete increases with respect to the increase in the sludge replacement

3.11 Conclusion

The main objectives of this work were to investigate the strength properties of sandcrete hollow blocks produced with sludge as partial replacement with river sand. From the results obtained after several laboratory test carried out, as well as the analysis. The following conclusion were arrived at.

- a) Sandcrete blocks made with sludge and quarry dust as partial replacement for river sand gives its best compressive strength result at 10% replacement with a value of 3.96N/mm^2 and water-cement ratio of 0.55.
- b) The percentage water absorption of the sandcrete block increase with increase in percentage replacement.
- c) The optimum percentage water absorption of the sandcrete block was gotten at 10% replacement of sludge.

3.12 Recommendations

After a successful completion of this project work, the following recommendations are made:

- a) A 10% replacement of sludge should be used as a partial replacement for river sand in the production of sandcrete blocks.
- b) Since sludge gotten from a water treatment plant have a similar chemical properties as fly ash, further research should be carried for it to be used as a partial replacement of cement in the production of sandcrete and concrete.

REFERENCES

- [1] Abdullahi A. (2005). Compressive Strength of Sandcrete Blocks in Bosso and Shiroro Areas Minna, Nigeria. AU J.T. 9(2): 126-131.
- [2] (ACI), A. C. (2007). Aggregates for concrete. ACI education bulletin e1-07, 3-29.
- [3] Afolayan, J. O., Arum, C. and Daramola, C. M. (2008). Characterization of the Compressive Strength of Sandcrete Blocks in Ondo State, Nigeria. Journal of CER&P. 5(1), 15-28. ISSN: 11729-5769.
- [4] Akilamudhan.P, Senthilkumar.K, Sivakumar.V, (2008), 'Experimental Studies On Disposal of Various Industrial Solid Wastes', Modern Applied Science., Vol 2, pp. 128-132.
- [5] BSI (1992). British Standards Institutions, Specification for aggregate from Natural Sources for Concrete, BS 882, London.
- [6] Chudley R., Roger Greeno. (2010). Construction Technology. Pearson education limited, Edinburgh Gate Harlow Essex CM20JE, England. P.278.
- [7] Eze-Uzoamaka, O.J. (2000). Nondestructive assessment of the structural stability of load bearing Sandcrete blocks. Construction Research International. (Proceedings of the Seventh C. I. B. Triennial Congress, Edinburgh), Vol. 19, Sept. p. 183-189.
- [8] Florek, A. (2005). Quality of Hollow Blocks Manufactured in Northern Nigeria. Proceedings, 17th Conference on Material Testing, Control and research, Lagos.
- [9] Neville, A.M., and Brooks, J.J., (2011) Concrete Technology, 1 st Ed., 438 pp., London UK. Okolie, O. G., Owoyale, O. S., and Yusuf, M. I. (2004). Assessment of Early Compressive Strength
- [10] Development of Concrete with Selected Ordinary Portland Cement. NJCTM, 9(1), 18-24. ISSN: 1119-0949.
- [11] Okpala DC (2003). Some engineering properties of sandcrete blocks containing rice husk ash.
- [12] Build. Environ., 28(3): 235-241.
- [13] Oyebade, M. N. and Anosike (2012). Sandcrete Blocks and Quality Management in Nigeria Building Industry. Journal of Engineering, Project, and Production Management, 37-46.
- [14] Seeley, I.H. (1999) "Building Technology" Macmillan, London. 4th Edition. Pp 2.
- [15] Thomas, k. and Chinsman, B. (1995). Discussions of Ref. 21, Proceedings of Institution of Civil Engineers, Part 2, 1978, Vol. 65, June, pp. 491-495.
- [16] Tyler, R.G. (1996). Sandcrete Blocks. West African Building Research Institute. Note N4,

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Assessing the adequacy and effectiveness of the current legal and institutional framework for a devolved land administration system in Zimbabwe.

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Abstract- Zimbabwe has been implementing devolution as espoused in the constitution of the country (Constitution of Zimbabwe, Amendment (20) Act 2013; Section 264(1)). This has been expressed in unequivocal terms and progress has been noted in local governance devolution. The same cannot be said of devolution of land administration. Yet the same has been touted as a solution to some of the main challenges in land administration in Zimbabwe. This had put the systems meant to support the devolution of land administration under the spotlight. The paper sought to examine the adequacy of the legal and institutional framework for a devolved land administration system in Zimbabwe. The paper relied on secondary data with the National Constitution serving as the principal document. Analysis was anchored by lessons drawn from Kenya. Findings showed that the legal and institutional framework in Zimbabwe is sub-optimal as it does not effectively give authority to local governance structures. In the context of agricultural land, authority still resides at the top with the Minister wielding a great deal of power. If anything, the hitherto powerful traditional leadership has been left with little say in and allocation. The Zimbabwe Land Commission despite being brought about by the new Constitution lack independence to act with the Minister having great influence over the body. The study concludes that the legal and institutional framework in Zimbabwe is inadequate to support a devolved land administration system.

Index Terms- Constitution, devolution, governance, land administration

I. INTRODUCTION

Land administration serves as a suite of tools that operationalises the instruments of land policy. In the context of the current study, land administration is conceptualised as the process of defining, recording and disseminating ownership related information, land value as well as utilization as regulated by the implementation of land management policies (UNECE, 1996). This conceptualisation tried to summarize the relationship that exists between tools and policies exceptionally well (Van der Molen et al, 2008). Land administration is thus a central concept in land governance and one that has proven to be a critical success factor

in the same context. Expectedly, a lot of attention has been given to land administration with calls being made for devolution of land administration especially in developing countries (Subedi, 2016). The case for devolution of land administration is predicated on the understanding that the model recognises the importance of local knowledge and responsibility thereby allowing member controlled institutions space to participate in land administration. The model is thus highly pragmatic recognising the shortcomings of the central government with regards to resources and capacity to effectively administer land which is a political and budgetary reality. Subsequently, devolution has dominated the discourse around land administration at global, continental, regional and national levels (World Bank, 2008).

Trends in land administration attest to the utility of devolved land administration. Hitherto, land tenure systems on the African continent had for long been characterised by strong and centralised state control over both management and administration of land. This has proven sub-optimal with various problems being noted. Cotulla, Toulmin and Hesse (2004) note that a combination of inadequacy of legislative models as well as the state's incapability to fully sustain and manage the land reform and other relevant resources resulted in a proliferation of various informal decentralised systems. More recently however, there have been efforts to adopt land laws and policies that provide greater decentralisation in land administration amongst African countries. Boone et al. (2016) note that countries like Kenya, Sudan and Botswana have seriously pursued devolution policies in land administration. Kenya's 2010 Constitution through the 2012 Land Acts restructured institutions culminating in the devolution of these to 47 county governments (Land Commission Act, 2012). Regulatory and oversight authority were vested in the nonpartisan and independent National Land Commission. Similarly, in Sudan, the Rural Land Governance Project provided support to the South Sudan Land Commission while County Land Authorities were set up to administer land.

More specifically, Ethiopia has embraced devolved land administration with the devolution of land administration is taking place at state level where land administration is undertaken autonomously (Wily, 2003). Such cases are an indication that

progress has varied across context (FAO, 2002). However, Cotula et al. (2004) notes that implementation has been largely slow in most cases and it has been marred by ambiguities and inconsistencies between laws and policies on devolution more so in countries where different players have driven the devolution process. In Burkina Faso, despite legislation promulgated in 1998 providing a solid foundation for the establishment of new and better local governments with responsibilities of managing natural resources and land, the old village level institutions from the 1980s are still in place with agrarian legislation still validating them (Reorganisation Agraire et Fonciere, amended 1996) (FAO, 2002).

In Zimbabwe, devolution has been a topical issue and the 2013 constitution provides fully for a devolved model of government in Zimbabwe (Constitution of the Republic of Zimbabwe, 2013). The Lancaster House Constitution hitherto in place in Zimbabwe provided for a unitary sort of government with little recognition for provincial and local governments which only exercised power delegated to them by the central government. Yet, the current state of affairs with regards to land administration mimics that of the colonial era where there is little or no local authority participation in land administration. The land administration system remains centralized, rigid and highly bureaucratic. This lack of local stakeholder or community participation has culminated in insecurity of tenure, ambiguous property rights definition and failure to effectively employ land reform as a vehicle for fostering development.

Land administration in Zimbabwe has been far from optimum with various issues blighting land holders including lack of security of tenure. Jacobs and Chavunduka (2003) note that land administration in Zimbabwe has been characterised by lack of accountability, lack of transparency, fragmentation, inadequate administrative capacity and poor information quality. Consequently, challenges like corruption particularly in matters of land allocation have been observed in Zimbabwe (Matondi, 2013). Given that the Zimbabwean economy is agrarian-based, it is necessary that land administration is optimum. This is more so given the interaction between land administration and economic development as noted by Subedi (2016). Devolution of land administration has been shown to help optimise land administration (Wily, 2003; Food and Agriculture Organisation (FAO), 2016). The same has been touted as a solution. Despite the Zimbabwean government driving towards full implementation of the devolution policy as per constitution, land administration remains poor. The need to fully implement devolved land administration in Zimbabwe has been clearly demonstrated. However, there is little in extant literature regarding the adequacy and effectiveness of the legal and institutional framework for a devolved land administration system in Zimbabwe. It is against such a background that this paper seeks to thoroughly assess the adequacy and effectiveness of the legal and institutional framework for a devolved land administration system model in Zimbabwe.

II. STATEMENT OF THE PROBLEM

Land administration in Zimbabwe has been far from optimum with various issues blighting land holders including lack of security of

tenure. Jacobs and Chavunduka (2003) note that land administration in Zimbabwe has been characterised by lack of accountability, lack of transparency, fragmentation, inadequate administrative capacity and poor information quality. Given that the Zimbabwean economy is agrarian-based, it is necessary that land administration is optimum. This is more so given the interaction between land administration and economic development as noted by Subedi (2016). Devolution of land administration has been shown to help optimise land administration (Wily, 2003). The efforts made across the continent to decentralise land administration are evidence of this. Despite the Zimbabwean government driving towards full implementation of the devolution policy as per constitution, there hasn't been much progress in devolution of land administration with chaos subsisting in this regard. It is important that the necessary support systems are in place and legal and institutional frameworks are arguably the most important systems in this context. As such their adequacy is of paramount importance. Given the apparent dearth of evidence on the adequacy of the institutional and legal frameworks for the devolution of land administration in Zimbabwe, the current paper examines the adequacy of these frameworks.

III. REVIEW OF RELATED LITERATURE

A. *Devolution in theory*

Devolution is concept that has been around for some time and the same has proven to be a pervasive one. Devolution can be understood to be a form of decentralisation. Decentralisation may take the form of deconcentration or devolution. The current study is interested in devolution which is conceptualised as entailing giving local stakeholders more independent powers over public service delivery. White and Smoke (2005) state that devolved administrations often give more authority and importance to resources management and policy decisions than decentralised ones. Devolution can be expected to result in enhanced problem solving capacity, better infrastructure service provision, better chances for local development be it economic or social as well as the application of more appropriate initiatives. The materialisation of the benefits that devolution promises is conditional with factors like capacity of local stakeholder and availability of resources influencing the same. In understanding outcomes of implementation, it is prudent to consider the conditions under which devolution is applied.

B. *Legal and institutional framework for a devolved land administration system: Lessons from Kenya*

In this section I rely heavily on the work of Boone et al. who have analysed land Law reform in Kenya extensively. As Dale and McLaughlin (1999) note, Land administration processes are normally influenced and governed by national culture while land administration-related institutional arrangements influenced by the systems which are centralisation and decentralisation. A lot of attention has been given to decentralisation and by extension devolution in recent times owing to its use in enhancing public services in emerging economies. The same requires land administration operations to be transferred to the local government levels. A devolved system of land administration lowers the need for coordination, creates opportunities for local populations and is

likely to promote enhanced administration and management (Food and Agriculture Organisation of the United Nations, FAO, 2017).

Legal and institutions framework relate to the set of services and laws that constitute a certain social aspect within a jurisdiction. In the current context, these laws and services make up land administration. The current section looks at the institutional and legal frameworks applicable to and administration. Such frameworks are very important to land administration as they are capable of ensuring that outcomes of any systems that are implemented are optimised notwithstanding the suitability of these systems to contexts. Kenya has led the way in making provisions for a devolved land administration system. The government in Kenya has attended to institutional and legal aspects of the new land administration system first and this underscores the importance of such aspects in the land administration matrix (The Land Commission Act, 2012). However, as indicated earlier in the section, having these frameworks in place is not enough as their utility will certainly be influenced by the conditions under which these frameworks are implemented. Boone et al. (2019) note that failure to operationalise the functional aspects of legal and institutional frameworks around land administration will render these ineffective in the pursuit of set objectives. This operationalisation can fail owing to various reasons including the actual abuse of these legal and institutional frameworks for purposes other than those for which they were put in place. Their utility with thus depend on the manner in which they are applied in practice.

The crafting and implementation of the new land policy in Kenya was a hard thought decision that was mainly informed by various challenges and recommendations by different commission established to probe certain related aspects. What is evident is that the Kenyan government was for quite some time under pressure to reform the land administration system (Rogers, 1973). Land disputes went for a long time without being resolved with some dating back as far as the colonial era (Boone, 2016). A new and revamped land policy was thus a necessity and the government had to act. Land administration in Kenya was hitherto a minefield, a matter that was capable of exploding and damaging the Kenyan society. Land was effectively weaponised by some unscrupulous leaders against their political opponents while at the same time using the same to buy loyalty and allegiance from certain members of the society.

Various commissions of inquiry made recommendations with the general idea put across being that the country needed to reform its land administration and management system. These include the Presidential Commission of Inquiry into the Land Law System of Kenya (Njonjo Commission), the Constitution of Kenya Review Commission (CKRC) as well as the Presidential Commission of Inquiry into Illegal and/or irregular Allocation of Public Land (Ndung'u Commission) (Di Matteo, 2015). Other stakeholder groups also put forward recommendations with regards to reforming the land laws in Kenya. A brief of the recommended new institutional framework by the Kenya Land Alliance and Institution of Surveyors of Kenya both of which are key stakeholders summarises the ideal underpinning principles of the same as follows:

- i. Coordination of all land delivery systems in the devolved government levels as well as devolved land administration and management;
- ii. Public –Private-Civil society partnerships to ensure that the implementation of the land policy is as inclusive as possible;
- iii. A robust monitoring and evaluation system to track progress made in the land policy implementation and offer timely feedback to both the public and all other stakeholder;
- iv. Guarantee of security of tenure for all land categories;
- v. Clear and unambiguous land rights for all categories;
- vi. A robust framework for the transfer and transmission of different land rights tailored to economic and cultural contexts;
- vii. Sustainable management and regulation of all land categories;
- viii. Accurate and highly accessible information systems for land administration; and
- ix. Availability of socially acceptable land dispute resolution mechanism that are cost- and time-effective

The already polarised Kenyan society was further sunk into chaos during the 2008 election in which many lost their lives while others were injured (Bunting, 2008). The subsequent political events saw the country enter into a government of national Unity which worked to produce a new constitution for Kenya. The 2010 Constitution in Kenya gave birth to 47 new counties which were empowered to control certain important aspects of land administration (Boone & Manji, 2016). These include control and management of public lands as well as crafting of databases for more effective management of land to combat ills like corruption and land dispossession, both rampant at the time. Suffice to say the Kenyan government has made efforts to optimise the devolved land administration system in place.

This was reinforced two years later as the country passed three new land laws (National Land Commission Act, 2012). Through the National Land Commission Act, 2012, the hitherto powerful government Ministry of Lands was stripped of some of its powers which were then given to the related National Land Commission provided for by the aforementioned law as per new constitution. The constitutional provisions for the Commission envisaged the same to be an independent commission which would oversee land administration matter through a network of subsidiary and equally independent bodies cascading down to county level.

Clearly, the National Land Policy in Kenya currently recognises the important of decentralising land administration as well as the important role that the National Land Commission can play in this regard. However, having the NLC in place alone was not enough as the same needed to be empowered to create and build its land reform implementation capacity by availing funding, human resources, and management information systems as well as the transformation of the environment. While Kenya has led the way in formulating the ideal legal and institutional frameworks to support a devolved land administration system, bureaucratic complexity, opacity in management, high transaction costs and substantial disuse have remained challenges (Boone et al., 2016a).

Even with the new land law and relevant institutions in place, land has remained highly contested in Kenya. These contestations have manifested at all levels including at National level where the executive branch and the Ministry of Lands strongly fought against the National Land Commission (Mulevu, 2017). Various tactics were employed in this regard including withholding of funding, obstructionism as well as withholding of important information (Boone et al., 2019). All these are potent tactics in paralysed a body like the NLC. Land is a very important resource globally and these contestations can be expected as control of land transposes to power in the patronage systems that have corroded democratic institutions in Africa. The integration of certain staffers from the Ministry of Lands to the NLC served to perpetuate the old challenges as the same underlying causes were simply passed on the new body. This was a clear failure to recognise the human factor in whatever challenge hindered the functional of the Ministry and the old land administration system. Efforts to address would have gone a long in enhancing the chances of success of the new body and system.

Between the years 2012 and 2015 constitutional provisions were violated and the transfer of authority and power to the NLC was delayed (Boone et al., 2014). These challenges spilled into the courts with the NLC approaching the highest court in Kenya (Supreme Court) where an advisory opinion was sought on various outstanding matters relating the new land administration systems as well as the transition (The National Land Commission, 2012). Ironically, the court only confirmed the contested powers of the Ministry of Lands mostly through inherent “ambiguities and loopholes” as well as contradiction in the new land laws (Rickard, 2020). This is a typical example of situations where laws are abused for the benefit of certain parties. The ensuing Land Law Amendment Act of 2016 not only gave the Ministry its powers back but rather threatened the devolution of land administration in Kenya.

IV. METHODOLOGY

The paper relies on secondary data in undertaking an analysis of the legal framework that underpins the devolution of land administration in Zimbabwe. The legal framework was analysed with special reference to the case of Kenya where an in-depth research on devolution of land administration has been undertaken over time by Boon et al. (2016). The authors’ submissions are rich and based on intensive field work that was undertaken in the aftermath of the land law reform in Kenya. Available secondary data was relied on and this was drawn from various publicly available sources with the Constitution being the principal document in this regard.

V. DEVOLUTION AS APPLIED IN LAND ADMINISTRATION IN ZIMBABWE

In this section we critically analyse the legal institutional framework for a devolved land administration in Zimbabwe. In a move away from this approach, the Zimbabwean government identified devolution as a key pillar in pursuit of its development goals. Devolution sees citizens being involved in setting the national development agenda including at community level. Devolution is enshrined in Section 264 of the Constitution of

Zimbabwe as well as other subsidiary pieces of legislation including the Urban Councils Act (Chapter 29:15) (Constitution of Zimbabwe, 2013). However, the subsequent implementation process has been marred by accusations and disagreements mostly regarding the readiness and willingness of the ruling party to see the process through as well as the willingness to relinquish authority to certain institutions as per constitutional provisions.

One of the main issues relates to control or authority over land and other natural resources. Meanwhile as Jacobs and Chavhunduka (2003) note land administration in Zimbabwe remains sub-optimal in its functionality. Zimbabwe is thus in need of a new land administration system in order to effectively harness agricultural sector development. This is highly necessary as the land reform programme in Zimbabwe reconfigured land ownership and use in the country. There 145 000 smallholder farmer that occupy 4.1 million hectares and 23 000 medium-scale farmers on 3.5 million hectares (http://www.pbs.org/newshour/bb/africa/land/gp_zimbabwe.html). This is as opposed to 45000 large scale farmers that dominated prior to the land redistribution exercise. It is therefore difficult with the current approach to know who has land and where as there are various illegal allocations as well as unclear boundary demarcations.

Disputes over land still persist together with arbitrary repossession which have sometimes been described as being politically motivated. For instance, there have been cases in the local courts relating to disputes over ownership of land in Zimbabwe. The case of Esidakeni farm in Matabeleland is a good example of land dispute and one where the Minister expropriated the farm with ease (Constitution of Zimbabwe, 2013). Similarly, former Youth Minister Saviour Kasukuwere losing their farms allocated under the land reform programme after the state reposed the same (<https://allafrica.com/stories/202001230652.html>). These challenges have been attributed to the current land administration approaches.

The 1990 Land Policy in Zimbabwe had been rendered irrelevant by the various changes in the Zimbabwean land administration context as events like the land reform and wide urbanisation had overtaken the same. A report by the Zimbabwe National Land Commission proved and shed light to massive changes brought about by the land reform programme and how crucial it is to resolve them through the national land policy which should be youth- and gender-sensitive and futuristic in orientation.

VI. ADEQUACY AND EFFECTIVENESS OF THE LEGAL AND INSTITUTIONAL FRAMEWORK: A CRITICAL ANALYSIS

The 2013 Constitution in Zimbabwe through section 296 facilitated the establishment of the Zimbabwe Land Commission which is meant to state land acquisition; state land disposal; to settle every individual as well as alienation land for Agricultural purposes, control and monitor the subdivision of land and the lease of land meant for other purposes apart from Agricultural use;

reallocation of land in order to avoid the biased allocation of many plots of land to one individual and assess the land size of the same; to amend Agricultural Land Settlement Act [Chapter 20:01] and the Rural Land Act [Chapter 20:18], to modify the Land Acquisition Act [Chapter 20:10], and to deal and resolve other matters arising due to the previously mentioned case (Constitution of Zimbabwe, 2013). However, members of the Land Commission are appointed by the President with their removal from office being subject to Section 237 of the constitution which governs the same in case of all Chapter 12 institutions in Zimbabwe.

Just like is observed in the case of Kenya, the Ministry of Lands in Zimbabwe has remained powerful with the land Commission largely limited to inquiries regarding parceling out of state land illegally or irregularly more so in Urban areas where home seekers have often been duped by 'land barons' of their hard earned cash only to be evicted. Most of the constitutional provision and guidelines in the 2013 Constitution pertaining to the activities of the Land Commission subordinate the Commission to the Ministry of lands from which approval should be sought prior to undertaking certain activities. For instance, Section 297 (2) state that "The Zimbabwe Land Commission, with the approval of the Minister responsible for land, may make regulations for any of the purposes set out in subsection" (Constitution of Zimbabwe, 2013). On the other hand, Section 297 (3) states that "The Zimbabwe Land Commission must exercise its functions in accordance with any general written policy directives which the Minister responsible for land may give it". This is speaking to the little room that the Zimbabwe Land Commission may have to manoeuvre within the land administration system in Zimbabwe. Just for perspective, in Kenya the National Land Commission was so empowered that it even dragged the Ministry of Lands to court after the latter interfered and attempted to impede its activities in the country (Boone et al., 2016).

The FAO report on the stakeholder meeting held in Bulawayo focusing on the gender-sensitive land policy framework under development highlighted various issues that stand as challenges to the functionality of the current land policy and its subsidiary frameworks (FAO, 2020). One of these relates to the misalignment of the local land policy framework with best practices in land administration internationally. This is an important aspect particularly in the current analysis where the case of Kenya was considered. Kenya is viewed as having made efforts to devolve land administration and can therefore be relied on when evaluating institutional frameworks in this regard.

Contestations have also subsisted in Zimbabwe owing mainly to concurrent role of chiefs, the Zimbabwe Land Commission and other state officials including ministers of state which have been largely repugnant with the constitutional imperatives (FAO, 2020). Further, the constitutional provisions for land administration devolution do not recognise Provincial and District Redistribution Land Committees nor does it provide for the formation of these to aid the Zimbabwe Land Commission. Ironically, these Committees have remained in place are more powerful in practice particular in the allocation of agricultural land. Failure to recognise these in the Constitution (Section 297) is itself a challenge and runs contrary to the fundamental principles

of devolution (Constitution of Zimbabwe, 2013). Chiefs through the Chiefs' Council have also lamented the stripping of powers to allocate land and serve as custodians of the same by the new land administration systems describing the same as "the death of chieftaincy" in Zimbabwe (FAO, 2020). Suffice to say there are a lot of grey areas in the constitution especially around the Zimbabwe Land Commission and its actual powers with regards to land allocation. The role of the Zimbabwe Land Commission and the inherent powers can be summed up being limited to making recommendations or implementing certain Ministerial and Government directives including undertaking land audits.

In Zimbabwe, a land audit was undertaken by a commission headed by Justice Uchena. Despite the audit being complete, the report was released much late albeit detailing some important ills and challenges in the current land administration and management particularly in urban areas (Uchena Commission Report, 2019). One key takeaway from the same however is that the land audit mainly focused on illegal sale of government land in urban centres with little being done with regards to agricultural land. In the case of land audits, issues around funding have sometimes proven to hamstring such operations. Funding and the forms of resource allocation are critical in the independent functioning of Chapter 12 bodies in Zimbabwe as they are in other countries (Constitution of Zimbabwe, 2013). A FAO stakeholders meeting report indicated that land administration in Zimbabwe suffered from a serious land of information systems to support data integrity and security (FAO, 2020). It is no surprise then that in attempts to curtail the functionality of these bodies, withholding funding has been the favourite tactic by the powers that be. The same is noted in Kenya where funding and information were withheld from the National Land Commission by both the Ministry of Lands and the Executive branch of government (Boone et al., 2019).

VII. CONCLUSIONS AND RECOMMENDATIONS

The discussion in the paper clearly shows that the endeavor to have in place a devolved land administration system may be difficult to materialise based on the current legal and institutional framework. The legal provisions for such a system fall short of facilitating the full implementation of devolution in the context of land administration. Authority still resides at the top of the chain with little of it having been passed down to local structures. This is more so in the most important aspects relating to allocation of agricultural land. Land allocation is still firmly under the Ministry of Land and Rural Resettlement with the Ministry retaining a lot of power (Constitution of Zimbabwe, 2013). The executive branch in Zimbabwe remains highly powerful with power contorted at the top with regards to land administration. While the national Constitution provides for the establishment of Zimbabwe Land Commission, the same is not adequately empowered to take authority and power in land matters down to the local governance structures (National Land Commission Act, 2017). The National Land Committee in Kenya on the contrary has been empowered to come up with subsidiary structures down to county level thereby putting in a position to effectively implement decentralisation of land administration in the country (National Land Commission, 2016). It is necessary that the power and role of the Zimbabwe Land Commission is revisited so as to ensure that the Commission

is empowered enough to effectively devolve the system of land administration down to local governance levels. This may include formation of local land committee which incorporate cultural and traditional players like chiefs to avoid conflict and ensure a unified approach to land administration. The constitutional provisions that subordinate the Land Commission to the Minister needs to be amended as these curtail the power and independence of the Commission especially given that the Minister is an appointee of the sitting president.

REFERENCES

- [1] Alden Wily, L., 2003. Governance and land relations: a review of decentralisation of land administration and management in AFRICA International Institute for Environment and Development, London.
- [2] Boone, Catherine et al. (2016): Land politics under Kenya's new constitution: Counties, devolution, and the National Land Commission, Working Paper Series, No. 16-178, London School of Economics and Political Science (LSE), Department of International Development, London
- [3] Catherine Boone, Alex Dyzenhaus, Ambreena Manji, Catherine W Gateri, Seth Ouma, James Kabugu Owino, Achiba Gargule, Jacqueline M Klopp, Land law reform in Kenya: Devolution, veto players, and the limits of an institutional fix, African Affairs, Volume 118, Issue 471, April 2019, Pages 215–237, <https://doi.org/10.1093/afaf/ady053>
- [4] Constitution of Kenya Review Commission (2002). Draft, the Constitution of the Republic of Kenya, 2002. Daily Nation, October 2, 2002.
- [5] Constitution of the Republic of Zimbabwe, 2013. Available at https://www.constituteproject.org/constitution/Zimbabwe_2013.pdf
- [6] Cotula, L., et al., 2004. LAND TENURE AND ADMINISTRATION IN AFRICA: LESSONS OF EXPERIENCE AND EMERGING ISSUES International Institute for Environment and Development, London.
- [7] Dale, P.F. & McLaughlin, J.D., 1999. Land Administration, New York: Oxford University Press.
- [8] Dumashie, D (2006).ISK/KLA Seminar- Kenya Draft National Land Policy. Key Note Presentation at Nairobi Safari Club on 24th October 2006.
- [9] FAO (2012). Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Security. Food and Agricultural Organisations of the United Nations FAO: Rome.
- [10] FAO Regional Office for Africa. Looking back, looking ahead: Traditional Leaders and Ministers of State for Provincial Affairs and Devolution review the draft National Land Policy Framework in Zimbabwe. <https://www.fao.org/africa/news/detail-news/en/c/1492567/>
- [11] Francesca Di Matteo. THE FORA OF PUBLIC ACTION IN KENYA: FROM THE ORIGINS OF THE NATIONAL LAND POLICY TO ITS POLITICIZATION. 2015. ffhalsbs-01205197f
- [12] Jacobs, H M and Chavunduka, C.(2003). Devolution for Land Administration in Zimbabwe:Opportunitiesand Challenges. University of Wisconsin – Madison
- [13] K Roth, Justice or impunity: what will Kenya choose, 3 April 2009, <http://www.hrw.org/en/news/2009/04/03/justice-orimpunity-what-will-kenya-choose>
- [14] Land Commission Act [Chapter 20:29] <https://old.zimlil.org/zw/legislation/act/2017/12>
- [15] Manji, A. (2021). Land Reform in Kenya: The History of an Idea. Strathmore Law Journal, 5(1), 267–278. <https://doi.org/10.52907/slj.v5i1.151>
- [16] Ministry of Lands, Kenya (2007) Revised Draft National Land Policy. National Land Policy Secretariat, Ardhi House, Nairobi
- [17] Ndung'u, G. J. (2014). Analyzing the Impact of Devolution on Economic Development Potentialities inKenya: Department of International Relations, School of Humanities and Social Sciences. Nairobi.
- [18] Oyon, P. R. G., Land Governance, Local Authorities and Unrepresentative Representation in Rural South Sudan RFGI working paper No. 27 Representation in Rural South Sudan a Preliminary Exploration
- [19] Rogers, Margaret. "THE KENYA LAND LAW REFORM PROGRAMME — A MODEL FOR MODERN AFRICA?" *Verfassung Und Recht in Übersee / Law and Politics in Africa, Asia and Latin America*, vol. 6, no. 1, 1973, pp. 49–63, <http://www.jstor.org/stable/43108270>. Accessed 27 Apr. 2022.
- [20] Subedi, G. P., Land Administration and Its Impact on Economic Development A thesis submitted to the fulfillment of the requirements for the degree of Doctor of Philosophy, 2016. Real Estate And Planning, Henley Business School.
- [21] The National Land Commission v. Attorney General and others (2016). UNECE (1996). Land Administration Guidelines. New York and Geneva: United Nations Economic Commission for Europe UNECE.
- [22] Van der Molen, P., E. H. Salayo and A. M. Tuladhar (2008). A Comparative Study to Land Policy in Nine Countries in Africa and Asia, in Integrating Generations, FIG Working Week, June 14-19, 2008, Stockholm. International Federation of Surveyors FIG.
- [23] White, R. & Smoke, P., 2005. East Asia Decentralizes. In East Asia Decentralizes: Making Local Government Work. Washington DC: The International Bank for Reconstruction and Development / The World Bank, pp. 1–24.
- [24] World Bank, 2008, World Bank Sustainable Land Management Sourcebook, Washington,D.C.
- [25] <https://allafrica.com/stories/202111110434.html>
- [26] <https://katibainstitute.org/923-2/>

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Debt To Asset Ratio, Return On Equity, Firm Size, And Underpricing Stock

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Abstract- The purpose of the present work is to determine the partial and simultaneous effect of debt to asset ratio (DAR), return on equity (ROE), and firm size on underpricing. It involved 52 non-financial companies that experienced underpricing during an IPO on the Indonesia Stock Exchange in the 2019-2020 period as the sample. Further, secondary data were used in this research. The collected data were analyzed by applying the multiple linear regression analysis.

It was suggested that partially, DAR had a negative and insignificant effect on underpricing, ROE positively and insignificantly contributed to underpricing, and firm size also had a negative and insignificant impact on underpricing. Additionally, DAR, ROE, and firm size did not simultaneously influence underpricing.

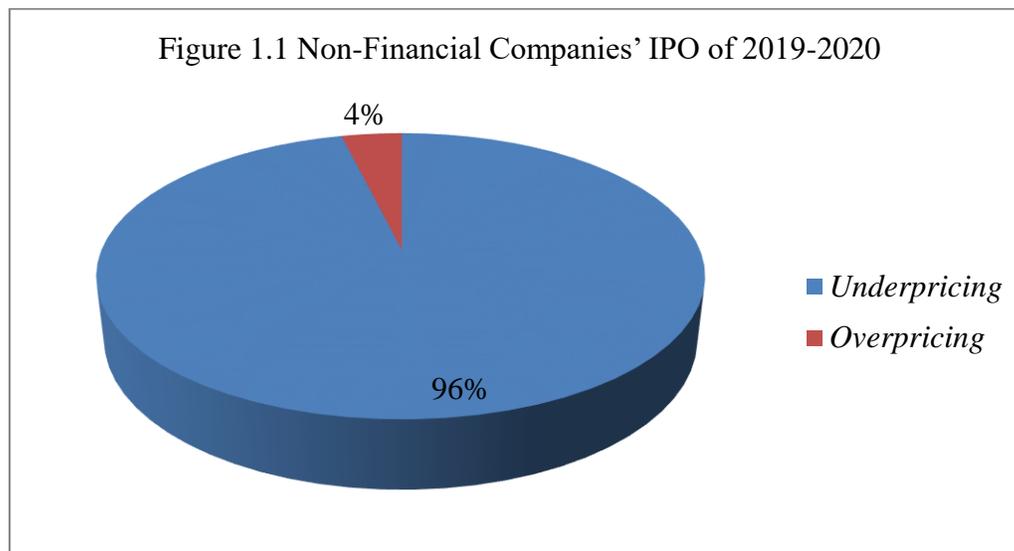
Index Terms- DAR, ROE, Firm Size, Underpricing

I. INTRODUCTION

Today's globalization era has rapidly developed the economy, making numerous firms expand to meet their financial needs by utilizing funds from inside and outside the firm. When a firm's funding in the form of retained earnings is yet to be sufficient, it is demanded to look for funds from outside by issuing shares in capital markets or becoming a public company known as "go-public". The first thing to do before a firm goes public in the Indonesia Stock Exchange (henceforth IDX) is performing initial public offerings (IPO). IPO refers to a process of offering shares for the first time to the public in the primary market. They are then traded in the secondary market. However, a company often faces an issue in doing IPO, i.e., determining the initial offer price. The

initial share price is determined by the firm (issuer) and underwriter that have agreed on the share price to be offered during the initial offering (Wahyusari, 2013). Determining share price during an IPO is crucial as it relates to the amount of fund the issuer will gain and the risk the underwriter will bear. The difficulty in determining the initial offer price is due to different interests between the issuer and the underwriter. Since the underwriter is highly experienced in the capital market, it understands information regarding the capital market better than the issuer. In defining share price, the underwriter tends to offer a lower price to minimize the risk of loss it may bear as a result of the unsold share and to attract investors. Also, the investors will be more likely to get a low price to receive profit in the form of an initial return.

Initial return (IR) is the difference between the closing market price on the first day of trading in the secondary market and IPO's offer price divided by IPO's offer price (Risqi & Harto, 2013). Meanwhile, the issuer is willing to have a high price to obtain maximum funds. This matter is majorly known as information asymmetry when the underwriter has more information than the issuer. Such an information asymmetry usually triggers the underpricing phenomenon (Wahyusari, 2013). Underpricing has commonly occurred during an IPO in various capital markets all over the world (Loughran *et al.*, 1994). A study on underpricing was firstly conducted by Ibbotson (1975) in the United States capital market, which then followed by other researchers around the world, including Indonesia. The degree of underpricing phenomena in capital markets worldwide is varied, ranging from the lowest percentage of 4.3 percent in France (Husson & Jacquillat, 1989) to the highest one in China with 388.0 percent (Datar & Mao, 1998).



The present study attempts to show the effect of debt to asset, return on equity, and firm size on underpricing. Underpricing can be detrimental to the issuer that performs an IPO because of the minimum gained funds. Despite the loss, underpricing is highly profitable for investors as they can get the initial return. On the other hand, investors will suffer a loss if overpricing takes place since they do not receive the initial return (Ayu *et al.*, 2017).

The above figure displays that most non-financial companies experienced underpricing during the IPO in IDX. A total of 101 non-financial companies carried out IPO in 2019-2020; 97 and four of which experienced underpricing and overpricing, respectively. Simply put, 96% of non-financial companies' IPO were underpriced, and 4% were overpriced during the period mentioned earlier.

According to Thoriq *et al.* (2018), financial and non-financial factors contribute to the phenomenon of underpricing. The financial factor includes financial leverage measured by debt to asset ratio (DAR) since DAR can observe the ratio between the debt and assets owned by a firm. The higher the DAR, the greater the assets financed by debt; the higher the DAR, the greater the underpricing, and the other way around. A study by Sinaga (2020) suggests that DAR negatively and insignificantly contributes to underpricing. It does not resonate with another finding by (Apriliansi, 2021) showing that DAR is impactful on the phenomenon of underpricing.

In addition to financial leverage measured by DAR, profitability measured by return on equity (ROE) also affects underpricing. ROE can measure the ability of a firm to earn profits based on its equity (Mayasari *et al.*, 2018). The higher the ROE, the better the firm's ability to make profits in the future. This will draw the investors' attention to the company shares with high ROE. High demand for company shares is positively impactful on the share price in the secondary market that also becomes higher, thus reducing underpricing. Research conducted by Mayasari *et al.* (2018) points out that ROE significantly influences underpricing.

In contrast to earlier findings, however, Lismawati and Munawaroh (2015) find out that ROE has a negative and insignificant effect on underpricing. The non-financial factor contributing to underpricing is firm size that can be seen from the

company's total assets. Firm size can signal that a firm with large assets will have a good prospect. Large-scale firms will be more likely to be well-known by the public as their prospect data are accessible. The low level of uncertainty or risk of the large-scale firms is able to reduce underpricing (Ramadana, 2018).

Putra (2018) discovers that firm size negatively and insignificantly influences underpricing. This outcome is contrary to that of Saputri and Marsoem Santoso (2020), who find that firm size significantly impacts the underpricing phenomenon. The present study focuses more on non-financial companies as they tend to experience underpricing than the financial ones on the ground that financial companies are regulated by financial agencies, namely Department of Finance and Bank Indonesia (the central bank of the Republic of Indonesia). On top of that, financial companies are supervised to minimize firms' uncertainty, and the risk of underpricing is lower than that of non-financial companies.

It is the background and previous studies that have driven the researchers to discuss the effect of debt to asset ratio, return on equity, and firm size on underpricing of non-financial companies that perform an IPO on the IDX in 2019-2020.

Underpricing

As Jogiyanto (2015) claimed, underpricing occurs when the offering price in the primary market is lower than the closing price on the first day of trade in the secondary market. Underpricing is calculated from the initial return. Initial return refers to the profit gained by investors and the difference in IPO's offer price in the primary market and the first-day closing price in the secondary market.

Debt to Asset Ratio

Debt to asset ratio (DAR) is used to measure the ratio between the debt and assets owned by a company by dividing the total amount of debt by the total assets (Fahmi, 2015:72).

Return on Equity

Return on equity (ROE) is a ratio used to measure the ability of a firm in utilizing its resources to generate profits or equity (Fahmi, 2015:82).

Firm Size

Firm size is proxied by using natural logarithms of total assets owned by a company in the last period before the company performs the listing process in the prospectus (Jogiyanto, 2015).

RESEARCH HYPOTHESES

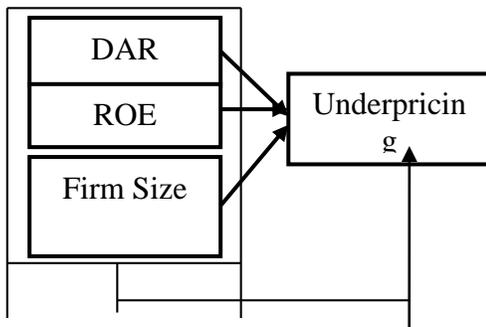
- H₁: Debt to asset ratio influences underpricing.
- H₂: Return on equity influences underpricing.
- H₃: Firm size influences underpricing.
- H₄: Debt to asset ratio, return on equity, and firm size simultaneously contribute to underpricing.

II. METHOD OF STUDY

Research Objectives

1. To determine the effect of debt to asset ratio on underpricing.
2. To determine the effect of return on equity on underpricing.
3. To determine the effect of firm size on underpricing.
4. To determine the simultaneous effect of debt to asset ratio, return on equity, and firm size on underpricing.

Research Design



Research Site and Time

The present work was conducted in non-financial companies that performed an IPO listed in the IDX through the *Galeri Investasi Bursa Efek Indonesia* Universitas Negeri Gorontalo, Jl. Jenderal Sudirman No.06 by visiting the official website of the IDX www.idx.co.id. Further, this research was carried out for six months, from January to June 2021.

Population and Sample

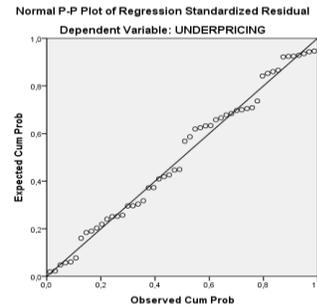
All 101 non-financial companies performing IPO on IDX in 2019-2020 period were involved as the population.

The study relied on purposive sampling, i.e., a sample taken based on certain criteria. A total of 52 non-financial companies had met the criteria, and thus serving as the sample.

Classical Assumption Test

Normality Test

Normality testing using a regression p-plot graph shows points spread around the diagonal line, and the spread of data (plot) follows the diagonal line. Accordingly, this regression model fulfilled the normality assumption as displayed in the following Figure 4.1.



Source: SPSS-processed secondary data, 2021

Multicollinearity Test

Multicollinearity takes place if there is a linear correlation between independent variables in the regression model. The results of the multicollinearity testing are as follows:

Variables	VIF	Tolerance
DAR	1.001	,999
ROE	1.015	,986
SIZE	1.013	,987

Source: SPSS-processed secondary data, 2021

The above table presents that the tolerance value ≥ 0.10 and VIF ≤ 10 ; hence, multicollinearity indication does not occur.

Autocorrelation Test

Autocorrelation test aims to identify the correlation between residual at the t-period and residual at the t-1 period (before t-period) by considering the value of Durbin-Waston (DW). Provided below are the results of the autocorrelation testing.

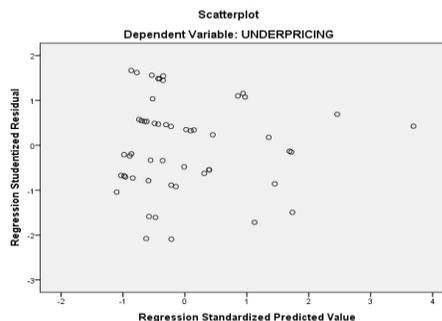
Model	Durbin-Watson
1	1.350

Source: SPSS-processed secondary data, 2021

It is seen in the table that the value of Durbin-Waston (DW) is in -2 to +2 or 1.350, meaning that there is no autocorrelation.

Heteroscedasticity Test

Heteroscedasticity test intends to observe whether or not there is variance dissimilarity from the residual of one observation to another observation in the regression model by seeing the plot graph between the value of dependent variable (ZPRED) and its residual (SRESID). Given below are the results of the heteroscedasticity testing.



Source: SPSS-processed secondary data, 2021

Drew upon the results, the points spread above and below 0 on the Y axis, or in other words, there is no heteroscedasticity indication in this research.

Multiple Linear Regression Test

After meeting the normality requirements, a multiple linear regression analysis was performed to determine the effect of independent variables (debt to asset ratio, return on equity, and firm size) on the underpricing phenomenon of non-financial companies that perform IPO ON the IDX in 2019-2020. The results of the regression analysis assisted by the SPSS 22 are as follows:

Model	B	Std.Error
Constant	0.573	0.376
DAR	-0.044	0.119
ROE	0.290	0.159
SIZE	-0.006	0.014

Source: SPSS-processed secondary data, 2021

The following is the formulated regression equation from the multiple linear regression model of this study:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

$$Y = 0.573 - 0.044X_1 + 0.290 X_2 - 0.006 X_3 + e$$

Below are the interpretations of the above equation:

1. The constant of 0.573 is positive, signifying that if the values of X1, X2, X3 arrive at 0, the variable Y (underpricing) will get 57.3%.
2. The coefficient of $\beta_1 = -0.044$ is negative: if X1 increases by one point, while other independent variables are constant, the variable Y drops by 4.4%.
3. The coefficient of $\beta_2 = 0.290$ is positive, so that if X2 increases by one point, while other independent variables are constant, the variable Y rises by 29%.
4. The coefficient of $\beta_3 = -0.006$ is negative: if X3 increases by one point, while other independent variables are constant, the variable Y drops by 0.6%.

T-test

The t-test is applied to investigate whether or not independent variables partially contribute to the dependent variable. The results of t-test calculation are shown in the following table:

Model	T	Sig.
Constant	1.524	0.134
DAR	-0.366	0.716
ROE	1.824	0.074
SIZE	-0.455	0.651

Source: SPSS-processed secondary data, 2021

The effect of DAR on underpricing

The testing results show the significance of DAR (0.716 > 0.05) and the value of t-count of -0.366 < t-table of -2.010. Therefore, DAR negatively and insignificantly affects

underpricing in non-financial companies that perform IPO in the IDX in the period of 2019-2020.

The effect of ROE on underpricing

The test results reveal the significance of ROE (0.074 > 0.05) and the value of t-count of 1.824 < t-table of 2.010. In short, ROE positively and insignificantly influences underpricing in non-financial companies that perform IPO in the IDX from 2019 to 2020.

The effect of firm size on underpricing

The test results indicate the significance of firm size (0.651 > 0.05) and the value of t-count of -0.455 < t-table of -2.010. Thus, firm size negatively and insignificantly contributes to underpricing in non-financial companies that perform IPO in the IDX between 2019 and 2020.

F-test

The f-test is employed to show the simultaneous effect of independent variables on the dependent variable. Presented below are the results of f-test calculation.

Model	F	Sig
Regression	1.320	0.279 ^b

Source: SPSS-processed secondary data, 2021

It is seen from the table that the F-count measures at 1.320 with the significance of 0.279. This significance value is greater than 0.05, implying that DAR (X1), ROE (X2), and firm size (X3) do not simultaneously affect the phenomenon of underpricing (Y) of non-financial companies that perform IPO in the IDX from 2019 through 2020.

Determination Coefficient Test (R²)

Determination coefficient (R²) test aims to measure the extent to which the model is able to describe the variation of the dependent variable. Displayed in the following table is the coefficient of determination (R²).

Model	R	R-squared	Adjusted R-squared
1	0.276	0.076	0.018

The R-squared reaches 0.076 or 7.6%, so that debt to asset ratio (DAR), return on equity (ROE), and firm size influence 7.6% of underpricing changes. Meanwhile, the remaining 92.4% are affected by other factors not examined in this research.

III. DISCUSSION

The effect of DAR on underpricing

The testing results show that DAR negatively and insignificantly contributes to underpricing of non-financial companies that perform IPO in the IDX in the period of 2019-2020. Such insignificance of effect is because DAR measures how much a firm is financed by the debt and how capable the firm to fulfill its obligations by using its assets have a relatively high risk

in paying off company obligations. For this reason, DAR is not the only ground of decision-making regarding the low IPO pricing or underpricing. Investors do not pay much attention to a firm's DAR. Instead, they consider that high DAR may be influenced by external factors of the firm. Investors, consequently, need to take into account the DAR before the company performs an IPO.

In connection with the theory of signaling, there is a model development where using debt is a signal conveyed by a company to the market. Companies use more debt as a positive sign or signal to trustworthy investors that the companies have a great prospect (Ross, 1977, in Hanafi, 2016:316). The results of this research are in line with the previous study by Sinaga (2020) proving that DAR negatively and insignificantly contributes to underpricing. Changes in capital structures (debt use) affect the risk level and fixed cost of each type of capital, which in turn contributing to a firm's share price. A high level of risk tends to lower a share price, yet the increase in the expected rate of return will raise the share price (Eugene F & Houston, 2010). The present study does not resonate with research conducted by Apriliani (2021) showing that DAR has a significant effect on the phenomenon of underpricing.

The effect of ROE on underpricing

The testing results show that ROE positively and insignificantly contributes to underpricing of non-financial companies that perform IPO in the IDX from 2019 to 2020. This insignificance of effect is due to the fact that ROE is a measure of a firm's capability in gaining net profits by utilizing all capitals within the firm, both its own capitals or from debt so that it is not the sole measure of the firm's profitability. A company with a high ROE is not necessarily able to use its own capital to generate high profits. Concerning the theory of information asymmetry, there is an information gap between the issuer and the underwriter. The underwriter that understands the capital market better tends to set a low price to be accepted by investors and reduce the risk of unsold shares. Conversely, the issuer that is more aware of the company's financial statements tends not to show the company's actual performance. As a result, investors do not fully believe the ROE financial statement presented by the company in the last year prior to conducting an IPO on the IDX.

This finding is consistent with that of Lismawati and Munawaroh (2015) suggesting that ROE positively and insignificantly influences underpricing. It is owing to investors' distrust that considers firms to have done earnings management of financial statements before they conduct an IPO in the prospectus. Therefore, financial information, such as ROE, is not responded positively as it does not show the firms' actual profitability, and instead, raises underpricing. Other investors consider that a high ROE caused by earnings management actually gives a bad signal, and its implication will increase underpricing. These research results differ from a study by Mayasari et al. (2018), pointing out that ROE significantly influences underpricing.

The effect of firm size on underpricing

The testing results reveal that firm size negatively and insignificantly contributes to underpricing of non-financial companies that perform IPO in the IDX between 2019 and 2020. Although firm size measures the size of a company's scale by

focusing on the total assets from the last financial statement before the company conducts an IPO, investors value more the result of financial performance of the company than the size, if it is not managed effectively and efficiently. This gives rise to the insignificant effect of firm size on underpricing.

With regard to the theory of signaling, firms give a signal on their quality and prospect in bearing underpricing. However, underpricing in this research is not only gone through by firms with big assets, but also by nearly all firms performing IPO. Despite the thing that a big company's scale also shows the wealth of a company from its high total assets, making the company's future prospect identified, firm size does not automatically lower underpricing rate because different types of industries have a different amount of assets (Purbarangga & Yuyetta, 2019). A large firm cannot necessarily make high profits; other large firms result in inadequate returns (Saefudin & Gunarsih, 2020).

In accordance with the present finding, a previous study by Putra (2018) has demonstrated that firm size negatively and insignificantly affects underpricing. This is because the data of firm size do not entirely signal the investors as they do evaluate not only the firm size, but also financial performance in making investment decisions. Accordingly, it will not be that impactful on the level of underpricing.

However, the current study's findings do not support the previous research by Saputri and Marsoem Santoso (2020), discovering that firm size has a significant impact on the underpricing phenomenon.

The effect of DAR, ROE, and firm size on underpricing

It is suggested that the variables of debt to asset ratio, return on equity, and firm size do not simultaneously influence the phenomenon of underpricing. This finding resonates with the one found by Purbarangga and Yuyetta A N (2019) that five independent variables of their study do not have a simultaneous impact on underpricing, so that explaining the variable of underpricing by 6.7%. The other 93.3% is explained by other variables.

The present work is also strengthened by Suryaningsih (2013) who proves that financial factors (return on asset, debt to equity ratio) do not simultaneously contribute to underpricing by 3.6%; the remaining 96.4% is described by other variables. In contrast, non-financial factors (initial share price, percentage of offered share, and company age) have a simultaneous effect on the underpricing by 25.5%. The rest 74.5% is affected by other factors unexamined. All in all, the underpricing phenomenon gets more effects from non-financial factors than financial ones.

IV. CONCLUSIONS

Significant findings to emerge from this study are as follows:

1. Debt to asset ratio (DAR) negatively and insignificantly affects underpricing. A high risk of DAR tends to lower a share price, yet the increase in the expected rate of return will raise the share price.
2. Return on equity (ROE) positively and insignificantly contributes to underpricing. ROE is not responded positively by investors as

it does not show the actual profitability of the firms, and instead, raising underpricing.

3. Firm size has a negative and insignificant effect on underpricing phenomenon. Firm size does not entirely signal the investors as they focus more on financial performance in making investment decisions. As a result, it will not be that impactful on the level of underpricing.
4. Debt to asset ratio, return on equity, and firm size do not simultaneously contribute to underpricing. The underpricing phenomenon is influenced more by non-financial factors than financial factors.

V. SUGGESTIONS

The present research comprises the following broad suggestions:

1. For Academicians

The findings of this research are expected to provide insights for academicians in finance and stock.

2. For Further Research Works

Considerably more works will need to be done by using broader variables, e.g., adding ROA, EPS, PER, current ratio for the financial variable, and auditor reputation, underwriter reputation, and industry types for the non-financial variable. Further studies are also expected to decrease the limitations of this research by adding samples and the year of conducting the study from financial and non-financial companies that experience underpricing.

3. For Firms

It is recommended that the initial share price is maximum to avoid underpricing.

4. For Investors

Investors who intend to invest in companies that conduct an IPO should take into account financial and non-financial variables to obtain a high initial return.

REFERENCES

- [1] Apriliani, A. (2021). Analisis faktor underpricing saat initial public offering di bursa efek indonesia Analysis of underpricing factors when ipo on the idx. 23(1), 127–132.
- [2] Ayu, G., Kartika, S., Pande, I. M., & Putra, D. (2017). Faktor-Faktor Underpricing Initial Public Offering Di Bursa Efek Indonesia [Factors of Underpricing of Initial Public Offering in Indonesia Stock Exchange]. *E-Jurnal Akuntansi*, 19(3), 2205–2233.
- [3] Datar, V., & Mao, D. (1998). Initial Public Offerings in China: Why is Underpricing So Severe. Working Paper. Seattle University.
- [4] Dama, H., Fransisca Dunga, M., & Salma Hasiru, F. (2020). Investment Decision, Market Capitalization, and Company Value. *International Journal of Advanced Research*, 8(12), 696–704. <https://doi.org/10.21474/ijar01/12200>
- [5] Dunga, Fransisca, M. (2020). Analisis Pengaruh Kinerja Keuangan Terhadap Return Saham Pada Perusahaan Sektor Industri Makanan dan Minuman Di Bursa Efek Indonesia [Analysis of the Effect of Financial Performance on Stock Returns of Companies in Food and Beverage Industry in Indonesia Stock Exchange]. *JAMBURA Jurnal Ilmiah Manajemen Dan Bisnis*, 3(1).
- [6] Eugene F, B., & Houston, J. F. (2010). *Dasar-Dasar Manajemen Keuangan [Basics of Financial Management]*. Jakarta: Salemba Empat.
- [7] Fahmi, I. (2015). *Pengantar Manajemen Keuangan Teori Dan Soal Jawab [Introduction to Financial Management: Theory and Question and Answer]*. Bandung: ALFABETA, cv.
- [8] Hanafi, M. M. (2016). *Manajemen Keuangan [Financial Management]*. Yogyakarta: BPFE.
- [9] Husson, B., & Jacquillat, B. (1989). French New Issues, Underpricing, and Alternative Methods of Distribution.
- [10] Jogiyanto, H. M. (2015). *Teori Portofolio dan Analisis Investasi (Edisi Kedelapan) [Portfolio Theory and Investment Analysis (Eighth Edition)]*. Yogyakarta: BPFE.
- [11] Lismawati, SE. M.Si. Ak. CA, L., & Munawaroh, M. (2015). Faktor-Faktor Yang Mempengaruhi Underpricing Saham Pada Penawaran Umum Perdana Di Bursa Efek Indonesia [Factors Influencing Underpricing in IPO in Indonesia Stock Exchange]. *Jurnal Akuntansi Dan Bisnis Krisnadwipayana*, 2(2). <https://doi.org/10.35137/jabk.v2i2.35>
- [12] Loughran, T., Ritter, J., & Rydqvist, K. (1994). Initial Public Offerings: International Insights. *Pacific-Basin Finance Journal*, 2, 165–199.
- [13] Mayasari, T., Y., & Yulianto, A. (2018). Pengaruh Return on Equity, Net Profit Margin dan Ukuran Perusahaan Terhadap underpricing [The Effect of Return on Equity, Net Profit Margin, and Firm Size on Underpricing]. *Jurnal Kajian Akuntansi*, 2(1), 41. <https://doi.org/10.33603/jka.v2i1.1271>
- [14] Purbarangga, A., & Yuyetta A N, E. (2019). Faktor-Faktor Yang Mempengaruhi Underpricing Pada Penawaran Umum Perdana [Factors Contributing to Underpricing during IPO]. ISSN 2502-3632 (Online) ISSN 2356-0304 (Paper) *Jurnal Online Internasional & Nasional Vol. 7 No.1, Januari – Juni 2019 Universitas 17 Agustus 1945 Jakarta*, 53(9), 1689–1699. www.journal.uta45jakarta.ac.id
- [15] Putra, K. M. S. (2018). Pengaruh Reputasi Underwriter, Reputasi Auditor dan Ukuran Perusahaan terhadap Underpricing Saham [The Effect of Underwriter Reputation, Auditor Reputation, and Firm Size on Underpricing]. *Jurnal Ilmu Dan Riset Manajemen*.
- [16] Ramadana, S. W. (2018). Beberapa Faktor yang Mempengaruhi Underpricing Saham Pada Perusahaan Yang Melakukan Initial Public Offering (IPO) Di Bursa Efek Indonesia [Factors Influencing Underpricing in Companies Performing IPO]. *Jurnal Riset Inspirasi Manajemen Dan Kewirausahaan*, 2(2), 102–108. <https://doi.org/10.35130/jrimk.v2i2.22>
- [17] Risqi, I. A., & Harto, P. (2013). Analisis Faktor-Faktor Yang Mempengaruhi Underpricing Ketika Initial Public Offering (Ipo) Di Bursa Efek Indonesia [Analysis of Factors Affecting Underpricing during IPO in Indonesia Stock Exchange]. *Diponegoro Journal of Accounting*, 0(0), 398–404.
- [18] Saefudin, S., & Gunarsih, T. (2020). Apakah Faktor Eksternal Memprediksi Underpricing Lebih Baik Dibandingkan Faktor Internal? Studi Initial Publik Offering Di Bei Tahun 2009-2017 [Do External Factors Predict Underpricing Better than Internal Factors? A Study on Initial Public Offering in Indonesia Stock Exchange of 2009-2017]. *JMBI UNSRAT (Jurnal Ilmiah Manajemen Bisnis Dan Inovasi Universitas Sam Ratulangi)*, 7(1). <https://doi.org/10.35794/jmbi.v7i1.28178>
- [19] Saputri, E., & Marsoem Santoso, B. (2020). Analysis of Financial Factors that Influence Underpricing of Company Conducting IPO in Indonesia Period 2018. 5(3), 401–412.
- [20] Sinaga, M. H. (2020). Pengaruh Financial Leverage Terhadap Initial Return Pada Perusahaan Yang Melakukan Initial Public Offering Di Bursa Efek [The Effect of Financial Leverage on Initial Return in Companies Performing IPO in the Stock Exchange]. *Jurnal Ilmiah AccUsi*, 2(2), 96–113. <https://doi.org/10.36985/accusi.v2i2.352>
- [21] Suryaningsih, A. (2013). Analisis faktor-faktor keuangan dan non keuangan yang mempengaruhi underpricing pada perusahaan yang melakukan Initial Public Offering periode 2012-2013 [Analysis of financial and non-financial factors contributing to underpricing in companies conducting IPO in the period of 2012-2013]. 1–15.
- [22] Thoriq, K. N., Hartoyo, S., & Sasongko, H. (2018). Faktor Internal dan Eksternal yang Mempengaruhi Underpricing pada Saat IPO di Bursa Efek Indonesia [Internal and External Factors Influencing Underpricing during IPO in Indonesia Stock Exchange]. *Jurnal Aplikasi Bisnis Dan Manajemen*, 4(1), 19–31. <https://doi.org/10.17358/jabm.4.1.19>
- [23] Wahyusari. (2013). Analisis Faktor-Faktor Yang Mempengaruhi Underpricing Saham Saat Ipo Di Bei [Analysis of Factors Contributing to Underpricing during IPO in Indonesia Stock Exchange]. *Accounting Analysis Journal*, 2(4), 386–394. <https://doi.org/10.15294/aaj.v2i4.2882>

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Oppositional Defiance Disorder as a predictor of Academic Performance of Pupils with Emotional and Behavioral Disorders in Public Primary Schools in Kisii County, Kenya

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Abstract- There are many categories of emotional and behavioral disorders among pupils but this study focused on oppositional defiance disorder and how it is affecting academic performance in Kisii South Sub County in Kisii County Kenya. Target population was 89 primary schools which was purposively selected based on researcher's judgement and familiarity. The researcher selected the samples using stratified random sampling. Data collection methods were interview, questionnaires, observation schedules and FGD. Quantitative data was analysed using frequency counts, percentages, and descriptive statistics in the form of tables using SPSS, and qualitative data was analysed thematically. The study recommends that the existing school programs should be strengthened and emphasis put on creation of more inclusive schools to cater for the learning needs of pupils with Oppositional Defiance Disorder.

Index Terms- Academic performance, Educational Strategies, Teacher challenges, Teacher preparedness. Oppositional defiance Disorder.

I. INTRODUCTION

The prevalence rates of Oppositional Defiance Disorder (ODD) in any population varies between 1.8%, to 16.8%, of any given population but the condition is found to be affecting boys than girls in school going age children (Justine, Monika, Katrin, Klein & Gontard, 2014). In Kenya population it is estimated that, the prevalence rate of ODD is 12.1% (Kamau, Kuria, Mathai, Atwoli & Kangethe, 2012). However in any population ODD can likewise be brought about by poor parental supervision, conflicting order practices and exposure to abuse or community violence (American Academy of Child Adolescent Psychiatry, 2015). ODD can cause a disability and affect working of an individual person (Kronenberger & Meyer, 1996). A pupil in class will tend to be oppositional towards certain adults especially a parent and a teacher and this is frustrating to the adults and teachers (Martha & Brian, 2016). Pupils with ODD will consistently challenge anything that is related to class and school work; they will refuse to do assignments and argue with their peers over something small and end up in a physical fight with others. This behaviour causes a significant impairment on academic performance something which they like.

In USA, a focus groups with scholarly teachers for the Army's Health Care Specialist (HCS), Advanced Individual Training (AIT) programme performs associated with Attention Deficit Hyperactivity Disorder (ADHD) and ODD were distinguished as possibly meddling with troopers coaching (Valerie and Jeny, 2013). The practices included difficulties in concentrating, neglecting to finish assignments and doing contradicting exercises during practices. The symptoms of ODD conditions were found to be interfering with rules and expected achievements in the military college and high school levels. In Europe in Midwestern metropolitan city a study on cognitive processes among ODD pupils and academic performance (John, 2014). Participants was parents and children who could speak English and Spanish. Children who showed symptoms of ODD comorbid were sampled and then they were given a test where they were to observe a screen and comprehend what the speaker was saying. A total of 344, children participated 178 (51.7%), were boys and 166 (48.2%), were girls. The study discovered that poor educational achievement was linked with advanced instructor reports of ODD issues. Higher levels of teacher reported ODD traits were linked to subordinate pre-academic abilities.

In African context a survey was carried out in South Africa in 2006 to examine implications of ODD characteristics on the family. The study focused on the financial liabilities, academic achievements and vocational outcomes for the ODD children. The focus was on common behaviours and how the learners could do their assignments, how they are executing their daily routines, following

school or classroom rules and many other class activities. The behaviours were observed among early childhood children and those above pre-schools and those who have completed school to find out if these behaviours affected their functioning in the society.

In Kenya situation a study was done by Nelima ,(2014) which sought to establish the effects of Social maladjustment behavior and how it is affecting academic performance among school going children in elementary schools in Kasarani Sub County Kenya was done. The study revealed that many school going children tend to have problems with peers .The findings revealed that probable factors such as violence and social maladjustments were causes of poor performance among pupils in Kenya. Reports from the Ministry of Education Kenya indicate that many boys who couldn't attain marks that could permit them to proceed to secondary schools joined some criminal gangs in the village making the community members to subject their families to criminal justices of the society like in the case of some families from Kisii south sub county who were excommunicated forcefully from their ancestral home because their relatives who dropped out of school or never proceeded to secondary school engaged in thuggery activities. (The Standard 22, November 2010).It is on the basis of these findings that the researcher sought to investigate why young men who could be schooling were subjected to criminal justice system of the society due to their ODD characteristics.

II. MATERIALS AND METHODS

The study was carried out in 18 public primary schools in Kisii County from April 2019 to December 2019. A total of 291 participants participated in the study.

Study Design: Descriptive research design.

Study Location: The study was carried out in Kisii County in Nyanza province, Kenya. It borders Nyamira county to the North East and South is Narok County, to the West, Migori county . The study was conducted in 18 public primary.

Study duration: April 2019 to December 2019.

Sample size: 18 Head teachers, 18 standard eight class teachers and 255 Pupils.

Sample size calculation: A sample of 291 participants was selected from a total of 2557 targeted participants. Head teachers were purposive selected from the 18 primary schools, 18 standard eight teachers were purposively selected and standard eight pupils were randomly selected.

Subject and selection method: The respondents were drawn from special primary school only. Head teachers and teachers were asked to answer questionnaires while parents were given interview guides.

Inclusion criteria:

1. All the 18 head teachers.
2. 18 Standard eight class teachers in the primary schools.
3. Standard Eight pupils 14 pupils from every school.

Exclusion criteria:

1. All regular primary school teachers.
2. All pupils with Oppositional Defiance Disorder.

Procedure Methodology:

After getting clearance and research permit from relevant authorities, the researcher visited the schools under study to establish rapport and sought permission from the administration to be allowed to conduct research in their schools. The researcher then personally distributed the questionnaires to the standard eight class teachers. The respondents were given time to go through the questionnaires and ask questions where they did not understand for clarification before the researcher left. The respondents were also advised not to write their names on the questionnaires. The filled questionnaires were collected after a duration of one month. The researcher also used FGD to gather the opinions of fellow pupils. At some point the researcher could observe physically the behaviour of the pupils mentioned and sometimes walk into the field to check on the behaviour to get the actual results. The researcher worked hand in hand with the teachers and two masters' students who were masters course work .Once the researcher ascertained that the information obtained is adequate, then the researcher moved to the next school and this continued for a period of one month. A month later, the researcher returned to school and collected questionnaires from class teachers

On the second visit to schools, the researcher conducted face-to-face interviews to the head teachers of the schools who were available in the schools under study and also on the same day the sampled standard eight pupils after seeking for permission from the relevant authorities, the pupils were issued with Questioners which they filled without indicating their names and immediately they handed them over to the researcher . The interview was conducted the same day the researcher collected the questionnaires. Information gathered was written down by the researcher audio data was recorded which was later stored under lock and key. The researcher filled observation checklist in outside classroom setting within stipulated period of time.

Statistical Analysis:

Quantitative information produced using questionnaires was cleaned and verified for precision and consistency prior to being put into SPSS programming for investigation. This quantitative data was analysed using content analysis technique through the SPSS software which so after the researcher tallied the frequencies, then the conversion into percentages was done. Descriptive statistics were

then utilized to examine that arrangement of information, as indicated by the targets of the survey, giving the impact of oppositional resistance problem on academic performance among children in public primary schools in Kisii County. The outcomes were summed up and recorded in tables and structured presentations. The themes that emerged from open ended questionnaires and interviews were integrated and that led to the arrival of a common understanding of the respondents' experiences on ODD. Qualitative data obtained from the Head teachers' interviews and open-ended parts of the questionnaires was credible, dependable confirmable and transferable due to this fact this information was analysed thematically.

II. RESULTS AND DISCUSSIONS

Educational strategies used by teachers in school while instructing pupils with odd

The objective of exploring possible educational Management strategies of managing pupils with ODD in Kisii South Sub County was done by the researcher administering a questionnaire and the table below indicates the findings obtained from class teachers. The class teachers suggested the approaches on the table below.

Table 4.1 Class Teacher Responses on Educational Strategies Provided for ODD pupils

Educational strategies	Agree	Disagree	None	Totals
Self-monitoring Technique	4(24%)	10(63%)	2(13%)	16(100%)
Positive behaviour support plan	1(6%)	13(81%)	2(13%)	16(100%)
Guidance and counselling	14(87%)	2(13%)	0(0%)	16(100%)
Using disciplinary committee	12(75%)	2(13%)	2(13%)	16(100%)
Referring to area chief	13(81%)	2(12%)	1(7%)	16(100%)
Seeking Sungu Sungu services	12(75%)	3(19%)	6(10%)	16(100%)

Table 4.3 displays different educational strategies that are being used in public primary schools that contributed in the investigation for pupils with ODD. From the questionnaire administered the class instructors had three selections for each plan to select from and they were, agree, and disagree, none. 63% of the class teachers hinted that self-monitoring technique will not work as a strategy to reinforce study habits for pupils with ODD (Lorraine, 2013). 4% of the teachers said this strategy was appropriate but with little knowledge on how it will be applied. From the responses the researcher noted that it was the strategy which a few respondents used (Conroy, Dunlap, Clarke & Alter, 2005). Many teachers who represent 87% indicated to use Guidance and counselling in most times during class work. 75% of the class tutors who partook in the investigation showed that their schools choose to administer disciplinary actions as a way of remedying pupils with ODD though with challenges. 81% of class teachers also indicated from the responses that some cases were referred to the area chief were working especially for boys who when threatened with school discipline could resort to man handling teachers. 75% of teachers indicated use of vigilante group "Sungu sungu" as possible strategy when dealing with those pupils with ODD who tend to have violent behaviors. From these findings t gatherings what came out, was that school administrations had zero tolerance to pupils who exhibited ODD characteristics (Barr & Parent, 2001).

Academic Performance Rating of Pupils with Odd by Class Teachers

This study sought to assess academic performance of pupils with ODD. This indicated the general academic performance of pupils with ODD. The researcher issued questionnaires to standard eight class teachers and the responses were summarised in Table 4.6 below.

Table 4.2 Influence of ODD on Academic Performance

Key: 1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree

Serial No	Statement	Agreement scale					TOTAL
		1	2	3	4	5	
1.	The learner being chased out of class		13.3			86.7	100
2.	The teacher and the pupil with ODD often argue much		20.0	6.7	13.3	60.0	100
3.	The pupil with ODD always disobeys rules ,regulations			6.7	40.0	53.3	100
4.	ODD pupils annoying the teachers		6.7	6.7	53.3	33.3	100
5.	Solving cases involving Pupil with ODD		6.7	13.3	40.0	40.0	100
6.	Teacher preparedness in handling a pupil with ODD			80.0	5.0	15.0	100
7.	ODD is causing a lot of challenges to your career		6.7	20	40.0	33.3	100
8.	ODD management With no results		6.7	13.3	33.3	46.7	100
9.	The pupil with ODD deliberately refuses to sit for exam	6.7	6.7	6.7	46.6	33.3	100
10.	The pupil with ODD answers questions in class without caring			6.7	66.7	26.6	100

Table 4.4 above shows that Majority 86.7% of class teachers strongly agreed that the learner often loses temper, which annoys the teacher and chases him or her out of class; they strongly agree 60.0% and agree 13.3% that the teacher and the learner often argue during lessons interrupting learning. It was also evident that most 53.3% strongly agreed and 40.0% agreed that the learners always disobey rules, regulations and request from teachers which annoys teachers affecting their motivation to work.

Most 53.3% agreed and 33.3% strongly agreed that the learner deliberately annoys teachers making teachers not to bother to look at the learner’s work. The findings show that most 40.0% strongly agreed and 40.0% agreed that the teacher spends most of the time solving cases involving the ODD pupil. Many admitted, 46.7% strongly agreed and 33.3% agreed that the Management strategies employed in their school has not yielded better results.

It was clear that majority 80.0% were undecided about the academic achievement levels of pupils’ ODD class. In addition, 40.0% agreed and 33.3% strongly agreed that ODD pupils were causing many challenges to their career. Majority 46.7% agreed and 33.3% strongly agreed that ODD learners deliberately refuses to sit for examinations. Lastly, class teachers agreed 66.7% that the ODD pupil answers questions without caring. During the exploration time frame in one of the schools as the investigator tried to see scholarly analysis of the pupils. The investigator had the option to recognize that the greater part of the students with ODD stayed predictable in accomplishing poor to average

The investigator sought to find out how pupils with OOD perform in their examinations and therefore the researcher administered a questionnaire to standard eight class teachers heads they had three choices for each achievement to choose from, chronic school failure, poor grade retention and below average. The table shows that the greater part of the reaction on the general scholarly execution of pupils with ODD is below average. Class eight class teachers rated general academic performance of ODD pupils in their classes. The results were presented in Figure 4.7.

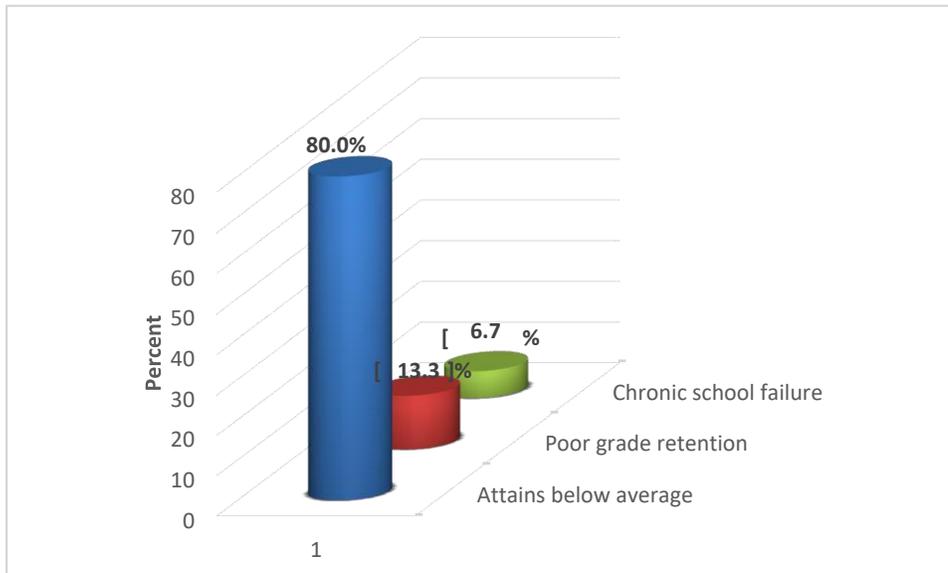


Figure 4.1 General academic rating of pupils with ODD

Majority 80.0% of the standard eight class teachers indicated that pupils with ODD attain below average. 13.3% indicated poor grade retention and 6.7% chronic school failures who end up dropping out of school. The discovery is in agreement with that of Wanjiru (2016) which revealed that most of the children who witnessed violence at home repeated the same behaviour in school and these children never attended classes well which later affected their performance.

IV. CONCLUSION

Research findings revealed that there were no formal educational strategies put in place so as to address the educational needs of pupils with ODD in public primary schools.

There were also poor grade scores or even chronic school failures that ended in school drop outs. Fourth, due to the characteristics posed by pupils with ODD these caused a lot of challenges to teachers and this greatly affected teachers' morale and content delivery which consequently had an impact in pupils' academic performance.

REFERENCES

- [1] G Alhowiml, M. S. & Alothman, I. A. (2018). Oppositional Defiant Disorder and Its Management Strategies among General and Special Education Teachers.
- [2] People: *International Journal of Social Sciences*, 4(3), 298-308
- [3] Aluja, A. (2004). Depressive Mood and Social Maladjustment: Differential Effects on Academic Achievement. *European Journal of Psychology of Education*, 19 (2), 121-131.
- [4] American Psychological Association (1989). *Psychological assessment*. The Association.
- [5] Amin, M.E. (2005). *Social Science Research: Conception, Methodology and Analysis*.
- [6] Makerere University Press, Kampala
- [7] Babbie, E. (1992). *The Practice of Social Research*. Belmont. Wadsworth
- [8] Barcalow, K. (2006). Oppositional Defiant Disorder: Information for School Nurses. *The Journal of School Nurses*, 22, 9-19.
- [9] Barela, R. N., Bernardino, H. P., Ana, V. M., Feliciano, A. C., & Averion, R. F. (2018). Conceptions of Students at Risk On Behavior Modification Program Create: A Story of One Public School in The Philippines. *International Journal of Social Sciences*, 3(3), 1010-1028. <https://dx.doi.org/10.20319/pijss.2018.33.10101028>
- [10] Bowen, G. A. (2009). Document analysis as a qualitative research method
- [11] Clarizio .H (1992) Social Maladjustment and Emotional Disturbance Problems and Positions Psychology in the school 29 /33/334
- [12] Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.).
- [13] Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers
- [14] Connelly, L. M. (2008). Pilot studies. *Medsurg Nursing*, 17(6), 411-2.
- [15] Conroy, M., Dunlap, G., Clarke, S., & Alter, P. (2005). A descriptive analysis of positive behavioral intervention research with young children with challenging behavior. *Topics in Early Childhood Special Education*, 25(3), 157-166
- [16] Creswell, J.W. (1998). *Qualitative Inquiry and Research Design: Choosing Among*
- [17] Five Traditions. SAGE: Thousand Oaks, CA
- [18] Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334

- [20] Donald, D.S. and P. Lolwana (2007). *Educational Psychology in Social context London*, Oxford.
- [21] Ercan, E. S., Kandulu, R., Uslu, E., Ardic, U. A., Yazici, K. U., Basay, B. K.,...Rohde, L. A. (2013). Prevalence and diagnostic stability of ADHD and ODD in Turkish children: A 4year longitudinal study. *Child and Adolescent Psychiatry and Mental Health*, 7(1), 30.
- [22] doi: 10.1186/1753-2000-7-30
- [23]
- [24] Forness, S. R. (1992). Legalism versus Professionalism in Diagnosing SED in the PublicSchool. *Psychology Review*
- [25]
- [26] Field, A. (2009). *Discovering Statistics using SPSS*. Sage: London
- [27] Gresham, F. M. and K.A. Gansle (1992). *Misguided Assumptions of DSM-III-R: Implications for School Psychological Practice*. *School Psychology Quarterly*.
- [28] Gunter P. J, Coutinho, M.J &Cade T. (2002). Classroom Factors linked with Academic gains among Learners with Emotional and Behavioural problems. *Preventing school failure*, 46 (3), 126-133
- [29] J. Kamau, W. Kuria, M. Mathai, L. Atwoli & R. Kangethe, (2012). Psychiatric morbidity among HIV-infected children and adolescents in a resource-poor Kenyan urban community AIDS Care. *Epub PMID*, 24(7):836-842.
- [30] Jeffrey, A.M., Shelagh, J. and Wouldiams (2004). Psychology in the Schools. Special Issue. *Differentiation of Emotional Disturbance and Social Maladjustment*, 41, Issue. 8 (867-877).
- [31] Jones, D. B. (2008). Phenomenological study: What are pre -kindergarten teachers' lived experiences with children identified with conduct disorder, oppositional defiance disorder, and attention -deficit hyperactivity disorder in the southeastern united states
- [32] Kamau, J., Kuria, W., Mathai, L., Atwoli, L., & Kangethe, R. K. (2012). Psychiatric comorbidity among HIV-infected children and adolescents in a resource-poor Kenyan urban community AIDS care. *Epub PMID*, 24(7), 836-842.
- [33]
- [34] Kamau, E. W. (1994). *Violent behavior against women and its effects on the academic performance of their children in selected primary schools in Kiambu County, Kenya*.
- [35] Kelter, J., & Pope, A. (2011). The effects of child gender on teachers' responses to oppositional defiant disorder. *Child and Family Behavior Therapy*, 33(1), 49-
- [36] 55. doi:10.1080/07317107.2011.545013
- [37] Kenya Human Rights Commission (KHRC). 23 October (2011) "Sungusungu: Merchants of Terror and Death in Kisii." <http://www.khrc.or.ke/mediacentre/press-releases/101-sungusungu-merchants-of-terror-and-death-inkisii.html>
- [38] Kombo, D.K. (2012). *Correlates of Learners Deviant Behavior in Selected Secondary Schools in Nairobi*. Nairobi: Kenya.
- [39] Kothari, C. R. (2010). *Research Methodology Methods and Techniques* (2nd Revised Edition). New Delhi: New AGE International Publishers Limited.
- [40] Kothari, C.R. (2009). *Research Methodology: Methods and Techniques*. New Age International, 401
- [41] Le Comple, M. & Goetz, J. (1982). Problems of reliability and validity in ethnographic research. *Review of Educational Research*, 52 (1): 31-60.
- [42] Loeber, R., Burke, J. & Pardini, D. A. (2009). Perspectives on oppositional defiant disorder, conduct disorder, and psychopathic features. *Journal of child psychology and psychiatry*, 50(1-2), 133-142.
- [43]
- [44] Masese, E. R., and E. Mwenzwa. (2012). The Genesis and Evolution of Sungusungu Vigilante Group Among the Abagusii Ethnic Group of Kenya. *Journal of Elixir Social Sciences*, 42(1).
- [45] McEvoy, A.S. and R. Welker (2000). Antisocial Behaviour, Academic Failure and School Climate. *A Critical Review Journal of Emotional and Behavioural Disorder*
- [46] Metcalf, K. (2010). Social Maladjustment in Children needs Parental Interventions in addition to professional help to diminish disruption in school and at home.
- [47] Mishra, A., Garg, S. P., & Desai, S. N. (2014). Prevalence of oppositional defiant disorder and conduct disorder in primary school children. *Journal of Indian academy of forensic medicine*, 36(3), 246-250.
- [48]
- [49] Mugenda, O. M and Mugenda, A. G. (2003). *Research methods: Quantitative and qualitative approach*. Nairobi; African Centre for Technology Studies (Acts) Press.
- [50] Mugo, B.C. (2013). *Assistive technology and Access to quality instruction for blind and visually impaired students: A comparative study of Kenyatta University, Kenya*. Thesis of Kenyatta University
- [51] Muhoro, S. G. (2015). Analysis of instructional strategies enhancing academic performance among learners with emotional and behaviour disorders in primary schools, Kandara Sub-County, Murang' a County, Kenya. Retrieved from <http://ir-library.ku.ac.ke/handle/123456789/15402>
- [52] Ogula, P. A. (2005). *Research methods*. Nairobi: Catholic University of Eastern Africa Publications
- [53] Orodho, J. (2005). *Elements of education and social science research methods*. Nairobi: Bureau of Educational Research
- [54] Orodho, A. J. (2003). *Essentials of education and social sciences research method*, Nairobi; Masola Publishers
- [55] Paul Oduor Ndiewo, Peter J. O. Aloka, Pamela Raburu , Influence of Learner
- [56] Involvement on Academic Performance of Secondary School Students in Kenya, *International Journal of Applied Psychology*, Vol. 6 No. 2, 2016, pp. 37-40. doi: 10.5923/j.ijap.20160602.03.
- [57] Pierangelo, R., & Giuliani, G. (2008). *Classroom Management for Students with*
- [58] *Emotional and Behavioral Disorders*. United States: Corwin Press
- [59] R.H. Parritz and M.F. Troy, (2014). *Disorders of childhood: Development and psychopathology* 2nd Edition (Wadsworth: Cengage Learning).

- [60] Reid, R., Trout, A. L., & Schartz, M. (2005). Self-regulation interventions for children with attention deficit/hyperactivity disorder. *Exceptional Children*, 71(4), 361-377.
- [61] Rowe, R., Maughan, B., Costello, E.J., & Angold, A. (2005). Defining oppositional defiant disorder. *Journal of Child Psychology and Psychiatry*, 46(13), 1309–1316.
- [62] Salend, S. J., & Sylvestre, S. (2005). Understanding and addressing oppositional and defiant classroom behaviours. *Teaching Exceptional Children*, 37(6), 32-39
- [63] Schwartz, (1999). *Subtypes of Victims and Aggressors in Children's Peer Groups which is a kind of Socially Maladjusted Behaviour*. Bubuque Iowa: WMC Publisher
- [64] Skoulos, V., & Georgiana, S. T. (2007). social skills of adolescents in special education who display symptoms of oppositional defiant disorder. *American Secondary Education*, 35(2), 103-115. from
- [65] Smith, G. T. & McCarthy, D. M. (1995). Methodological considerations in the refinement of clinical assessment instruments. *Psychological Assessment*, 7, 300-308.
- [66] The People Daily. 31 August (2013) "Organised Gangs on Steady Rise, Crime Report
- [67] in Kisii
- [68] The Public Policy Research Institute, Texas A&M University (2011)
- [69] The Standard 10 August 2011. "Dark Secrets of Kenya's Deadliest Gang."
- [70] The Standard 22 November 2010. Robert Nyasoto. "Sungu Sungu Vigilantes Group Unleashes Terror Against Its Targets with Ruthlessness and Impunity."
- [71] The Standard 26 April 2011. "Kisii Leaders Must Bottle Sungu Sungu Genie."
- [72] The Standard. 4 September (2013). Ransom Gangs Hit Nairobi, Says National Crime Research Centre Report.
- [73] Uba, A. O. Makinde, D. Adjumo and A. Aladjaria (2004). *Essentials of Educational*
- [74] *Foundations and Counselling*. Lle-lfe;Obfami Owolowo University
- [75] Undiyaundeye, F. F. (2018). Management Strategies for Children with Special Needs in Early Years. *International Journal of Social Sciences*, 4(2), 110-117
- [76] Uwezo (2015): Are Our Children Learning? The State of Education in Kenya in 2015 and Beyond. Nairobi: Twaweza East Africa
- [77] Washington University School of Medicine in St. Louis. (2007, December 19). Excessive Tantrums in Pre-schoolers May Indicate Serious Mental Health Problems. *Science Daily*.
- [78] Wichstrom, L., Berg-Nielsen, T. S., Angold, A., Egger, H. L., Solheim, E., & Sveen, T. H. (2012). Prevalence of psychiatric disorders in preschoolers. *Journal of Child Psychology and Psychiatry*, 53(6), 695-705.
- [79] Whalen, C. K., Henker, B., Ishikawa, S., Jamner, L. D., Floro, J. N., Johnston, J. A. &
- [80] Swindle, R. (2006) An Electronic Diary Study of Contextual Triggers and
- [81] ADHD: Get Ready, Get Set, Get Mad. *Academy of Child and Adolescent Psychiatry*, 45, 166-174
- [82] World Health Organisation, Violence the evidence (Liverpool JMU, Centre for Public Health, 2010) 17-30 available at <http://www.ngeckenya.org>
- [83]

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Capacity Building Interventions and Performance of Rwanda Civil Society Organizations: Case of CCOAIB, Kigali-Rwanda

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Abstract

The purpose of this study were to examine the capacity building interventions received by CCOAIB, to study the extent to which Capacity building interventions have contributed to CCOAIB's performance and; to evaluate the most contributing capacity building interventions to organization's performance. The researcher used is descriptive research design. The sample size was 169 respondents from a population of 300 employees of CCOAIB within City of Kigali. In selecting the sample size the researcher used purposive sampling technique. Research instruments used included Questionnaire, interview guides, for secondary data, organizational reports, employee capacity development manuals, journal, books and articles were used.. Descriptive statistics were used where distribution through STATA. Interventions received by CCOAIB are under three capacity building levels, individual capacity building interventions comprising of short term training and certified training, Organizational capacity building interventions comprising of staff motivation mechanisms, management style, network systems and technical competencies framework and Institutional capacity building interventions comprising of policies, rules and regulations. Based on the received capacity building interventions below is the extent to which the organization performed based on its objectives, the objective of empowering of members, 55 employees reported that this objective performed below 49%, 69 employees said that the objective performed between 50% and 75%, only 45 respondents said the objective performed between 76 and 100%. The objective of Monitoring development, 90 respondents said its performance was at 49% and below, 60 respondents said

the objective performed between 50% and 75% whereas 19 respondents said the objective had performed between 76% and 100%. Empowering members' objective was performed perfectly well, it scored the highest under the percentage range of between 76% and 100% with 45 respondents confirming this, followed by monitoring development and generating support. We observe significant associations between capacity building interventions and the performance of CCOIAB's set objectives. Organizational capacity building interventions were contributed most to the organization's performance. The research recommends developing a Capacity Needs Assessment, a proper result based management system needs to be developed and carrying out performance evaluation and there is need to invest more efforts and resources in short term courses and certified courses for employees. The findings of the research will be significant in that they will be used for; academic purposes, a guide to policy direction for policy formulators, help policy makers to make informed decisions and it will also be useful to other stakeholders' investment in the Civil Society like donors.

Keywords: *Capacity building, Performance, Non-government Organization, Rwanda Civil Society Organization.*

1. Introduction:

Capacity building is extensively well known, both officially and unofficially, as comprising of a series of scopes, from the knowledge and know-how of persons to institutional ability plus corresponding structures and customs that direct their processes. Capacity building

involves beset and planned modification options that will govern the attainment of an amount of defined outcomes; an important piece in institutional development which emphasizes positive institutional change and performance. Envisioned results would normally develop from human resources purposely deciding on accomplishing their professions inversely and with better capability. Capacity building can either be people or organizational processes centered. Contributing to capacity building as a 'means of conducting business has several inferences on a specific culture; capacity levels are an overall apprehension to all institutions, countries and persons as they describe an institution's performance, granting an advantage to other actors. (Christoplos, 2013).

Rwanda like any sub Saharan African developing country, still is fighting and progressively moving from traits that characterize a developing country such as poverty, illiteracy and limited institutional capacity. In 1994 Rwanda had a devastating genocide that was against the Tutsi, this claimed an estimate of over nine hundred thousand men, women plus Children who heartlessly were murdered in a well-planned Genocide. This cataclysmic event left roughly 500,000 children parentless. Institutional infrastructure were horribly destroyed as a result this made the country grieve, this caused destruction of the rural economy, which involves almost three quarters of the population. The ramifications of the genocide stimulated the Civil Society Organizations to arise targeting to administer to social needs and providing support to victims of the genocide against Tutsi mostly women and children. Rwanda Governance Board (RGB), a government institution that is mandated to register Civil Society Organizations in Rwanda was established. It has a unit that manages local Non-Government Organizations, Religious Based Organizations and political organizations' registering and monitoring the operating of these organizations (UNDP, Capacity building in Rwanda , 2008).

It is after this that the government started to intentionally build the capacity of the local Civil Society organizations through the Rwanda Civil Society Platform and its member umbrellas among other stakeholders that have been giving capacity building to the Rwanda's civil Society Organizations (UNDP, Human Resource Development Report, 2009).

CCOAIB has worked with in Rwanda since 1987, and has built a network of partnerships with stakeholders and donors from the Public sector and Civil Society Organization (both locally and internationally) that have continually supported the initiatives of CCOAIB and those of its member organizations, amongst these include

capacity development of its staff members and member organizations.

Rwandan government and other donor agencies have invested a lot of money in the capacity building interventions aimed at capacitated the Civil Society organizations to be able to perform in accordance to their given mandate. However several reports have highlighted institutional capacity challenges of the Civil Society Organizations. Civil Society Index Rwanda report carried out by CCOAIB, examined the state of civil society in Rwanda under four dimensions: structure, working environment, values, and impact. Within the structure dimension, only charitable giving and collective community action appear to be strong. Significant weaknesses prevail in citizen participation in non-partisan action, volunteering, membership of umbrella bodies, and geographical distribution. Key weaknesses include insufficient material, human, and financial resources; heavy dependence on external financing; precariousness of financial position and need to constantly look for new projects (CCOAIB, Civil Society Index Rwanda report , 2011).

Rwandan government and other donor agencies have invested in capacity building interventions for Civil Society Organizations; there still exists inadequate institutional capacities at levels of individual, organizational and institutional capacity. It is against this background that the researcher considered the need to critically analyze the relationship between the capacity building interventions and the performance of the Civil Society Organization using CCOAIB as the case study organization. To attain this, the following specific objectives were formulated:

- i. To examine the capacity building interventions received by CCOAIB
- ii. To study the extent to which Capacity building interventions have contributed to CCOAIB performance and;
- iii. To evaluate most contributing capacity building interventions to organization's performance.

2. Review of Literature

Ahmad discovered that a specific employee capacity building approach given time and funding for execution had direct exaggerated effect on employee performance. Furthermore studies related to the above are required to purport what is perceived to be true. Employee capacity building can and does have an impact on employee performance. There is practically no question that well

planned capacity building programs transform the performance of employees. Tamir also states that efficiency and effectiveness in employee performance leads to overall growth, capacity building of employees contributes to increased productivity (Tahir, 2014).

Organizations can intentionally encourage their invention and institutional performance through sound determined, deliberate and prudently designated alternatives concerning their capacity creation and utilization method (Murphy, Trailer & Hill, 2012).

According to UNDP, capacity building has three levels and these include; first the institutional level capacity these include the societal arrangements in which the human resources and institutions function. This includes laws, social norms, rules, power relations and policies that direct civic arrangements. This sets the overall capacity building scope. Second to it is the organizational level which looks at internal structures, systems and procedures that control institution’s effectiveness. Third to this is the individual level which entails experience, attitude, skills and knowledge that facilitate a person’s performance. These are in most cases acquired through formal training and education formally while on the other the hand others come informally through observing and acting. (UNDP, Human Resource Development Report, 2009).

NGOs possess the capability of playing a paramount role in delivering local services and acting as advocates for community needs. They are also seen by communities as impartial at a greater rate as compared to government entities and company representatives.

NGOs tend to manage better and resourced better than Community Based Organizations, while as others grapple with capacity matters pertaining to effective management systems, funding, skills and transparency.

The purpose is to improve the skills, knowledge and competencies in their dealings in the communities. NGOs invest in capacity building, linking the gained capacities in short term to a longer term perspective is of paramount importance. If capacity building is operational, NGOs can then apply their learnt skills and experiences to manage future projects in other areas and with other companies or organizations (LenCD, 2011).

3. Material and method

The researcher adopted an analytical and descriptive research design with both qualitative and quantitative data

4. Results

4.1. Examination of capacity building interventions received by CCOAIB

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to describe the relationship between capacity building interventions and performance of Rwanda Civil Society Organization.

The total population consisted of 300 respondents all staff members of CCOAIB umbrella organizations in Rwanda, located in Kigali city and its suburbs. A sample size for this study was developed using the formula of Slovin, computed as

$n = N / (1 + Ne^2)$. Where number of samples (n), total population (N), margin

of error (e) Cited by Ngechu (2004). In this case N=300 taking the confidence level of 95% that is with a permissible error of 5%. The researcher got a sample size of 169 using Slovin formular. All the 169 questionnaires distributed were responded to and collected which made the response rate 100%. $n = \frac{N}{1 + (Ne^2)}$ $n = \frac{300}{(1 + 300 * 5\%^2)}$ this gives 169. To cross check and verify the accuracy of the sample size number, the researcher used RAOSOFT online sample size calculator and got the sample size of 169. The researcher used the sample size of 169 respondents.

Table 3.1: Sample size

Category	Researcher’s sample	Percentage
Operational employees	81	48%
Middle managers	53	31%
Senior Managers	35	21%
TOTAL	169	100%

Source: Researcher’s sample design (2020).

Questionnaires were used to collect primary data for the years 2010 to 2022. This data was analyzed using STATA. Face-to-face interview were used for qualitative data collection. Secondary data was collected using documentary techniques aimed at assembling the information collected from books, journals, articles and periodicals;

Approximately 23% of respondents interviewed indicated receiving either a short-term training or a

certified training. The individual capacity building interventions received were subjectively selected and

didn't meet the objective capacity needs of the trainees. Approximately 55% of respondents interviewed reported receiving training (short-term training, certified training and others), whereas 47% received a job promotion. This indicated that employees that receive capacity building are more likely to perform their assigned duties better than their counter parts that received no capacity building and at times get promoted at work.

Organizational capacity building interventions received by CCOAIB employees include; 38% employees received staff motivation mechanisms, 17% reported the organization having received management style, 18% reported the organization having received financial management, 28% reported the organization having received network systems whereas 27% reported the organization having received technical competency frameworks. Staff motivation mechanisms scored the highest percentage of (38%) in performance, this shows that, employees are more likely to be productive when they are recognized, appreciated and rewarded for the good work that they are doing for the organization.

Approximately 50 respondents confirmed that their organization had received capacity support to update policies, rules and regulations whereas 119 respondents

Table 1: Results from a logistic regression for member empowerment

Variables	Mode 1 (individual capacity building)	Model 2 (Organizational capacity building)	Model 3 (Institutional capacity building)
Individual capacity building	-0.160 (0.374)		
Organizational capacity building		0 (.)	
Institutional capacity building			-0.730* (0.342)
Constant	-0.310 (0.178)	-0.326* (0.157)	0.890 (0.599)
Observations	169	167	169

Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001

Source: Primary data (2020).

From the Table 4.4 above, we observe that individual capacity building interventions have a standard error of -0.160 (0.374), showing a negative relationship with member empowerment objective, however, this

said their organization did not receive any capacity support to update policies, rules and regulations. This shows that Institutional Capacity Building interventions are not given much priority as compared to the other capacity building interventions.

With reference to the contribution of policies, rules and regulations to performance, 32 respondents agreed that updated policies, rules and regulations contributed to the performance of the organization whereas 137 respondents did not agree. This confirms the level of the limited attention given to institutional capacity building.

4.2. The extent to which Capacity Building interventions have contributed to CCOAIB's performance

Performance was defined as the ability of CCOAIB to achieve its organization's set objectives which include: Members' empowerment, monitoring members' development and generating support for her members. To determine the extent of members' empowerment objective's contribution, employees were asked if CCOAIB has achieved its objective of empowering its members through the capacity building interventions received. Table 4.4 below shows logistical regression for the objective of member empowerment with the capacity building interventions received at all levels by CCOAIB.

relationship is not statistically significant That is, receiving individual capacity building interventions such as, certified training and short term trainings had no significant effect on the performance and attainment of

CCOAIB’s member empowerment objective as reported by employees, where as Institutional capacity building registered a standard error of -0.730 (0.342) which makes the relationship statistically significant and negative. This shows that Institutional Capacity Building interventions contributed to the attainment of the organization’s objective of member empowerment.

Furthermore, it is emphasized in table 4.5 below, that through institutional capacity building interventions received by the organization, CCOAIB was able to meet its objective that relates to member empowerment. 54% of employees reported that the organization was meeting its member empowerment objective compared to only 36% who said the organization did not receive any form

of institutional capacity building and thus wasn’t meeting its members’ empowerment objective, yielding a significant difference of approximately 18%. Towards the end of quarter three of the year 2019/2020, CCOAIB had a confident record of accomplishments compared to projections. Three objectives were continually implemented with a completion rate of 85% (i.e 47 main activities out of 55).The failure to carry out all planned activities was due to insufficient funds, delay in the disbursement of funds and Covid-19 pandemic crisis (CCOAIB, Annual narrative report period July 2019- June , 2020).

Table 2: T-test results for the three capacity building interventions across member empowerment.

Objective	Capacity building	Groups	Observations	Mean
Member Empowerment	Individual	Received capacity building	39	.4230769
		No capacity building received	130	.3846154
		Difference		.0384615
	Organizational	Received capacity building	167	.4191617
		No capacity building received	2	0
		Difference		-.4191617
	Institutional	Received capacity building	50	.54
		No capacity building received	119	.3613445
		Difference		.1786555**

***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Source: Primary data (2020).

For monitoring member’s development objective, It was noted that there is a statistically significant difference between the groups of employees that reported receiving the different types of capacity building interventions and those that did not report receiving any capacity building interventions. On CCOAIB’s objective of monitoring development of members, the T-test indicated that Individual Capacity Building Intervention contributed a mean score of 0.5128205 registering a difference of –

0.666667, Organizational Capacity Building interventions scored a mean of 0.4670659 registering a difference of -0.4670659 and Institutional Capacity Building intervention scored a mean of 0.46 registering a different of 0.021849.

Those that received capacity building interventions of any type were likely to say that they improved their skills and executed their jobs with ease especially

planned activities under the objective of monitoring members' development as illustrated in table 4.6 below.

The employees that received capacity building at CCOAIB showed high levels of performance and creativity in the way they performed their jobs.

Table 3: T-test results for the 3 capacity building interventions across monitoring development objective.

Objective	Capacity building	Groups	Observations	Mean
Monitoring Development of members	Individual	Received capacity building	39	.5128205
		No capacity building received	130	.4461538
		Difference		-.0666667
	Organizational	Received capacity building	167	.4670659
		No capacity building received	2	0
		Difference		-.4670659
	Institutional	Received capacity building	50	.46
		No capacity building received	119	.4621849
		Difference		.0021849

***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Source: Primary data (2020).

Since the differences are statistically significant, we can say for sure that the capacity building interventions received had an effect on the performance of activities planned under the objective of monitoring development. This evidence proves that there is a positively impactful relationship between capacity building interventions received at CCOAIB and its performance in meeting the set objectives.

4.2.4 Generating Support for members' objective

Employees were asked if CCOAIB achieved its objective of generating support for its members. Similar to the member empowerment objective, employees reported that Institutional Capacity Building interventions received by CCOAIB enabled it to achieve its aforementioned objective.

Table 4: T-test results for the 3 capacity building interventions across generating support objective

Objective	Capacity building	Groups	Observations	Mean
Generating Support for members	Individual	Received capacity building	39	.3589744
		No capacity building received	130	.4846154
		Difference		.125641
	Organizational	Received capacity building	167	.4610778
		No capacity building received	2	0
		Difference		-.4610778
	Institutional	Received capacity building	50	.34
		No capacity building received	119	.5042017
		Difference		.1642017*

***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Source: Primary data (2020).

Table 4.7 above, shows that there is no significant mean difference between employees that received capacity building interventions or didn't with the organization objective of generating support for members. With generating support objective study results show that institutional capacity building interventions scored a mean contribution of 0.3589744 indicating a difference of 0.125641, organizational capacity building

interventions also scored a mean of 0.4610778 indicating a difference of -0.4610778 and institutional capacity building interventions contributed a mean of 0.34 indicating a difference of 0.1642017 illustrating clearly that there is no significant mean difference between the received capacity interventions and the objective of generating support for members.

Table 5: Contribution of Capacity building to performance across respondent characteristics

Outcome variable			Difference	Statistical significance
Gender	Male	Female		
	55%	47%	8%	
Education	Less than Bachelors	Bachelor or more		

	52%	39%	13%	
Experience	Less than 5 years	5 or more years		
	32%	67%	35%	***

***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Source: Primary data (2020).

From Table 4.8 above, we observe that respondents with more work experience (more than 5 years) were more likely to report that the individual capacity building intervention received helped them to improve their performance. 67% of employees with more than 5 years of experience reported capacity building interventions contributing to their performance, compared to only 32% of those with less than 5 years of work experience. We do not see any statistically significant difference across age, gender and level of education.

4.2.5 Performance of CCOAIB set objectives as a result of received capacity building interventions.

a result of the received capacity building interventions, the objective of empowering of members, 55 employees believed that this objective performed below 49%, 69 employees said that the performance of the aforementioned objective had score between 50% and 75%, only 45 respondents said the objective performed between 76 and 100% as a result of capacity interventions received by the organization.

As regard to the performance of the objective of monitoring development, 90 respondents said that the organization objective was performed at 49% and below, 60 respondents said the organization performed between 50% and 75% whereas 19 respondents said the objective had performed between 76% and 100% .

Statistics show that empowering members' objective was performed perfectly well, it scored the highest under the percentage range of between 76% and 100% with 45 respondents confirming this, followed by monitoring development and generating support.

Statistics also show that monitoring development objective performed worst among all the objectives with 70 respondents ranking performance at below 49%, 60 respondent ranked performance between 50% and 75% and finally only 19 respondents ranked 76%-100%.

Generating support registered 70 respondents ranked performance at below 49%, 89 respondents ranked the objective between 50-75% and 10 respondents ranked the objective performance at 76%-100%.

In conclusion, we note some significant associations between capacity building interventions and the CCOIAB's set objectives highlighted in our data. For example, we see that institutional capacity building is positively associated with objectives such as member empowerment and monitoring of development. On the other hand, we did not see clear effects of some capacity building interventions on the objectives, for example, we did not see clear association between individual capacity building and generating support for members, monitoring development of members as objectives.

4.3 To evaluate most contributing capacity building interventions to organization's performance.

Findings from the study show that organizational capacity building interventions received were more relevant in contribution to CCOAIB's organization performance; 167 employees have received Organizational capacity building interventions, 38% employees received staff motivation mechanisms, 17% reported the organization having received management style, 18% reported the organization having received financial management, 28% reported the organization having received network systems whereas 27% reported the organization having received technical competency frameworks. Employees confirmed that organizational capacity building interventions created an enabling environment where they were able to execute their duties thus enhancing their performance. Well planned capacity building strategies enable organizations develop and deliver programs that adhere and measure efficiency and effectiveness of organizations' interventions. These measurement imperatives must be used to evaluate the capacity building strategies implemented to help organizations achieve their goals in an ever changes business environment (Kara DeCorby-Watson & Gloria Mensah, 2018). In this case organizational capacity building interventions can be leveraged to help CCOAIB improve it strategy implementation to achieve its goals and objectives.

5. Discussion

This section attempts to discuss the findings from the study answering the research questions the study was set out to investigate and the major outcomes that were

discovered from the field, findings show that CCOAIB received three types of capacity building interventions which include; individual capacity building interventions, organizational capacity building interventions and institutional capacity building interventions. The organization received more individual capacity building interventions as compared to organizational capacity building interventions and institutional capacity building interventions.

Not all interventions that were implemented at CCOAIB fully helped the fulfillment of the performance of the Organization's set objectives. Findings show that for instance individual capacity building interventions had a negative relationship with member empowerment objective; this relationship was found to be not statistically significant. Whereas for institutional capacity building interventions received, finding showed that these capacity building interventions enabled the organization to perform well and meet its objective of member empowerment.

Findings show that respondents that received capacity building interventions of any type were likely to say that capacity building interventions received improved their performance of these individuals and had a great impact on the attainment of the organizations set objectives.

We also observed that employees with more work experience (more than 5 years) were more reported that the individual capacity building intervention received helped them to improve their performance.

The findings paint a fairly effective picture of capacity building delivery method to CCOAIB. However they were not given enough time and attention which affected excellence. Tahir says that specific employee capacity building approach given time and funding for execution have direct exaggerated effect on employee performance. Employee capacity building can and does have an impact on employee performance. There is practically no question that well planned capacity building programs transform the performance of employees. Tamir also states that efficiency and effectiveness in employee performance leads to overall growth, capacity building of employees contributes to increased productivity (Tahir, 2014).

Furthermore regarding the capacity building level interventions to be developed, organizations should include changes aiming at developing different levels of capacity, that is, information, skills, processes and structures. For required change to be fully implemented, the organization must move through several stages of

capacity building, increasing sophisticated skills, new information, processes and structures (Westat, 2015).

The findings tell of a story that confirms that there is a relationship between capacity building and performance of the Civil Society of Rwanda, organizational capacity building interventions contributing the lion share to the performance of employees, this was confirmed further by employees who said after receiving organizational capacity interventions, they were well suited to execute their duties with ease because of the enabling environment. This is evidence that well planned capacity building interventions whose execution is preceded by a meticulous capacity needs assessment at all levels of capacity contributes to performance of organizations and enables them to meet their set goals and objectives as the study confirms it with the Rwanda Civil Society Organization.

6. Conclusion

The Capacity Building Interventions received by CCOAIB are documented as stemming from the three levels of capacity building that is, Individual Capacity Building (short term trainings and certified trainings), Organizational Capacity Building (staff motivation mechanisms, management style, financial management, network systems and technical competencies frameworks) and Institutional Capacity Building (updated policies, rules and regulations). The extent to which the organization performed was viewed based on the Organization's set objective attainment in line with the capacity building interventions received. Under the objective of empowering of members, 55 employees believed that this objective performed below 49%, 69 employees said that the performance of this objective had scored between 50% and 75%, only 45 respondents said the objective performed between 76 and 100%. As regards to the performance of the objective of monitoring development, 90 respondents said that the organization objective was performed at 49% and below, 60 respondents said the organization performed between 50% and 75% whereas 19 respondents said the objective had performed between 76% and 100%. Statistics show that empowering members' objective was performed perfectly well, it scored the highest under the percentage range of between 76% and 100% with 45 respondents confirming this, followed by monitoring development and generating support.

These results above show that the contribution of the capacity building interventions to the performance of CCOAIB was immense with the Organizational capacity building intervention contributing the most abilities for

the employees through an enabling environment that forced effectiveness and efficiency in the execution of the Organization's planned activities.

The most relevant capacity building intervention in the performance of CCOAIB's objective attainment is the Organizational capacity building interventions; these contributed an enabling environment of CCOAIB employees that enabled them to perform their duties assigned to them effectively and efficiently.

from <https://www2.ed.gov>:
<https://www2.ed.gov/about/offices/list/ose/p/rda/cipp2-conceptualizing-capacity-building-2-10-15.pdf>

Reference:

- 1.CCOAIB. (2011). *Civil Society Index Rwanda report* .
- 2.CCOAIB. (2020). *Annual narrative report period July 2019-June 2020*. Kigali Rwanda: CCOAIB.
- 3.Christoplos. (2013). *Implementation evaluation of the cooperation strategy with Kenya 2009-2013*. Nairobi: SIDA.
- 4.Kara DeCorby-Watson & Gloria Mensah. (2018). Effectiveness of capacity building interventions. *Effectiveness of capacity building interventions: a systematic review* , 13-15.
- 5.LenCD. (2011). *The Bonn workshop Consensus on capacity development*. Len CD.
- 6.Murphy, Trailer & Hill. (2012). Measuring Performance in Entrepreneurship Research. *Journal of Business Research*,. *Journal of Business Research*, 36, 15-23.
- 7.Tahir Ahmad. (2014). Capacity building boost employee performance in banking. *International Journal of Public Administration and Management Research*.
- 8.UNDP. (2008). *Capacity building in Rwanda* . UNDP.
- 9.UNDP. (2009). *Human Resource Development Report*.
- 10.Westat. (2015).
<https://www2.ed.gov/about/offices/list/ose/p/rda/cipp2-conceptualizing-capacity-building-2-10-15.pdf>. Retrieved September 23rd, 2021,

English Language As A Medium Of Instruction And Learners' Academic Performance In Secondary Day Schools Of Ruhango District, Rwanda

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Abstract

The purpose of this paper was to find out how English language as a medium of instruction affects the learners' academic performance in secondary day schools of Ruhango district. Specifically, the paper analyzed the use of English as medium of instruction in secondary day schools, the status of learners' academic performance in English language in secondary day schools and the relationship between English as medium of instruction and learners' academic performance in the classroom. The paper used the survey design whereby the questionnaires were used to collect data and data collected were analyzed using descriptive and inferential statistics generated from a computer based software known as statistical package for social sciences. The stratified sampling, and simple random sampling techniques were used to select a sample size of 266 learners from 1002 learners and 27 teachers from 100 teachers. Results revealed that learners expressed that they like studying in English language (59.8%) despite the challenges they encounter. Learners expressed that they fear to speak English in public (28.6%). Teachers expressed that they need more training in English language (55.6%). Concerning the learner's academic performance, the study revealed that learners like studying English as subject but they perform poorly in it. The majority of them score between 21-40 marks (31.2%). The study revealed that learner's use of English as medium of instruction is positively correlated with improved learner's proficiency in the use of English, improved scores in English subject and learner's interest in reading and writing in English. In light with these results, the paper recommended the need of enough and updated teaching aids in English language, more motivation to both learners and teachers for improving the use of English language and learner's academic performance. More training in English language for both learners and teachers is needed to improve English language in use in Ruhango district secondary day schools.

Keywords: *Academic Performance, Day School, Medium of Instruction, Secondary Schools.*

1. Introduction

The learner always seeks an awareness on structures, content and contextual knowledge and should be facilitated with the tactics of practical communication. According to Yule (2010), English in the modern world is not just a language. It is how the world deals with business and shares the ideas. In short term, it is how the world communicates. In reality, when the medium of instruction becomes a foreign language, classroom interactions also become limited and most of the time it leads to the teacher's centered method than the learner centered one and all this leads to low performance of the learners. Here in Rwanda, this becomes one of the barriers to the effective implementation of the new education system which is Competence Based Curriculum (CBC).

According to R.E.B report of 2014, the Rwandan government recognizes this through policies such as Rwanda vision 2020 and EDPRS II, seeks to improve opportunities for the next generation of Rwandans by improving the English language levels of all Rwandan children in education, ICT, business, trade, diplomacy and cultural exchanges across the region and beyond. For this to happen, the English language levels of Rwandan teachers must be improved as much as possible. Although a great effort has been made to improve the use of English language as a medium of instruction in secondary schools, a big number of learners and teachers are still struggling to master that language and use it effectively. Lack of that English language mastery of course, has

the negative effects on the learner's academic performance. Some learners have tried their best to understand the subject contents taught to them but they end up with poor performance because of the limitations in the use of English language.

One of those limitations is lack of motivation and exposure to English as the new language of instruction in Rwanda. In other words, English language is not yet a language of communication in Rwandan schools as it was expected and learners are still poor in the academic performance. The researches have been done in this area but still the challenges and issues related to the implementation of the new language transition policy are not exhausted. Therefore, this study sought to find out how the new medium of instruction (English) in Rwanda is related to the learners' academic performance in secondary day schools, particularly in Ruhango District..

The research objectives were:

- i. To analyze the learners' use of English language as Medium of Instruction in secondary day schools in Ruhango District
- ii. To examine the status of learners' academic performance in English language in secondary day schools of Ruhango District
- iii. To establish the relationship between English as Medium of Instruction and learners' academic performance in the classroom.

2. Review of Literature

This paper deals with a review of the past studies that are related to English language as a medium of instruction and learner's performance. A study of Nzanana (2016) argues that English as a second or foreign language simply means the use of English by speakers with different native languages. English as a foreign language is used for non-native English speakers learning English in a country where English is not commonly spoken. The term English as a Second Language has been seen by some to indicate that English would be of secondary importance in use.

Yule (2010) argues that some children grow up in a social environment where more than one language is used and are able to acquire a second language in circumstances similar to these of first language acquisition. Those fortunate individuals are bilingual. For instance, the general census of 2002 on the languages used in Rwanda showed clearly that the majority of Rwandan population were using the native language (Kinyarwanda): 93.18% of the population were using Kinyarwanda only while 0.06% were using English only.

A study of Sibomana (2014) on the acquisition or learning of English as a second language in Rwanda: challenges and premises. The study suggests that while the teaching of English language has been improved and several factors appear to increase Rwandan people's motivation to learn English, the context is not yet favorable to the attainment of communicative competence in this language. For example, the results from the census conducted in 2012 on the use of languages in Rwanda revealed that among 6,187,890 people of fifteen years old and above, 14.7% were able to use English and 0.1% of them were using English only. On the other hand, 48.8% were using Kinyarwanda only and 6.5% could use both Kinyarwanda and English.

A study of Mouhamad (2016) on English as a Medium of Instruction in the tertiary education setting of the United Arab Emirates: the perspectives of content teachers. The study problematizes taken-for-granted assumptions surrounding an exclusive English medium of instruction model as it is currently implemented in the UAE's Higher Education Institutions, where low English proficiency level and a limited use of Arabic are characteristics.

Laxmi (2018) observed that most of the teachers in community schools have never studied in English and were not trained to teach in English. Furthermore, those teachers did not have enough training in teaching in English language. For instance, the below entry test results from four academic years highlight the English difficulties that students in Rwanda were facing: in 2010, among 2,362 learners who did the test, 20.4% passed and 79.5% failed. In 2012-2013, among 2839 learners, only 4.5% passed the test while 95.4% failed.

Tabaro (2015) made a study on Rwandan's Motivation to learn and use English as a Medium of Instruction. The study revealed that Rwandans are aware of benefits that they can enjoy from mastering and using English language, which normally range from economic affairs, world globalization, political and diplomatic relations among others. This focused on the motivation factors of learning and using English as medium of instruction but it did not show deeply how English as medium of instruction affects the academic performance of secondary schools' learners in Rwanda, particularly those in the secondary day schools.

Nzanana (2016) conducted the study on Language Learning Motivation and Proficiency in Learning of English as a Foreign Language: the case of University students in Rwanda. That study aimed at investigating the relationship between English as a Foreign Language (EFL) learners' motivation and their oral proficiency. The results from survey and interviews with both students and teachers revealed that students were highly motivated, while their oral proficiency was found to be average. Findings revealed a weak correlation between learners' motivation to learn English and their oral proficiency.

3. Materials and Methods

This study used a descriptive design by using the quantitative approach through the interviews or the questionnaires distributed to the respondents from the sample population. In this regards, the target population for this research was all secondary day schools in Ruhango District. The paper involved both learners and teachers from six selected schools among those day schools with the sampled population of 1002 learners and 100 teachers. The sample size of 293 was calculated by the following formula.

Eq (1):

$$n = \frac{N}{1+N(e)^2}$$

When

n represent sample size; N represents population size; E represent margin error which is equal to 5% (0.05).

The questionnaire was composed of the closed-ended questions provided for each category of respondents. This type of data collection instrument was chosen by the researcher because it helps to reach a large number of respondents in a good rang of time. It helped to give the reliable data simply because the respondents feel free, in their own mood to provide answers without the researcher’s presence consideration.

4. Results and Discussion

4.1. Learners’ Use of English language as a Medium of Instruction

Table 4. 1 The first objective determined the use of English language as Medium of Instruction.

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		N	Total Mean	sdv
	N	%	N	%	N	%	N	%	N	%			
I Like Studying in English Language	0.4	6.1	13	4.9	30	11.3	63	23.7	159	59.8	266	3.54	1.32
English Language Is an Easy Language for Me	48	18.0	60	22.6	47	17.7	73	27.4	38	14.3	266	3.75	1.38
There Is a Lack of Enough English Language Teaching Aids in Our School	43	16.2	57	21.4	53	19.9	63	23.7	50	18.8	266	3.71	1.33
I Fear to Speak English in front of Many People	18.8	2.6	40	15.0	66	24.8	76	28.6	34	12.8	266	3.90	1.27

Source: Primary Data (2022)

The analysis of data about the statement “I like studying in English language” showed that one hundred and fifty-nine (59.8%) of the learners who responded said that they do like studying in English language; they strongly agreed to that statement and sixty-three (23.7%) respondents agreed. On the other side, some of the respondents did not agree on that point. As the figures presented in the table above show it, thirteen (4.9%) disagreed and only one (0.4%) respondent strongly disagreed.

The paper revealed that Seventy-three (27.4%) of the respondents agreed and thirty-eight (14.3%) strongly agreed. Forty-seven (17.7%) learners said that they were not sure of that statement. On the other side, sixty (22.6%) respondents disagreed while other forty-eight (18%) strongly disagreed. On the side of teachers, the majority of the respondents agreed that they don’t get chance to practice English language. In the table above, fourteen (51.9%) respondents agreed and one (3.7%) of them disagreed. Among those respondents, four (14.8%) of them were not sure. On the opposite side, six (22.2%) respondents disagreed and other two (7.4%) strongly disagreed. The findings in the table 4.5 show that fifty (18.8%) learners who responded said they strongly agree that there is a lack of enough teaching aids in English language. Sixty-three (23.7%) among the respondents agreed, fifty-three (19.9%) respondents said that they were not sure while fifty-seven (21.4%) disagreed and even forty-three (16.2%) of them strongly disagreed. The paper show that thirty-four (12.8%) respondents strongly agreed while seventy-six (28.6%) respondents agreed. On the other hand, forty (15%) respondents did not agree, even fifty (18.8%) of them strongly disagreed. Other sixty-six (18.8%) were not sure of that statement.

4.2. Level of Learners’ Academic performance in English Subject

Table 4. 2 I like Studying English Subject

I like Studying English Subject	Frequency	Percent
Strongly Agree	168	63.2
Agree	85	32.0
Not Sure	11	4.1
Disagree	2	.8

Total	266	100.0
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Source: Field data (2022)

Relating this to the findings in this study, the table above shows that the learners like studying English as a subject. One hundred and sixty-eight (63.2%) respondents strongly agreed that they like studying English subject. On the other hand, eighty-five (32%) respondents agreed on the same statement. Eleven (4.1%) learners who responded to the questionnaire were not sure and only two (0.8%) learners disagreed. Therefore, the findings proved that the learners in secondary day schools like English as a subject despite the difficulties they encounter in the process of learning that subject such as lack of enough teaching aids and well trained teachers in that language.

Table 4. 3 In English subject evaluations I normally get the marks between:

Marks	Frequency	Percent
0-20	61	22.9
21-40	83	31.2
41-60	76	28.6
61-80	32	12.0
81-100	14	5.3
Total	266	100.0

Source: Field data (2022)

The findings show clearly that the performance of the learners in English subject is still poor. The majority are getting below fifty per cent in evaluations' results. In the table above, sixty-one respondents (22.9%) get between 0-20 marks in English subject evaluations. Eight three of the respondents (31.2%) fall under the category of those who score between 21-40 marks while seventy-six of those respondents (28.6%) score between 41-60 marks. On the other hand, some learners are trying to get higher marks in their performance. Thirty-two respondents (12%) get between 61-80 marks and fourteen of those respondents (5.3%) can score between 81-100 marks in the evaluations. There are some of reasons of poor performance in English subject as they were given by learners: they said that some English subject teachers are not competent, they meet challenges while teaching.

Table 4. 4 When I read English texts, I understand well the content

When I read English texts, I understand well the content	Frequency	Percent
Strongly Agree	38	14.3
Agree	68	25.6
Not Sure	59	22.2
Disagree	90	33.8
Strongly Disagree	11	4.1
Total	266	100.0

Source: Field Data (2022)

The paper show clearly that the majority of learners are not able to understand the contents of the English texts. Ninety respondents (33.8%) went against that they can understand what they read in English, even eleven of the respondents (4.1%) strongly disagreed.

4.3. Relationship Between English Language as a Medium of Instruction and Learner's Academic Performance

The third objective established the relationship between English Language as a Medium of Instruction and Learner's Academic Performance in Secondary Day Schools of Ruhango District, Rwanda. In this regards a correlation and regression analysis were performed in order to evaluate either a positive or a negative correlation between dependent and independent variables. The establishment of a correlation analysis between English Language as a Medium of Instruction and Learner's Academic Performance in Secondary Day Schools has based on the improved learner's proficiency in the use of English language, improvement in the classroom work commitment, improved scores in English subject and Learner's interest in reading and writing in English language in the previous five years.

Table 4. 5 Coefficients of Between English Language as a Medium of Instruction and Learner's Academic Performance

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	.047	.074		.641	.523
Learner's use of English as medium of instruction	.059	.053	.088	1.121	.263
Teacher's use of English as medium of instruction	.089	.043	.103	2.072	.001
Teacher's and learner's practice of English language outside the school compound	.514	.052	.515	9.820	.000
Learner's use of English as medium of instruction	.361	.039	.441	9.257	.000

a. Dependent Variable: Learner's academic performance

Source: Primary Data (2022)

Information demonstrated that English as a Medium of Instruction was associated with improve impact on Learner's academic performance. The regression analysis demonstrated was a positive significance correlation between English as a Medium of instruction and learner's academic performance owing to all determined p value were than 0.05 each. Coefficients gave regression model, $Y=B_0+B_1X_1+B_2X_2+B_3X_3+B_4X_4+E$. This become $.047+0.88X_1+.089X_2+.514X_3+.361X_4$, English as a medium of instruction. In another context, population plays a significant and role of English as a medium of instruction and their Learner's academic performance (Mouhamad, 2016). This study not only looked at learner's use of English as medium of instruction but how teacher use English as medium of instruction and how learners practice English language outside the school compound.

5. Discussion

Results to the first objective concur with the findings of Yule (2010) mentions that most of us are not exposed to a second language until much later and our ability to use a second language even after years of study rarely matches ability in first language. Sibomana (2014), observes that while the teaching of English language has been improved and several factors appear to increase Rwandan people's motivation to learn English, the context is not yet favourable to the attainment of communicative competence. Therefore, we can say that English language as one of the official languages in Rwanda is not difficult to learn and use for the learners in secondary day schools in Rwanda. It is just a matter of interest and motivation to them in the process of learning it.

These findings can be related to the ones of Tabaro (2015) who revealed that although English has been taught as a subject for more than twenty years and efforts were made to enhance its use, the proficiency in English language has been found wanting by many Rwandan people. English hardly finds its way in Rwandans daily communication. Shortly, the use of medium of instruction did not work successfully because Rwandan community is monolingual where Kinyarwanda dominates all other languages used in Rwanda.

These findings are closely related to what Nizeyimana et al. (2020) mention in their research. They say that in Rwanda, most of learners in public day schools are from poor families where there a shortage of the required school materials in their learning process. Such materials include the textbooks. In other term, the English language teaching materials such as textbooks are still few in Rwandan secondary day schools. The quantity of those teaching materials and the number of the learners who use them are incomparable. Besides, some teaching aids, especially the textbooks are old and they need to be replaced. If those teaching materials were provided in a good quantity, learners would improve on their academic performance.

Tabaro (2015) argues that the use of medium of instruction did not work successfully simply because Rwandan community is purely monolingual whereby Kinyarwanda is spoken across the country. In other words, learners fear to speak English language in public due to the lack of enough practice and exposure to the use of that language. Of course, the lack of practice and exposure affects the academic performance of the learners since they don't speak it frequently in order to discover and correct their mistakes.

Results on the level of Learners' performance in English Subject did not contradict the observation of Fareen (2020) mentions that a medium of instruction plays an essential role in knowledge and skills transfer to the learner. The teacher should talk or teach in consideration of the learner's level of comprehension and the learner should be able to understand what his/her teacher is saying while teaching. Fareen (2019) argues that if language is source to deliver the thoughts and ideas, communication is the process to engage the speaker and listener to employ the act of sending and receiving the message or any other information. Language becomes the soul and spirit of expression. Therefore, to build up necessary skills in active language learning is important for creating the cognitive ability of learners. Yule (2010) suggests that the second language should be taught systematically so that learners can gradually transfer skills from the familiar language to the unfamiliar one. When the learners are able to express themselves, teachers can easily diagnose what has been learned and what remains to be taught. As a solution, more effort is needed to help the learners to raise up their level of understanding the subject contents in English language especially in creating motivation to them and helping them to improve on the vocabulary and grammar.

Results on the relationship Between English Language as a Medium of Instruction and learner's Academic Performance demonstrated the existence of positive correlation between English as a Medium of Instruction and Learner's academic performance owing to the fact the determined the p value of .000 was < 0.05 which implies that English as a Medium of Instruction and Learner's academic performance is significant. Laxmi (2018) felt that the lack of English language proficiency of the teachers is the biggest challenge community schools are facing to implement English as medium of instruction. Most of the teachers in community schools have never studied in English and were not trained to teach in English. Relating this study to the case of Rwandan education, most of teachers are still struggling to teach in English because they find it as new language in Rwanda.

6. Conclusion

After analyzing the findings, the researcher concluded that there is a considerable improvement in the use of English in Rwandan society. Particularly, the research findings have shown that the learners' and teachers' proficiency in the use of English language as medium of instruction is still growing up gradually. The majority of learners and even their teachers are interested and committed to use English language in the academic activities. 59.8% of the learners expressed that they like studying in English while 74.1% of teachers agreed that English is an easy language for them. Although the results showed that there is a positive step in the use of English language, there are some challenges that hinder the use of English language to go at high speed. Those challenges were expressed by some respondents and included: Rwanda is a monolingual community; citizens are more comfortable when they use their mother tongue as a common language of communication. The teaching aids that are prepared in English language in secondary day schools here in Rwanda are still limited; they are not enough at all. Therefore, they fear to use that language in public places because of not being sure and confident of their pronunciation and vocabulary.

The Ministry of Education should organize some programs which can motivate the learners such as English reading, speaking, listening, writing and singing, competitions. It will also be helpful if some language centers are created in a good number in order to assist those who want to learn English language. Furthermore, some games prepared in English language could help the learners to improve their exposure to English language.

The learners' performance in English subject is yet to be improved. Therefore, the teachers concerned in this subject should make more effort to help their learners to increase the level of performance. With this regard, learners need qualified and competent

teachers in English language, enough and updated teaching aids prepared in English language as medium of instruction. In the findings the majority of teachers expressed that they need more training in the use of English language. They still have some difficulties to express themselves in that language although they use it as a medium of instruction.

References

- Fareen, J. (2020). English Language Use and Usage in Formal and Social Contexts- A Critical Review. *UGC Care Journal*, 43 (03), 163-171
- Laxmi, P., O. (2018). Shifting of Medium of Instruction to English in Community Schools: Policies, Practices and Challenges in Nepal. Retrieved on 18 March 2019 from
- Mouhamad, M. (2016). *English as a Medium of Instruction in Tertiary Education Setting of the UAE: The Perspectives of Content Teachers*. University of Exeter Ed. D in TESOL Thesis
- Nzanana, J., B. (2016). *Language Learning Motivation and Oral Proficiency in Learners of English as a Foreign Language: the case of University Students in Rwanda*. Kigali- Rwanda
- Rwanda Education Board [REB], (2016). *Competence Based Curriculum*. Kigali-Rwanda
- Sibomana, E. (2014). The language of English as a second language in Rwanda: challenges and promises. *Rwandan Journal of Education*, 2(2), 19-28.
- Tabaro, C. (2015). Rwandans' Motivation to Learn and Use English as Medium of Instruction. *International Journal of Humanities and Social Science* 5(2), 78-84.
- Wilson, J, (2010). *Essentials of business research: A guide to doing your research project*. SAGE Publication.
- Yule, G. (2010). *The Study of Language (Fourth Edition)*. Cambridge University: New York

Project Communication Management And Performance Of Selected Non-Governmental Organization Projects In Kigali Rwanda

A Case of Profifa Project

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Abstract

The purpose of this study was to examine the role of communication management on Performance of selected Non-Governmental Organization Projects in Kigali Rwanda using a case of Promotion for financial inclusion for smallholder farmer's project. The specific objectives were to assess the effect of communication plan, communication implementation and communication control on project Performance. This study allowed to put into practice and to enrich knowledge acquired in project management. Scholars and researchers found this study as useful source of reference material for future studies on a related field or subject. This study used theory of change, and social information processing theory of communication. The study used a descriptive research design with a correlation regression effect with both qualitative and quantitative approaches. The population of this study was 1238 of smallholders and 10 project team members; the researcher selected a sample size of 302 respondents using both purposive and simple random sampling techniques. Both questionnaire and interview guide were used to collect information from respondents and key informants. The researcher generated descriptive statistics and inferential statistics to establish correlation and regression analysis. Results to the first objective felt that the most commonly adopted communication plan parameters were plan of content of the communication (81.3%), and the frequency of information needed was adequately designed (71.8%). Correlational results show a significant correlation between the plan of frequency of information needed and timely delivered to beneficiaries ($r=0.206$; $p\text{-value}=0.000$). The study felt that the design of frequency of information needed is significantly affecting the timely delivered of PROFIFA project to beneficiaries ($b=0.199$; $p\text{-value}=0.001$). Results to the second objective revealed that the most commonly used communication implementation approaches were the nonverbal communication (86.3%), sharing and distributing information (75.5%). The study show that written communication is significantly correlated with quality of services ($r=0.122^*$; $p\text{-value}=0.035$), nonverbal communication is correlated with quality of services ($r=0.123^*$; $p\text{-value}=0.034$). Written communication is affecting the quality of services ($b=0.140$; $p\text{-value}=0.016$), and nonverbal communication is affecting the quality of services ($b=0.138$; $p\text{-value}=0.019$). Results to the third objectives revealed that the most commonly used parameters for communication control were verification of procedure efficiency (69.1%), and establishment of corrective measures (68.4%). Correlation results demonstrated significant correlations between corrective measures and timely delivered of services to beneficiaries ($r=0.105$, $p\text{-value}=0.071$). A regression analysis found significant effect between corrective measures and project timely delivered to beneficiaries ($b=0.115$; $p\text{-value}=0.049$). The study concludes that effective communication practice greatly impacted the performance of PROFIFA project in Nyamagabe District, Rwanda. The study recommends that managers to come up with the best communication model. Managers should ensure that decisions made rely on input of all members.

Keywords: *Project Communication Management, Communication Plan, Communication implementation, Communication Control, Quality Delivery, Timely delivery.*

1. Introduction

A project can make use of countless research, statistics, and methodologies but without proper communication, most things have fallen apart, it is why the purpose of this study was to examine how communication affects project performance by using PROFIFA as a case study. PROFIFA aimed to link small-scale farmers to the financial sector so they can have access to credit. Joslin and Müller (2015) mention that communication continues being the main reason for the failure of many projects, a lack of communication is a major red flag in all companies, businesses, and organizations.

Communication is the heart of implemented projects of the construction industry, where project managers consume 90% of their time communicating with project participants. According to the Project Management Institute, the lack of communication leads to project failures over 30% of the time in such a sense, it is also very important to examine the role of communication in Project Performance in farmer financial inclusion projects to increase the level of communication. Limited published data was available on the role of communication in farmer's projects; it is a great significance to carry out this research project to add information to the gap in literature exists.

For the accomplishment, the researcher will always use each finding to lead him to something else. This study seeks to examine the role of project communication management on performance of non-governmental organization project.

The research objectives were:

- (i) To establish the effect of communication plan on the performance of PROFIFA project;
- (ii) To ascertain the effect communication implementation on the performance of PROFIFA project;
- (iii) To determine effect of communication control on performance of PROFIFA project.

2. Review of Literature

Cheung et al. (2013) assessed the role of liaison with project manager's skills in managing time scheduling and project quality outcomes. They used regression analysis to show the relationship between communication skills and to manage project performance. The study findings figured out that communication skills were critical to the success of project in maintaining quality of results and timely delivery. Results also set off project companies to the profits of project managers in enhancing their communication skills. The study concluded that communication plays a major role in completing project tasks on time. As results, project communication also affects the quality of the project.

A study carried out by Joslin and Müller (2015) on project communication, personal commitment, social networks, and perceived performance of the project. The study used a correlational research design on a sample of 345 respondents. The results of the study show that there are notable positive associations between project communication, distinguished performance of the project, personal commitment and social networks. Effective project communication, social networks and personal commitment have led to the conclusion that conditions and social networks for better performance of citizenship schemes in commercial banks in Uganda.

A study done communication management plan by Saunders, et al., (2012). The study used a descriptive research design and theoretical framework suggests using the following sources of information for this purpose: lessons learned information, organizational chart, external needs, and interviews with stakeholders, stakeholders' analysis. The results evidence that most used appeared to be meetings with stakeholders and lessons learned information. However, some of respondents use only one or two sources, what does not give the full picture of stakeholders' needs, thus may cause misunderstanding and lower communication effectiveness. Moreover, some managers do not define stakeholders' requirements at all, what is contradicting the theoretical approach.

According to Zulch (2014), a communications plan should be set up as early as possible in the definition phase and adequately maintained throughout the M-P. Amongst the objectives of the communication plan are to Cheung, et al., (2013). Raise awareness of the benefits and impact of the business blueprint; keep all staff in the target business areas informed of progress prior to, during and after implementation; gain commitment from staff in the target business area to the changes being introduced.

A study of Kernbach (2015) on communication skills are the most major skill since project managers are constantly involved in formal or informal communication at each stage of the project. The study established that construction project managers spent 76 % of their time on the project communicating verbally. The study indicated that listening is considered as an important component of a project manager's communication skills. It also indicated that to build a good network of communication, the project manager needed to create trust and understanding of relationships with project team members.

A study of Goetsch and Stanley (2014) on project managers play an important role in gathering and disseminating relevant information to the relevant parties. Therefore, the communication skills of the project manager will affect the project performance in a timely manner and in a quality period. It recommends that that managers update team members on their role requirements and update their stakeholders on progress. Furthermore, good project managers are people develop relevant competencies to adequately satisfy requests from both parties.

Electronic communication was ranked the highest as effective communication method. The communication method ranked second is written communication with oral communication ranked third. Visual communication is ranked fourth and nonverbal communication is ranked fifth as effective communication method. Electronic and written communications are the most effective communication methods to use. The two methods both imply a written format, because a fax and email,

although sent electronically, is written (Kiradoo,2017). The deduction can thus be make that written communication is the most effective communication method the project manager can use during the execution of a project and that oral communication is the second most effective communication method to use.

A study of Kiradoo (2017) on phase of the project, details related to the project objectives, priorities, customer needs, issues, details and more are needed to make a complete development of trustworthy and trustworthy (Joslin & Ralf, 2015). The study demonstrated that communication provides more than just data transfer”. It provides an opportunity for various project teams within the program to voice their concerns and concerns. Research suggests that when people are free to learn from others, their relationships can be strengthened and effective communication within the program management team can be seen as a sign of readiness and trust within the program management team.

Garbharran et al. (2012) emphasize that consideration for the transfer instructions are part of the communication, so the project perspective needs to be constantly updated and shared as the project progresses. A common topic in studies on communication, which is one of the competencies of the project manager, is the process of transferring in-formation to project stakeholders and planning is based on different and distinct requests (Pinto and Pinto, 1990). In their research, they emphasize the necessary networks and information, the transfer of in- formation and the amount of information that must flow among team members.

A study of Kiradoo (2017) on effective communication is one of the main elements of project management, and therefore it is necessary to be constantly engaged with communication. The study findings show that the need a lot of time and resources to implement. Therefore, project managers are responsible for projects. Project managers spend at least 80–90% of their time communicating on projects Olsson (2011). By the use of communication skills, project managers help to plan, direct, control, and coordinate their operations throughout the project life cycle. Most of the communication activities of project managers involve interpersonal communication and project communications, sharing information with project team members, and other stakeholders (Bilczynska, 2014)..

3. Materials and Methods

This study used a descriptive design by using the quantitative approach through the interviews or the questionnaires distributed to the respondents from the sample population. The target group consists of interest groups (small farmers) and a project team supported by Care International Rwanda. In this regards, Care international has implemented PROFIFA project in five Districts (Huye, Nyamagabe, Rulindo, Gakenke, Gicumbi, Bugesera, Gatsibo, Kayonza). The sample size of 293 was calculated by the following formula.

Eq (1):

$$n = \frac{N}{1+N(e)^2}$$

When

Where, N= Target Population 1238; Precision error = 5 %(0.05). Mathematically, the sample was obtained in the following ways: With N=1238 employees; e=5%; considering the confidence levels of 95%; n is equal of 302 employees grouped in 3 levels. As the researcher calculated in the above formula the sample size of project beneficiaries in the study. Therefore, was 302 beneficiaries from different district of Rwanda, the overall sample size of the study was summarized as follows.

The questionnaire was composed of the closed-ended questions provided for each category of respondents. This type of data collection instrument was chosen by the researcher because it helps to reach a large number of respondents in a good rang of time. It helped to give the reliable data simply because the respondents feel free, in their own mood to provide answers without the researcher’s presence consideration.

4. Results and Discussion

The study findings on project communication management and performance of non-governmental organization projects in Rwanda with reference to PROFIFA project was analyzed according to research variables and specific objectives of the study. The study variables (indicators) were communication plan, communication implementation and communication control. The specific objectives were: to establish the effect of communication plan on the performance of PROFIFA project; to ascertain the effect communication implementation on the performance of PROFIFA project; and to determine the effect of communication control on performance of PROFIFA project.

Table 4. 1 Descriptive Analysis of Level of Performance of PROFIFA Project

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	Mean	Std
	N	%	N	%	N	%	N	%	N	%			
Quality of services	42	14.1	79	26.5	11	3.7	79	25.5	87	29.2	298	3.3020	1.475
Timely delivery	21	7.0	27	9.1	9	3.0	79	37.2	87	43.6	298	4.0134	1.2115
Cost Efficiency and Effectiveness	19	4.4	44	14.8	14	4.7	118	39.6	103	34.6	298	3.8121	1.2356

Source: Primary data (2022)

The study demonstrated that that 79(26.5%) and 87 (29.2%) respectively agreed and strongly agreed with an increase of quality of services offered by PROFIFA Project. This reflects a mean of 3.3020 and a standard deviation of 1.475. Additionally, PROFIFA project was timely delivered to beneficiaries as well as 111(37.2%) agreed with the statement, while 130 (43.6%) respondent strongly agreed the statement. In this vein, the mean of responses was 4.0134 and the standard deviation was 1.21154. Finally, the cost allocated to PROFIFA Project was efficient and effectively used as confirmed by respondents. In this context, 118(39.6%) respondents agreed while 103(34.6%) respondents strongly agreed with a mean of 3.8121 and a standard deviation of 1.23566. The project manager in Nyamagabe argues, “in this district, we have attempted to give cows our partners in development in all sectors of the district where small farmer households received funds and other support.” This leads to an increase of their living conditions and level of agricultural production.

4.2. Effect of Planning of Project Communication on Performance of PROFIFA Project

Table 4. 2 Planning of Project Communication

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total		
	N	%	N	%	N	%	N	%	N	%	N	Mean	Std
Content of the communication	18	6.0	36	12.1	2	2.7	128	43.0	114	38.2	298	3.9530	1.1910
Information Frequency	32	10.7	50	16.8	13	4.4	91	30.5	112	37.6	298	3.6745	1.3991
Responsibility for information delivery	32	10.7	72	24.2	12	4.0	102	34.2	80	26.8	298	3.4228	1.3838
Risk of description	44	14.0	25	8.4	7	2.3	101	33.9	121	40.6	289	3.7718	1.4313

Source: Primary Data (2022)

A descriptive analysis of planning of project communication at PROFIFA presented in Table 4.5 evidenced that 128(43.0%) respondents agreed, and 114(38.3%) strongly agreed that the content of the communication in PROFIFA was planned. In this regards, the mean of 3.9530 and standard deviation was 1.19108. Furthermore, 91(34.2%) and 112(37.6%) respondents respectively agreed and strongly agreed that the frequency of information needed was adequately designed. The mean of responses was 3.6745 while the standard deviation was 1.39917. However, the responsibility for information delivery was defined and planned for the PROFIFA as 102 (34.2%) agreed, and 112(34.2%) strongly agreed with the statement. It implies that mean of response was 3.4228 and the standard deviation was 1.38380. Finally, 102(34.2%) respondents strongly agreed and 112(34.2 %%) respondents strongly agreed that the risks were described

Table 4.3 Correlation between Planning of Project Communication and Performance of PROFIFA Project

	Pearson Correlation	Sig. (2-tailed)	N	Frequency of the information needed	Responsibility for information delivery	Risk of description	Quality	Time	Cost
Content of the communication	1		298						
Frequency of information needed	.045	.435	298	1					
Responsibility for information delivery	.006	.918	298	.115*	1				
Risk of description	.031	.151**		.076	.076	1			

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	Sig. (2-tailed)	.591	.009	.190				
	N	298	298	298	298			
Quality	Pearson Correlation	.003	-.022	.028	.039	1		
	Sig. (2-tailed)	.953	.701	.629	.502			
	N	298	298	298	298	298		
Timely	Pearson Correlation	.035	.206**	.060	.068	.050	1	
	Sig. (2-tailed)	.542	.000	.305	.241	.385		
	N	298	298	298	298	298	298	
Cost	Pearson Correlation	.013	.047	.009	.011	.005	.023	1
	Sig. (2-tailed)	.825	.417	.874	.850	.926	.692	
	N	298	298	298	298	298	298	298

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data (2022)

Findings show insignificant relationship between content of communication plan for PROFIFA project quality (r=.003; p value=0.953); the planning of communication content of PROFIFA and project time was not correlated (r=.003; p value=.542); the planning of communication content in PROFIFA insignificantly correlated with project cost (.013; p-value=.825). Correlation analysis between the adequate design of frequency of information need and performance of PROFIFA project show that the plan of frequency of information needed is insignificantly correlated with project quality (r=.022; p-value=.701); with project cost (r=-.047; p value=.417). There were insignificantly correlated with an increase of project quality, project cost given the p value was >0.005 suggesting that increase in planning the frequency of information needed by the project did not lead automatically to project quality, and project cost. Contrary to the significant correlation between the plan of frequency of information needed and project time (r=.206; p-value=.000). This was statistically correlated given the p value was <0.005 proposing that increase in planning the frequency of information needed by the project has led to a project time.

Results on the correlation between responsibility plan and performance of PROFIFA project felt that responsibility plan for information delivery for the PROFIFA was not significantly correlated with quality of PROFIFA project (r=.028; p-value=.629). In addition, responsibility plan for information delivery for the PROFIFA was not significantly correlated with time (r=.060; p value=.305). Finally, responsibility for information delivery for the PROFIFA was not significantly correlated with efficiency and cost of PROFIFA Project (r=.009; p-value=.874). These correlations were statistically not significant given that the p value was <0.05 implying that a change of responsibility plan for information did not affect performance of PROFIFA project.

4.3 Effect of Implementation of Project Communication on Performance of PROFIFA Project

The study second specific research objective was to ascertain the effect communication implementation on the performance of PROFIFA project. The research started the analysis of this objective by providing descriptive statistics on how PROFIFA implements project communication. The implementation of project communication was analysed using verbal communication, written communication, non-verbal communication, sharing and distributing information. Results are presented in Table 4.10.

Table 4.4 Implementation of Project Communication

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total N	Mean	Std
	N	%	N	%	N	%	N	%	N	%			
Verbal communication	50	16.8	40	13.4	10	3.4	83	27.9	115	38.6	298	3.5805	1.51598
Written communication	25	8.4	38	12.8	12	4.0	142	47.7	81	27.2	298	3.7248	1.22740
Nonverbal communication	54	18.1	64	21.5	12	4.0	108	36.2	60	20.1	298	3.1879	1.44189

Sharing and distributing information	30	10.1	39	13.1	4	1.3	103	34.6	122	40.9	298	3.8322	1.35290
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Source: Primary Data (2022)

The study findings analysed in Table 4.4 provide data on how PROFIFA has implemented the project communication in Nyamagabe District. In this regard, the study indicated that 83(27.9%) respondents agreed while 115(38.6%) strongly agreed that PROFIFA has implemented the verbal communication in delivering services. This led to a mean of response of 3.5805 and a standard deviation of 1.51598. Furthermore, nonverbal communication was adopted to implement PROFIFA project as agreed by 142 (47.7%) respondents and strongly agreed by 115(38.6%) respondents with a mean of 3.7248 and standard deviation of 1.22740.

However, the written communication was also important in implementing project communication. This was demonstrated by an agreement from 108(36.2%) respondents and a strongly agreement from 60(20.1%) respondents with a mean of 3.1879 and standard deviation of 1.44189. Finally, the study demonstrated that 103(34.6%) respondents agreed, 122(40.9%) respondents strongly agreed that sharing and distributing information applied during the implementation of project communication, the above considerations led to the mean of 3.8322, and standard deviation of 1.35290. Qualitative data was relevant with evidences from interview held with project manager of PROFIFA project in Nyamagabe District in the City of Kigali, Rwanda. The manager focuses “the importance of project implementation communication in enhancing the level of success in PROFIFA project in Nyamagabe District”

4.4 Effect of Control of Project Communication on Performance of PROFIFA Project

The third research specific objective was to determine the effect of communication control on performance of PROFIFA project in Nyamagabe District. The parameters of communication control assessed were verification of procedure efficiency, verification of communication tools, an establishing corrective measures, and reporting data.

Table 4.5 Project Communication

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total N	Mean	Std
	N	%	N	%	N	%	N	%	N	%			
Verification of procedure efficiency	12	4.0	63	21.1	17	5.7	105	33.9	105	35.2	298	3.7517	1.24941
Verification of communication tools	44	14.8	57	19.1	6	2.0	76	25.5	115	38.6	298	3.5403	1.51537
Establishing corrective measures	20	6.7	60	20.1	14	4.7	110	36.9	94	31.5	298	3.6644	1.29027
Reporting data	14	4.7	73	24.5	11	3.7	109	36.6	91	30.5	298	3.6376	1.27242

Source: Primary Data (2022)

Results in Table 4.5 felt that the verification of procedure efficiency was used as agreed by 105(33.9%) and strongly agreed by 105(35.2%) respondents with a mean of 3.7517 and standard deviation of 0.2494. Results on whether the verification of communication tools was adopted in PROFIFA project was agreed by 76 (25.5%) and strongly agreed by 115(38.6%) with a mean of 3.5403 and standard deviation of 1.51537. It was demonstrated that 110(36.9%) agreed while 94(31.5%) strongly agreed that there was an establishment of corrective measures (agree=110, 36.9; strongly agree=94; 31.5) with a mean of with a mean of 3.6644 and standard deviation of 1.29027. Whether data was timely reported, 109 (36.6%) respondents and 91(30.5%) strongly agreed with a mean of 3.6376 and standard deviation of 1.27242. This was accepted when interview with the agronomist.

Table 4.6 Correlation between Control of Project Communication and Project

Performance of PROFIFA

		Verification of procedure	Verification of communication tools	Establishment of corrective measures	Reporting data	Quality	Time	Cost
Verification of procedure	of Pearson Correlation	1						
	Sig. (2-tailed)							
	N	298						
Verification of communication tools	of Pearson Correlation	-.020	1					
	Sig. (2-tailed)	.736						
	N	298	298					
Establishment of corrective measures	of Pearson Correlation	.123*	-.060	1				
	Sig. (2-tailed)	.034	.300					
	N	298	298	298				
Reporting data	Pearson Correlation	.113	.187**	-.007	1			
	Sig. (2-tailed)	.052	.001	.909				
	N	298	298	298	298			
Quality	Pearson Correlation	.052	.045	.080	.021	1		
	Sig. (2-tailed)	.373	.443	.169	.720			
	N	298	298	298	298	298		
Time	Pearson Correlation	.027	.085	.105	.045	.050	1	
	Sig. (2-tailed)	.646	.145	.071	.440	.385		
	N	298	298	298	298	298	298	
Cost	Pearson Correlation	.031	.041	.013	.037	.005	.023	1
	Sig. (2-tailed)	.597	.482	.822	.524	.926	.692	
	N	298	298	298	298	298	298	298

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary data (2022)

Results in Table 4.6 show insignificant negative correlations between project verification of procedure and quality ($r=0.052$, p -value= 0.373); project the verification of procedure efficiency and timely delivered to beneficiaries ($r=.027$, p -value= 0.646), project verification of procedure efficiency and efficient and effective use of cost allocated to PROFIFA Project ($r=0.031$, p value= 0.597). All correlations were insignificant given that the p value was > 0.05 proposing that an increase in project verification of procedure did not increase the quality of services, timely delivered, efficient and effective use of cost allocated and vice versa.

A negative and insignificant correlation was found between verification of communication tools in PROFIFA project and increase of quality of services offered by PROFIFA Project($r=0.045$, p value= 0.443). The verification of communication tools in PROFIFA Project is statistically insignificant with timely delivered to beneficiaries ($r=0.085$, p value= 0.145).The verification of communication tools was negatively insignificant with efficient and effective of cost allocated to PROFIFA project ($r=0.041$, p value= 0.482). All the correlations were statistically insignificant given that the p value was > 0.05 proposing that an increase in verification of communication tools in PROFIFA project did not increase quality of services, timely delivered, efficient and effective use of cost allocated and vice versa.

Furthermore, an establishment of corrective measures was insignificant with the quality of services offered by PROFIFA Project ($r=0.080$, $p\text{-value}=0.169$), and an establishment of corrective measures was insignificantly correlated with efficient and effective use of cost allocated to PROFIFA project ($r=0.013$, $p\text{-value}=0.822$). Finally, the study found a significant correlation between establishment of corrective measures and timely delivered of services to beneficiaries ($r=0.105$, $p\text{-value}=0.071$).

Insignificant correlation was found between timely report of information or data in PROFIFA project and quality of services ($r=0.021$; $p\text{ value}=0.720$), timely report data reported and timely delivered to beneficiaries ($r=0.045$; $p\text{-value}=0.440$), timely report of data and efficient and effective use of cost allocated ($r=0.037$; $p\text{-value}=0.524$). All the correlations were statistically insignificant given that the p value was > 0.05 proposing that an increase in timely report of information or data in PROFIFA project increase quality of services, timely delivered, efficient and effective use of cost allocated and vice versa.

5. Discussion

The findings from the first objective concurs with the work of Čulo and Skendrović (2010), where they reiterate that people who were responsible for effectively communicating each format of project information accurately and on time with the correct format. The study concurs with the findings of Cheung, et al.,(2013) where they assessed the role of liaison with project manager's skills in managing time scheduling and project quality outcomes. They used regression analysis to show the relationship between communication skills and to manage project performance. This sets off of project companies to the profits of project managers in enhancing their communication skills.

This study concurs of (Joslin & Müller, 2015) where they specified that project communication, personal commitment, social networks, and perceived performance of the project. The results of the study show that there are notable positive associations between project communication, distinguished performance of the project, personal commitment and social networks. The study did not contradict Mangal (2013) who argued that managed by respondent vary in the size and complexity, with budget range from up to 250,000 US dollars to over 10 million US dollars and number of stakeholders from up to 10 till over 100 people or groups, actively involved in the project. The study found the same results as Zulch (2014) felt that a communications plan should be set up as early as possible in the definition phase and adequately maintained throughout the M-P. The study second specific research objective was to ascertain the effect communication implementation on the performance of PROFIFA project. The research started the analysis of this objective by providing descriptive statistics on how PROFIFA implements project communication. Results are relevant with findings of Kernbach (2015), where in his study; he established that construction project managers spent 76% of their time on the project communicating verbally. This study did not contradict the findings of Goetsch and Stanley (2014) who suggest that the project managers play an important role in gathering and disseminating relevant information to the relevant parties. Therefore, the communication skills of the project manager will affect the project performance in a timely manner and in a quality period. This study is relevant with a research done on the communication is the process of acquiring all relevant information, interpreting this information and effectively disseminating the information to persons who might need it. Communication is of vital importance to everyone involved in, and influenced by projects (David, 2011).

The present research did not contradict the findings on managing a project requires constant selling and reselling of ideas, explaining the scope and methodologies of the project to diverse groups of people (Cromity, 2011). The third research specific objective was to determine the effect of communication control on performance of PROFIFA project in Nyamagabe District. The parameters of communication control assessed were verification of procedure efficiency, verification of communication tools, an establishing corrective measures, and reporting data. The present research did not contradict the findings of Kiradoo (2017) said communication provides more than just data transfer". It provides an opportunity for various project teams within the program to voice their concerns and concerns.

This study concurs with the findings of Perumal and Bakar (2011) since they acknowledged that applying appropriate systems helps individuals in organizations to effectively establish their internal and external communications within the organization. Communication has connected people in a secure community and produced useful tools for creating as well as exchanging documents for controlling effectiveness processes.

This study did not contradict the findings of Garbharran et al. (2012) emphasize that consideration for the transfer instructions are part of the communication, so the project perspective needs to be constantly updated and shared as the project progresses. A common topic in studies on communication, which is one of the competencies of the project manager, is the process of transferring information to project stakeholders and planning is based on different and distinct requests. The present research did not contradict the findings on project managers are responsible for projects. Project managers spend at least 80–90% of their time communicating on projects Olsson (2011). This study did not contradict the findings of Olsson (2011) where he specified that use of communication skills, project managers help to plan, direct, control, and coordinate their operations throughout the project life cycle. Most of the communication activities of project managers involve interpersonal communication and project communications, sharing information with project team members, and other stakeholders.

6. Conclusion

From analysis and discussion of information, it is undisputable specific objectives were deeply analyzed. The study variables were communication plan, communication implementation and communication control. The specific objectives were: to establish the effect of communication plan on the performance of PROFIFA project; to ascertain the effect communication implementation on the performance of PROFIFA project; and to determine the effect of communication control on performance of PROFIFA project.

To the first objective, the study concludes that in planning for communication of PFOFITA Project, Care International has adopted content plan, frequency of information needed, responsibility for information delivery, and description of risks for communication. In this vein, the most commonly adopted communication plan parameters were plan of content of the communication, and the frequency of information needed was adequately designed. Correlational results show a significant correlation between the plan of frequency of information needed and timely delivered to beneficiaries ($r=-0.206$; $p \text{ value}=0.000$). The study findings felt that the design of frequency of information needed is significantly affecting the timely delivered of PROFIFA project to beneficiaries ($b=-0.199$; $p \text{ value}=0.001$). It means that any change in communication plan affect the timely delivered of PROFIFA Project to beneficiaries.

To the second objective, the study concludes that in implementing PROFIFA project, the Care International used verbal communication, written communication, non-verbal communication, sharing and distributing information. However, the most commonly used communication implementation approaches were the nonverbal communication and sharing and distributing information. The correlational analysis for effect on written communication on quality of services timely delivery and efficient and effective use of cost allocated to project, demonstrated that written communication is statistically significant with an increase of quality of services offered by PROFIFA Project ($r=-0.122^*$; $p \text{ value}=0.035$). Results on nonverbal communication felt that it is significantly correlated with an increase of quality of services offered by PROFIFA project ($r=-0.123^*$; $p \text{ value}=0.034$). Regression analysis written communication is significantly affecting the quality of services offered by PROFIFA Project ($b=0.140$; $p \text{ value}=0.016$), and nonverbal communication is significantly affecting the quality of services offered by PROFIFA project ($b=-0.138$; $p \text{ value}=0.019$). Results felt that verbal communication is significantly affecting the Timely Delivered of PROFIFA project ($b=-0.038$; $p \text{ value}=-0.038$). The written communication affects significantly timely delivered of PROFIFA project ($b=0.140$; $p \text{ value}=0.016$), while nonverbal communication is significantly affecting the timely delivered of PROFIFA project ($b=-0.138$; $p \text{ value}=0.019$).

To the third objective, the study concludes that the most commonly used parameters for communication control were verification of procedure efficiency, and establishment of corrective measures. Correlation results demonstrated the significant correlation between establishment of corrective measures and timely delivered of services to beneficiaries ($r=-0.105$, $p \text{ value}=0.071$). A regression analysis found significant effect between establishment of corrective measures and timely delivered of PROFIFA project to beneficiaries ($b=-0.115$; $p \text{ value}=0.049$). Based on the study findings the study recommends an assumed communication-management improvement model for successful project delivery. The communication can be considered as the critical factors required in non-governmental organizational projects to enhance communication practice for project performance in Rwanda. It is recommended that project managers may use the study findings in the sense that communication is the foundation that supports the pillars and cornerstones for achieving the project objectives.

Project managers are expected to learn the communication theories and come up with the best communication model that is suitable for the context of communication. Future studies are needed to expand the sample size and look the internal and external communication in a wider sample. Theories in the areas of external communication is too limited in this study, further studies are important in the way to include more exploration of theories in the aspects of external communication.

References

- Bilczynska Wojcik, Aneta. (2014). *Communication management within virtual teams in global projects*. Dublin Business School.
- Cheung, S., Yiu, T., & Lam, M. (2013). Interweaving trust and communication with project performance. *Journal of Construction Engineering and Management*, 139(8), 941-950.
- Cromity, J. (2011). Fostering internal communication. *Journal of Pictoral*, 35 (4), 34-37.
- Culo, K., & Skendrovic, V. (2010). Communication management is critical for project success. *Informatol*, 43 (3), 228-235.
- David, G. (2011). Internal communication-essential component of crises management. *Journal of Media Research*, 2(10), 72-81.
- Goetsch, D. L., & Stanley, B. D. (2014). *Quality management for organizational excellence*. Upper Saddle River, NJ: Pearson.
- Joslin, R., & Müller, R. (2015). Relationships between a project management methodology and project success in different project governance contexts. *International Journal of Projects Management*, 33(1), 1377-1392.
- Kernbach, S., Eppler, M., & Bresciani, S. (2015). The use of visualization in the communication of business strategies: an experimental evaluation. *International Journal of Business Communication*, 52(2), 164-187.
- Kiradoo, G. (2017). The impact of communication in managing the Project Performance to ensure project success. *International Journal of Advanced Research in Engineering and Technology*, 8(6), 131-136.
- Mangal (2013). Successful Project Delivery in the Swaziland Construction Industry, pp. 19–21.

Olsson, B. J. (2011). Projects as communication system: Creating a culture of innovation and culture. *Journal of International System*, 31(1), 30-37.

Perumal and Bakar (2011) . A Guide to the Project Management Body of Knowledge: PMBOK Guide: Project Management Institute.

Pinto and Pinto (1990). *Effective communication* . Himalaya Publishing House.

Saunders, M. Senaratne, S., Ruwanpura, M. (2012). Communication in construction: a management perspective through case studies in Sri Lanka. *Architect. Eng. Des. Manag.* 12 (1),

Zulch, B. (2014). Leadership communication in project management. *Procedia-Social and Behavioral Sciences*, 119 (1), 172-181.

Changes in eating habits, physical activity, and its association with mental health status during COVID-19.

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Abstract- Context: The Novel Coronavirus (COVID-19) is spreading rapidly. The government efforts to break the chain have affected individual's physical and mental well-being. The lockdown led to restricted access to fresh fruits, vegetables and other essential items in India. Physical activity was also restricted in major parts of the country

Aims: The study aimed to see the effect of eating habits and physical activity changes on mental health status during this pandemic.

Settings and Design: A web-based cross-sectional survey

Methods and Material: A web-based cross-sectional survey was conducted using the snowball –sampling technique between 13 June-31st July, 2020 via sharing a link on social media platforms.. The score for mental health was calculated using the Healthcare Worker Exposure Response and Outcome- Daily experience index (HERO) scale.

Statistical analysis used: Multivariate logistic regression were used to examine the associations.

Results: A total of 1021 eligible responses were used for the final analysis. Males and females who reported more often eating snacks (OR- males-7.86, females 2.62), or eating unhealthy food (OR males- 3.88, females 2.50) or increased frequency of meals (OR males 2.60) or following sedentary life (OR males 3.19, females 2.57) were associated with poor mental health status. In contrast, males (OR 2.28) who reported eating fruits less often were associated with mental health status.

Conclusions: The COVID-19 pandemic has changed the eating habits and physical activity among the general population. The unhealthy eating factors and sedentary behaviours were associated with poor mental health. The study findings emphasis on urgent need in developing guidelines for healthy eating habits, physically active and mental health interventions during such pandemic outbreaks.

Index Terms- Mental Health, eating habits, Physical activity, COVID- 19, Pandemic, India

Key Messages - The COVID-19 pandemic has posed a significant threat to the overall health. The influence on both genders is different when viewed through the gender lens. Additionally, it

appears that psychological well-being is primarily affected among younger generation. Hence, a holistic approach to physical and mental health from social contextual, as well as policymakers is urgently required.

I. INTRODUCTION

The eating behaviour constantly changes and is dynamically connected to the alterations in the physical as well as psychological environment of the individual. A study conducted by Torres SJ, et al. showed that only 20% of people do not change feeding behaviours during stressful periods, while rest had shown change in caloric intake when stressed. ^[1] Physical inactivity is one of the most commonly neglected risk factor in mental health problems ^[2]. In a study conducted by Peluso MA et al., hypotheses that exercise may cause self-efficiency and social interaction which has benefice effects on mental health ^[3]. Evidence has shown that changes in physical activity and eating habits may also affect the psychological well-being ^[4]. The unmatched situation like COVID-19 pandemic has brought about significant changes in the eating habits and physical activity of people around the globe.

In light of the above, an online survey was conducted to understand the changes in eating habits, physical activity and mental health during COVID-19.

II. SUBJECTS AND METHODS:

A web-based cross-sectional survey was administered to obtain data using a snowball- a non-probability –sampling technique for recruiting the adult Indian population aged 18 years and above, during the COVID-19 pandemic. 'Research Electronic Data Capture, (RedCap) a secure web application for building and managing online surveys, and databases ^[5]. The survey link was shared on social media sites such as WhatsApp (57.1%), LinkedIn (9.6%), Facebook (5.3%) and, Instagram (1.6%). Healix website (2.4%) and email (3.3%) was also used to share the survey link. The link was active on the portals between 13th June to 31st July 2020. Online written consent was obtained from all the

participants before the initiation of the survey. A total 270 individuals were excluded from the study, out of them 141 surveys had missing values in the data, 3 reported other gender and remaining 126 mostly, duplicate email ids. .

The questionnaire included 32 questions with different sections such as demographic details, comorbidities, COVID-19 symptoms, mental health, eating habits, physical activity, and smoking and alcohol consumptions. The score for mental health was adapted from the Healthcare Worker Exposure Response and Outcome (HERO) – daily experience index scale was used to assess mental health status [6]. The score was categorized as ‘good mental health’ if the score was “zero to four” and ‘poor mental health’ if the score was “five to seven”. To capture the information on the eating habits and physical activity questions such as “I ate snacks since the last two months”, “I ate unhealthy (fat-rich/ oil-rich/ sugar-rich/ salt rich) food since last two months”, “I ate fruits since the last two months”, “The frequency of meals (Number of meals) increased since the last two months”, “Portion size of the meals increased since the last two months”, “I ate vegetables since the last two months”, “I was sedentary since the last two months”, “I exercised since the last two months” were asked. The response was recorded as “More often”, “Less often” or “No change”.

The locations from where the participants responded the survey, were clubbed into six geographic zones i.e. West zone (Maharashtra, Goa, Gujarat, and Rajasthan), East Zone (Bihar, Orissa and West Bengal), North Zone (Haryana, Jammu & Kashmir, Punjab, Uttaranchal, Uttar Pradesh, Chandigarh, and Delhi), South Zone (Tamil Nadu, Telangana, Kerala, Andhra Pradesh, and Karnataka), North-East zone (Assam, Manipur and Arunachal Pradesh) and Central zone (Madhya Pradesh and Chhattisgarh). For analysis purposes, these six zones were further

categorized into three zones namely, West Zone, Central Zone and all other zones.

Descriptive statistics were calculated for all variables. A categorical variable was compared by the Chi-squared test (χ^2 -test) and Fisher's exact test. All statistical analyses were performed and a two-tailed P value < 0.05 was considered statistically significant. In the logistic regression model, association of eating habits or physical activity with mental health adjusted by confounders like age, education, zones. The data were analysed using the Statistical Package for the Social Sciences (SPSS) v25.0.

III. RESULTS:

The territorial response to the survey spread over all Indian regions: 68.41% from the West zone, 16.8% from the Central zone, 7.6% from the North zone, 4.5% from the South zone, 1.9% from the East zone, and 0.48% from North-East zone. Females 45% and males 54.9% participated in the online survey.

Table 1 shows the logistic regression analysis of the association between socio-demographic factors and mental health status.

The results show that females in the age group of 18-25 years had 15 times higher odds of having poor mental health when compared to the females of 55 years and more. Similarly, females in the age group of 26-35 years (OR 8.31) and 36-45 years (OR 8.11) had eight times higher odds of poor mental health when compared to the females of 55 years and more. No such association were found in the males. As compared to west zone males and females, males in central zone (OR 2.46) and both males and females (OR males -2.47, females 2.02) from other combined zones had two times higher odds of poor mental health.

Socio-Demographic Factors		Mental Health status									
		Female					Male				
		No	Yes	AOR	95% C.I.		No	Yes	AOR	95% C.I.	
					Lower	Upper				Lower	Upper
Age	18-25	64	20	14.67*	1.87	115.19	37	9	2.11	0.71	6.26
	26-35	127	27	8.31*	1.09	63.44	160	14	0.77	0.29	2.01
	36-45	90	18	8.11*	1.04	63.28	166	21	1.10	0.44	2.74
	46-55	67	4	2.68	0.29	25.14	74	11	1.20	0.43	3.38
	55 years and more	40	1	Reference category			62	7	Reference category		
Education	Above graduate	258	50	1.40	0.75	2.59	262	30	0.77	0.43	1.37
	Below graduate	130	20	Reference category			237	31	Reference category		
Zone	Other combined zones	48	17	2.02*	1.04	3.92	70	14	2.47*	1.22	5.01
	Central Zone	61	7	0.81	.34	1.91	87	17	2.46*	1.27	4.79
	West Zone	278	46	Reference category			342	30	Reference category		

Note '**' indicated by statistically significant AOR values adjusted by age, education and zones

Table 2 shows the results of the logistic regression analyses of the association between eating habits, physical activity, and poor mental health adjusted by age, education, and

zones. In males who reported having snacks more often since last 2 months had 7.86 times higher odds and females had 2.73 times higher odds of having poor mental health when compared to those

who reported no change in the snack consumption since last two months. Similarly, males who reported having less often snacks since the last two months had 3.09 times higher odds and females had 2.31 times higher odds of having poor mental health than those who reported having no change. Males who ate unhealthy food since the last 2 months had 3.93 times odds and females had 2.72 times odds of having poor mental health than those who reported no change. Males who reported having fruits less often since last

two months had 2.26 times higher odds of having poor mental health than those who reported no change. Males who reported of more often-increased frequency of meals had 2.54 times higher odds of having poor mental health than those who reported no change. Being more often sedentary was reported by males had 3.33 times and females had 2.61 times higher odds of poor mental health than those who reported no change.

Table-2		Logistic regression analysis of association between eating habits and mental health status									
		Mental Health status									
		Female					Male				
		No	Yes	OR	95% C.I.		No	Yes	OR	95% C.I.	
Lower	Upper				Lower	Upper					
		Eating habits									
I ate snacks since last 2 months	More Often	129	30	2.73*	1.18	6.35	141	37	7.86*	2.92	21.14
	Less Often	146	31	2.31*	1.00	5.32	193	20	3.09*	1.12	8.55
	No change	106	8	Reference category			159	5	Reference category		
I ate unhealthy (fat rich/ oil rich/ sugar rich/ salt rich) food since last 2 months	More Often	65	23	2.72*	1.30	5.71	71	22	3.93*	1.76	8.78
	Less Often	186	28	1.03	0.53	2.00	214	24	1.37	0.70	2.70
	No change	134	17	Reference category			211	16	Reference category		
I ate fruits since last 2 months	More Often	185	21	0.74	0.36	1.52	190	29	1.92	0.89	4.12
	Less Often	96	33	1.95	0.99	3.87	138	21	2.26*	1.03	4.98
	No change	104	16	Reference category			167	12	Reference category		
Frequency of meals (Number of meals) increased since last 2 months	More Often	79	19	1.65	0.84	3.24	110	25	2.54*	1.25	5.17
	Less Often	91	17	0.99	0.52	1.91	140	15	1.29	0.62	2.67
	No change	214	34	Reference category			247	21	Reference category		
		Physical Activity									
I was sedentary since last 2 months	More Often	81	32	2.61*	1.35	5.03	80	23	3.30*	1.69	6.45
	Less Often	142	16	0.72	0.35	1.49	160	16	1.16	0.58	2.31
	No change	157	19	Reference category			254	23	Reference category		

Note- Logistic regression analysis adjusted by age, education, zones; '' indicated by statistically significant OR values*

IV. DISCUSSION

The past (SARS) and the current (COVID-19) pandemics have imposed significant health and economic challenges to the world [7]. India being the most populous country was profoundly impacted due to the COVID-19 pandemic. On January 30, 2020 the first case of COVID-19, infection was reported from India. Within a span of five -six months, the numbers reached to 395,048 laboratory-confirmed cases and 12,948 deaths by end of June 2020[8]. The rise in the rate and spread of infection called for the undivided attention of the governmental and non-governmental organizations to formulate action plans to halt the infection rate. This led to the formulation of certain norms such as the use of a facial mask, hand sanitation; prevent social gatherings, home quarantine, and partial or complete lockdown in the Nation

Demographics and mental health status

From prehistoric cultures to more civilised nations, gender roles have been culturally dictated [9]. Although more women from all age groups as well as different socioeconomic classes work outside the home, this does not relieve them of their domestic responsibilities or change their social status appreciably. Literature has shown that age as well as gender are the critical determinant of mental health status. The pattern of psychological distress seen in females is different from those seen among males. Both the genders communicate, deal with relationships, express their thoughts, and react to stress in different psychologically and physiologically ways, according to theories [9]. Similar to the literature, in the current study, the data showed that females had higher odds of poor mental health when compared to males. In addition, the association is seen in younger females when compared to older female participants of the study.

Eating habits and mental health during COVID-19 pandemic

Habits such as unhealthy diet, physical inactivity, alcohol intake and smoking are not only major contributors to the global burden of disease [10], but are also positively associated with adverse mental health outcomes [11]. The guidelines addressing the COVID-19 outbreak have highlighted the importance of maintaining a healthy nutritional status and being physically active [4]. In a meta-analysis done by Lai et al., showed that an increased intake of healthy diet (diet high in vegetables and fresh fruits, whole grains and fish) reduced the odds of mental health problem such as depression [12]. Knowing the fact that eating choice is impacted by mental health, addressing the mental health aspect during such pandemics is essential [13]. However, there is a gap in the literature for larger observational studies, which address the characteristics of behavior patterns such as dietary intake and physical activity during and after the outbreak of pandemic such as COVID-19[14]. A study conducted among the Chinese population after the outbreak recorded for an unhealthy lifestyle. The standard guidelines of five servings /day of fresh fruit and vegetable intake went as low as, less than five servings in a week. Reduced vegetable intake was reported by 30% and fruit intake was reported by 60% of the study participants [15].

The studies done in the European countries reported a 40% increase in the consumption of comfort foods [16]. A similar study conducted in India looked at the overall effect of COVID-19 on lifestyle behavior and reported that unhealthy eating

behavior increased from 64.1% in pre-COVID-19 times to 81.6% during the COVID-19 pandemic. The study also reported a considerable rise in the intake of junk food and fried food [17]. In the current study, the more-often intake of snacks were reported by 33.5% of the respondents. Further, the more often intake of snacks (18.8% females and 20.7% males) were associated with poor mental health. The comfort food snacking most often is loaded with empty calories and low nutrient quality. Evidence shows that individuals under stressful situations tend to increase snacking behaviour as a coping mechanism. Supplementary to these findings, advocacy of various methods to avert stress may be advisable to promote healthy and sustainable eating habits [18].

Scarmozzino F et.al. conducted a study in Northern Italy reported that sweet intake increased by 50% leading to rapid weight gain, which may be associated with poor mental health [19] Another study done in Mumbai, India reported that 50% of the survey respondents reported an increased number of meals consumed in the day. The study also reported that the portion size was large [20]. The eating habits underwent drastic changes because of pandemic led lockdown. It can be reasonably hypothesized that since during the lockdown all the meals were prepared and consumed at home and additionally the increased time spent at home may result in increased frequency of snacks and larger portion size of meals [20]. Similar findings were observed in the current study were, 23.0% of the respondents reported of the more-often increased frequency of meals. The more often increased frequency of meals (18.5% of males) were associated with poor mental health when compared to those who reported no change. Evidence has shown that during the lockdown although food intake increased, diet diversity and fresh fruits and vegetables, intake reduced rising concerns on the food quality and nutrient composition of the meals [21]. During the lockdown and unavailability of fresh fruits and vegetables, the vegetable intake reported was 11.4% in females and 13.9% in males. Additionally, a low fruit intake of 28.5% was reported among males and females in the current study. The low fruit intake was associated with poor mental health; this finding is consistent with previous studies [22].

Physical Activity and mental health during COVID-19

Daily physical activity can be regarded as an essential component in maintaining the physical and mental health of the individuals. "Exercise make you feel well", is a common conjecture often reported for the psychological effects of physical activity such as walking or other structured exercises[3].

Literature has shown a strong association between exercise and mental health. Clinical trials in the past have revealed that regular exercise can prove as a therapy for mental health issues such as depression and anxiety and the effect can be comparable to that of an anti-depressant [3]. A cross-sectional study done in the United Kingdom revealed that vigorous activity was positively associated with mental health even after adjusting for health , socioeconomic status and gender of the study population [23]. In the past during the SARS pandemic, a study conducted in Hong Kong showed that increased physical activity was positively associated with low levels of stress in the general population [24]. In a study done in India reported that 20% of the participants (21.2% females and 19.2% males) were physically inactive during the COVID-19 pandemic [25]. Similarly, in the current study, sedentary behavior was reported by 21.5% of the respondents. In

addition, poor mental health was associated (28.3% females and 22.3% males) with more often-sedentary behavior.

In the recent scientific literature, researchers have delineated to the effect of physical activity on mental health. A cohort study conducted by Dishmon et al., reported 20-33% lower odds of depression for a physically active group of individuals [26]. A recent cross-sectional analysis showed that physical inactivity could be strongly associated with depressive symptoms and metabolic syndrome [27]. A study conducted by Berk et al., concluded that the Lifestyle factors such as unhealthy eating, inactive lifestyle, smoking, and substance use contributed to an increased risk of a mental health problem such as depression, thus, encouraging healthy behavior has the potential to substantially reduce the burden of disease and improve overall health [28].

Evidence has shown that the psychological response to the virus outbreak may elevate the risk of dysfunctional eating behaviours like considering food as a reward and physiologically associating gratification as a response to the negative experience of self-isolation, mental health status and leading to increased body weight and obesity [29]. Thus, COVID-19 pandemic has surfaced the need of developing guidelines with scientific information and disseminating it to individuals and communities to maintain healthy eating habits and physical activity while in quarantine or restricted movements.

Determining a causal relationship between mental health and eating habits and physical activity might be a limitation due to the nature of the study. The study may not be a National representation of the data as the response were varied between the zones. Since the study was done via the use of social media, the sample could be only the reorientation of the population who use or have access to the social media sites and those who can read and write in the English language. Even though the results demonstrated that, the social demographic details of the study population can reprint the overall general population in India.

In conclusion, the poor mental health among the younger population from the current study may be a high alert for the appropriate action from the social, political and policy makers' point of view to address these issues among the younger population known as the future of the Nation. Further, if the poor eating habits are sustained in the period after the lockdown, they are likely to be responsible to accord multi-fold health issues for the mental and physical wellbeing of the population at large. The unhealthy eating habits clubbed with sedentary behaviour are commonly seen during the lockdown. We are currently at the crossroads with an end of one lockdown and a setting in of the other; therefore, changes in eating habits and physical activity are crucial to maintaining a healthy lifestyle. Further, the Nation needs to be ready to address the altered eating habits, physical inactivity leading to increased risk of Non-communicable disease including mental health problems following the pandemic. The trans-diagnostic approach can be applied to the healthy lifestyle, which would include the psychological as well as physical measures adapted to return to normal life and or adapt to the new normal post the pandemic. With the COVID-19 pandemic is still ongoing, our data can be confirmed and investigated in future larger population studies.

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REFERENCES

- [1] Torres SJ, Nowson CA. Relationship between stress, eating behavior, and obesity. *Nutrition*. 2007;23(11–12):887–94.
- [2] Callaghan PJ. Exercise: a neglected intervention in mental health care? *Psychiatr Ment Health Nurs*; 2004 Aug;11(4):476–83.
- [3] Peluso MAM, Guerra de Andrade LHS. Physical activity and mental health: the association between exercise and mood. *Clinics (Sao Paulo)*. 2005;60(1):61–70.
- [4] Sukhwani V, Deshkar S, Shaw R. COVID-19 Lockdown, Food Systems and Urban-Rural Partnership: Case of Nagpur, India. *Int J Environ Res Public Health*. 2020;17(16):3390 17165710.
- [5] PA Harris, R Taylor, R Thielke, J Payne, N Gonzalez, JG. Conde. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2).
- [6] URL: https://www.nlm.nih.gov/dr2/HERO_Daily_Impact_Index.pdf. March 30, 2020
- [7] Murhekar MV, Bhatnagar T, Selvaraju S.et.al. Prevalence of SARS-CoV-2 infection in India: Findings from the national serosurvey., *Indian J Med Res*. 152:476–83.
- [8] Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *Lancet*. 2020;365.
- [9] Malhotra S SR. Women and mental health in India: An overview. *Indian J Psychiatry*. 2015;57(Suppl 2):S205–11.
- [10] GBD 2017 Risk Factor Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occu 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018 Nov 10;392(10159):1923–94.
- [11] Rao S, Shah N, Jawed N, Inam S, Shafique K. Nutritional and lifestyle risk behaviors and their association with mental health and violence among Pakistani adolescents: results from the National Survey of 4583 individuals. *BMC Public Health*. 2015 Apr 28;15(431):431
- [12] J.S. Lai, S. Hiles, A. Bisquera, A.J. Hure, M. McEvoy, J. Attia. A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. *Am J Clin Nutr*. 2014;99:181-197.
- [13] Dallman MF. Stress-induced obesity and the emotional nervous system. *Trends Endocrinol Metab*. 2010;21:159–65.
- [14] The Mental Health Consequences of COVID-19 and Physical Distancing: The Need for Prevention and Early Intervention. *JAMA Intern Med* [Internet]. 2020 Apr 10; Available from: <http://dx.doi.org/10.1001/jamainternmed.2020.1562>
- [15] Hu Z, Lin X, Chiwanda Kaminga A, Xu H. Impact of the COVID-19 Epidemic on Lifestyle Behaviors and Their Association With Subjective Well-Being Among the General Population in Mainland China: Cross-Sectional Study. *J Med Internet Res*. 2020;22(8):e21176.
- [16] Betty Pfefferbaum CSN. Mental Health and the Covid-19 Pandemic. *N Engl J Med*. 2020;(383):510–2.
- [17] Chopra, S., Ranjan, P., Singh, V., Kumar, S., Arora, M., Hasan, M. S., Kasiraj, R., Suryansh, Kaur, D., Vikram, N. K., Malhotra, A., Kumari, A., Klanidhi, K. B., & Baitha, U. Impact of COVID- 19 on lifestyle-related behaviors- a cross-sectional audit of responses from nine hundred and ninety-five participants from India. *Diabetes & metabolic syndrome*. 2020;14(6).
- [18] Yau YH PMN. Stress and eating behaviors. *Minerva Endocrinol*. 2013;38(3):255–67.
- [19] Scarmozzino F VF. Covid-19 and the subsequent lockdown modified dietary habits of almost half the population in an Italian sample. *Foods*. 2020;9.
- [20] V. M. The Impact of COVID-19 on the Dietary Habits of Middle-Class Population in Mulund, Mumbai, India. *AJIR*. 2020;82.
- [21] Mascherini G, Catelan D, Pellegrini-Giampietro DE, Petri C, Scaletti C, Gulisano M. Changes in physical activity levels, eating habits and

psychological well-being during the Italian COVID-19 pandemic lockdown: Impact of socio-demographic factors on the Florentine academic population. PLoS ONE. 2021;16(5):e0252395.

- [22] Lettuce be happy: A longitudinal UK study on the relationship between fruit and vegetable consumption and well-being. *Soc Sci Med.* 2019 Feb;(222):335–45.
- [23] Steptoe A BN. Sports participation and emotional wellbeing in adolescents. *Lancet.* 1996 Jun 29;347(9018):1789–92.
- [24] Lau JTF, Yang X, Tsui HY, Pang E, Wing YK. Positive mental health-related impacts of the SARS epidemic on the general public in Hong Kong and their associations with other negative impacts. *J Infect.* 2006 Aug;53(2):114–24.
- [25] Podder V, Nagarathna R, Anand A, Suchitra PS, Singh AK, Nagendra HR. Physical Activity Patterns in India Stratified by Zones, Age, Region, BMI and Implications for COVID-19: A Nationwide Study. *Annals of Neurosciences* [Internet]. 2021 May; Available from: <http://dx.doi.org/10.1177/0972753121998507>.
- [26] Gw IDR. Physical activity epidemiology. *Human Kinetics.* 2013.
- [27] Siddiqui, F., Lindblad, U. & Bennet, L. Physical inactivity is strongly associated with anxiety and depression in Iraqi immigrants to Sweden: a cross-sectional study. *BMC Public Health* [Internet]. 2014;14(502). Available from: <http://dx.doi.org/10.1186/1471-2458-14-502>
- [28] Berk M., Sarris J., Coulson C.E., Jacka F.N. Lifestyle management of unipolar depression. *Acta Psychiatr Scandinavica Suppl.* 2013;127:38–54.
- [29] Evers C, Dingemans A, Junghans AF, Boevé A. Feeling bad or feeling good, does emotion affect your consumption of food? A meta-analysis of the experimental evidence. *Rev: Neurosci Biobehav.* 2018

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The Effect Of Attitude, Subjective Norm, Perceived Behaviour Control On Intention To Reduce Food Waste And Food Waste Behaviour

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Abstract: Food waste behavior is currently interesting topic for researcher and environmentalist. This study aims to investigate the effect of attitude, subjective norm, perceived behavioral control on intention to reduce food waste and food waste behavior. A questionnaire survey was applied to 200 household respondents in West Sumatra. The convenience sampling technique was used to collect data from respondent. Research instruments from previous studies were adapted to measure the variables in this research. Structural Equation Modelling technique was used to analyse data of this research. Research result found that attitude has positive and significant effect on household intention to reduce food waste. In addition intention to reduce food waste also has significant effect food waste behavior. In this study, subjective norm and perceived behavioral control do not have significant effect on household intention to reduce food waste.

Key Words: *attitude, subjective norm, perceived behavioral control, food waste reduction intention.*

1. Research Background

Every year the amount of food available to all living things. According to the level of supply chain of the food, the foods that are not exhausted in a production they become a new product to be created into other foods can be in the form of fertilizer products, animal feed and so on (Stancu et al., 2016). According to the Food and Agriculture Organization (FAO) in 2013-2014 there were 13 billion tons of food that became waste because it was not consumed every year it created a crisis, the loss decreased to the economic value USD 1 trillion (Sakaguchi et al., 2018).

The factories generate waste for multiple households, it can make better use of the resources who consumers tend to cook less from scratch at home therefore processed food has arguably a positive effect of household food waste (Behavior et al., 2019). In addition, the 'pot and plate' portion sizes have increased over time, food is leftover because the amount prepared was too large or it has not been used in time, package sizes play also an important role to reduce food waste (Behavior et al., 2019). In contrast, better technologies, such as cookers, smart fridges, and meal planning tools can have a positive effect on the reduction of food waste (Behavior et al., 2019). They support food management in a sustainable manner and can reduce food waste, the consumption of more delicate products with shorter shelf-life is associated with an increasing amount of food waste, perishable goods make up for a large part of food waste (Behavior et al., 2019).

Food waste is a much-debated definition in literature and researchers agree that a universal definition of food waste is missing (Behavior et al., 2019). The most commonly used definition is provided by the Food and Agriculture Organization (FAO) refers to food waste as "the wholesome edible material intended for human consumption, arising at any point in the Food Supply Chain (FSC) that is instead discarded, lost, degraded or consumed by pests" (Behavior et al., 2019). According to Stuart (2009) extends this definition by

“including edible material that is intentionally fed to animals or is a by-product of food processing diverted away from the human food” (Behavior et al., 2019). The term food waste generally applies when it occurs at consumer or retail stages.

Indonesia is the 2nd largest producer of food waste in the world, this is stated in a report entitled “Improving food: towards a more sustainable food system”, released in 2011. The report states that the average Indonesian population wastes around 300 kg of food every year. (Khairunnisa, 2020). Parfik and friends (2010) on FAO, Food waste that is generated during the process of making food and after food cooked activities related to the behavior of sellers and consumers (Dewilda et al., 2019). The problem of food waste globally is of particular concern to be addressed in improving the environmental sustainability (Dewilda et al., 2019). Indonesia especially Padang City, the management and processing of food waste is still integrated with the municipal waste (Dewilda et al., 2019). UU No.18 yr 2008 sub.2 concerning waste management which contains food waste from restaurants and household In Law No. 18 of 2008, everyone is obliged to reduce waste that is environmentally sound in managing household waste and types of household waste.

(Dewilda et al., 2019). According to Perda No.21 yr 2012 concerning waste management in Padang City, the community must participate in waste management (Dewilda et al., 2019).

TPB is one of many models that applies to understanding consumer behavior in various contexts (Coşkun & Yetkin Özbük, 2020). The main theory in this model is how individual interest is affected by subjective norms, attitude, and perceive behavioural control (Coşkun & Yetkin Özbük, 2020). Although TPB has extended models to the development for the capacity to predict the presence which has described the investigation of food waste behavior within the context of the household (Coşkun & Yetkin Özbük, 2020).

The result of previous research (Coşkun & Yetkin Özbük, 2020) an extended TPB constructs two theoretical, price consciousness and food taste which was hypothesized another would predict intention to reduce food waste All of these are samples that are able to strengthen this hypothesis (Coşkun & Yetkin Özbük, 2020), although TPB is needed in this study, moral value and the quality of communication for preventing food spoil are the sub-sections that we highlight.

Based on this research background, this study want to investigate the effect of **attitude, subjective norm and perceived behavioral control on customer intention to reduce food waste and food waste behavior.**

2. LITERATURE REVIEW

2.1 Theory of Perceived Behavioural (TPB)

It was developed by Icek Ajzen in 1991 that is concerned with behavioral which intention is the Theory of Planned Behavior (TPB), intention to perform a certain behavior is the central factor in the theory which entails the motivational factors that influence behavior. While it assumes that the stronger the intention towards a behavior, the more likely it is performed (Behavior et al., 2019). Referring to Ajzen (2012), information relevant to our behavior is followed fairly and consistently, not automatically or mindlessly. Referring to Ajzen and Fishbein (1980), this includes dominant behaviors of interest to social psychologists. They formulate a limited focus on behavior over which the individual has full, explicit volitional control. However, this formulation seems to impose severe limitations on a theory that has been designed to predict and explain any socially significant behavior. Serious difficulties in the implementation of which are designed to obtain a theory of behavior that has been targeted is the result of considering too much behavior that is basically under volitional control (Ajzen, 2012).

The basic rule is that the stronger the intention is determined by three conceptually independent predictors: Attitude, Subjective Norm, and Perceived Behavioral Control (PBC) (Behavior et al., 2019). Referring to (Ajzen, 2012), subjective is assumed to be a behavioral belief and evaluation of the combined results to obtain an overall negative or positive attitude towards behavior. Attitude is the result of the direct contribution of the subjective.

Theory of planned behavior is seen as useful for dealing to be used as a starting point to change it with a complex topic like sustainability which is highly volatile for human behavior and social issues, the theory seems to be a good choice to understand the decision making processes in this field (Behavior et al., 2019). Armitage and Corner (1999) stated that as attitudes and subjective normss, perceived behavioral control is assumed to be beliefs that are easily accessed and followed consistently, for this example beliefs about resources and barriers that are allegedly able to facilitate or interfere with the performance of certain behaviors.

2.2 Attitudes, Subjective Norm, Perceived Behavioral Control, and Intention

It based on Vabø & Hansen (2016), the Attitude describes a person is in favor of carrying out a certain behavior, then the Subjective Norm extents a person feels social pressure to perform the behavior, while Perceived Behavioral Control is concerned with the ability and opportunity of an individual (Behavior et al., 2019). (Ajzen, 2012) stated that attitude can be traced to general theorizing about the formation toward any object is related to ends which it serves. That is its consequences judged by some function in object leads to good or bad affecting expected from the assessment scales that had been applied to measure attribute by attribute evaluation.

Following Rosenberg and Hovland (1960), attitudes can be inferred from cognitive, affective, or conative responses to the attitude object to be pressure for evaluatively consistent with each other (Ajzen, 2012). Attitude toward the behaviour is further assumed

to have a causal effect on intentions to engage in the behaviour on conation. Basis for an observed attitude toward behaviour implies that appropriate means must be employed to identify the readily accessible beliefs statements constructed by the investigators although responses to a prior set of belief statements can be used to infer underlying attitudes assume that these responses necessarily provide information about accessible beliefs that provide the causal basis for the attitude. Based on Ajzen and Fishben (1975), they highlight the differences between the two types of attitudes, attitudes towards physical objects, attitudes towards health and safety issues, racial relations, politics (participating in an election, donating money to a political candidate, voting for a candidate), the environment (using public transit, recycling, conserving energy), or any other domain (Ajzen, 2012). Attitudes and behaviour correlate with each other in terms of their action, target, context, and time elements to extent the compatible.

Daulany (1968) underlines that behavior is called a normative norm with regard to different social references, they combine to produce an overall subjective norm, then draw an analogy with the expected value model determined by the more accessible total set of normative norms. (Ajzen, 2012). Subjective norms are conceptually independent of attitudes toward the behaviour in principle may coincide rarely each other. Ajzen (2005) notes that there are many factors, both internal and external factors capable of interfering with (or facilitating) the performance of certain behaviors, the extent to which people have the necessary information, emotions, personal skills and competencies, availability of social bolster, and coercion, and the absence or availability of external constraint.

From a psychological perspective, it's interesting to note the tendency for most people to assume a perceived and believed behavioral control role. The conceptualization of behavioural control in the TPB is based on the work of Bandura (1977). The TPB focuses on the extent to which people believe they are capable of performing a certain behaviour. Clearly, then, one way in which self-efficacy or perceived behavioural control can influence performance of difficult behaviours is by its effect on persistence. The more people believe they can successfully complete an intended behaviour, the more likely they are to persist with it. Behavioral control can be measured in two ways: the perceived role of behavioral control beyond its effect, and the perceived behavioral control of situations. The TPB is a model that can be used to understand any behavior that is motivated by social psychology interests. Previous research revealed that perceived behavioral control is also an important predictor of behavioral intentions.

Behavioral control can indirectly influence behavior by its influence on intention to engage in behavior and persistence in the meet of handicaps confluence during execution. Perceived behavioral control can be a potential proxy for actual surveillance. Remember that you are responsible for controlling your behavior, even if you have good intentions.

Ajzen and Fishbein (2008) A strong interaction between intentions and perceived behavioural control when there is relatively little variance in either of these factors. People vary greatly in their intentions to perform the behaviour of interest and vary in their perceptions of control over the behaviour, expecting a strong moderating effect (Ajzen, 2012).

Attempts to result on the satisfy response are enhanced the more parties are motivated to comply with what they should responsible to do. Dulany's theory of propositional control is the idea that people can control their thoughts and beliefs by using correct propositional arguments. in relation to behavioural intentions is the actual response is assumed to be a direct function of the behavioural intention (Ajzen, 2012). According to Daulany's theory, people can control their responses by intentionally selecting a particular response. This determines the feedback that actually comes out. There are two function of intention: the intention itself and the personal context. The first is the most basic unit of measurement in the metric system. The first is the assumed distribution of reinforcing weighted by the subjective value of the reinforcer. The more believe people outcome, the more value they outcome, their stronger intention is to result on the feedback in question. The second thing affecting intentions is the assumed reinforcement distribution, which is weighted by the assumed reinforcer's significance.

According to (Ajzen, 2012) stated that the extent of actual behavioural surveillance is thought to moderate the influence of intentions on behaviours. When people have high control, their intentions should be enough to predict their behaviour. However, the degree of control someone has will vary, so intentions and behaviour will interact to jointly affect performance. Although the person's behaviour may try to control the situation, in the end they may not be able to do so completely. The behavior was observed in situations where it is assumed that the performer's intentions behind performing the behavior were intended under some conditions. This assumption of intention is important in understanding the behavior. Perceived self-efficacy seems to play a role in improving performance. In the theory, intentions of this kind are said to be a result of attitudes and subjective norms with respect to the behavior of interest.

Attitude, subjective norm, and perceived behavioural control are all important factors in the formation of behavioural intentions. The TPB and other reasoned action models suggest that people's behaviour is based on their intentions. The idea from Sheeran (2002) is that intentions and behaviour are strongly linked, but this link can be affected by the degree of control we have over our behaviour. Second, if people change their intentions, this will often be followed by changes in their behaviour. The results for both of these propositions is strong. Many researches show that behavioural intentions explain a lot of variance in behaviour.

2.3 Behavior

According to Giroto et al., the use of computers has had a significant impact on the way scientists and researchers conduct their work. Pointing out that food waste has both an emotional and psychological component can help individuals reduce their food waste. The others in Govinda (2017), the customers shape the way they are buying, transporting, conserving, preparing and consuming food (Behavior et al., 2019). The behaviour is a response is perceived to produce a certain outcome that is believed indicate a true response (Ajzen, 2012).

The behaviour is mediated and indeed controlled by higher mental processes. Daulany (1968) attributed a causal or instrumental role to conscious, volitional processes with practice will tend to habituate and conscious rules may become unconscious. Most social psychologist behaviors are capable of producing more than one outcome, which are assumed to hold multiple behavioural beliefs that relate performance to a different outcome. The person's motivation is then weighted by this outcome. The referent's perceived expectation of keeping that normative reference may be more than a referent person or group, including a person's spouse or partner, family, friends, and depending on the behavior under consideration, coworkers, health professionals, and law enforcement agencies (Ajzen, 2012). The behaviour is likely to lead to certain outcomes, which together with the evaluations of these outcomes will produce a favourable or unfavorable result. However, it is important to expect attitudes that affect all potential outcomes.

2.4 The Relation of Attitude and Intention to Reduce Food Waste

Attitudes are formed about the attitude object and direct experiences not to be observed directly but measured on responses in the form of beliefs are considered cognitive responses towards a specific activity and the outcome evaluation of these actions (Behavior et al., 2019). The negative consumer assessment on food waste behavior will enhance the effect of attitude on their intention to reduce food waste behavior (Coşkun & Yetkin Özbük, 2020)

(Bhatti et al., 2019) established that attitude had the strongest effect on the intention the higher is the expected intentions to perform that behavior as an important predecessor of the general assessment toward specific through made up of consistent or conflicting beliefs about the consequences of certain or not to perform a particular behavior consequently the actual behavior.

Previous studies see this often as the most important factor influencing intention (De Pelsmaeker et al., 2017). However, attitudes can change over time with a change in information at the given time (Glasman & Albarracín, 2006). In addition, social factors can have an impact on the development or change of attitudes (De Pelsmaeker et al., 2017). Different levels of situational and personal factors can have an influence on the extent to which attitudes are forecast intention (Vermeir & Verbeke, 2007). The result in (Behavior et al., 2019), Intention was detected to attitude meaning that with a stronger increases who will also intend to reduce their food waste strongly with the inserting the independent variables showed a significant relationship to the dependent variable Intention.

The following hypotheses were developed:

H1 : *Attitude is positively related to household's intention to reduce food waste*

2.5 The Relation of Subjective Norm on Intention to Reduce Food Waste

Ajzen (1991) outlines a social factor named 'Subjective Norm' is defined as the perception of social pressure to accomplish a specific behavior comprise of normative beliefs and willingness to comply. Vabø & Hansen, (2016) stated that the effect of subjective norms is depended on the individual who feel others influence while rotten the food (Coşkun & Yetkin Özbük, 2020). Individualistic or collectivistic value of others will influence the degree of consumer food waste intention (Behavior et al., 2019). Based on discussion above, the following hypothesis is proposed.

H 2 : *Subjective Norms has significant effect on household's intention to reduce food waste*

2.6 The Relation of Perceived Behavioral Control on Intention to Reduce Food Waste

Ajzen, (1991) stated that Perceived Behavioral Control (PBC) describes the perceived difficulty or easy of the behavior assumed to take anticipated obstacles and past experiences into consideration (Behavior et al., 2019). Atkinson, (1964) stated that deals with the concept of success in terms of the likelihood that an individual succeeds is motivated as long as there is a good chance of (control of) success (Behavior et al., 2019).

PBC (Londono et al., 2017) is influenced by the individual's confidence in their ability to perform a behavior and includes internal factors e.g. self-efficacy and external factors e.g. perceived barriers impacted by consumer perception and product availability perception (Behavior et al., 2019). Behavior et al., (2019) found the Perceived Behavioral Control supported the reduction of food waste intention. Accordingly, the hypothesis stated to have the confidence in their ability, also have the intention to throw less food away (Behavior et al., 2019).

The following hypotheses were developed:

H3 : Perceived Behavioural Control positively influence household's intention of food waste reduction

2.7 The Relation of Intention to Reduce food Waste on Food Waste Behaviour

The main factor influencing an individual's behavior is their intention. Intention is defined as the perceived pressure from others that is felt by an individual while doing a certain behavior. In this article predicting food waste reduction intentions, attitudes refer to favorite or unfavorable assessments of food waste behavior. When a person receive pressure from other social while wasting food, he/she has a greater intention to reduce food waste. If a person believes that the things responsible for food waste are under his control, his/her intention to du food waste reduction increases (Cokkun & Yetkin Özbük, 2020).

The following hypotheses were developed:

H4 : Intention of food waste reduction negatively influence household's food waste behaviour

3. RESEARCH METHODS

A questionnaire survey was conducted to 200 respondents in West Sumatra. Research instruments for this study were adapted from previous studies. The instrument for attitude towards foodwaste were adapted from Stefan et al (2013); Behavior et al., (2019); Coşkun & Yetkin Özbük (2020). The instrument for subjective norm were adapted from Stefan et al (2013); Behavior et al., (2019); Coşkun & Yetkin Özbük (2020). The instrument for perceived behavioral control were adapted from Stefan et al (2013); Behavior et al., (2019); Coşkun & Yetkin Özbük (2020). The instrument for intention of food waste reduction were adapted from Stefan et al., (2013); Luu (2020) and Behavior et al., (2019). The instrument for food waste behavior were adapted from Aydin & Yildirim (2021) and Behavior et al., (2019) The population of this study is household in Indonesia. Convenience sampling technique was applied in this study. Data of this study were analysed by applying structural equation modelling technique using Smart PLS 3.00 software.

4. RESEARCH FINDINGS

4.1 Profile of Respondents

This section will discuss data analysis and research results related to the intention to reduced food waste in West Sumatra. Based on gender, majority (64.5%) of respondents are female. Regarding education, majority of respondent (63,26%) hold bachelor degree. In term of age, majority of research respondents (90%) are 23 years old and above.

4.2 Measurement Model

a. Convergent Validity

Individual indicators are declared valid in measuring its latent variable when they have a correlation value above or greater than 0.70. However, a significant correlation value from 0.50 to 0.60 is still acceptable (Ghozali, 2014). The outer loading of PLS output shows us the validity of research indicators in measuring its latent construct.

Table 1
Indicators Outer Loading

	Attitude	Food Waste Behaviour	Intention to Reduce Food Waste	PBC	Subjective Norm
X1.1	0,898				
X1.2	0,756				
X1.3	0,859				
X2.1					0,946
X2.2					0,903
X3.1				0,857	
X3.2				0,877	
X3.3				0,736	
Y1		0,889			

Y2		0,873			
Y3		0,808			
Y4		0,876			
Y5		0,723			
Y6		0,898			
Z1			0,884		
Z2			0,829		
Z3			0,785		

Based on table 4.12, all indicators have met these criteria so that the indicators are said to be valid and can be used to measure its latent variable.

b. Discriminant Validity

In this study, a cross loading construct has been used to assest the Discriminant Validity of the construct (Ghozali, 2014). The cross loading value of this construct can be seen in table below. It can be seen from the table 2 that correlation between indicator and its construct is higher than correlation with indicator of other construct. Therefore, it can be concluded that discriminat validity of this research model was fulfilled.

Table 2
Indicators Cross Loading

	Attitude	Food Waste Behaviour	Intention to Reduce Food Waste	Perceived Behavioural Control	Subjective Norm
X1.1	0,898	-0,353	0,398	0,321	0,294
X1.2	0,756	-0,094	0,284	0,182	0,169
X1.3	0,859	-0,392	0,362	0,269	0,314
X2.1	0,329	-0,272	0,308	0,292	0,946
X2.2	0,245	-0,231	0,232	0,226	0,903
X3.1	0,356	-0,491	0,273	0,857	0,269
X3.2	0,197	-0,296	0,250	0,877	0,225
X3.3	0,199	-0,273	0,138	0,736	0,202
Y1	-0,359	0,889	-0,393	-0,366	-0,198
Y2	-0,313	0,873	-0,314	-0,443	-0,267
Y3	-0,261	0,808	-0,273	-0,334	-0,258
Y4	-0,267	0,876	-0,366	-0,341	-0,201
Y5	-0,237	0,723	-0,191	-0,361	-0,283
Y6	-0,318	0,898	-0,279	-0,439	-0,253
Z1	0,394	-0,303	0,884	0,297	0,267
Z2	0,294	-0,333	0,829	0,201	0,177
Z3	0,353	-0,302	0,785	0,197	0,292

Table 7. The measurement of cross loading

c. Reliability

The reliability of research variable in this study is measured by using Cronbach’s Alpha and Composite Reliability. A variable is said to be reliable if it has value of Cronbach Alpha and Composite Reliability > 0.70 (Hair et al. 2014).

Table 3
Reliability of Research Variable

	Cronbach's Alpha	Composite Reliability
Attitude	0,790	0,877
Food Waste Behaviour	0,922	0,938
Intention to Reduce Food Waste	0,780	0,872
Perceived Behavioural Control	0,775	0,864
Subjective Norm	0,834	0,922

Table 3 shows us that all variables have value of Cronbach Alpha and Composite Reliability are above 0,70. Its means that the all variables of this research are reliable.

Table 4
The Result of Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Attitude -> Intention to Reduce Food Waste	0,316	0,323	0,078	4,077	0,000
Intention to Reduce Food Waste -> Food Waste Behaviour	-0,364	-0,366	0,071	5,090	0,000
Perceived Behavioural Control -> Intention to Reduce Food Waste	0,107	0,110	0,063	1,715	0,087
Subjective Norm -> Intention to Reduce Food Waste	0,125	0,123	0,084	1,498	0,135

Attitude has significant effect on Intention to Reduce Food Waste (H1 is Accepted). Subjective Norm does not have significant effect on Intention to Reduce Food Waste (H2 is Rejected). Perceived Behavioral Control does not have significant effect on Intention to Reduce Food Waste (H3 is Rejected). Intention to Reduce food Waste has significant effect Food Waste Behaviour (H5 is Rejected).

The results for the hypotheses in the current research model. H1 proposed that attitude would be positively influence household intention of food waste reduction. As presented in Table 8, a positive and significant association was found for attitude and households’ food waste reduction intention ($p < 0.01 = 0,000$), which lent credence to H1. H4 proposed that households’ food waste reduction intention would be positively associated with the food waste behavior. Households’ food waste reduction intention exhibited a positively significant relationship with food waste behavior ($p < 0.01 = 0,000$), which provided evidence for H4.

H3, and H2 postulated the perceived behavioural control, subjective norm toward food wasting and meaningfulness of food waste reduction, respectively, for households’ food waste reduction intention. Perceived behavioural control displayed the significantly negative link with households’ intention to reduce food waste ($p > 0.01 = 0,087$). H2 proposed subjective norm identity as a normative norm for households’ food waste reduction. As Table 8 indicates, H2 received empirical support through the marginally negative significant term for the interactional effect of intention to reduce food waste also H3 ($p = 0.135 < 0.10$).

4.3 Discussion

This research wants to find out how the characteristics of household behavior affect the generation of food waste in developing countries influencing the emergence of food waste in the household, the level of our household sample in affordable people shows no comparative study in developing countries or other countries (Amirudin & Gim, 2019). The results of the research explain the fact that city dwellers tend to donate leftovers, different in the countryside to cook their own food which indirectly reduces food waste. The essential of not rely on intention as a proxy measure for behavior because it would only be easy to conclude that the study was designed to show very different relationships in past and future studies, indonesia still has complex food challenges (Aydin & Yildirim, 2021). The government has an important role through policies and interventions such as addressing all aspects of the food chain so that efficient. However, some policies should be significantly limited taking into account the broad Sustainability strategy with existing theories, education related to household routines should be considered, this can be achieved through awareness campaigns in online media and other media in their use are simple, effective and culturally relevant by focusing on change the attitude of not wasting food.

a. The effect of attitude on household intention to reduce food waste behaviour

This study found that attitude has significant influence on customer intention of food waste reduction. It means the more positive consumer attitude to not waste the food the higher their intention to reduce food waste. In other word, the attitude is the importance predictor of customer intention of food waste reduction. This study inline with previous research that found that attitude has significant influence on customer intention to reduce food waste (Behavior et al, 2019).

Why attitude has significant effect on intention since attitude result from customer evaluation on positive and negative consequences of food waste behavior. When customer aware on the negative consunquences of food waste behavior such as waste the money and can cause pollution to the environment then their attitude will be more positive to not waste the food. This attitude finally will increase the customer intention to reduce food waste.

b. The effect of subjective norm on household intention to reduce food waste behaviour

This study found that subjective norm doesn't have significant effect on customer intention to reduce food waste. It means that subjective norm is not the good predictor for customer intention of food waste behavior. This research result is opposite with many extant literatures that found that subjective norm has significant influence on customer intention of food waste reduction behavior (Coşkun & Yetkin Özbük, 2020; Behavior et al., 2019).

Why subjective norm doesn't have significant effect on intention to reduce food waste since mostly friend, family and relative have important role to shape the customer basic value and belief. The role of other people to influence someone's belief and value is more effective during childhood and teenages. In other words, the people around us have teached us the values that waste the food is bad habit and forbidden by the norms and religy started form childhood until now. When the people getting adult they already started to have strong belief that waste the foods is bad habit and forbidden. Therefore, the effect of other people believe does not strong enough to increase intention to reduce food waste for adult people, since they already embrace the same value with other people around them.

c. The effect of perceived behavioural control on household intention to reduce food waste behaviour

This study found that perceived behavioral control doesn't have significant influence on customer intention of foodwaste reduction. It means that perceived behavioral control is not an impotant predictor on customer intention to reduce food waste. This study is contradictive with previous studies that found that behavioral control perception have significant influence on customer intention of food waste reduction (Coşkun & Yetkin Özbük, 2020; Behavior et al., 2019)).

Behavioral control perception doesn't have significant influence on customer intention of food waste reduction may be there are some possibilities. Firstly, responden of this research may be already have sufficient dgree of perceived behavioral control to reduce food waste behavior. In other words, respondent believe that they have enough ability to reduce food waste behavior through some efforts such as save the food in storage properly, cook the food efficiently, and buy the food sufficiently. Therefore, improve customer's behavioral control perception doesn't have significant influence on customer of food waste reduction behavior.

d. The effect of household intention to reduce food waste behaviour on food waste behaviour

This study found that intention to reduce food waste behavior has significant effect on food waste behavior with negative direction. It means the higher customer intention of food waste reduction the lower customer behavior to waste food will be. This study inline with previous research that found that customer intention to reduce food waste has significant effect on food waste behavior (Stancu et al., 2016; Mondéjar-Jiménez et al., 2016; Coşkun & Yetkin Özbük, 2020).

The significant effect of food waste reduction intention on consumer's food waste behavior may be because intention is strong predictor behavior. There is strong possibility of consumer to apply intention of food waste reduction behavior if there is no something special handicap (i.e sufficient food storage is not available). Therefore many study usually use consumer intention to predict consumer behavior.

5. CONCLUSION AND RECOMMENDATION

This study found that attitude is strong predictor of household intention to reduce food waste. This research also found that intention to reduce food waste is strong predictor of food waste behavior. Unfortunately, in this study subjective norms and behavioral control perception are not good predictor of customer intention food waste reduction.

In this research attitude has important role in order to enhance household intention of food waste reduction directly and to food waste behavior indirectly. Therefore developing strong household attitude to food waste behavior is the main responsibility of stakeholder such as government, industries, NGO, educational institution and other parties. Providing education to households about the disadvantages of food waste behavior and providing knowledge how to do food conservation effectively, how to do food purchase effectively and how to cook and serve food properly will improve household attitude towards food waste behavior and finally will lead to reduce food waste behavior.

REFERENCES

- Ajzen, I. (2012). The theory of planned behavior. *Handbook of Theories of Social Psychology: Volume 1, July*, 438–459. <https://doi.org/10.4135/9781446249215.n22>
- Amirudin, N., & Gim, T. H. T. (2019). Impact of perceived food accessibility on household food waste behaviors: A case of the Klang Valley, Malaysia. *Resources, Conservation and Recycling*, 151(December 2018), 104335. <https://doi.org/10.1016/j.resconrec.2019.05.011>
- Aydin, A. E., & Yildirim, P. (2021). Understanding food waste behavior: The role of morals, habits and knowledge. *Journal of Cleaner Production*, 280, 124250. <https://doi.org/10.1016/j.jclepro.2020.124250>
- Baittri, J. H. (2020). *Sampah Kota Padang Berkurang saat Wabah Corona?* MONGABAY. <https://www.mongabay.co.id/2020/05/20/sampah-kota-padang-berkurang-saat-wabah-corona/>
- Behavior, P., Wajon, A. E., & Richter, J. (2019). *Students ' Intention to Reduce Food Waste An approach with an extended version of the Theory of June.*
- Bhatti, S. H., Saleem, F., & Ahmad, A. (2019). *The determinants of food waste behavior in young consumers in a developing country.* <https://doi.org/10.1108/BFJ-06-2019-0450>
- Candra, R. (2021). *Produksi 641 Ton Sampah Sehari, Ini Rencana Wali Kota Padang.* Jawapos. <https://www.jawapos.com/jpg-today/01/02/2019/produksi-641-ton-sampah-sehari-ini-rencana-wali-kota-padang/>
- Coşkun, A., & Yetkin Özbük, R. M. (2020). What influences consumer food waste behavior in restaurants? An application of the extended theory of planned behavior. *Waste Management*, 117, 170–178. <https://doi.org/10.1016/j.wasman.2020.08.011>
- Dewilda, Y., Aziz, R., & Fauzi, M. (2019). Kajian Potensi Daur Ulang Sampah Makanan Restoran di Kota Padang. *Jurnal Serambi Engineering*, 4(2), 482–487. <https://doi.org/10.32672/jse.v4i2.1325>
- Faren, F. P. (2021). *ANALISIS TIMBULAN DAN KOMPOSISI SAMPAH RUMAH TANGGA SELAMA MASA PANDEMI COVID-19 DI KOTA PADANG* [Andalas University]. <http://scholar.unand.ac.id/id/eprint/68919>
- Heller, M. C., Selke, S. E. M., & Keoleian, G. A. (2019). Mapping the Influence of Food Waste in Food Packaging Environmental Performance Assessments. *Journal of Industrial Ecology*, 23(2), 480–495. <https://doi.org/10.1111/jiec.12743>
- Khairunnisa, S. N. (2020). *Indonesia, Negara Penghasil Limbah Makanan Peringkat Kedua Tertinggi di Dunia.* Kompas.Com. <https://www.kompas.com/food/read/2020/10/13/171900475/indonesia-negara-penghasil-limbah-makanan-peringkat-kedua-tertinggi-di?page=all>
- Kosassy, S. O., Raid, N., & Yasmeardi, F. (2022). *Pengelolaan Sampah Rumah Tangga di Kelurahan Banuaran Kota Padang.* 1(1), 56–61.
- Luu, T. T. (2020). *Reducing food waste behavior among hospitality employees through communication : dual mediation paths.* 32(5), 1881–1904. <https://doi.org/10.1108/IJCHM-09-2019-0779>
- Machura, P. (2013). Moral norms, moral ideals and supererogation. *Folia Philosophica*, ENG 29(January 2013), 127–159.
- Mattar, L., Abiad, M. G., Chalak, A., Diab, M., & Hassan, H. (2018). Attitudes and behaviors shaping household food waste generation: Lessons from Lebanon. *Journal of Cleaner Production*, 198, 1219–1223. <https://doi.org/10.1016/j.jclepro.2018.07.085>
- Mondéjar-Jiménez, J. A., Ferrari, G., Secondi, L., & Principato, L. (2016). From the table to waste: An exploratory study on behaviour towards food waste of Spanish and Italian youths. *Journal of Cleaner Production*, 138, 8–18. <https://doi.org/10.1016/j.jclepro.2016.06.018>
- Nusaka, S. (2020). *Food Waste Behaviour in Canada amidst COVID 19: Combining the Resource Based View (RBV) and the Theory of Planned Behaviour (TPB).* 2507(February), 1–9.
- Padang, P. K. (n.d.). *Peraturan Walikota Padang.Pdf.*
- Qian, K., Javadi, F., & Hiramatsu, M. (2020). Influence of the COVID-19 pandemic on household food waste behavior in Japan. *Sustainability (Switzerland)*, 12(23), 1–14. <https://doi.org/10.3390/su12239942>
- Roe, B. E., Qi, D., & Bender, K. E. (2020). Some issues in the ethics of food waste. *Physiology and Behavior*, 219, 112860. <https://doi.org/10.1016/j.physbeh.2020.112860>
- Romani, S., Grappi, S., Bagozzi, R. P., & Barone, A. M. (2018). Domestic food practices: A study of food management behaviors and

- the role of food preparation planning in reducing waste. *Appetite*, 121, 215–227. <https://doi.org/10.1016/j.appet.2017.11.093>
- Ruslinda, Y., Aziz, R., & Abuzar, S. S. (2005). *SAMPAH DARI BERBAGAI SUMBER DI KOTA PADANG GENERATION, COMPOSITION, AND RECYCLING POTENTIAL OF SOLID WASTE FROM SEVERAL SOURCES IN PADANG*.
- Russell, S. V., Young, C. W., Unsworth, K. L., & Robinson, C. (2017). Bringing habits and emotions into food waste behaviour. *Resources, Conservation and Recycling*, 125(March), 107–114. <https://doi.org/10.1016/j.resconrec.2017.06.007>
- Sakaguchi, L., Pak, N., & Potts, M. D. (2018). Tackling the issue of food waste in restaurants: Options for measurement method, reduction and behavioral change. *Journal of Cleaner Production*, 180, 430–436. <https://doi.org/10.1016/j.jclepro.2017.12.136>
- Stancu, V., Haugaard, P., & Lähteenmäki, L. (2016). Determinants of consumer food waste behaviour: Two routes to food waste. *Appetite*, 96, 7–17. <https://doi.org/10.1016/j.appet.2015.08.025>
- Stefan, V., van Herpen, E., Tudoran, A. A., & Lähteenmäki, L. (2013). Avoiding food waste by Romanian consumers: The importance of planning and shopping routines. *Food Quality and Preference*, 28(1), 375–381. <https://doi.org/10.1016/j.foodqual.2012.11.001>
- Suriyani, L. De. (2020). *Produksi Sampah dari Rumah Meningkat di Masa Pandemi Corona, Kok Bisa?* MONGABAY. <https://www.mongabay.co.id/2020/04/28/produksi-sampah-dari-rumah-meningkat-di-masa-pandemi-corona-kok-bisa/>
- Susana, E. (2018). Moral Value in Charlotte Bronte's Novel Jane Eyre. *KnE Social Sciences*, 3(4), 287. <https://doi.org/10.18502/kss.v3i4.1940>
- Tobari. (2021). *Kadis DLH: Penanganan Sampah di Kota Padang Butuh Dukungan dan Peran Serta Masyarakat*. Infopublik. <https://infopublik.id/kategori/nusantara/565446/kadis-dlh-penanganan-sampah-di-kota-padang-butuh-dukungan-dan-peran-serta-masyarakat>
- Wahyudi, I. (2022). *CCF Norwegia bantu pengelolaan sampah di Padang*. Antara. <https://www.antaraneews.com/berita/2657817/ccf-norwegia-bantu-pengelolaan-sampah-di-padang>

User Classification Model for Quality of Web Experience

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Abstract- In this paper, a machine learning model was developed for classifying users' quality of experience (QoE) on the web. Key Performance Indicators (KPIs) were extracted from Quality of Web Service (QWS) dataset generated using Principal Component Analysis (PCA) algorithm. The quality of web service dataset was trained using random forest algorithm of different tree sizes. The model was used to develop an application capable of classifying the users' quality of experience on the web in order to predict the user's experience based on the website of interest and the system was implemented in python programming language. The performance of the model was also evaluated using other existing models such as classification and regression trees (CART) and support vector machines. The results obtained showed that when dimensions of data are reduced through feature extraction techniques such as PCA, the most important information were kept by selecting the principal components that explained most of the relationships among the features and that PCA also reduces the dimensionality of data without losing information from any feature. From the evaluation results obtained, all the algorithms achieved a percentage accuracy of 85 and above which is a very good performance. The results also show that Support Vector Machine generated result with the least percentage accuracy on the task of quality of experience prediction while random forest and CART algorithms performed better than others. From other testing parameters used, it was also discovered that accuracy and precision had more impact on quality of experience prediction than sensitivity and other parameters used and had a very important influence on the web quality of experience measurement.

Key Words: classification, influence factors, predictive modelling, Quality of experience, user, Web.

I. INTRODUCTION

Traditional monitoring and management approaches of networks based only on quality of service (QoS) optimization are not sufficient to ensure user's needs [1]. This led to investigation into the new concept called users' quality of experience to evaluate the real quality of experience perceived by the users. There are several metrics, called Quality of Experience Influence Factors (QoE IFs), which can affect the perceived quality by the user. These factors are closely related to human perception and could serve as more valuable quality indicators for all system's actors (user, service and network provider, e.t.c). From the users' side, it ensures that

he perceives the best service regardless their mobility and their context. From the provider's side, it helps them to provide, restore and ensure the best service to their users, and to decrease the error rate and increase their profit. Although many works have addressed QoE classification, but the concept is still hard to investigate especially in mobile environment and also because QoE is used in several context including video, gaming, voice over internet protocol (VoIP). In this paper, user classification model was developed for extracting key performance indicators accurately from quality of web service dataset generated using PCA algorithm.

When Quality of Experience (QoE) is mentioned in the telecommunication sector, people talk about video streaming, peer to peer file sharing, online gaming, cloud storage, cloud based computation, download speed, voice and video call quality e.t.c. The actual service "received" by users determines users QoE as opposed to Quality of Service (QoS) "rendered". Measuring QoE starts from the content providers; content distribution networks (CDNs), Internet Service Providers (ISPs), cross-CDN optimization services and finally converges on the user. A lot of research and infrastructural innovations have gone into making sure that the user receives a better QoE especially, in the design of content delivery systems. Some of these infrastructures include placing caches in front of content servers to return frequently requested content [2]. The robustness of the internet and telecommunication is tied to the communication and infrastructural improvements made over time on content delivery. The challenges of measuring QoE is enormous which includes the increasing complexity of the cable network environment, increasing load on the network, heterogeneity of technologies especially in cellular data networks [3]. Researches have also gone into measuring QoE based on metrics from the end of Content Distribution Networks, Internet Service providers, content providers and cross-CDN optimization service providers. The user who sustains these players with revenue collected directly or indirectly is left out. It is important to measure QoE using metrics from the user's end. Often, mobile phone users have complained about poor QoE received from telecommunication service providers [2]. These complaints have come most times without actual and comprehensive data backing up the claims. Researchers have explained QoE from every perspective (content providers, content distribution networks, internet service providers, cross-CDN optimization services). Yet the users out of these players

directly or indirectly are less equipped with the appropriate tools and data to measure QoE from their end

II. RELATED WORKS

Some papers related to classification of web users' experiences were reviewed and are discussed as follows:

[4] analyzed and modeled mobile QoE data from a large group of Finnish users (users from Finland) in the field. Reflecting the development of mobile networks, service quality was high and better than in prior studies but the paper focused only on a single country (Finland), so the results was not generalized to countries with significantly different population or mobile network characteristics.

[5] presented the application of diverse Machine learning techniques in key areas of networking across different network technologies but did not advance the state-of-the-art to finally realize the long-time vision of autonomic networking.

[6] devised a method that predicts the QoE Mean Opinion Score based on machine learning classifier to deduce the best algorithm but the model was limited to M5P algorithm.

[7] carried out a short term study to develop a system that runs on commodity access points (APs) to assist ISPs in detecting when Wi-Fi degrades QoE but in particular, intermittent events are challenging to troubleshoot and require a long-term monitoring approach.

[8] presented an extensive review of the state-the-art research in the area of QoE modeling, measurement and prediction but QoE should be performed over several months to achieve accurate results which the study failed to address.

[9] proposed an initial method for estimating the quality of experience of web services for web service selection using a fuzzy-rough hybrid expert system. The presented how different QoS parameters impact the QoE of web services. For this, they conducted subjective tests in controlled environment with real users to correlate QoS parameters to subjective QoE. Based on this subjective test, membership functions and inference rules for the fuzzy system were derived. Membership functions were derived using a probabilistic approach and inference rules were generated using Rough Set Theory (RST). They evaluated the system in a simulated environment in MATLAB. The simulation results showed that the estimated web quality from system had a high correlation with the subjective QoE obtained from the participants in controlled tests. But feature selection methodologies that could automatically select the most impacting QoS parameters were not included.

[10] proposed an alternative approach to select base classifiers forming a parallel heterogeneous ensemble in order to trim poorly performing classifiers; so that a more effective heterogeneous ensemble can be generated. More specifically, the proposed

trimming approach was designed to find an optimal subset of classifiers to form the desired heterogeneous ensemble. To address this issue, the differences in effectiveness between base classifiers forming the ensemble were utilized to spot weak classifiers. For evaluating the proposed approach, eighteen benchmark datasets were used for generating the heterogeneous ensemble classification and comparisons with the state-of-the-art methods were conducted. The experimental analysis demonstrated the effectiveness and superiority of the proposed approach when compared to other state-of-the-art approaches. But the authors failed to investigate alternative approaches to exclude poorly performing classifiers to enhance the performance of heterogeneous ensemble classification.

[11] presented a new prediction model to detect technical aspects of teaching and e-learning in virtual education systems using association rules mining. Supervised techniques are applied to detect efficient QoE factors on virtual education systems. But some meta-heuristic algorithms could be applied to improve the feature selection strategy.

[12] proposed a fast localization iris recognition algorithm which used the iris segmentation algorithm to quickly extract the iris region for recognition but network training will improve the recognition rate of iris network when combined with deep learning.

[13] in another paper investigated the impact of the most widely used preprocessing techniques, with respect to numerical features, on the performance of classification algorithms using deep learning approach but they would have also considered clustering algorithms.

[14] reviewed data preprocessing techniques that were used to analyse massive building operational data but did not consider using semi-supervised learning to fully exploit the hidden values in massive amounts of unlabeled data.

[15] proposed enhanced pre-processing algorithms with feature selection and machine learning and evaluated the algorithms using performance evaluatory measures but failed to experiment classifiers from statistical, neural, fuzzy, genetic algorithms and also, tree families that could enhance the resulting accuracy was not taken into consideration.

But in this paper, a user classification model was developed to classify the user's quality of experience on the web. Key Performance Indicators (KPIs) were extracted from Quality of Web Service (QWS) dataset generated. Principal Component Analysis (PCA) algorithm was used to extract relevant features and reduce the dimensions of the dataset generated. The quality of web service dataset was trained using random forest algorithm of different tree sizes. The model was used to develop an application capable of classifying the users' quality of experience on the web based on the website of interest and was implemented with python programming language.

III. MATERIALS AND METHODS

A. Research Methodology

The research methodology used to develop this model is Object Oriented System Analysis and Design Methodology (OOADM).

This programming paradigm was used because the components are constituents of objects which involve classes and their methods of interaction. The Unified Modeling Language (UML) was employed to visualize the architectural blueprint of the proposed system in diagrams since UML is a component of object oriented system analysis and design.. To develop the proposed system, Quality of Web service dataset with features that impact users' experience of these services (youtube, facebook, VoIP, web browsing, file transfer) were extracted.

The tools used in gathering data include: Quality of experience extraction tool that is capable of extracting parameters from data set obtained from a network operator. These metrics generated are stored and periodically sent to the QoE server for preprocessing and analysis. Data argumentation was also done at this level to get web based Key Performance Indicators (KPIs) which was used for training and prediction. We ended up having a fully labeled QoS/QoE dataset which was used to build and train machine learning based predictors / models.

B. Design Architecture of the User Classification Model

Figure 1 shows the architecture of the user classification model developed for web users.

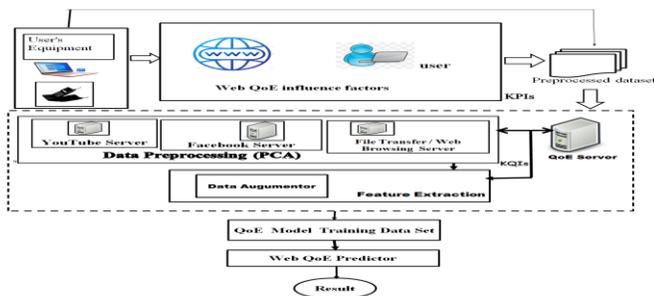


Figure 1: Architecture of User Classification Model for web users

The system architecture consists of the following layers: user equipment, data preprocessing module, Quality of Experience server, feature extractor, model training and the predictive module.

The data capture module/ Users Equipment: This layer is responsible for collecting the data from the user's device as soon as the network is launched. The required parameters are captured for the different webservers (facebook, skype, Youtube, e.t.c.). The data set in table 1 consists of 364 instances of measured key performance indicators (KPIs) obtained from Quality of Web service dataset generated.

QoE Server: This layer holds the data temporarily when packets are sent on a network. It sends and receives requests from various servers (youtube, facebook, Skype, whatsapp e.t.c) and records them depending on the web site the user wants to visit. It then passes the QoE metrics measured for preprocessing.

Data preprocessing was also carried out to constructively pattern it to be trainable with random forest and also to extract the relevant features from the dataset. The data is preprocessed using different

techniques and libraries in python, which converts the data into binary numbers.

The following preprocessing steps were used to scale the quality of web service dataset obtained before training with machine learning models.

1. Load data set
2. Import libraries
3. From sklearn.preprocessing import MiniMaxScaler
4. Set data link
5. Data parameters
6. Prepare dataframe using the given link and define
7. Separate array into input and output
8. Initialize the MinMaxScaler
9. Learn the standard parameters for each of the data and transform.
10. Summarise transformed data

Table 1 :Quality of Web Service Dataset

S/N	Response Time	Availability	Throughput	Successability	Reliability	Latency	WSRF
1	45	83	27.2	50	97.4	43	100
2	71.75	100	14.6	88	85.5	64.42	93
3	117	100	23.4	83	88	111	90
4	70	100	5.4	83	79.3	63	90
5	105.2	100	18.2	80	92.2	104.6	90
6	224	100	24.6	83	80	223	90
7	99.2	100	13.7	80	76.3	62.4	89
8	108.2	100	16.8	80	90.7	108	88
9	125.2	100	16.4	80	89.2	125	88

The transformed data was stored in Quality of experience server which was fed into the decision trees for training the random forest classifier. In training the dataset, random forest was used which involved using the extracted features as input to train a QoE model. The accuracy of the model was evaluated using appropriate testing parameters like accuracy, precision, specificity and sensitivity. The model is useful for real time quality of experience predictions. To classify the user's experience, the correlation between KPI and KQI enables the model to predict the unknown KQI from the known KPI. The system classifies the quality of experience of web users in two ways:

a. When a user wants to predict his experience from a live website, he simply extracts parameters from the website and then provide the web address of the site he wants to visit. The system then returns the estimated QoE class of the site in question.

b. The user can equally predict his experience by using the dataset already captured from different websites to predict the quality of experience of the user on that website. The result from this module can now be compared between objective parameters QoE score and subjective QoE to know how accurate the estimation is. The result of this module can equally be used to send report to network operators or ISPs upon request.

The last is the User's Interface which is the main interface where inputs of parameters are done. It comprises of the graphic user interface of the system which the user can see to make inferences and decisions pertaining to his opinion on web experience.

B Model Building

The first goal of this paper was to scale the data from the original range so that all the values are within the new range 0 and 1, while the end goal is

to develop user classification model for classifying the user's web experience into four categories. Class 1 represents very good experience, class 2 represents good experience, and class 3 represents fair experience while class 4 represents poor experience as the case may be. To achieve the first goal, scikit-learn object called MinMaxScaler was used to normalize the dataset in table 1 to obtain the scaled dataset shown in Table 2.

Table 2: Normalised Quality of Web Service Data

S/N	Response Time (s)	Availability	Latency	Jitter	QoS level
1	68	0.00	1.00	0.20	1
2	78	0.00	1.00	0.20	1
3	83	0.00	0.00	0.80	1
4	85	0.00	0.70	0.20	1
5	71	0.00	0.30	0.10	1
6	65	0.00	0.30	0.30	1
7	61	0.00	0.00	0.40	1
8	76	0.10	0.30	0.20	1
9	70	0.00	0.30	0.10	1

After Rescaling, table 2 shows the output with all the values in the range between 0 and 1. The training dataset in Table 2 contains the most relevant features that affect the web quality of experience of internet users.

C PCA Based Feature Selection

The main goal of this paper was also achieved by building the QoE feature extraction model using the Principal Component Analysis (PCA) algorithm and training it with random forest and then implemented in python. This was necessary to ensure that the model built was accurate and must be capable of transforming large volume of the data set into principal components to make it less prone to errors. The result of the PCA transformation of the dataset is shown in table 3. A PCA based feature extraction model of web quality of experience was developed by extracting features from the normalised dataset shown in table 2. The PCA algorithm also helped in dimensionality reduction in order to enhance the accuracy of the model. The feature extraction module was developed to extract these relevant data which was trained with random forest algorithm. The columns Response time, Availability, Latency, and Jitter are the features which represent inputs to the model while the column "QoS level" is the target variable or the classes. The Principal Component Analysis Algorithm was used in extracting the relevant data. Similarly, the Random Forest algorithms on SPM 8.2 was used to train the model with the results compared with other existing models.

The detailed steps employed in the feature extraction algorithm are as follows;

Step 1: For any two feature vectors of the training data get their matrixes

Step 2: Calculate the summation of the matrixes for the two feature vectors of the training data.

Step 3: Calculate the covariance matrix of the feature vectors. The covariance matrix is given by

$$Cov(Matrix) = \frac{1}{(n-1)} \sum (x - \mu)(x - \mu)^T.$$

(1)

Where n is the number of training samples, x is the corresponding vector values, U is the mean of the training data and T is the transpose of the matrix

Step 4: Find the eigen values and the corresponding eigen vectors

$$AX = \lambda X \Rightarrow \lambda_1 \lambda_2$$

(2)

$$AX = \lambda X$$

Where A is the eigen value, λ is the corresponding eigen vector and X is the corresponding vector values.

Step 5: When the eigen vector corresponding to the largest eigen values is obtained, then the first is

referred to as the first principal component else if they are equal to each other, both feature vectors are taken.

Step 6: Continue testing the feature vectors until all the significant eigenvectors with the highest eigen values are gotten. The subsequent ones are called principal component PC(2), PC(3)..., PC(n).

Step 7: Reducing the dimensions of the data set

The last step in performing PCA was to re-arrange the original data with the final principal components which represent the maximum and the most significant information of the data set. In order to replace the original data axis with the newly formed principal components, we simply multiplied the transpose of the original data set by the transpose of the obtained feature vector.

The output from the feature extraction using PCA is shown in table 3. After the PCA, the new data has been reduced to two features as shown in the table with the same number of rows as the original features. This shows the strength of using PCA to extract relevant features from a large dataset as well as for dimensionality reduction.

Table 3: Output features from PCA

Principal Component 1	Principal Component 2
9.19283683	1.94858307
2.3878018	-3.76817174
5.73389628	-1.0751738
1.25617928	-1.90229671

IV IMPLEMENTATION

The implementation was done by extracting parameters from 346 websites and training them in order to classify the experience of the users into the four categories – very good, fair, poor and very poor experiences.

A Results

Figures 2 – 10 show the details of the results obtained from the modelling techniques and the comparison with existing algorithm.

Classification and predictions were performed by loading the dataset into the user's device. This is simply achieved by clicking the extract parameter icon on the home page of the user classification system. This enables the system to locate various web servers available on the internet to extract parameters relating to quality of web experience. The system prompts the user to type a web address of interest to view his or her experience.

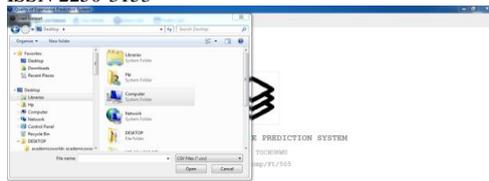


Figure 2: Dataset Loading dialogue



Figure 6: QoE prediction prompt



Figure 3 : QoE parameter extraction interface

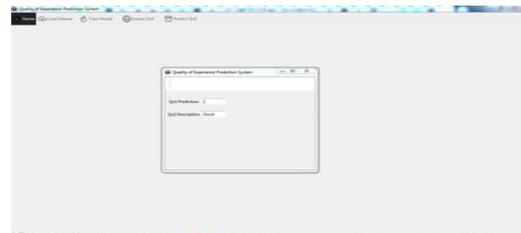


Figure 7 : QoE prediction output for single website



Figure 4: Feature extraction completion confirmation page



Figure 8 : QoE prediction output fo multiple websites



Figure 5: QoE prediction prompt for multiple website

B Discussion of Results

In order to predict the user’s QoE from different websites, using the parameter extraction feature of the system, network parameters were captured for 346 websites according to the dataset model designed in the system. The websites were assessed over a period of 50 days spread over the different times of the day. Similarly, the parameters were captured over different Internet provider's network namely MTN, Glo Mobile, Airtel and Etisalat using 3G, 3.5G and 4G networks respectively.

The outputs from user classification model for quality of experience of web users are shown in figures 2 - 8. Figures 2

C MODEL EVALUATION The accuracy metric plot of the model against that of CART Algorithm using Gini index and Information gain as splitting functions for test proportions of 0.2, 0.3 and 0.4 as shown in figure 9 shows that the QoE model performed at accuracy level of 93 % and above while support vector machine had the least performance accuracy of 82 at 0.30 test proportion.

Figures 10 also shows the plot of precision of the model compared to that of existing models for test proportions of similar values. It can be observed in the figure that the QoE model consistently performed better than models built on both CART algorithm and support vector machines in terms of precision.

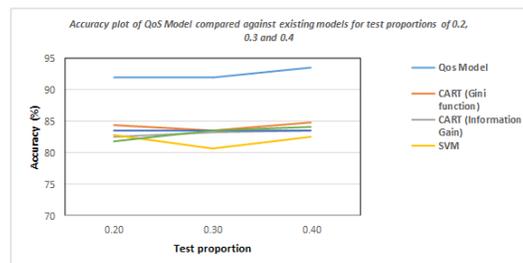


Figure 9 : Accuracy of QoE Model against existing models

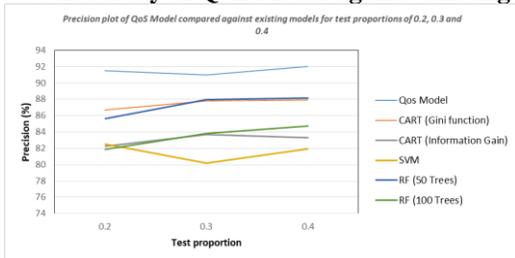
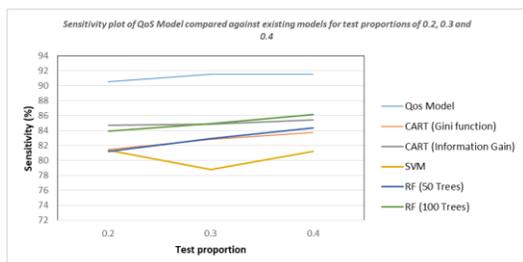


Figure 10 : Precision of QoE Model against existing models



and 3 shows the website QoE parameter extraction interface and the parameter extraction completion confirmation dialogue respectively. Figure 4 shows the parameter extraction output and figure 5 is the QoE prediction prompt for a multiple website, while figure 6 shows the QoE prediction prompt for a single website.

Similarly, figures 7 and 8 show the QoE prediction output for a single website and QoE classification output for multiple websites respectively.

Figure 11: Sensitivity of QoE Model against existing models

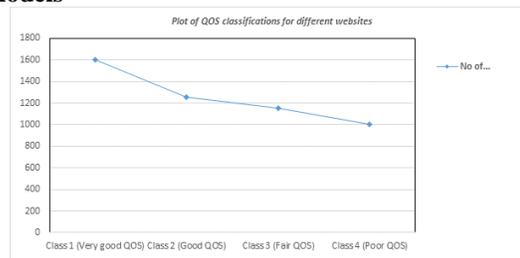


Figure 12: Plot of QoE classification for multiple websites

Figure 11 shows that in terms of sensitivity; the QoE model still performs better than other models using the same test proportions of 0.2, 0.3 and 0.4 respectively.

From the graph shown in figure 11, it can be observed that out of the 1800 websites analysed, about 1200 -1600 users would experience very good service, 115- 1200 would be good while 1000 – 1200 users would have fair experience and 1000 would have poor experience on the web at the time they were analysed.

5. Conclusion

User classification model for web quality of experience was designed, developed, and trained for web QoE prediction with highly accurate results. From the PCA usage as feature extraction technique in QoE modeling, most of the tests that form feature vectors are mostly high dimensional data which were reduced by feature extraction module before using the random forest classifier to train the data. Also, dimensionality reduction of data was also necessary in order to increase the amount of data and reduce over fitting during training the model

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REFERENCES

[1] Amour, L., Sami, S., Hoceini, S., and Mellouk, A. (2015). Building a Large Dataset for Model-based

- QoE Prediction in the Mobile Environment. Proceedings of the 18th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (pp. 313-317). Cancun, Mexico : ACM
- [2] Balachandran, A. (2014). *Large scale data analytics of user behavior for improving content delivery*. Carnegie Mellon University School of Computer Science.
- [3] Serral-Gracià, R., Cerqueira, E., Curado, M., Yannuzzi, M., Monteiro, E., & Masip-Bruin, X. (2010). An overview of quality of experience measurement challenges for video applications in IP networks. In *International Conference on Wired/Wireless Internet Communications* 252-263. Springer, Berlin, Heidelberg.
- [4] Boz, E., Finley, B., Oulasvirta, A., Kilkki, K., & Manner, J. (2019). Mobile QoE prediction in the field. *Pervasive and Mobile Computing*, 59, 101039.
- [5] Boutaba, R., M. Salahuddin, and N. Limam (2018): A comprehensive survey on machine learning for networking: evolution, applications and research opportunities. *J Internet Serv Appl* 9, (16) . <https://doi.org/10.1186/s13174-018-0087-2>
- [6] Abar, T., Ben – Letaifa A., and S. El Asmi (2020): ‘Quality of experience prediction model for video streaming in SDN networks’, *Int. J. Wireless and Mobile Computing*, 18(1), 59–7.
- [7] Horad D. (2018). Narrowing the gap between QoS metrics and web QoE using Above- The-Fold metrics. *International Conference on Passive and Active Network Measurement* . 1-13. Berlin: Germany.
- [8] Nadhom, M., & Loskot, P. (2018). Survey of public data sources on the Internet usage and other Internet statistics. *Data in brief*, 18, 1914-1929.
- [9] Pokhrel, J., Lalanne, F., Cavalli, A., & Mallouli, W. (2014). QoE estimation for web service selection using a fuzzy-rough hybrid expert system. In *2014 IEEE 28th International Conference on Advanced Information Networking and Applications* 629-634. IEEE.
- [10] Alshdaifat, E. A., Al-hassan, M., & Aloqaily, A. (2021). Effective heterogeneous ensemble classification: An alternative approach for selecting base classifiers. *ICT Express*, 7(3), 342-349.
- [11] Tan, C., and Lin, J. (2021). A new QoE-based prediction model for evaluating virtual education systems with COVID-19 side effects using data mining. *Soft Computing*, 1-15.
- [12] Alshdaifat, N. F. F., Talib, A. Z., & Osman, M. A. (2020). Improved deep learning framework for fish segmentation in underwater videos. *Ecological Informatics*, 59, 101121.
- [13] Alshdaifat, E. A., Ala'a Al-shdaifat, A. Z., & Aloqaily, A. (2020). The Impact of Data Normalization on Predicting Student Performance: A Case Study from Hashemite University. *International Journal*, 9(4).
- [14] Balachandran, A., V. Sekar, A. Akella, S. Seshan, I. Stoica & H. Zhang, (2013). Developing a predictive model of quality of experience for internet video. In *ACM SIGCOMM computer Communication Review* . 43,339–350. Hong Kong, China.
- [15] Banumathi, S., & Aloysius, A. (2019). An Enhanced Preprocessing Algorithms and Accuracy Prediction Of Machine Learning Algorithms. *International Journal of Advanced Research in Computer Science*. 8 (8)

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Management and Treatment of Acne Vulgaris

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Abstract: With the present-day fast lifestyle leading to stressful conditions, coupled with increase in dietary intake of fast foods, the incidence of acne vulgaris may evolve as a major medical problem in the near future. Acne vulgaris can have physiological manifestations such as eruptions which tend to impair the appearance of a person as also psychological manifestations such as feeling of ugliness, depression, low self-esteem etc. Acne vulgaris can be prevented by maintaining self-hygiene and application of topical products which prevent the development of conditions favourable for formation of acne vulgaris. Cosmetics can also help in treatment of acne vulgaris once they are formed. The prevention and treatment of acne vulgaris assume tremendous significance since untreated acne vulgaris can leave permanent scars which may be difficult to remove.

Keywords: Acne vulgaris, treatments, inflammation, skin microbiota in acne.

Introduction:

Acne which is an inflammatory disorder of pilosebaceous unit that occurs during adolescence which causes characteristic lesions with open (black) and closed (white) comedones, which may progress into inflammatory lesions (papules, pustules, nodules and cyst) ⁽¹⁾. Acne in general is a form of eruption on the skin mainly in the facial area which tends to affect the appearance of an individual. Acne is common among both males and female genders and mostly affects people in their adolescence. Acne has both physiological as well as psychological effects on the person. While the physiological effects are mainly soreness accompanied with pain, the psychological effects are anxiety, depression and low self-esteem. In one of the studies, it was also reported that 8.8 % of women dealing with acne reported suffering from depression which was twice the number of men. ⁽²⁾ With proper care, development of acne can be prevented with the help of conventional therapies as well as alternative therapies containing new agents under development for the treatments that are available for curing acne once the skin condition arise.

Acne Vulgaris:

All the types of acne are disorders of pilosebaceous units, which are composed of hair follicles, sebaceous glands and hair. ⁽³⁾ These skin condition that is formed when a hair follicle becomes plugged with oil, dirt, and dead skin cells. This accumulation causes the formation of whiteheads, blackheads, pimples or cysts. Acne has been found to be more common in teenagers but it may affect people of all ages. Based on age, acne can be neonatal, infantile, mid-childhood and preadolescent. This classification is based on a panel convened by the American Acne and Rosacea Society.

Neonatal acne is also called baby acne or neonatal cephalic pustulosis and expresses itself in new born babies, in about two weeks after birth and does not usually leave scars. Infantile acne affects children of ages six weeks to one year and is more common in boys than in girls, at a ratio of 3:1. Mid-childhood acne affects children from ages 1-6 years and is rather rare, and may result in

hyper-androgenism, and therefore a visit to an endocrinologist must be made. Preadolescent acne expresses itself in the first signs of puberty, between ages 7 to 12 years or up to menarche in females and is the most common age group that is affected by this skin condition, usually affecting the T-zone of the face. Adult acne or post-adolescent acne onsets in the teenage years or after the age of 25 and can be persistent. The scarring of the skin may depend on the severity of the acne. ⁽⁴⁾

Whiteheads are closed plugged pores on skin while blackheads are open plugged pores. Both, whiteheads and blackheads are non-inflammatory. Whiteheads are formed when the follicular wall bulges. Blackheads on the other hand, are formed when the pore is open and is congested with oil and bacteria which turns brown when exposed to air. While whiteheads and blackheads are non-inflammatory in nature, papules, pimples, pustules, nodules and cysts cause inflammation of the skin. Papules are small, red and tender bumps on the skin, pimples or pustules are papules which contain pus, showing as a white tip, nodules are large, solid and painful lumps under the skin and cysts are cystic lesions that are under the skin, painful and pus filled. While whiteheads and blackheads may be treated with cosmetics and physical procedures, the latter four which are inflammatory in nature are harder to treat and may need medical attention. ⁽⁵⁾

Formation of Acne vulgaris:

Acne vulgaris is the formation of comedones, papules, nodules or cysts as a result of obstruction and inflammation of pilosebaceous units which consist of hair follicle and their accompanying sebaceous gland causing increased sebum production. These obstructions are also contributed to by keratin retention and growth of bacteria which results in inflammation. One of the major pathogenic factors involved in acne vulgaris is hyper-keratinization. The sebaceous follicles get obstructed and result in abnormal keratinization of infundibular epithelium. The increase in sebaceous gland secretion due to androgens and microbial colonization of pilosebaceous units by *P. acnes* leads to the formation of perifollicular inflammation. Increased activity of the sebaceous glands results in the proliferation of *P. acnes* which is anaerobic in nature, retains sebum from pilosebaceous ducts. These anaerobic organisms consist of ribosome rich cytoplasm with thick cell wall producing various biologically active mediators that results into inflammation by promoting leukocyte migration and follicular rupture. In case of inflamed lesions, several neutrophils and macrophages infiltrate surrounding hair follicles causing phagocytosis of *P. acnes*. For examination of neurogenic factors involved in pathogenesis of acne vulgaris, one can quantitatively assess the effect of neuropeptides on morphology of sebaceous glands by in vitro analysis using electron microscopy ^[6]. In general *Propionibacterium acnes* (*P. acnes*), an anaerobic bacterium is believed to play a vital role in the formation of acne vulgaris on the skin. The accumulated sebum gets oxidized in a process called sebum peroxidation. The oxidative damage thus caused by the free radicals lowers the oxygen supply to the area and *P. acnes* being anaerobic, thrives in this environment. ⁽⁷⁾

The mechanism of acne formation involves pathogenic factors like seborrhea, sebum retention and inflammation in the respective sequence. The sebum retention is caused by hyper-keratinization of the infra infundibulum of the sebaceous duct. This is due to the stimulation of sebaceous gland by androgens which may be due to the excessive sensitivity of sebaceous end-organs to androgens. The corresponding inflammation is related to the inflammatory role of various enzymes of *P. acnes* and to the chemotaxis of neutrophils. ⁽⁸⁾

P. acnes plays a vital role in acne pathogenesis. One mechanism is through the Toll-like receptors (TLRs).

There are four distinct stages or steps to the formation of acne vulgaris on the skin. These are:

1. Androgen that act on the sebaceous gland to increase sebum production – Stimulation of sebaceous gland is due to the potent androgen 5 α -DHT as the sebaceous gland cells consist of all the necessary enzymes required for the conversion of testosterone to 5 α -DHT. 5 α -reductase type I Isozyme catalyzes the conversion of testosterone to 5 α -DHT in peripheral

tissues by a NADPH dependent reaction, expressed where cytoplasm and cell membrane compartment is present in skin cell. This is particularly more frequent in facial sebocytes. ⁽⁹⁾

2. This increase in sebum facilitates the growth and proliferation of the bacterium *P. acnes* – The increase in sebum excretion has a major role in pathophysiology of acne vulgaris. Other than this, there are other functions of sebaceous gland which are also responsible for acne development such as sebaceous proinflammatory lipids, production of different cytokines, various neuropeptides like corticotrophin releasing hormone produce by sebocytes and substance P (belonging to tachykinin family of peptides found in peripheral and central nervous systems) in nerve endings of healthy glands of acne patients. ⁽¹⁰⁾
3. There is impairment in the follicular desquamation – This causes the desquamated matter to plug the opening of the follicle. Linoleic acid is responsible for regulating interleukin (IL)-8 secretions which regulates the inflammatory responses regarding acne vulgaris. The deficiency of Linoleic acid can cause impairment in the follicular epithelium barrier, allowing other fatty acids produced by bacterial lipase activity or sebocytes metabolism to penetrate the epithelium, leading to the deficiency of essential lipids ⁽¹¹⁾
4. The presence of *P. acnes* causes conversion of sebum to free fatty acids in greater amounts – *P. acnes* is known to releases lipase that produce fatty acids by digesting sebum, which results into inflammation of the skin. At least 12 putative lipases are encoded in the genome of *P. acnes* but only two of them (GehA and GehB) possess a signal peptide for secretion. They are 42% identical on protein level. GehA is thought to be the main enzyme responsible for hydrolysis of sebum triglycerides, resulting in production of free fatty acids, and is considered as the inflammatory agent. It increases adhesion between *P. acnes* and the cells of hair follicle, promoting colonization of *P. acnes*. Whereas, GehB is shown to be associated with healthy skin and beneficial effect of lipase. However, there are possibilities that different lipases play distinctive roles in regard to health and disease ⁽¹²⁾

In males, the androgens target the sebaceous gland and acne may be caused by excessive sensitivity of the gland to androgens. In women however, an ovarian or adrenal hyperandrogenism may be the cause.

Conditions Favourable for Acne Formation:

Typical areas for appearance of acne are forehead, face, chest, shoulders and upper back as they contain relatively more pilosebaceous units. This means that acne prone skin is typically oily in nature. There are certain triggers for the formation of acne on skin or those that may worsen it. Factors such as hormonal changes, diet, stress and certain medications may in fact worsen the acne condition. Acne vulgaris can also be hereditary in some cases.

The hormone, androgen increases during puberty which affects the sebaceous glands causing them to enlarge, thus producing more sebum. This is a common occurrence. In males suffering from acne vulgaris, the skin may exhibit high levels of 5 α -reductase which causes increase in the conversion rate of testosterone to a more active dihydrotestosterone. Hyperandrogenic conditions like excess of adrenal androgen and 21-hydroxylase deficiency and polycystic ovarian syndrome may aid with the development of acne. Many females undergo hormonal changes in later stages of life, which can lead to acne breakouts. Premenstrual breakouts are common in women. Medications that include steroids such as corticosteroids, testosterone or lithium also contribute to acne formation on skin. ⁽¹³⁾

A diet rich in carbohydrate foods, such as breads, pasta, cereal made of wheat flour, chips, sodas, sugar sweetened beverages, sweeteners such as maple syrup, honey and cane sugar and high glycemic foods may worsen acne. Different receptors are expressed

by the sebaceous gland, responsible for inducing sebum. Studies have identified the receptors which get activated by dietary substances. Free fatty acids and cholesterol present in diet are known to stimulate the peroxisome proliferator-activated receptor (PPAR α , β and γ) and (IGF)-1 which is an insulin-like growth factor receptor is stimulated by sugar and, leptin receptor by fat. Bodyweight is regulated by adipocytes which is secreted by leptin hormone and known to link lipid metabolism with inflammation in various cell types. This result suggests that leptin plays the major role in inducing inflammation and altering lipid profile in sebocytes and can be a link between diet and inflammatory acne development.⁽¹⁰⁾ Application of oily, occlusive cosmetic products like face creams, lotions may also contribute to acne.

Acne vulgaris not only affects the skin but also may take a toll on the emotional health of an individual. This is due to the fact that acne may result in discolored skin and permanent scarring on the areas that it affects. It may also leave open pores on the skin. Studies have shown that people suffering from acne vulgaris can develop signs of depression, anxiety, low self-esteem, poor self-image and an overall low quality of life.⁽¹⁴⁾

Even though acne vulgaris is not a fatal or life-threatening skin condition, it does impact more than just the skin of a person. Untreated acne vulgaris can result in permanent scarring of the skin. Untreated cases of severe acne such as cystic may result in more severity such as acne conglobate which is characterized by nodules of cysts under the skin which is a very painful condition.

Other effects of acne vulgaris include post inflammatory hyperpigmentation and excoriated acne. The former is the change in skin color after the acne has healed and the inflammation from the acne is gone. It results in hyperpigmentation due to the quantity of melanin deposits in that area. These are temporary blemishes on the skin and heal over time, usually without the aid of treatment or medication. Excoriated acne, however, is another specific kind of acne which results when the papules, pimples in the affected area are popped, picked at or squeezed. This condition is characterized by an intense urge to pick and scratch at the lesions even if they are small whiteheads or blackheads.

Acne vulgaris is known to grow in the following four grades:

Grade I – Simple non inflammatory acne consisting of comedones and a few papules.

Grade II – Here comedones, papules as well as a few pustules are observed.

Grade III – Larger inflammatory papules, pustules and a few cysts are observed.

Grade IV – Here, cysts are seen to become confluent.⁽¹⁵⁾

Acne vulgaris treatment:

Physical treatments:

Physical ways of dealing with blackheads and whiteheads include extraction with the help of an extractor which can be helped with association of steaming. Such facilities and procedures are offered at spas and performed by professionals.

As an alternative to topical and oral treatments for acne vulgaris, laser and radiofrequency had been discovered in the recent years. Lasers are believed to reduce inflammatory acne lesions by targeting the factors such as *P. acnes* bacterium, activity of sebaceous gland and inflammation reduction. The Pulsed Dye Laser which is known for dermal remodeling and collagen production, is used for acne scarring.⁽¹⁶⁾

Pulsed dye laser is mostly used for collagen production and can also reduce inflammatory acne. Recent studies have found that it has no effect on degree of *P.acnes* colonization or sebum production in the skin and found to have significant upregulation of

transforming growth factor β , and potent inhibitor of inflammation. This is likely due to its local anti-inflammatory effects. The combination of radiofrequency and pulsed light device has been used for treating acne. Recent clinical study has shown improvement in acne with reduction in both perifollicular inflammation and sebaceous glands with reduction by 47 percent in mean acne lesion counts. Another study has also shown 75 percent reduction in inflammatory acne lesion in more than 90 percent of patients.⁽¹⁶⁾

Use of intense pulsed light for acne vulgaris treatment is based on the production of singlet oxygen (O_2) post photo activation of porphyrins that are synthesized by *P. acnes* and then stored. An intense pulsed light provides a source which offers irradiation at a specific wavelength which can be modified by filters. In one such study with 19 patients suffering from mild to moderate acne, the patients were exposed to wavelengths ranging from 430 nm to 1100 nm with an energy density of 3.5 J/cm², pulse width of 35 milliseconds.⁽¹⁷⁾ Differences were seen in non-inflammatory as well as inflammatory cases with a decrease in lesions up to 79 percent in non-inflammatory and 74 percent in inflammatory cases one month after the final treatment.

An infrared diode laser can effectively reduce inflammatory acne lesion with conjugation of a dynamic cooling device and with a flux rate of 14 J/cm². Because of the safety this procedure offers along with its efficacy, it has become a common treatment for acne. Radiofrequency combined with pulsed light device has also been used to treat acne with two weekly sessions for 4 weeks. A reduction of 47 percent in mean acne lesion was observed in 32 patients.⁽¹⁶⁾⁽¹⁸⁾

Chemical treatments:

For mild acne vulgaris, first line treatments include benzoyl peroxide or a topical retinoid. A combination of such along with an antibiotic can also be used. For moderate acne vulgaris, the first line of treatment includes a combination of benzoyl peroxide along with topical antibiotic such as erythromycin or clindamycin. Whereas, the first line treatment for severe acne vulgaris includes an oral antibiotic, benzoyl peroxide a topical antibiotic and a topical retinoid. Isotretinoin, which is an effective retinoid against severe, nodular or cystic acne. In case of females, spironolactone can also be considered as a mode of treatment.⁽⁵⁾ Even though, topical and oral antibiotics are very effective against acne vulgaris, an individual exposed to its prolonged use may develop a resistance to it.

Combination of Physical and Chemical treatments:

Lasers such as Potassium Titanyl Phosphate Vascular Laser have shown to be effective against acne vulgaris. It is said to work by selective photo-thermolysis of blood vessels or photodynamic effect on *P. acnes* and sebaceous gland. In a study the Erbium Glass Laser has shown to be effective against acne with 78 percent reduction in lesions after four sessions at 4-week intervals. *P. acnes* produces an endogenous coproporphyrins and photo-porphyrins in the metabolic process. When these are exposed to visible light—red, blue or green, these endogenous porphyrins get excited and generate a reactive singlet oxygen species which damages the cell membrane of the bacterium.⁽¹⁹⁾

Photodynamic therapy (PDT) has also been used for treating acne. PDT involves light sensitive medication and a light source which is used to destroy any abnormal cells. With this procedure, bactericidal activity has been observed.⁽²⁰⁾ It involves the exogenous 5-aminolevulinic acid which is a porphyrin precursor and is converted intracellularly into photoporphyrin IX which is its photoreactive species. Indocyanine green, a dye that binds albumin and is known to be selectively absorbed by the sebaceous gland had also been used for treating acne. Although, Photodynamic therapy has a good efficacy rate, it is said to be characterized by pain and eruptions of pustules and cysts and phototoxicity. Methyl aminolevulinate, a methyl ester of 5-aminolevulinic acid has shown a decrease in post treatment adverse effects.⁽¹⁶⁾ PDT involves the use of photosensitizer in combination with light and oxygen. Mechanism of PDT action is considered due to the reduction of sebum excretion and Cutibacterium acnes colonization along with its

immunomodulatory effects. Red light is most commonly used along with intense pulsed light. Where both inflammatory and noninflammatory lesions response to PDT treatment in clinical studies. ⁽²¹⁾

Acne patches or pimple patches have also been introduced into the market which have been embraced widely. These are anti-acne in nature and are like stickers that can be applied over the acne lesion or bump to help disinfect it and reduce their size considerably. They are beneficial in the manner that they create a barrier between the outer environment and the lesion to protect them from worsening. The patches have shown to help reducing mild acne but it cannot be held as an alternative or substitute for medical treatments, especially in cases as severe as cystic acne. These patches are formulated and manufactured with active ingredients which target acne spots and minimize them. They are beneficial as they act as a shield from the environment and prevent an individual from picking at the lesion from time to time. They contain a hydrocolloid component which absorbs the pus and reduces the inflammation and keeps the area moist. ⁽²²⁾

Skin Microbiota in Acne and Probiotic Treatment:

In general, 60% of the species comes under genera staphylococcus (firmicutes), Corynebacterium and Propionibacterium (actinobacteria). In the oily areas of the skin, lipophilic species of propionibacterium and cutibacterium predominate. Whereas, in the moist regions, staphylococcus and Corynebacterium species can be seen and in dry areas of the skin, a mixture of all the four phyla can be seen. ⁽²³⁾ It has been stated that 10^6 aerobic bacteria can be present per cm^2 in moist skin and $10^2 - 10^6$ anaerobes are present in per cm^2 in dry skin. ⁽²⁴⁾

Probiotics can be used for the acne treatment by topical application that can alter the skin microbiota and help in improving skin immune response. This also helps in improving the skin barrier and production in antimicrobial peptides. For example, streptococcus thermophiles can enhance ceramides which helps to trap water in our skin and phytosphingosine, which is a ceramide sphingolipid shows antimicrobial activity against *C. acnes* and thus is found to have a positive effect against acnegenic condition. ⁽²⁵⁾ There are several techniques that describe the mechanism of antimicrobial peptides where it states that these peptides contact microorganisms and exert their action. One such model is *the toroidal type*, where integration between antimicrobial peptides and lipid chains takes place in such a way that the hydrophilic regions of these peptide face inside the pore and hydrophobic region is in contact with the phospholipid which helps in the union between the external and internal membrane. Another mechanism is the *carpet type model* where translocation of membrane takes place in peptide-pathogenic contact where peptide aggregation takes place on the membrane and generates tension, this is similar to the micelle formation in a detergent. High molecular weight peptides which are found in natural killer cells and cytotoxic T-cell have a broad-spectrum bactericidal action against *P. acnes* which has 5 alpha helicoidal regions made up of 74 amino acids in which disulfide bonds are contained. This polypeptide has the most relevant fragment having 31-50 sequence with antibacterial and anti-inflammatory effects. Another example is, CEN1HC-Br antimicrobial peptide obtained from sea urchin having heterodimeric peptide of 30 amino acids with disulfide intramolecular bridge which attributes antimicrobial activity against *P. acnes*. ⁽²⁶⁾

Research study also have demonstrated positive effect for the tropical probiotic treatment of acne vulgaris. One such study where Enterococcus faecalis strain was used for the lotion treatment for eight weeks has shown the positive effect in pustule type acne lesion. Another study where Nitrosomonas eutropha was used for 12 weeks, showed reduction in acne severity and inflammatory lesions. ⁽²³⁾ Bacteriotherapy is mostly used for the treatment where one or multiple pure cultures are used in which:

1. Probiotics where living microorganisms are used which give beneficial effect.
2. Thermo killed bacteria (Postbiotics) where bacterial cell, enzymes and excreted bacterial product are used but the bacteria do not replicate.
3. Cell lysates (Postbiotics) where physically killed bacteria are used in which cell wall and cell content are present. Here, the bacteria do not replicate anymore but the enzymes are still active.

In microbiome products, fermented products are also used in which bacteria are not added but the supernatant which contain antioxidant, amino acid, lipids are used. Studies have also shown beneficial impact of using beneficial bacteria on human skin and its potential as a cosmetic ingredient. ⁽²⁷⁾

Cosmetics involved in Prevention and Treatment of Acne Vulgaris:

Acne vulgaris is a very common condition of the skin, affecting both males and females. It may arise at any age, though puberty is a very common stage for acne vulgaris to affect an individual.

Preventive cosmetics for acne vulgaris:

Acne vulgaris is a common occurrence in oily skin. A person with oily skin is very prone to acne and thus the term, “Acne prone skin”. These individuals are encouraged to use non- comedogenic and non-acnegenic products. The class of non-comedogenic products contain ingredients specifically that do not clog pores. As acne vulgaris is a skin condition that expresses itself when the pores of the skin are clogged or plugged, it is essential to do what needs to be done to help them keep open and airy. It may also be important for people with acne prone skin to opt for non-comedogenic, skin care and make up cosmetic products. They must opt for products carrying ingredients such as essential oils like grapeseed oil, sunflower oil, neem oil, rosehip seed oil, sweet almond oil, hempseed oil, benzoyl peroxide, resorcinol, aloe vera which are non-comedogenic in nature. They should strictly avoid cosmetic products containing comedogenic ingredients such as acetylated and ethoxylated lanolins, almond oil, ascorbyl palmitate, avocado oil, beeswax, capric acid, isopropyl myristate and its derivatives such as isopropyl palmitate, myristyl myristate, propylene glycol-2 myristyl propionate, D&C Red dyes.

A very common misconception about non-comedogenic cosmetic products is that they do not contain oils of any kind, natural, mineral or synthetic and are always water-based. When in fact, non-comedogenic products even though may be water based, they do contain oils, but these oils are non-comedogenic in nature, meaning they do not settle in the pores. It is one of the distinguishing points between a non-comedogenic and a non-acnegenic product, the latter being oil- free. There is no standardized scale to measure the non-comedogenic factor of such a product. So, on a scale of 1 to 5, if a product ranks at 0 – 2 in terms of how much pores have been clogged by the product, it gets labeled as a non-comedogenic product. ^{(28) (29)}

Topical treatment for acne vulgaris:

People suffering from mild or moderate cases acne vulgaris sometimes prefer to self-medicate, turning to over-the-counter drugs and products. Noticing this behavior of consumers, many cosmetic, personal wellness and skin care brands have designated the term “Anti Acne Products” to a particular group of products. These products are developed and marketed as such and are formulated with ingredients that are effective against acne vulgaris such as Salicylic acid, Benzoyl peroxide, Niacinamide, Glycolic acid, Zinc salt of pyrrolidone carboxylic acid, Alpha hydroxy acids (AHAs), Beta hydroxy acids (BHAs), Retinoids, Lactic acid and Sulfur. An array of products has been developed under Anti acne products such as creams, lotions, serums, face-washes, scrubs, face packs, gels, foams, sheets, exfoliators and soaps. Some brands also offer an entire regimen or routine specifically for acne prone skin.

Natural, herbal and home remedies for acne vulgaris:

Indians have always had a knack for home remedies for various skin and health conditions. Acne vulgaris is no exception to this. Many people who suffer from acne vulgaris have been known to opt for such remedies rather than medications or cosmetics as a first line approach. Natural, herbal and fruit extracts and oils such as Neem leaf oils, Tea tree oil, Aloe vera gel and extracts, Pear extracts etc. have been included in many anti acne formulations. These have greatly helped overcome the issue of attaining resistance from prolonged use of antibiotics. Nigella sativa (Black seeds) have been used as an approach to treat acne vulgaris. A clinical trial was done to evaluate the efficacy of N. sativa hydrogel against acne vulgaris. It was observed that the hydrogel product was able to

show decrease in the amount of acne lesions.⁽³⁰⁾ There are also some raw remedial approaches for prevention and treatment that are carried out at home. Ingredients like Apple cider vinegar, Cinnamon, Honey, Witch hazel, Green tea, Aloe vera are generally used to treat acne at home, many of these ingredients are antibacterial and anti-microbial in nature. Apple cider vinegar contains organic acid such as citric acid, which can kill bacteria and suppress inflammation and lactic acid improves acne scars. It has been found to kill *P. acnes*. Honey and Cinnamon are able to fight bacteria and decrease inflammation. A study in 2017 showed that a combination of Cinnamon bark extract and Honey had antibacterial action on *P. acnes*. Green tea is very rich in antioxidants and contains compounds that help against acne when consumed or applied on skin.⁽³¹⁾ It is likely to act against acne as the polyphenols in green tea are able to fight bacteria and reduce inflammation. The main antioxidant in green tea epigallocatechin-3-gallate (EGCG) has been observed to cause decline in sebum production and inhibits the growth of *P. acnes* as shown through research⁽³²⁾ Another such ingredient is Aloe vera, which naturally contains salicylic acid and sulfur both of which are very commonly used in anti-acne cosmetic products. Tea tree oil has also been used for the treating acne, having anti-inflammatory and antibacterial properties. It is advised to use Tea tree oil in diluted form as it is comedogenic in nature and may be slightly irritant on its own, in conjugation with a non-comedogenic agent as a carrier oil.⁽³³⁾

Topical Ingredients used for alleviating acne:

Some ingredients have been extensively used in formulation of products which help to prevent and treat acne vulgaris. These include sulfur, benzoyl peroxide, salicylic acid, retinoids, derivatives of vitamin A, adapalene and tretinoin (Retin A).

Benzoyl peroxide is an effective topical agent, having been used since many years in these formulations in concentrations of 2.5 to 10%. It has been incorporated in creams, gels, lotions etc. Benzoyl peroxide is a broad-spectrum antibiotic agent, and has an advantage due to its effective oxidizing activity. It is anti-inflammatory, comedolytic, keratolytic and is very effective against mild to moderate acne vulgaris.⁽³⁴⁾ It acts on the epithelial cells of the skin, increasing the over cellular turnover rate. It helps in the peeling of the skin and thus, aiding with resolving comedones. Benzoyl peroxide is metabolized in the epidermis upper layer to benzoic acid and free oxygen radicals. The former lowers the skin pH and the latter disrupts microbial cell membrane as it has broad-spectrum antimicrobial activity. It also has shown to be keratoplastic by inhibiting epidermal metabolism and DNA synthesis. It also helps in reducing metabolism of sebaceous gland cell but reduction in sebum is not well known. Reduction in free fatty acid in sebum is due to the antibacterial effect as lipases are responsible for free fatty acids production. Benzoyl peroxide also shows follicular flushing action.⁽³⁵⁾

Salicylic acid is oil soluble, so naturally it can help with the breakdown of oils and sebum that have collected in the pores over time to cause acne vulgaris and unclog them for good. It can be used in anti-acne as well as non-comedogenic products as it works by breaking down the sebum to clean out the pores. It is a good ingredient for persons with oily and acne prone skin, where the cells tend to stick close, and clog pores, this ingredient works by dissolving the oily material that holds the cells so close, thus relieving them. In higher concentrations it can help heal pustules and redness, being anti-inflammatory in nature.⁽³⁴⁾

Alpha hydroxy acids (AHAs) can treat acne by reducing inflammation and washing away the dead skin cells. They help stimulate the growth of new skin by reducing the concentration of calcium ions in the skin which aids in shedding of the cells at the surface and therefore aid with healing acne scarring. AHAs are able to reduce the epidermis pH and inhibit the action of transferases and kinases, interfering with formation of ionic bonds, helping to stimulate the process of desquamation.⁽³⁶⁾ The most common AHAs used in cosmetics are glycolic acid and lactic acid. Beta hydroxy acids (BHAs) are oil soluble which allows them easy penetration into deeper layers of skin. They are capable of unclogging the pores and even control oil level in the skin. They are also good exfoliators and skin peeling agents, so they can wash away the dead skin cells easily and improve the overall appearance of the

skin. Salicylic acid, as mentioned above is a BHA along with citric acid. Both are commonly used in acne concerning cosmetic products. ⁽³⁴⁾ Chemical peels may contain up to 50% of salicylic acid. Superficial chemical peels have also been used to treat acne vulgaris and its scarring. ⁽³⁷⁾

Azelaic acid belongs to the dicarboxylic acid family and is an exfoliant with antibacterial and antioxidant properties. It is available in concentrations up to 10 percent to 20 percent in creams or serums. It can be used for both facial acne and body acne in a foaming formulation. It can be a little drying in nature and therefore it is advised to be used in combination with a hydrating agent. It works by loosening the acne prone skin, and targeting *P. acnes*, inhibiting its growth. The antimicrobial activity of Azelaic acid is due to its ability to inhibit microbial cellular protein synthesis. It also reduces dark spots and is therefore effective for acne scarring as well. ⁽³⁸⁾

Retinoids are derivatives of vitamin A which are widely used in acne concerning formulations. They work by binding to nuclear receptors and trigger them to normalize the cell turnover cycle. Retinoids also target abnormal follicular epithelial hyperproliferation and reduces follicular plugging and micro-comedones. Some retinoids that are currently being used in cosmetics concerning acne vulgaris are Tretinoin, Adapalene, Tazarotene, Isotretinoin, Metretinide, Retinaldehyde, and B-Retinoyl Glucuronide. The concentration of retinoids used in formulations depends on their tolerability by the skin.

The exact mechanism for treatment of topical tretinoin function is not completely understood but the medication is thought to be through binding of retinoic acid receptors (RARs) alpha, beta and gamma along with retinoid X receptors (RXRs) by inflammatory mediators blocking. This leads to the increase in production of procollagen to augment collagen type I and III formations. The positive effect of Tretinoin is to modify the abnormal follicular formation which is because of the excessive keratinization of epithelial cells as tretinoin promotes cornified cell detachment and enhances shedding. This increases the mitotic activity which increases the loosely bond corneocytes turnover. This results into expulsion of comedogenic contents with reduction of micro-comedo precursor lesion of acne.

Retinoic acid usually binds to retinoic acid receptor alpha, a steroid thyroid hormone receptor which forms the heterodimers with RXR and retinoic acid which responds to the genes involved in cell differentiation. Topical dosages of tretinoin consist of 0.1%, 0.08%, and 0.04% applied once daily. ⁽³⁹⁾

Adapalene, (6-[3-(1-adamanty)-4-methoxyphenyl]-2-naphthoic acid) causes an anti-inflammatory effect by inhibiting the activity of lipoxygenase, as it is lipophilic in nature. It has an affinity for the retinoid acid receptor (RAR) which is present in the epithelial cells. Once this Adapalene-RAR complex is formed, it binds with the retinoid X receptor (RXR). With gene transcription, it then binds at specific DNA sites which causes effects such as keratinization and anti-inflammatory properties. It is an advantage that Adapalene is effective at less concentrations. It was found that Adapalene absorption through skin is in low amounts. About 0.25ng/ml of it was found in plasma of patients of acne vulgaris being treated topically with Adapalene chronically. ⁽⁴⁰⁾

Studies done on the topical acne treatment where (ADA) adapalene loaded PAMAM dendrimer were used and compared with the commercial gel product “Differin” gel, which targeted the pilosebaceous units—especially hair follicles. Results found that the PAMAM dendrimer gel formulation in lower ADA doses compared with a commercial product showed improved follicular localization and skin deposition of ADA. Overall, it was considered to be safe which minimizes the side effect and provides efficiency in topical treatment for dermatological diseases such as acne vulgaris even in the reduced doses of administration. Thus we can say, the improvement in the delivery of topical drug in nanoform can give effective result with no side effect. ⁽⁴¹⁾

Tazarotene is an acetylenic class of retinoids. A pro-drug that is converted to its active form, cognate carboxylic acid of tazarotene. Tazarotenic acid binds to all three members of retinoic acid receptor RAR alpha, RAR beta and RAR gamma. The therapeutic effect of tazarotene for acne is considered due to its anti-hyperproliferative and anti-inflammatory effects. Topical application of tazarotene reduces the expression of hyperproliferative keratins K6 and K16, which are increased in a comedogenic condition. It also suppresses the activator protein 1, resulting in reducing expression of several matrix metalloproteinases from keratinocytes which are increased in the condition of acne vulgaris. It has also shown the inhibition of TLR-2 induced innate response which triggers inflammation in acne, by decreasing the expression of Toll-like receptor (TLR) 2 and reducing the ligand binding with *P. acnes*. It results into increased epidermal turnover, normalized epidermal cellular differentiation and downregulates the expression of epidermal growth factor receptor, all of which result in reduction of hyperpigmentation and decreased hyperkeratinization. ⁽⁴²⁾

Isotretinoin mechanism of action is said to be only treatment that has implication for entire pathogenesis of acne. In general, retinoid plays a role through nuclear interaction with retinoic acid receptors (RARs), which are ligand-dependent transcription factors. Thus, regulation of gene transcription mainly occurs by the interaction of retinoid composition with receptor. Overall retinoid contributes to decreasing corneocyte adhesion, supporting cellular proliferation and follicular renewal, induction of cell apoptosis and immune regulation. Isotretinoin may alter comedogenesis through these mechanisms, by reducing sebum production and colonization of *P. acnes* and giving anti-inflammatory effects. It also affects comedogenesis by decreasing hyper-keratinization. The mechanism is still not known. It is also said that isotretinoin does not have direct antimicrobial activity. It reduces the sebum excretion and size of pilosebaceous ducts which in turn reduces the favorable environment for *P. acnes*. Isotretinoin also improves the host defense mechanisms and modifies chemotaxis monocytes which produce anti-inflammatory effects. Thus, reducing *P. acnes* population and resulting in decreasing acne inflammation. ⁽⁴³⁾

Other topical retinoids have been used for more than 30 years which target the microcomedo-precursor lesion of acne. These can be used as a first line treatment or with the combination to treat mild to moderate inflammatory acne. Its effectiveness is very well documented as it targets abnormal follicular epithelial hyperproliferation, it also reduces follicular plugging and micro-comedones along with non-inflammatory and inflammatory acne lesions. Their biological effectiveness is due to nuclear hormone receptors such as retinoic acid receptor RAR and retinoids X receptor RXR with three subtypes α , β , and γ and cytosolic binding proteins. ⁽⁴⁴⁾

Almost all anti-acne cosmetic formulations contain antibacterial agents which inhibit the action and growth of *P. acnes* and reduce inflammation. Some such antibiotics are erythromycin and clindamycin which are popularly used in many high-end cosmetic products for acne vulgaris. They are both effective against inflammatory acne in combination of concentration of 1-4%. Some other ingredients that are used in these formulations are niacinamide (Vitamin B₃), Vitamin C, various types of clays and charcoal. ⁽⁴⁵⁾

Conclusion:

With the emerging trends of consumption of fast foods by adolescents, the incidence of acne vulgaris may become a major medical problem in our society in the recent future. In this context, the importance of self-hygiene and healthy diet as preventive measures for acne vulgaris cannot be over emphasized. Cosmetics including both chemical and herbal play a vital role in prevention and treatment of acne vulgaris. Oral and topical medications for acne vulgaris are essential in severe cases to avoid complications arising due to untreated acne vulgaris.

References:

- (1) Bhate K., Williams H.C. Epidemiology of acne vulgaris. Br J Dermatol. 2013;168(3):474–485.

- (2) Yentzer B.A., Hick J., Reese E.L., Uhas A., Feldman S.R., Balkrishnan R. Acne vulgaris in the United States: a descriptive epidemiology. *Cutis*. 2010;86(2):94–99
- (3) Amita H. Sutaria; Sadia Masood; Joel Schlessinger. “Acne Vulgaris”, StatPearls Treasure Island (FL): StatPearls Publishing; 2022 Jan <https://www.ncbi.nlm.nih.gov/books/NBK459173/>
- (4) Oakley, A (2021, July) Acne vulgaris <https://dermnetnz.org/topics/acne-vulgaris>
- (5) Mayo Clinic (2020, September 12). Acne. <https://www.mayoclinic.org/diseases-conditions/acne/symptoms-causes/syc-20368047>
- (6) Toyoda M, Morohashi M. Pathogenesis of acne. *Med Electron Microsc*. 2001 Mar;34(1):29-40. DOI: 10.1007/s007950100002. PMID: 11479771.
- (7) Boston Acne Specialists. Sebum Oxidation is the Initial Stage of Comedogenesis. <https://www.bostonacnespecialists.com/single-post/2015/08/01/sebum-oxidation-is-the-initial-stage-of-comedogenesis#:~:text=The%20Role%20Inflammation%20Plays%20in%20Acne%20Formation&text=To%20set%20the%20stage%20for,environments%20with%20low%20oxygen%20content>
- (8) Beylot, C (2002, April) Mechanisms and causes of acne. *Rev Prat*. 2002 Apr 15;52(8):828-30. French. PMID:12053788.<https://pubmed.ncbi.nlm.nih.gov/12053788/>
- (9) Makrantonaki, E., Ganceviciene, R., & Zouboulis, C. (2011). An update on the role of the sebaceous gland in the pathogenesis of acne. *Dermato-endocrinology*, 3(1), 41–49. <https://doi.org/10.4161/derm.3.1.13900>
- (10) Christos C. Zouboulis, Acne and sebaceous gland function, *Clinics in Dermatology*, Volume 22, Issue 5, 2004, Pages 360-366, ISSN 0738-081X, <https://doi.org/10.1016/j.clindermatol.2004.03.004>.
- (11) Prasad, Shyam Baboo. "Acne vulgaris: A review on pathophysiology and treatment" *Asian J Pharm clin res* 9, no. 4 (2016): 54-59.
- (12) Bek-Thomsen, Malene, Hans B. Lomholt, Carsten Scavenius, Jan J. Enghild, and Holger Brüggemann. "Proteome analysis of human sebaceous follicle infundibula extracted from healthy and acne-affected skin." *PLoS One* 9, no. 9 (2014): e107908.
- (13) Seaton ED, Mouser PE, Charakida A, Alam S, Seldon PM, Chu ACBr *J Dermatol*. (2006 Oct) Investigation of the mechanism of action of nonablative pulsed-dye laser therapy in photorejuvenation and inflammatory acne vulgaris. <https://pubmed.ncbi.nlm.nih.gov/16188181/>
- (14) Nguyen CM, Beroukhim K, et al. “The psychosocial impact of acne, vitiligo, and psoriasis: a review.” *Clin Cosmet Investig Dermatol*. 2016;9:383-92.
- (15) Adityan, B., Kumari, R., Thappa, D.M. (2009, May) Scoring system in acne vulgaris. *Indian J Dermatol Venereol Leprol* <http://www.bioline.org.br/pdf?dv09103>
- (16) Jih, M.H, Kimyai-Asadi, A. (2007, August 21) Laser Treatment of Acne Vulgaris <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2884837/>
- (17) Elman M, Lask G.(2004 Jun). The role of pulsed light and heat energy (LHE) in acne clearance. *J Cosmet Laser* <https://www.healthline.com/health/beauty-skin-care/non-comedogenic> - [noHeaderPrefixedContent https://pubmed.ncbi.nlm.nih.gov/15203999/](https://pubmed.ncbi.nlm.nih.gov/15203999/)
- (18) Ruiz-Esparza J, Gomez JB (2003, April) Nonablative radiofrequency for active acne vulgaris: the use of deep dermal heat in the treatment of moderate to severe active acne vulgaris (thermotherapy): a report of 22 patients. *Dermatol Surg*. <https://pubmed.ncbi.nlm.nih.gov/12656809/>
- (19) Boineau D, Angel S, Auffret N, Dahan S, Mordon S. (2004) Treatment of active acne with an erbium glass (1.54 micron) laser. *Lasers Surg Med*. <https://www.tandfonline.com/doi/abs/10.1080/14764170600915985>

- (20) Itoh Y, Ninomiya Y, Tajima S, Ishibashi A, (2001 March) Photodynamic therapy of acne vulgaris with topical delta-aminolaevulinic acid and incoherent light in Japanese patients. *Br J Dermatol*. <https://pubmed.ncbi.nlm.nih.gov/11260017/>
- (21) Ma, Ying & Xiang, Leihong. (2021). Photodynamic Therapy for Acne Vulgaris: Mechanism and Clinical Practice. 10.1007/978-3-030-68996-4_8.
- (22) Sachar, A., (2020, January 21) Vogue India, How effective are pimple patches in reducing acne? <https://www.vogue.in/beauty/content/how-to-reduce-acne-pimple-patches-effective-skin-care-for-pimples#:~:text=%E2%80%9CThe%20patches%20have%20two%20main.and%20keeps%20the%20area%20moist.>
- (23) Navarro-López, V.; Núñez-Delegido, E.; Ruzafa-Costas, B.; Sánchez-Pellicer, P.; Agüera-Santos, J.; Navarro-Moratalla, L. Probiotics in the Therapeutic Arsenal of Dermatologists. *Microorganisms* 2021, 9, 1513. <https://doi.org/10.3390/microorganisms9071513>
- (24) Xu, H., & Li, H. (2019). Acne, the Skin Microbiome, and Antibiotic Treatment. *American journal of clinical dermatology*, 20(3), 335–344. <https://doi.org/10.1007/s40257-018-00417-3>
- (25) Lee YB, Byun EJ, Kim HS. Potential Role of the Microbiome in Acne: A Comprehensive Review. *Journal of Clinical Medicine*. 2019; 8(7):987. <https://doi.org/10.3390/jcm8070987>
- (26) Gómez DM, Lone YC, Salazar LM, Trojan J (2019) Antimicrobial peptides, novel solution for the treatment of precancerous disease acne - A review. *Trends Med* 19: DOI: 10.15761/TiM.1000210
- (27) C. Callewaert, N. Knödseder, A. Karoglan, M. Güell, B. Paetzold, Skin microbiome transplantation and manipulation: Current state of the art, *Computational and Structural Biotechnology Journal* (2021), doi:<https://doi.org/10.1016/j.csbj.2021.01.001/>
- (28) Bose, S (2021, July 19) Understanding The Meaning of Non-Comedogenic Ingredients and Products, *BeBeautiful.in*, <https://www.bebeautiful.in/all-things-skin/everyday/non-comedogenic-ingredients-and-products>
- (29) Oleck, J (2020, July 8) What Noncomedogenic Means in Skin Care Products, *Healthline*. https://www.healthline.com/health/beauty-skin-care/non-comedogenic#_noHeaderPrefixedContent
- (30) Khan, A., Javeda, M., Sultana, M.H., Ahsanb, W. Black Seeds (Nigella Sativa) *Pharmacological and Therapeutic Applications*, Pgs. 119-148
- (31) Julianti, E., Rajah K.K, Fidrianny, I, (2017, April 11) Antibacterial Activity of Ethanolic Extract of Cinnamon Bark, Honey, and Their Combination Effects against Acne-Causing Bacteria. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5489923/>
- (32) Yoon J.Y, et al, (2013, February) Epigallocatechin-3-gallate improves acne in humans by modulating intracellular molecular targets and inhibiting P. acnes. <https://pubmed.ncbi.nlm.nih.gov/23096708/>
- (33) Klein, E. McDonell, K (2020, November 4) 13 Powerful Home Remedies for Acne. <https://www.healthline.com/nutrition/13-acne-remedies>
- (34) Sachar, A. (2021, February 25) 6 Top Anti-Acne Ingredients And How To Use Them In Your Skincare Routine. <https://www.vogue.in/beauty/content/best-anti-acne-ingredients-and-how-to-use-them-in-your-skincare-routine>
- (35) Ralf S Mueller, Chapter 24 - Topical dermatological therapy, Editor(s): Jill E Maddison, Stephen W Page, David B Church, *Small Animal Clinical Pharmacology (Second Edition)*, W.B. Saunders, 2008, Pages 546-556, ISBN 9780702028588, <https://doi.org/10.1016/B978-070202858-8.50026-9>.
- (36) Tang, S-C., Yang, J-H., (2018, April 10) Dual Effects of Alpha-Hydroxy Acids on the Skin <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6017965/>
- (37) Chen, X., Wang, S., Yang, M., Li Li (2018, August 28) Chemical peels for acne vulgaris: a systematic review of randomised controlled trials <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5931279/#:~:text=Chemical%20peels%20have%20antibacterial%2C%20anti,or%20as%20a%20maintenance%20therapy.>

- (38) Drugbank online, Azelaic acid, <https://go.drugbank.com/drugs/DB00548>
- (39) Yoham AL, Casadesus D. Tretinoin. [Updated 2021 Nov 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557478/>
- (40) Piskin, S., Uzunali, E., (2007 Aug) A Review of the Use of Adapalene for the Treatment of Acne Vulgaris <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2374937/>
- (41) Gökçe BB, Boran T, Emlik Çalık F, Özhan G, Sanyal R, Güngör S. Dermal delivery and follicular targeting of adapalene using PAMAM dendrimers. *Drug Deliv Transl Res.* 2021 Apr;11(2):626-646. DOI: 10.1007/s13346-021-00933-6. Epub 2021 Mar 5. PMID: 33666878.
- (42) Gregoriou, S., Kritsotaki, E., Katoulis, A., & Rigopoulos, D. (2014). Use of tazarotene foam for the treatment of acne vulgaris. *Clinical, cosmetic and investigational dermatology*, 7, 165–170. <https://doi.org/10.2147/CCID.S37327>
- (43) SITO HANG, I. B. S. (2021). ISOTRETINOIN FOR TREATING ACNE VULGARIS. *International Journal of Applied Pharmaceutics*, 13(2), 20–25. <https://doi.org/10.22159/ijap.2021v13i2.40045>
- (44) Rathi S. K. (2011). Acne vulgaris treatment : the current scenario. *Indian journal of dermatology*, 56(1), 7–13. <https://doi.org/10.4103/0019-5154.77543>
- (45) Bandyopadhyay, D., (2021 Mar-Apr), *Indian J Dermatol.*, 66(2): 117–125. doi: 10.4103/ijd.IJD_99_18 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8208253/>

Using Multimedia To Improve Listening Skills For Students At Central Ethnic Minority College Preparatory School

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Abstract- In the past, due to the lack of modern facilities and technology, teaching grammar made up a majority part of the lesson plans. However, thanks to the increasing demand for globalization, the teaching trend has been shifted to teaching all of the four skills: listening, speaking, reading, and writing.

However, among the skills mentioned above, according to an informal survey, most English students have admitted that they encountered a lot of difficulties improving their listening skills. The most common reason is that they have been taught in traditional ways. In other words, they practice listening passively. Sometimes teachers just play the recording and ask students to listen, which means students do not have enough guidelines and motivation to practice listening skills.

The answers to their problems can be the use of multimedia in classes. Thanks to the fast development of technology, teachers can apply effective tools in the classroom to make their lessons interesting and comprehensible.

With the above facts, the authors have conducted a study to identify the current situation of the listening skill of students at Central Ethnic Minority College Preparatory School (CEMCPS) and suggest some ways of using multimedia to help students make better progress in improving their listening skills.

Index Terms- listening skills, multimedia, Central Ethnic Minority College Preparatory School, CEMCPS

I. INTRODUCTION

The feelings of the students at Central Ethnic Minority College Preparatory School of towards listening skills

Most of the students consider Listening the most difficult skill, in comparison with Speaking, Reading, and Writing skills. To be specific, the statement was strongly agreed by 23 out of 40 participants, equivalent to 57.5%. It was also agreed upon by 25% of the participants. Although there are opposite ideas, they accounted for only 17.5%.

Maybe listening is considered the most difficult skills by a majority of the students, it could result in negative feelings among them.

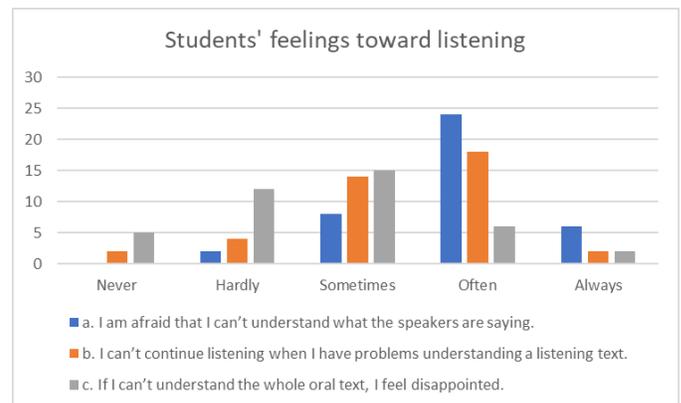


Figure 1.1: Students' feelings toward listening

As shown in figure 1.1, when being asked if they worried that they could not understand what the speakers were saying before they do the listening tasks, none of the students claimed not to be nervous. Six of them (equivalent to 15%) always feel worried and the other twenty-four (equivalent to 60%) often have that feeling. One-fifth of the participants sometimes feel that way while only 5% claimed that they hardly have the problem. The statistics show the fact that students are under pressure even before they listen as they are afraid that they could not understand the oral text. The statistics illustrate how discouraged the students feel when they could not understand the whole oral text. Just 12.5% never feel disappointed while the others, more or less, have that feeling. While 30% is hardly demotivated by not understanding the whole listening text, 37.5% of them sometimes feel that way. Much worse, six students often feel disappointed (making up 15%) and 5% always has that negative feeling.

The difficulties encountered by the students at Central Ethnic Minority College Preparatory School of towards listening skills in the listening process

Table 1.1. Students' difficulties in the listening process

	N	H	S	O	A
Before listening					
Before listening, it is hard for me to predict from the clues what I will hear.	4	7	1 5	1 0	4
While listening					
a. It is difficult for me to connect what I have heard with something from an earlier part of the listening text.	2	4	1 2	1 9	5
b. It's hard for me to check whether I understand correctly the meaning of the whole chunks of the listening text.	3	2	4	2 1	1 0
c. Because I have to hear and process information constantly, I don't remember the previous content.	7	5	1 6	1 0	2
d. I find it hard to determine the main idea of the listening text	1	3	1 0	1 7	9
e. As the listening tasks vary, I do not know which strategy to apply to different types of tasks.	8	6	1 5	1 0	1
f. It difficult for me to guess the meaning of unknown words by linking them to known words.	0	3	1 9	1 5	3
g. Although some words sound familiar, it is difficult for me to recall their meaning immediately.	6	6	1 7	1 1	0
h. I have difficulty checking my understanding of the text based on what I already know about the topic.	6	7	1 6	8	3
i. I find it difficult to use the context to guess those parts of a listening text that I cannot hear clearly.	1	2	1 0	1 5	2
After listening					

Before listening, one of the most common strategies that teachers often recommend their students to do before listening is predicting what they are going to hear. However, whether students could apply it well should be made clear. According to the statistics, only four students claimed that they could predict from the clues what they would hear, accounting for only one-tenth of the participants. Seven students hardly find applying the strategy difficult, making up 17.5%. However, there were more students find this tip hard to apply. Ten out of forty students said anticipating the information before listening based on given hints is sometimes a problem for them. There were a larger number of students who often found it hard to determine what they are going to hear, accounting for nearly forty percent. While there was ten percent of the students who always could apply the tip, there was the same number who always got trouble predicting from the clues what they would hear. This data has posed an urgent requirement of finding solutions to help students better prepare before

practicing listening skills. By having good preparation, students could understand the text better and become more confident and motivated.

Obviously, the problem arises more in the process of listening. Therefore, more questions were created to investigate deeply into specific challenges that the students have encountered.

Firstly, when students listen to a long text, relating what they have just heard with things from an earlier part can be problematic. Only two students (equivalent to 5%) never considered it a problem. 10% of the respondents hardly had any trouble. However, 12 respondents said they sometimes could not connect the information they heard with that from the previous part. This problem often occurred to nearly half of the participants. It even happened to 12.5% of the students whenever they were listening. It could be concluded that when listening, most of the students had problems processing the information. Specifically, it is hard for them to link the information of different parts of the oral text together.

(Wray, 2002) embraces different types of multi-word units, or what most non-academic texts for teachers refer to simply as (lexical) chunks. These, in turn, can be subdivided into such overlapping categories as collocations, lexical phrases, phrasal verbs, functional expressions, idioms, and so on. Although some words seem to be familiar to students, their meaning, when they are put in fixed phrases can vary. The change in the meaning of the word can confuse English learners, especially when practicing listening as they have to think and process information in such a short time. It could be the reason why one-fourth of the students claimed that they always had difficulty checking whether they correctly understand the meaning of the whole chunks of the listening text. More than half of the students often had to struggle with this during listening. Ten percent of the participants sometimes found it hard to check if they understood the meaning of the whole chunks precisely. Those who hardly or never experienced the problem only accounted for more than ten percent in total.

Many teachers said that the students could understand single sentences better than they do with the whole talk. One of the most common reasons is that the recording was played non-stop from the beginning until the end. The students, therefore, have to process a large amount of information in an instant time. As a result, even if they can hear the whole text, they cannot remember what is mentioned before. Among surveyed participants, only four students never experienced this problem, comprising 10%. Those who hardly encountered this matter consisted of almost the same number, 12.5%. The number of students who sometimes and often got the problem was quite similar, with 32.5% and 35% respectively. There were still 10% of the participants who claimed that this matter always caused trouble for them.

As it has been known that there are a lot of distractors in the oral text; thus, it is hard for the students to follow the general ideas of the speakers. In a spoken language such as conversation, we always find redundancy of words, like repetitions, elaborations, and insertions of "I mean" (Brown, 2003). The redundancy of words works well for the speakers as they could have more time to find or arrange their ideas logically. However, it makes their expression longer, which means the listeners had to receive more information to process. Thereby, it is hard for them

to determine the main idea of the listening text. Only one out of forty surveyed students claimed that they never had difficulty doing so and three others just hardly had the problem. However, the ones who had trouble identifying the main idea comprised the major proportion. 25% of the students sometimes had to struggle to get the main idea of the text, while this often happened to more than 40% of the respondents. Nearly one-fourth of the participants found finding the main idea of the listening text challenging. Main-idea questions have long been considered a challenge for the students. To detect the main idea, students not only could recognize and understand keywords and phrases of the oral text but also had good generalization skills. Even in a reading text, as a teacher, the writer noticed a lot of my students had difficulty in finding the main idea, let alone the listening text, which requires students to employ more skills but the time allowed is really short. The total number of students who frequently had trouble finding the main idea of the oral text accounted for nearly two-thirds of the total participants. This number presented the urgent need for effective solutions to help students overcome this matter.

The results of the questionnaire survey on how students could apply listening strategies to complete the listening tasks showed that about nearly 25% of the respondents had no or hardly any difficulty choosing suitable strategies for different types of listening tasks. This number is almost equal to the one who was often confused with choosing the good steps to deal with the listening task. Half of the students sometimes find it hard to employ the feasible approach to handle certain listening tasks.

A lot of listening difficulties that the students had resulted from the lack of vocabulary understanding. No student never had such a difficulty in guessing the meaning of the unknown words. In addition, only three students claimed to hardly had the trouble. The number of students who sometime, often and even always found it challenging to predict the meaning of unfamiliar words were nineteen, fifteen and three respectively.

During the teaching time, the author has witnessed a number of students who could catch and even repeated the words that they had listened to before. However, they could not connect the sounds with their meaning. When the teacher showed the words and their meaning, they were very surprised as they already knew those words but they could not remember the meaning right after listening to them. While 5% of the students claimed that they had never experienced this matter, the same number admitted that it always happened to them. 10% hardly found it difficult to immediately recall the meaning of familiar words. Meanwhile, the number of respondents who said that they sometimes or often had the problem is the same which accounted for 75% in total.

In addition, it is also difficult for students to check their understanding of the text based on their knowledge of the topic. While the students who never or hardly had the problem were only six and seven respectively, those who sometimes, often, and always got the troubles accounted for sixteen, eight, and three sequentially.

Besides, not all students could understand the whole oral text, they had to used given context to guess the parts that they did not hear clearly. However, most of the students were often confused in doing so (accounting for nearly 40%). Only one student never found it difficult to guess the missing parts.

After listening, eleven out of forty students often found it difficult to estimate the general accuracy of their understanding.

The number of the students who never or hardly had the troubles were only six in each group.

Using multimedia for improving English listening skill of the students at Central Ethnic Minority College Preparatory School

a. Using power point presentation

Although power point presentation has long become familiar among teacher, it is an effective tool to give lecture in general and teach listening in particular. During the studying time, the writer, also the teacher used this tool in various activities. Firstly, when giving a lecture or mini-lecture, PowerPoint helps to highlight key points in teacher's presentation. The visual format of PowerPoint allows the teacher to easily project timelines, and images. Adding visual component in audio material is proven more helpful to engage students emotionally (Whiting & Granof: 2010). For example, when teaching new vocabulary items, the teacher displayed pictures or animations which could illustrate their meaning. This way not only could draw the students' interest but also help students understand and remember the meaning of vocabulary items. Secondly, the teacher used PowerPoint to provide an outline of the listening text (in the form of mind map, for example) so that students could easily follow the overall listening text. Thirdly, PowerPoint was used to present instructions for a paper assignment or class activity. The sequential order of the slides lends itself to providing step-by-step instructions. In addition, the teacher prepared PowerPoint slide shows to project a discussion prompt to the class. This technique is particularly suited to post-listening stages when the students reviewed what they had learned and developed their critical thinking skills. The teacher then used PowerPoint to project bulletin board or other class materials relevant to the prompt and/or follow up questions. During the experiment period, PowerPoint was used not by the teacher herself but by the students as well. Students were asked to work in groups and prepare PowerPoint slide shows to present their ideas. During the experiment stage, PowerPoint was also employed in displaying tests or quizzes. PowerPoint gave the teacher the ability to project a test or quiz question, discuss it with the class, and then project the answer below or alongside the question. The teacher also used PowerPoint to project student responses to questions.

b. Using videos

It could be boring or difficult for the students if they just listen to the oral text without any illustrations. Therefore, videos would be a good option. When using videos, the teacher divided it into three stages, previewing, viewing and post viewing.

In previewing stage, students were let to watch a small part of the video to guess the content of the video or to give their ideas on the matter presented in the video. This way could not only draw students' attention into the lesson but also help them brainstorm some vocabulary items that could be used in the oral text. Another way which was applied in this stage is that students watched the video clips without hearing the sound or seeing the subtitles. Based on the displayed images, students had to discuss the content of the video clips. The visual illustrations could help students in understanding the main content of the videos and also provide them with visual clues so that they could link the information of

different parts of the listening text, even when they could not hear some parts clearly.

In viewing part, a wide range of activities were organized. Students could be asked to listen for the main idea, for details, for a sequence, for specific vocabulary, for attitude and opinions, etc. Although the students could understand the message of video, they still encountered difficulties in listening selectively to specific vocabularies and details of the information. It was due to the background utility of authentic materials which were not exactly designed for foreign language learning. Therefore, choosing suitable videos for students and providing them with key vocabulary items play an important role as it could improve students' attitude toward English and greatly improve students' motivation to get engaged with the lesson. With videos, teachers could let students check their accuracy by watching the subtitles. Although teacher's feedbacks were still necessary, this way enabled students to evaluate themselves and allowed them to remember the vocabulary items longer.

In post viewing stage, students were asked to summarize or retell the content of the video. Besides, they were expected to express their opinions about the video more specifically. Teachers assisted them by showing the outline of the video or giving them time to prepare for their presentation.

c. Using dictionaries

Students are allowed to use their dictionaries, both online and published version to check the meaning of unknown words and phrases. The students were advised not to use bilingual dictionaries so that they were not framed to a single meaning of the vocabulary items. The use of dictionaries was arranged in forms of either pair work or groups work and the students were given time to find out what the vocabulary items mean. Dictionaries could greatly support the students' comprehension, especially in understanding idioms or proverbs.

II. CONCLUSION

In conclusion, listening is considered the most difficult language aspects by most of the students. Due to this perception, it has negative effects on the students' feelings. The difficulties

that students at Central Ethnic Minority College Preparatory School had before listening was predicting what they would hear. The challenge they found while listening consisted of connecting what they have heard with something from an earlier part of the listening text; checking whether they understand correctly the meaning of the whole chunks of the listening text; remembering the previous content of the listening text; determining the main idea of the listening text; deciding which strategy to apply to different types of tasks; guessing the meaning of unknown words by linking them to known words; recalling the meaning of familiar words immediately; checking their understanding of the text based on what they already knew about the topic; and using the context to guess those parts of a listening text that they could not hear clearly. In addition, after listening, the students have to struggle evaluating the overall accuracy of their comprehension.

To help students deal with the aforementioned problems, it is recommended to appropriately apply multimedia in teaching. Based on the current available equipment, it is advisable to use PowerPoint presentation, videos and dictionaries to improve students' listening skills.

REFERENCES

- [1] [1] Brian I.P.F.C.K. et al., (2017). The Effect Of Teaching Using Audiovisual (Video) Media, On Seventh Grade Students' Listening Comprehension at Smp Negeri 1 Mengwi Academic Year 2017/2018. *Jurnal Pendidikan Bahasa Inggris Undiksha*, 5(2).
- [2] [2] Elfiona, E., et al., (2019). *Mobile-Based Media as the Solution in Teaching and Learning Listening Skill*. International Conference on Education, Science and Technology.
- [3] [3] Meskill, C. (1993). ESL and multimedia: A study of the dynamics of paired student discourse. *System*, 21(3), 323-341.
- [4] [4] Rost, M. (1993). *Listening in language learning*. New York: Longman.
- [5] [5] Vaughan, T. (2020). *Multimedia: Making It Work*: McGraw Hill.

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Expansion of education system: Changing teaching in keyboard and screen

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Abstract- Impact of covid19 found on the economy of countries, its effect on the social and education world is also clearly visible. Since pandemic changed the basic structure of higher education system, society is now forced to convert itself into a virtual social space, so the education system is also forced to run with the help of keyboards and screens. Although there are many problems like money, digital equipment, digital devices, internet speed and availability, but in the coming times, India has to stand in a strong position parallel to the higher educational institutions of the world. This study, attempted to know how much students are liking this method, usefulness of the meth as well as how much teachers consider the education being done by keyboard and screen method.

Index Terms- Corona transition, education world, digital education, keyboard, screen, educational dialogue

I. INTRODUCTION

COVID 19 Pandemic and education

Corona infection, which was first observed in Wuhan city of China on December 31, 2019 (Kavanagh, 2020; Wu, Leung and Leung, 2020; Zhu et al., 2020). Thereafter, global spread of COVID-19 infection threatened the human life worldwide (Tahir and Batool, 2020). Engulfed almost the whole world, has changed not only economic but also social and educational values. While India's economic system has suffered heavy losses due to the corona infection, there are also some changes in the society, which are being seen as an extension of traditional methods.

Schools-colleges and universities have been closed for a long time due to corona infection and education was feared to be badly affected, in a country like India where even today basic facilities are not available, in the country it is a dream (Gülcan, 2015; Bhavya Bhasin, Gautam Gupta and Sumedha Malhotra, 2021; Nimavat et al., 2021; Zhao and Watterston, 2021). It seemed like but government departments together with private institutions have changed the meaning of education. Everyone is communicating knowledge through keyboards and screens. However, neither the students nor the teachers are fully prepared for this challenge. In such a situation, British Prime Minister Winston Churchill's statement that 'crisis should never be let go in vain' means that challenges should also be used as opportunities. The challenge of the corona pandemic can also be turned into an opportunity.

Challenges for education due to pandemic

Recognizing these challenges, higher educational institutions are striving to create a conversational environment with less resources. Digital education seems to be taking the place of classroom teaching. Digital education platforms like 'Swayam' and 'Swayamprabha' had already been developed by the University Grants Commission and the Ministry of Human Resources, but they were being used very little [3, 5]. But today due to corona virus infection, the attention of students, researchers and teachers is now trying to see them as opportunities in challenges (Madeshia and Verma, 2020; Khan et al., 2021; Maatuk et al., 2021).

Need and importance of education for a life

According to Gandhiji, 'Education means all round development of the best physical, mental and spiritual powers inherent in the child' i.e. complete development of the child is not only meant to make a student read or write, but it is necessary that he acquires the right

knowledge (Dehury and Bai, 2006; Rao, 2020). Tagore says that 'highest education establishes a harmonious relationship with all beings in our life', similarly efforts are being made to harmonize with digital education in the crisis of Corona (Connell, 2010; Lal, 2018). Digital learning can be understood as a web based education, which effectively uses information technology to impart knowledge to the students (Gülcan, 2015). In this, instead of paper and pen, keyboard and screen are used. Through this you can share any audio-video or your thoughts digitally (Daniel, 2020; Gupta and Golplani, 2020).

In urban areas, students have more technical means, so they have already been using it. It was also being used by the teachers as the main means of education, so there is a positivity to be seen in this area as through this you can easily get the solution of your problem sitting at home. The Prime Minister's Rural Digital Literacy Campaign was also launched by the Modi government, which is considered to be the world's largest literacy campaign. Under this campaign, there was talk of making 60 million households digitally literate in rural India, but this program could not be completely successful.

II. PROBLEM STATEMENT

The requisites of digital education are not only merely the resources like internet, mobile or laptop, tablet or desktop, software and medium of digital classes but also the challenges are training of teachers, students, parents, who are the users. Most of the software demands registering through an email id, which is not a cup of tea to many students and parents of remote areas. The problem of internet connectivity and speed is also a major one in remote and rural areas. This research seeks the answers of many problems like (1) whether students are able to adjust with digital education, (2) how prepared are the students and teachers for keyboard and screen and (3) Is there a need for expansion of keyboard and screen education post corona pandemic times.

III. METHODOLOGY

Questionnaires were prepared for the purpose and observation method was also used and finally it was used for data collection. After collecting data from 30 students and 20 professors related to various government, non-government and private colleges and universities of Meerut, it has been analysed. The corona pandemic has completely changed the traditional way of Indian education system. Students living in rural and urban areas have different experiences regarding the education affected due to Corona infection. The study started with drafting of a questionnaire which consists the possible problems due to changing teaching in keyboard and screen. The collected data analysed and critical factors identified and the remedies also suggested.

IV. DATA COLLECTION AND ANALYSIS

As per finalized objectives, a suitable questionnaire has been prepared keeping it easy and relevant for students and teachers. All the data has been collected in a comfortable environment making it very clear and point to point. All collected data then has been observed and analyzed to find out results after deep interpretation and conclusions have been drawn.

The experience of teaching and learning in digital mode is quite different with traditional talk and chalk method of classroom teachings hence it's very important to find out whether the students and teachers are satisfied with digital and online method of studies. There is a vast difference in the experiences of students and teachers regarding the ongoing online education through various apps. While 46 percent students are satisfied with online education, 14 percent students say that all their problems are not being solved by online studies. If we talk about professors, 16 percent teachers say that they are satisfied with online learning, but 24 percent teachers are not happy with it, because with the ease with which the subject can be understood and explained in a face-to-face classroom, it cannot be explained in online class. Some points can be explained, but not all points can be fully explained.

The second question is what kind of problems are coming during online studies? There is variety of problems faced by students as well as teachers during online studies as interruption in internet connectivity during studies, frequent mobile calls or messages during studies in case of mobile device usage during studies, unavailability of proper gadgets suitable enough for efficient studies. After talking on this topic, we found that 4 percent of the students do not have a mobile phone. At the same time, 4 percent of the students do not have a laptop. However, the biggest problem is with connectivity. Internet connectivity is the biggest problem in rural areas. The other problem emerges is that students get a limited internet access, which ends up in online video classes. There is no

problem with teachers regarding mobile, but 6 percent teachers have problem with laptop. If we talk about connectivity, like students, teachers too are facing this problem. 14 percent of teachers say they have a problem with the internet. But it can be said that the problem of internet connectivity in the lockdown period has reduced as compared to earlier.

The third question of survey is are you digitally literate? Teachers were not very friendly using these devices and methods of teaching. Many of them have not been digitally trained or ready to use all these methods. There is a difference between students studying in private and government colleges and universities regarding digital education. There are many such students who do not even have the knowledge to make PPT. A 42 % students consider themselves to be digitally literate, while 18 percent students say that they are not digitally literate. If we talk about teachers, then 34 percent of the teachers are digitally literate, but teachers who are older and have been teaching in a very traditional way, problems like making PPT, creating audio-video content are coming in front of them. But they are working to empower themselves digitally with the help of other people and are taking their knowledge and skills to the students.

The fourth question of survey is have you used online education in any form before the corona infection ? Before the breakdown of corona pandemic, a few students and teachers had been using the digital platforms of teaching and learning purposes. Most of them belonged to private schools and colleges using smart classes and digital boards. Those who were previously acquainted with digital mode of teaching and learning, felt ease in conducting sessions using online medium but to those who were not well acquainted with new methods of teaching learning, it was a hard nut to crack. A 34 percent of the students have been taking education in some form or the other online, but 26 percent of the students say that they did not take any online education, they have taken the knowledge in the traditional way. While 34 percent of professors say that they have acquired online knowledge in various ways, but there are 6 percent teachers who still believe and give preference to the traditional method. There has been a drastic increment in numbers of users for online education before and after corona pandemic effect.

The last question of questionnaire was, does keyboard and screen education need to be expanded after the corona infection is over? When the people have embraced these new methods of teaching and learning, question arises whether these methods will stay after corona pandemic and if yes then in what extent user agree to expand the horizon of online teaching and learning methods. What changes are to be accommodated to make it more efficient, user friendly and productive and will it be aligned along with the traditional methods of teaching and learning?

Teaching through keyboard and screen continues, going through various problems, but what will be its future, 44 percent of the students say that it is necessary to expand keyboard and screen education because it is the demand of the future. If we have not made ourselves digitally literate and do not understand this expansion of education, then we will be left behind. However, 16 percent of the students did not appear in favour of it. They say that education should be done in the traditional way. If we talk about teachers, then with some conditions, teachers talk about the expansion of keyboard and screen education. Just as the students say that we will be left behind, in the same way teachers have to prepare themselves to prepare the country builders and they welcome this new method of teaching whole heartedly. Because in the coming time digital education will be expanded further. The corona pandemic has proved that you have to prepare yourself. The best way to compete in teaching-learning field is to understand, analyse and calculate the futuristic model of education and to imbibe all the necessary skills set and proficiency in order to be future ready as well as to avoid the awful circumstances of Paradigm shift.

V. RESULTS AND DISCUSSION

The online education is present and future of education industry. We have observed a boost in users of online education. Many suitable mediums and platforms are available free of cost as well as paid versions of online education are also available giving multiple options to make it more comprehensive. It has opened many doors of opportunities to various people associated with teaching and learning directly and indirectly. Yet it brings many challenges as well. Internet connectivity is one major issue to be resolved especially in remote and rural areas. It also challenges IT industries to make software which can work consuming less storage and efficient even in low internet speed. Next challenge in online education as per perceived feedbacks is availability of electronic gadgets like mobile, laptops, desktops and tablets in sufficient numbers in each family as per the requirement. Government needs to take initiative to either provide the gadgets to students of under privileged family or to provide subsidies in purchasing them because along with the purchasing cost, monthly bills of internet also adds on to the pocket of parent in this financial crisis along with corona pandemic. It will motivate more number of students to be benefitted through online education. The discussed data against the different selected factors is also represented graphically in Figure 1. (a) effect of online studies (b) digital literacy (c) use of online education before COVID19 (d) utility of keyboard and screen education (e) kind of problems in pandemic

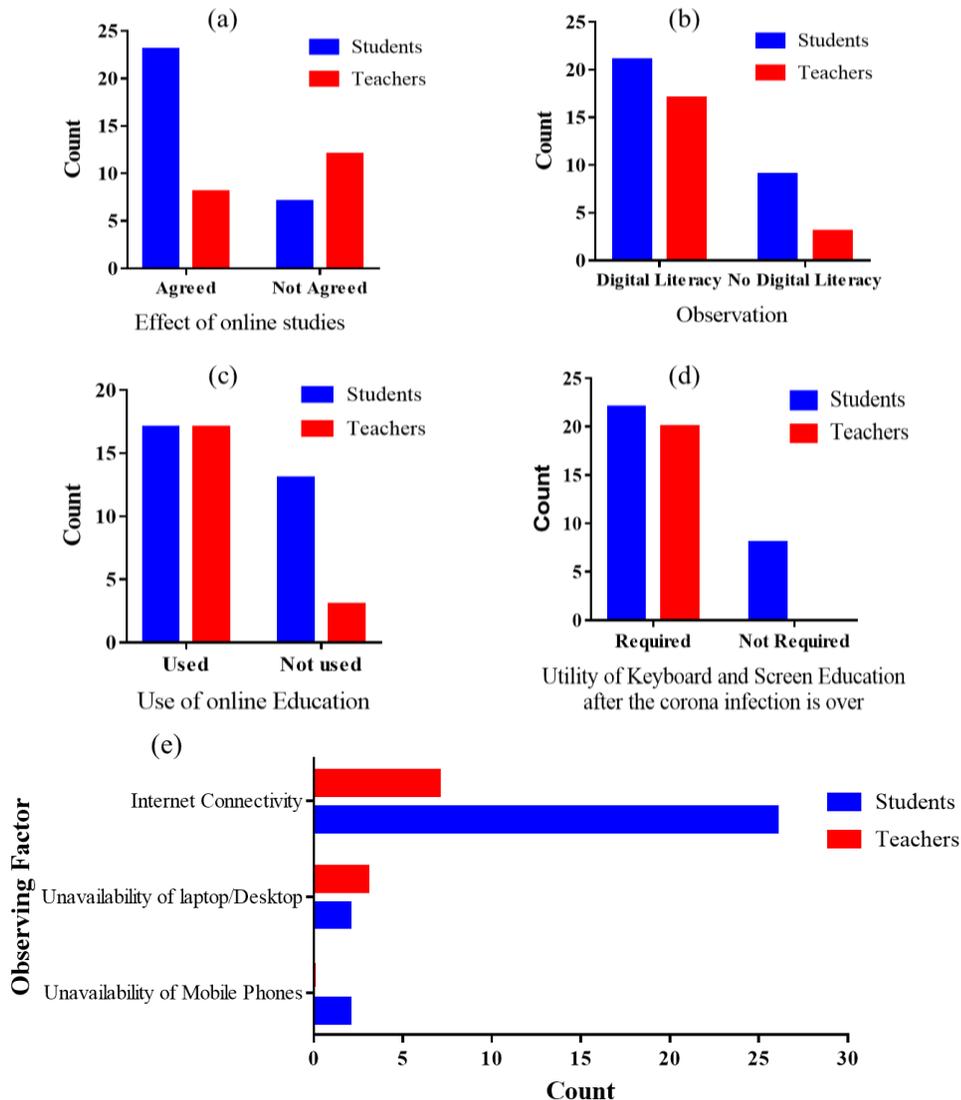


Figure 1 Responses against different selected factors (a) effect of online studies (b) digital literacy (c) use of online education before COVID19 (d) utility of keyboard and screen education (e) kind of problems in pandemic

Next observed challenge is competency of teachers and learners using technology and digital education. Most of teachers aged above 45 years were not digitally literate or competent enough to make ppt, create audio-video content etc. 18 percent of students were also found to be digitally incompetent on imbibing education using online modes. Though government of India has been trying to accelerate the digital education by initiating many online programs like NPTEL, Swayamprabha etc. yet it has not been effective enough to make concern people get trained specially in government schools and colleges as per recorded data.

Students and teachers Combining these teacher student ratio about digital incompetency makes a good number hence a rigorous training program to make people tech-savvy is to be initiated by education stakeholders to make digital education program successful and productive. It has been observed by analyzing recorded data that more than 80 percent of student and teacher believes that online education horizon needs to be expanded post corona pandemic which again invites education stakeholders to increase their attention and efforts for promoting digital education and to make its access quicker, more productive and cost savvy.

VI. CONCLUSION

Corona pandemic has completely changed our social and educational structure, we have to change ourselves with time to adapt. It is said in the Gita that change is the law of nature. That is why we have to change ourselves according to the need of the times. Everyone is favoring this changed form of teaching method in their own way. While the new generation is openly accepting this new method of teaching along with being digitally literate, teachers have also started preparing themselves to overcome this challenge. Although the Internet is like a bottomless ocean in front of the students, but the teachers have to do the job of filling the ocean in the ocean. What is necessary, what is right, understanding the psychological level of the students, the teachers have to reach them.

In this era of Corona transition, education of keyboard and screen has taught a lot. But there are many problems in front of us like digital literacy, digital divide, telecom infrastructure, capacity of online system, availability of laptops and desktops, software, educational equipment, online assessment, which the government will also have to take important steps to overcome.

One of the truths of technical education is that it does not make any distinction between a boy and a girl. It is also true that in the times to come, teaching and research in higher education will change from live faces to keyboards and screens. That is why teachers have to make a habit of establishing educational dialogue on digital platforms. Along with this, students also have to pay positive attention towards keyboard and screen education to establish themselves at par with the students of other countries.

There is a lot of confusion right now regarding the corona infection, in such a situation, sitting at home can keep yourself safe and at such times education from keyboard and screen can prove to be capable of educating you. The Corona transition has certainly made an effort to accelerate the adoption of technology, but there is a need to strengthen the digital learning infrastructure. At the same time there is also a need to bring about drastic changes in the thought process in the minds of the students and academicians.

REFERENCES

- [1]. Bhavya Bhasin, Gautam Gupta and Sumedha Malhotra (2021) 'Impact of Covid-19 Pandemic on Education System', *EPRA International Journal of Environmental Economics, Commerce and Educational Management*, (May 2020), pp. 6–8. doi: 10.36713/epra6363.
- [2]. Connell, K. M. O. (2010) 'Tagore and Education: Creativity, Mutuality and Survival', *Asiatic: IIUM Journal of English Language and Literature*, 4(1), pp. 65–76.
- [3]. Daniel, S. J. (2020) 'Education and the COVID-19 pandemic', *Prospects*. Springer Netherlands, 49(1–2), pp. 91–96. doi: 10.1007/s11125-020-09464-3.
- [4]. Dehury, D. and Bai, M. (2006) 'Mahatma Gandhi 's Contribution to Education', *Orissa Review*, pp. 1–5.
- [5]. Gülcan, N. Y. (2015) 'Discussing the Importance of Teaching Ethics in Education', *Procedia - Social and Behavioral Sciences*. Elsevier B.V., 174, pp. 2622–2625. doi: 10.1016/j.sbspro.2015.01.942.
- [6]. Gupta, A. and Golplani, M. (2020) 'Impact of Covid-19 on Educational Institutions in India', *Purakala*, 31(21), pp. 661–671. doi: 10.13140/RG.2.2.32141.36321.
- [7]. Kavanagh, M. M. (2020) 'Authoritarianism, outbreaks, and information politics', *The Lancet Public Health*. The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license, 5(3), pp. e135–e136. doi: 10.1016/S2468-2667(20)30030-X.
- [8]. Khan, M. A. *et al.* (2021) 'Students' perception towards e-learning during covid-19 pandemic in India: An empirical study', *Sustainability (Switzerland)*, 13(1), pp. 1–14. doi: 10.3390/su13010057.
- [9]. Lal, S. (2018) 'Rabindranāth Tagore's Ideals of Aesthetic Education', *The Journal of Aesthetic Education*, 18(2), pp. 31–39.
- [10]. Maatuk, A. M. *et al.* (2021) 'The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors', *Journal of Computing in Higher Education*. Springer US, (0123456789). doi: 10.1007/s12528-021-09274-2.
- [11]. Madeshia, P. K. and Verma, S. (2020) 'Review on higher education in India', *Journal of Critical Reviews*, 7(10), pp. 1161–1164. doi: 10.31838/jcr.07.10.228.
- [12]. Mishra, L., Gupta, T. and Shree, A. (2020) 'Online teaching-learning in higher education during lockdown period of COVID-19 pandemic', *International Journal of Educational Research Open*. Elsevier Ltd, 1(September), p. 100012. doi: 10.1016/j.ijedro.2020.100012.
- [13]. Nimavat, N. *et al.* (2021) 'Online Medical Education in India – Different Challenges and Probable Solutions in the Age of COVID-19', *Advances in Medical Education and Practice*, 12, pp. 237–243.
- [14]. Rao, A. V. (2020) 'Mahatma Gandhi views on Philosophy of Education', in *ICMGECS*, pp. 93–99.
- [15]. Tahir, M. B. and Batool, A. (2020) 'COVID-19: Healthy environmental impact for public safety and menaces oil market', *Science of the Total Environment*. Elsevier B.V., 740, p. 140054. doi: 10.1016/j.scitotenv.2020.140054.
- [16]. Wu, J. T., Leung, K. and Leung, G. M. (2020) 'Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study', *The Lancet*. Elsevier Ltd, 395(10225), pp. 689–697. doi: 10.1016/S0140-6736(20)30260-9.
- [17]. Zhao, Y. and Watterston, J. (2021) 'The changes we need: Education post COVID-19', *Journal of Educational Change*. Springer Netherlands, 22(1), pp. 3–12. doi: 10.1007/s10833-021-09417-3.
- [18]. Zhu, N. *et al.* (2020) 'A Novel Coronavirus from Patients with Pneumonia in China, 2019', *New England Journal of Medicine*, 382(8), pp. 727–733. doi: 10.1056/nejmoa2001017.

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The efficacy of *Rosmarinus officinalis* L. extract in keeping quality of cold fish fillet

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Abstract- The effect of rosemary extract on the shelf stability and organoleptic quality of fish stored at 2°C was determined after 0, 3, 6, 9, 12 and 15 days of refrigerated storage. Fish fillet (*Seriola Dumeriri*) treated with 1% (aqueous solution) of rosemary extract had significantly ($P < 0.05$) lower thiobarbituric acid (TBA) and Total Volatile Nitrogen (TV-N) values until 12 day of refrigerated storage compared to control. The result revealed that samples treated with rosemary had lower total bacterial count and psychrophilic count than those of untreated samples. The organoleptic results showed that fish fillets treated with rosemary had a good acceptance throughout storage and rosemary treatment extended the stability of fish fillets to 12 days during refrigerated storage in comparison with the untreated samples.

Index Terms- "Fish preservation, *Rosmarinus officinalis* L., Fish fillets, Natural preservatives "

I. INTRODUCTION

Fish is a highly demanded and nutritious food product, yet perishability remains the biggest challenge for its preservation. The deterioration of fresh fish during storage is attributed to different damage mechanisms, like microbiological spoilage, autolytic degradation, and lipid oxidation [Prabhakar et al., 2020]. Fish is a good source of protein and is low in total fat. It has the added advantage that it is high in fatty acids that protect against heart disease and to some extent is useful for protecting against angina pectoris. On the other hand fish is a sensitive and perishable food tending to fast spoilage. Fish is a complex process in which microorganisms interact with physical and chemical changes. Usually, enzyme activities in fish tissues and chemical reactions are responsible for the loss of freshness of fish, whereas the microbial metabolic activities are involved in the overall spoilage (Khan et al., 2006). After fish are caught, spoilage starts rapidly, and rigor mortis is responsible for changes in the fish after its death. A breakdown of various components and the formation of new compounds are responsible for the alterations in odor, flavor, and texture that happen throughout the spoilage process, and deterioration occurs very quickly due to various mechanisms triggered by the metabolic activity of microorganisms, endogenous enzymatic activity (autolysis), and by the chemical oxidation of lipids (Prabhakar et al., 2020; Gram and Huss, 1996). Lipid oxidation can occur either enzymatically or non-enzymatically in fish. In the enzymatic hydrolysis (lipolysis) process, glycerides are split by lipases, forming free fatty acids that are responsible for the common off-flavor (rancidity) and from the denaturation of sarcoplasmic and myofibrillar proteins (Huis In't Veld, 1996). Lipid oxidation can occur either enzymatically or non-enzymatically in fish. In the enzymatic hydrolysis (lipolysis) process, glycerides are split by lipases, forming free fatty acids that are responsible for the common off-flavor (rancidity) and from the denaturation of sarcoplasmic and myofibrillar proteins (Huis In't Veld, 1996). The use of synthetic and natural antioxidants to control lipid oxidation in seafood is a necessary measure. Synthetic antioxidants such as butylhydroxytoluene (BHT) and butylhydroxyanisole (TBHQ) and others are used to solve oxidation problems. However, it has been found that synthetic antioxidants are carcinogenic and mutagenic agents, so they are being tried to replace them with natural antioxidants (Pourashouri et al., 2009). Several studies have been conducted to extend the shelf life of fresh foods including fish products by using different preservation strategies. Thus, *Rosmarinus officinalis* extracts have been successfully used as natural preservatives; as an antioxidant agent in numerous species of sardines (*Sardine pilchardus*) (Serदारoglu and Felekoglu, 2005) as well as in tilapia (*Oreochromis niloticus*) (Ibrahim and Sherif, 2008). The Mediterranean climate in Libya favors the growth of a great number of plant species, some of which have various medicinal and antioxidant potential properties. Rosemary (*Rosmarinus officinalis* L.) belongs to *Lamiaceae* family is one of the widely spread plant in El-Jabel El-Agadar province (East of Libya) and seems to be a rich source of phenolic acids (Adris et al., 2019), therefore, it is considered to be a promising source of natural antioxidants and antimicrobial agents (Adris et al., 2019). There was an evidence that rosemary is able to prolong the shelf life of food and maintain its quality during storage, and therefore it has already been used as a vital preservative in the food industry. Twenty seven spices have been defined by the US Food and Drug Administration (FDA) as safe, including rosemary (Charalambous, 1994). Because of consumer demand for fresh refrigerated foods with extended shelf life, considerable research has been directed toward using various preservation strategies to preserve or prolong the shelf life, while ensuring the safety, of fresh foods including fishery products (Sallam, 2007). However,

limited data is available regarding the application of rosemary extract to prolong the shelf life of fish. Therefore the objective of this study was to evaluate the effectiveness of rosemary extract on extending the shelflife of fish fillet prepared from Seriola Dumeriri fish.

II. MATERIALS AND METHODS

Plant Material

The rosemary plant (*Rosmarinus officinalis* L.) was collected from the Al-Jabal Al-Akhdar region (in the far east of Libya) *Rosmarinus officinalis* L. (Rosemary) in late spring and transferred to the laboratory where the plant leaves were washed, dehydrated (room temperature; ~ 28°C) and powdered with using an electric grinder and the powder was kept in a closed container at -60 degrees until extraction.

Preparation of Rosemary extract

Because nearly all of the identified components from plants active against microorganisms, are aromatic or saturated organic compounds and they are most often obtained through initial extraction of organic solvents, methanol is used in this study to extract biologically active ingredients (Naili et al., .2010) from rosemary plant. Extraction of rosemary plant was conducted by weighing 50 g of dried rosemary then extraction by adding 500 ml of methanol (80%) with shaking (120 rpm) for 24 hrs. After filtration through gauze, plant debris was re-extracted twice then the collected extract was filtrated by filter paper (Whatman no.1). The filtrates were concentrated under reduced pressure (at 35°C) then lyophilized and saved in closed bottles at 5°C until use.

Fish Sample preparation and treatment:

Fresh Cerola Dumeriri was caught from the sea of Haniyeh District, Al-Jabal Al-Akhdar Governorate-Libya and immediately cooled by placing in an ice box and transported to the laboratory within three hours of catching. It is a high quality fish and abundant in the shores of Libya in the spring and autumn. It is characterized by a grayish-blue color, a length of about 125 cm, and a streamlined body with a crescent tail. After gutting, the fish muscle was washed and filleted (130 ±10 gm each) then immersed for 10 min in 1% aqueous solution (w/v) of lyophilized methanolic rosemary extract. Fillet samples were left to drain and placed in sterile polyethylene bags and refrigerated at 2 ±1C° for fifteen days. Three samples were withdraw every days for chemical and microbiological analysis.

pH measurement

pH of treated and untreated fish samples was measured according to the method mentioned by (Abou-Taleb et al.,2007) by adding distilled water to fish fillet sample at a ratio of 1:10 (water: fish meat) and homogenizing the sample using an electric mixer. The pH was measured using a PH meter (Terminal 740 inolab sezius, WTW, Germany).

Thiobarbituric acid (TBA) Test:

This test was carried out by measuring the malondehyde according to the method described by Siu and Draper (1978), where 10 grams of fish meat were mixed with 50 milliliters of distilled water in an electric mixer for 2 minutes. The homogenate was transferred to a boiling flask and 47.5 ml of distilled water and 2.5 ml of 4N HCl were added (final pH 1.8).The mixture was heated until about 50 ml of distillate was collected. Five ml of distillate was transferred to a test tube then 5 ml of 0.02M thiobarbituric acid (TBA) in H₂O was added. The tube was placed in a water bath for 35 minutes and cooled for 10 minutes. The absorbance was measured at the wavelength of 538 nm in Aquamate Plus UV/Vis Spectrophotometer (Thermo Scientific, England). The concentration of TBA was expressed as mg Malone Aldehyde/kg of fish meat.

Total volatile base nitrogen (TVB-N) Test:

Total volatile nitrogen compounds were measured according to the standard method described in (AOAC, 2002). For this 100 g of fish meat were homogenized with a laboratory blender for 2 min after adding 300 ml of Trichloroacetic acid (7.5%). The mixture was filtered to obtain a clear solution ready for analysis. 50 ml of the filter were transferred to a distillation tube and 10 ml of sodium hydroxide (NaOH 20%) were added and the apparatus immediately sealed and the steam distillate was collected in a flask containing 5 mL of 4 % boric acid and a few drops of mixedindicator (methyl red /methylene blue 2:1). The steam distillation procedure was continued for 5 min and the distillate had been collected. The obtained quantity of basic solution was titrated with hydrochloric acid (N 0.05). The TVB-N content was determined after blank correction that had been determined by the steam distillation with 50 mL of distilled water sample. Concentration of volatile nitrogen compounds was expressed as mg nitrogen/100 g of fish meat.

Microbiological analysis of fish fillet

Microbial loads of rosemary treated and control fillet samples (three samples each) was determined by withdrawing samples periodically during refrigerated storage. Ten gm of each treatment was homogenized into stomacher bag using Stomacher Blender (LB400,VWR,UK) for 2 min. Serial dilutions were prepared and pour plate technique was applied according to the standard methodologies (Gerhardt *et al.*, 1994). The total viable count of bacteria and count of psychrotrophic bacteria. were expressed as log CFU/g.

Sensory evaluation of treated fish fillet

Sensory analyses of fish fillet samples was conducted using 9-point hedonic scale (Peryam and Girardot, 1952) to determine the consumer acceptability of uncooked rosemary treated and control fish fillet. Testers were received an explanation of the study Fish samples were presented to the testers and asked to score smell, colour and general acceptance from 1 to 9 where 1 = very

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disliked, 5 = disliked and disliked (midpoint), and 9 = very liked. Scores of separate attributes were gathered to give a comprehensive sensory score.

Statistical analysis

Statistical analysis was performed using complete randomized design. Two-way ANOVA analysis ($P \leq 0.05$) was conducted to determine the efficacy of the rosemary in keeping quality of refrigerated fish. Means were separated using Duncan’s multiple range test with $\alpha = 0.05$. Analyses were performed with SPSS software (Version 14.0; SPSS, Chicago, IL).

III. RESULTS AND DISCUSSION

Change in pH

The change in pH of fish fillets during storage at 2°C is shown in Figure (1). Initially, pH was approximately 6.2 at time zero for both not treated (control) and fish treated with rosemary extract. During the storage at 2°C, pH values of control increased rapidly from this sampling day onwards to reach 6.6 on day 9 of cold storage and continued to increase at a faster rate than the treated fish samples to reach a value of 7.2 at the end of the cold storage period (15 days). However, a slight increase (6.5) was reported for treated fish samples at day 15 of storage. The increase in pH values is due to the deterioration of the food substance as a result of microbial activity and basic nitrogenous compounds such as ammonia and other basic nitrogenous compounds, which are produced as a result of the action of microbes (Gram and Dalgaard, 2002).

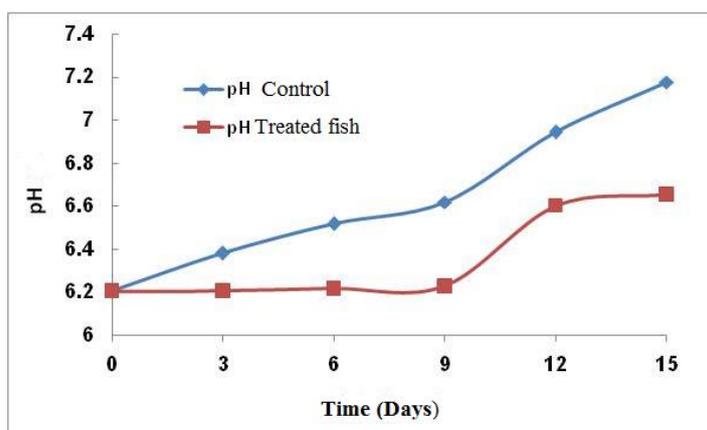


Figure (1): Effect of rosemary extract on the pH of fish stored at 20°C for 15 days.

Changes in total volatile nitrogen compounds (TVB-N):

Volatile nitrogen compounds are an important indicator of fish quality during storage. The TVB-N is widely used as a fish spoilage index, as an increase in this parameter has been associated with bacterial spoilage and endogenous enzyme activity, which lead to the loss of quality in fish (Dolea et al., 2018). The acceptability limit of TVB-N varies and depends on the fish species, region, season, age or sex. In addition, this parameter depends on whether the fish is fresh or processed (Dolea et al., 2018). Connel (1990) suggested that 30-40 mg N/100 g and 60 mg N/100 g sample of TVB-N (in terms of wet weight) is an upper limit for freshwater and saline fish respectively. In this study, changes in total volatile basal nitrogen (TVB-N) of fish during storage at 2°C are shown in Figure (2). Nitrogenous compounds value decreased immediately after treatment from 9.24 for untreated fillets to 8.72 mg nitrogen/100 g for treated fish sample.

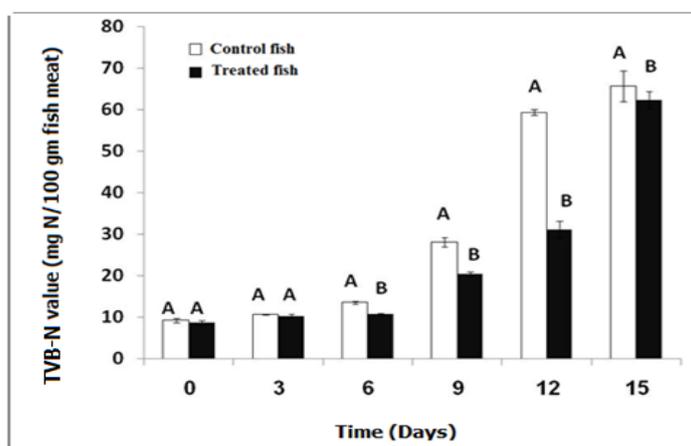


Figure (2) :Effect of rosemary extract on content of TVB-N (mg nitrogen/100 g of fish meat) of fish stored at 2°C. In each time period the averages bearing similar letters have no significant differences at ($p \leq 0.05$).

During cold storage, these volatile compounds increased in control samples reaching 28.14 mg nitrogen/100 gm on day 9, although it was still within the acceptable limit for fresh fish. In contrast, the TVB-N levels of samples treated with rosemary extract, kept under the acceptability limit (31.16 mg nitrogen/100 g sample) until day 15. Control samples showing an important increase through to day 15 of study where values were significantly exceeded the upper limit (63 mg nitrogen/100 g sample) of TVB-N (Fig. 2). The increase in shelf life of treated fillets may be due to the inhibitory effect of rosemary on microbial growth, which delayed the hydrolysis of fish protein in treated fish compared to control samples. The ability of this extract to inhibit fat oxidation is related to the total content of phenolic compounds, as phenolic antioxidants prevent the formation of fat free radicals, which interact with the absorbed oxygen in the self-oxidation process, thus delaying the process of self-oxidation of fat (Dolea et al., 2018).

Changes in TBA

TBA is a reference for measuring secondary lipid oxidation by measuring malonaldehyde, which is a by-product of oxidation resulting from the breakdown of hydroperoxides formed during the oxidation of polyunsaturated fatty acids. The peroxides are compatible with the oxidative deterioration of the unsaturated fatty acids of fish meat and lead to the production of undesirable taste and smell and thus be undesirable. The value of TBA is one of the important methods for the determination of oxidation products in fats and oils (Ramanathan and Das, 1992; Kulas and Ackman, 2011). Bonnl (1994) stated that good quality fish and fish products have TBA values of less than 2 mg malonealdehyde /kg of fish meat and therefore fish with TBA values of more than 2 mg malonealdehyde/kg will give a rancid odor and taste. In current study, changes in TBA of fish during storage are shown in Figure (3): Immediately after treatment and until the third day of cold storage, there were no significant differences ($p > 0.05$) between rosemary treated and untreated fillet samples. During storage, the TBA values of the control increased to reach 2 mg malonealdehyde /kg fish meat on the third day, which is considered within the acceptable limit, while the TBA values for the treated fish did not exceed 1.97 mg malonealdehyde /kg fish meat until the fifteenth day of storage at 2°C. On the contrary, control samples showing a progressive increase through to day 15 of study to exceed (3.4mg malonealdehyde /kg of fish meat) the acceptable limit of this parameter (2 mg malonealdehyde/kg). The obtained results suggested that rosemary extract extended the shelf life of treated fish fillets compared to untreated fillets. The inhibitory effect of rosemary on oxidation in this study is consistent with the results of several other studies. Varelziz *et al.*, (1997) found that using rosemary extract to preserve frozen and chopped mackerel fillets delayed fat oxidation and produced significantly less malonaldehyde compared to untreated samples. Tironi *et al.*, (2010) studied the effect of rosemary extract (200-500ppm) on the changes that could occur in protein and fat in minced salmon frozen at -11°C and found that the high concentration of rosemary delayed the oxidation process up to 50% compared to the untreated samples and there was a decrease in muscle tone loss. Cadun *et al.*, (2008) studied the effect of rosemary extract (300 ppm) on the quality of cryo-stored shrimp (1°C). The study showed that adding rosemary extract significantly decreased TVB-N value during storage and TBA value of the treated group compared with that of the untreated group. A similar study showed that rosemary extract was very effective in reducing lipid oxidation in slices of sea propolis (*Sparus aurata*) stored at 1°C (Gimenez *et al.*, 2004). In another study, rosemary extract (0.2%) was used as a natural preservative to control the chemical properties (TVB-N and TBA values) in vacuum-packed carp (*Carassius auratus*) cooled and stored at 1 m. Rosemary significantly slowed the increase in TVB-N and TBA values in treated samples compared to untreated ones (Li *et al.*, 2012).

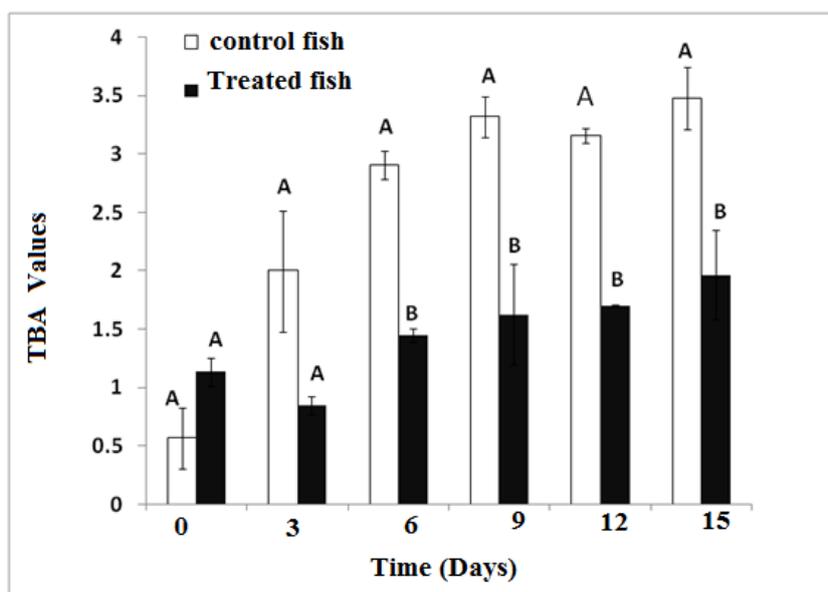


Figure (3): Effect of rosemary extract on fish content stored at 2°C of TBA (mg Malone Aldehyde/kg of fish meat) In each period the averages bearing similar letters have no significant differences at the level of probability ($p \leq 0.05$).

Microbiological analysis

Figure (4) represents the total viable counts (TVC) of fish fillet throughout 15-days of cold storage at 2°C ±1. It is clear that dipping fish fillet samples into 1% (w/v) aqueous solution of rosemary extract caused a significant dropping in bacterial count ($p < 0.05$) on fillets samples. The initial count of TVC was around 6.0 log₁₀ CFU/g and rosemary treatment exhibited an immediate effect on treated fillet as bacterial count decreased significantly to 4.1 log₁₀ CFU/g. After fish catching, some sources of contamination such as aquatic environment, surface or intestinal microorganisms, equipments, and handling may contribute in quick deterioration of fish muscle. In this study, TVC values of control and treated fillet samples exhibited a gradual increase during storage period starting from day 6 as the control fillet samples reached a value of 7.70 log₁₀CFU/g which was beyond the microbiological acceptability limit of fresh fish (7.0 log₁₀ CFU/g). On the contrary a reduction of up to 2 log cycles between rosemary treated fillet and control samples was reported after 12 days of cold storage suggesting the efficacy of treatment in keeping microbiological acceptable limit up to 12 days compared to only 6 days for controls as total count significantly increased and exceeded the permissible limit to reach a value of 9.0 log₁₀CFU/g (Fig. 4).

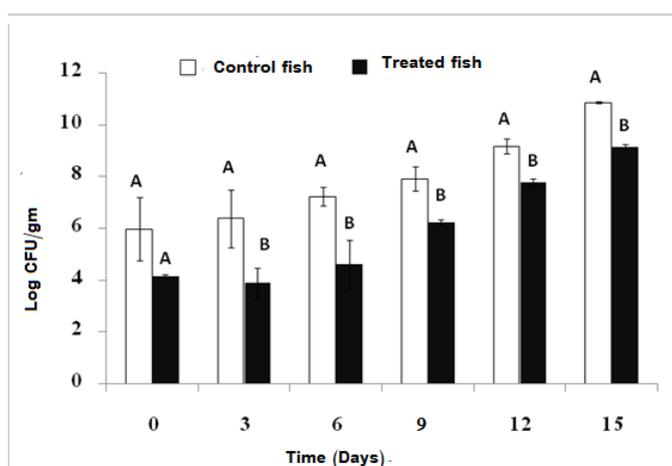


Figure 4: Effect of rosemary methanolic extract on total viable count of fish fillets during cold storage at 2°C for 15 days. Bars: represent means ± SD of three replicates. For each day significant differences ($P \leq 0.05$) indicated by different letters on bars.

Regarding psychrotrophic bacteria (PTC), the same behavior as that of TVC was reported as control again exhibited higher counts throughout the storage period compared to treated samples (Fig. 5). In general, results detected that rosemary extract delayed the rate of microbial spoilage and increased the shelf life of treated fillet to 12 days during refrigerated storage at 2°C.

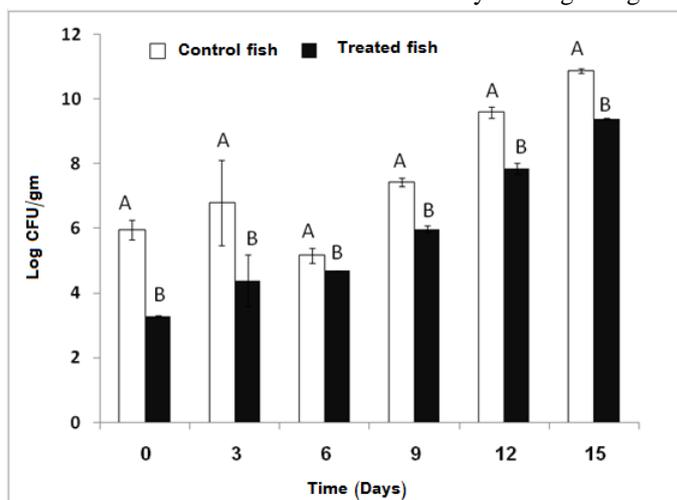


Figure 5: Effect of rosemary extract treatment on total psychrophilic bacteria count on fish fillet treated stored at 2°C for 15 days. Bars: represent means ± SD of three replicates. In each time period the averages bearing similar letters have no significant differences at ($p \leq 0.05$).

The antimicrobial properties of rosemary have been reported in the literature (Kenar *et al.*, 2010; Ucak *et al.*, 2011; Gao *et al.*, 2014). Kenar *et al.*, (2010) reported that shelf life of vacuum packed sardine fillet stored at 3±1°C has extended to seven days after dipping fillet in ethanolic extract of rosemary. Additionally, rosemary extract (at 0.4 and 0.8%) was found effective in controlling biochemical indices and bacterial growth in vacuum packed Atlantic mackerel burgers during cold storage (Ucak *et al.*, 2011). Recently, Gao *et al.*, (2014) displayed a synergistic effect of rosemary extract with nisin in prevention lipid oxidation, protein degradation, nucleotide breakdown and microbial growth in pompano fillet (*Trachinotus ovatus*) during cold storage at 4°C. Turhan *et al.*, (2009) investigated the effect of brining with rosemary extract on the oxidative stability of anchovies stored at 4°C for 28 days. Their results indicated that adding brining with rosemary extract delayed the lipid oxidation of anchovies and the highest antioxidant effect was observed in brined anchovies with rosemary during storage as indicated by peroxide value (POV), thiobarbituric acid reactive substance and oxidative rancidity scores.

Effect of rosemary extract on sensory characteristics of fish fillet

Sensory assessment is the most popular way of assessing the freshness of fish. It is simple, fast, and provides immediate quality information. The sensory specifications of fish are clearly visible to the consumer and are essential for consumer satisfaction (Sallam *et al.*, 2007). Table (1) displays a summary of the results of sensory evaluation of fillet stored at 2°C. The assessment was performed for all treatments every 3 days up to day15. Rosemary treatment and controls had no significant differences in the acceptability of sensory characteristics during the first three days of storage period. However, from day 6 onwards treated fillet samples were more acceptable since score of all sensory attributes were significantly ($p < 0.05$) higher than those of control samples (Table 1).

Table 1: Effect of rosemary extract on sensory characteristics of fish fillet stored at 2°C

Storage time (days) at 2°C	Treatment	Smell	Colour	Overall acceptability
0	Control	8.8 ^a	8.7 ^a	8.6 ^a
	1% rosemary	8.9 ^a	8.8 ^a	8.7 ^a
3	Control	7.5 ^a	8.0 ^a	7.8 ^a
	1% rosemary	8.8 ^a	8.9 ^a	8.6 ^a
6	Control	6.2 ^a	6.9 ^a	6.1 ^a
	1% rosemary	8.0 ^b	8.4 ^b	8.0 ^b
9	Control	4.8 ^a	3.7 ^a	5.5 ^a
	1% rosemary	6.9 ^b	6.9 ^b	6.5 ^b
12	Control	3.0 ^a	2.5 ^a	3.1 ^a
	1% rosemary	6.4 ^b	6.7 ^b	5.2 ^b
15	Control	2.0 ^a	2.1 ^a	2.2 ^a
	1% rosemary	3.2 ^b	3.9 ^b	4.3 ^b

For each sensory attribute; in the same day averages with the same letters indicate no significant differences at ($P \leq 0.05$).

CONCLUSION

Rosemary extract showed the ability to delay oxidation and microbial spoilage and extend the shelf life of refrigerated fish, which enhances the possibility of using this herb to preserve this type of perishable food. The study showed promising results for the possibility of using extracts derived from these plants as potential alternatives to preservatives in the food industry. However, if plants and extracts are to be used for food preservation, issues of safety and toxicity will always need to be addressed.

REFERENCES

- Abou-Taleb M, El-Sherif SA, Elhariry H. Preservation effect of four plant extracts used to extending the shelf-life of mullet fish fillets during cold storage. *Journal of Dairy and Food Sciences*. 2007; 2:74-82.
- Adris A A, Tower M A ,Soultan A A, Bellail A A, Ibrahim FAA. Antioxidant and Antimicrobial Activities of Rosmarinus officinalis L. Growing Naturally in El-Jabal El-Akhdar Province –Libya and its Effect on Keeping Quality of Cold Serola dumeriri Fillets. *Journal Food and Dairy Scinces, Mansoura University*. 2019; 10: 23 – 30.
- AOAC. 2002. Official Methods of Analysis of AOAC international (17th Ed.) M.D, USA: Association of Official Analytical Chemistry.
- Bonnel, AD. Quality Assurance in Seafood Processing. Academic press, 1994; pp: 72. New York, USA.

- Cadun A, Kisla D, Cakli S. Marination of deepwater pink shrimp with rosemary extract and the determination of its shelf-life. *Food Chemistry*. 2008; 109: 81–87.
- Charalambous G. 1994. Spices, herbs and edible Fungi. El Sevier Science, Amsterdam, London, New York, Tokyo.
- Connel JJ. Control of fish quality. News Books, a Division of Blackwell Scientific Publication, 1990; Cambridge- U. K.
- Dolea D, Rizo A, Fuentes A, Barat JM and ndez-Segovia F. Effect of thyme and oregano essential oils on the shelf-life of salmon and seaweed burgers *Food Science and Technology International*. 2018; 24: 394–403.
- Gao M, Feng L, Jiang T, Zhu J, Fu L, Yuan D and Li J. The use of rosemary extract in combination with nisin to extend the shelf life of pompano (*Trachinotus ovatus*) fillet during chilled storage. *Food Control*. 2014; 37: 1-8.
- Gerhardt P, Murry RGTE, Costilow RN, Nester EW, Wood WA and Phillips GB.. *Manual of Methods for General Bacteriology*. 1994; American Society for Microbiology, (USA).
- Gimenez, B, Roncales P, Beltran JA. The effects of natural antioxidants and lighting conditions on the quality characteristics of gilt-head sea bream fillets (*Sparus aurata*) packaged in a modified atmosphere. *Journal of the Science of Food and Agriculture*. 2004; 84: 1053–1060.
- Gram L, and Dalgaard P. Fish spoilage bacteria problems and solutions. *Current Opinion in Biotechnology*. 2002; 13: 262–266.
- Gram, L.; Huss, H.H. Microbiological Spoilage of Fish and Fish Products. *Int. J. Food Microbiol*. 1996, 33, 121–137.
- Huis In't Veld JHJ. Microbial and biochemical spoilage of foods: An Overview. *International Journal of Food Microbiology*. 1996; 33: 1–
- Ibrahim SM and Sherif SA. Effect of some plant extracts on quality aspects of frozen tilapia (*Oreochromis niloticus* L.) fillets. *Global Veterinaria*. 2008; 2: 62-66.
- Kenar M, Ozogul F and Kuley E.. Effects of rosemary and sage tea extracts on the sensory, chemical and microbiological changes of vacuum packed and refrigerated sardine (*Sardina pilchardus*) fillets. *International Journal of Food Science and Technology*. 2010; 45: 2366-2371.
- Khan MA, Parrish CC and Shahidi F. Effects of mechanical handling, storage on ice and ascorbic acid on lipid oxidation in cultured Newfoundland blue mussel (*Mytilus edulis*). *Journal of Food Chemistry*. 2006; 99: 605-614.
- Kulas E and Ackman G. Different tocopherols and the relationship between two methods for determination of primary oxidation products in fish oil. *Journal of Agriculture and Food Chemistry*. 2001; 49: 1724-1729.
- Li T, Li J, Hu W, Zhang X, Li X, Zhao J. Shelf-life extension of crucian carp (*Carassius auratus*) using natural preservatives during chilled storage. *Food Chemistry*. 2012; 135: 140–145.
- Methods and Recent Innovations. *Food Research. Int*. 2020, 133, 109157.
- Naili MB, Alghazeer RO, Saleh NA and Al-Najjar AY. Evaluation of antibacterial and antioxidant activities of *Artemisia campestris* (Astraceae) and *Ziziphus lotus* (Rhamnaceae). *Arabian Journal of Chemistry*. 2010; 3: 79-84.
- Peryam DR and Girardot NF. Advanced taste-test method. *Food Engineering*. 1952; 24: 58–61.
- Pourashouri P, Shabanpour B, Aubourg S, Rohi G and Shabani A. . An investigation of rancidity inhibition during frozen storage of wells catfish (*Silurus glanis*) fillets by previous ascorbic and citric acid treatment. *Journal of Food Science and Technology*. 2009; 448: 1503-1509.
- Prabhakar PK, Vatsa S, Srivastav PP, Pathak SS. A Comprehensive review on freshness of fish and assessment: Analytical Ramanathan L and Das NP. Studies on the control of lipid oxidation in ground fish by some polyphenolic natural products. *Journal of Agriculture and Food Chemistry*. 1992; 40:17-21.
- Sallam KI, Ahmed AM, Elgazzar MM, Eldaly EA. Chemical quality and sensory attributes of marinated Pacific saury (*Cololabis saira*) during vacuum-packaged storage at 4 °C. *Food Chemistry*. 2007b;102: 1061–1070.
- Sallam KI. Antimicrobial and antioxidant effects of sodium acetate, sodium lactate, and sodium citrate in refrigerated sliced salmon. *Food Control*. 2007a ; 18:566–575.

Serdaroglu M and Felekoglu E. Effects of using rosemary extract and onion juice on oxidative stability of sardine (*Sardina pilchardus*) mince. *Journal of Food Quality*. 2005; 28: 109-120.

Siu GM, Draper HH. A survey of the malonaldehyde content of retail meats and fish. *Journal of Food Science*. 1978; 43: 1147–1149.

Tironi VA, Tomas MC and Anon MC. Quality loss during the frozen storage of sea salmon (*Pseudoperca semifasciata*). Effect of rosemary (*Rosmarinus officinalis* L.) extract. *LWT Food Science and Technology*. 2010; 43: 363-372.

Turhan S, Sagyr I and Temiz H. Oxidative stability of brined anchovies (*Engraulis encrasicolus*) with plant extracts. *International Journal of Food Science and Technology*. 2009; 44: 386- 393.

Ucak I, Ozgul Y and Durmus M. The effects of rosemary extract combination with vacuum packing on the quality changes of atlantic mackerel fish burgers. *International Journal of Food Science and Technology*. 2011; 46: 1157-1163.

Vareltzis K, Koufidis D, Graviilidou E, Papavergou E, Vasiliadou S. Effectiveness of a natural rosemary (*Rosmarinus officinalis*) extract on the stability of filleted and minced fish during frozen storage. *Zeitschrift für Lebensmitteluntersuchung und –Forschung*. 1997; 205: 93-96.

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Using Storytelling To Enhance Grade-10 Students' Listening Comprehension At A High School

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Abstract- Thanks to globalization and integration, English has become an indispensable tool to connect the whole world. In every area, from business, research, etc. to daily life, English is used worldwide. That is the reason why English proficiency has become one of the most important criteria to consider when recruiting a candidate or promoting an employee.

Understanding the significant role of English, the Ministry of Education has continuously updated the textbooks so that students have modern and constructive materials to study this international language. The new textbooks are written in order to develop all of the four skills, listening, speaking, writing, and reading skills. However, in the teaching process, the author realizes that students encounter a lot of difficulties practicing listening skills.

In general, students cannot recognize some words due to their mispronunciation. Intonation is also a barrier for them to understand. Nevertheless, among the reasons, demotivation is the main cause of unimproved listening skills. At school, teachers have to follow the curriculum; therefore, listening is taught in a traditional way. That means students learn listening lessons passively. When the teachers play the recordings, they listen and do the tasks in the textbooks. According to my observation, the majority of students are not eager to learn listening lessons. Therefore, they just try to fulfill the tasks because they follow their teacher's instructions.

As a teacher, this matter has been my concern for a long time. That is the reason why I have looked for a lot of materials to find ways to get my students involved in listening lessons. I have found that storytelling can be a good way to improve the listening skills of students in general and my students at a high school in particular. Storytelling is interesting not only because of the pictures in it but also because the content of every stage in the story conveys meaningful thought and feeling in which the learners of English expect to get the knowledge and the message behind the story (Brewster, 1991). In addition, storytelling can draw students' attention and interest to the lessons. Storytelling is a social experience because it connects a teller and a listener (Smyth, 2005).

Although storytelling can shed light on the process of teaching and learning listening lessons, it is still necessary to have a formal study in this matter to collect students' feedback so that it can be applied synchronously and effectively. Therefore, the

author would like to conduct the study "Using Storytelling to Enhance Grade-10 Students' Listening Comprehension at a High School".

Index Terms- listening comprehension, storytelling, grade 10

I. INTRODUCTION

The students' attitude toward listening

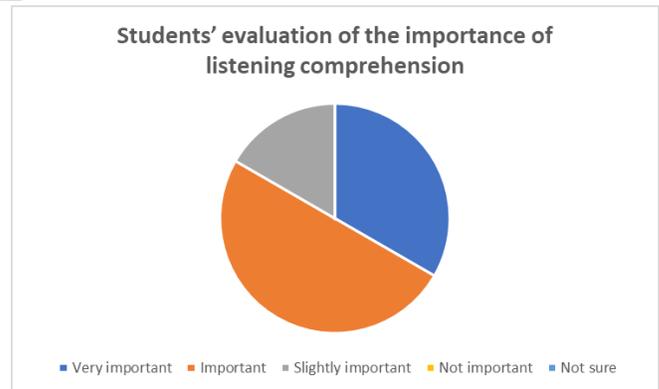


Figure 1.1. Students' evaluation of the importance of listening comprehension in acquiring the English language

The chart illustrates how students thought of the importance of listening comprehension in acquiring the English language. Students seemed to be so sure of the importance of listening comprehension that no one selected the "not sure" option. Also, nobody denied the significant role of listening. Those who claimed that listening comprehension was very important and important accounted for 83.3% in total.

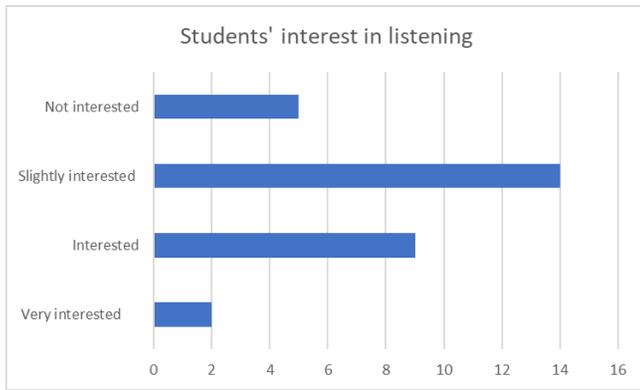


Figure 1.2. Students' interest in listening

According to figure 1.2, about two-thirds of the students said that listening is not interesting or slightly interesting.

Figure 1.3 shows how attentive the students were during listening lessons.

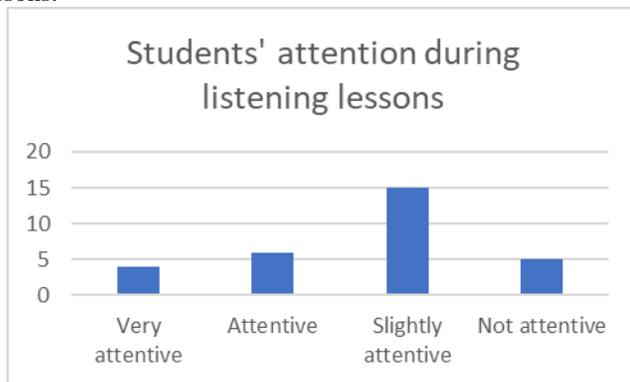


Figure 1.3. Students' attention to listening

Only 13.3% said that they were very attentive in listening lessons. Meanwhile, those who claimed to be inattentive and slightly attentive accounted for a much higher percentage, about 67%.

It could be summarized that most of the respondents did not have a positive attitude toward listening, which could result in a lot of difficulties in listening.

The students' difficulties in listening

The main difficulties of the students in listening could be summarized in table 1.1 below:

Table 1.1. Students' difficulties in listening

Students' difficulties in listening	Number of students	Percentage
I find it hard to understand what I listen to without looking at the scripts.	20	66.7
I can't recognize familiar words when the speakers use different intonations.	20	66.7

I often don't understand the details of the texts I listen to.	21	70
I often lose focused when the listening text is too long.	19	63.3
I don't know how to catch the key words while listening.	21	70
I can't understand the oral text because of new vocabulary items	15	50
I often feel stressed when listening.	19	63.3

As illustrated in table 1.1, students had a number of difficulties in listening. The biggest problems for students were catching the key words while listening (70%) and understanding the details of the listening texts (70%). Other major challenges consisted of recognizing familiar words when the speakers use different intonations (66.7%) and understanding the oral text without looking at the script. How to stay focused while listening to a long text was also a challenge for 63.3% of the students. A similar number of students felt stressed when listening. In addition, approximately half of the research participants claimed that their difficulties came from new vocabulary items. From the data collected, it could be concluded that the lack of interest, practice and limited listening skills were the most important reasons for students' difficulties in listening. Therefore, there was an urgent need for suitable solutions to help students improve their listening.

II. THE EFFECTIVENESS OF STORYTELLING IN ENHANCING GRADE-10 STUDENTS' LISTENING COMPREHENSION

The researcher determined which class would be the control and which would be the experimental group (CG and EG) and had the two groups perform a pre-test before using Storytelling. The pre-questionnaire was then delivered to students in the experimental group in order to obtain information about their attitudes toward listening comprehension lessons while they were taught normally. The researcher employed the Storytelling technique with the EG in the second step. The teacher prepared eight distinct stories to tell in four weeks with the help of the researcher. The stories were chosen based on a number of factors, including the difficulty level, the number and complexity of words used, and the appeal of the topics to tenth graders. Each story's activity sheet was also developed ahead of time, with the goal of assessing the vocabulary learned and the capacity to listen for details. The teacher was in charge of telling the stories. She used photos, PowerPoints, films, and realia to get students to pay attention. After the students had finished listening, the teacher instructed them to complete the activity worksheets. The control group continued to learn in the same manner as before, with no special treatment.

After the four-week research period, the teacher gave both the EG and the CG a post-test to examine the differences in order to evaluate the effectiveness of the storytelling strategy on students' listening capacity. Following the test, the researcher handed the EG students a post-questionnaire to see the difference in their attitudes about the use of the storytelling technique in teaching listening.

Table 1.2 below shows the students' minimum and maximum scores on the two tests.

Table 1.2. Students' minimum and maximum scores on the pre-test and posttest

	Test	Minimum score	Maximum score
Experimental group	Pre-test	4.5	8
	Post-test	6.5	9
Control group	Pre-test	5	8
	Post-test	5.5	8.5

The results in the table above show that both groups improved after learning to listen over time, whether they received treatment or not. The EG, on the other hand, had better results than the CG.

The minimum and maximum scores of the two groups were not statistically different in the pre-test. To be more explicit, the experimental and control groups' lowest scores were 4.5 and 5.0, respectively, while their maximum scores were both 8.0. In the posttest, however, it is clear that the EG's minimum and maximum scores were greater than the CG's. The experimental group's minimum and maximum scores were 6.5 and 9.0, respectively compared with 5.5 and 8.5 for the control group.

Besides the results of the pretest and posttest, students' opinions on the effectiveness of storytelling in improving their listening comprehension were also collected.

Table 1.3. Students' opinions on the effectiveness of storytelling in improving students; listening comprehension

	Number of students	Percentage
It's much easier for me to recall words that I've learned through stories.	20	66.7
I retain the meaning of words learned from stories for a longer period of time.	18	60
When I'm listening, I know how to identify keywords.	18	60
When I'm listening, I'm more focused.	20	66.7
I can recognize the words in different intonations	21	70

The details of the story I'm listening to make sense to me.	19	63.3
When I'm listening to a tale, I frequently guess what'll happen next.	12	40
For me, listening to stories is an enjoyable pastime.	18	60
Listening is something that interests me more.	20	66

Table 1.3 illustrates positive results. Specifically, over two-thirds of the students (70%) said they could recognize the words in different intonations. Storytelling also helped them retain the meaning of new words for a longer period of time. Students were also better at recognizing keywords when listening (60%) and focusing (67.6%), as well as grasping the specifics of the stories more easily (63.3%). Storytelling stimulated the interest in learning to listen in 63 percent of the students. Furthermore, 60 percent of the students said that listening to stories became enjoyable for them.

III. CONCLUSION

Storytelling was found to be beneficial in helping pupils enhance their overall listening comprehension skills based on the data obtained. It aided children in learning vocabulary and pronunciation, improved their capacity to listen to specific details, and required them to use various listening skills in order to comprehend the meaning of stories. Following the research period, students in the experimental groups discovered that using the Storytelling technique made learning the skill more fascinating. They also reaped a slew of other advantages from employing the approach in listening classes.

Some recommendations are proposed to help improve the effectiveness of teaching and learning listening comprehension. To begin with, teachers should clearly describe the benefits of storytelling in learning listening to better encourage students, as many students are unfamiliar with the usage of storytelling in learning hearing. They should also provide clear directions so that students understand exactly what they are expected to accomplish when learning listening through Storytelling in order to maximize the activity's benefits.

Knowing that students may encounter some difficulties at the beginning of the learning period, such as the feeling of stressful if they do not understand the stories, the pressure from listening for long texts, it is advisable for teachers to be careful in choosing stories which are suitable to students' level. Simple and appropriate language, compelling plots, and clear messages may make stories more appealing and less demanding.

Students should be given appropriate things to undertake in order to increase their listening engagement. When using Storytelling, visual aids such as picture illustrations, videos, and realia can be used to make it more interesting for students. This is

also a fantastic approach to get them to become more interested in hearing and hence more attentive.

For some students, learning new vocabulary items can be a major challenge. A story with a lot of new terms makes it difficult to listen and demotivates the audience. As a result, teachers should provide adequate help, such as a dictionary for each story or pre-teach the new challenging terminology to pupils in order to facilitate message understanding.

Digital storytelling, in addition to teacher-led storytelling, could be used. This type of storytelling allows students to visualize the content of stories and includes noises that make them more vivid while also providing a fresh learning experience. More significantly, instead of relying on their teachers, students might continue learning after class hours using digital storytelling.

REFERENCES

- [1] [1] Alsofi, A. (2008). The Difficulties of Teaching English Novel for the Eleventh Grade from the Teachers' Perspective in Gaza, Islamic University, Gaza.

- [2] [2] Bausch, W. (1994). *Storytelling and Faith*: Prentice Hall.
- [3] [3] Davies, G. (2019). *Developing listening skills with storytelling*-OXFORD UNIVERSITY PRESS.
- [4] [4] Laura Sealey Sánchez (2013). *Developing linguistic skills through storytelling in the EFL classroom: Final degree project*. Facultad de Ciencias de la Educación, Universidad de Málaga.
- [5] [5] McDrury and Alterio. (2003). *Learning Through Storytelling in Higher Education: Using Reflection and Experience to Improve Learning*. 1st Edition, Kindle Edition, Routledge.
- [6] [6] Rebecca Isbell. (2002). *Telling and Retelling Stories: Learning Language and Literacy*. Supporting Language Learning.

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Assessment of regular monitoring effect on academic performance among secondary schools in Meru County; Kenya.

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Abstract

Study purpose was to assess regular monitoring effect on academic performance among secondary schools in Meru County; Kenya. The target population for this study was secondary schools Principals or Deputy and the teachers and students in all the 930 schools in the County. Stratified random sampling was used to obtain the required sample of 186. Stratification ensured that each department is represented in the sample. Before going to collect data, pilot study was carried out to ensure that the instruments test what they are meant to. The questionnaire was checked if the words are well understood by participants. Primary data was collected through the use of key informant method using a self-administered questionnaire. Data was analyzed using quantitative technique and both descriptive and inferential statistics have been used in the data analysis. Descriptive statistics was used to deduce any patterns, averages and dispersions in the variables through the measure of locations (mean) and measure of dispersions (standard error mean). Inferential statistics was used to determine the relationship between the study variables and included correlation, analysis of variance and regression. The study results have been presented in cumulative frequency tables and bar graphs. The study results show that effect of regular monitoring by the principals on performance in that 40.2 percent of the academic performance of secondary schools in Meru County can be explained by regular monitoring. The study recommends that the secondary schools in Meru County should stiff to improve on their regular monitoring and enhance teachers' participation by the principals in an effort to improve on their academic performance

Key words: Regular monitoring, Academic performance, Secondary schools.

1. Introduction

According to Maina, (2011) head teachers ought to take up their duties as excellence assurance officers in their schools and make sure that there is enough departmental control. They need to introduce staff evaluation through close designed forms to improve standards and connect in evaluative class surveillance to ensure that a variety of training methods apart from class conversation is used. Head teachers should come up with school income generating actions to ease current financial trouble that result in student non-attendance, transfers, unruliness and insufficient facilities. They should often invite excellence assurance officers to make recommendation on school affairs and neighborhood relations. What is not well understood is that learning running in schools includes the submission of running philosophies in scheming, rising and carrying out means towards attainment of educational goals (Oden, 2011) This efficiency is judged by the degree to which schools usually meet the prospect of the society within which they are recognized.

The Kenyan government has shown commitment to provision of excellent secondary school education through distribution of financial resources, provision of trained teachers a well as establishing of quality assurance department in the schools (Allen (2013), According to Stewart, *et al* (2011), teacher's shortage, basic facilities lack, community interferences, inefficient teaching methodology and management related issue such as poor management of school facilities have been blamed for the academic performance in schools.

2. Research Methodology and Design

A correlational research strategy was adopted to conduct the study. Correlational research is research concerned with establishing

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relationships between two or more variables in the same population or between the same variables in two populations (Kothari, (2010). Correlational research studies relationships among variables, some of which may not be the actual cause of another. A descriptive research design strategy was embraced during the study where only quantitative data were utilized.

3. Results and Discussion

The study’s objective was to assess of regular monitoring effect on academic performance among secondary schools in Meru County; Kenya.

3.1. Regular Monitoring on Academic Performance

The researcher sort to assess the extent to which regular monitoring affect academic performance of secondary schools, respondents were to give their view on how regular monitoring had affected academic performance of secondary schools in Meru county secondary schools. The results were as shown on table Table.4.3.

Table 3.1 Regular Monitoring on Academic Performance

Organizational Structure Measures	Mean	t-value	Sig. (p-value)
Leaders in this school have a unique style leadership	2.423	52.654	0.000
Leaders choose style to employ based on the state of affairs	2.024	49.814	0.000
I only make use of leadership styles I found successful over time	2.084	43.452	0.000
Leadership tuition helps me be acquainted with right style to employ in the school	2.391	36.291	0.000
Leaders are given room to exercise my preferred leadership styles	2.029	34.891	0.000
Overall mean score=2.190			

Source: Primary Data, 2019

Overall, the intensity of regular monitoring affect academic performance of secondary schools in Meru County on percentage of 43.8 out of the maximum score of 5. This can be interpreted, its influence in academic performance has a direct positive effects on learning and the results in class. Regular monitoring by school seniors in relation to this study has good impact on academic performance to students in secondary school

3.1.2 Effect of Regular Monitoring on Academic Performance

The study’s first object was to assess the extent to which regular monitoring by principals and the academic performance of schools in Meru County. In order to evaluate extent to which regular monitoring by principal and the academic performance, the study had the following research question;

RQ1. To what degree does regular monitoring effect on academic performance of Secondary schools?

In order to be able to answer the research question above, the researcher used regression coefficient (beta β) which indicates the direction of the effect on the dependent variable caused by the independent variable. The collective mean scores of academic performance events were regressed alongside the mean scores of events of performance of Secondary schools in Meru County and results recorded in table 4.9.

Table 3,2 (a) Regression Grades for Regular Monitoring and Performance

Model 1			
R	R Square	Adjusted R Square	Std. Error of the Estimate
.634	.402	.768	.3821

Source: Primary Data, 2017

The results show that 40.2% of performance of Secondary schools in Meru County can be explained by regular monitoring by principal (R squared = .402) table 4.9. The study therefore found out that there was an effect of regular monitoring by principal on the performance

of Secondary schools. This study result concurs with the results of a study done by Nancy (2005) which found out that progress monitoring is a practice that helps teachers use student performance data to continually evaluate the effectiveness of their teaching and make more informed instructional decisions. By regularly measuring all skills to be learned, teachers can graph changes if the rate at which a particular student is learning seems insufficient, the teacher can adjust instruction. Although schools can develop the probes themselves, developing enough equivalent, alternate probes for frequent measurement at each grade level is daunting for many schools. Therefore, they often turn to commercially available products, most of which are computer-based and can automatically graph the progress of individual students. The study demonstrated that when teachers use student progress monitoring, students learn more, teacher decision making improves, and students become more aware of their own performance.

Table 3.3 (b) Regression Grades for Regular Monitoring and Performance ANOVA

	Sum of Squares	DF	Mean Square	F	Sign. (p-value)
Regression	2.018	1	2.218	39.018	.006
Residual	1.640	144	.124		
Total	3.368	145			

Source: Primary Data, 2017

The effect of regular monitoring by principals in Secondary schools in Meru County on performance was positive and significant in that its R was .552 (table 4.9a). The study results on the other hand shows that 32.8 percent of the performance of Secondary schools in Meru County can be explained by regular monitoring by principals (R squared = .328). From the above regression analysis, the study found out that there is a relationship between regular monitoring by principals and performance of Secondary schools in Meru County. The study results answer the research question in that it has found out that regular monitoring by principals had an effect on the performance of Secondary schools in Meru County.

4. Conclusion and Recommendations

The study assessed the extent to which regular monitoring by principals affect performance of secondary schools in Meru County. The results revealed that regular monitoring by principals was found to have effect on academic performance of secondary schools. The effect was significant because it had p-value less than 0.05 with academic performance of secondary schools in Meru County depended on the regular monitoring by principals with forty point two percent of performance being explained by regular monitoring by principals (R squared = .402). The study result is in agreement with Nancy (2005) the scholars argue that improvement on monitoring helps the teachers to keep on evaluating the effectiveness of training so as to make informed decisions. Fuchs (2002) conducted analysis of students monitoring that considered it as a method reliable and a varied predictor of subsequent performance on variety outcome measures. Deno (2003) has validated the use of regular academic monitoring as a way that encourages students to work hard which improves the results. This means that the performance of secondary schools depends largely on the regular monitoring by principals of the schools.

The study results show that effect of regular monitoring by the principals on performance in that 40.2 percent of the academic performance of secondary schools in Meru County can be explained by regular monitoring. Based on the study findings therefore, the study can conclude that regular monitoring helps in improving the academic performance of secondary schools in Meru County. Secondary schools in Meru County should therefore stiff to improve on their academic performance of secondary schools in Meru County because this study found it to have an effect on academic performance of secondary schools in Meru County.

The study recommends that the secondary schools in Meru County need to perk up on their regular monitoring by the principals in an effort to improve on their academic performance.

5. References

Allen (2013), 6th edition. Leadership, a communication perspective Waveland Press. *Styles of Leadership" Assortment*
 Kothari, C. R (2010) *Research Methodology: Methods and Techniques*, second revised Edition, New Age International (P) Ltd Publishers New Delhi.

- Maina, J. (2011) *the life of leadership: Creating culture, community and personal meaning in our schools*. San Francisco: Jossey-Bass.
- Oden, S. (2011) *Leadership that matters*, San Francisco: Berrett-Koehler Publishers Inc. New York.
- Otton, V. (2005) "A Method of Comparing Follower Satisfaction with the Authoritarian, Democratic, and Laissez-faire Styles of Leadership" *Communication Teacher*
- Stewart R Clegg, Martin Kornberger, Tyrone Pitsis .(2011). *Managing and organizations*. An introduction to the theory and practice. London.

Aspects of economic diplomacy

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Abstract- The basic area of economic diplomacy is the promotion and promotion of trade volume, which means creating opportunities to increase exports to existing markets, as well as identifying new potential markets for domestic companies. An important aspect of economic diplomacy in the field of improving the volume of trade is the support of companies involved in negotiations with government bodies or companies from the country in which they intend to invest or are already present in that market.

The nature of economic diplomacy in a particular country is determined by a wide range of variables, which are related to the political issues or political context in a particular country that make up the stability of the legal environment, the ability to satisfy justice in court, or the degree of corruption in the country in which the company intends to invest or improve. the existing scale of pols.

Index Terms- economic diplomacy, economy, trade,invest

I. INTRODUCTION

In the broadest sense, economic diplomacy has the most important role in contributing to the improvement of economic opportunities and performance of the state and the companies established in it. Economic diplomacy fulfills its role and has an impact on many areas with which it is connected in a certain way. The main focus is on politics, trade and security. Nowadays, the economy is not only and exclusively the traditional maximization of company profits, but also touches on the areas of politics and security, while the area of trade is one of the basic activities through which globalization is most visible. Modern economic diplomats are not narrowly specialized in a certain field, but they are equally familiar with each of the listed areas.

The connection of economic diplomacy with political, security and trade issues is important, primarily due to the fact that the economy cannot be seen as an independent activity. The state, ie companies, will not be ready to cooperate with states and companies burdened with internal problems, whether they are of a political or security nature. Accordingly, the following is an overview of the most important aspects of economic diplomacy in the context of globalization.

II. SECURITY AND GEOPOLITICAL ASPECT OF ECONOMIC DIPLOMACY

The geopolitical position of a country is the most important segment of a complex geographical position, which includes natural, economic, political and geographical factors and combines a complex assessment of natural potentials, geodemographic processes and cultural and political status. At the same time, the geopolitical position contains the influences of geographical factors on the political-historical process and it determines the development of the state and the potential of its integration into economic security and political integration processes. Almost all countries of the modern world are considering current models of collective security in the context of the relationship between power and authority, within the process of globalization and the creation of the so-called new world order in terms of achieving the necessary level of defense and security as a whole. Analyzing the current geopolitical and geostrategic environment, in the context of the mentioned challenges that pose a threat to the security of states, it can be concluded that states that rely on their own forces will not be able to achieve a satisfactory level of security and reach the appropriate level of development. In this context, one of the solutions is to establish alliances with other countries through security connections that will enable them to adequately protect key national and state interests and raise the general level of social and defense strength of the state. It is in these processes that economic diplomacy can make a significant contribution, given that achieving goals related to ensuring an appropriate level of collective security of several countries is not entirely possible if economic diplomacy is not involved in these processes. Namely, achieving the set goals in the field of state security in modern conditions implies the engagement of significant financial resources. In that way, the economy becomes a direct partner in this process, because significant amounts of money are allocated for the needs of ensuring security in a large number of countries. At the same time, collective bodies in the field of security, ie international security organizations, also require certain financial resources necessary for their work. In proportion to the economic strength and capabilities of economic diplomacy, states gain a more or less privileged status, ie an influential position within these organizations.

III. THE POLITICAL ASPECT OF ECONOMIC DIPLOMACY

As economic diplomacy is an activity that includes all the most important aspects of the modern state's activities in relations with partners abroad, it is necessary to consider its role from a political point of view. Economic diplomacy does not exclusively ensure the economic prosperity of the state, but, when conditions allow it, it also provides support for the financial and trade foreign policy of the state. Therefore, economic diplomacy is one of the most important agendas in discussions between states. In the first years after the end of the Second World War, the activities of economic diplomacy were included in the field of political diplomacy. An example of the beginnings of the intertwining of economic and political diplomacy is post-war Japan, which lost its political influence very soon after the end of the Second World War. In the mid-fifties of the twentieth century, primarily thanks to well-organized economic diplomacy, Japan succeeded in regaining lost political influence and strengthening its economic status.

When it comes to Europe, political issues have always been ahead of economic ones, and, as such, they have actually been the basis for achieving economic goals. In the modern world, it is almost impossible to separate political diplomacy from economic diplomacy, because in the conditions of globalization, they practically represent two sides of the same coin. Namely, economic and political goals are equal today and it is not possible to draw a clear line of separation between them, because in the background of the realization of every goal in the sphere of politics, there is the economy, and vice versa. In the background of every success in the field of economy, there is a certain political interest in achieving that success. The greatest economic powers of today's world are at the same time the leading political forces, which indicates that there is no economic power without political power, ie that the political aspect of economic diplomacy is an indispensable part of modern economic diplomacy.

IV. TRADE ASPECT OF ECONOMIC DIPLOMACY

The trade aspect of economic diplomacy is as important as the aforementioned security and political aspects. This is important to point out because some of the basic goals of economic diplomacy are focused on trade. "The development of the trade aspect of economic diplomacy took place in the following phases: Trade promotion is usually the first goal of economic diplomacy. The intensification of foreign direct investment during the 1970s laid the foundations for trade to become a significant source of government revenue.

- The second phase of the development of the trade aspect of economic diplomacy coincides with the mid-1980s, when, thanks to economic diplomacy, clusters of participants in the promotion of trade and investment were connected and mobilized.
- The third phase was the promotion of countries, especially those activities that have increased employment and trade.
- The last phase was of a regulatory nature. At this stage, the World Trade Organization was formed (1995) as a body that regulates trade relations between countries on a global level."

Nowadays, the most important goal of most countries is to be more successful in the field of exports compared to the competition. In order to realize a competitive advantage, it is necessary for countries to be efficient and productive in terms of using these opportunities to enter foreign markets. In order to create opportunities of this kind, it is necessary for economic diplomacy to contribute through the results of its actions. The link between economic diplomacy and trade is most pronounced in insufficiently large domicile markets that have limited potential, and to which international trade provides potential in all areas. International trade and economic diplomacy provide the national economy with numerous benefits, the most important of which are those related to the effects of increased competition, which directs domestic companies towards increasing productivity.

Also, there is specialization in certain areas and providing access to new knowledge and development potentials. There are few countries that have created an environment that is characterized by constantly stable business conditions for companies. Namely, frequent changes in the field of trade, changes in economic centers and trade flows, mean that it is not easy to provide stable business conditions, and countries that do not respond to these changes in a timely and appropriate manner are left without the profits they need for further economic growth and economic development. It is obvious that international trade brings numerous benefits to all actors, but there are also certain problems. Namely, insufficiently large economies find it difficult to access sectors based on high-tech knowledge. The barrier is also high production costs and more difficult access to geographically remote markets.

"Thanks to globalization and economic diplomacy, access to hitherto inaccessible markets is no longer an obstacle. Without economic diplomacy, it is unrealistic to expect trade to become an important factor in the stability of the national economy. "Economic diplomacy, that is, economic diplomats who win in the trade sphere of the economy, have real opportunities to further improve the level of economic development of their country."

V. FUNCTIONS AND GOALS OF ECONOMIC DIPLOMACY

According to some analytics, the main function of economic diplomacy is "protection of national interests in international economic relations". In order for a state to receive international recognition in terms of economic strength and developed international economic relations, it is necessary to provide appropriate bodies and services, to determine means and mechanisms and to engage appropriate professional staff who will be able to continuously implement previously established state policy. to represent the national economy at the international level, both bilaterally and multilaterally. The basic function of economic diplomacy presented in this way confirms the previous allegations that economic diplomacy is a very complex activity that cannot reach the maximum if all relevant elements of the system that make it up do not provide their own maximum and if they do not function as a whole.

"Despite the very detailed and complete division of functions of economic diplomacy, it cannot be said that this classification is complete. One of the reasons for that lies in the fact that new functions of economic diplomacy are constantly

appearing, as a result of globalization and increasingly complex economic relations. In modern economic relations, economic diplomacy should contribute to the following goals:

- increasing export capacity and reducing dependence on the country's imports,
- improving international competitiveness in the field of economy,
- providing financial and strategic support from the most important international organizations,
- preserving the security of the state within the national framework,
- active participation in projects of world importance, • positioning of domestic products on international markets,
- creating a world-renowned brand and brand and
- providing a better standard of living for its inhabitants.

One of the key tasks of economic diplomacy is to enable domestic companies to conquer new markets at the regional or global level within the defined trade policy of the state, with the support of the government. Through conquering new markets, preconditions are being created for profit growth, which has its implications for the overall economic growth and development of the country. In the realization of the stated goals, the role of economic diplomacy is related to providing a strategic advantage to export companies through the "elimination" of a foreign competitor from the international market.

The modern international market is characterized by constant economic struggle in which the economic development of one company often leads to business losses and slowing down the development of another company. The redirection of profits from foreign competitors to domestic companies affects the growth of the national income of one country, while reducing the national income of another country. The basic task of economic diplomacy is to protect and promote national economic interests, which can be successfully implemented only if the harmonization of the strategy for ensuring national economic security, the strategy of foreign trade relations and the trade policy of one country is ensured.

Due to these risks, economic diplomats, as a rule, adhere to the criteria prescribed by the competent institutions of the home country in order to ensure that the services they provide are aimed at the appropriate economic entities. In the context of conducting economic diplomacy activities and its planning, in most cases, special attention is paid to start-ups and companies operating in priority areas, in terms of importance for achieving the goals of economic growth of the home country. Numerous examples of economic diplomacy that does not charge for its commercial services are present, but such an approach is increasingly questionable. The prevailing view among economic diplomats is that the services provided by economic diplomacy should be charged, not in order to increase revenues but in order to ensure the quality of services provided and gain a reputation. There are also views that economic diplomacy should charge at least some of the services it provides and offer them to those economic entities that are able to pay for such services. If the company is confident in the quality of its product or service, and if it is

confident in its strategy of internationalization of business, then it will be ready to pay for the service of economic diplomacy.

Performance measurement is also important, although it is complex. There is a growing belief that economic diplomats should be judged for their work by company executives and government. Performance can be measured by industry feedback, number of customers, customer loyalty and revenue generated. Indices can also include earned service earnings, growth in exports by economic diplomat clients, a list of business transactions (or problems) concluded (or resolved) with the help of a commercial diplomat, a business view of economic diplomat relevance, compliments and user complaints analysis, government compliance. selection rules or criteria, the contribution of the economic diplomat to the fulfillment of government goals, etc. The quality management certificate can also be used to improve performance. " The best source of information used in the selection of entities to be provided with economic diplomacy services are recommendations. Anglo-Saxon economic diplomats use recommendations when it comes to buying new companies. Most systems of economic diplomacy in the world obtain the opinions of companies that have served the needs of impact assessment, recognition and implementation of the necessary corrective measures.

VI. CONCLUSION

Accelerated development of information technologies, in turn, has also contributed to significant changes in the field of diplomacy, with the development of the Internet being the factor that has had the greatest impact on changes in diplomatic practice. All these changes have created new challenges for modern diplomacy, which primarily relate to security issues in the world, promoting the need to respect human rights, democratization and sustainable development, as well as economic cooperation and joint struggle against international crime, terrorism and the like. The term economic diplomacy is considered to be all activities of official representatives of a certain country whose primary goal is to increase the volume of exports, increase the volume of investments from abroad and to ensure the active participation of the state in international economic forums. In this context, economic diplomacy is a form of managing and maintaining economic relations between different countries. Economic diplomacy has its most important role in improving the economic capabilities and performance of the state and the companies established in it. Economic diplomacy fulfills its role and has an impact on many other areas with which it has a certain relationship. This primarily refers to the field of politics, trade and security. Today, the economy is not only focused on maximizing profits, but also in the field of politics and security, while trade is one of the activities in which globalization is most visible. Modern economic diplomats are not narrowly specialized in a certain area, but it is necessary for them to know all the mentioned areas equally, ie politics and security and trade.

One of the key tasks of economic diplomacy today is to enable domestic companies to conquer new markets at the regional or global level within the defined trade policy of the state, with the help and support of the government. Through conquering new markets, preconditions are created for the growth of company profits, which has direct effects on the overall economic

development of the economy of a particular country. In the context of achieving these goals, the role of economic diplomacy is to provide a strategic advantage to export companies through the "elimination" of foreign competitors from the international market. The modern international market is in a state of constant economic struggle in which the economic development of one company often leads to business losses and slowing down the development of another company. The basic task of economic diplomacy is to protect and promote national economic interests, which can be successfully implemented only if the harmonization of the strategy for ensuring national economic security, the strategy of foreign trade relations and the trade policy of one country is ensured. Economic diplomacy in the context of improving the volume of trade is a significant factor in the current process of globalization. The basic area of economic diplomacy is the improvement and promotion of trade, which means creating opportunities to increase exports to existing markets, as well as identifying new potential markets for domestic companies.

REFERENCES

- [1] Barston R.P., "Modern Diplomacy" London, (1996).

- [2] Berridge G. R., "Diplomacy-theory and practice", London – New York - Munich, 1995. str. 1., a prema knjizi Miodraga Mitića "Diplomatija kao delatnost, organizacija, veština, profesija", Beograd (1999).
- [3] Berridge, G. J., "A Dictionary of Diplomacy", Basingstoke: Palgrave, (2001).
- [4] Freeman W. C., "The Diplomat's Dictionary", Unated States Institute for Peace Press, Washington, (1997).
- [5] Graham, E. S., „Emotion and Public Diplomacy Disposition in Internatioans Communications, Dialogue and Persuasion”, International studies review, Oxford Academic, (2014), pp. 522-539.
- [6] Hamilton K. and Langhorne R., "The practice of diplomacy" it's evolution, theory and administration", London - New York (1995).
- [7] Naray, O. "What a good Commercial Diplomat has to know and be capable of", Exchange: The Magazine for International Business and Diplomacy, 2 (2010).
- [8] Nick S., "Diplomatija - metode i tehnike" Barbat, Zagreb (1997).
- [9] Okano-Heijmans, M., and Ruel, H., "Commerciële diplomatie en internationaal ondernemen: Koopman versus dominee in de nieuwe economische wereldorde[permanent dead link]", International Spectator, 65(9), 463-467., (2011).
- [10] Veenstra, M. E. H. Van, Yakop, M., & Bergeijk, P. A. G. Van., "Economic Diplomacy, the Level of Development and Trade. Discussion papers in diplomacy", (2010).

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Comparison of surgical and conservative treatment of muscular invasive urothelial carcinoma in bladder: A study at Tishreen University hospital (2016-2022)

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Abstract: This research aims to study muscular invasive urothelial carcinoma patients in the bladder in terms of their disease progression, after studying the management methods used and the treatments used after surgical intervention, and the consequent change in survival rate and quality of life.

Patients with invasive urothelial carcinoma undergo multiple treatment procedures, and some of these procedures are large and carry a high risk to the patient's life and quality of life, and some patients are subject to major therapeutic interventions and they are not candidates for it, so it was necessary to study extensively for patients with this type of cancer

Index Terms- Radical cystectomy, curettage with radiotherapy, curettage with chemotherapy, urothelial carcinoma, Tishreen university hospital.

I. INTRODUCTION:

T Urothelial Carcinoma is considered an important medical problem in the clinical practice; it is divided into muscle-invasive and non muscle-invasive. The muscle-invasive type is considered as a systemic disease at 95% of patients, that has an effect on the quality of life and survival.

Aim and importance of the study:

The aim of this study is to understand the progression of muscle-invasive bladder carcinoma and to know the best method in management of it analysis different ways of management.

The patients of muscle-invasive bladder carcinoma undergo different ways of management methods, but these may have high risk on the quality of life and survival. So this study included a multi methods of treatment.

Patients and methods:

The study included muscle-invasive bladder carcinoma conditions that admit at urological department at Tishreen University Hospital, in the period between 2016-2022. The study was prospective and retrospective.

The management modalities was included:

1. Radical cystectomy.
2. Bladder preservation treatment, which includes:
 - TURBT+
 - a. Radiotherapy
 - b. Chemotherapy

C. TriModal therapy (TMT)

Results:

The study included 123 males and 13 females, the majority of patients were in the 7th decade of life. There were 116 smoker patients. Gross hematuria was the most common admission complain at the first visit, gross hematuria and LUTs were the most common complains through the study. The radiographic investigation showed that the 61.03% of patients have multi focal bladder tumor. The pathologic results showed that the most common histologic type was TCC with a percentage of 94.12%. Radical cystectomy was applied in 40 cases, while bladder preservation management was applied in 96 cases. In bladder preservation management: 33 patients undergo chemotherapy, 17 patients undergo radiotherapy, and 46 patients undergo TMT.

Discussion:

We can see from the table that the lowest mortality rate is for the group that is underwent to curettage with chemotherapy, and the highest survival rate is for the group that underwent radical cystectomy, while the lowest survival rate is for the group that received radiotherapy only, and that is for patients at PT2 cancer stage.

Whereas for patients at PT3 cancer stage, we can see that the lowest mortality rate is for group underwent radical cystectomy in addition to patients underwent to curettage with chemotherapy, and the highest survival rate is for the group that is underwent to the mutual triple therapy, while the lowest survival rate is for the group underwent to radiotherapy only.

Concerning patients with PT4 cancer stage, the highest survival rate is for group that underwent radical cystectomy, however the lowest survival rate is for group that is underwent to radiotherapy only, knowing that all patients in this group had died at the end of the study.

CONCLUSION

- 1- Muscle-invasive bladder carcinoma usually manifest after the 5th decade of age, with a peak at the 7th decade.
- 2- All types of smoking are important risk factor to develop a bladder carcinoma. Quitting smoking or never beginning it considered an important prevention factor.
- 3- Gross hematuria is the most common complain that the patient could consult for, so it should not be ignored.
- 4- The early diagnosis of bladder carcinoma is important to improve the prognosis and survival, and it plays a role to prevent progression to muscleinvasive carcinoma and spreading metastases.
- 5- The incidence of muscle-invasive carcinoma is more common among men than women.
- 6- Radical cystectomy is the best choice for patients with PT2 tumors who can undergo surgery.
- 7- TMT is the best choice for patients with PT3 tumors or patients who can't undergo surgery.
- 8- TMT is the best choice of bladder preservation treatment.
- 9- Chemotherapy isn't recommended alone. 10- Radiotherapy isn't recommended alone.
- 11- There is no relation between the site of bladder tumor and the progression or prognosis of the disease.

	<i>PT2</i>				
<i>Received therapy</i>	Number of patients	Patients percentage%	Mortality	Mortality percentage%	Survival rate (month)
Radical cystectomy	25	39.06%	20	80.00%	22.43
Curettage with radiotherapy	6	9.38%	6	100.00%	8.43
Curettage with chemotherapy	12	18.75%	8	66.67%	12.93
Mutual triple therapy	21	32.81%	18	85.71%	21.37
Total	64	100.00%	52	81.25%	18.98

	<i>PT3</i>				
Received therapy	Number of patients	Patients percentage%	<i>Mortality</i>	Mortality percentage%	Survival rate (month)
Radical cystectomy	10	16.67%	8	80.00%	17.24
Curettage with radiotherapy	10	16.67%	10	100.00%	9.51
Curettage with chemotherapy	15	25.00%	12	80.00%	10.83
Mutual triple therapy	25	41.67%	23	92.00%	18.51
Total	60	100.00%	53	88.33%	14.88

	PT4				
Received therapy	Number of patients	Patients percentage%	Mortality	Mortality percentage%	Survival rate (month)
Radical cystectomy	5	41.67%	5	%100.00	17.24
Curettage with radiotherapy	1	8.33%	1	100.00%	9.51
Curettage with chemotherapy	6	50.00%	6	100.00%	10.83
Total	12	100.00%	12	100.00%	14.88

	Age				
Age (years)	Number of patients	Patients percentage%	Mortality	Mortality percentage%	Survival rate (month)
[50-59]	32.00	23.53%	28.00	87.50%	14.85
[60-69]	58.00	42.65%	51.00	87.93%	15.43
[70-79]	28.00	20.59%	25.00	89.29%	16.33
<50	5.00	3.68%	3.00	60.00%	15.91
>80	13.00	9.56%	11.00	84.62%	11.87
Total	136	100.00%	117	86.03%	14.8

Analysis of the Use of the Scrum Method in ERP Information System development (Case Study PT XYZ)

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I. INTRODUCTION

Nowadays, the rapid development of technology cannot be denied and abandoned. This has an impact on everyone's behavior in responding to technological changes, including business people who must also implement digitalization of information systems in all aspects of the business, both in the supply chain function, distribution to the accounting record function.

Prior to the existence of the information system, some work was done manually which took a long time so it was very possible that there were many errors that arise due to manual processes and there was no automatic validation of each business process. With the rapid development of technology today, it can be said that information systems go hand in hand as quickly as the development of information technology

In this case the author will discuss the problems that occur during the process of implementing Information Systems at PT. XYZ thus the author puts it in the final project entitled "Analysis of the Use of the Scrum Method in ERP Information System Development at PT XYZ".

1.2 Formulation of the problem

Based on the above background, the problem discussed in this study is "Analysis of the Use of the Scrum Method in ERP Information System Development at PT XYZ".

1.3 Research Objectives

Knowing how the framework of using the SCRUM method in the development of an ERP information system at PT XYZ

1.4 Research Benefits

The results of this study are expected to provide benefits for those in need, including:

1. For researchers, it is hoped that this research can bring insight as well as a place to practice some of the knowledge that has been obtained during college.
2. For the community, this research is expected to help the community, especially business actors, to

understand the use of the scrum method in the development of information systems.

3. For the world of education, this research is expected to be used as a reference for future research and is expected to provide empirical evidence that can add to the taxation literature.

II. THEORETICAL BASIS

2.1 System Definition

According to Andrianof (2018), the system is an element that is incorporated and integrated with each other to form a single unit to achieve the expected goals and objectives.

2.2 Understanding Enterprise Resource Planning (ERP)

Monk and Wagner (2013:1) state that the ERP system is the core software used by organizations to integrate and coordinate information in each business area. ERP systems help organizations manage overall business processes by using the same database and reporting tools that can be used together. Indeed, ERP systems aim to help companies achieve good and smooth integration of company data and business processes.

Utami et al. (2016) suggested that ERP is a system designed to integrate all internal and external activities. Suryalena (2013) ERP is a corporate information system designed to coordinate all resources, information and activities needed for complete business processes. This system has a database and software to process the data. The software has a function to integrate all departments in managing company resources.

Islamiyah (2012) suggests ERP as follows: ERP (Enterprise Resource Planning) is a concept for planning and managing company resources including funds, people, machines, spare parts, time, materials and capacity that have a wide influence from top management to operations. in a company so that it can be used optimally to generate added value for all stakeholders (stakeholders) of the company. ERP is an integrated system that has the aim of summarizing the existing business processes so that it becomes an efficient and effective collaboration and the system is supported by information technology and can produce information that supports the company to be more competitive.

2.3 Agile Development

Agile development is a software development method that prioritizes team member interaction and collaboration with clients rather than the processes and types of tools required (Martin, 2003). Agile methods are very appropriate to be applied to software development that is required to be able to adapt to rapidly changing needs. An important priority in Agile deployments is meeting client needs by building value applications quickly and regularly. To support this, one of the principles of Agile is the process of presenting results which is carried out within a period of two to four weeks, with a preference for a faster time scale (Martin and Martin, 2006).

2.4 Scrum

Scrum was developed by Jeff Sutherland in 1993 with the aim of being a development and management method that follows Agile principles (Pham, 2011). Furthermore, the development of Scrum was carried out by Ken Schwaber and Beedle. Scrum is a complex process because there are many factors that influence the final result (Majeed, 2012). The Scrum framework consists of the Scrum Team and the required roles, events, artifacts, and associated rules (Ken Schwaber and Jeff Sutherland, 2017). Each component in this framework has a specific purpose and is critical to the successful use of Scrum. The Scrum Team aims to optimize flexibility, creativity and productivity. The facts prove that the form of a Scrum Team can make teams more effective in doing all kinds of work and all kinds of complex work (Ken Schwaber and Jeff Sutherland, 2017). Events are created to create routines and minimize other meetings that are not part of Scrum. Scrum artifacts represent work or business value to create transparency and opportunities for inspection and adaptation. The artifact described by Scrum aims to maximize the transparency of important information, so that everyone has the same understanding of the artifact (Ken Schwaber and Jeff Sutherland, 2017). Scrum artifacts represent work or business value to create transparency and opportunities for inspection and adaptation. The artifact described by Scrum aims to maximize the transparency of important information, so that everyone has the same understanding of the artifact (Ken Schwaber and Jeff Sutherland, 2017). Scrum artifacts represent work or business value to create transparency and opportunities for inspection and adaptation. The artifact described by Scrum aims to maximize the transparency of important information, so that everyone has the same understanding of the artifact (Ken Schwaber and Jeff Sutherland, 2017).

III. RESEARCH METHODOLOGY

3.1 Research Design

The research method is basically a scientific way to obtain data with a specific purpose and use. The research method is a scientific way to obtain data with a specific purpose of use (Darmadi, 2013:153). The scientific method means that research activities are based on scientific characteristics, namely rational, empirical and systematic. This study used descriptive qualitative method. (Moleong, 2008:6) explains that descriptive research is research that describes and describes the current state of the object of research as it is based on the facts. This research is an attempt to reveal problems or circumstances or events as they are so that

they are only revealing facts. The results of the study are emphasized to provide an objective picture of the actual state of the object under study. This study seeks to analyze and describe the conditions of using the Scrum method in the development of an ERP information system at PT XYZ

3.2 Place and time

The place of this research is PT XYZ. As for the reason for doing research in the place in question, namely because of the suitability of the problems at hand. The time of the study began in February 2022.

3.3 Materials and Methods

In SCRUM and like other development methods, the first information that must be obtained is information about the needs, features and purpose of the feature being created. This information is obtained from the results of interviews with users directly and analysis of current documents, hereinafter referred to as User Stories.

There are 3 things that need to be prepared in the development process using SCRUM, namely Roles, Artifacts (documents) and Events.

1. SCRUM Roles: Roles are team members that must be in development using SCRUM, namely:
 - a. Product Owner (PO) Is the person responsible for defining the features and usability to be developed. Tasked with bridging the needs of users with the development team. IT Manager or Project Manager can be used as Product Owner.
 - b. Scrum Master (SM)

Is a person who is very knowledgeable in putting the values, principles and practical values of Scrum into practice. In charge of supervising, leading the team and helping the development team stay within the Scrum rules. Anyone can be used as an SM, the most important thing is that SM must be someone who understands Scrum values.

Development Team Is the person who does the development of the application directly. System analysts, programmers, testers are referred to as the development team in SCRUM.

2. *Artifacts* :The supporting documents in the development of Scrum are:
 - a. *Product Backlog*This document is filled out by the Product Owner which contains the features desired by the user. In this document, they are sorted by priority which must be done first.

- b. *Sprint Backlog*This document contains a list of features, the name of the person who created the application, the time (in hours), the definition of completion.

3. *Events in SCRUM*: is a series of events that must always be carried out by all the teams involved, namely,

a. Sprint Planning

In this event, the Product Owner and the Development Team agree on the common goals of each task.

Determined completion time and which team will complete each task. This event is a very important event because from this event a work plan will be produced in one sprint in the future.

b. Daily Scrum

This event is held every day for a maximum of 15 minutes [5]. Done in the morning before the Development Team goes to work. The purpose of this event is to facilitate the obstacles faced by the Development Team during the development process. This event is only attended by the development team, and the essence of this meeting is to convey the work that has been done the previous day and what will be done the next day.

c. Sprint Review

Done at the end of each sprint. The goal is to see the status of the product being developed, especially the features that have been completed. The participants are potential users, Scrum team, Product Owner and Development Team.

d. Sprint Retrospective Done after Sprint Review. The goal is to find out the obstacles in the application development process. Attended by Product Owner, Scrum

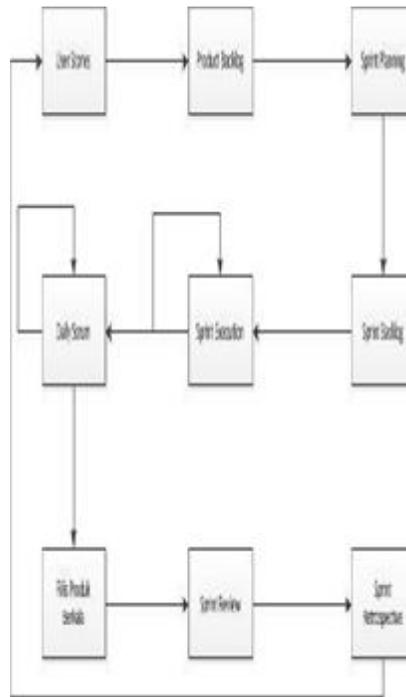
Master, and Development Team. The point of this event is to convey what has been done in the previous sprint, obstacles and solutions that will be carried out by the team to accelerate performance and plans to be carried out in the next sprint.

Scrum is a framework for project management that has Product Backlog and Sprint Backlog artifacts. Here, the author uses web-based Enterprise Resource Planning (ERP) software development project data. Based on the results of needs analysis and interviews with users, user needs are obtained in the form of Backlog Items (user stories). From the Backlog Item that has been created, it will then be transformed into the SCRUM framework. More detail, described in figure 2



Figure 2: Scrum Framework

Source: Rubin (2012)
 Figure 3: Scrum Cycle



IV. RESULTS AND DISCUSSION

The cycle of Scrum in the ERP development process can be seen in Figure 3 which consists of:

1. User Stories

This document contains information about the user name, the need for the feature and the purpose for which the feature was created. This information is generated from the interview process and ongoing document analysis with users. The person who has direct contact with this user is the Product Owner. The Product Owner records user requirements in the form of a Product Backlog.

2. Product Backlog (PB)

After a user story is created, the Product Owner records it in the Product Backlog. This document contains information on user requirements, the features to be created, the size of the work (in numbers), the priority of each feature. The list of features in this document is called Product Backlog Items (PBI). In the process of preparing the PBI, there is a process called Grooming. Grooming is an activity that refers to 3 things, namely the creation and detailing of work, PBI estimation, and PBI priorities. So, in the grooming process, the details of the developed features are determined, the estimated weight (in numbers) of each feature is determined, and the development team determines which features should be worked on first. Below is a template for the Product Backlog:

Table I Product Backlog

Kebutuhan	Fitur yang dibuat	Pi
User ingin menginput order dan surat jalan	Sales Order	High
User dapat membuat faktur dan pelunasan	Payment	Medium

Source: Analysis result

3. Sprint Planning

Before starting application development, the Product Owner, Scrum Master, and the Development Team meet at an event called Sprint Planning. The duration of the event for this project is 8 hours. In the Sprint Planning, it discusses the work to be done, the appointment of a team that will work on a job, the duration of time (in hours) and the final goal of each job. Below are the steps taken in sprint planning:

- a. The team determines their respective capacities. This initial process is carried out by the team by determining their own workload to complete one sprint. In this paper, the author makes units of days to determine the availability of time (in days) to

complete the sprint. Below is a table of workload capacities:

Table II Product Backlog

Nama	Kesediaan	Aktifitas selain Scrum	Jam kerja	Total waktu utk proyek
Andi	5	1	7	100
Soni	5	1	7	50
Feri	3	3	7	10
Total				170

Source: Analysis Results

- b. Determine the achievement of each job. In this case, it is the product owner who determines the achievement of each job in PB. An important milestone for the development team to build on to build features. If there is a job whose achievement has not been determined, it can be determined during the sprint planning event.
- c. Determine the PBI to be resolved. Choose a PBI that already has an achievement, but if a PBI doesn't have an achievement then choose a PBI starting from the top and then going down. If the PBI chosen is too complex, then the PBI can be broken down into a more detailed form of PBI. In this case, all PBIs already have achievements so that the development team can choose PBIs that will be completed according to their respective capacities and must be committed to achievements. Then the PB is transferred to a document called the sprint backlog, because in the sprint backlog (SB) each feature, the details of the feature, the estimate (in hours) and the name of the developer can be clearly seen. The SB document format will be discussed in the next point.

From the results of the sprint planning, it is determined that the length of the 1st sprint is 30 working days and is written in the form of a sprint backlog (SB) document. This development involves 4 people, namely 1 Product Owner, 1 Scrum Master as well as a developer and 2 development team members. In this case, the 2nd sprint has not been determined because there could be changes in needs or features in the 1st sprint development process.

4. Sprint Backlog(SB)

SB is one of the documents in Scrum that contains information about the features created, the details of each feature, the time (hours) of creation, the name of the developer and the achievements of each feature. SB is required by the Product Owner as a technical guide for application development projects.

SB is a development of PB which is detailed and produced after the sprint planning event.

Table III Sprint Backlog (1st Sprint)

PBI's	Estimasi	Durasi	PIC	Capaian
Membuat Database Relationship	1	1	Feri	Done
Membuat Mockup	1	1	Feri	Done
Membuat Flowchart sistem	1	1	Feri	Done
Sales Order	5	6	Andi	Done
Testing SO	1	1	Feri	Done
Shipment	5	2	Andi	Done
Testing Shipment	1	1	Feri	Done
Invoice	5	2	Soni	Done
Testing Invoice	1	1	Feri	Done
Payment	5	4	Soni	Done
Testing Payment	1	1	Feri	Done

Source: Research Results

The PB that has been created by the Product Owner is transferred to the form of a Sprint Backlog during the sprint planning event. Below is a document format from SB.

5. *Sprint Execution*

After the sprint backlog has been compiled that has been agreed upon in the sprint planning, then the next step is to run the development process in accordance with the sprint backlog which is called the sprint execution stage. Sprint execution is the work process of the Scrum team to towards the achievement of each work listed in the sprint backlog. Sprint execution is carried out after the sprint planning event and ends before the sprint review event begins. SB and its achievements are the basis as well as input for the development team in carrying out the sprint execution process, while the output is the product release. To make it easier to control during sprint execution, a work board is made as below:

Table IV Workboard (1st Sprint)

PBI's	To Do	In Progress	Completed
Membuat Database Relationship			<input checked="" type="checkbox"/>
Membuat Mockup			<input checked="" type="checkbox"/>
Membuat Flowchart sistem			<input checked="" type="checkbox"/>
Sales Order			<input checked="" type="checkbox"/>
Testing SO			<input checked="" type="checkbox"/>
Shipment		<input checked="" type="checkbox"/>	
Testing Shipment	<input checked="" type="checkbox"/>		
Invoice	<input checked="" type="checkbox"/>		
Testing Invoice	<input checked="" type="checkbox"/>		
Payment	<input checked="" type="checkbox"/>		
Testing Payment	<input checked="" type="checkbox"/>		

Source: Research Results

6. *Daily Scrum*

Is one of the events in Scrum that is carried out for a maximum of 15 minutes in 1 day. Technically, the event was held in the morning before the development team did the sprint execution and was only attended by the Scrum Master and the development team. The Daily Scrum is carried out every day and there are 3 core things that will be asked to the development team, namely what has been done before, what will be done next and what obstacles are hindering the development process.

7. *Periodic product release*

In the 1st sprint stage (30 working days) and 30 daily scrums, 11 features were obtained from a total of 35 features that have met the achievements and are ready to be released to the user. The development team has done 11 product releases and there are feature revisions from users to the development team which are then incorporated into the 2nd sprint. Features that have met the achievements are written as Done in their status in the sprint backlog document.

8. *Sprint Review*

After the 1st sprint is completed, the Product Owner, Scrum Master, Development Team and Users hold a meeting called a sprint review. Sprint review aims to discuss the work and releases that have been done during the previous sprint. The development team explained to the event participants, the work that had been done and had met the achievements. The development team demonstrates the completed features in front of the users. Users provide feedback and input to the development team on features that have been completed. If there is an addition from the

user, it is included in the work in the 2nd sprint along with features that have not been completed.

9. Sprint Retrospective

After the Sprint Review event is completed, the next event that must be carried out is the sprint retrospective. This event was attended by only the Scrum team, namely the Product Owner, Scrum Master and the Development Team for 3 hours for 1 sprint that has been passed. This event discusses 3 things, namely:

- a. What has been done in the previous sprint so that it can meet the achievements
- b. What are the obstacles in the 1st sprint so that it does not meet the achievements
- c. What will be done in the 2nd sprint in order to meet the achievements

In this event, the development team conveyed the problem to the Scrum Master and Product Owner, then the problem was discussed with the team and a joint solution was obtained. After the sprint retrospective was held, the team conducted a sprint planning event to plan the 2nd sprint.

V. CONCLUSION

From the Scrum stages that have been carried out, ERP development using Scrum was completed in 3 sprints with a simple design and easy for users to understand. Scrum does not require a long time for ERP development, this is because the Development Team makes applications that are simple and tailored to user needs. Scrum does not require a large team to develop ERP because all teams play a multi-skill role, both as systems analysts, programmers, testers and implementors. Scrum requires every team member to have multiple skills both in the analysis and development stages, because if this condition is not met, what will happen is a project time delay that has been determined during sprint planning.

REFERENCES

Chairan, Chusnul Fatiha. 2016. Pengaruh Implementasi Sistem Enterprise Resource Planning dan Ruang Lingkupnya Terhadap Risiko Perusahaan. Skripsi diterbitkan. Makassar: Program S-1 Departemen Akuntansi Fakultas Ekonomi dan Bisnis Universitas Hasanuddin Makassar.

Darmadi, Hamid. (2013). Metode Penelitian Pendidikan dan Sosial. Bandung: Alfabeta.

Dhewanto, Falahah dan Wawan. 2007. ERP: Menyelaraskan Teknologi Informasi Dengan Strategi Bisnis. Bandung: Informatika.

Dityawarman, Fridma. Kertahadi dan Riyadi. 2016. Pengaruh Task-ERP Fit Dan Pemanfaatan ERP Terhadap Kinerja Karyawan (Studi Pada Karyawan PT PLN (Persero) Distribusi Jawa Timur Area Malang). Jurnal Administrasi Bisnis (JAB)|Vol. 35. Fakultas Ilmu Administrasi Universitas Brawijaya, Malang.Education, Inc.

Ernizar, Shinta. 2011. Analisis Penerapan Teknologi Informasi dengan Menggunakan Metode Cobit (Control Objectives

For Information And Related Technology) di PLN (Persero). Skripsi diterbitkan. Medan: Program Sarjana Teknik Fakultas Teknik Industri Universitas Sumatera Utara.

Hikariati, Yoshiko. 2012. Identifikasi Risiko Terhadap Penerapan Sistem Enterprise Resource Planning (ERP) Pada Tahap Pasca implementasi di PT Indofarma Tbk. Tesis diterbitkan. Jakarta: Program Magister Manajemen Fakultas Ekonomi Universitas Indonesia.

Indriantoro, Nur., dan Supomo, Bambang. 2013. Metodologi Penelitian Bisnis Untuk Akuntansi & Manajemen. Yogyakarta: BPFE.

Islamiyah, Shofawaty Nur. 2012. Analisis dan Implementasi Modul Voucher Financial Management Pada OPENERP. Jurnal Teknologi Informasi

Ken Schwaber dan Jeff Sutherland. (2017). "Panduan Scrum" Scrum Guide Indonesia. Diakses 20 November 2020. Tersedia: <https://www.scrumguides.org/scrum-guide-2017.html>

Kurniawati, Melati. Gunarta, I Ketut dan Baihaqi, Imam. 2015. Dampak Implementasi Enterprise Resource Planning (ERP) pada Kinerja Keuangan: Pendekatan Resources Based View. Prosiding Seminar Nasional Manajemen Teknologi XXIII. Program Studi Pascasarjana Jurusan Teknik Industri Institut Teknologi Sepuluh Nopember, Surabaya.

Majeed, H. (2012). Issues and Challenges In Scrum Implementation. International Journal of Scientific and Engineering Research, 3, 8.

Martin, R.C. (2003). Agile Software Development: Principles, Patterns, and Practice, 2nd ed. Upper Saddle River: Pearson Education.

Martin, R.C. dan Martin, M. (2006). Agile Principles, Patterns, and Practice in C#. Upper Saddle River: Pearson Education.

Moleong Lexy J. 2004, Metodologi Penelitian Kualitatif. Bandung: Remaja Rosdakarya.

Monk, E.F, Bret J. Wagner. (2013). Concepts in Enterprise Resource Planning – Fourth Edition. Course Technology. Cengage Learning.

Pham, A. e. (2011). Scrum in Action Agile Software Project Management and Development. Boston: Course Technology PTR.

Rashid, M. A., Hossain, L., dan Patrick, J. D. 2002. The Evolution of ERP Systems: A Historical Perspective, (Online), (<https://faculty.biu.ac.il/~shnaidh/zooloo/nihul/evolution.pdf>, diakses 16 April 2017).

Rubin, K. S. (2013). Essential Scrum A Practical Guide To

Sugiyono. 2016. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Cetakan ke-24 Bandung: Alfabeta,

Suryalena. 2013. Enterprise Resource Planning (ERP) Sebagai Tulang Punggung Bisnis Masa Kini. Jurnal Aplikasi Bisnis. Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Bina Widya. Riau. The Most Popular Agile Process. Upper Sadle River: Pearson

Utami, Sri Setyowati. Susilo, Heru dan Riyadi. 2016. Analisis Penerapan Enterprise Resource Planning (ERP) (Studi pada PT Domusindo Perdana). Jurnal Administrasi Bisnis (JAB) Vol. 33 Fakultas Ilmu Administrasi Universitas Brawijaya, Malang

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Comparison of Injury Severity Score (ISS), New Injury Severity Score (NISS), Revised Trauma Score (RTS), and Trauma and Injury Severity Score (TRISS) In Predicting Mortality In Polytrauma Patients At Haji Adam Malik General Hospital

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ABSTRACT

Background: Polytrauma is a trauma that involves injury to 2 or more body regions, where at least one of them can cause death. Definitive follow-up of trauma patients can reduce mortality. Trauma scoring can make it easier for clinicians to assess the severity of a patient's trauma and assist in deciding what management to choose.

Methods: This study used an observational diagnostic test design by taking secondary data from medical records from January 2019-July 2021 as many as 150 people. This study aimed for differences in the sensitivity and specificity values of the ISS, NISS, RTS, and TRISS scoring systems in predicting mortality of polytrauma patients at RSUP HAM.

Results: The sensitivity, specificity, positive predictive value and negative predictive value of ISS with a cut-off point of 37.5 were 83.9%, 90.8%, 70.3%, 95.6%; NISS with 49 cut-off points are 67.7%, 96.6%, 84%, and 92%, respectively; RTS with a cut-point value of 6.952 are 9.7% and 22.7%, respectively, and TRISS with a cut-point value of 96.83, respectively, is 3.2% and 55.5%.

Discussion: ISS and NISS can be used as predictors of mortality in polytrauma patients, while RTS and TRISS cannot be predictors of mortality due to their low sensitivity and specificity because these scores relied on physiological factors and didn't exclude systemic comorbidities.

Keywords: *ISS, NISS, RTS, TRISS, predictor, mortality, polytrauma*

INTRODUCTION

Trauma is the leading cause of death and disability worldwide. More than 5 million people worldwide die each year from injuries caused by traffic accidents, falls from a height, drowning, fire, poisoning, suicide, violence, or war. These trauma deaths are responsible for 9% of global mortality, more than HIV/AIDS, malaria, and tuberculosis combined.¹ The incidence of trauma can continue to increase, especially in developed countries with industrialization, where motorized vehicles are increasingly used.²

Polytrauma is trauma that involves injury to 2 or more body regions, where at least one of them can cause death. Polytrauma injuries are severe, some require ICU care, and often require surgical intervention, with high mortality.³ Mortality of polytrauma

patients reached 18-23% worldwide in 2000-2005, with 4 deaths from 17 polytrauma patients at dr. Cipto Mangunkusumo from January 2011 to December 2014.⁴

Several studies have shown that many trauma patients die at the time of the incident or within the first 48 hours after being brought to the ED.⁵ The cause of death is the main thing studied in scientific research whose main goals are efforts to improve life safety and reduce the incidence of complications that can develop into patient death. The literature shows that the most common cause of early death (first 24 hours) in polytrauma patients is central nervous system (CNS) injury, followed by blood loss due to internal organ injury. The most common causes of advanced death are complications from CNS injury, infection, sepsis, and Multiple Organ Failure (MOF).⁶

Definitive follow-up of trauma patients can reduce mortality. Trauma scoring can make it easier for clinicians to assess the severity of a patient's trauma and assist in deciding what management to choose.⁷ Trauma scoring was introduced more than 30 years ago to numerically assess anatomic lesions and physiological changes after injury. Physiological scoring describes changes in vital signs and consciousness. Anatomical scoring describes all injuries recorded at the time of clinical examination, imaging, surgery, or autopsy. Both are used to stratify trauma patients and measure the severity of the injury.^{8,9} Several scoring systems are based on anatomies such as AIS (Abbreviated Injury Scale), ISS (Injury Severity Score), NISS (New Injury Severity Score), and others. While the scoring system based on physiology is like RTS (Revised Trauma Score), Glasgow Coma Score, and others.¹⁰

Based on the AIS, the ISS was introduced in 1974 as a tool for measuring injury severity. Since then, the ISS has been validated in many studies and has become one of the scoring tools to describe the severity of injury in trauma patients.¹¹ However, one of the drawbacks of the ISS was that the ISS could not describe multiple injuries in one body region. Of these limitations, Osler et al. (1997) modified the scoring to create NISS, using the 3 most severe injuries in any region, even within 1 body region.¹² Champion et al. (1989) introduced the RTS, a scoring widely used to assess prognosis in trauma patients. This physiological scoring consists of GCS, systolic blood pressure, and respiratory rate, which are included in certain equations.¹³ However, its use is not easy in the ED. The Trauma and Injury Severity Score (TRISS) was developed by Boyd et al. (1987) to predict posttraumatic survival. The TRISS consists of a combination of physiological (RTS) and anatomical (ISS) and age scoring, stratified by the mechanism of injury (blunt or penetrating). TRISS shows a stronger prediction of posttraumatic survival than RTS and has been validated in several studies.¹⁴ Although its use is too complex, TRISS is most commonly used worldwide to evaluate trauma patients, being a predictor and determining appropriate management and prevention of complications in trauma.¹⁵

In several previous studies, comparisons have been made between these scoring systems. Research by Yadollahi et al. (2020) showed that the TRISS, RTS, GCS, and ISS scoring systems all have an effective approach in evaluating the prognosis, mortality, and possible complications in patients with trauma cases. Thus, this scoring system can be recommended for use in trauma centers.¹⁶ In another study by Kuo et al. (2017), have not found any difference between ISS and NISS in their predictive properties. Several studies have found that TRISS has the highest effectiveness.¹⁷ Based on this background, it can be seen that polytrauma causes a fairly high mortality rate. In this study, the researchers wanted to compare the ISS, NISS, RTS, and TRISS scoring systems in predicting mortality in polytrauma patients at Haji Adam Malik Hospital Medan.

METHODS

This study uses an observational diagnostic test design by taking secondary data from the patient's medical record. In this study, researchers will analyze the differences in the sensitivity and specificity of the ISS, NISS, RTS, and TRISS scoring systems in predicting the mortality of polytrauma patients at Haji Adam Malik General Hospital. The implementation time is in October 2021 after obtaining approval from the Faculty of Medicine Universitas Sumatera Utara ethics committee.

The population in this study was the medical records of all patients in the Emergency Department of Haji Adam Malik General Hospital with polytrauma in the period January 2019 – July 2021. The sample of this study was part of the population that met the inclusion criteria. Samples were taken using non-probability sampling, namely consecutive sampling technique. The

inclusion criteria of this study were patients aged >18 years and the patient was still alive when he was brought and received treatment at the ER Haji Adam Malik General Hospital. Selected research subjects using the inclusion criteria that have been determined. Data were collected on research subjects including age, gender, and data from medical records. ISS, NISS, RTS, TRISS scoring were measured and the cut-off point, sensitivity, and specificity were measured in predicting mortality. To analyze the cut-off point, sensitivity, specificity, positive predictive value, and negative predictive value, the data will be tabulated in a 2x2 table for each score. Then it will be seen the accuracy value for the four scores is compared.

RESULTS

In this study, 150 research subjects were obtained which included the inclusion criteria who had polytrauma at Haji Adam Malik General Hospital from January 2019 to July 2021. The characteristics of the research subjects are presented in table 4.1. The majority of the subjects were 112 men (74.7%) and 38 women (25.3%). The average age of the research subjects was 39 years.

All subjects were polytrauma patients as many as 150 patients (100%), of which 31 patients died (20.7%) and 119 patients (79.3%) survived. The most common trauma mechanism was blunt trauma in 142 patients (94.7%) while penetrating trauma was 8 people (5.3%). The patient's average consciousness was GCS 12. The average hemodynamic state of the systolic blood pressure was 117 mmHg and the respiratory rate was 24x/minute.

Based on the use of a scoring system in patients with polytrauma, this study uses 4 types of scoring. The mean ISS score in the patients in this study was 30.84, in survived patients was 27.1 and in patients who died was 45.16. The average NISS score was 38.14, the average RTS score was 7.159, and the average TRISS score was 83.54, which is shown in Table 1.

Table 1. Characteristics of Research Subjects

Characteristics	n=150
Age, (years)	39,48 ± 15,22
Gender, n(%)	
Man	112 (74,7)
Woman	38 (25,3)
Mechanism of Trauma, n(%)	
Blunt	142 (94,7)
Penetrating	8 (5,3)
GCS scale	12,6 ± 3,37
Systolic blood pressure, (mmHg)	117 ± 23
Respiratory rate, (x/minute)	24,8 ± 5,68
Trauma scoring	
ISS Score	30,84 ± 10,14
Mortality	45,1613±9,05942
Survive	27,1092±6,94017
NISS Score	38,15 ± 14,46
Mortality	54,0968±16,88659
Survive	33,9916±10,35922
RTS Score	7,16 ± 1,09
Mortality	5,6134±1,27597
Survive	7,5588±0,5478
TRISS Score	83,54 ± 22,54

Mortality	49,0087±24,8176
Survive	92,5388±9,49671
Output, n(%)	
Die	31 (20,7)
Survive	119 (79,3)

The value of determining the ISS score in predicting mortality in polytrauma patients is presented on the ROC curve and the AUC (area under the curve) value, namely [AUC 0.943 (0.888 – 0.997); p-value <0.001], meaning that the ISS score has a strong ability to predict mortality in polytrauma patients. Next, the plotting is done to find out the optimal cut-off point along with the sensitivity, specificity, positive predictive value, and negative predictive value of the cut-off point. The graph shows that the optimal cut-off point is 37.50, meaning that polytrauma patients who have an ISS score of 37.50 have a mortality probability with a sensitivity of 83.9%, specificity of 90.8%, positive predictive value (PPV) 70.3%, and a negative predictive value (NPV) of 95.6% as shown in Figure 1.

The determination value of the NISS score in predicting mortality in polytrauma patients is presented on the ROC curve and the AUC (area under the curve) value, namely [AUC 0.857 (0.765 – 0.950); p-value <0.001], meaning that the NISS score has a strong ability to predict mortality in polytrauma patients.

Table 2. Mortality Based on Scoring Cut Point Value

Scoring	Mortality	Survive	Total
ISS ≥37,5	26 (70,3%)	11 (29,7%)	37 (100%)
ISS <37,5	5 (4,4%)	108 (95,6%)	113 (100%)
NISS ≥49	21 (84%)	4 (16%)	25 (100%)
NISS <49	10 (8%)	115 (92%)	125 (100%)
RTS <6,952	29 (51,8%)	27 (48,2%)	56 (100%)
RTS ≥6,952	2 (2,1%)	92 (97,9%)	94 (100%)
TRISS <96,83	31(31,3%)	68(68,6%)	99(100%)
TRISS ≥96,83	1(1,96%)	50 (98,03%)	51 (100%)

Next, the plotting is done to find out the optimal cut-off point along with the sensitivity, specificity, positive predictive value, and negative predictive value of the cut-off point. The graph shows that the optimal cut-off point is at a score of 49.0, meaning that polytrauma patients who have a NISS score of 49 have a mortality probability with a sensitivity of 67.7%, specificity of 96.6%, positive predictive value (PPV) 84%, and negative predictive value. (NPV) 92% as in Figure 2.

The value of determining the RTS score in predicting mortality in polytrauma patients is presented on the ROC curve and the AUC (area under the curve) value, namely [AUC 0.047 (0.014 – 0.080); p-value < 0.001], meaning that the RTS score cannot be a predictor of mortality in polytrauma patients as shown in Figure 3.

The value of determining the TRISS score in predicting mortality in polytrauma patients is presented on the ROC curve and the AUC (area under the curve) value, namely [AUC 0.045 (0.003 – 0.086); <0.001], meaning that the TRISS score cannot be a predictor of mortality in polytrauma patients as shown in Figure 4.

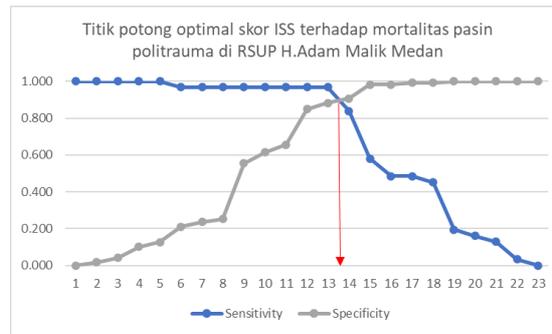
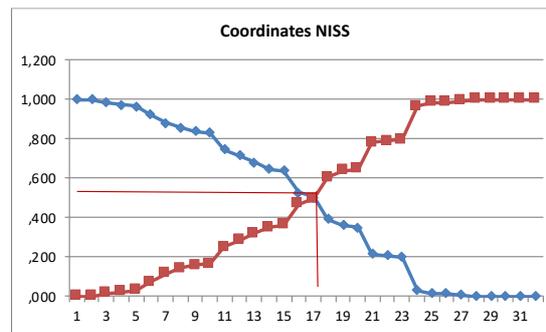
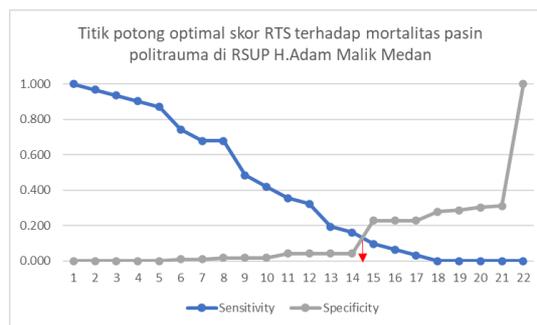


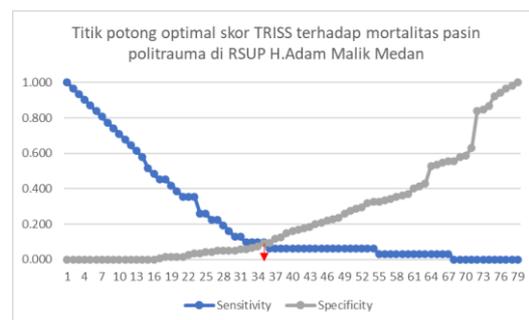
Figure 1. ISS Cut-off Score



Gambar 2. NISS Cut-off Score



Gambar 3. RTS Cut-off Score



Gambar 4. TRISS Cut-off Score

DISCUSSIONS

In this study, based on gender, polytrauma patients were dominated by men, namely 112 patients (74.4%) and 38 women (25.3%) with a mean age of 39 years. There is some consistent literature including the study by Patil et al. In India, which recorded 200 elderly polytrauma patients, 74% were male with a mean age of 66.35 years.¹⁸ The study by Wui et al. in 2014 in Singapore of

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48,317 trauma cases, male patients were 69.19% compared to 30.18% women, and more than half (59.43%) were under 60 years old, with the most vulnerable age group being between 20 -29 years (18.25%; 215 patients) followed by the age group of 60-69 years (15.37%; 181 patients) which may be due to men having more outdoor activities.¹⁹ Fifty patients were collected randomly. randomized to the ED in the study by Rizk et al. found an average age of 37.04 ± 13.42 years consisting of 42 men (84%) and 8 women (16%).²⁰

The most trauma mechanism found in this study were blunt trauma as many as 142 patients (94.7%) and penetrating trauma by 8 people (5.3%). This is in line with research by Wui et al. which stated that the mechanism of trauma was dominated by blunt trauma, approximately 98.13%.¹⁹ In this study the overall mortality rate of the sample was 31 people (20.7%). This prevalence value is close to the prevalence of mortality due to polytrauma in the study of Mohtasam-Amiri et al. ie 17%, the study of Yousefzadeh-Chabok et al. reported at 13.9%, and the study of Patil et al. reported a mortality of 17% with the mechanism of injury dominated by traffic accidents (94%).^{18,21} Mortality of polytrauma patients reached 18-23% worldwide in 2000-2005, with 4 deaths from 17 polytrauma patients at dr. Cipto Mangunkusumo from January 2011 to December 2014.⁴

This study obtained an average ISS score in the patients of this study, which was 30.84, with a cut-off point of 37.50, a sensitivity predicting mortality of 83.9%, and a specificity of 90.8%. The study by Patil et al that got the ISS cut-off point of 15 showed a sensitivity value of 91% and a specificity of 89%, in line with the results that the researchers found.¹⁸ Another study by Samin et al showed that the ISS score was used as the cut-off point 38 with a sensitivity value of 91% and a specificity of 90%.²²

This disparity in results can be explained by a study conducted by Honarpisheh in 2012 which stated that anatomical damage factors, physiological disorders, and patient conditions affected the ISS score assessment, where this could have an impact on the final score assessment results and its relationship with polytrauma.^{21,22}

This study found that the mean NISS score for the patients in this study was 38.14 with a cut-off point of 49.0. The sensitivity predicted mortality was 67.7% and specificity was 96.6%, with the mean NISS in patients who died being $54.09 \pm 16, 8$ when compared with the living 33.9 ± 10.3 . In contrast to Patil et al, the NISS cut-off value was <17 (91% sensitivity, 93% specificity) and the mean NISS value in patients who died was 27.65 ± 7.49 and 8.80 ± 6.19 for survivors.¹⁸ Orhon et al added the mean NISS for non-survivors $27.62 \pm 12,85$.²³

The discrepancy between this study and other studies may be due to the limited number of patients in the study and the greater proportion of patients with severe injuries. NISS has an advantage over ISS, which is that it can account for multiple injuries in the same location, for example in head trauma and penetrating abdominal trauma.¹⁸

The calculation of the mean RTS score in this study was 6.952 with a cut-off point of 6.952, sensitivity prediction of mortality 9.7%, specificity 22.7%, AUC 0.047. It can be concluded that in the study population, the RTS score cannot be used as a predictor of mortality. A systematic review by Manoochechry et al of 11 studies (total trauma patients = 20,631) that assessed RTS had a sensitivity of 82% and a specificity of 91%. The study was conducted in six different countries, including Colombia, India, Iran, Nigeria, Turkey, and Uganda where the majority of the sample consisted of men (76.68%).²⁴ The mean RTS in Patil's study was 7.108 (97% sensitivity, specificity). 80%).¹⁸

Meanwhile, in a cohort study in Egypt of 200 emergency room patients at Kasr Al Ainy Hospital, Egypt, it was found that 78.5% of male individuals with blunt abdominal trauma had a mean RTS score of 11.41. There was a statistically significant correlation between RTS and mortality with a cut-off value of <11 (RTS=10 or less), a sensitivity of 92.9%, and a specificity of 81.8%.²⁵

The study by Rizk et al found that RTS was better than ISS in predicting mortality among polytrauma patients. The prevalence of death was significantly high in patients with low RTS scores and high ISS scores. Several reasons why RTS is better than ISS include (1) in injured patients, the direct cause of death is physiological disorders of various body systems; (2) patients with the same ISS may have significantly different physiological disorders; (3) there is a significant correlation between RTS and

duration of hospitalization for trauma patients, and (4) ISS has a debilitating nature when more than one major injury occurs in the same body region.²⁰

RTS accuracy as a predictor of mortality can be influenced by various factors and RTS results can be found differently in each demographic group. Research by Manoochery in 2019 showed that the sensitivity value of the RTS was found to be higher in studies conducted on a sample of >1000, which indicates that better mortality predictor results will be obtained in studies with much larger samples.²⁴

This sensitivity value increases in studies with larger sample sizes, which is related to the heterogeneity of the samples studied in different populations. Moreover, related factors such as age and physiological factors can also influence the outcome of the RTS which contributes significantly in determining the sensitivity and specificity of the RTS.²⁴

The mean TRISS score in the patients in this study was 83.54 with a mean score of 92.5 ± 9.4 in living patients and 49 ± 24.8 in patients who died (the cut-off point was 96.83 with a mortality prediction sensitivity of 3.2%, specificity). 55.5%, AUC 0.045). It can be concluded that in the study population, the TRISS score cannot be used as a predictor of mortality. Patil et al obtained the cut-off point of 91.6 with a sensitivity of 97% and a specificity of 88%. In the group who died, the mean TRISS was 58.48 ± 25.58 and 95.49 ± 4.41 for those who recovered.¹⁸ In Orhon et al., the mean TRISS rate in the group who died was higher, namely 72.80 ± 19.35 and 98.34 ± 6.58 for cured.²³ Accordingly, of the 426 trauma cases involved in the Hoke et al study, the TRISS score was able to predict mortality with a sensitivity of 97.1% and a specificity of 76.7%.²⁵

In a study conducted by Mitchell et al in Canada in 2007, it was reported that the TRISS scoring system has a good ability to predict the prognosis of patients with trauma.²⁶ In a study conducted in India, Hariharan et al concluded that using the TRISS system to predict Morbidity and mortality after falls in the elderly can play an important role in treatment planning.²⁶

Studies by Milton et al in Africa reported the sensitivity and specificity of TRISS 87% and 68%, ISS 81% and 61%, and RTS 81% and 60%, respectively. Among these scores, TRISS has a sensitivity for predicting mortality in the polytrauma population.²⁷ The statistically significant difference between ISS, NISS, RTS, and TRISS was also examined by Patil et al with $p < 0.0001$, where the ISS and NISS scores for the recovered were significantly lower than those who died, while the RTS and TRISS scores of survivors were higher than those of those who died.¹⁸

The role of TRISS as a predictor of mortality could be influenced by various factors. Gunawan explained in 2017 that the score could not account for multiple injuries in the same body region. Second, the score didn't exclude systemic comorbidities, which also played a role in the patient's prognosis. Third, the score could not evaluate intubated patients, because the score depends on the patient's respiratory rate.⁴

Other special conditions such as trauma epidemiology, emergency care, referral systems, and medical care cannot be ignored. Ultimately, the outcome of the polytrauma patient depends on these factors, including the severity of the trauma, comorbidities, emergency personnel, and the trauma management system. Another study by Siritongtaworn in 2009 also stated that TRISS can predict survival after trauma. Prediction accuracy was improved by recalculation of the TRISS coefficients, but additional improvements were not seen with models that included information about comorbidities. Moreover, variation in trauma may be the result of several factors, including the severity of the patient's injury and comorbidities, the clinician's handling of each patient, and the treatment of the trauma center's specific system.²⁸ The limitation of this study is that the results could be influenced by many biased factors that can affect trauma scores. These relied on physiological factors and didn't exclude systemic comorbidities so we wished that further researches can exclude comorbid variables.

CONCLUSION

A total of 150 patients at the Haji Adam Malik General Hospital in the period January 2019 - July 2021 experienced polytrauma. The majority of trauma patients were 112 men (74.7%) and 38 women (25.3%) with the mean age of the study subjects 39 years. The mortality rate in this study was 31 patients (20.7%) and 119 patients (79.3%) were alive. The intercept value for the

ISS in this study was 37.5; the cut-off point for the NISS in this study was 49; the value of the RTS cut-off point in this study was 6.952; The TRISS cut-off point is 96.83 in this study.

Meanwhile, the sensitivity, specificity, positive predictive value, and negative predictive value of ISS with a cut-off point of 37.5 are 83.9%, 90.8%, 70.3%, 95.6%; the sensitivity, specificity, positive predictive value, and negative predictive value of NISS with a cutoff point of 49 were 67.7%, 96.6%, 84%, and 92%, respectively; the sensitivity and specificity values of RTS with a cut-off value of 6.952 were 9.7% and 22.7%, respectively. In this study, RTS could not be a predictor of mortality in polytrauma patients; and the sensitivity and specificity of TRISS with a cut-off value of 96.83 were 3.2% and 55.5%, respectively. In this study, TRISS could not be a predictor of mortality in polytrauma patients.

REFERENCES

1. Breugel J.M.M., Niemeyer M.J.S., Houwert R.M., Groenwold R.H.H., Leenen L.P.H. and Wessem K.J.P. 2020. Global Changes in Mortality Rates in Polytrauma Patients Admitted to the ICU-a systematic review. *World Journal of Emergency Surgery* 15:55.
2. Krug E.G., Sharma G.K. and Lozano R. 2004. The Global Burden of Injuries. *Am J Public Health*. 35:386-90.
3. Ciechanowicz D., Samojlo N., Kozłowski J., Pakulski C. and Zyluk A. 2020. Incidence and Etiology of Mortality in Polytrauma Patients: an Analysis of Material from Multitrauma Centre of the University Teaching Hospital no 1 in Szczecin, over a period of 3 years (2017-2019). *Pol Przegl Chir*. 92(4):1-6.
4. Gunawan B., Dumastoro R. dan Kamal A.F. 2017. Trauma and Injury Severity Score in Predicting Mortality of Polytrauma Patients [Research Article]. Jakarta: Department of Orthopaedic and Traumatology FM Universitas Indonesia, 5(3).
5. Evans J.A., van Wessem K.J., McDougall D. 2010. Epidemiology of Traumatic Deaths: Comprehensive Population-based Assessment. *World J Surg*. 34:158-63.
6. El Mestoui Z., Jalalzadeh H., Giannakopoulos G.F., Zuidema W.P. 2017. Incidence and Etiology of Mortality in Polytrauma Patients in a Dutch level I trauma center. *Eur J Emerg Med*. 24(1):49-54.
7. MacKenzie E.J., Rivara F.P., Jurkovich G.J., Nathens A.B., Frey K.P., Egleston B.L., et al. 2006. A National Evaluation of the Effect of Trauma-Center Care on Mortality. *N Engl J Med*. 354:366-78.
8. Beuran M. and Negoi I. 2012. Trauma Scores: a Review of the Literature. *Chirurgia (Bucur)* 107(3):291-7.
9. [ACS] American College of Surgeons. 2018. Shock. In: *Advanced Trauma Life Support Student Course Manual*, 10th ed. American College of Surgeons, Chicago, 3:46-7.
10. Carmichael S., Mowery N., Martin R. 2020. Management of Acute Trauma. In: *Sabiston Textbook of Surgery*, 21st ed. Elsevier, Philadelphia, pp. 386-428.
11. Baker S.P., O'Neill B., Haddon W. Jr., Long W.B. 1974. The Injury Severity Score: a Method for Describing Patients with Multiple Injuries and Evaluating Emergency Care. *J Trauma*. 14(3):187-96.
12. Osler T., Baker S.P., Long W. 1997. A Modification of the Injury Severity Score that both Improves Accuracy and Simplifies Scoring. *J Trauma*. 43(6):922-5.
13. Champion H.R., Sacco W.J., Copes W.S., Gann D.S., Gennarelli T.A., Flanagan M.E. 1989. A Revision of the Trauma Score. *J Trauma*. 29:623-9.
14. Yadollahi M., Kashkoe A., Rezaiee R. et al. 2020. A Comparative Study of Injury Severity Scales as Predictors of Mortality in Trauma Patients: Which Scale is the Best. *Bulletin of Emergency and Trauma* 8(1):27 – 33.
15. Kuo S., Kuo P., Chen Y. et al. 2017. Comparison of the new Exponential Injury Severity Score with the Injury Severity Score and the New Injury Severity Score in trauma patients: A cross-sectional study. *PLOS One*. 12(11): 1-12.

16. Javali R.H., Krishnamoorthy, Patil A., Srinivasarangan M., Suraj, Sriharsha. 2019. Comparison of Injury Severity Score, New Injury Severity Score, Revised Trauma Score, and Trauma and Injury Severity Score for Mortality Prediction in Elderly Trauma Patients. *Indian J Crit Care Med.* 23(2):73-77.
17. Wui, L. *et al.* 2014. 'Epidemiology of trauma in an acute care hospital in Singapore', *Journal of Emergencies, Trauma, and Shock*, 7(3), p. 174. doi: 10.4103/0974-2700.136860.
18. Rizk, Y. E. *et al.* 2020. 'Injury Severity Score (ISS) versus Revised Trauma Score (RTS) as a predictive value and outcome in polytrauma patients', *Benha Journal of Applied Sciences (BJAS)*, 5(6), pp. 191–197.
19. Mohtasham-amiri, Z. 2016. 'Comparison of Revised Trauma Score, Injury Severity Score and Trauma and Injury Severity Score for Mortality Prediction in Elderly Traumatic Patients', *Turkish Journal of Trauma and Emergency Surgery*. doi: 10.5505/tjtes.2016.93288.
20. Samin O.A. and Civil I.D. 1999. The New Injury Severity Score Versus The Injury Severity Score In Predicting Patient Outcome: A Comparative Evaluation On Trauma Service Patients Of The Auckland Hospital. In: *43rd Annual Proceedings Association For The Advancement Of Automotive Medicine*, pp. 1–15.
21. Orhon, R. *et al.* 2014 'Comparison Of Trauma Scores For Predicting Mortality And Morbidity On Trauma Patients', *Turkish Journal of Trauma and Emergency Surgery*, 20(4), pp. 258–264. doi: 10.5505/tjtes.2014.22725.
22. Manoochery, S. *et al.* 2019. 'A Comparison between the Ability of Revised Trauma Score and Kampala Trauma Score in Predicting Mortality; a Meta-Analysis.', *Archives of academic emergency medicine*, 7(1), p. e6. doi: 30847441.
23. Höke, M. H., Usul, E. and Özkan, S. 2021. Comparison of Trauma Severity Scores (ISS, NISS, RTS, BIG Score, and TRISS) in Multiple Trauma Patients, *Journal of Trauma Nursing*, 28(2), pp. 100–106. doi: 10.1097/JTN.0000000000000567.
24. Mansour, D. A., Eisha, H. A. A. and Asaad, A. E. 2019 'Validation of revised trauma score in the emergency department of Kasr Al Ainy', *The Egyptian Journal of Surgery*, 38, pp. 679–684. doi: 10.4103/ejs.ejs_82_19.
25. Hariharan, S. *et al.* 2009. Evaluation of Trauma Care Applying TRISS Methodology in a Caribbean Developing Country, *The Journal of Emergency Medicine*, 37(1), pp. 85–90. doi: 10.1016/j.jemermed.2007.09.051.
26. Mitchell, A. D., Tallon, J. M. and Sealy, B. 2007 'Air versus ground transport of major trauma patients to a tertiary trauma centre: a provincewide comparison using TRISS analysis', *Can J Surg*, 50(2).
27. Milton, M., Engelbrecht, A. and Geysler, M. 2021. 'Predicting mortality in trauma patients - A retrospective comparison of the performance of six scoring systems applied to polytrauma patients from the emergency centre of a South African central hospital', *African Journal of Emergency Medicine*, 11(4), pp. 453–458. doi: 10.1016/j.afjem.2021.09.001.
28. Siritongtaworn, P., Opananon, S., The Use of Trauma Score-Injury Severity Score (TRISS) at Siriraj Hospital: How Accurate Is It? *J Med Assoc Thai* 2009; 92 (8): 1016-21

Cystoscopy Findings in Females with Recurrent Lower Urinary Tract Infections who were referred to Tishreen University Hospital between 2021 - 2022

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Abstract- Background :

The importance of our study comes from that recurrent lower urinary tract infection in females is one of the most common cases that referred to the urology clinic, and it is considered a challenge to treatment in the case of reliance on clinical, radiological and laboratory diagnosis only, while cystoscopy may provide information that may be useful in managing the reviewed cases.

Objective :

Recurrent urinary tract infection is common in adult females. This study aimed at study of cystoscopic findings in females with recurrent lower urinary tract infections and their usefulness in the treatment and prevention of recurrence

Patients and Methods :

1. In this cross-sectional study, females (above 20 years) with recurrent lower urinary tract infection, who were referred to Tishreen University Hospital between 2021-2022, were evaluated. After collecting demographic information, urine culture and lower urinary tract ultrasonography were performed for all patients; those with Primary neurogenic bladder, Urogenital cancers, and congenital urinary tract anomalies were excluded. Eligible patients underwent urethra and bladder cystoscopy, and the findings were recorded. Associations between clinical risk factors and abnormal findings were analyzed.

Results :

- The sample size of female patients in our study was 53 patients, 21 patients (39.6%) had abnormalities of the lower urinary tract, 14 patients (66.7%) had significant abnormalities, 7 patients (33.3%) had changes in the bladder mucosal , Biopsies were taken for histological study.
- The significant lower urinary tract abnormalities were as follows: 9 patients had meatal urethral stenosis (64.3%), 3 patients had bladder diverticula (21.4%), 1 patient had a urethral polyp (7.1%), and one patient had a sessile bladder tumor (7.1%).
- The biopsies result was as follows: 4 patients had cystic cystitis (57.1%), 2 patients had chronic cystitis (28.6%), and one patient had squamous metaplasia (14.3%).
- Evaluation of the relationship between risk factors and cystoscopic findings showed that only the age of patients was related to the presence of bladder diverticulosis (P value = 0.032), where the mean age of bladder diverticulosis patients (63.6 years) was significantly higher than that of patients without bladder diverticulosis (49.7 years). The evaluation also showed that there was no correlation between cystoscopic findings and other various risk factors (P value > 0.05).

Conclusion:

- Although the majority of lower urinary tract abnormalities in females who have recurrent lower urinary tract infections can be detected by different imaging methods, cystoscopy has an effective role in diagnosing lower urinary tract abnormalities in some cases, especially in patients who do not show an improvement in the treatment plans followed.
- And although cystoscopy may be unpleasant and cause pain, bleeding and infection, with the patient exposed to the complications of anesthesia, it may be of great benefit in revealing some of the possible causes of infections that can be treated and thus improving the quality of life of patients and reducing significant costs on health care systems.

Keywords :Recurrent Lower Urinary Tract Infections – urethra and bladder Cystoscopy - Cystoscopy Findings

I. INTRODUCTION

Lower Urinary Tract Infections is one of the most common types of infections in women, especially bacterial infections, which pose a challenge to clinicians and impose significant costs on health care systems. (Miller JL, Krieger JN. Urol Clin North Am. 2002.)

□ Each year, about 10% of women have a one-time lower urinary infection, about 53% of women over 55 years of age and 36% of younger women have a recurrence of symptomatic lower urinary infection within one year.

(Aydin A, Ahmed K, Zaman I, Khan MS, Dasgupta P. Int Urogynecol J. 2015((Foxman B, Barlow R, D'Arcy H. Ann Epidemiol. 2000 (

□ Recurrent Lower Urinary Tract Infections are very common in women and have a significant impact on quality of life and reduced social function and can lead to sexual disorders. (Levin A. *An Intern Med.* 1998 (

□ Lower Urinary Tract Infections are divided into two groups. "reinfection" and "bacterial persistence." Reinfection occur at irregular intervals and are caused by organisms that vary from one infection to another, while bacterial persistence is the persistence of the infection with the same organism without healing, as it goes through stages of remission and virulence. (ACOG Practice Bulletin No. 91. *Obstet Gynecol.* 2008.) (Nicolle LE, Ronald AR. *Infect Dis Clin North Am.* 1987.(

□ It is believed that most recurrent urinary tract infections are reinfections, which are more common in women who do not have urinary tract abnormalities. Whereas, bacterial persistence occurs in women with anatomical abnormalities, or with the presence of a foreign body in the urinary tract, or in patients with severe chronic diseases.

□ Diagnostic evaluation for recurrent lower urinary tract infection usually includes clinical, laboratory and ultrasound examinations. Other investigations in patients with uncomplicated recurrent lower urinary tract infection are unnecessary, as other imaging modalities and cystoscopy have a non-routine diagnostic role.

(van Haarst EP, van Andel G, Heldeweg EA. *Urolog.* 2001((Nickel JC, Wilson J, Morales A, Heaton J. *Can J Surg.* 1991(

□ There is a percentage of women with Recurrent Lower Urinary Tract Infections who have urinary tract abnormalities, such as urethral strictures and bladder diverticulosis, detecting and correcting the cause of the recurrent infection is necessary for the possibility of treating such patients. (Nicolle LE, Ronald AR. *Infect Dis Clin North Am.* 1987.(

□ Other imaging modalities and cystoscopy can be useful in such cases.

(Lane DR, Takhar SS. *Emerg Med Clin North Am.* 2011)

(Kumar V, Patel HR, Nathan SM, Miller RA, Lawson AH. *Urol Int.* 2004(

II. OBJECTIVES:

Our main aim is the study of cystoscopic findings in females with recurrent lower urinary tract infections and their usefulness in the treatment and prevention of recurrence.

The minor aims include:

1. Evaluation of the role of cystoscopy in identifying different pathogens of clinical significance in females with recurrent lower urinary tract infections.
2. Determining the predictive value of the risk factors in the cystoscopy findings.

Patients and Methods:

- The research included females patients who attended Tishreen University Hospital in Lattakia (clinic and urology department) who met the inclusion criteria in the period between: (10.02.2021 - 28.02.2022).
- The sample of patients was 53 patients.
- Before starting the study, the objectives of the study and the method of performing cystoscopy were explained in detail to all patients, with assuring them about the confidentiality of the data. After obtaining the informed consent of the patients, a full medical history was taken with a clinical examination and ultrasound. The patients were asked about the risk factors and recorded with other personal data.
- Urine and sediment examination and urine culture were performed for all patients.
- Cystoscopy and urethroscopy were performed on the patients under local or general anesthesia in the female position. A 20 rigid cystoscope with a 30° lens was used.

Inclusion criteria:

1. All patients with recurrent lower urinary tract infection at least twice within six months or three times within a year of women over 20 years of age.
2. Desire to participate in the study.

Exclusion criteria:

2. Primary neurogenic bladder.
3. Urogenital cancers.
4. Congenital urinary tract anomalies.
5. Not wanting to continue studying for any reason.

Statistical Analysis

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Descriptive Statistics:

- Data were collected, organized, classified and quantitative variables displayed in a clear manner through arithmetic averages and standard deviations within tables.
- Qualitative variables are presented as percentages.

Inferential Statistics:

The following tests were applied:

- Chi-square test to test the relationship between two variables.
- Fisher's exact test to test the relationship between variables and risk factors.
- t-test to show the differences between the means.
- The results are considered statistically significant at P value < 0.05.
- The IBM® SPSS® (version 27) has been approved for data analysis and statistical results.

Results:

- Table 1 shows that the average age of females in our sample of patients was (50.5 years), and their ages ranged between (32-72 years), while the average age at first diagnosis of lower urinary infection was (32.5 years), and the age of onset of infection ranged between (20-45 years), The average number of recurrences of lower urinary infection annually was (4.5 times), and the number of recurrences in the study sample ranged between (3-6 times annually), our body mass index was (25.2), and the index in the sample of patients ranged between (20-30.5).
- Table 2 shows that the patients in the study sample were distributed according to their marital status, where the number of married patients was (45) patients, (84.9%) of the study sample, while the unmarried women were (8) patients, or a percentage of (15.1%).
- Table 3 shows that the patients were distributed according to their use of contraceptives. The number of patients who used contraceptives was (18), or (34%) of the study sample size and (40%) of married patients, while the number of patients who did not use contraceptives was (35) patients, or (66%) of the total sample size.
- Table 4 shows that the patients who use contraceptives were distributed according to the type of contraceptive used. Patients used the IUD primarily as a contraceptive (6) patients with a percentage of (33.3%), then the contraceptive pills (5) patients with a percentage of (27.8%), then condoms (4) patients with a rate of (22.2%), and finally natural contraception was (3) patients, or (16.7%) of the sample of patients who use contraceptives.
- Table 5 shows that the sample of patients was distributed according to the presence of prolapse in their pelvic organs, whether uterine prolapse or bladder prolapse, and their number was (14) patients, or (26.4%).
- In Table 6 shows that the Patients were distributed according to their pelvic surgery to correct uterine prolapse, bladder prolapse or hysterectomy. The number of women who underwent surgery was (16) patients, representing (30.2%) of the total sample size.
- Table 7 shows that the patients were distributed according to the presence of menopause, the number of patients with menopause was (32) and their percentage was (60.4%) of the total sample size.
- Table 8 shows that after performing an cystoscopy of the urethra and bladder with a rigid cystoscope measuring 17 for all the (53) patients, the results showed the presence of abnormalities in the lower urinary tract in (21) patients, or a rate of (39.6%), while the cystoscopic findings were normal in (32) patients (60.4%) of the total sample size.
- Table 9 shows that the cystoscopic findings of the sample patients were divided into two groups: a group that had significant cystoscopic findings (important abnormalities in the lower urinary tract) and their number was (14) patients, representing (66.7%) of the sample size of patients who had cystoscopic findings, and a group that had insignificant cystoscopic findings (changes in the lower urinary tract mucosa) and their number was (7) patients, representing (33.3%) of the sample of patients with cystoscopic findings.
- Table 10 shows that our significant cystoscopic findings were distributed as follows: (9) patients had urethral meatal stenosis (64.3%) of the significant cystoscopic findings, (3) patients had bladder diverticulosis (21.4%), and one patient

had a bladder tumor sessile (7.1%), and one patient had a urethral polyp (7.1%).

- Table 11 shows that as for the patients who had changes in the lower urinary tract mucosa with cystoscopic findings, who were (7) patients with a percentage of (13.2%), a biopsy was taken from the suspected cystoscopic areas using a 20 rigid cystoscope and biopsy forceps and the samples were sent to the histopathology laboratory .
- Table 12 shows that the results of biopsies for the patients were as follows: (4) patients had cystic cystitis (57.1%), two patients had chronic cystitis (28.6%), and one patient had squamous metaplasia (14.3%).
- Table 13 shows that by dropping the data, we found that the value of the statistical significance of all the studied risk factors for patients with urethral strictures was > 0.05 , meaning that they are not statistically significant (there are no significant differences for risk factors between the group of patients who have urethral stricture and the group of patients who do not have urethral stricture).
- Table 14 shows that by dropping the data, it was found that the statistical significance of age for bladder diverticulosis patients was < 0.05 , meaning that it is statistically significant, as the average age of bladder diverticulosis patients was (63.6) years higher than that of patients without bladder diverticulosis (average age of 49.7 years). The rest of the risk factors were not statistically significant for bladder diverticulosis patients (significant value > 0.05).
- Table 15 shows that by dropping the data on the SPSS program to show the relationship between all risk factors and cystoscopic findings as a whole, we found that the marital status of patients and their use of contraceptives has statistical significance (significance value < 0.05), as the highest percentage of patients with cystoscopic findings in our study were from Married women who use contraceptives, and this is due to the fact that the highest percentage of married patients in our study (45 patients out of 53 was married), (84.9%) of the total sample size. The predominant segment of married women in our study is due to our selection of the age segment greater than 20 years in this study, and the youngest patient in our study was 32 years old. The rest of the risk factors did not show any relationship between them and the cystoscopic findings (statistical significance value > 0.05).

Discussion:

- The sample size of patients in our study was 53 patients.
- After performing the lower urinary cystoscopy for the study sample, the cystoscopic findings were as follows: 21 patients (39.6%) had abnormalities of the lower urinary tract. 14 patients (66.7%) had significant abnormalities, while 7 patients (33.3%) had changes in the bladder mucosa, from which biopsies were taken for histological study.
- The significant lower urinary tract abnormalities were as follows: 9 patients had urethral strictures (64.3%), 3 patients had bladder diverticula (21.4%), one patient had a urethral polyp (7.1%), and one patient had a sessile bladder tumor (7.1%).
- The biopsies result was as follows: 4 patients had cystic cystitis (57.1%), 2 patients had chronic cystitis (28.6%), and one patient had squamous metaplasia (14.3%).
- Evaluation of the relationship between risk factors and cystoscopic findings showed that there is no statistical relationship between the presence of urethral stricture and age at first diagnosis of infection, number of recurrences of infection, marital status, age, use of contraceptives, presence of uterine or bladder prolapse, correction of prolapse or hysterectomy, menopause, and BMI (P-value > 0.05).
- The evaluation of the relationship between risk factors and cystoscopic findings showed that only the age of the patients was related to the presence of bladder diverticulosis (P-value = 0.032), as the mean age of the patients with diverticulosis (63.6 years) was significantly higher than that of the patients who did not have bladder diverticulosis (49.7 years) while there is no statistical relationship between the presence of bladder diverticulosis and other risk factors.
- By evaluating the relationship between the complete cystoscopic findings and risk factors, it was found that the highest percentage of patients with cystoscopic findings were married women who use contraceptives (the statistical significance value < 0.05) because the married women in our study are the dominant group because we chose the ages in our study to be greater than 20 years, and the youngest patient in our study was 32 years old.

Conclusions:



Although the majority of lower urinary tract abnormalities in women who have recurrent lower urinary tract infections can be detected by different imaging methods, cystoscopy has an effective role in diagnosing lower urinary tract abnormalities in some cases, especially in patients who do not show an improvement in the treatment plans followed.



Although cystoscopy may be unpleasant and cause pain, bleeding and infection, with the patient exposed to the complications of anesthesia, it may be of great benefit in revealing some of the possible causes of infections and thus improving the quality of life of patients and reducing significant costs on health care systems.

III. RECOMMENDATIONS AND SUGGESTIONS:

We recommend cystoscopy of the bladder and urethra to all females with recurrent lower urinary tract infections who do not respond to the used treatment protocols because of its usefulness in detecting some abnormalities in the lower urinary tract that are not detected by ultrasound, thus contributing to the treatment and prevention of recurrence.

REFERENCES

- [1] Miller JL, Krieger JN. Urinary tract infections cranberry juice, underwear, and probiotics in the 21st century. *Urol Clin North Am.* 2002.
- [2] Aydin A, Ahmed K, Zaman I, Khan MS, Dasgupta P. Recurrent urinary tract infections in women. *Int Urogynecol J.* 2015
- [3] Foxman B, Barlow R, D'Arcy H. Urinary tract infection: Self-reported incidence and associated costs. *Ann Epidemiol.* 2000
- [4] Hooton TM. Recurrent urinary tract infection in women. *Int J Antimicrob Agent.* 2001
- [5] Epp A, Larochelle A, Lavatis D. Recurrent urinary tract infection. *J Obstet Gynaecol Can.* 2010
- [6] Levin A. Recurrent urinary tract infection: new theories and an old remedy. *An Intern Med.* 1998
- [7] American College of O; Gynecologists. ACOG Practice Bulletin No. 91: Treatment of urinary tract infections in nonpregnant women. *Obstet Gynecol.* 2008.
- [8] Franco AV. Recurrent urinary tract infections. *Best Pract Res Clin Obstet Gynaecol.* 2005.
- [9] Nicolle LE, Ronald AR. Recurrent urinary tract infection in adult women: diagnosis and treatment. *Infect Dis Clin North Am.* 1987.
- [10] van Haarst EP, van Andel G, Heldeweg EA. Evaluation of diagnostic workup in young women referred for recurrent urinary tract infections. *Urolog.* 2001
- [11] Segal AJ, Amis EJ, Bigongiari LR, Bluth EI, Bush WJ, Choyke PL, et al. Recurrent lower urinary tract infections in women. American College of Radiology. ACR Appropriateness Criteria. *Radiology.* 2000
- [12] Engel G, Schaeffer AJ, Grayhack JT. The role of excretory urography and cystoscopy in the evaluation and management of women with recurrent urinary tract infection. *J Urol.* 1980
- [13] Nickel JC, Wilson J, Morales A, Heaton J. Value of urologic investigation in a targeted group of women with recurrent urinary tract infections. *Can J Surg.* 1991
- [14] Lane DR, Takhar SS. Diagnosis and management of urinary tract infection and pyelonephritis. *Emerg Med Clin North Am.* 2011
- [15] Kumar V, Patel HR, Nathan SM, Miller RA, Lawson AH. Do we need to perform cystoscopy on all adults attending urology centres as outpatients? *Urol Int.* 2004
- [16] Lawrentschuk N, Ooi J, Pang A, Naidu KS, Bolton DM. Cystoscopy in women with recurrent urinary tract infection. *Int J Urol.* 2006
- [17] Howles S, Tempest H, Doolub G, Bryant RJ, Hamdy FC, Noble JG, et al. Flexible cystoscopy findings in patients investigated for profound lower urinary tract symptoms, recurrent urinary tract infection, and pain. *J Endourol.* 2012
- [18] Pagano MJ, Barbalat Y, Theofanides MC, Edokpolo L, James MB, Cooper KL. Diagnostic yield of cystoscopy in the evaluation of recurrent urinary tract infection in women. *Neurourol Urodyn.* 2017
- [19] Daneshpajoo A, Mirzaei M. Cystoscopy Findings in Females with Recurrent Urinary Tract Infection, *Nephro-Urol Mon.* 2018 .

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Table 1: shows the mean, standard deviation and range for each of the following variables: age - age at first diagnosis of lower urinary infection - number of recurrences of lower urinary infection - body mass index

age		Age at first diagnosis of infection	Number of recurrences of infection	BMI
N	Valid	53	53	53
	Missing	0	0	0
Mean		50.5283	32.5094	4.5094
Std. Deviation		10.98531	7.50031	1.12014
Minimum		32.00	20.00	3.00
Maximum		72.00	45.00	6.00

Table 2: shows the distribution of patients by marital status

Marital status

Frequency		Percent	Valid Percent
Valid	married	45	84.9
	unmarried	8	15.1
	Total	53	100.0

Table 3: shows the percentage and size of the sample of patients who use contraceptives.

Use of contraceptives

Frequency			Percent	Valid Percent
Valid	Yes	18	34.0	34.0
	No	35	66.0	66.0
	Total	53	100.0	100.0

Table 4: Distribution of the types of contraceptives used and their percentage of the sample size of patients who use contraceptives

Type of contraceptives

Frequency		Percent	Valid Percent	
Valid	natural contraception	3	16.7%	16.7%
	contraceptive pills	5	27.8%	27.8%
	condoms	4	22.2%	22.2%
	IUD	6	33.3%	33.3%
	Total	18	100.0	100.0

Table 5: shows the number and percentage of patients who have pelvic organ prolapse (uterine prolapse or bladder prolapse) .

Presence of uterine or bladder prolapse

Frequency		Percent	Valid Percent	
Valid	Yes	14	26.4	26.4
	No	39	73.6	73.6
	Total	53	100.0	100.0

Table 6: Indicates patients who have had a hysterectomy or surgery to correct uterine prolapse or bladder prolapse.

Correction of prolapse or hysterectomy

Frequency		Percent	Valid Percent	
Valid	Yes	16	30.2	30.2
	No	37	69.8	69.8
	Total	53	100.0	100.0

Table 7: Shows patients who have menopause and their percentage.

Menopause

Frequency			Percent	Valid Percent
Valid	Yes	32	60.4	60.4
	No	21	39.6	39.6
	Total	53	100.0	100.0

Table 8: It shows the number and percentage of patients who have lower urinary tract abnormalities.

Abnormalities of the lower urinary tract

Frequency			Percent	Valid Percent
Valid	Yes	21	39.6	39.6
	No	32	60.4	60.4
	Total	53	100.0	100.0

Table 9: Shows the distribution of abnormalities in the lower urinary tract according to importance to significant and changes in bladder mucosa.

distribution of abnormalities

Responses			Percent	Percent of Cases
N				
valid	Significant abnormalities	14	66.7%	66.7%
	Changes in the bladder mucosa	7	33.3%	33.3%
Total		21	100.0%	100.0%

Table 10: Shows the distribution of cystoscopic findings and their percentage from a sample of patients who have significant cystoscopic findings

distribution of significant cystoscopic findings

Responses				
N			Percent	Percent of Cases
Significant abnormalities	urethral meatal stenosis	9	64.3%	64.3%
	bladder diverticulosis	3	21.4%	21.4%
	bladder tumor sessile	1	7.1%	7.1%
	urethral polyp	1	7.1%	7.1%
Total		14	100.0%	100.0%

Table 11: shows the number and percentage of patients who had a biopsy taken during cystoscopy

Biopsy

Frequency				
			Percent	Valid Percent
Valid	Yes	7	13.2%	13.2%
	No	46	86.8%	86.8%
	Total	53	100.0	100.0

Table 12: Shows the biopsy results obtained during cystoscopy and their percentage of patients with changes in the bladder mucosa.

Biopsy results

Responses		N	Percent	Percent of Cases
Changes in bladder mucosa	Cystic cystitis	4	57.1%	57.1%
	Chronic cystitis	2	28.6%	28.6%
	Squamous metaplasia	1	14.3%	14.3%
	Total	7	100.0%	100.0%

Table 13: shows the mean, standard deviation and the statistical significance value of the risk factors among patients who have urethral stricture and those who do not have urethral stricture.

Urethral stricture		Age at first diagnosis of infection	Number of recurrence of infection	Marital status	age	Use of contraceptive -ves	Presence of bladder prolapse	Correction of prolapse or hysterectomy	Menopausal use	BMI
Yes	Mean	30.8889	4.7778	1.3333	51.5556	1.8889	1.7778	1.7778	1.3333	24.6111
	N	9	9	9	9	9	9	9	9	9
	Std. Deviation	7.09656	1.09291	.50000	14.44049	.33333	.44096	.44096	.50000	3.83061
No	Mean	32.8409	4.4545	1.1136	50.3182	1.6136	1.7273	1.6818	1.4091	25.4205

N	44	44	44	44	44	44	44	44	44
Std. Deviation	7.61560	1.13002	.32104	10.33795	.49254	.45051	.47116	.49735	3.06128
Total Mean	32.5094	4.5094	1.1509	50.5283	1.6604	1.7358	1.6981	1.3962	25.2830
N	53	53	53	53	53	53	53	53	53
Std. Deviation	7.50031	1.12014	.36142	10.98531	.47811	.44510	.46347	.49379	3.17822
p-value	0.482	0.436	0.097	0.761	0.116	0.760	0.576	0.679	0.492

Table 14: shows the mean, standard deviation, and the statistical significance value of the risk factors between patients who have bladder diverticulosis and those who do not have bladder diverticulum.

		Age at first diagnosis of infection	Number of recurrence of infection	Marital status	age	Use of contraceptives	Presence of uterine or bladder prolapse	Correction of prolapse or hysterectomy	Menopausal use	BMI	
Bladder diverticulosis	Yes	Mean	34.3333	4.0000	1.0000	63.6667	1.6667	1.6667	1.6667	1.0000	25.500
		N	3	3	3	3	3	3	3	3	3
		Std. Deviation	3.51188	1.00000	.00000	11.93035	.57735	.57735	.57735	.00000	3.1225
No		Mean	32.4000	4.5400	1.1600	49.7400	1.6600	1.7400	1.7000	1.4200	25.270
		N	50	50	50	50	50	50	50	50	50
		Std. Deviation	7.67982	1.12866	.37033	10.53819	.47852	.44309	.46291	.49857	3.2122
Total		Mean	32.5094	4.5094	1.1509	50.5283	1.6604	1.7358	1.6981	1.3962	25.2830
		N	53	53	53	53	53	53	53	53	53
		Std. Deviation	7.50031	1.12014	.36142	10.98531	.47811	.44510	.46347	.49379	3.1782
p-value			0.669	0.423	0.462	0.032	0.982	0.785	0.905	0.154	0.904

Table 15: shows the mean, standard deviation, and the statistical significance value of the risk factors among patients who had cystoscopic findings as a whole and those who did not have cystoscopic findings.

		Age at first diagnosis of infection	Number of recurrence of infection	Marital status	age	Use of contraceptives	Presence of uterine or bladder prolapse	Correction of prolapse or hysterectomy	Menopausal use	BMI	
Cystoscopic findings	Yes	Mean	34.3333	4.0000	1.0000	63.6667	1.6667	1.6667	1.6667	1.0000	25.500
		N	3	3	3	3	3	3	3	3	3
		Std. Deviation	3.51188	1.00000	.00000	11.93035	.57735	.57735	.57735	.00000	3.1225
No		Mean	32.4000	4.5400	1.1600	49.7400	1.6600	1.7400	1.7000	1.4200	25.270
		N	50	50	50	50	50	50	50	50	50
		Std. Deviation	7.67982	1.12866	.37033	10.53819	.47852	.44309	.46291	.49857	3.2122
Total		Mean	32.5094	4.5094	1.1509	50.5283	1.6604	1.7358	1.6981	1.3962	25.2830
		N	53	53	53	53	53	53	53	53	53
		Std. Deviation	7.50031	1.12014	.36142	10.98531	.47811	.44510	.46347	.49379	3.1782
p-value			0.669	0.423	0.462	0.032	0.982	0.785	0.905	0.154	0.904

Cystoscopic findings			Number of recurrence of infection	Marital status	age	Use of prolapse contracepti- -ves			Menopa- use	BMI
Yes	Mean	31.3333	4.5238	1.3333	52.0000	1.9048	1.8095	1.7143	1.3333	24.2381
	N	21	21	21	21	21	21	21	21	21
	Std. Deviation	7.40495	1.12335	.48305	14.37011	.30079	.40237	.46291	.48305	3.66271
No	Mean	33.2812	4.5000	1.0313	49.5625	1.5000	1.6875	1.6875	1.4375	25.9375
	N	32	32	32	32	32	32	32	32	32
	Std. Deviation	7.57855	1.13592	.17678	8.17130	.50800	.47093	.47093	.50402	2.71718
Total	Mean	32.5094	4.5094	1.1509	50.5283	1.6604	1.7358	1.6981	1.3962	25.2642
	N	53	53	53	53	53	53	53	53	53
	Std. Deviation	7.50031	1.12014	.36142	10.98531	.47811	.44510	.46347	.49379	3.20397
p-value		0.3533	0.9406	0.0021	0.4348	0.0018	0.3339	0.8392	0.4578	0.0582

Surface And Subsurface Expressions Of Jacobabad Khairpur Highs, Southern Indus Basin Using Well Data: An Approach For Well Prognosis

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Abstract- The study area lies in Rohri near Sukkur part of the Jacobabad Khairpur High, which is the part of Sukkur rift zone. The High trends NNW-SSE that separates the Southern Indus Basin from the Middle Indus Basin. The Southern Indus Basin is an extensional regime basin formed due to the Separation and rifting of Indian Plate from African Plate, during this rifting normal faulting occurred as a result several fractures developed because of magma upwelling, which results in the development of detached blocks that moved relative to one another, these blocks are named as Mari-Kandhkot Highs and Jacobabad Khairpur Highs which probably represents the Horsts structure on the regional scale, coupled with Pano-Aqal Graben, these structures are collectively known as Sukkur Rift Zone. The research work is based on constructing the structural and stratigraphic correlations of the wells that are drilled along and across the Highs, to understand the trends and variations in the subsurface geologic formations, developing the depth contours to visualize and examine the shapes of the Paleo-High during the different geologic time periods and Isopach maps to determine the subsurface thickness of several formations that were encountered during drilling in the wells, based on these correlations, depth contours and Isopach maps; constructing the Pseudo-well at the outcrop of Habib Rahi Formation, based on geographic co-ordinates to examine the shape of Jacobabad Khairpur Highs across this well and to suggest the location for hydrocarbon prospectives, that was uplifted during Himalayan Orogeny. Depositional history of Indus-01B and (Pseudo well) to determine and examine the past geological depositional model of formations found in the wells. Reservoir characteristics of Kandra-01 are determined at Sui Main Limestone level to know the hydrocarbons values and suggestions for (Pseudo-well) with comparing results of Indus-01B.

On the Northwestern part of the Jacobabad Khairpur High the entire Cretaceous rock sequence is absent and Paleocene Dunghan Formation overlies the Middle Jurassic Chiltan Formation (Jhatpat-01), and the (Jacobabad-02) wells, which indicates that the Jacobabad High were formed after the deposition of Mid-Jurassic Chiltan Formation and remained uplifted. Due to the absence of main source rock Sembar Formation (Cretaceous) and main reservoir rocks Lower Goru Formation and Seal rock Upper Goru Formation (Mid-Cretaceous) indicating sub-aerial conditions that resulted in the dry wells like Jhatpat-01, Khairpur-01, Khaipur-02 and Kandra-02. On the Eastern part of the High at Rohri (Pseudo-Well), based on the observations from correlations and maps, there is an evidence of complete petroleum system due to the presence of source rock Sembar Formation (Cretaceous) about 20m which is the assumed thickness, reservoir rock Lower Goru Formation 700m and seal rock Upper Goru Formation about 250m and Sui Main Limestone 70m as a main reservoir target with source Ranikot Formation of (Paleocene) and Sui Shale and Ghazij Formation as seal rocks. While in the Southern portion the Cretaceous sequence is present over the Mid-Jurassic rocks, that depicts an interpretation of the submerge of High allowing the deposition of the Mid-Cretaceous rocks. Petrophysical interpretations of Kandra-01 shows good reservoir characteristics for Sui Main Limestone. The reservoir parameters for Sui Main Limestone in Kandra-01 shows average porosity of 14.5% with water saturation 54.12% and hydrocarbons saturation of 45.88%. It is concluded that the reservoir values for (Pseudo-Well) will be in between Kandra-01 and Indus-01B. The Depositional model represents two major tectonic events, the Indian Plate rifting during the time of Middle Jurassic, it was the time when Khairpur-Jacobabad High begins to develop and the Eocene time period indicated by sharp uplift feature in model which is Himalayan Orogeny, and it was the time when the Jacobabad Khairpur High completely developed. Depth contour maps also shows bulge like feature indicating the uplift feature. The Himalayan Orogeny results in the uplift of Rohri (Pseudo-well). This significant feature marks the Paleo High.

Index Terms- Jacobabad Khairpur Highs, Rohri, Southern Indus Basin, Depth Contour Maps, Isopach Maps, Structural Correlations, Stratigraphic Correlations, Depositional Modelling, Petrophysical Interpretations, Well Prognosis

I. INTRODUCTION

The study area Rohri with the exact co-ordinates 27° 67' 76''N 68° 91' 24''E; is on the eastern flank of Jacobabad Khairpur High, which is the part of Sukkur Rift Zone, Southern Indus basin. Sukkur Rift Zone comprises of normal faults associated Horsts and Graben Structures, which include Mari Kandhkot High, Panu Aqal Graben and Jacobabad Khairpur High (Farah et al, 1984). The study area is situated on the separating boundary between Central and Southern Indus Basin. The Central and Southern Indus Basin are separated by Jacobabad and Mari Kandhkot Highs (Figure 1), together termed as Sukkur Rift (Raza et al, 1989). The study area has a prominent position in hydrocarbon prospecting with Sargodha high, Indian Shield and marginal zone of Indian Plate in north, east and west respectively (Kazmi, A and Rana, 1982). Different structural styles of Southern Indus Basin are the result of different tectonic events throughout its geological history (Ahmed and Ali 1991). There are three significant post-rifting tectonic events that can be distinguished in Southern Indus Basin, a Late Cretaceous uplift and inversion, a late Paleocene right-lateral wrenching, and a late Tertiary Holocene uplift of the Khairpur High (Kazmi and Jan 1997; Hedley et al. 2005). Rocks of Eocene are well exposed on the surface across and along the Jacobabad High which is due to collision of Indian and Eurasian Plate. This piece of work is based on studying the subsurface and surface structural styles of Jacobabad Khairpur High at Rohri area and assigning new location for well prognosis. For new prospects in any area, seismic data interpretation for hydrocarbon traps is not sufficient, further detail study like Petro physical analysis, reservoir characterization, rock physics analysis and seismic modeling is required (Coffen, 1984). The work is done by using 12 wells data to construct structural well correlations and stratigraphic correlation to visualize the trends and variations in geological formations found in these wells, depth contour maps to determine the shape of the High at different formation levels, Isopach maps to examine the subsurface thickness of the formations, depositional or back-stripping model to understand the past geological depositional styles in different geological time periods, based on these structural and stratigraphic correlations, depth contours and Isopach maps, suggesting the new well at Rohri (Pseudo-Well) where the Eocene Habib Rahi Formation is exposed; name given on the basis of well correlations, to examine and determine the shape of the Jacobabad High at this location which is based on the actual and assumed thickness of formations found in the wells that are used in this research for future hydrocarbon explorations. Petrophysical interpretations and reservoir characteristics of Sui Main Limestone of Kandra-01 to suggest an idea of hydrocarbons prospects for Pseudo-Well by comparing values of Indus-01B previously done by (U. Shakir., et al, 2017).

1. Geology and Tectonic Settings

Pakistan lies on one of the most ubiquitous and active regions of the world. Its geographical position makes it most complex and active in terms of geology and tectonics, as it is almost wedged between Indian and Eurasian Plate coupled with Afghan Micro block. The zone of collision between Eurasian and Indian Plate is continuously in convergence that gives rise to mighty Himalayas, and adjacent mountain ranges with a rate of 3-5 cm/year. This collision is the main cause of the development of the sedimentary basins of Pakistan because the rate of uplift is balanced by the rate of erosion which causes sedimentary basins to develop. Based on the sedimentation history and structural style, the Indus Basin is divided into three segments namely Upper, Central and Southern Indus basins. (Ahmad, et al, 2012; Berger A., et al, 2009) Relatively high areas from shoreline of Jacobabad-Khairpur and Mari Kandhkot highs distributed the lower portion of Indus basin in central and southern basins mutually known as Sukkur Rift. From geological point of view the study area lies in eastern part of Jacobabad Khairpur High which is the NNW-SSE trending High (Siddique, N.K 2004). The Southern Indus Basin is bounded by Indian Shield to the east, marginal zone of Indian Plate to the West. Its Southward extension is confined by Offshore Murray Ridge-Oven Fracture Plate boundary. On the northern side the Jacobabad High delimits the Southern Indus Basin from the Middle Indus Basin. In the southeastern corner, Precambrian basement rocks are exposed at Nagar Parkar (Quadri and Shoib 1986) (Figure 1). The Jacobabad, Mari-Kandh Kot and Lakhra highs all have the appearance of horst blocks and probably formed in response to the extensional tectonic style of Lower Indus Basin (Quadri and Quadri, 1996) which formed in response to the spreading axis between Madagascar and the Indo-Pakistan continental mass in the mid Cretaceous. Later transpression between the convergent Indo-Pakistan and Eurasian plates caused inversion and the superimposition of a transform style. The Sibi lineament separates the Jacobabad high from its magnetic "paired" highs. This magnetic high was probably shifted because of inadequate identification of objects on maps (Kadri 1995).

In the Rohri Sukkur area mostly Eocene rocks are exposed on the surface, but the oldest rocks found in the Southern Indus Basin is Wulgai Formation of (Triassic) Age (Jhatpat-01). On the northwestern part of Jacobabad Khairpur High there is absence of entire Cretaceous succession, based on subsurface well data from (Jhatpat-1) of (AMOCO) and (Jacobabad-2) of (PPL), and the Paleocene Dunghan Limestone directly overlying the Middle Jurassic Chiltan Formation, marking the well renowned unconformity K-T boundary (Siddiqui, N.K 2004). The Dunghan Formation was deposited when the Indian Plate passes over the Kerguelen Hotspot, becoming the part of continental shelf and depositing Dunghan Limestone (Naveed Ahsan et al, 2018). While on southern side of this High significant succession of Upper Cretaceous is present indicating submerging of Jacobabad High allowing deposition of Cretaceous succession based on data from Kandra-04D and Kandra-01 (Figure 2). Whereas in the Panu Aqal Graben nearer to the Northeastern part of the High, an example from Sundrani-01 (Figure 2), and the oldest rock encountered during drilling is Chiltan Formation of (Middle-Jurassic), but the point to be noticed is that the Sembar Formation of (Early-Cretaceous) is present in a sufficient thickness, well enough to produce hydrocarbons. This is the only well nearer to the eastern side of Jacobabad Khairpur High, where the entire Cretaceous sequence is present over the Jurassic rocks, over the Cretaceous the Paleocene Ranikot Formation is present, above which the Dunghan Limestone

was deposited and the sequence extends upto recent alluvium. The Indus-01B was drilled upto Cretaceous Pab sandstone. It means there should be existence of older Cretaceous and Middle Jurassic Chiltan Formation that we have shown in our correlations using assumed thickness (Figure 5.1). The Eocene strata is present within and on the surface with minor truncations and pinch outs in the subsurface. In the study area the Eocene Habib Rahi Formation Member of Kirthar Formation is exposed which was then uplifted by Himalayan Orogeny. In short, the geology of Southern Indus Basin ranges from Triassic to recent alluvium (Figure 3).

2. Petroleum Activities of the Study Area

The first wells drilled in the vicinity of Jacobabad Khairpur High was Jacobabad-01 and Jhatpat-01 1958 and 1960. In 1989, LASMO (of U.K.) made a gas discovery in Lower Goru Sandstone (Cretaceous) at Kadanwari, south of Khairpur Jacobabad High (Young, H., 1992). Three gas discoveries have been made so far including (Khairpur, Jacobabad and Kadanwari). The Khairpur and Jacobabad discoveries are from Early Eocene carbonate (Sui Main Limestone) with a porosity about 12%. The Kadanwari discovery is from Goru Sandstone (Cretaceous), which is a continuation of Badin's Goru reservoir and is sourced by Sembar Formation of (Early Cretaceous) (Riaz Ahmed and Jalil Ahmed 1991). The Jhatpat-01 of AMOCO was drilled upto the maximum level of (Triassic) Wulgai Formation. Kandra-04D is drilled upto Chiltan (Jurassic) level with missing of source rock Sembar Formation for most prolific Goru Formation, whereas in Kandra-01 Upper Cretaceous Goru Formation is encountered during drilling with no source Sembar Formation (Cretaceous). According to (Riaz Ahmed and Jalil Ahmed 1991), it is possible and expected that a commercial gas discovery can be made by drilling southern culmination, where Habib Rahi and Pirkoh Limestone are present with effective seal provided by the increased shale content towards South.

Previously the similar work was done by (U. Shakir et al. 2017), that work was to some extent is based on seismic interpretations, attribute analysis and petrophysical interpretations of Badar South-01 and Indus-01b of Panu Aqal Graben. They have had suggested location for new well at seismic line GHA94-16 shot point 75. The work is based only on Pano Aqal Graben, but our research is more than this because in a sense we used 12 wells data and we have adopted new technique; like, structural and stratigraphic correlations using well tops, depth contours with Isopach maps, with detailed subsurface depositional modelling of Pseudo-Well with an ideal conditions for the presence of hydrocarbons. They have concluded that the new well total depth should be up to Cretaceous Pab Sandstone with Sui Upper and Sui Main Limestone as a potential target. Our work shows that there is possibility for the presence of Cretaceous Sembar Formation which is the potential source rock based on assumed thickness and correlations starting in the North from Sundrani-01 to Indus-01b upto Sagyun-01 in the South.

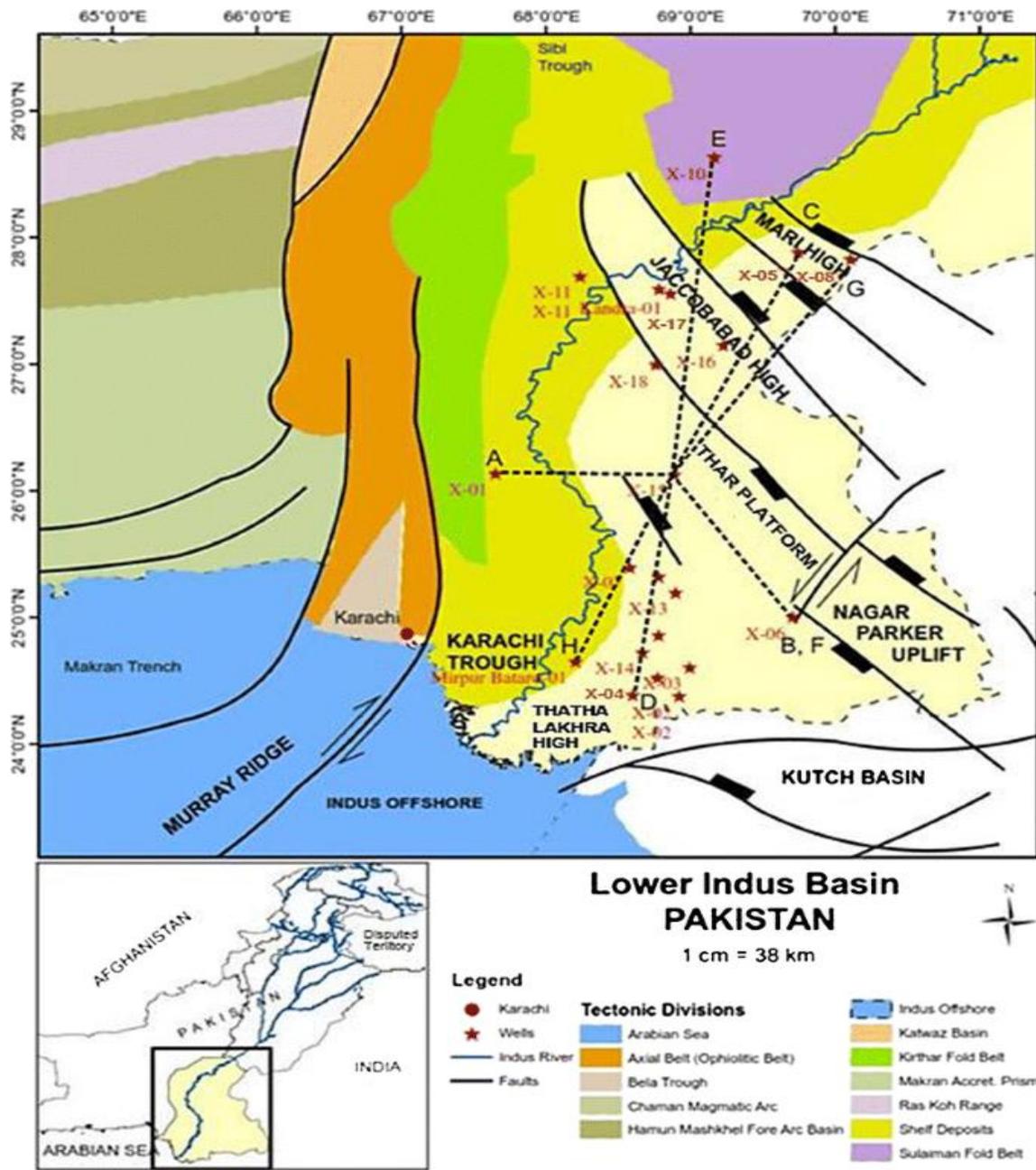


Figure 1. Map showing the study area (i.e., Southern Indus Basin) (modified after Kazmi and Rana 1982; Quadri and Quadri 1996; Raza et al, 1990)

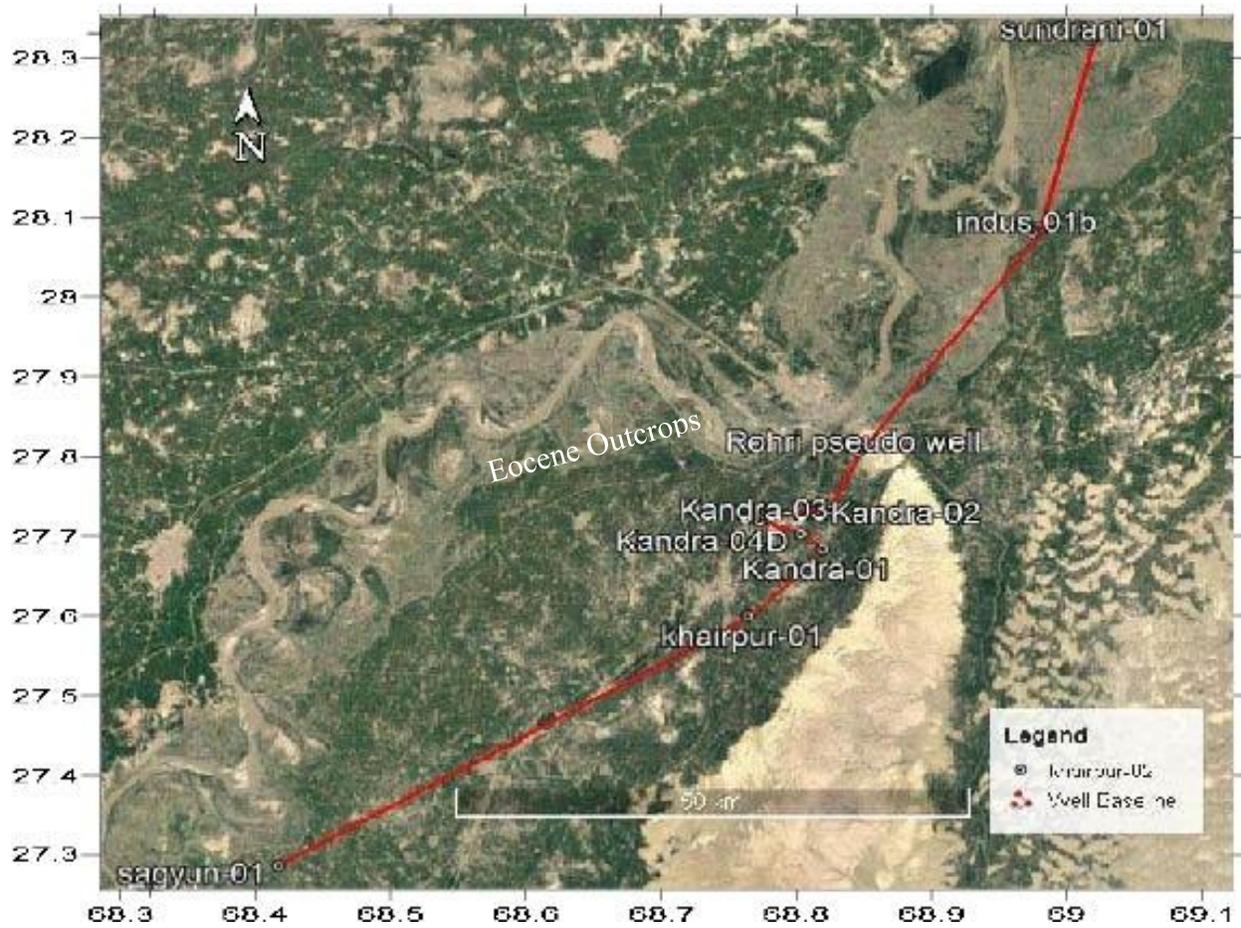


Figure 2. Google Earth map of study Area with well location and names.

ERA		AGE		DISCRIPTION	LITHOLOGY	
PERIOD	EPOCH	FORMATION				
CENOZOIC	QUATE-RNARY	RECENT	ALLUVIUM	CLAY, SHALE, SANDSTONE, CONGLOMERATE		
		PLIOCENE- PLEISTOCENE	SIWALIK	SANDSTONE, SHALE, CONGLOMERATE		
	TERTIARY	MIOCENE	GAJ	SHALE, LIMESTONE, SANDSTONE		
		OLIGOCENE	NARI			
		EOCENE	LATE			
			MIDDLE	KIRTHAR	SHALE, LIMESTONE	
			EARLY	LAKI	LIMESTONE INTERBEDDED SHALE	
		PALEOCENE	RANIKOT	LIMESTONE, SANDSTONE, SHALE, BASALT		
	MESOZOIC	CRETACEOUS	LATE	PAB	SANDSTONE, SHALE	
				MUGHAL KOT	LIMESTONE, SHALE WITH MINOR SANDSTONE	
PARH				LIMESTONE		
MIDDLE			GORU	UPPER	MARLY SHALE	
				LOWER	SANDY SHALE	
EARLY			SEMBAR	OIL/GAS SHALE		
JURASSIC		LATE				
		MIDDLE	CHILTAN	LIMESTONE		
		EARLY	SHIRINAB	LIMESTONE, SHALE, SANDSTONE		
TRIASSIC		EARLY-LATE	WULGAI	SANDSTONE, SHALE		
CAMBRIAN NOT ENCOUNTERED						

Figure 3. Generalized Stratigraphy of the Southern Indus Basin (after Raza et al, 1990)

II. MATERIAL AND METHODS

For this research work 12 wells data were acquired from Directorate General of Petroleum Concession. The data include well tops acquired by different companies during drilling of these wells and LAS file of Kandra-01. Different techniques (Figure 4) have been used in the research work to obtain the desired results. Due to confidentiality of seismic data that are not in public domain, we can't get the seismic lines data to use it in this research. Therefore, an exceptional and extraordinary methodology was opted to use only well tops data for subsurface mapping including depth contour maps and Isopach maps, structural and stratigraphic correlations using actual well tops and assumed data to better understand the subsurface structural variations and trends in geologic formations found in the respective wells to create an ideal approach for Well-Prognosis, past depositional models were also constructed using the well tops data for examining the past depositional settings of formations during different geological time periods for (Pseudo-well). Petro-physical interpretations are done on different formations to calculate volume of shale, water saturation and hydrocarbons saturation.

First we have constructed structural correlations of 12 wells namely Kandra-01, Kandra-02, 03 and 04D, Khairpur-01, 02 and 03, Sagyun-0, these wells are drilled on the southern side of the Jacobabad Khairpur High, whereas Jacobabad-02, 03 and Jhatpat-01 which are drilled on the Northwestern side of the High are used. In addition to this 2 wells data namely Sundrani-01 and Indus-01B which are penetrated in the vicinity of Panu Aqal Graben are also used. Three structural correlations were constructed from North to South on a regional scale. This approach was opted to examine the shape of Jacobabad Khairpur High using all wells in one correlation, while the second correlation is constructed using selective wells to better understand the trend and shape of this High, an ideal case was generated which will later be described in the results and discussion section. The third correlation was constructed from Panu Aqal Graben to Northwestern side of the High in an East-West direction. The technique used to construct the correlation is very simple; first, we have drawn the correlation using actual well tops data on a simple graph paper, after which the shape of Jacobabad High was

determined and then the assumed or prognosed thickness technique is opted which is actually taking the thickness half of the original thickness of different formations found in the above mentioned wells, this gives us the ideal shape of the Jacobabad High and provided an insight to construct and assign a new well (Pseudo-Well) based on the trends and variations of these formations. After doing all this on the graph paper, the structural correlations were created on Corel-Draw software. The stratigraphic correlation was constructed by taking Paleocene as a base level to better understand the shape and trends dynamic during Paleocene time period.

After constructing the structural and stratigraphic correlations next step was to create the depth contour and Isopach maps using the well tops data on Surfer software by Golden Software Company. As Surfer is used for surface mapping, we have assigned negative well tops values to visualize the subsurface depth contours and Isopach maps. The technique was very easy and simple; the negative values of all well tops of formations are pasted on the Surfer sheet along with coordinates to create a dat. file, which was then converted to a grid file using Grid menu, after which the grid file was used to create a 3D depth contour maps. The Isopach maps were developed using the Math option after which, we have used an equation;

$$Z = A - B;$$

Where Z is the resultant surface,

A is the upper surface or Formation top,

And B is the lower surface or Formation bottom.

This equation gives us the Isopach maps of the desired formations. It must be kept in mind that we have to create another dat. files for the desired formation thickness map with equal number of lines so that x, y and z layers of upper surface is equal to the lower surface and vice versa.

Depositional models of Pseudo-well and Indus-01B were constructed on Petro Mod (Schlumberger), using the well tops we have got after the structural correlations and depth contour maps. The data was entered to software using 1D modelling menu along with formation names, depth, ages and petroleum system data which means that whether the formation is source, reservoir, and seal, under burden or over burden. Furthermore, the temperature curve was taken on a regional scale (South Asia) already present in the software. This technique gives us the unique models of the Pseudo-well. These models include depth, facies, and temperature and porosity curves.

Petrophysical interpretations were done using Interactive Petrophysics software by (Schlumberger). The LAS file of Kandra-01 was interpreted. The interpretations were done to calculate the volume of shale (Vsh), Porosity (ϕ), water saturation (Sw), and hydrocarbon saturation (Shc). First we have loaded the data into the software then, selected the triple combo to view the logs in the form of curve. The next step was then to calculate the volume of shale (Vsh), after which, the zoning is done, by splitting the first zone into the respective ones, then the porosity (ϕ) and water saturation calculations were done using the interpretations options and choosing the mentioned step. After all of this the cross plots were interpreted, matrix density, log calibrations were adjusted. As a result the lithology log was prepared with respective logs interpretation and hydrocarbons signs. Cut-off and summation option was selected and the report was generated.

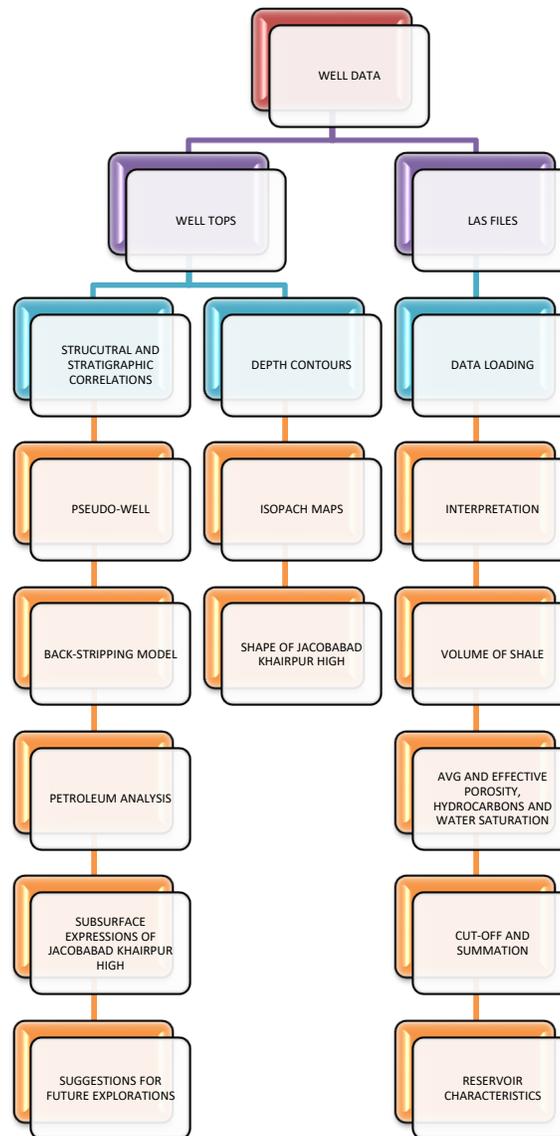


Figure 4. Methodology work flow of the research work.

III. RESULTS AND SUMMARY

This section deals with results and discussions about well data used in this research for understanding the surface and subsurface expressions of Jacobabad Khairpur High. The subsurface mapping, structural interpretations, reservoir modelling and petro-physical analysis can be used to locate the hydrocarbons. The Middle to Late Eocene Habib Rahi Formation outcrops are exposed in the Rohri, Sukkur area (Figure 2). The story begins why it is present on the surface? After interpreting well data by constructing the structural correlations of wells drilled across the Jacobabad Khairpur High, it is obvious that due to the Himalayan Orogeny which is the final time when Jacobabad High reactivated causes the subsurface strata to be uplifted onto the surface, which is evident by the presence of bulge in the depth contour maps of the different formation levels and are discussed in this section is divided into various sub-sections based on the data used in this research work. Let's discuss the first section:

1.1. Well Structural Correlation

1.1.1. Case 1:

Regional Northeast to Southwest structural correlation of wells drilled across Khairpur-Jacobabad High. These structural correlations are constructed in different cases to better understand the trends of geologic formations and the structure they have been making in the subsurface and to construct the geology of the Rohri from these correlations to assign new location for Pseudo-Well. The first structural correlation (Figure 5.1 a) shows that starting from

Northeast direction i.e. from Sundrani-01 well drilled in the Panu Aqal Graben, the oldest rock encountered is Middle Jurassic Chiltan Formation with a thickness of 187m and is found from the depth of 3823m. Above the Chiltan Formation there is an unconformity and the Sembar Formation of Early Cretaceous unconformably overlies the Middle Jurassic Chiltan Formation. Thickness of Sembar Formation is 145m, this well contains complete package of Cretaceous rock indicating uniform deposition during Cretaceous time period. The K-T boundary is present between Cretaceous Pab Formation and Paleocene Ranikot Formation. Thickness of Ranikot Formation is 132m and the sequence gets normal upto Alluvium. The Indus-01B is drilled upto Cretaceous Pab Formation upto the depth of 1364m but based on the regional correlation and assumed thickness there is a chance for the presence of the Cretaceous source Sembar Formation and reservoir and seal rock Upper and Lower Goru Formation. The estimated thickness is equals to the half of the original thickness found across wells in which they are present. Using assumed thickness the Indus-01b could be penetrated upto the Middle Jurassic Chiltan Formation. The assumed thickness of Chiltan Formation is 750m, Sembar 30m, Lower Goru 700m, Upper Goru 250m. The most important thing to be noticed is that the Cretaceous sequence becomes thinner towards Sindh Platform (Sagyun-01) well. The Habib Rahi Formation was our main target because it was exposed on the surface at Rohri (Figure), and its thickness remains consistent from Sundrani-01 to Indus-01B. There is no such existence of Habib Rahi Formation in the Khairpur-01, it means that from Indus-01B the Habib Rahi Formation was uplifted to the surface (Figure 5.3 f), where we have placed the Pseudo-well. The correlation shows an uplift feature at the Pseudo-well location which is the result of Jacobabad Khairpur High development and the Eocene Himalyan Orogeny (see figure 5.3 a) with the Habib Rahi Formation of 100m (assumed thickness) at the surface, below which, the Ghazij Formation starting from Sundrani-01 to Indus-01b to Rohri (Pseudo-well), the assumed thickness of the Ghazij Formation is 250m. Sui Upper Limestone is present below the Ghazij Formation with the assumed thickness of the 30m, Sui Shale with 60m, Sui Main Limestone with 70m, Upper Paleocene Dunghan Formation with 40m, Ranikot 20m, unconformity between Ranikot and Middle Cretaceous Upper Goru Formation. It is important to keep in mind that the Upper Cretaceous sequence is absent based on our regional correlations. The Goru Formation thickness is estimated to be about 250m (assumed thickness), Lower Goru 700m and Sembar Formation (Cretaceous) 20m. Below Sembar there is possibility for the presence of Jurassic Chiltan Formation with the thickness of 750m. The Pseudo-well gives an idea for the presence of Hydrocarbon system based on the presence of source, reservoir, and seal rock. In the Khairpur-01 and Sagyun-01 the Eocene strata become more pronounced, whereas, the Paleocene strata become thinner. The Chiltan Formation reaches the maximum thickness towards South of Jacobabad Khairpur High. Jacobabad Khairpur High starts to developed after the deposition of (Middle Jurassic) Chiltan Formation and remains uplifted till (Middle Cretaceous) time in the South allowing deposition of Middle Cretaceous rocks.

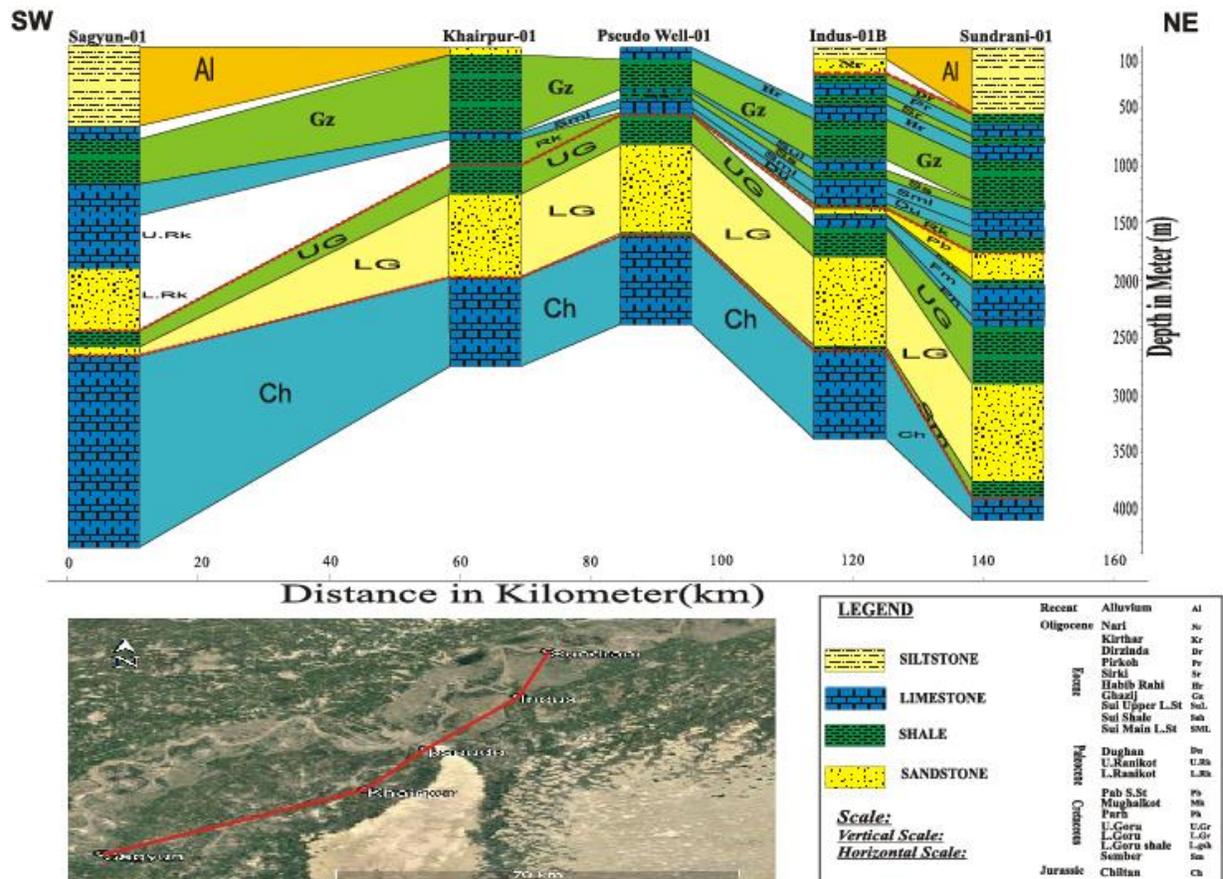


Figure 5.1 (a). The Northeast to Southwest correlation of wells drilled across the Jacobabad Paleo-High.

2.1.1. Case 2:

(Figure 5.2 b) shows Regional Northeast to Southwest structural well correlation. This correlation is constructed using 9 wells data to view the subsurface trends and variations on the regional scale and to determine the behavior of geologic formations at the (Pseudo-Well) location. Starting from Northeast i.e. Sundrani-01 the same patterns and trends as discussed in the previous case till to Indus-01b and Pseudo-Well. From (Pseudo-well) to Kandra-02 which is originally drilled upto 591m at the Sui Main Limestone as a target, using prognosed thickness, we have extended it upto the Chiltan level as Kandra-01 was penetrated upto the Chiltan level, so if the Kandra-02 was drilled further, then the subsurface scenario be like, the Habib Rahi Formation pinchout in the subsurface (Figure 5.2), Ghazij Formation thickness increases consistently from Northeast towards the Southwest, Sui Main Limestone is present with Sui Shale and Sui Upper Limestone pinchout from the (Pseudo-Well) to Kandra-02, the thickness of the Sui Main Limestone is 68.5m at the depth of 591m, below the Sui Main Limestone based on assumed thickness from the correlations there is presence of Ranikot Formation with 20m thickness and the thickness remains consistent throughout to the South marking the so called unconformity with the underlying Cretaceous Upper Goru Formation. The prognosed thickness of the Upper Goru is 250m, Lower Goru is 700 there is a chance from our correlation that 20m of Sembar Formation (Figure 5.2) might be present in this well if drilled to the Jurassic level also there is unconformity between Middle Jurassic Chiltan and Cretaceous Sembar Formation. Khairpur-02 well is drilled upto the depth of 3557m, with the Chiltan Formation at the bottom. From Kandra-02 to Khairpur-02, the alluvium is at the top with the same thickness as of Kandra-02, the Ghazij Formation with increased thickness, below which the Sui Main Limestone with the highest encountered thickness of 122m. It is interesting to notice that only in Khairpur-02 (Paleocene) Dughan Formation is found, it was deposited when the Indian Plate crossed over the Kerguelen Hotspot and then became part of the continental shelf to deposit this Limestone of Dughan Formation with a thickness of 30m. The Ranikot Formation below Dughan was drilled with a maximum thickness here of 56m, below which the (Cretaceous) Upper Goru with the actual thickness of 413m and Lower Goru with 900m thickness with missing of major source rock Sembar Shale. This increased in thickness of (Middle-Cretaceous) rocks indicate that the Jacobabad Khairpur High was uplifted after the deposition of Middle Jurassic till Middle Cretaceous, an evidence based on the correlation (Figure 5.2), suggesting that during the time of (Mid-Cretaceous) Jacobabad Khairpur High submerged in the Southeastern crest, allowing the considerable thickness of (Middle Cretaceous) rock but then after the deposition of Upper Goru of (Middle Cretaceous) level it was again uplifted, based on the absence of (Upper Cretaceous) rocks. The Kandra-03 was drilled upto the (Early Eocene) Sui Main Limestone as a target Formation. After assigning prognosed thickness the well hits the depth of 2300m approximately. With Alluvium at the top followed by Lower Alabaster Shale also known as Ghazij Formation, Sui Upper Limestone below which Sui Main Limestone with thickness of 60m. After

assigning the assumed thickness below the Sui Main Limestone is Ranikot with 20m thickness with the same K-T boundary between (Middle Cretaceous) and (Upper Paleocene) i.e. Upper Goru and Ranikot Formation. Below the (Middle Cretaceous) there is also an unconformity with Chiltan Formation of (Middle Jurassic). Kandra-04D and Kandra-01 are the only wells in the vicinity of Jacobabad Khairpur High with maximum actual thickness of 1055m and 1125m(Middle Cretaceous) Lower Goru Formation which may be due to submerge of High at the time of Middle Cretaceous depositing maximum amount of Lower Goru reservoir sands and shale. These two wells were drilled upto the Chiltan Limestone. From Knadra-01 to Khairpur-01 which is drilled up to Upper Goru of Middle Cretaceous age at the total depth of 1375, ranging from Alluvium to Ghazij with the maximum thickness in this well throughout the Jacobabad Khairpur High to Sui Main Limestone below which the Ranikot Formation marking K-T boundary. Below this the assumed thickness were used till Chiltan Limestone. Farther to the South towards the Sindh Platform, from Khairpur-01 to Sagyun-01, Alluvium attains maximum thickness of 668m, the Kirthar Formation of (Eocene) is present, the sequence remains the same till Ghazij to Sui Main Limestone, below which the Ranikot Group; Upper Ranikot and Lower Ranikot attains the maximum thickness then the sequence extends from Upper Goru to Lower Goru with considerable actual amount of thickness to Chiltan Formation. It is important to keep in mind that Sagyun-01 is the only well where (Middle Jurassic) Chiltan Formation attains the maximum thickness of 1634m.

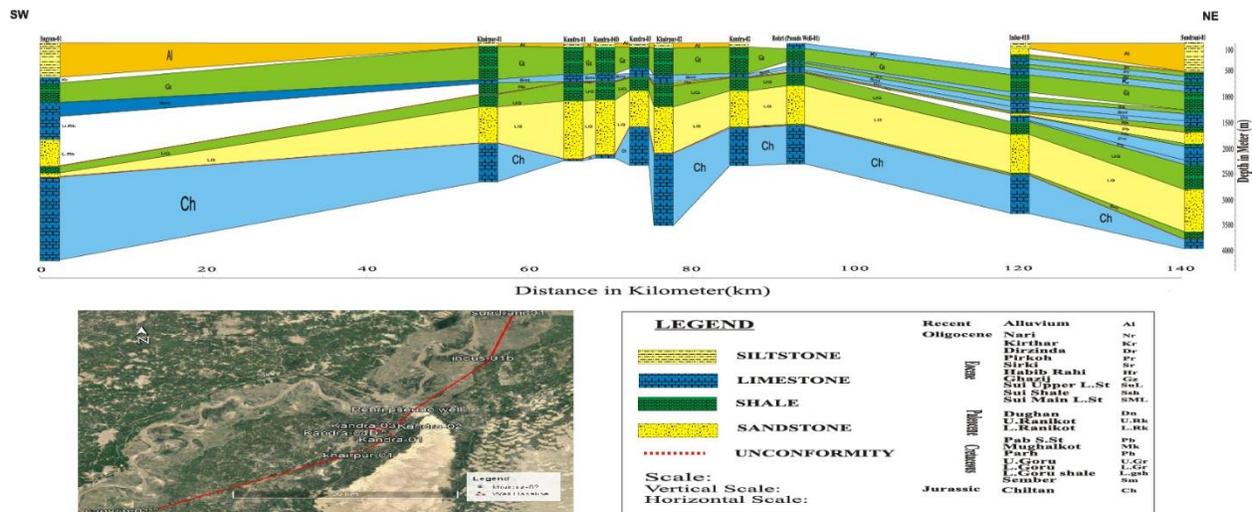


Figure 5.2. Regional Northeast to Southwest correlation on wells drilled across the Jacobabad Paleo-High, where the Lower-Mid-Cretaceous rocks overlies the Mid-Jurassic Chiltan Formation marking an unconformity, while the Upper Paleocene rocks overlies the Mid-Upper Cretaceous rocks demarcating the K/T boundary.

1.1.1. Case 3:

The third regional Northeast to Northwest correlation (Figure 5.1 c) shows the structural and stratigraphic configuration from Sundrani-01 to Jhatpat-01 to understand the subsurface trends and variations from Panu Aqal Graben to Northwestern most part of Jacobabad Khairpur High. Cretaceous and Tertiary rocks are absent on the Northwestern part of the High (Jhatpat-01), where the (Paleocene) Dughan Formation directly overlies the (Mid-Jurassic) Chiltan Formation, indicating the uplift of the High right after the deposition of Chiltan Formation, the High remains uplifted till the deposition of (Mid-Paleocene) Dughan Formation. The Cretaceous and Tertiary sediments are comparatively thin in the top most portion of the Jacobabad Khairpur High. Wulgai Formation of (Triassic) age is only found in the Jhatpat-01 well throughout the Jacobabad High.

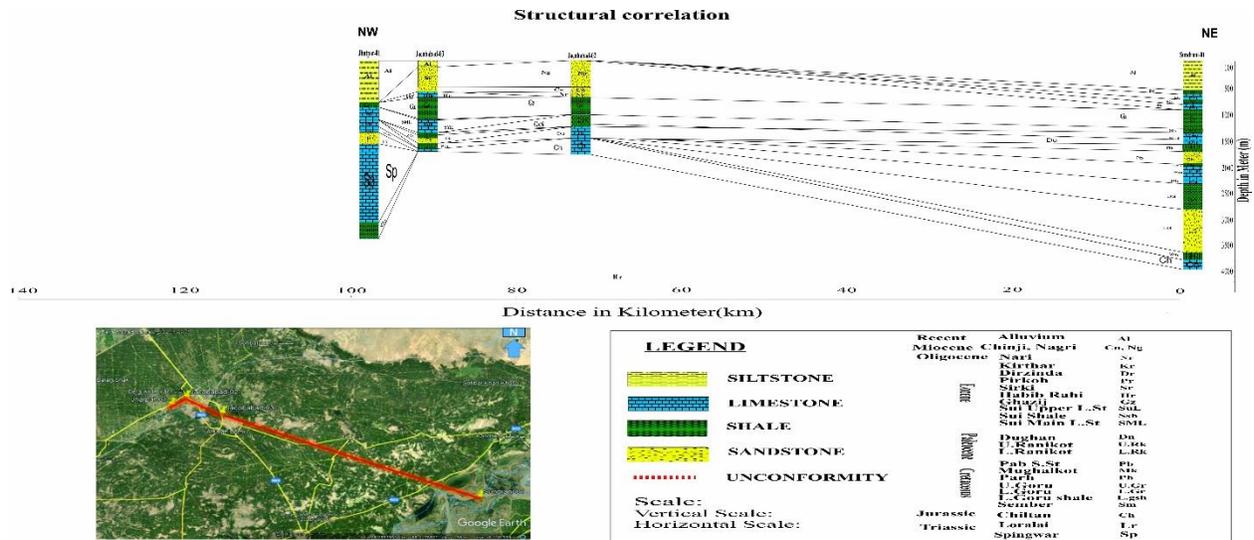


Figure 5.1c: Regional Northeast to Northwest structural correlation across Panu Aqal Graben and Northwestern part of Jacobabad High. Cretaceous sequence is absent in the Northwestern side of the High and Paleocene Dunghan Limestone overlies the Jurassic Chiltan Limestone.

1.2. Stratigraphic Correlation

The stratigraphic correlation of the 4 wells (Figure 5.2) from Northeast to Southwest was created to examine and visualize the subsurface variations and trends of Mid-Jurassic to Cretaceous rock sequence at the base Paleocene (unconformity) of Pseudo-well (Rohri).

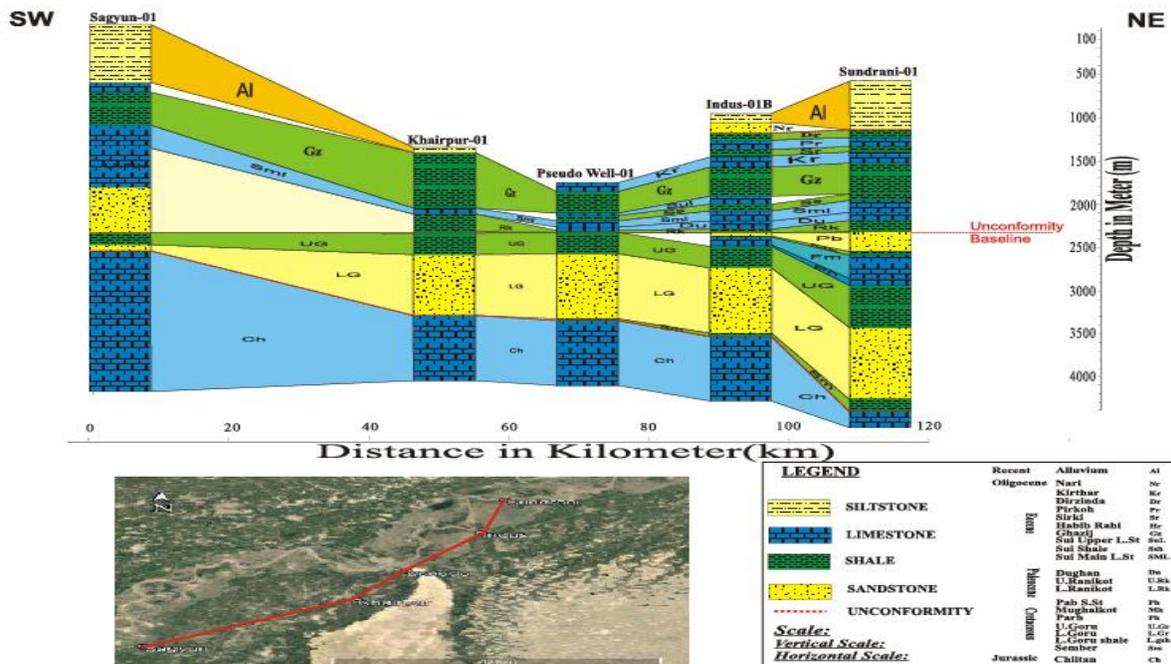


Figure 5.2. Northeast to Southwest Stratigraphic correlation with Paleocene as a base, Cretaceous sediments are comparatively thinner to the South and Jurassic Chiltan Formation thickness increases towards South and gets thinner towards Northeast.

1.3.Subsurface Evolution of Jacobabad Khairpur High

1.3.1. Depth Contour Maps

For subsurface mapping, as discussed earlier that Surfer was used, at first the excel sheet was prepared using well tops of the respective wells and assigning negative values for subsurface mapping. The excel sheet in Surfer was prepared in such a way; that the Longitude, Latitude of wells and well tops were written on that sheet. The process followed for all the desired Formations to construct their depth contour maps. After which the dat file was prepared and then converted it into the grid file to use the 3D surface option. It must be kept in mind that for depth contour construction assumed well tops were also used to check out the (Pseudo-Well) characteristics in the subsurface.

1.3.1.1. Depth Contour Map of Chiltan Formation

Figure 5.3(a, b) represents the Depth Contour Map of Chiltan Formation. The maximum depth of the Chiltan Formation was encountered in the Sundrani-01 with a depth of 3823m, while the shortest depth was found in the Jhatpat-01 of 1335m, it is important to notice that around the Northwestern margin of Jacobabad Paleo-Highs the Cretaceous Sequence is totally missing due to the exposure. There is an obvious bulge feature observed at the Chiltan Formation exactly at our (Pseudo-Well) location. That bulge is an explanation to the uplift of the Rohri area during Jacobabad Khairpur High development. It is important to note that there is no convergence of contours near the bulge but a smaller convergence can be seen near Kandra-01 and all other wells on the South. The Jacobabad High orientation can be easily seen in the (figure 5.3 a) which is NNW-SSE. In figure (5.3 a) Northwestern side wells are just represented but data of Jhatpat-01, Jacobabad-02 and 3 were not used. (Figure 5.3 b) represents the Jacobabad Khairpur High with Northwestern part included with contour interval of 500.

Depth Contour Map of Chiltan Formation Level

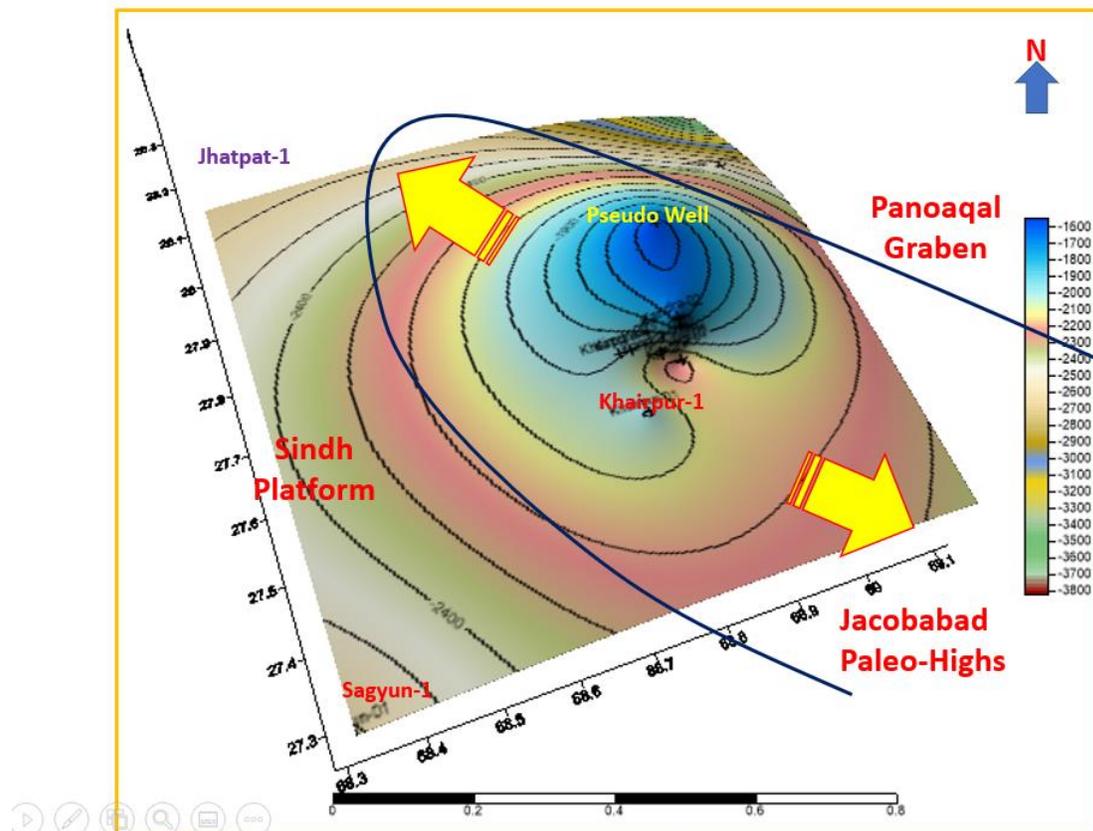


Figure 5.3 a. shows Bulge around the Khairpur-Jacobabad Highs flattened over the Middle Jurassic Chiltan Formation.

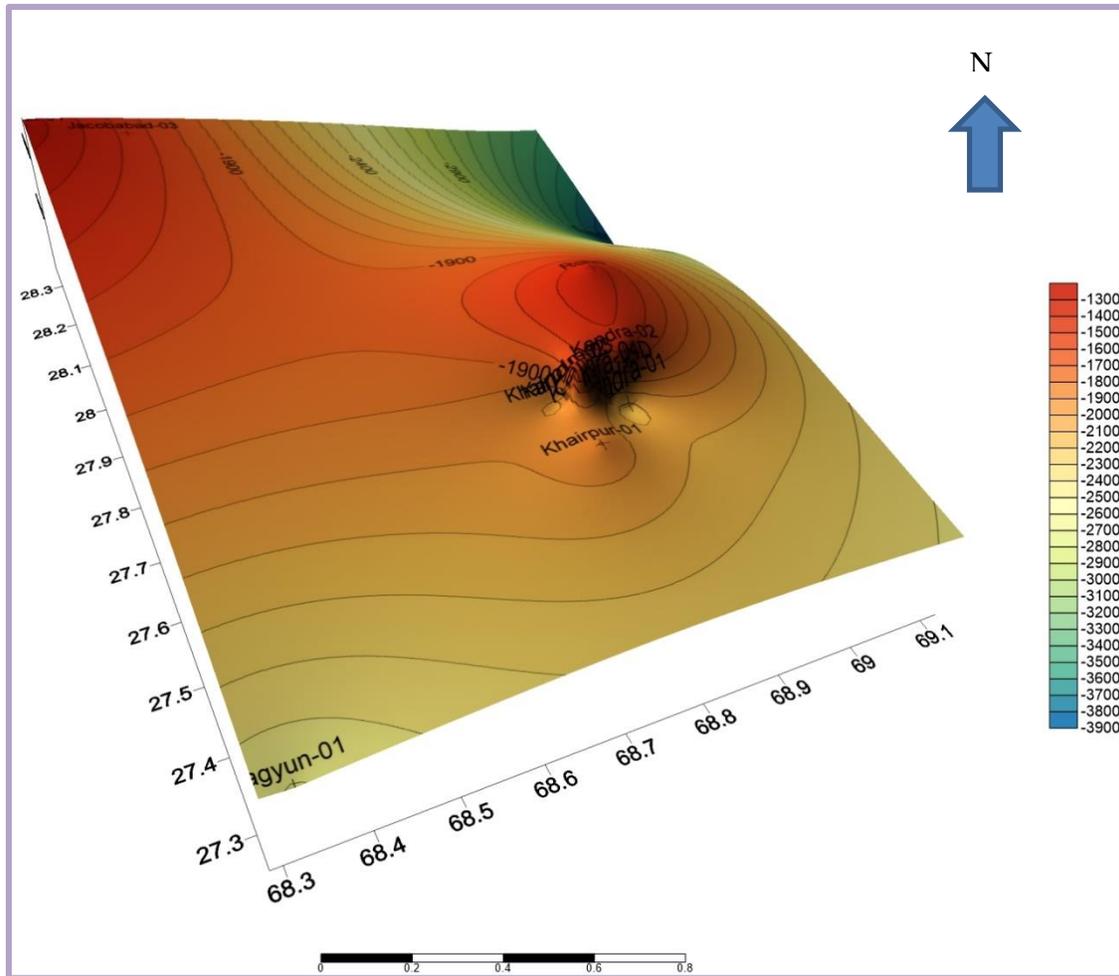


Figure 5.3 b. Shows Bulge across the Pseudo well, with Northwestern side wells included.

1.3.1.2. Depth Contour Map of Lower Goru Formation

Lower Goru, as encountered in wells, shows maximum depth in Sundrani-01 2850m, while the minimum depth was 1102m in Kandra-04D. The (figure 5.3 c) shows the bulge at Rohri Jacobabad Paleo-High when flattened over the Lower Goru Formation at the time of Middle Cretaceous. On the Northwestern side of the High there is absence of entire Cretaceous succession. Contour interval is 500.

Depth Contour Map of Lower Goru Formation Level

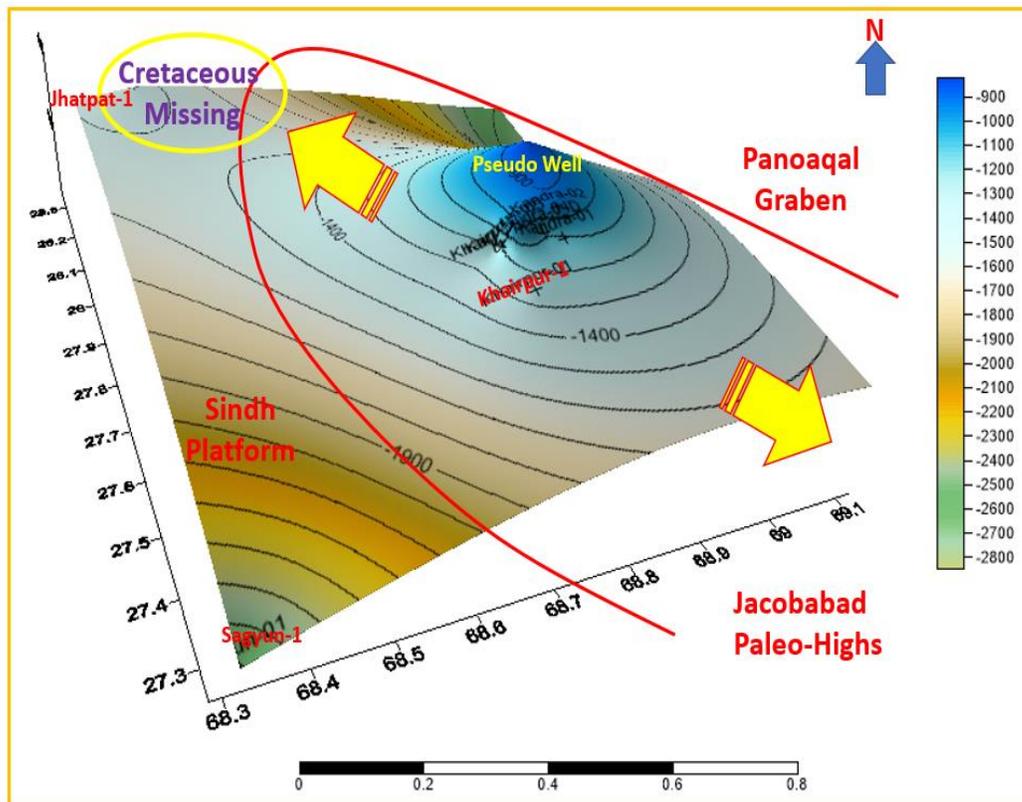


Figure 5.3 (c). Depth Contour map of Chiltan Formation, bulge can easily be seen near the eastern side of Jacobabad High at (Pseudo-Well).

1.3.1.3. Depth Contour Map of Upper Goru Formation

The Upper Goru Formation of Middle Jurassic encountered during drilling shows maximum depth in Sagyun-01 with a depth of 2402m, while the minimum depth was found in 748m in Kandra-04D. (Figure 5.3 d) shows bulge around the Jacobabad Paleo-Highs flattened over the Upper Goru Formation. Contour level is 500.

Depth Contour Map of Upper Goru Formation Level

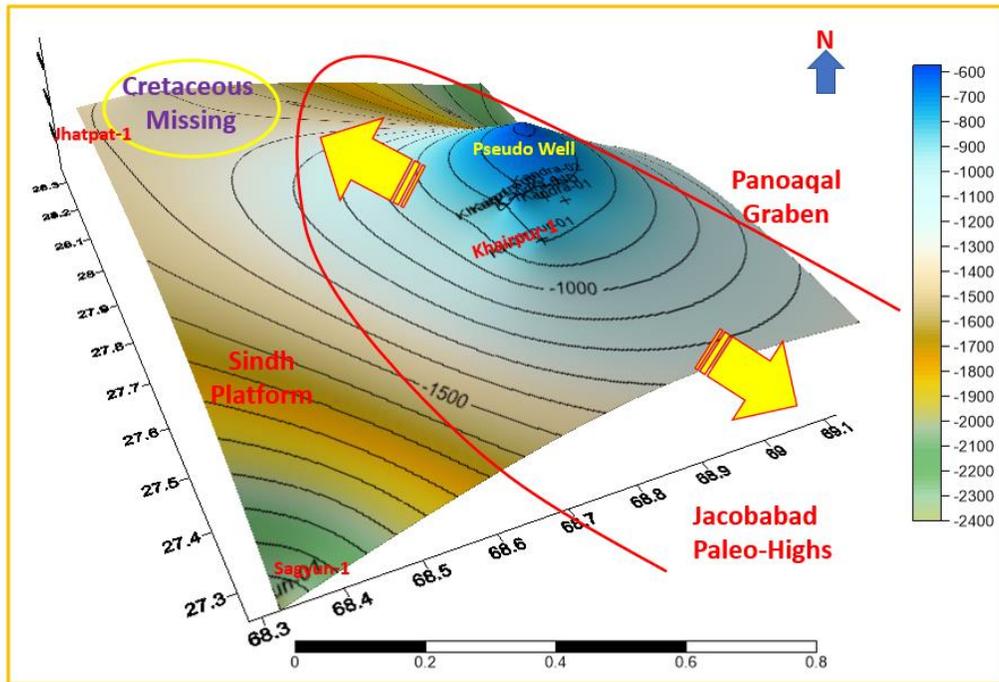


Figure 5.3 (d). Depth Contour Map of Upper Goru Formation, Bulge is also present at the Upper Goru level on (Pseudo-Well).

1.3.1.4. Depth Contour Map of Ghazij Formation

The Ghazij Formation of Late Paleocene encountered during drilling attains the maximum depth in Sundrani-01, while the minimum depth was found in Khairpur-01 about 61m. The figure below shows the Jacobabad Paleo-Highs flattened over the Ghazij Formation level (Figure 5.3 e). Contours are smooth and there is no convergence or sharpness in the contours at the Ghazij Formation level, contour interval is 500.

Depth Contour Map of Ghazij Formation Level

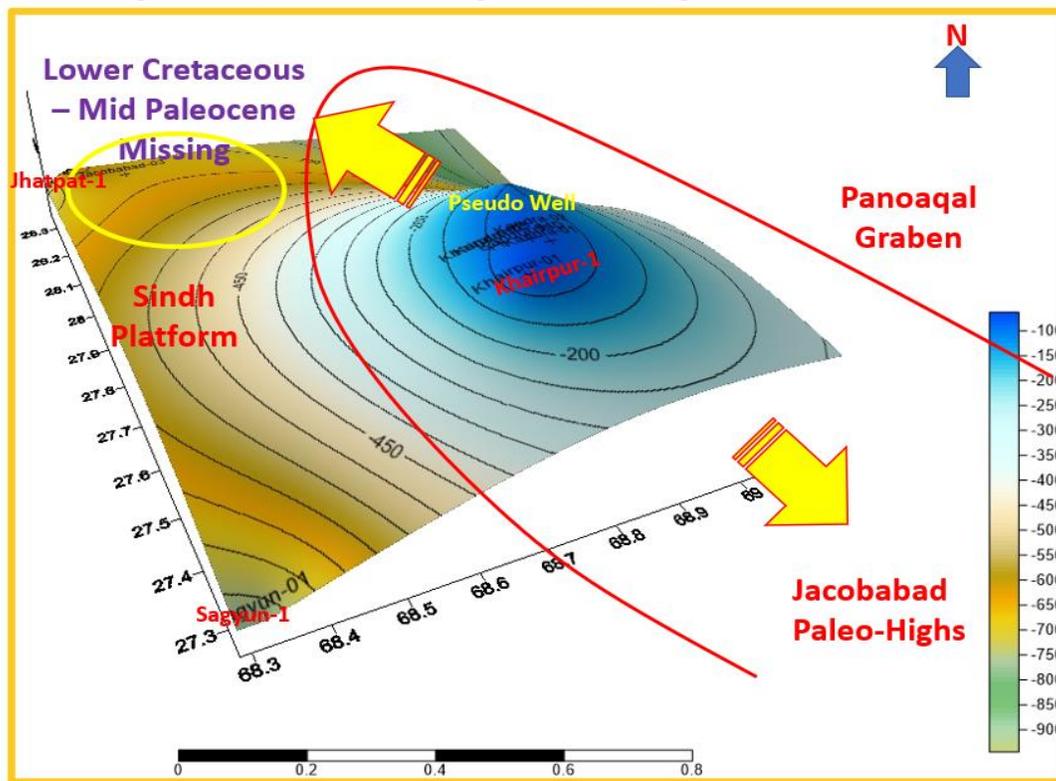


Figure 5.3 (e). Depth Contour Map of Ghazij Formation level showing the subsurface expressions of Jacobabad High, the bulge at (Pseudo-Well) location can easily be seen.

1.3.1.5. Depth Contour Map of Sui Main Limestone

Sui Main Limestone attains maximum depth of 1375m in the Sundrani-01 well of Panu Aqal Graben whereas in the vicinity of Jacobabad High is in Jacobabad-03 drilled at the Northwestern portion of the High of 1091m, and minimum depth is found in the Kandra-04D of 587m. (Figure 5.3 f) shows the depth Contour map of Sui Main Limestone with bulge present at the Rohri (Pseudo-Well) location. While the 1d depth contour map of Sui Main Limestone shows sharpening or closure of contour from Indus-01B to (Pseudo-Well), this feature may be an illustration of normal fault associated Horst and Graben structure (Figure 5.3 g). Contour interval is 250.

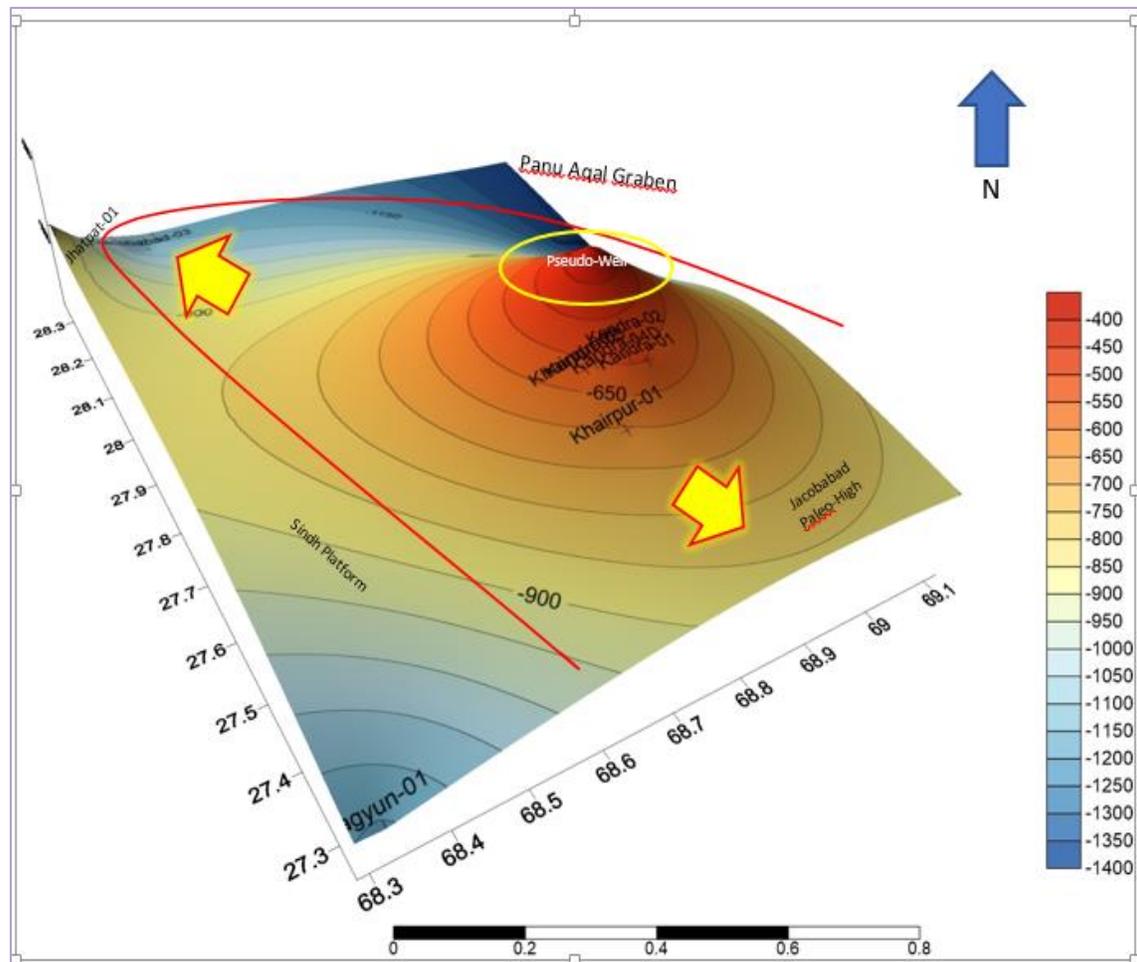


Figure 5.3 (f). 3D Depth Contour Map of Early Eocene Sui Main Limestone level with Bulge at (Pseudo-well) location in the subsurface.

1.3.1.6. Depth Contour Map of Middle Eocene Level

The Middle Eocene Formations encountered during drilling attained the maximum depth in Sundrani-01 about 1335m in Sundrani-01, whereas the minimum depth was 587m in Kandara-04D. (Figure 5.3 h) below shows the depth contour map of Middle Eocene level with an ideal picture of Jacobabad Khairpur-Highs, flattened over the Middle Eocene Sequence, at the time of Middle Eocene. It must be kept in mind that at Rohri where (Pseudo-Well) is suggested and placed the Middle Eocene Habib Rahi Formation is exposed at the surface.

Depth Contour Map of Middle Eocene Level

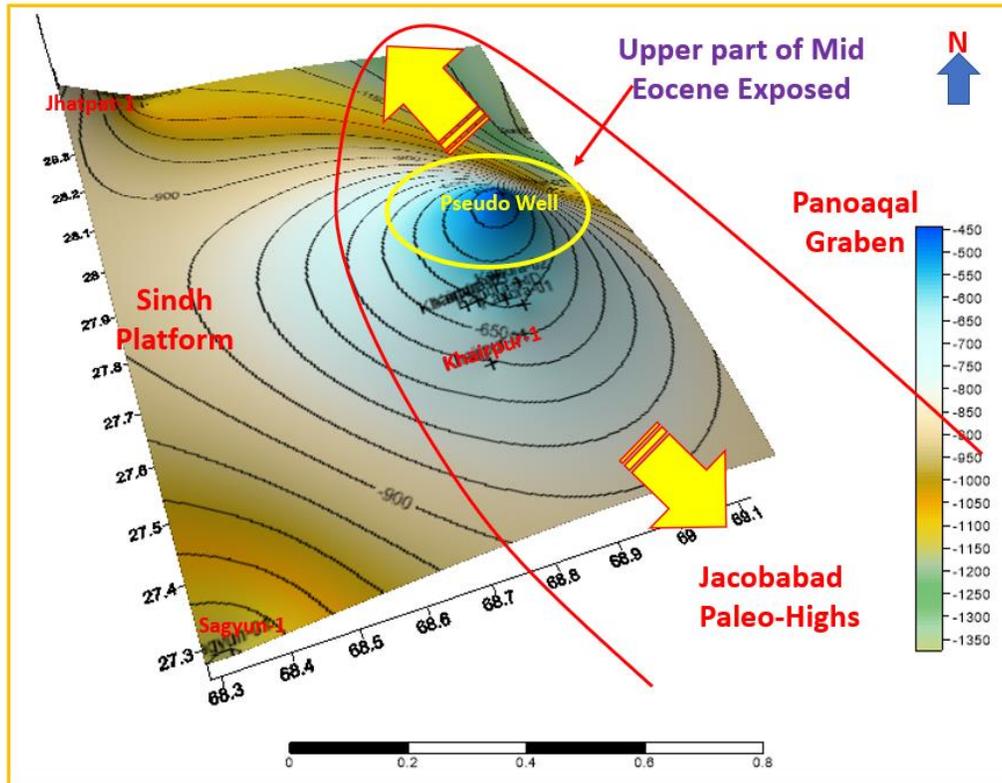


Figure 5.3 (g). Depth Contour Map of Eocene level representing the NNW-SSE oriented Jacobabad Khairpur High with bulge at the (Pseudo-Well). Closure of contours from Indus-01B to (Pseudo-Well) can be seen easily.

1.3.1.7. Digital Elevation Model on Alluvium

The (Figure 5.3 h) shows the Surface elevation of Jacobabad-Khairpur High flattened over the Alluvium. The minimum elevation is about 45m in Sindh Platform areas, whereas the maximum elevation is around the Rohri area.

DEM on Surface of Alluvium

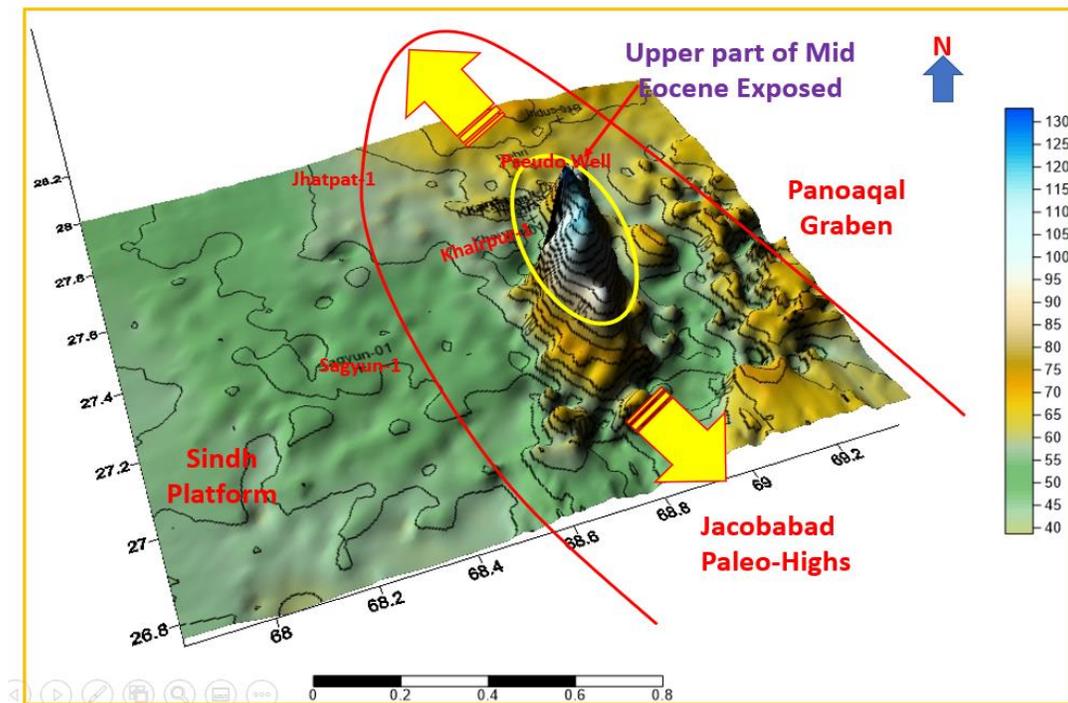


Figure 5.3 (h). Digital Elevation Model on Surface of Alluvium showing the surface orientation of Jacobabad Khairpur High.

1.3.2. Isopach Maps

Isopach maps were constructed on Surfer software in such a way that the upper part of the Formation was subtracted from lower part of the Formation using Math option in the grid menu. The Isopach maps were developed to determine the thickness of the formations and to analyze and disclose the 3D subsurface model of the study area (Pseudo-Well). The 3D surface were created for Chiltan Formations, Lower and Upper Goru Formation and Sui Main Limestone respectively.

1.3.2.1. Isopach Map of Chiltan Formation

The Chiltan Formation has maximum deposition towards South and Northwest of Jacobabad High. The maximum thickness of 1731m was encountered in Jhatpat-01 drilled at the Northwestern part of the High. At the Rohri area (Pseudo-well) the contours get wider like a flat surface. Below which there is slope towards the Kandra wells after which towards Khairpur field contour shows depression (Figure 5.3 i). The contour interval is 500.

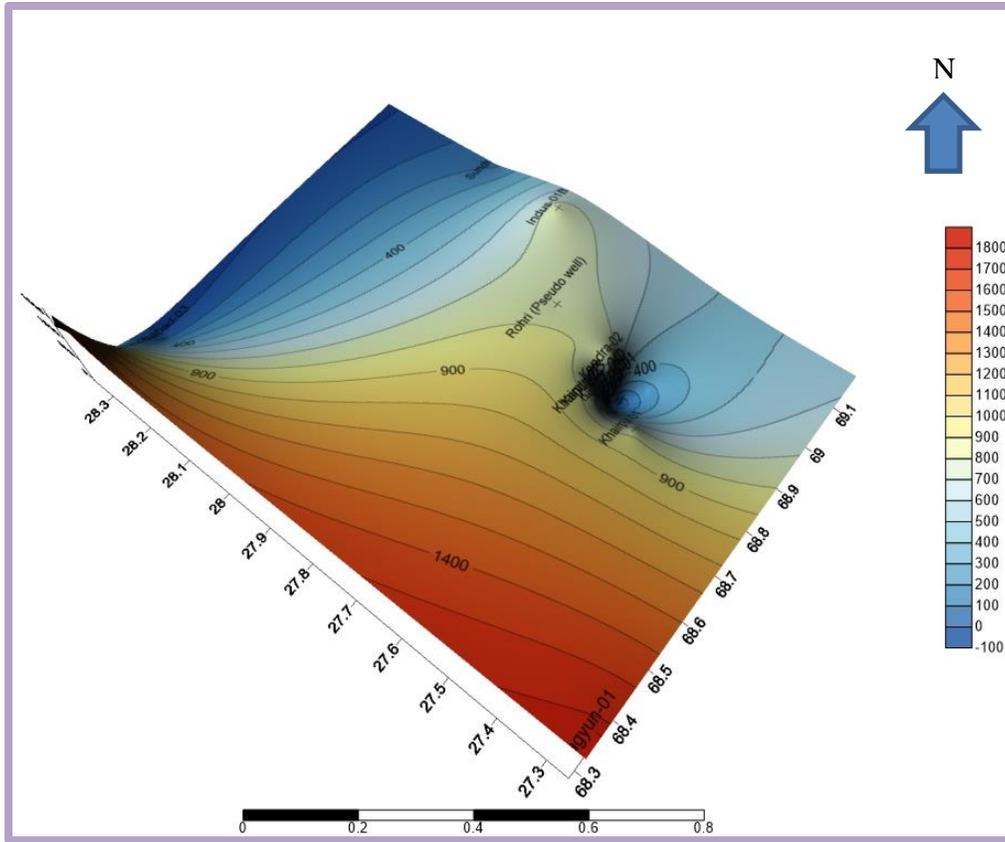


Figure 5.3 (i). 3D Isopach map of Chiltan Formation level.

1.3.2.2. Isopach Map of Lower and Upper Goru

The maximum thickness of Lower Goru is 1125m in Kandra-01 making it the main depo-center of Lower Goru Formation (Figure 5.3 j). Whereas, the maximum thickness of Upper Goru Formation in Sundrani-01 of Pano Aqal Graben is 490m and in the vicinity of Jacobabad High maximum thickness is in Kandra-01 of 366m (Figure 5.3 k).

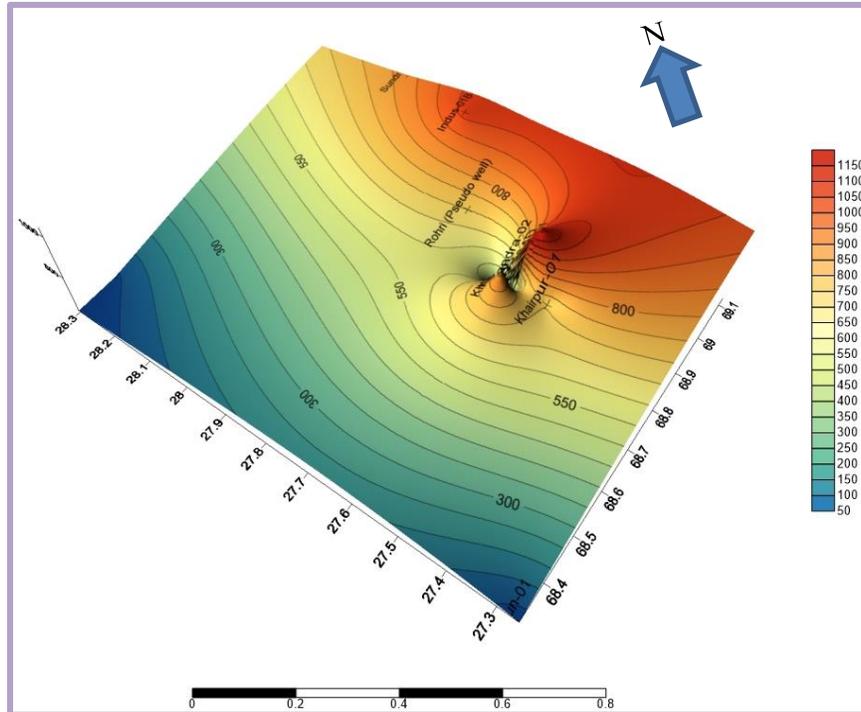


Figure 5.3 (j). Isopach map of Lower Goru Formation, with maximum thickness in Kandra-01.

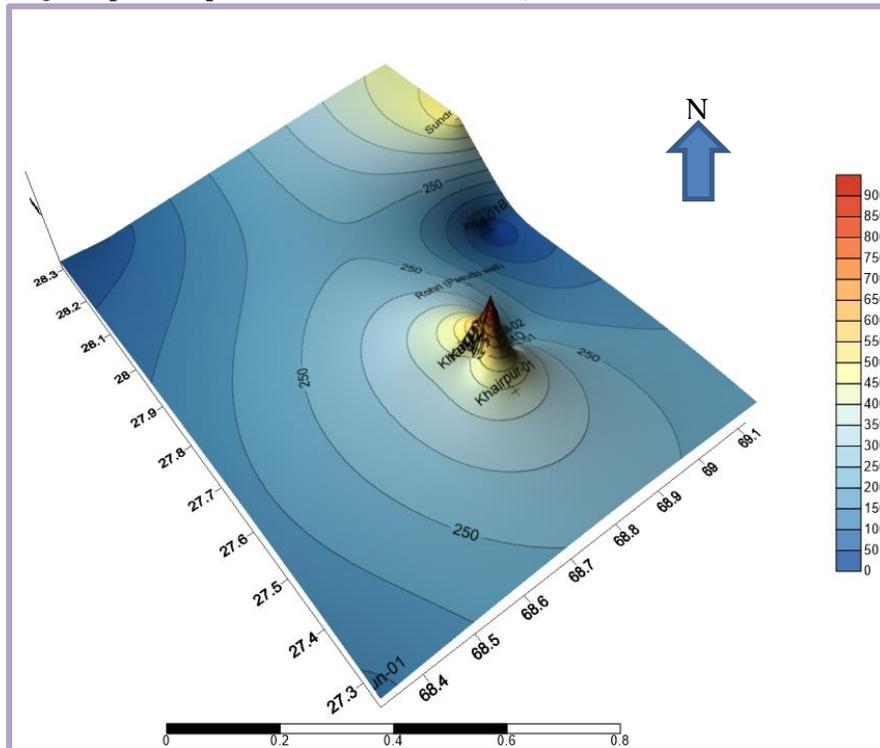


Figure 5.3 (k). Isopach map of Upper Goru Formation, with maximum thickness in Kandra-01.

1.3.2.3. Isopach Map of Sui Main Limestone

The Sui Main Limestone one of the most prolific reservoir of Southern Indus Basin. The Sui Main Limestone attains a maximum thickness in the Northwestern part of Jacobabad Khairpur High of 270m (Figure 5.3 l), although across

the other wells drilled in the Jacobabad Khairpur area, Sui Main Limestone is relatively thinner. The reason of the maximum thickness at Northwestern part is it's continuation from the Sui area towards east.

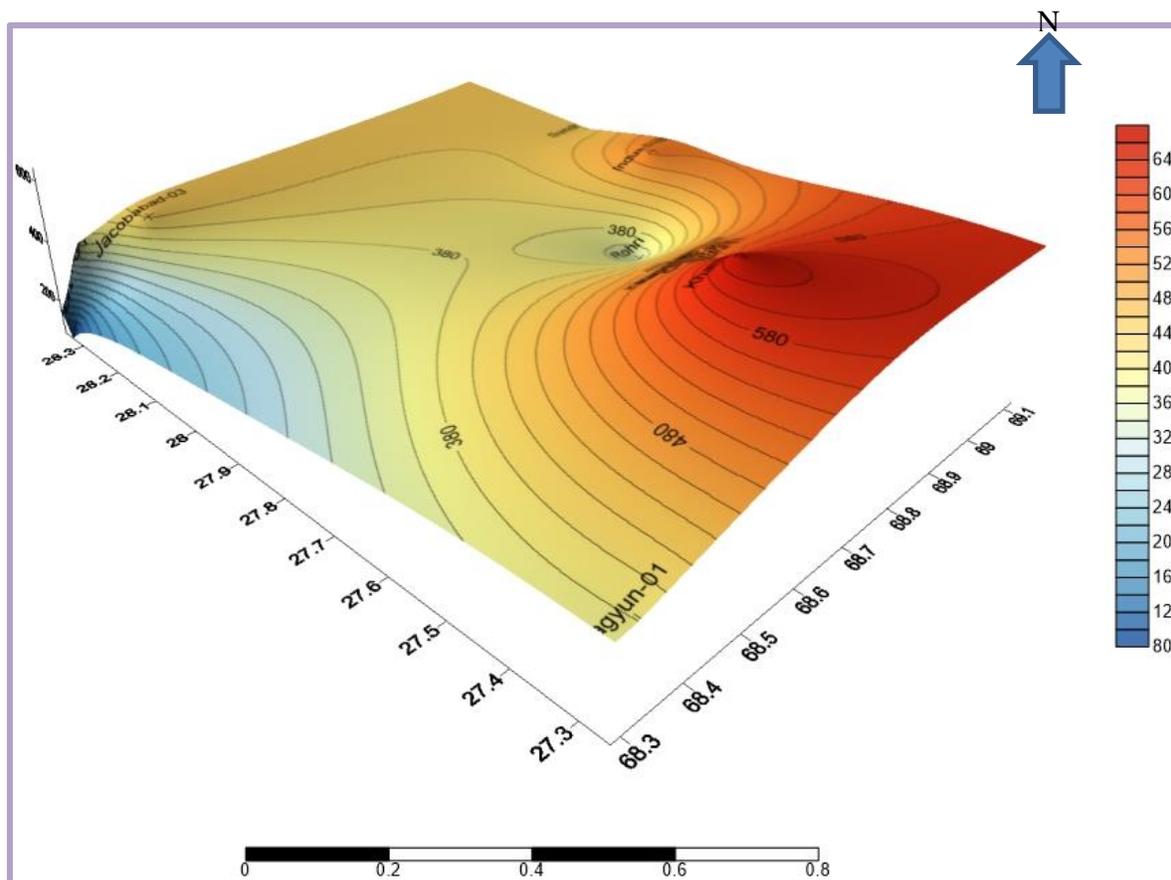


Figure 5.3 (I). 3D visualization of Sui Main Limestone Grid.

1.4. Petrophysical Interpretations

Petrophysical interpretations on Kandra-01 were done using Interactive Petrophysics by (Schlumberger GmbH) discussed earlier in the materials and methods. The petrophysical interpretations and analysis was conducted for Sui Main Limestone of Eocene age. The Indus-01B well data analysis results for reservoir characteristics of Sui Main Limestone were taken from (Unsa Shakir et al, 2017) for comparing the impact result of Jacobabad High on Sui Main Limestone versus Sui Main Limestone of Pano Aqal Graben. Volume of shale (V_{sh}), Porosity (ϕ), water saturation (S_w) and Hydrocarbon saturation (S_{hc}) were calculated based on petrophysical analysis. The Gamma ray log is the record of formations's radioactivity and measure the amount of shale as a function of depth (Zia et al, 2016). In Kandra-01 the volume of shale in the upper part of the reservoir starting from 600m to 700m is decreasing, while below the depth of 714m the volume of shale is increasing consistently till the depth of 2000m, right after this depth there is decrease in the volume of shale due to the presence of Chiltan Limestone at the depth of 2242m (Figure 5.4 a). The Sui Main Limestone shows good reservoir characteristics values while permeable and impermeable zones were marked by GR log (Figure 5.4 b). Also the Lower Goru Formation shows good reservoir characteristics. The GR log values were not so high and remains low throughout the Sui Main Limestone. Below the Sui Main Limestone the GR log response increased and generally reached the maximum value above the Base line in Lower Goru zone. According to (Unsa Shakir et al, 2017), in Indus-01B the volume of shale values in the upper reservoir part of reservoir are increasing, but after the depth of 1190m decreasing trend started in shale volume till 1235m. Sui Main Limestone interval shows good reservoir characteristics. The permeable and impermeable zones were identified using SP and GR log. The values of shale are 29%, average porosity 15.45%, Effective porosity 13.19%, average water saturation 90% and hydrocarbon saturations are 10% (Table 5.2). Due to higher water saturation at Sui Main Limestone reservoir level Indus-01B is abandoned well. In Kandra-01B volume of shale values from 600 to 743m for Sui Main Limestone are 20.9%, average porosity 14.5%, Effective Porosity 14.43%, average water saturation 54.12% and hydrocarbon

saturation 45.88% (Table 5.3). The Kandra-01 was drilled for Chiltan Formation as a target which has a gas potential. The suggestions for reservoir characteristics of (Pseudo-well) will be in between Indus-01B and Kandra-01 with the assumed success rate of 30% due to unavailability of Seismic data and well data for other wells for large scale assumptions and interpretations for the end result for (Pseudo-Well).

Table 5.2. Petrophysical Analysis Results of Indus-01B (after Unsa Shakir et al, 2017)

Indus-01B				
Interval	Shale Volume %	Average Porosity %		Saturation
Formation Top (m) and Base (m)	29	Total (ϕ)	Effective (ϕ)	Water Saturation
1120 1240			15.45	13.19

Table 5.3. Petrophysical Analysis Results of Kandra-01

Kandra-01				
Interval	Shale Volume %	Average Porosity %		Saturation
Formation Top (m) and Base (m)	20.9	Total (ϕ)	Effective (ϕ)	Water Saturation
600 743			14.5	14.43

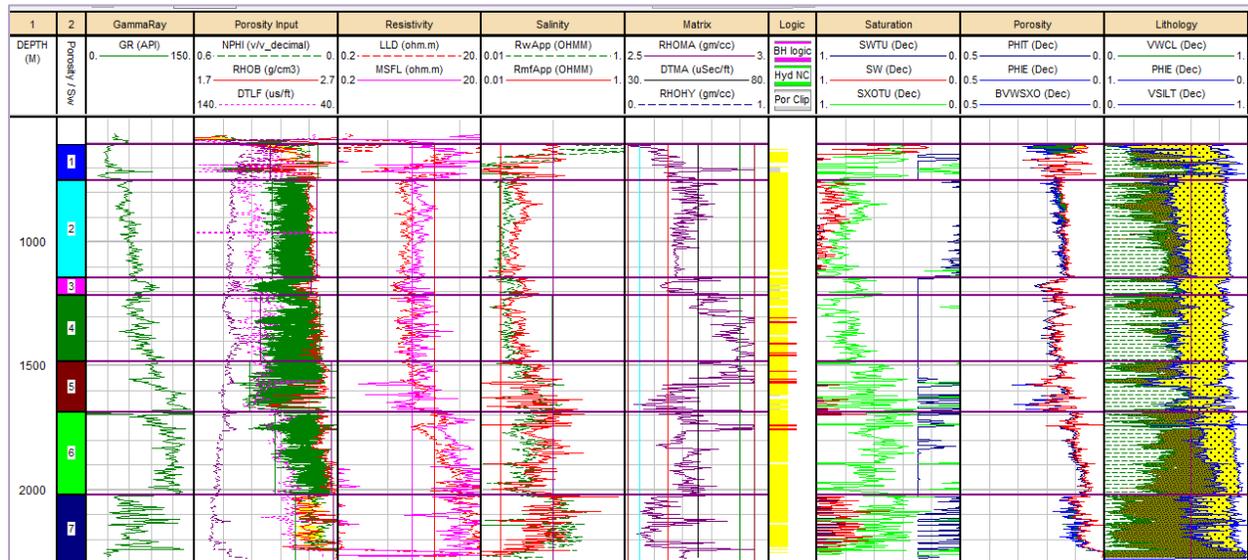


Figure 5.4 (a). Petrophysical interpretations of Kandra-01.

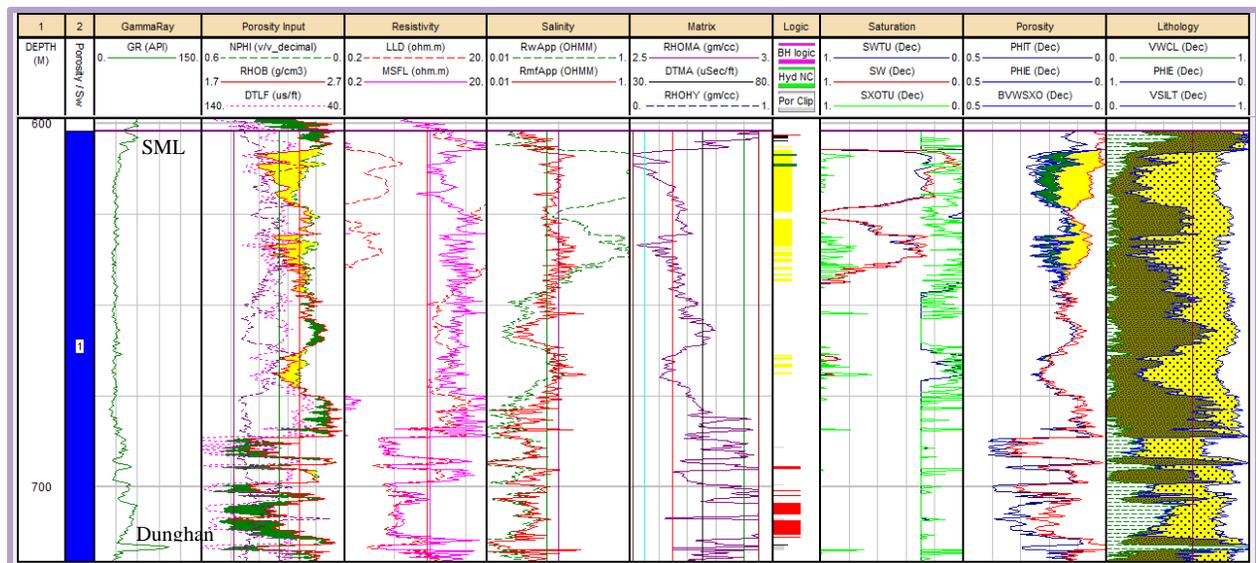


Figure 5.4 (b). Petrophysical interpretations of Sui Main Limestone Zone of Kandra-01.

1.5. Depositional Modelling

Backstripping is a powerful tool for quantifying the tectonic subsidence and uplift history of a sedimentary basin (Watts & Ryan 1976). This depositional model of Indus-01B is constructed based on well tops provided by the Directorate General of Petroleum Concession of Pakistan (DGPC), and (Pseudo-Well) placed at the Rohri based assumed thickness derived from structural and stratigraphic correlation. The main purpose as mentioned earlier is to construct the ideal depositional model of the well understanding the lithologic trends, variations in lithologies, porosity trends. While the temperature is based on the regional scale due to confidentiality of the data that is not given to us, the temperature trends are just ideally been taken to simple correlate it with the depth to reach up to the conclusion. The method to construct the models was very simple by taking the wells tops values and giving age values to the respective Formations given by the Stratigraphic Committee of Pakistan, and producing the simple burial history of the wells, understanding the burial history of the Formations, the decrease in porosity, temperature variations and idealizing the past geological conditions to examine the subsurface expressions around the Jacobabad Paleo-Highs. For this purpose, the Software Petro Mod (Gmbh) is used. The main key point was to analyze the subsurface tectonic and geological history of the Rohri area where we have placed the (Pseudo-Well) for future exploration activities, based on the depth contours, structural, and stratigraphic correlations, variations in the trends of Formations encountered during drilling, the results were up to some level like the adjacent wells as drilled by the specific companies.

The depositional model shows that the well Indus-01B (Fig 5.5 a) which is located in the Pano Aqal Graben was drilled to the Upper Cretaceous Pab Sandstone, based on the structural and stratigraphic correlations, and depth contours of the 09 wells around the vicinity of Jacobabad Paleo Highs, the prognosed thicknesses were used to look up to the Middle Jurassic Chiltan Formation, most of the wells were drilled to the Middle Jurassic Formations, this idealized concept led us to the conclusion that during the Middle Jurassic Time period, the Chiltan Formation, which is mostly Limestone and act as a reservoir in some parts of Lower Indus Basin, was deposited in the Shallow marine environment, above which there is a major unconformity between Chiltan Formation of Middle Jurassic and Early Cretaceous Sembar Formation deposited in deep marine environment during rifting of Indian Plate from Gondwanian domain, which then lead the way for the deposition of 1080m complete Cretaceous rocks. This exceptional theory is based on the prognosed thickness used in the depositional model of the Indus-01B; that if it was drilled further below the Pab Sandstone, the situation will be much similar to our model that represents an ideal case. The Upper Paleocene Ranikot Formation overlies the Pab Sandstone of Upper Cretaceous marking the K/T boundary and then sequence get normal above the Ranikot Formation, due to the presence of entire Eocene Rocks, up to the recent alluvium. The reason of this well not producing hydrocarbons is due to high water saturation reservoir zone. Our aim was just to know about the ideal burial history of this well, based on well tops data.

The Rohri (Pseudo well) (Figure 5.) which is the prognosed well based on following the regional structural correlation of the Formations, encountered during the drilling in the wells around the Jacobabad Paleo-Highs, and depth contours of the respective Formations, which leads to develop the ideal well by assuming the thicknesses of the

Formations, that were correlating with others while some Formations were pinching out. The well then shows that at the bottom the Middle Jurassic Chiltan Formation is present in subsurface, indicating shallow marine environment based on the Limestone lithology, trending across the respective wells, above which the small bed of Sembar Formation of Lower Cretaceous age lies. An unconformity occurs due to gap in deposition from Middle Jurassic to Lower Cretaceous that depicts an interpretation for the deposition of Early to Middle Cretaceous rocks, based on the correlations from Northeast to South West starting from Sundrani-01 to Indus-01B up to Rohri and so on. The Sembar Formation indicated the deep marine environment due to its marine Shale source rock, marking the transgression of the regional sea level, while the sequence is followed by the Mid-Cretaceous Lower Goru Sandstone that represents the marine regression for the non-marine reservoir of Lower Goru to be deposited. Above the Lower Goru the Upper Goru Shale and marl deposited, representing the transgression of the sea level to deposit the regional seal to cap the Lower Goru, The Ranikot Formation then mark the unconformity between Mid-Cretaceous to Upper Paleocene, known as K/T boundary. The sequence then gets normal due to the presence of the Dungan Formation of Paleocene age and above that the Sui Main Limestone of Early Eocene get deposited, the sequence then get similar to Khairpur-01 that the Sui Shale, Sui Upper Limestone, Ghazij Shale, and Kirthar Formation deposited marking several changes in the environment of deposition, from shallow marine to deep marine and vice versa. The Kirthar Formation is exposed due to some tectonic activity, we may not know the exact case what were the reasons that causes it to expose to the surface. In other wells all the members of Kirthar Formations are exposed like in Sundrani-01 and Indus-01B but at the surface the Habib Rahi Formation is only exposed, after the Indian Eurasian Plate collision and uplifting of Himalayas. But in the other wells like Kandra-01, Kandra-04D, Khairpur-01 etc. wells there is no such record for the presence of Habib Rahi Formation, trending from Northeast to Southwest, the Kirthar Formation whose member is Habib Rahi Formation, was then encountered in the Sagyun-01 well located in the Sindh Platform, creating the mystery that has yet to be resolved. May be it is due to regional scale normal faulting that results into the Horsts and Graben structures causes the erosion of Habib Rahi Formation beyond the Rohri area towards Sindh Platform. The model history of (Pseudo-well) suggest an existence of petroleum system and can be used for future exploration activities by considering Lower Goru (700m) of Cretaceous based on the presence of source Sembar Formation(20m) and Sui Main Limestone (Eocene) as reservoir rock. The porosity and temperature curves also suggests the sufficient temperature nearly upto 100 C.

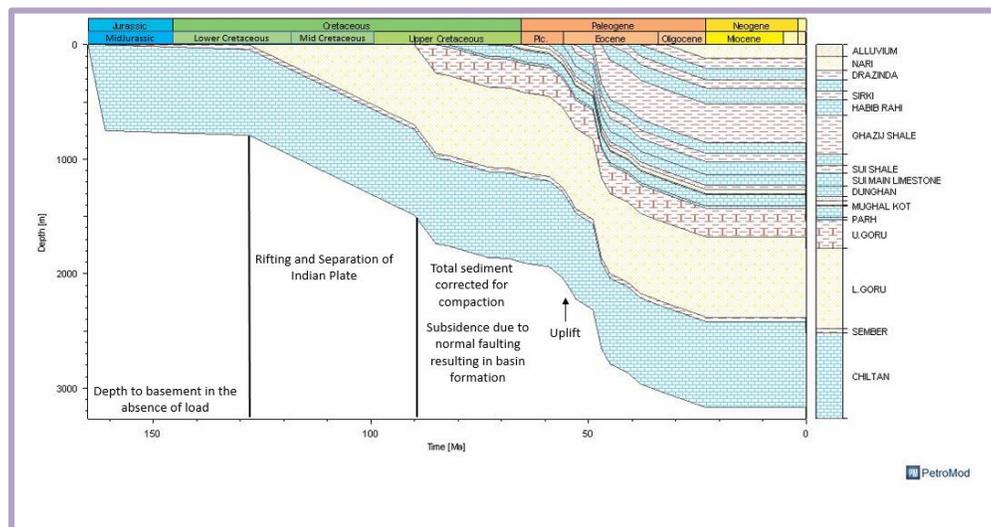


Figure 5.5 a. Depositional Model of Indus-01B, from Chiltan to Mughal Kot are prognosed thickness.

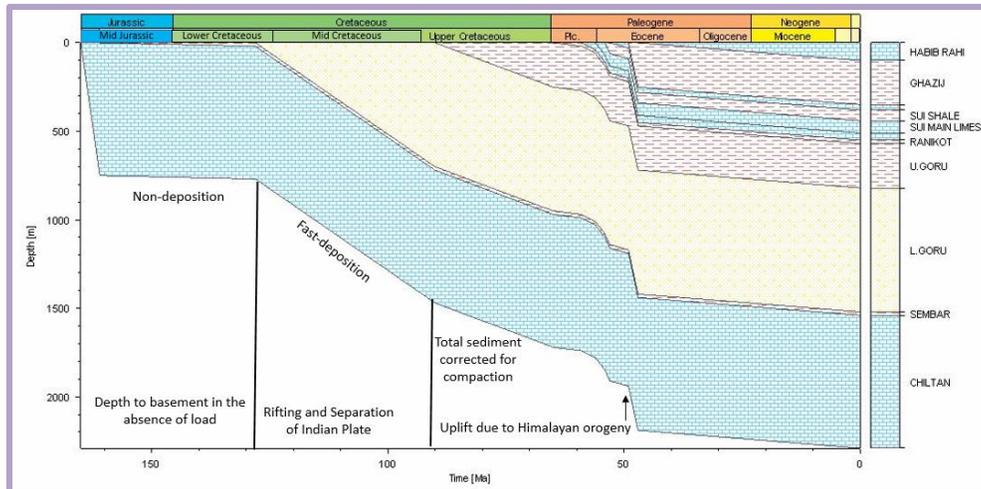


Figure 5.5 b. Probable Depositional Model of Rohri (Pseudo-Well) based on Assumed Thickness

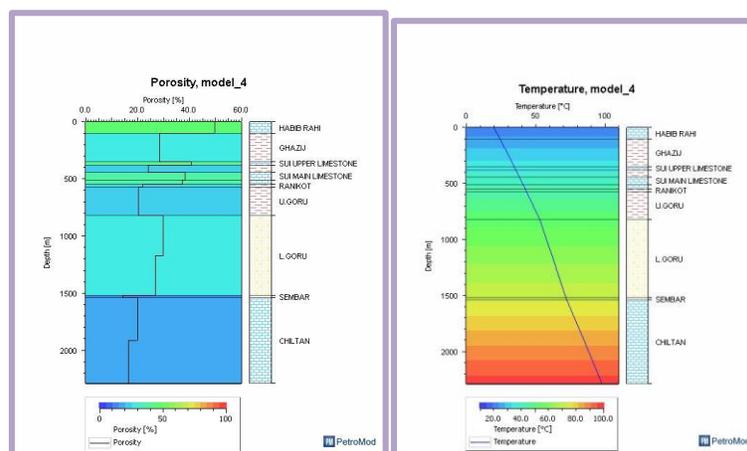


Figure 5.5. c. Possible Porosity Curve Model of Rohri (Pseudo-Well), porosity vs depth relationship as porosity is decreasing with depth.

Figure 5.5. d. Possible Temperature vs depth relationships of Rohri (Pseudo-well), as temperature is increasing with depth.

1.6. Well Prognosis (Pseudo-Well)

The Probable Rohri (Pseudo-Well) is placed at the section of Habib Rahi Formation exposed in the Rohri area at Latitude 27°39'52.0"N and Longitude 68°89'33.9"E. The (Pseudo-Well) is prognosed based on the depth contour maps as well structural and stratigraphic correlations of 9 wells starting from Pano Aqal Graben to South of Jacobabad Khairpur Highs. The location is marked on the top or apex of bulge as shown in depth contour maps (fig. 5.3 h). The total depth of the prognosed well will be 2290m. The Sui Main Limestone with probable depth of 440m, Upper Goru Formation at 570m, Lower Goru Formation at 820m, Sembar Formation at 1520m and Chiltan Formation at 1540m possibly (fig. 5.6). The petroleum prospect for the Prognosed will be like Indus-01B. Sembar Formation as source for Lower Goru Formation and Upper Goru as seal for Lower Goru and Ranikot Formation as source for Sui Main Limestone with Sui Shale and Ghazij Formation as double seal for Sui Main Limestone. Chiltan Formation can also be drilled and test for reservoir. The details of the of the (Pseudo-Well) are given in Table 5.6 (a). The prognosed formations thickness that will be encountered in the new (Pseudo-Well) are calculated by developing depth contour maps and correlations of the desired formations and adding average values of other formations found in the other wells. The success ratio for the hydrocarbons prospect of the prognosed well is almost about 30%.

Table 5.6 (a). Detail Analysis of Prognosed (Pseudo-Well)

Well Name	Rohri (Pseudo-Well)
Location	Rohri
Co-ordinates	Latitude 27°39'52.0"N and Longitude 68°89'33.9"E
Target Formations	Sui Main Limestone and Upper Goru
Total Depth	2290m
Formation at the bottom (Total Depth)	Chiltan Formation
Type of Well	Exploratory
Area	Jacobabad Khaipur High

Table 5.6 (b). Petroleum Play and Prospect of Prognosed (Pseudo-Well)

Source	02
Reservoir	02
Seal	03
Trap	Normal Faulting (Horst and Graben)
Success ratio	30%

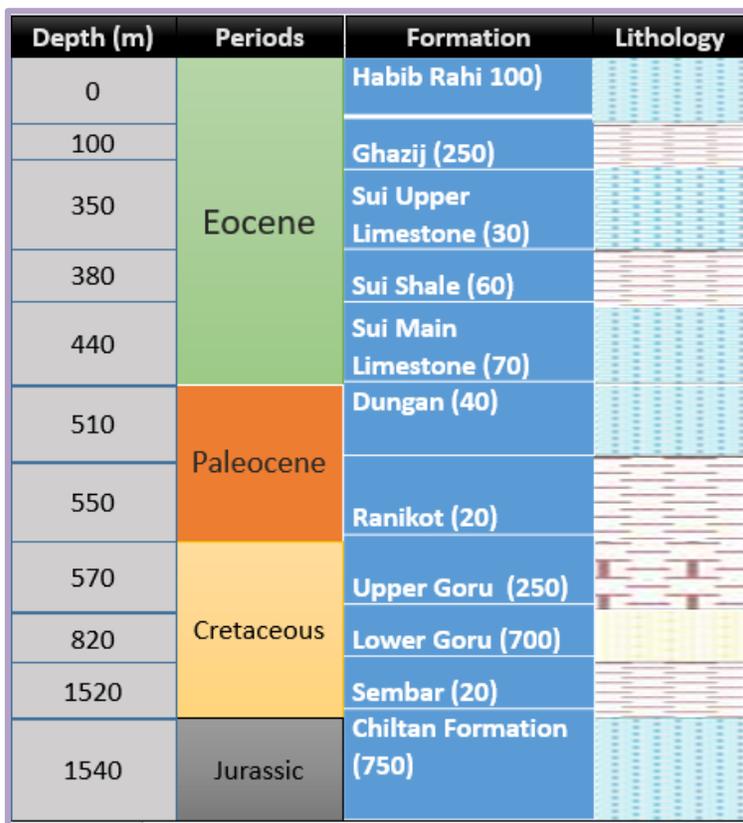


Figure 5.6. Well Prognosis of Rohri (Pseudo-Well).

IV. CONCLUSIONS

Jacobabad Khaipur High is an extensional rifting associated feature formed from Jurassic to Paleocene. It is characterized as a regional Horst structure. The orientation is NNW-SSE. It has impacted the petroleum system of the area. On Northwestern side Cretaceous rocks are entirely absent and there is an unconformable contact between Jurassic and Paleocene rock. The Southern most region of the High has considerable thickness of Middle Cretaceous above Jurassic formation, with the absence of Early Cretaceous. The Eastern side particularly Rohri where Middle Eocene Habib Rahi Formation is exposed shows tectonic uplift associated feature as a bulge like structure both on the surface and in the subsurface that was uplifted as a result of Himalayan Orogeny, based on depth

contour maps and structural correlations. The correlations depth contour maps are constructed using assumed thicknesses, visualizing an ideal conditions of the subsurface as most of the wells were drilled at very shorter depth due to non reservoir conditions. Petrophysical interpretation analysis of Kandra-suggests that Sui Main Limestone has good reservoir characteristics but. The (Pseudo-Well) is prognosed at the outcrop of Habib Rahi Formation Rohri area East of Sukkur and North of Kandra-01 based on different well correlations and depth contour maps. Depositional model of the Indus-01B and (Pseudo-Well) shows two major tectonic events first one during Cretaceous (130 m/y) right after the deposition of Middle Jurassic Chiltan Formation and the second one Himalyan Orogeny during Early Eocene (50 m/y) ago indicated by sharp uplift feature. The (Pseudo-Well) shows an ideal locaton for future hydrocarbons exploraton. There is presence of main reservoir Sui Main Limestone with source Ranikot Formation and seal Sui Shale and Ghazij Shale in the (Pseudo-Well). There is also presence of Sembar Formation with 20m thickness as a soruce for Lower Goru as a reservoir and Upper Goru Formation. Sui Main Limestone shows good reservoir charactersitics in Indus-01B and and Kandra-01. The reservoir value for hydrocarbon saturations in Kandra-01 and Indus-01B are 45.88% and 10%. The future chances for hydrocarbon saturation would be around 40-50%. In short, the (Pseudo-Well) reservoir conditions must be in between Indus-01B and Kandra-01.

REFERENCES

- [1] [1] Farah, A., Lawrence, R. D. and De Jong, K. A., 19H4, 'An Overview of the Tectonics of Pakistan', in Haq, B. U. and Milliman, J. D., Marine Geology and Oceanography of Arabian Sea and Coastal Pakistan, Van Nostrand Reinhold Company, P. 161-176.
- [2] [2] Raza, et al., 1989, 'Petroleum Zones of Pakistan'. P.lkistan Journal of Hydrocarbon Research, V. J, No. 2, P. 1-18.
- [3] [3] Kazmi, A. and Rana, R. 1982. Geology and Tectonic of Pakistan, Graphic publishers Karachi Pakistan, Geological Survey of Pakistan.
- [4] [4] Ahmed, R and Ali, S. M., 1991, "Tectonic and Structural Development of the Eastern Part of Kirthar Fold Belt and Its Hydrocarbon Prospects", Pakistan Journal of Hydrocarbon Research, v. 3, No.2, P. 19- 31.
- [5] [5] Kazmi AH, Jan MQ (1997) Geology and tectonics of Pakistan. Graphic Publishers, Karachi.
- [6] [6] Hedley R, Warburton J, Smewing J (2005) Sequence stratigraphy and tectonics in the Kirthar Fold Belt. Pakistan. Assoc Pet Geol/Soc Pet Explor-Ann Tech Confer, Islamabad, pp 61–72
- [7] [7] Coffeen, J.A. 1984. Seismic Exploration Fundamentals, Penn Well Publication Company.
- [8] [8] U. Shakir et al. / The Nucleus 54, No. 1 (2017) 38-45.
- [9] [9] Ahmad, N., Mateen J., Shehzad Ch., Mehmood N. and Arif F., 2012. Shale Gas Potential of Lower Cretaceous Sembar Formation in Middle and Lower Indus Basin Pakistan, Pakistan Journal of Hydrocarbon Research, Edn22, 51-62.
- [10] [10] Berger A., Gier S. and Krois P., 2009. Porosity-preserving chlorite cements in shallow-marine volcanoclastic sandstones Evidence from Cretaceous sandstones of the Sawan gas field Pakistan, AAPG Bulletin, 93(5) 595–615.
- [11] [11] Siddiqui, N.K., 2004, Sui Main Limestone: Regional geology and the analysis of original pressure of a closed system reservoir in Central Pakistan. AAPG, Bull., Vol. 88, no. 7, pp. 1007-1035.
- [12] [12] Quadri, V. N. and Shuaib, S. M., 1986, "Hydrocarbon Prospects of Southern Indus Basin, Pakistan", AAPG Bulletin, v. 70. No.6, P. 730-747.
- [13] [13] Quadri VN, Quadri SMGJ (1996) Anatomy of success in oil and gas exploration in Pakistan 1915-94. Oil & Gas J 94(20).
- [14] [14] Kadri (1995) Petroleum geology of Pakistan. Pak Pet Ltd, Karachi 1: 35–108.
- [15] [15] Young, H., 1992, 'First Oil in the Sind', in Hatley, Jr., A.G., ed., American Association of Petroleum Geologists, Tulsa, The Oil Finders. P.95-1 07.
- [16] [16] Kazmi AH, Rana A (1982) Tectonic map of Pakistan, at a scale of 1: 200000. Geological Survey of Pakistan, Quetta.
- [17] [17] Raza HA, Ali SM, Ahmed R (1990) Petroleum geology of Kirthar Sub-basin and part of the Kutch Basin, Pakistan. Pak J Hydrocarb R 2(1): 29–73.
- [18] [18] A. Zia, M. Awais, M.Ishaq, S. Hamid, N.Akhtar and L. Sheikh, "Application of well log Analysis to assess the petrophysical parameters of the early eocene Sui Main Limestone (SML) in Kharnhak-1 well, Middle Indus Basin, Pakistan",. Iranian Journal of Oil & Gas Science and Technology, vol. 5, no. 2, pp. 1-20, 2016.
- [19] [19] Watts, A. & Ryan, W., 1976. Flexure of Lithosphere and continental margin basins, Tectonophysics, 36(1-3), 25-44.

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AUTHORS CONTRIBUTION

Muhammad Haris is the corresponding and first author of this research. He has worked entirely over this project including well interpretations, write-up. Syed Kamran Ali is the supervisor of Muhammad Haris. Muhammad Haris collaborated with Shah Zeb Ali Muhammad Zaheer and Shahzad as co-authors and worked along with them entirely on this project including interpretations, technical write-up and formatting work. Tariq Mehmood is the Co-Supervisor of Muhammad Haris, thanks to his technical assistance and guidance during interpretations of well data. Thanks to the rest of all the other authors for their support, guidance and their extraordinary concerns in interpretations and write up of this entire project.

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CONFLICT OF INTERESTS

The authors have no conflict over this research.

Parasitic Helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable Fish Farm, Jos, Plateau State, Nigeria

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Abstract- Parasitic helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable fish farm, Jos, Plateau State, Nigeria was evaluated using standard parasitological procedures. 4 different parasite species belonging to 2 parasitic classes; 3 species of Cestode (*Bothriocephalus spp.*, *Diphilobothrium latum* and *Ligula intestinalis*) and a species of Nematode, (*Camallanus spp.*) were recovered from the studied fish species. A total of 113 parasites comprising of 52(46.02%) and 61(53.95%) parasites were recovered from 89 (59.30%), comprising of 41(54.70%) and 48(64.00%) infested *C. gariepinus* and *P. obscura*, respectively. Infestation was more in *C. gariepinus* compared to *P. obscura*. There was no significant difference ($p>0.05$) between the rate of parasitic prevalence of *C. gariepinus* and *P. obscura*. Variation in parasitic prevalence between the sexes of *C. gariepinus* and *P. obscura*, existed, being more prevalent in male *C. gariepinus* than the female but more prevalent in the female *P. obscura* than the male. However, there was no significant difference ($p>0.05$) in the infection rates with respect to the sexes of the fish species. The distribution of helminth parasites in the fishes showed a notable preference for the intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions. Intestine of the infested fish samples of both species had more parasites than the stomach. Larger sizes of *C. gariepinus* and *P. obscura* had more parasitic helminth load than the smaller sizes. Results of the correlation matrix for total number of parasites found on *C. gariepinus* and *P. obscura* showed that there was no significant difference ($P>0.05$) between total length and total number of parasites but there was a significant difference ($P<0.05$) between total length and weight and total number of parasites and weight of the samples of *C. gariepinus*. For *P. obscura*, there was a significant difference ($P<0.05$) between total length and weight, total length and total number of parasite and total number of parasites and weight of the fish species.

Index Terms- *Clarias gariepinus*, *Parachanna Obscura*, parasitic helminthes fauna, Length, Prevalence, Sex, Zoonotic threat

I. INTRODUCTION

Fish provides a comparatively cheap source of animal protein for man and his livestock and attention is now being focused on fish production, both from natural water and aquaculture (Komatsu and Kitanishi, 2015). It is highly priced in Nigeria either as smoked, dried or fresh.

Clarias gariepinus is generally classified as omnivores or predators feeding mainly on aquatic insects, fish and higher plants debris as reported for catfishes in the River Ubangui, Central African Republic (Ahmad, 2014). They have also been found to feed on terrestrial insects, molluscs and fruits. The catfishes utilize various kinds of food resources available in their habitat (Bruton, 2010). Studies on the biology, nutrition/growth and management of catfish have been carried out (Omeji *et al.*, 2013; Emere and Dibal, 2014).

African snakehead, *Parachanna obscura* is an emerging aquaculture candidate in Nigeria and the sub-Saharan region as a whole. The species is preferred for its palatable fillet and strong flesh integrity. Ama-Abasi and Ogar (2013) reported that the species is high in protein and fat contents thereby making it a good healing agent for post operation patients. *Parachanna obscura* has high economic value and represents a good potential for African aquaculture (Bolaji *et al.* 2011). It is not a fatty fish but an intermediate one (Mujinga *et al.* 2009). Because of its tasty flesh, with

only few bones, *P. obscura* is favourite food fish and constitute an extremely important part of the staple food for African people (O' Bryen and Lee 2007).

Like humans and other animals, fishes suffer from various disease and parasite infections (Bamidele, 2015). Parasitic diseases of fish are very common all over the world and are of particular importance in the tropics (Soliman and Nasr, 2015). Various parasites are associated with *C. gariepinus* in the wild and cultured environment where they cause morbidity, mortality and economic losses in aquaculture practice in various parts of the world (Biu *et al.*, 2013). There is an increasing awareness of the importance of parasitic diseases as one of the major detrimental factors in fish farming (Keremah and Inko-Tariah, 2013). However, paucity of information on the parasitic status of *C. gariepinus* and more especially, *P. obscura* necessitated this study with the view to determine the Helminth Bioload of *Clarias gariepinus* and *Parachanna Obscura* in the study area and quantifying the helminthic burden, evaluating the relationship between the helminthic burden and rate of infection, the sex and length of *C. gariepinus* and *Parachanna Obscura*.

II. MATERIALS AND METHODS

Sample collection and identification

150 samples comprising of 75 samples each of *C. gariepinus* and *P. Obscura* were randomly purchased live from a reputable fish farm, Jos, Plateau State, Nigeria located at latitude 9° 26' 14" N and Longitude 9° 13' 8" E. The fish samples were transported in 25 litre of 6 plastic containers containing water to the Department of Fisheries and Aquaculture Laboratory, Joseph Sarwuan Tarka University, Makurdi where they were sorted according to different sizes with the total length and weight of the fishes been measured using a ruler in centimetre (cm) and a top loading weighing balances (Golden Mettler, Model: GW: 1.3kg, NW; 1kg - US.) in grams, respectively. The sexes of the fishes were identified by visual examination of the urinogenital system.

Dissection of fish samples, Examination and identification of parasites

The fishes were immobilized by cervical dislocation for easy handling prior to dissection on a dissecting board and were dissected through the abdomen by making a longitudinal slit on the ventral surface from the anus to a point level with the pectoral fins using a surgical blade. The alimentary tract was isolated, stretched out and grouped into esophagus, intestine and stomach. Sections of the fish samples were placed into three separate Petri dishes containing 0.6% saline. Each section was slit longitudinally and examined for parasites using a Zpix microscope Mm640 connected to a laptop (6735s). Parasites found were counted, fixed and preserved in 10% formalin (Frimeth, 1994). After mounting the parasites on a slide in Canada balsam, they were later identified using technique described by Paperna (1996), Cheng (1973).

III. STATISTICAL ANALYSIS

Chi- square was used to investigate significant differences in prevalence rate. Descriptive statistics was used to show the parasitic loads of fish associated with sex using Social Science Software (SPSS 22.0).

IV. RESULTS

4 different parasite species belonging to 2 parasitic classes; Cestodes (*Bothriocephalus spp.*, *Diphilobothrium latum* and *ligula intestinalis*) and Nematode, *Camallanus spp.*) were recovered from the studied fish species (Table 1). All recovered and identified parasites were found in both *C. gariepinus* and *P. obscura* with the exception of *L. intestinalis* which was recovered from only *P. obscura*

Table 1 Parasites of *C. gariepinus* and *P. obscura* from Panyam Fish Farms, Jos

Class of parasites	Parasite species	Fish Host
Cestodes	<i>Bothriocephalus spp.</i>	<i>Clarias gariepinus</i> and <i>Parachanna obscura</i>
	<i>Diphyllobothrium latum</i>	<i>Clarias gariepinus</i> and

		<i>Parachanna obscura</i>
	<i>Ligula intestinalis</i>	<i>Parachanna obscura</i>
Nematode	<i>Camallanus spp.</i>	<i>Clarias gariepinus</i> and <i>Parachanna obscura</i>

Table 2 shows the overall prevalence of *C. gariepinus* and *P. obscura* from a reputable fish farm, Jos. Out of the 150 samples comprising of 75 each of *C. gariepinus* and *P. obscura*, a total of 89 (59.30%) were infested with *C. gariepinus* accounting for 41(54.70%) while *P. obscura* accounted for 48(64.00%). Infestation was more in *P. obscura* compared to *C. gariepinus*. However, there was no significant difference ($p>0.05$) between the rate of parasitic prevalence of *C. gariepinus* and *P. obscura* from the reputable Fish Farm, Jos

Table 2. Overall prevalence of *C. gariepinus* and *P. obscura* from a reputable Fish Farm, Jos.

Fish species	Number of fish examined	No. (%) of infested fish
<i>C. gariepinus</i>	75	41(54.70)
<i>P. obscura</i>	75	48(64.00)
Total	150	89(59.33)
χ^2		0.06
P value		0.16

$\chi^2 =$ Chi square, $p>0.05$

Table 3 shows the prevalence of parasite species infestation in relation to the infested body parts of *C. gariepinus* and *P. obscura* from reputable Fish Farms, Jos. A total of 113 parasites comprising of 52(46.02%) and 61(53.95%) parasites were recovered from *C. gariepinus* and *P. obscura*, respectively. Out of the 52 (46.02%) parasites recovered from *C. gariepinus*, *Camallanus spp.* recorded the highest number/percentage parasite 26(50.00%) while the least 8(15.38%) was recorded for *Bothriocephalus spp.* Out of the 61 (53.95%) parasites recovered from *P. obscura*, while *Camallanus spp.* recorded the highest number/percentage parasite 27(44.26%), the least 5(8.20%) was recorded for *L. intestinalis*.

Generally, out of the 113 parasites recovered from the fish species, while *D. latum* recorded the highest number/percentage parasite 45(39.82%), *L. intestinalis* recorded the least number/ percentage parasite 45(4.42%)

Table 3. Prevalence of infection in *C. gariepinus* and *P. obscura* in relation to the infested body parts of the host fish from a reputable Fish Farms, Jos

Fish species	Parasite species	No. of fish infested	Prevalence	Site of infection/No. of parasites			Total No. (%) parasite	intensity
				Esophagus	Intestine	Stomach		
<i>C. gariepinus</i>	<i>Bothriocephalus spp.</i>	7	9.30	1	4	3	8(15.38)	1.14
	<i>D. latum</i>	15	20.00	0	11	7	18(34.62)	1.20
	<i>Camallanus spp.</i>	19	25.30	0	16	10	26(50.00)	1.37
	Total	41	54.70	1	32	20	52(100.00)	3.71
<i>P. obscura</i>	<i>Bothriocephalus spp.</i>	13	17.30	3	7	5	15(24.59)	1.15
	<i>D. latum</i>	22	29.30	0	19	8	27(44.26)	1.23
	<i>Camallanus spp.</i>	10	13.30	0	3	11	14(22.95)	1.40
	<i>Ligula intestinalis</i>	3	4.00	0	5	0	5(8.20)	1.67
	Total	48	64.00	3	36	25	61(100.00)	5.45
Synopsis of each parasite								
	<i>Bothriocephalus spp.</i>	20(22.47)	26.70	4	11	8	23(20.35)	2.29
	<i>D. latum</i>	37(41.57)	49.30	0	30	15	45(39.82)	2.43
	<i>Camallanus spp.</i>	29(32.58)	38.70	0	19	21	40(35.40)	2.77
	<i>Ligula intestinalis</i>	3(3.37)	4.00	0	5	0	5(4.42)	1.67
	Total No.(%)	89(100.00)	59.30	4(3.54)	65(57.72)	44(38.94)	113(100.00)	9.16

% = Percentage

Table 4 shows the infestation status, percentage parasite burden and prevalence of the sexes of *C. gariepinus* and *P. obscura* from a reputable Fish Farm, Jos. Out of the 75 samples of *C. gariepinus* while 41 comprising of 27 (65.90%) male and 14(34.10%) female were infested, 34 samples comprising of 19 (55.90%) males and 15(44.10%) females were not infested. Out of the infested samples of *C. gariepinus*, male had higher percentage prevalence (36.00%) than the female (18.70%). Out of the 75 samples of *P. obscura*, while 24 comprising of 17 (35.40%) infested and 7(25.90%) non infested samples were male, 51 comprising of 31(64.60%) infested and 20(74.10%) non infested samples were female. Female *P. obscura* had higher percentage prevalence (41.30%) than the male (22.70%). The study revealed that there was no significant difference ($p>0.05$) in parasite burden between the male and female *C. gariepinus* and *P. obscura*, respectively.

Table 4. The infestation status, percentage parasite burden and prevalence of the sexes of *C. gariepinus* and *P. obscura* from a reputable Fish Farms, Jos

Fish species	No.(%) of fish Examined	Infestation status			No.(% parasite burden	Prevalence
		No.(%) infested	No.(%) non infested	non infested		
<i>C. gariepinus</i>						
Male	46	27(65.90)	19(55.90)	29(55.80)	36.00	
Female	29	14(34.10)	15(44.10)	23(44.20)	18.70	
Total	75	41(54.70)	34(45.30)	52(100.00)	54.70	
<i>P. obscura</i>						
Male	24	17(35.40)	7(25.90)	26(42.60)	22.70	
Female	51	31(64.60)	20(74.10)	35(57.40)	41.30	
Total	75	48(64.00)	27(36.00)	61(100.00)	64.00	

No. = Number, % = Percentage

Table 5 shows the results of the size variation in the prevalence of helminth parasites of *C. gariepinus* and *P. Obscura* from a reputable fish farm, Jos, Plateau State, Nigeria. For samples of *C. gariepinus*, fishes with standard length range of 42.10-46.10cm were most infected with a prevalence of 77.78% followed by fishes within the length range of 46.10-48.00cm with a prevalence rate of 70.00%. Fishes within the range of 38.10-42.10cm had the least prevalence rate of 36.36%. Highest number/percentage parasite 22(42.31%) was recorded for fishes within the range of 42.10-46.10cm while the least 5(9.62%) was recorded for fishes within the range of 38.10-42.10cm

For samples of *P. obscura*, fishes with standard length range of 29.10-31.10cm were most infected with a prevalence of 77.78% followed by fishes within the length range of 25.00-27.00cm with a prevalence rate of 52.38%. Fishes within the range of 27.10-29.10cm had the least prevalence rate of 33.33%. Highest number/percentage parasite 29(47.54%) was recorded for fishes within the range of 25.00-27.00cm while the least 7(11.48%) was recorded for fishes within the range of 27.10-29.00cm.

Table 5. Prevalence of parasite species of *C. gariepinus* and *P. obscura* with respect to length groups from a reputable Fish Farm, Jos

Fish species/Total length groups (cm)	Parasite species				TNP. (%) Parasite
	<i>Bothriocephalus spp.</i>	<i>D. latum</i>	<i>Camallanus spp.</i>	<i>L. intestinalis</i>	
<i>C. gariepinus</i>					
34.0-38.0	2(13.33)	1(7.69)	5(20.83)	0(0.00)	8(15.38)
38.1-42.0	4(26.67)	5(38.46)	2(8.33)	0(0.00)	11(21.15)
42.1-46.0	8(53.33)	3(23.08)	11(45.83)	0(0.00)	22(42.31)
46.1-48.0	1(6.67)	4(30.77)	6(25.00)	0(0.00)	11(21.15)
Total	15(28.85)	13(25.00)	24(46.15)	0(0.00)	52(100.00)
<i>P. obscura</i>					
25.0-27.0	7(24.14)	3(33.33)	0(0.00)	1(16.67)	8(13.11)
27.1-29.0	9(31.03)	0(0.00)	13(76.47)	0(0.00)	22(36.07)
29.1-31.0	13(44.83)	6(66.67)	4(23.53)	5(83.33)	28(45.91)
Total	29(47.54)	9(14.75)	17(27.87)	6(9.84)	61(100.00)

Results of the prevalence of parasite species of *C. gariepinus* and *P. obscura* with respect to the weight groups from a reputable Fish Farm are shown in Table 6.

For *C. gariepinus*, highest percentage parasite infestation (36.54%) was recorded for length group 616.74-666.1g, the lowest (7.69%) was recorded for length group 466.71-516.1g. no parasite was recorded for length group 416.70-466.0g.

For *P. obscura* while highest percentage parasite infestation (34.43%) was recorded for weight groups 200.1-225.0g, the lowest (9.84% each) was recorded for weight groups of 125.0-150.0g and 150.1-175.0g, respectively.

Generally, of the parasite species from *C. gariepinus* with respect to weight, while *Camallanus sp* (46.15%) accounted for the highest percentage parasite infestation, the least (25.00%) was recorded for *D. latum*. On the other hand, while *Bothriocephalus sp* (47.54%) accounted for the highest percentage parasite infestation for *P. obscura*, the least (9.84%) was accounted for *L. intestinalis*.

Table 6 prevalence of parasite species of *C. gariepinus* and *P. obscura* with respect to weight groups

Fish species/weight groups (grams)	Parasite species				TNP. (%) Parasite
	<i>Bothriocephalus spp.</i>	<i>D. latum</i>	<i>Camallanus spp.</i>	<i>L. intestinalis</i>	
<i>C. gariepinus</i>					
416.70-466.70	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
466.71-516.71	0(0.00)	3(23.08)	1(4.17)	0(0.00)	4(7.69)
516.2-566.72	0(0.00)	5(38.46)	0(0.00)	0(0.00)	5(9.62)
566.73-616.73	5(33.33)	0(0.00)	4(16.67)	0(0.00)	9(17.31)
616.74-666.74	7(46.67)	1(7.69)	11(45.83)	0(0.00)	19(36.54)
666.75-716.75	3(20.00)	4(30.77)	8(33.33)	0(0.00)	15(28.85)
Total	15(28.85)	13(25.00)	24(46.15)	0.00(0.00)	52(100.00)
<i>P. obscura</i>					
125.0-150.0	3(10.34)	3(33.33)	0(0.00)	0(0.00)	6(9.84)
150.1-175.0	2(6.90)	1(11.11)	3(17.65)	0(0.00)	6(9.84)
175.1-200.0	11(37.93)	0(0.00)	1(5.88)	0(0.00)	12(19.67)
200.1-225.0	8(27.59)	5(17.24)	6(35.29)	2(33.33)	21(34.43)
225.1-250.0	5(17.24)	0(0.00)	7(41.18)	4(66.67)	16(26.23)
Total	29(47.54)	9(14.75)	17(27.87)	6(9.84)	61(100.00)

Results of the correlation matrix for total number of parasites found on *C. gariepinus* and *P. obscura* are as shown in Table 7. For *C. gariepinus*, there was no significant difference ($P>0.05$) between total length and total number of parasites but there was a significant difference ($P<0.05$) between total length and weight and total number of parasites and weight of the fish species. For *P. obscura*, there was there was a significant difference ($P<0.05$) between total length and weight, total length and total number of parasite and total number of parasites and weight of the fish species.

Table 7. Correlation matrix for total length, weight and number of parasites in *C. gariepinus* and *P. obscura* from a reputable Fish Farm, Jos

	<i>C. gariepinus</i>			<i>P. obscura</i>		
	TL	WT	TNP	TL	WT	TNP
TL	1.00			1.00		
WT	0.844*	1.00		0.865*	1.00	
TNP	0.043	0.173*	1.00	0.233*	0.206*	1.00

TL = Total length, WT = Weight, TNP = Total number of parasite.

*Correlation is significant at the $p<0.05$ level (two tailed)

V. DISCUSSION

Parasitic helminth fauna of *Clarias gariepinus* and *Parachanna Obscura* from a reputable fish farm, Jos, Plateau State, Nigeria was evaluated using standard parasitological procedures. The helminth parasites recovered were *Bothriocephalus spp.*, *Diphillobothrium latum*, *Camallanus spp.* and *Ligula intestinalis*. Among these parasites, while *Bothriocephalus spp.*, *D. latum* and *Camallanus spp.* were recorded from both *C. gariepinus* and *P. obscura*, *L. intestinalis* was recorded from only *P. obscura*. *Bothriocephalus spp.* was recovered from the esophagus, intestine and stomach of both infested fish samples, *D. latum* and *Camallanus spp.* were recovered from the intestine and of both species while *L. intestinalis* was recovered from the intestine of only *P. obscura*.

The recovery of these parasites in the present study is not amazing as they have been previously recovered from same fish species or other freshwater fish species from elsewhere. Afolabi *et al.*, (2020) reported *Camallanus spp.* in their comparative study of African catfish parasites from cultured and natural habitats, Bichi, and Yelwa, (2010) recovered *Bothriocephalus spp.* from *C. gariepinus* (Teugels) at Bagauda Fish Farm, Kano, Auta *et al.*, (2019) recovered *Bothriocephalus spp.* from *C. gariepinus* caught in selected points along River Kaduna, Nigeria, Also, the recovery of *D. latum* and *Camallanus spp.* from the studied fish is not surprising as they have been recovered from other freshwater fish species. Absalom *et al.*, (2018) documented the presence of *D. latum* in *C. gariepinus* from River Gudi Nigeria, Solomon *et al.*, (2018) reported *Camallanus spp.* from *Bagrus bayad* from Lower River Benue Makurdi, Nigeria; Omeji *et al.*, (2018) reported *D. latum* from *Synodontis euptera* and *Auchenoglanis occidentalis* from Lower River Benue, Nigeria, Osho, (2017) reported *D. latum*, *Camallanus spp.* and *L. intestinalis* from *Parachanna obscura* in River Ogun, Southwest Nigeria.

The presence of these parasites in the studied fish could cause some pathological effects such as mechanical damage (fusion of gill lamellae, tissue replacement), physiological damage (cell proliferation, immunomodulation, altered growth, detrimental behavioral responses,) and/or reproductive damage (Knudsen *et al.* 2009, Al-Jahdali and Hassanine 2010) in the fish and even reducing the market value of the infested fish. The parasites could become zoonotic if the fish are not properly cooked before consumption (Kawe *et al.*, 2016).

The problem of fish infestation by parasites in the study area could be attributed to pond fertilization using organic manure from commercial farms, especially poultry. The use of organic materials as fertilizers in fish farming may not only harbor pathogenic parasites but also confers resistance to antibiotics by transferring antibiotic residuals or resistant parasites to fish especially if such manure is obtained from commercial farms (Adegoke *et al.*, 2016). According to the authors, Organic fertilizers are an essential source for plant nutrients and a soil conditioner in agriculture. Due to its sources and the composition of the organic inputs as well as the type, functionality and failures of the applied treatment process, the organic fertilizer may contain various amounts of infectious agents and toxic chemicals, especially the antibiotics that can be introduced to the subsequent food chain.

The overall prevalence of helminth parasites recorded in this study (59.33%) for *C. gariepinus* and *P. obscura* was high. In the findings of other researchers in Nigeria, such high prevalence has been reported. Anosike *et al.* (1992) recorded a prevalence rate of 59.8%, Salawu *et al.* (2013) reported a prevalence rate of 75%.

The high prevalence of parasites in the study area could be attributed to the availability of conditions that favoured parasite infestation such as pollution, the host and its feeding habits, availability of intermediate hosts, which harbour the infective larval stage of some of these helminth parasites making them available to the fish in their habitat, occasional surveillance, overcrowding of fish in the culture medium and periodic checks of the water body for parasites. This study agrees with the reported work of Enyidi and Maduakor (2017). In the fish farms, farmers are allowed to indiscriminately dispose of their waste and faecal matters therein which subsequently washed into the pond thus providing suitable conditions for parasites to flourish. Also, differences in prevalence of parasites in fish may be due to several other factors. Williams and Jones (1994) suggested that parasitism differs in various aquatic ecosystems and this is determined by the interaction between biotic and abiotic factors. Fish species in good environmental conditions rarely come down with diseases (Oswald and Hulse, 1992). Reports have also shown that helminths are generally found in all freshwater fishes, with their prevalence and intensity dependent on factors of parasite species and their biology, host and its feeding habits, physical factors and hygiene of the water body, and presence of intermediate hosts where necessary (Shukerova *et al.*, 2010; Hussen *et al.*, 2012).

Variation in parasitic prevalence between the sexes of *C. gariepinus* and *P. obscura*, existed, being more prevalent in male *C. gariepinus* than the female but more prevalent in the female *P. obscura* than the male although, there was no significant difference ($p > 0.05$) in the infection rates with respect the sexes of the fish species. This indicates that parasitic helminth infection of *C. gariepinus* and *P. obscura* from the reputable Fish Farm, Jos was independent of sex

The higher infection rate recorded for male *C. gariepinus* than the female in this study is at variance with the finding of Hassan *et al.*, (2010), who reported higher infection rate in female samples of *C. gariepinus* than the male even though there was no significant difference in the infection rates between the sexes of *C. gariepinus* from Lekki Lagoon.

The higher infection rate recorded for female *P. obscura* than the male in this study is in agreement with the findings of Osho (2017) who reported that there was no significant difference in the infection rates between male and female of *P. obscura*, even though the female samples had higher rate of infection than the male. However, Oben *et al.*, (2015) discovered that female samples of *P. obscura* from the lower Cross River system had significantly lower parasite burden than the male samples. Differences in the incidence of infestation between male and female fish may be due to differential feeding either by quantity or quality of food eaten or as a result of different degrees of resistance and infection (Emere, 2000).

In this study, the distribution of helminth parasites in the fishes showed a notable preference for the esophagus, intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions, this agrees with the earlier work of (Goselle *et al.*, 2008) and few others who showed that helminths have preference for region of attachment in the alimentary canal of fish. Never the less, intestine had higher percentage parasite infestation than the esophagus and stomach. The higher prevalence of parasites in the intestine compared to the esophagus and stomach signifies that intestine was the most preferred predilection site and this could be due to the favourable conditions and large surface area provided by the intestine which enhanced their survival (Owolabi, 2008). Similar finding was reported by (Aliyu and Solomon. 2012).

This study revealed that the larger sizes of *C. gariepinus* and *P. obscura* from the reputable Fish farm, Jos had more parasitic helminth load than the smaller sizes. The number of parasites for most of the organisms was dependent on the size of the fish. The high incidence of infestation obtained in the bigger size fish compared to the smaller fish could be an indicator that size of the fish is important in determining the parasite load. Mohammed *et al.*, (2009) reported that prevalence was found to increase as the fish grew, and that

could be attributed to the longer time of exposure to the environment by body size. The differences in parasitic load could also be attributed to the random selection of the fish samples in the different length and weight groups and to the probable high level of immunity built up in the fish samples (Kawe *et al.*, 2016, (Akinsanya *et al.* (2008). Similar observation had been made by Uruku and Adikwu (2017, Omeji *et al.*, (2014)

CONCLUSION

From this study, *C. gariepinus* and *P. obscura* were infested with different helminth parasites belonging to 3 species of class cestode and a species of nematode. These two freshwater fish species with high economic values could be of serious potential health hazard to consumers if not well taken care of as food and delicacies prepared without adequate processing has the potential of infecting consumers with helminthiasis and thereby constituting health risk.

In order to avert zoonotic cases, relevant government authorities and policy makers should take note of this health issues which could become a menace to fish consumers and ensure that adequate measures are taken most especially, in the processing of these fish for consumption to ensure that the fish meets food safety standards.

REFERENCES

- [1] Absalom, K.V., Makpo, J.K. and Mustapha, A.J. (2018). Prevalence of gastrointestinal helminth parasites of *Clarias gariepinus* at River Gudi, Akwanga Local Government Area of Nasarawa State, Nigeria. *International Journal of Fisheries and Aquaculture Research* 4(1):9-15
- [2] Adegoke, A.A., Awolusi, O.O. and Stenström, T.A. (2016). Organic Fertilizers: Public Health Intricacies. Open Access Peer-Reviewed Chapter. DOI: 10.5772/64195
- [3] Afolabi, J.O., Olususi, F.C. and Odeyemi, O.O. (2020). Comparative study of African catfish parasites from cultured and natural habitats *Bulletin of the National Research Centre*. 44:163
- [4] Ahmad, M.T. (2014). Effect of *Mangifera indica* L. (Mango) Kernel on *Clarias gariepinus*
- [5] (African catfish) Fingerlings Infected with *Aeromonas caviae* (Doctoral dissertation).
- [6] Department of Veterinary Pharmacology and Toxicology, Ahmadu Bello University, Zaria, Nigeria. Pp. 1-12.
- [7] Aliyu, M.D., Solomon and J.R. (2012). The intestinal parasite of *Clarias gariepinus* found at lower Usman Dam, Abuja. *Researcher* 4(9):38–44
- [8] Al-Jahdali, M.O., and El-S Hassanine, R.M. (2010). Ovarian abnormality in a pathological case caused by *Myxidium* sp. (Myxozoa, Myxosporidia) in onepot snapper fish *Lutjanus monostigma* (Teleostei, Lutjanidae) from the Red Sea. *Acta Parasitologica* 55:1-7.
- [9] Ama-Abasi D. and Ogar, A. (2013). Proximate composition of Snakehead, *Parachanna obscura* from the Cross River, Nigeria. *Journal of Fisheries and Aquatic Sciences*. 8(1):295-298.
- [10] Anosike, J. C., Omoregie, E., Ofojekwu, P. C. and Nweke, I. E. (1992). A survey of Helminths parasites of *Clarias gariepinus* in Plateau State. *Nigeria Journal of Aquatic Sciences*, 1: 39 - 43. 7
- [11] Auta, I.K., Badaru, A.A. Ibrahim, B. and Abdullahi, S.A. (2019). Occurrence of helminths on *Clarias gariepinus* (African catfish) caught in selected points along River Kaduna, Nigeria. *Science World Journal* Vol. 14(No 3) 2019
- [12] Bamidele A (2015). A two fish species study of the parasitic helminth fauna of *Synodontis*
- [13] *filamentosus* (BOULENGER, 1901) and *Calamoichthys calabaricus* (SMITH, 1865)
- [14] From Lekki Lagoon, Lagos, Nigeria. *Ife Journal of Science*, 17(1): 97-108.
- [15] Bichi, A.H. and Yelwa, S.I. (2010). Incidence of piscine parasites on the gills and gastrointestinal tract of *Clarias gariepinus* (Teugels) at Bagauda Fish Farm, Kano
- [16] Biu, A. A, and Akorede, G. J. (2013). Prevalence of endoparasites of *Clarias gariepinus* (Burchell, 1822) in Maiduguri, Nigeria. *Nigeria Journal of Fisheries and Aquaculture*. 1(1): 20-24
- [17] Bolaji, B.B., Mfon, T.U. and Utibe, D.I. (2011) Preliminary study on the aspects of the biology of snakehead fish *Parachanna obscura* (Gunther) in a Nigerian wetland. *Afri J Food Agri Nutr Dev* 11(2):4708–4717
- [18] Bruton, M.N. (2010). The food and feeding behaviour of *Clarias gariepinus* (Pisces, Clariidae) in lake Sibaya, South Africa, with its emphasis on its role as a predator
- [19] of cichlids. *Transactions of the Zoological Society*. 35 (1): 47.
- [20] Cheng T (1973). *General Parasitology*. Academic press, New York, USA. Pp 965.
- [21] Emere, M.C. and Dibal, D.M. (2014). Diseases of a (Clarifies *gariepinus*) fresh water fish from
- [22] river Kaduna, Nigeria. *World Rural Observations*, 6(2): 77-81.
- [23] Emere, M.C. (2000). Parasitic infection of the Nile perch (*Lates niloticus*) in River Kaduna.
- [24] *Journal of Aquatic Sciences*. 15: 51-54.
- [25] Enyidi, U.D. and Maduakor, C. J. (2017). Prevalence of bacteria and nematode parasites in African catfish *Clarias gariepinus* cultured in smallholder concrete ponds in Nigeria. *Journal of Biology and Nature* 7(4): 169-176, 2017
- [26] Frimeth, J. (1994). *General Procedures for Parasitology*. In: Suggested procedures for
- [27] the detection and identification of certain finfish and shellfish pathogens, (Thoesen
- [28] J, editor). Fourth edition, Fish Health Section, Bethesda, MD: American
- [29] Fisheries Society. Pp 5-6.
- [30] Goselle, O.N., Shir, G.I., Udeh, E.O., Abelau, M. and Imandeh, G.N. (2008). Helminth parasites of *Clarias gariepinus* and *Tilapia zilli* at Lamingo Dam, Jos, Nigeria. *Science World*
- [31] *Journal*, 3(4): 23-27.
- [32] Hassan, S. M. Haq, A. U. Byrd, J.A. Berhow, M.A. Cartwright, A.L. and Bailey, C.A. (2010). Haemolytic and antimicrobial activities of saponin-rich extracts from guar meal. *Food Chem.*, 119:600–605
- [33] Hussen, A., Tefera, M. and Asrate, S. (2012). Gastrointestinal helminth parasites of *Clarias gariepinus* (Catfish) in Lake Hawassa Ethiopia. *Scientific Journal of Animal Science*, 1(4): 131-136.

- [34] Kawe, S.M., God'spower, R.O., Balarabe, M.R. and Akaniru, R.I. (2016). Prevalence of gastrointestinal helminth parasites of *Clarias gariepinus* in Abuja, Nigeria. *Sokoto J Vet Sci* 14(2):26–33
- [35] Keremah, R.I. and Inko-Tariah, M. B. (2013). Comparative study of ectoparasites on Nile tilapia (*Oreochromis niloticus*) cultured under integrated and unintegrated pond systems. *African Journal of Biotechnology*, 12(19): 2711.
- [36] Knudsen, R., Amundsen, P.A., Jobling, M., and Klemetsen, A. (2009). Differences in pyloric caeca morphology between Arctic char *Salvelinus alpinus* ecotypes: adaptation to trophic specialization or parasite-induced phenotypic modifications? *Journal of Fish Biology* 73:275-287.
- [37] Komatsu, K. and Kitaniishi, K. (2015). Household Protein Intake and Distribution of Protein Sources in the Markets of Southern Ghana: A Preliminary Report. *African Study Monographs*., 51(3): 157-173
- [38] Mohammed, A., Kalu, A.U., Yem, I.Y., Kolndacha, O., Nyaku, R, E. and Sanni, A. O. (2009) Bacteriological quality of *Clarias gariepinus* (Burchell, 1822) in lake Alau, Borno State, Nigeria. *Best Journal* 6 (1), 15 –18.
- [39] Mujinga, W., Mutala, S. and Hu'sken, S.M.C. (2009) Rapport d'analyse et table de valeur bromatologique de cate'gorie des poisons trouve's sur les marche's de poisson a' Lubumbashi, Re'publique De'mocratique du Congo. Programme re'gional Les pe^ches et le VIH/SIDA en Afrique: investir dans des solutions durables. Rapport de projet du WorldFish Center, 14 p
- [40] O' Bryen, P.J. and Lee, C.S. (2007) Discussion summary: socioeconomic aspects of species and systems selection for sustainable aquaculture. In: Leung P, Lee CS, O' Bryen PJ (eds) *Species and system selection for sustainable Aquaculture*. Blackwell Publishing, Oxford, pp 477–487
- [41] Oben, B.O., Molua, E. L. and Oben, P.M. (2015). Profitability of Small-Scale Integrated Fish-Rice-Poultry Farms in Cameroon. *Journal of Agricultural Science*. Vol. 7, No. 11. Pp 232 – 244.
- [42] Omeji, S, Solomon, S.G. and Uloko, C. (2013). Comparative study on the Endo-parasitic
- [43] infestation in *Clarias gariepinus* collected from earthen and concrete ponds in
- [44] Makurdi, Benue State, Nigeria. *Journal of Agriculture and Veterinary Science*, 2(1).
- [45] Omeji, S., Tihamiyu, L.O., Annune, P.A. and Solomon, S.G. (2014) Ecto and intestinal parasites of *Malapterurus electricus* from Upper River Benue. *Journal of Global Biosciences* Volume 3, Number 6, 2014, pp. 895-903
- [46] Omeji, S., Garba, A.A. and Agbo, J.O. (2018). Endoparasitic fauna and Condition factor of
- [47] two fish species from Lower River Benue, Nigeria. *International Journal of Life Sciences Research*. Vol. 6, Issue 3, pp: (368-375)
- [48] Osho, F.E. (2017). Parasitic helminth fauna of *Parachanna obscura* in River Ogun, Southwest Nigeria. *African Journal of Resources Management Fisheries and Aquatic*. Pp 79-85
- [49] Oswald, E., and Hulse, J.H. 1992. *Fish quarantine and Fish disease in South East Asia*.
- [50] Report of Workshop held in Jarkata, Indonesia. Coordinating Programme
- [51] (Philippines) and International Development Resource Centre, Canada. 5pp.
- [52] Owolabi, O. D. (2008). Endoparasitic Helminths of the UpsideDown Catfish, *Synodontis membranaceus* (Geoffroy Saint Hilarie) in Jebba Lake, Nigeria. *International Sokoto Journal of Veterinary Sciences*, Volume 14 (Number 2). August, 2016 33 *Journal of Zoological Research*, 4(3):181-188.
- [53] Paperna, I. (1996). *Parasites, Infections and Diseases of Fishes in Africa: An Update*. Food and Agriculture Organization of the United Nations, Rome, Italy, ISBN-13: 9789251037720,
- [54] pp: 1-22.
- [55] Salawu M. T., Morenikeji, O. A., Sowunmi, A. A. and Odaibo, A. B. (2013). Comparative survey of helminth parasites of *Clarias gariepinus* and *Clarias pachynema* from the Ogun River and Asejire Dam in south-west Nigeria, *International Journal of Fisheries and Aquaculture*, 5[1]: 7-11.
- [56] Shukerova, S., Kirin, D. and Hanzelova, Y. (2010). Endo helminth communities of the perch, *Perca fluviatilis* (Perciformes: Percidae) from Srebama biosphere reserve, Bulgaria. *Helminthologia*, 47(2):99-104
- [57] Soliman, N.F. and Nasr, S.M. (2015). Metal contents in common edible fish species and
- [58] evaluation of potential health risks to consumers. *Journal of Coastal Life Medicine*, 3(12): 956-961.
- [59] Solomon, S.G., Omeji, S. and Attai, A.F. (2018). Endoparasitic Helminths of *Bagrus bayad* from lower river Benue Makurdi, Nigeria. *International Journal of Fisheries and Aquatic Research*. pp. 50-53
- [60] Uruku, M.N. and Adikwu, I.A. (2017) Seasonal prevalence of parasites of clariids fishes from the lower Benue River, Nigeria. *Nig J Fish Aquacult* 5(2):11–19
- [61] Williams, H. and Jones, A. (1994). *Parasitic Worms of Fish*. Taylor and Francis, United Kingdom.

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A Study on Mental Health and Life Satisfaction among Management Female Students in Ranchi Town

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Abstract- The present study aims to investigate the impact of religion and marital status on mental health and life satisfaction among management female students. The sample was consisted of 80 management students selected by stratified random sampling from different institutions located in Ranchi town. The stratification was based on two groups of religion (Hindu and Muslim) and marital status (married and unmarried). In total, there were four sample sub - groups based on 2 x 2 factorial design and for each sample sub-group, 20 cases were selected randomly. General Health Questionnaire (GHQ)-12 by Shamsunder et al. (1986) and Goutam et al. (1987) was applied to measure the level of mental health. Life Satisfaction Scale by Q.G. Alam (2001) was used to find out the level of life satisfaction among the student sample. ANOVA, t-test and Correlation were used to analyze the data by SPSS. The results indicated that there was no significant effect of religion on mental health and life satisfaction. There was significant effect of marital status on mental health and life satisfaction of the student sample. Mean scores revealed that unmarried management female students have better mental health and more satisfied with life as compared to married management female students. And co-relation between mental health and life satisfaction was found significant in relation to religion (Hindu and Muslim) and marital status (married and unmarried).

Index Terms- life satisfaction, mental health, religion, marital status

I. INTRODUCTION

Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make choices. Mental health is important at every stage of life, from childhood and adolescence through adulthood. Mental health is a level of psychological well-being, or an absence of mental illness. It is the "psychological state of someone who is functioning at a satisfactory level of emotional and behavioural adjustment". Komrad (2012) asserts that "mental health problems affect all segments of the society, regardless of age, gender, education, or ethnicity". Bhatia (1982) considered mental health as the ability to balance feelings, desires, ambitions and ideas in one's daily living. It means the ability to face and accept the realities of life. According to the World Health Organization, however, mental health is "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community."

Life satisfaction is an overall assessment of feelings and attitudes about one's life at a particular point in time ranging from negative to positive. It is one of three major indicators of well-being: life satisfaction, positive affect and negative affect (Diener, 1984). Life satisfaction is the way people show their emotions and feelings (moods) and how they feel about their directions and options for the future. Life satisfaction gives meaning to one's life and it can be source of a feeling or self-worth. In the Indian context, most of the elderly review their part life in terms of self-fulfilment (Butler, 1976). Ruchi Sundriyal and Dr. Ravindra Kumar conducted a study in 2013 on Depression and Life Satisfaction among 60 Married & Unmarried Women. Results found that there is significant difference regarding depression and life satisfaction between married and unmarried woman. Results revealed that unmarried women have higher depression in compare to married women. On life satisfaction scale unmarried women have higher life satisfaction in compare to married women. Saleh A. Al Khatib studied in 2013 to investigate the predictive role of life satisfaction, self-esteem, gender and marital status on depressive symptoms. The sample consists of 547 (315 female; 232 males) undergraduate students from university of Science and Technology in United Arab Emirates. The findings show that Female students reported higher level of depressive symptoms than males. Also single students obtained higher depression than married. The findings showed that lower life satisfaction and lower self-esteem were associated with high levels of depressive symptoms. Guarnaccia and Worobey, (1991) investigated the effects of marital status on levels of depressive symptoms. Their findings revealed that unmarried women reported higher levels of depressive symptoms than married women. Similar results were found in a study conducted by Roberta and Roberts (1982). Recently, Talaei et al. (2009) conducted a research on 1300 Iranian man college students to investigate the correlation between depression, self-esteem, and support among

Iranian college students. Their findings showed that single students experienced more depression than the married. Fergusson, McLeod, Horwood and Swain (2015) studies that mental health was strongly associated with life satisfaction. Overall, this study showed that life satisfaction influences mental disorder, and mental disorder influences life satisfaction.

Raj, Kumar and Verma (2017) examined the relationship between life satisfaction and mental health on research scholars from the Tata Institute of Social Sciences (TISS) & International Institute for Population Sciences (IIPS). Out of total 144 participants, 94 respondents were taken from IIPS and 50 respondents from TISS. Findings of the study clearly highlighted the role of life satisfaction in determining mental health of the research scholar.

II. OBJECTIVES

- i. To study the impact of religion and marital status on mental health of the female students.
- ii. To study the impact of religion and marital status on life satisfaction of the female students
- iii. To study the inter-relationship between mental health and life satisfaction

III. Hypotheses

- i. There may be significant impact of religion on mental health.
- ii. There may be significant impact of marital status on mental health.
- iii. There may be significant impact of religion on life satisfaction.
- iv. There may be significant impact of marital status on life satisfaction.
- v. There may be significant relationship between mental health and life satisfaction.

IV. Methodology

Research design

a) Sample

The sample of present study was consisted of 80 management students selected by stratified random sampling from different management institutions in Ranchi town. In total there were 4 sample sub-groups based on 2x2 factorial design and for each sample sub- group, 20 cases were selected randomly.

The criteria of the stratification were:-

- Religion – 2 (Hindu and Muslim)
- Marital status-2(married and unmarried).

b) Research design

Table –1:

Religion	Hindu		Muslim	
	Married	Unmarried	Married	Unmarried
Marital status	20	20	20	20
Total	40		40	
Grand Total	80			

Tools:

The following tools were used for the study

i. Personal Data Questionnaire:

This questionnaire was designed by the researcher to collect information about the respondents' personal history viz. name, age, gender, marital status ,religion, education, Institution, place of residence, family income etc.

ii. General Health Questionnaire (G.H.Q.) -12:

General Health Questionnaire (G.H.Q.)-12 was developed by David Goldberg and Paul Williams, (1979). Hindi version was developed by Sham sunder et.al, (1986) and Goutam et.al, (1987).. Half items are positively framed (e.g. 'Over the past few weeks, have you been able to enjoy your normal day to day activities?') and half are negatively framed (e.g. 'Over the past few week, have you lost much sleep over worry?').It has four response alternatives. Scores 0 0 1 1 are divided from positive to negative items. Thus GHQ-12,

Offers a possibility of maximum score of 12. A total GHQ-12 scores have been calculated by summing all scores, where higher score indicated higher level of psychological distress. Reliability of the test was 0.83 determined by test - retest method and the validity was 0.73.

iii. **Life Satisfaction Scale**

This test was developed by Q. J. Alam and Ramji Srivastava (2001) which consists of 60 items. Every item has to be responded either in 'yes' or 'no'. There is no other alternative. Every 'yes' response is assigned 1 score. The test retest reliability was 0.84. The validity of the scale was obtained by correlating it with Saxena's Adjustment Inventory and Srivastava's Adjustment Inventory. The quotient obtained was .74 and .82 respectively).

III. RESULTS & ANALYSIS

Table-2: Analysis of Variance (ANOVA) showing the impact of religion and marital status on mental health:

Mental Health					
Sources of Variations	Sum of Square	df	Mean Square	F Value	Level of Significance
Main Effects					
A. Religion	0.013	1	0.013	0.29	NS
B. Marital status	2.813	1	2.813	6.62	SIG
Interaction Effects					
A X B	0.112	1	0.112	0.26	NS
Within (Error)	32.25	76	0.424		

NS: Not Significant

** Significant at 0.01 level

The result of Analysis of Variance (ANOVA) shown in above table summarized as follows:

Main Effects

- The F value of religion is 0.29, which is found statistically not significant. It indicates that Hindu and Muslim female students did not differ significantly on mental health.
- The F value of marital status is 6.62, which is found statistically significant. It shows that married and unmarried female students were significantly differ on mental health.

Interaction Effects

- The F value of A x B (Religion and marital status) factors is 0.26, which is found statistically not significant. It indicates that religion and marital status jointly did not effect on mental health of the sample.
- Above result are shows that hypothesis (i): 'There may be significant impact of religion on mental health.' is not significant. Hypothesis has not proved.
- Hypothesis (ii) 'There may be significant impact of marital status on mental health.' is significant.Hypothesis has been proved.

Table-3: Analysis of Variance (ANOVA) showing the impact of religion and marital status on life satisfaction:

Life Satisfaction					
Sources of Variations	Sum of Square	df	Mean Square	F Value	Level of Significance
Main Effects					
A. Religion	4.00	1	4.00	0.05	NS
B. Marital status	915.30	1	915.30	12.50**	SIG
Interaction Effects					
A X B	7.57	1	7.57	0.10	NS
Within (Error)	5561.17	76	73.17		

NS: Not Significant / ** Significant at 0.01 level

Main Effects

- The F value of religion is 0.05, which is found statistically not significant. It indicates that Hindu and Muslim female students did not differ significantly on life satisfaction.
- The F value of marital status is 12.5, which is found statistically significant. It shows that married and unmarried female students significantly differ on life satisfaction.

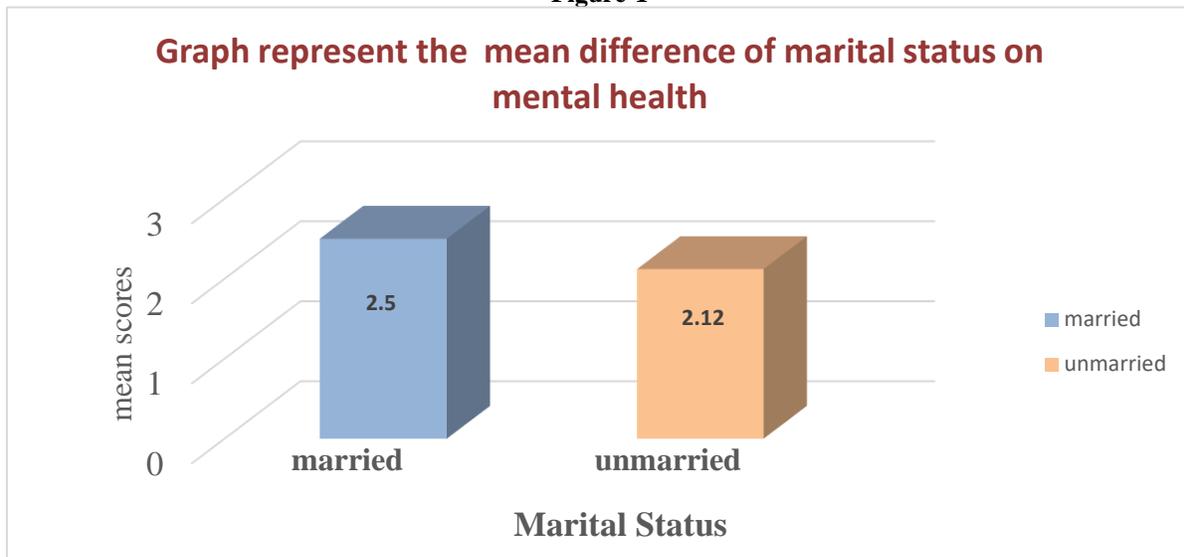
Interaction Effects

- The F value of A x B (Religion and marital status) factors is 0.10, which is found statistically not significant. It indicates that religion and marital status jointly did not effect on life satisfaction of the sample.
- Above result are shows that hypothesis (iii): ‘There may be significant impact of religion on life satisfaction’ is not significant.Hypothesis has not proved.
- Hypothesis (IV): ‘There may be significant impact of marital status on life satisfaction’ is significant.Hypothesis has been proved.

Table 4: Comparison between Married and Unmarried female groups on Mental Health

Group	N	Mean	SD	t-value
Married	40	2.50	0.59	2.60
Unmarried	40	2.12	0.68	

Figure-1



Above (table-4) and figure (figure-1) indicates that

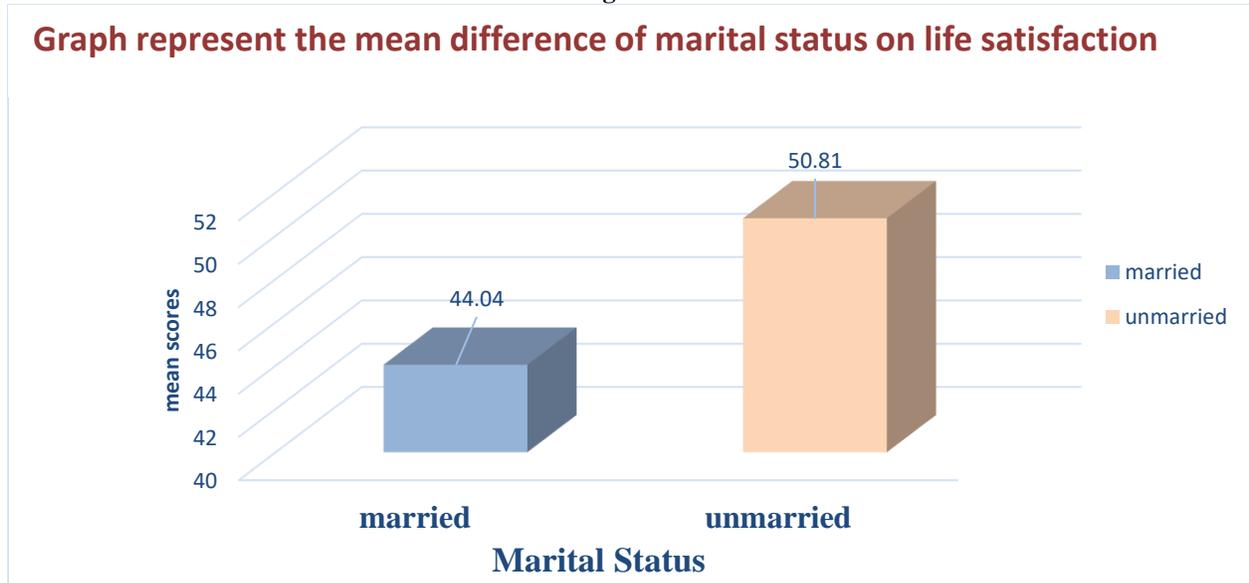
- There are significant difference between married and unmarried group is found 2.6, which is significant at .01 level.
- Mean scores of married female students are significantly higher than unmarried female students on mental health.

Above result proved the hypothesis (ii): ‘There may be significant impact of marital status on mental health ’.

Table 5: Comparison between married and unmarried groups on life satisfaction

Group	N	Mean	SD	t-value
Married	40	44.04	7.29	3.58
Unmarried	40	50.81	9.47	

Figure -2



Above (table-5) and figure (figure-2) indicates that there significant difference between married and unmarried group is found 3.58, which is significant at .01 level.

Mean scores of unmarried female students are significantly higher than married female students on life satisfaction. Above result proved the hypothesis (Iv): ‘There may be significant impact of marital status on life satisfaction’.

Table – 6: Inter-correlation between mental health and life satisfaction on total sample. (Total Sample =100)

	Life Satisfaction	P-Value
Mental Health	0.73**	0.01 level

** Significant at 0.01 level

- Above (table 6) reveals that there is a significant positive relationship between mental health and life satisfaction.
- The relationship between mental health and life satisfaction has been found 0.73, which is significant at 0.01 level.
- Above result has proved the hypothesis (v): ‘There may be significant relationship between mental health and life satisfaction’.
- This hypothesis has been accepted.

Table – 7: Inter-correlation between mental health and life satisfaction in respect of Religion. Hindu’s (N=40) / Muslim’s (N=40)

	Student’s Mental Health	Life Satisfaction
Student’s Mental Health		0.69**
Life Satisfaction	0.76**	

** Significant at 0.01 level

- Above(table 7) reveals that among group of Hindu female student’s mental health has been found to significantly and positively related to life satisfaction ($r = 0.69, P < 0.01$).
- Among group of muslin female student’s mental health has been found to significantly and positively related to life satisfaction ($r = 0.76, P < 0.01$).
- Above result has proved the hypothesis (v): There may be significant relationship between mental health and life satisfaction’ This hypothesis has been accepted.

Table – 8: Inter-correlation between mental health and life satisfaction in respect of marital status. Married (N= 40) / Unmarried (N=40)

	Student’s Mental Health	Life Satisfaction
Student’s Mental Health		0.65**
Life Satisfaction	0.73**	

** Significant at 0.01 level

- Above(table 8) reveals that among group married female students mental health has been found to significantly and positively related to life satisfaction ($r = 0.65, P < 0.01$).
- Among group of unmarried female students mental health has been found to significantly and positively related to life satisfaction ($r = 0.73, P < 0.01$).
- Above result has proved the hypothesis (v): There may be significant relationship between mental health and life satisfaction’
- This hypothesis has been accepted.

IV. Discussion

- There was found no significant impact of religion on mental health and life satisfaction of the female students.
- There was found significant impact of marital status on mental health and life satisfaction of the female students. The results obtained from the analysis are consistent with previous studies (Ruchi Sundriyal & Dr. Ravindra Kumar (2013).
- There was found significant mean difference between married and unmarried female students on mental health and life satisfaction.
- There is a significant positive relationship between mental health and life satisfaction. The results obtained from the analysis are consistent with previous studies (Fergusson, McLeod, Harwood, Swain, Raj, Kumar and Verma (2015).

V. CONCLUSION

It was concluded from the above analysis that there has been no significant impact of religion and significant impact of marital status on mental health and life satisfaction of the female management student sample in Ranchi town. It was also revealed that mental health and life satisfaction are positively correlated to each other.

REFERENCES

[1] Alam, Q. J. and Srivastava, Ramji (2001). Life Satisfaction Scale. Agra: National Psychological Corporation.4/230.

[2] Bhatia, B. D. (1982). Mental hygiene in education. In B. Kuppuswamy (Ed.) Advanced Educational Psychology, New Delhi: Sterling Publishers

[3] Diener, E. (1984). Subjective well-being. Psychological Bulletin, 95(3): 542–575.

[4] Fergusson, D., McLeod, G., Horwood, L., Swain, N., Chapple, S., &Poulton, R(2015). Life satisfaction and mental health problems (18 to 35 years). Psychological Medicine, 45(11), 2427-2436. doi:10.1017/S003329171500042.

[5] Goutam, S., Nijhawan, M., Kamal, P. (1987). Standardization of Hindi Version of Goldberg’s General Health Questionnaire. Indian Journal of Psychiatry, 29(1&2), 162-167.

[6]

[7] Guarnaccia, P.J., Worobey, J.L. (1991). The impact of marital status and employment status on depressive symptoms affect for Hispanic Americans. J. Commun. Psychol. 19:136-149.

[8] Hasnain, N., N., Ansari, S.A., & Sethy, S. (2011). Life satisfaction and self esteem in married and unmarried working women. journal of the indian academy of applied psychology ,37(2),316-319

[9] Khatib, A.S. (2013). Satisfaction with life, Self-esteem, gender and marital status as. predictors of depressive symptoms among United Arab Emirates college students. International Journal of Psychology and Counselling, 5(3), pp. 53-61

[10] Mexican Americans. Hispanic Journal of Behaviour Science 4:199-221. predictors of depressive symptoms among United Arab Emirates college

- [11] Raj .D, &Verma, N.(2017).Life Satisfaction and Mental Status of Research Scholars in Research Institute: A Comparative Study of TISS and IIPS. The International Journal of Indian Psychology, 4(4). ISSN 2348-5396 (e)DIP: 18.01.073/20170404 DOI: 10.25215/0404.073 <http://www.ijip.in>.
- [12] Roberts, R.E, Roberts, C.R. (1982). Marriage, work and depressive symptoms among Mexican Americans.Hispanic journal of behavioural sciences,4(2):199-221
- [13] Sundriyal,R.,& Kumar.(2013). Depression and Life Satisfaction among Married & unmarried women. journal of humanities and social sciences,16(3),33-36
- [14] Talaei. A, Fayyazi. M, Ardani .A (2009). Depression and its correlation with esteem and social support among Iranian university students. Iranian Journal of Psychiatry 41(1):17-22

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A study to evaluate the effectiveness of planned teaching programme (PTP) on knowledge regarding voluntary blood donation among adolescence in a selected area of Gulbarga, Karnataka.

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Abstract- Blood is a vital fluid. Its loss due to any injury or disease is life threatening. Though Science has made countless discoveries and inventions, we are not yet able to make this magic potion, which has no substitute. Requirement of safe blood is increasing and regular voluntary blood donations are vital for blood transfusion services.¹To evaluate the effectiveness of planned teaching programme regarding voluntary blood donation on adolescents in a selected area of Gulbarga, Karnataka.

A quasi experimental, pre-test- post-test design, non probability convenient sampling technique was used. Checklist was used to collect data. Data Analysis was done by using descriptive and inferential statistics

The results of the study shown that pre-test overall knowledge score of adolescents regarding voluntary blood donation was 43.7%, mean and the standard deviation was 2.3. During post-test overall knowledge score of adolescents was 76.0% mean and standard deviation was 2.7. Hence the difference between pretest and post-test overall knowledge score was 32.3%. So, the results of the study shown the difference between the pre-test and post-test knowledge score of the adolescents regarding voluntary blood donation was statistically significant and the difference is due to the administration of planned teaching programme to adolescents regarding voluntary blood donation. There is significant association between some demographic variables and knowledge level. Results show that the planned teaching programme was effective in increasing the knowledge of adolescents of Gulbarga as the pair t test value is significant at the level of 0.01

Index Terms- Planned teaching Programme, blood donation, Adolescents

I. INTRODUCTION

Requirement of safe blood is increasing and regular voluntary blood donations are vital for blood transfusion services.¹ Though Science has made countless discoveries and inventions,

we are not yet able to make this magic potion, which has no substitute. The blood supply is critically low in all societies. Blood is considered a national resource; hence it is the responsibility of the State to secure that blood reserves are sufficient and safe. Blood donation is an example of genuine altruism where the altruistic behavior is incorporated into the self as a role.²

Our body has approximately. 5.5 liter of blood of which only 350 ml - 450 ml of blood is taken depending upon weight of donor. The withdrawn blood volume is restored within 24 hours and the hemoglobin and cell components are restored in 2 months. Therefore, it is perfectly safe to donate blood every three months. One pint of blood given by a donor can save the lives of as many as three people. The blood goes to those suffering from cancer, severe burns, leukemia, anemia and hemophilia and others undergoing surgery. A donor's body will not weaken or miss that one-pint, and donors can donate blood again after 56 days. The simple process of donating blood takes less than an hour and can save numerous lives. And it might just make your life a little healthier.¹

There has been a steady decline of blood donation while the demand for transfusion continues to rise Recruitment and retention of donors to sustain and increase the donor base are critical for blood banks.⁴ Over 80 million units of blood are donated every year but only 38% are collected in developing countries, where 82% of global population resides. Hence, the need to increase the number of voluntary donors to ensure blood freely and without any reward. The decision to donate blood is motivated by a host of factors including altruism, social behaviors, social pressure and replacement.³

The eligibility to blood donation is not very demanding. A donor only needs to be between 18-60 years of age with a weight of 50 kg or above with pulse rate, body temperature and blood pressure should be normal. Both men and women can donate. Young people, in particular, are in demand because they are, generally, healthier than other age groups and thus, more able to give.⁵

Less than a quarter of countries have achieved 100% voluntary blood donation. Many countries are still dependent on donation by families or friends of the patient who requires blood. In addition, some countries like Bangladesh still have paid donors. Yet, evidence from around the world demonstrates that voluntary unpaid donors are the foundation of a safe blood supply because they are least likely to transmit potentially life-threatening infections such as HIV and hepatitis virus to recipient.⁵

It is to these unsung heroes that World Blood Donors Day (WBDD) is dedicated. This day is celebrated on 14th June to coincide with the birthday of Karl Land Steiner, the Nobel Prize winner and discoverer of ABO blood group system. World Blood Donor Day is an annual event officially designated by world health assembly to recognize and thank millions of voluntary blood donors. The aim is to create wide awareness to the importance of voluntary blood donation and to encourage more people to become regular blood donors. The sole purpose is not to attract a big influx of new donors on 14th June. Rather, it is designed to celebrate and thank those individuals who voluntarily donate their blood without any reward except the knowledge that they have helped some lives especially those who give blood on regular basis (2-3 or more times/year).⁵

Adolescents for voluntary work because youth are healthy, active, dynamic and receptive and constitute a greater proportion of populating a healthy attitude. Among adolescents will bring changes as they are the backbone of the country they have to be encouraged. Inspired and motivated to donate blood voluntarily.⁶ In India for a population of 900 million and bed strength of little over half a million, blood needs met in relation to population per 1000 are less than 10 donations per year. As is seen, blood is always in short supply and recruitment of donors is never met fully. This state of affairs could be overcome to a large extent by optimization of blood usage by way of component therapy. Adoption of novel techniques for the recruitment of voluntary blood donors will motivate people at large to donate blood. Apart from the overall shortage of blood, there is still a dependency on the professional donors and other problems like inadequate infrastructure and shortage of trained personnel. Blood transfusion is an essential component for modern medicine and saves tens and thousands of lives every day. In a country like India for safe blood transfusion the only way open is switching blood donation programme.⁷

The WHO recommends that all countries should be self-sufficient in all blood products and that all blood donation should be voluntary, anonymous and non-remunerated. To achieve this goal, government, blood banks and volunteers must work together, every part of the world understand for voluntary blood donation now-a-days but still lack of knowledge and have many confusions and factors such as social, economic, fear (psychological), to obstruct any blood donation practice. WHO, Govt. of every states and voluntary health agencies such as red cross doing best job on motivation for voluntary blood donation including health education, camps, motivations, etc.⁸

II. NEED OF THE STUDY

India with a population of about one hundred crores is naturally the country which requires lot of blood to save lives of

its citizens. It has been quoted that there is a need of about 8 million units of blood every year in our country.¹²

The blood is needed every minute to replace blood lost because of accident, to treat shock, for minor and major surgeries, for burn victims. Patient suffering from anemia, during childbirth for the mothers, for children suffering from ailments like thalassaemia, hemophilia, leukemia & blood cancer. In India 60% of population are eligible to donate blood, yet less than 5% do. Unfortunately, 83% of global population living in developing countries have access to only 40% of blood supplied rather than voluntary non-remunerated low risk donors & this blood in 60% of cases is collected from paid & replace donors.¹³

Today there are 1,659 blood banks in the country with 45.5% run by the government. It would thus seem that there is just one government blood bank for a population of more than a million. Rough estimates tell us that eight million units of blood are required.¹⁴ According to WHO, India's total requirement of blood (life saver) calculated on the basis of WHO criterion of 10-11 units per hospital bed in the range of 60,00,000 per year.⁴ Rough estimate tell us that eight million units of blood are required.¹⁷ However, it is the people who donate regularly whose blood saves lives during emergency situations because it is they're waiting on the hospital shelves.¹⁶

The health department is yet to wake up from its deep slumber in order to meet blood requirement of patients across the state. Even after decade since they became districts in 1998, Koppal, Bangalore rural and Chamarajanagar do not have a single blood bank. Ramnagar and Chickaballapur, which became districts in 2007, also lack blood banks.¹⁷

Nearly 100 blood banks are situated in southern Karnataka, while the number of blood banks in 11 districts of north Karnataka is just 43! Bangalore city and Mysore district alone have 75 blood banks. As per Karnataka state AIDS prevention society (KSAPS) statistics, the state currently has 170 blood banks, of them, Bangalore city has 64 blood banks, Mysore 11, Mangalore 11, Hubli-Dharwad 8, Belgaum 6, Gulbarga 4, Bellary 5, Bidar 2, Bijapur 6, Karwar 4, Haveri 1, Gadag 2 and Bagalkot.¹⁷

The Government needs to set up at least one blood bank in every district ensured equal distribution. According to this study the annual blood requirement in Andhra Pradesh 5,60,000 and total collection 4,28,874; in Assam 1,70,000 and collection 87,943; in Goa 13,500 and collection 12, 499; in Karnataka 5,30,000 and collection 3,82,968.¹⁷

The investigator out of his own experience during his practice in the nursing field, found that many times patients relatives searching for blood and blood donors in the institutes & colleges, but there no body aware to donate blood which could have been easily promote by acquiring adequate knowledge. Thus, investigator felt that planned teaching programme would increase the knowledge and attitude towards the blood donation. Also not forgoing the facts, the student investigator acknowledges that very few studies has been conducted regarding blood donation.

III. METHODOLOGY

Statement of problem: A study to evaluate the effectiveness of planned teaching programme (PTP) on knowledge regarding voluntary blood donation among adolescence in a selected area of Gulbarga, Karnataka.

Objectives of the study:

1. To assess the knowledge of adolescents regarding voluntary blood donation before administering the planned teaching programme.
2. To develop and administer planned teaching programme on voluntary blood donation.
3. To assess the knowledge of adolescents regarding voluntary blood donation after administering the planned teaching programme.
4. To evaluate the effectiveness of planned teaching programme regarding voluntary blood donation.
5. To examine association between the level of knowledge and selected socio demographic variables of adolescents regarding voluntary blood donation.

Hypothesis

H1: There will be statistically significant difference between the scores obtained by the adolescents (study subjects) on the level of knowledge about voluntary blood donation prior to and after the planned teaching programme.

H2: There will be a statistically significant association between the scores obtained by the adolescents on knowledge with selected socio demographic variables towards voluntary blood donation.

Research approach: an evaluative research approach, one group pre-test post-test, quasi experimental design

Variable: Dependent: Knowledge regarding awareness of voluntary blood donation

Extraneous variable: Demographic variables viz. age, religion, education, marital status, occupation, income per month, and source of information regarding blood donation.

Independent Variable: Planned teaching programme.

Target population: adolescents who are residing in selected area of Gulbarga.

Description of the tool used in the study

Tool consists of 2 sections

Section A: Socio-demographic data of the participant. It consists of 07 items for obtaining information about selected base line data such as- age, religion, educational status, marital status, occupation, monthly income, and source of information about Voluntary blood donation.

Section B: The structured knowledge questionnaire includes 30 MCQS (Multiple- choice question). Each MCQS

carries 3 options out of them one correct answers and others are distracters. Scoring key is, ‘one’ was awarded to correct response and ‘zero’ for wrong response. It consists of, Introduction about blood donation, Importance of blood donation, Meaning of blood donation, Criteria for blood donation, Contraindications for blood donation, Preparation for blood donation, Procedure for blood donation, Donor recovery, Health benefits of blood donation, Myths and facts about blood donation, Complications and risk to donors.

Validation of the tool

The prepared tool along with objectives of the study, problem statement and blue print were submitted to 09 experts for content validity. Seven were from the field of nursing, and one was from statistics department to obtain content validity in order to obtain content validity.

Reliability of the instrument

The reliability of the tool is computed by using split half technique employing spearman Brown’s Prophecy formula. Karl-Pearson’s co-efficient of Correlation was, $r = 0.90$ and hence the tool was found to be reliable.

Method of data collection

After the completion of the pilot study, written permission was obtained from Medical Officer In Change , Nandur PHC, Gulbarga and the investigator obtained consent from 60 Adolescents who were willing to participate. The information pertaining to socio-demographic data was collected. A self-administered questionnaire was used to obtain knowledge about Voluntary blood donation. The intervention which includes, the sample of planned teaching programme with the assistance of power point. There after the planned teaching was administered for 2 hours after 7 days of interval post-test was conducted from the same adolescences.

Plan for data analysis

1. Descriptive statistics analysis includes percentage (%) mean, median, frequency and standard deviation for Voluntary blood donation among the Adolescents of selected area of Gulbarga

2. Inferential statistics: Includes paired t test and chi-square test for the assessment knowledge of Adolescents and to associate with socio-demographic variables is planned.

IV. RESULT AND ANALYSIS

Objective -1: To assess the knowledge of Adolescents regarding Voluntary blood donation before administering the planned teaching programme.

Classification of Adolescents on pre-test knowledge level regarding Voluntary blood donation

			[1] n=60
[1] Level of knowledge	[2] Score	[3] No of Respondents	
		[4] No	[5] %
[6] Inadequate	[7] < 50%	[8] 48	[9] 80.00

[10] Moderate	[11] 50--75%	[12] 12	[13] 20.00
[14] Adequate	[15] >75%	[16] 0	[17] 0.00
[18] Total		[19] 60	[20] 100

Table-1 depicted that majority of Adolescents 48(80%) had inadequate level of knowledge about Voluntary blood donation, whereas 12(20%) of Adolescents had moderate level of knowledge and none of Adolescents had adequate knowledge regarding Voluntary blood donation before administration of planned teaching programme.

3. To assess the knowledge of adolescents regarding voluntary blood donation after administering the planned teaching programme.

Classification of Adolescents on post-test knowledge level regarding Voluntary blood donation

			[21] n=60
[1] Level of knowledge	[2] Score	[3] No of Respondents	
		[4] No	[5] %
[6] Inadequate	[7] < 50%	[8] 0	[9] 0.00
[10] Moderate	[11] 50--75%	[12] 20	[13] 33.33
[14] Average	[15] >75%	[16] 40	[17] 66.67
[18] Total		[19] 60	[20] 100

The above **table-2** depicted that the post-test level of knowledge of Adolescents on Voluntary blood donation, in which majority of Adolescents 40(66.67%) had average level of knowledge about Voluntary blood donation whereas 20(33.33%) of Adolescents had moderate level of knowledge and none of

Adolescents had inadequate knowledge regarding Voluntary blood donation after administration of planned teaching programme.

Objective 3: To evaluate the effectiveness of planned teaching programme to Adolescents regarding the knowledge about Voluntary blood donation

				[21] n=60
[1] Domain	[2] Mean	[3] SD	[4] Mean%	[5] Paired 't' test
[6] Importance, meaning of donor and recipient for blood	[7] 2.1	[8] 0.89	[9] 30.0	[10] 18.2**
[11] Criteria, contraindications and preparation for blood donation	[12] 5.1	[13] 1.6	[14] 34.0	[15] 24.6**
[16] Procedure, health benefits, myths and complications of	[17] 2.5	[18] 1	[19] 31.3	[20] 27.6**
[21] Overall	[22] 9.7	[23] 2.2	[24] 32.3	[25] 34**
[26] **Significant at P<0.01 level, df 59, t value 2				

Table-3 depicted that the mean and standard deviation of knowledge score obtained by Adolescents in each aspect of

Voluntary blood donation after the administration of the planned teaching programme with mean of 11.2, S.D of 2.9 and mean% of

37.33. The table shows that Adolescents had scored more in Voluntary blood donation- Importance, meaning of donor and recipient for blood donation, Criteria, contraindications and

[1] S.No	[2] Demographic variables	[3] No	[4] %	[5] Knowledge		[8] >	[12] %	[6] Chi-square
				[7] < Median				
				[9] No	[10] %	[11] No		
[13] 1	[14] Age in years	[15]	[16]	[17]	[18]	[19]	[20]	[21]
[22]	[23] a) 19-20	[24] 12	[25] 20.0	[26] 6	[27] 50	[28] 6	[29] 50	[30] 4
[31]	[32] b) 21-22	[33] 18	[34] 30.0	[35] 11	[36] 61.1	[37] 7	[38] 38.9	[39] df 3
[40]	[41] c) 23-24	[42] 21	[43] 35.0	[44] 12	[45] 57.1	[46] 9	[47] 42.9	[48] N.S
[49]	[50] d) 25years	[51] 9	[52] 15.0	[53] 2	[54] 22.2	[55] 7	[56] 77.8	[57]
[58] 2	[59] Gender	[60]	[61]	[62]	[63]	[64]	[65]	[66]
[67]	[68] a) Male	[69] 43	[70] 71.7	[71] 21	[72] 48.8	[73] 22	[74] 51.2	[75] 0.5
[76]	[77] b) Female	[78] 17	[79] 28.3	[80] 10	[81] 58.8	[82] 7	[83] 41.2	[84] df 1
[85] 3	[86] Religion	[87]	[88]	[89]	[90]	[91]	[92]	[93]
[94]	[95] a) Hindu	[96] 38	[97] 63.3	[98] 24	[99] 63.2	[100] 14	[101] 36.8	[102] 5.99
[103]	[104] b) Christian	[105] 10	[106] 16.7	[107] 4	[108] 40.0	[109] 6	[110] 60.0	[111] df 2
[112]	[113] c) Muslim	[114] 12	[115] 20.0	[116] 3	[117] 25.0	[118] 9	[119] 75.0	[120] S
[121]	[122] d) Others	[123] 0	[124] 0.0	[125] 0	[126] 0.0	[127] 0	[128] 0.0	[129]
[130] 4	[131] Educational	[132]	[133]	[134]	[135]	[136]	[137]	[138]
[139]	[140] a) Illiterate	[141] 4	[142] 6.7	[143] 4	[144] 100	[145] 0	[146] 0.0	[147] 11.8
[148]	[149] b) Primary	[150] 14	[151] 23.3	[152] 9	[153] 64.3	[154] 5	[155] 35.7	[156] df 3
[157]	[158] c) High	[159] 20	[160] 33.3	[161] 12	[162] 60.0	[163] 8	[164] 40.0	[165] S
[166]	[167] d) PUC	[168] 18	[169] 30.0	[170] 6	[171] 33.3	[172] 12	[173] 66.7	[174]
[175]	[176] e) Degree	[177] 4	[178] 6.7	[179] 0	[180] 0.0	[181] 4	[182] 100	[183]
[184] 5	[185] Marital status	[186]	[187]	[188]	[189]	[190]	[191]	[192]
[193]	[194] a) Married	[195] 42	[196] 70.0	[197] 26	[198] 61.9	[199] 16	[200] 38.1	[201] 5.8
[202]	[203] b) Unmarried	[204] 18	[205] 30.0	[206] 5	[207] 27.8	[208] 13	[209] 72.2	[210] df 1
[211]	[212] c) Divorced	[213] 0	[214] 0.0	[215] 0	[216] 0.0	[217] 0	[218] 0.0	[219] S
[220] 6	[221] Occupation	[222]	[223]	[224]	[225]	[226]	[227]	[228]
[229]	[230] a) Agriculture	[231] 8	[232] 13.3	[233] 5	[234] 62.5	[235] 3	[236] 37.5	[237] 8.2
[238]	[239] b) Self-	[240] 28	[241] 46.7	[242] 19	[243] 67.9	[244] 9	[245] 32.1	[246] df 2
[247]	[248] c) Private	[249] 24	[250] 40.0	[251] 7	[252] 29.2	[253] 17	[254] 70.8	[255] S

preparation for blood donation, Procedure, health benefits, myths and complications of blood donation after the administration of planned teaching programme .The calculated value is greater than the tabulated value at the level of significant $p < 0.001$ level, df 59 by paired ‘t’ test so the null hypothesis is rejected hence the planned teaching programme was effective in improving knowledge of adolescents.

Objective-4: To examine association between the level of knowledge and selected socio demographic variables of Adolescents towards Voluntary blood donation

Table 4 depicted that the association of knowledge level of Adolescents towards Voluntary blood donation before administering the planned teaching programme with their selected demographical variables by using Chi-square test. The analysis revealed that there is significant association was found with – religion, educational qualification, marital status and occupation at $p < 0.05$ and no association found with age and age and gender with knowledge level of adolescences at level of significance 0.05

V. CONCLUSION

From the data analysis and findings of the present study, it is concluded that there was significant difference between the pre-test knowledge level and post-test knowledge level of Adolescents regarding Voluntary blood donation. The mean knowledge score of 60 Adolescents during the pre-test was 39.3% where as it had increased up to 76.0% during the post-test as an effectiveness of planned teaching programme. Therefore, the difference assessed was 32.3% between pre-test and post-test. Hence on-going teaching and health education programs can further improve the knowledge of adolescents.

Implications:

The assessment of knowledge about Voluntary blood donation among Adolescents will help Nurses to plan organize health education in deficit areas of knowledge, guidance and counseling services for adolescents and general public. This will assist in adopting healthy living and promote mental health.

REFERENCES

- [1] 1. Indian journal of Medicine, Volume-II, page no. 24-26.
- [2] 2. Nilsson Sojka B, Sojka P., The blood-donation experience: perceived physical psychological and social impact of blood donation on the donor. Vox Sang 2003 Feb; 84(2): 120-8.

- [3] 3. Oswalt RM, Hoff TE. The motivations of blood donors and non-donors: A community survey. *Transfusion* 1977; 15:68-73.
- [4] 4. Watanabe KK, Scriber GB, Hayes A, Williams AE. Factors influencing the recruitment and retention of young donors. *Transfusion* 1999; 39: Supplement: A3-20A.
- [5] 5. George A.O.Alleyne. ensuring safe blood in the Americas. *American Journal of Public Health*. 2003; 13: 2-3
- [6] 6. Seram Nekan, Voluntary blood donation –a human act, National Guide Book on Blood Donor Motivation, Feb 2004.
- [7] 7. Namgay Shenga¹, KR Thankappan², CC Kartha³, Ranabir Pal, Analyzing socio demographic factors amongst blood donors, *donor journal of emergency, trauma, and shock* 2010, 3 , 21-25.
- [8] 8. Niels Mikkelsen, Allian, JP Promoting Voluntary Blood Donation, newsletter of international Society of blood transfusion, 2005.
- [9] 9. Farooq Fazili, MD, Blood Safety and Rational Use of Blood, *Indian Journal for the Practicing Doctor*, Vol. 3, No. 1 (2006-03 - 2006-04).
- [10] 10. Article published on www.myoclinic.com
- [11] 11. Article published on www.Heartcenter.com
- [12] 12. Ghosh A, Basu A., “Blood”. *West Bengal Voluntary Blood Donors Forum*; 1996. P.59.
- [13] 13. India's National Magazine from the publishers of THE HINDU, Volume 22 - Issue 14, Jul 02 - 15, 2005.
- [14] 14. The times of India, 14 June 2007, Article on blood donation.
- [15] 15. Inderbir Singh, *Indian journal of community medicine*, volume-IV, Page no.234-237.
- [16] 16. M.Glies, C.Mc Clenahan, An application of the theory of planned behavior to blood donation, *Health education research*, Volume-19, no: 4,380-391, Aug.2004.
- [17] 17. Jagadish Angadi. Blood safety: status of moderate performing states. *Deccan herald*. 2009 oct 1; page no-4.

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Perceptions and Practices of Warm-Up Activities by English Teachers in Thai Nguyen

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Abstract- English is the most widely used language in the world, which has a great influence on students' future job opportunities. That is the reason why this subject has been put into the curriculum of Vietnamese students at an early age with the purpose of helping them master this language. There are many factors that affect students' ability and teaching method is one of the most important factors. Although warm-up activities are not the key things in the teaching and learning method, it has contributed to creating an effective learning environment and inspiring them to learn. In this way, students can feel more relaxed before learning. This research aims at investigating the perception and practice of warm-up activities by English teachers in Thai Nguyen. A sample of 6 teachers and 197 students from three different secondary schools in Thai Nguyen city participated in this study. There were several data collection instruments used, including teachers' interviews, observation, and students' questionnaires. The results of this research showed that all teachers have a positive opinion towards using warm-up activities in their classes. They also have some similarities and principles in implementation. Hopefully, this study will make a small contribution to clarify the perception as well as the practice of teachers in using warm-up activities in English classes.

The students have 3 English classes per week and each lesson lasts 45 minutes. All classrooms at these schools were equipped with full of facilities for teaching and studying. The teachers have enough equipment to organize their warm-up activities, such as blackboards, whiteboards, posters, speakers, projectors, tables, and chairs. In addition, all of these teachers have their own laptops to serve their teaching job.

This study was conducted from May 2021 to February 2022.

Participants

This study involved 20 teachers from different secondary schools in Thai Nguyen city. The selected teachers need to meet these two requirements. Firstly, they must have over two years of experience in teaching English to secondary students. Secondly, these teachers have used warm-up activities in their classes. These criteria play an integral part in collecting comprehensive data. As stated above, due to the Covid 19 pandemic, the writer could focus mostly on 6 teachers at the Son Cam 1, Tan Long, and Hoang Van Thu schools. Therefore, the table below only describes the detailed information of the observations at these schools.

Table 1: Detailed participants

School	Teachers	Class
Son Cam 1 secondary school	A	7A
	B	8A
Tan Long secondary school	C	7A
	D	8A
Hoang Van Thu secondary school	E	7A
	F	8A

I. THE STUDY SETTING

The study was carried out to investigate the perceptions and practices of English teachers in Thai Nguyen on using warm-up activities in their classes. Thai Nguyen is a mountainous province, which is located in the North of Viet Nam. Due to the difference in economic growth among the parts of the province, the language ability of Thai Nguyen is, therefore, different. In some parts, students have chances to expose to English early since kindergarten; however, in other areas, they start learning English later since primary level.

In the chosen schools, students started learning English at the same level (primary level). Generally, they can understand simple conversations, words, and phrases. They can use English to introduce their name, hometown, and class. Many of them can ask and answer questions related to popular topics. Some can understand and deal with less familiar topics.

Data collection instrument

This study aims at finding out the teachers’ perceptions and practices on warm-up activities, so some data collection instruments were used.

Questionnaires

Babbie (1990) defined questionnaires as a document that consists of kinds of questions to collect appropriate information for analysis. Acharya (2010) also illustrated the definition of questionnaires as well as gave the importance of having suitable questionnaires since it can cause misleading the research. A questionnaire has been considered as one of the most common ways to gather data with a large number of participants. Therefore, to collect data from 20 teachers to learn about their perceptions and practices, this instrument is completely suitable for this study. Table 2 below gives main information of the questionnaire.

Table 2: Main information of the teacher’s questionnaires

Type	Number of questions	Number of respondents
Questionnaire	8	20

The questionnaire consists of 8 questions, which can take the respondents no more than 10 minutes to complete. Questions 1 to 7 are close-ended questions, which were designed to collect teachers’ opinions on the importance of warm-up activities, how they organize the warm-up part, and the types they often use. In question 8, teachers selected the five types of warm-up activities they use frequently and provide information on other types which were not listed. Also in question 8, the teachers are asked to number each of the five types that they selected in the order of the least to the most frequency.

Observation

In the Oxford dictionary, observation is defined as "the act of watching somebody or something carefully in a period of time, especially to learn something". The writer also observed the lessons of each teacher to find out how those participants organized warm-up activities in their classes. Aside from questionnaires and teachers’ interviews, the writer chose different lessons to observe as listed below:

Table 3: Details of the class observation

School	Class	Lessons
Son Cam 1 secondary school	7A	26
	8A	25
Tan Long secondary school	7A	26
	8A	25
Hoang Van Thu secondary school	7A	26
	8A	25

The observation collected data from 6 classes at three secondary schools as shown in table 3. The classes are selected based on the schedule of the author and the teachers at these schools. The lessons were chosen unintentionally due to the school boards’ permission. The author managed to observe the same lesson for each grade so that the data classification and analysis would be more reliable.

The information needed to be collected and analyze includes the types and time duration of warm-up activities, the participation of students and how teachers deal with problems (if any) when organizing these activities.

Interviews

Besides questionnaires and observations, the writer decided to choose interviews as another chosen data collection instrument. This type is one of the most commonly used instruments in studies. A group of authors whose names are Mathers. N, Fox. N, and Hunn. A stated that "there are a range of approaches to interviewing, from completely unstructured in which the subject is allowed to talk freely about what they wish, and highly structured in which the subject responses are limited to answering direct questions". The writer interviewed 6 teachers in Son Cam 1, Hoang Van Thu, and Tan Long secondary schools.

There are five interview questions, which took from 10 to 15 minutes for each teacher to answers. All of the questions are open-ended in order to get detailed opinions from these teachers to analyze their perceptions and practices of using warm-up activities in their lessons. The information of the interviews can be summarized as follows:

Table 4: Main information of the teachers’ interview

Type	Number of questions	Number of respondents
Interview	5	6

Questions 1 and 2 focus on the teachers’ opinions about the importance of warm-up activities. Question 3 was designed to collect the problems in organizing warm-up parts. Questions 4 and 5 will look into the solutions which the teachers applied to overcome difficulties.

Data collection procedure

This study was carried out from May, 2021 to February 2022. To collect data, the write implemented the following steps:

Preparation

Firstly, the writer reviewed the research questions to determine the data collection instruments. After that, the writer made a detailed schedule for each data collection instrument, including observation, questionnaires, and interviews. Then, after studying related theories and previous studies, the writer wrote items for each instrument. Those items were reviewed by peer teachers to limit the subjectiveness before being delivered to the respondents. It would take a lot of time for the writer to meet and deliver the questionnaire to each respondent in person. Therefore, the questionnaire was created online for convenience.

After finishing the preparations of data collection instruments, the writer contacted the school boards of the selected school to ask for permission so that the writer could come and carry out the research. Finally, the writer discussed with the respondents to make arrangements based on their schedules.

Implementation

Questionnaires: After making sure that all of the respondents know how to fill out the questionnaire forms, the

author sent the link of the questionnaire to the respondents. When all of the 20 respondents filled in the form, the writer was available to support if necessary.

Interviews: The author met each respondent, explained the procedures, interviewed, and recorded their responses.

Observation: Based on the agreed schedules, the writer came to each selected school to observe selected lessons. The lessons were filmed so that they could be used in the next stages. The writer mostly recorded the warm-up part in each class.

Planning for data analysis

To prepare for data analysis, all of the data collected were processed by the author.

The data collected from questionnaires were statistically synthesized for the analysis process. All of the recordings from teachers' interviews were transcribed and grouped. Teaching videos recorded from the observation stage were watched carefully so that the data could be classified.

Data analysis

Data from the questionnaires was collected and processed into IBM SPSS Statistics 20. The qualitative data collected from the interviews and observations were also summarized and classified. All of the data were quantitatively analyzed and illustrated by a system of charts or tables.

Analyzing the figures helped in illustrating the perceptions and practices of using warm-up activities of English teachers in Thai Nguyen. They were categorized in terms of the importance of warm-up activities, the types of warm-up activities that are often used, the problems that the teachers had when organizing warm-up activities, and the solutions that the teachers found to deal with the problems.

II. FINDINGS

A. Result of the interviews

Perceptions of warm-up activities by the English teachers in Thai Nguyen city

The importance of warm-up activities

To find out the perception of English teachers towards using warm-up activities, the researcher interviewed their opinion about the importance of these activities. When being asked, all these six teachers agreed that warm-up activities play an important part in their teaching. They also gave different explanations about their answer.

Teacher A considered warm-up a key part since it helps review the previous lessons and brings an enjoyable learning environment. In this way, students can have better preparation.

Teacher B also had the same opinion as teacher A about the importance of warm-up activities. Besides, she added that those activities bring fun and energy to motivate learners of all ages.

Aside from listing benefits and affirming the importance of warm-up activities, teacher D figured out the reasons why students need to be warmed up at the beginning of every class.

The rest of the teachers also stated the importance of warm-up activities and explained the same ways as the teachers mentioned above. It could be seen that all of the teachers appreciate the importance of warm-up activities.

However, when being asked whether they omit the warm-up stages due to some reasons, such as the length or the difficulty levels of the lessons there were different ideas among them. Teachers A, C, D, E, and F continued to emphasize the significance of warm-up activities and affirmed that the warm-up stage is the indispensable part of every lesson. Teacher F also shared her solutions to deal with this situation.

"Some lessons are quite difficult for students to understand so it takes teachers more time to explain. When there are difficult lessons, I often choose short warm-up activities such as singing a song or something like that. Maybe it isn't related to the lesson but at least my students are relaxed before a difficult lesson."

(Teacher F)

In contrast, teacher B admitted that sometimes she had to begin the lessons without warming up as she worried that she could not cover all of the knowledge of the lesson.

It can be seen that although all of the teachers understand that warm-up activities are important and can list the benefits of warm-up activities, there is still a teacher who chose not to organize warm-up activities due to the limit of time.

Challenges of using warm-up activities in English classes

When being asked whether they have encountered any difficulties when using warm-up activities in English classes, all of the teachers said "yes". However, each one has her own problems. From their ideas, we can summarize the list as follow:

- 1) Students refuse to participate in activities;
- 2) They are unhappy when their team lose in a competition;
- 3) They do not know what to do; therefore, it takes time for teachers to explain;
- 4) They are not willing to start a new period after break time;
- 5) They overuse their first language in class;
- 6) They do not get on well with each other;
- 7) They are so keen on the activities that they do not want to stop;
- 8) They became over-excited and noisy;
- 9) They do other things (like talking with each other) instead of doing the tasks.

Practice of using warm-up activities by the English teachers in Thai Nguyen city

As previously stated, all of the teachers encountered problems when organizing warm-up activities in their class. However, they all found their own solutions to deal with the problems. Although the measures cannot completely eradicate the issues, they really work in limiting the problems.

Five out of six teachers said setting classroom rules right from the beginning and sticking to them are effective in limiting students' misbehaviors. Teacher F suggested using some signs to help students notice their mistakes. For example, when they speak Vietnamese, the teacher can point to the sign so that students stop speaking Vietnamese. This way can also work when students make a lot of noise or do other things instead of doing their tasks. Teacher A also recommended that teachers should set rules for each activity so that it can limit students' misbehaviors.

For those who do not want to join the activities, teacher A suggested *"it is important to know the reasons why they behave that way before finding the solutions. For example, if it is due to low language levels, teachers should organize more simple*

activities or if it is because they are shy or unconfident, they should be allowed more time for preparation.”

According to teacher C, teachers can start the lesson with a “time challenge”. Teachers challenge students to do certain tasks in a short time, to see who can do the fastest. This way students will feel less stressed after break time and be ready for the new lessons.

In teachers B, D, and E’s opinions, teachers should understand students’ profiles before organizing any activities. When they know clearly about their students’ interests, language levels, etc., they can make suitable decisions on what types of activities to choose and how to organize them. In addition, teacher B advised other teachers to use short and simple instructions so that all students understand what to do.

In sum, though all of the teachers had several problems when organizing warm-up activities in their class, they could find ways to solve the problems. Although the solutions cannot guarantee a “problem-free class”, they can greatly help the teachers restricts the negative points.

B. Result of the questionnaires

The questionnaires were delivered to 20 secondary teachers in Thai Nguyen city. In the questionnaires, the teachers had to decide how much they agree with the statements provided and specify the types of warm-up activities they often use in their class. The data collected on teachers’ opinions can be summarized in the table below:

Table 5: The perceptions and practice of using warm up activities in English classes

Statements	Opinions (Unit: Person/ People)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1. Warm-up activities are integral to English lessons.	0	0	0	2	18
2. I always organize warm-up activities for every lesson.	0	0	2	2	16
3. Warm-up activities always start at the beginning of every lesson.	0	0	0	0	20
4. Warm-up activities last from 5 to 7 minutes.	0	1	3	5	11
5. I use different activities for the warm-up part.	0	0	3	5	12
6. I can manage the whole class when organizing warm-up activities.	0	3	2	14	1
7. All of my students feel excited when I organize warm-up activities.	0	1	3	2	14

The importance of warm-up activities

According to the data collected 100% of the teachers recognized the importance of warm-up activities.

The frequency of doing warm-up activities

As shown in table 5, 16 teachers strongly agreed that they always organize warm-up activities for every lesson. 10% agree and the same number of teachers had neutral ideas. It could be concluded that although teachers understand the significance of warm-up activities, they do not always organize them in their class.

How to organize warm-up activities

100% teachers agreed that warm-up activities always start at the beginning of every lesson. However, they have different ideas on the length of the activities. While the majority (80%) strongly agreed and agreed that warm-up activities should last from 5 to 7 minutes, 15 % had neutral ideas and 5% disagreed.

Talking about the use of different activities for the warm-up part, 12 teachers claimed they organized various activities, making up 60%. 5 teachers agreed, whereas the rest were neutral.

About how to manage the activities, the number of teachers who strongly agreed that they could manage the whole class when organizing warm-up activities was only 5%. While 60% agreed, there were 10% who had neutral opinions, and 15% disagreed.

60% strongly agreed that their students felt excited when they organized warm-up activities. Two other teachers (equivalent to 10%) agreed that the warm-up part brought excitement to their students. Nevertheless, 15% stayed neutral, and the minority of 5% disagreed. Though a large number of students have positive feelings about the warm-up parts, teachers are sometimes not able to satisfy the whole class.

Types of warm-up activities often used

Teachers were asked to select the five types of warm-up activities that they organize frequently in their class. The five most frequently-used activities include Q&A, Storytelling, Games, Pictures/Videos, and Songs.

Games and Songs are the top used activities, which were selected by all of the teachers. Pictures/Videos chosen by 12 teachers (equivalent to 60%) came second. Storytelling with 20%, Q&A with 12% are the next frequently used warm-up activities.

C. Results of observation

The results of observation process include the types of warm-up activities, the time appointed to the warm-up part, the participation of students in warm-up activities and the teacher’s solutions for problems.

Types of warm-up activities

Among the types of warm-up activities that the teachers organized during their lessons, games and songs, which were used by 4 teachers, took the first place. The other two teachers selected Q&A and Pictures/Videos. During the observation time, no teachers used Storytelling, Role play, or other activities for the warm-up part.

The average time of the warm-up part

All of the teachers spent no more than 7 minutes organizing warm-up activities. Two-thirds of the teachers used from 3 to 5 minutes to do warm-ups for their class. One teacher held warm-up activities for a shorter time (between 3 and 5 minutes) and another one spent a longer time (between 5 and 7 minutes).

The participation of students in warm-up activities

The writer classified how students participated in the warm-up activities into three groups:

- (1) those who actively participate in the activities;
- (2) those who participate in the activities;
- (3) those who do not participate in the activities.

Students in group (1) were recognized for their eagerness to join the activities. They were willing to volunteer or make contributions to their group. They focused on the activities and used English most of the time. Students who were put in group (2) are those who followed the teacher’s instructions. However, they did not raise their hands or contribute ideas. They accepted their teacher’s or classmates’ suggestions. Sometimes they used their first language to confirm with friends. Finally, students classified into group (3) are those who did other things during the activities. Some of them pretended to follow the instructions but in fact, they took no notice of the activities. A few others do not understand the teacher’s instructions but had no attempts to do so. The table below illustrates how students participated in warm-up activities.

Table 6 The participation of students in warm-up activities

Students’ participation:	Percentage (%)
Students actively participate in the activities	67.5
Students participate in the activities	23.9
Students do not participate in the activities	8.6

Over two-thirds of the students actively joined the activities, which is really a good sign. It means the warm-up activities could draw their attention and satisfied most of the students. There were 47 students who just participate in the activities, equivalent to 23.9%. There remained 17 students who did not join the activities, accounting for 8.6%.

The problems arose during warm-up activities and teacher’s solutions

Based on the specification in the observation sheets, four main problems arose in the classes:

- (1) Students did other things (talked to each other, did the exercises of other subjects, sleep);
- (2) Students did not like the activities (right after listening to the instructions of the activities, students became discouraged and refused to join);

- (3) Students made a lot of noise.
- (4) Students did not understand what to do

For problem 1, teacher C asked students to stop doing other things and told one student sitting nearby to keep an eye on each. Meanwhile, teacher E used her sign rules to ask students to stop, and she stood next to those students to make sure they started joining the activities. Teacher F had those students stand up and answer her questions (she used Q&A as a warm-up activity).

To deal with problem 2, teacher A asked the students to be the referees. Those students seemed to be interested in the new role and got more engaged. Teacher B reminded the students that they have to participate because that was a part of the lesson. The students were quite reluctant and joined passively. Teacher D encouraged the students to join, but the students continued to lose focus after a few minutes. About teacher F, she talked to the student and accepted him not to participate in the activity after asking him to promise to behave better next time. Although the student did not participate, she did not bother the other students. About solutions for problem 3, teacher A came and stood close to the group making the most noise. Teacher B spoke so softly that students had to turn their voices down to listen to her. Teacher C played a piece of music to attract students’ attention. Teacher E asked the class to stand up and sit down three times until students became less noisy.

For the last problems, both teachers D and F explained the rules for the students one more time and checked whether they understood or not. Teachers A and E asked their teammates to explain to them.

In conclusion, all of the teachers could address the problems arising in their class and found their own ways to deal with them.

III. DISCUSSIONS

What are English teachers’ perceptions on the use of warm-up activities in English classes?

The results from questionnaires, interviews, and observations all showed that English teachers highly value the role of warm-up activities in their teaching process. They understand the positive impacts of warm-up on their students and their teaching environment. Therefore, most of them claimed to use different types of warm-up activities for their lessons. The most frequent types include songs, games, Q&A, storytelling, pictures/videos, and role play. Among those types, songs and games proved to be the most favorite types of the teachers, based on the results of the questionnaires and the observations.

How do the English teachers implement warm-up activities in their classes?

Based on the results of questionnaires, interviews, and observations, it is clearly shown that the frequency and the way to implement warm-up activities of these English teachers are slightly different. Some of them have warm-up activities every day, while the others do not. However, they all said that this part is important and they always try their best to organize with the regardless of time limitation.

Furthermore, the time they spend on warm-up activities is also not similar among the teachers. While most of the teachers

used from 3 to 5 minutes, it took the others longer (5 to 7 minutes) or shorter (3 to 5 minutes). These teachers shared the same ideas that this part needs to be organized within a reasonable amount of time (no more than 7 minutes) to avoid affecting the other parts of the lessons.

In terms of activities used, most of the teachers said that they use different types of activities for warm-up. The majority of them strongly agreed and agreed that their students were excited during the warm-up part.

The participating teachers also understand the significance of classroom management during warm-up parts. Specifically, they could list the main problems that they encountered and proposed solutions for each of them. Based on the interviews, there were 9 main problems while based on the observations, there were 4. In general, these problems are related to students' understanding and their behaviors. The solutions that were most proposed by these teachers included simple class instructions, setting classroom rules, and understanding students.

In conclusion, teachers could anticipate the possible problems in their class and suggested solutions. During their lesson, when there were problems, they could recognize the issues and had their own ways to handle them. However, some solutions worked well while others did not.

IV. CONCLUSION

This research was done to investigate the perceptions of English teachers in Thai Nguyen on the use of warm-up activities and how they implement these activities in their own classes. The study used interviews, questionnaires, and observations as data collection instruments. All of the data were processed and analyzed quantitatively and illustrated in the form of tables and charts. The findings from all of the study instruments were consistent, which ensures the reliability of the results. The study results can be summarized as follows:

Firstly, most of the teachers appreciate the role of warm-up activities in teaching and learning. They clearly understand the benefits of the warm-up parts. The mentioned advantages included creating a positive environment, reviewing previous lessons, and relieving stress. As the teachers know the influence of warm-up activities on their students, the majority of them consider warm-up an indispensable part of the teaching procedures. However, there remains an idea that when the lessons are long or difficult, the warm-up can be omitted to save time for other stages.

To draw the interests of the students, most of the teachers applied different types of warm-up activities for their lessons. The top five warm-up types that are often used by teachers consist of games, songs, pictures/videos, storytelling, and role-play. Among these types, games, and songs are chosen by most of the teachers (33.3% votes for each type).

Although warm-up plays an important part in the lesson, all of the teachers agreed that it should not last long. To be more detailed, based on the observation results, all teachers spent less than 7 minutes on this part. It took two-thirds of the teachers to organize this part.

Moreover, teachers could name major problems which often occurred during classes. The problems listed included refusing to participate in the activities, being discouraged when losing in a competitive activity, not understanding teachers'

instructions, being unwilling to study after break time, using Vietnamese too much, having conflicts with classmates, not wanting to stop, making loud noise, and losing focused.

The teacher also took steps to deal with the problems. The main solutions proposed involved setting classroom rules, understanding students, making class instructions more simple and clearer. The observation results showed that most of the teachers could manage over two-thirds of the class well (67.5 students actively participated in the activities). When there occurred problems, each teachers resolved them in different ways. Some measures could work well but other did not.

In short, the study presented the importance of warm-up activities in the views of English teachers. The frequently used activities, the problems when organizing the activities, and solutions to deal with them were also illustrated and analyzed. Therefore, the results of the study could be a good source of reference for English teachers in organizing warm-up activities.

V. LIMITATIONS AND RECOMMENDATIONS

Limitations: Due to the lack of time and the complicated pandemic situation, the study could not be conducted with a large number of participants. The writer could collect the opinions of only 20 secondary English teachers in Thai Nguyen for the questionnaire surveys. Also because of the pandemic, the writer could contact only three secondary schools to ask for permission to carry out the research there. Therefore, the interviews were implemented with only 6 participants, and the observations were made in only 6 classes.

Recommendations

For English teachers

Implementing warm-up activities is a great way to gain students' attention and achieve the objectives of lessons. When organizing warm-up activities, teachers should have a clear understanding of their students so that they can choose suitable and useful activities. Besides, as warm-up could help in revising the previous lessons, improving the class atmosphere, preparing good conditions for the students to learn new lessons, it should not be skipped. Teachers also need to distribute the time for warm-up activities properly so that it will not last for too long and affect other parts of the lessons.

Teachers also should use a variety of activities for this part as each warm-up type can develop different skills for students. When organizing activities, anticipating the possible problems and thinking of the solutions in advance could be a good idea to help teachers avoid problems in the class. Teachers should give clear and simple instructions so that students with low language ability can understand what to do. Besides, setting classroom rules and sticking to them are also good ways to help limit students' negative behaviors.

For further researchers

There is still more room for other researchers who are interested in this topic. The main focus of this study is the perceptions of English teachers in Thai Nguyen on the use of warm-up activities and how they implement these activities in their own classes. It means that the studies just presented the findings based on the data collected. Researchers could focus

deeper on the problems when organizing warm-up activities and analyze the feasibility of possible solutions for them.

Secondly, as the participants of the study are English teachers in Thai Nguyen, further studies could be conducted for teachers in other areas. Moreover, the study was conducted with limited numbers of participants, researchers could carry out the study with larger scale to collect more data.

Another suggestion is to investigate deeper in warm-up activities for certain school levels so that researchers could find the most suitable types of warm-up activities for students at different age and language levels.

However, with the regardless of those limitations, the writer expects that this research can make way for further studies so that there will be more sources of reference for teachers. In this way, teachers could have more ideas in teaching and improve their teaching methods.

REFERENCES

- [1] [1] Akther, Ashia (2014). Role of warm up activity in Language classroom: Tertiary Scenario. Allwright, R. (1984) . The importance of interaction in classroom language learning. Applied Linguistics.
- [2] [2] Andy and Cortnie Brooks. 2017. "Fun Activities for Teaching English". Ywam MontanaLakeside: The Tesol Department

- [3] [3] Baron-Cohen, S. (1995). Mindblindness: An essay on autism and theory of mind. Cambridge, MA: The MIT Press.
- [4] [4] Jeon, I. J., & Hahn, J. W. (2006). Exploring EFL teachers's perceptions of task-based language teaching: A case study of Korean secondary school classroom practice. Asian EFL Journal, 8(1), 123-143.
- [5] [5] Joshi, M. (2006). Diversity in Lecture-Delivery. Journal of NELTA, 11 (1-2), 1-151. Retrieved from <http://nelta.org.np/uploads/files/2006.pdf>
- [6] [6] Jun, Z. Y. (2000). Warm-up Exercises in Listening Classes. The Internet TESL Journal, VI (10). Retrieved from <http://iteslj.org/Techniques/Zhang-ListeningWarm-up.html>
- [7] [7] Kathleen, Robert, and Andrew. Research Paper: "Use of Warm up Exercises in Just-in-Time Teaching to Determine Students Prior Knowledge and Misconceptions in Biology, Chemistry, and Physics". University Purdue University Indianapolis, 2003
- [8] [8] Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. New York: Macmillian.
- [9] [9] Robbins, S. P. (2005). Organizational behavior. Upper Saddle River, NJ: Pearson/ Prentice Hall.

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Countering Terrorism through Diplomatic Missions in IGAD Countries: Harvests from Capacity Building and Promotion of Partnerships

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Abstract: The global community has intensified its efforts in counter-terrorism, making use of various strategies, including international multi-lateral organizations and diplomacy. One of the most prominent hotspots for terrorist activities in Somalia, following the collapse of the national government three decades ago, and the intensification of Al Qaeda sponsored Al-Shabaab activities. Foreign missions and inter-governmental agencies have great potential in contributing to international efforts in combating terrorism. The study examined the influence of Somalia-based IGAD countries' diplomatic missions in capacity building and partnerships in countering terrorism. The study was guided by the political theory of anarchism which relates to the realism concept. A descriptive research design involving a mixed research approach of both qualitative and quantitative data was employed. An interview schedule was administered for the head of mission, while questionnaires were used for the rest of the officers. The findings of this study were potentially important sources of policy framework on the role of diplomacy in counterterrorism. The study found that there is a great influence of Somalia-based IGAD countries' diplomatic missions in capacity building for countering terrorism. The study also revealed that the Somalia-based IGAD countries' diplomatic missions influence the promotion of partnerships for countering terrorism. The significance of the study is to show the relationship between diplomacy and counterterrorism and how diplomacy can be used effectively to counter terrorism in a transnational relationship.

Key Words: *Terrorism, Diplomatic Missions, IGAD Countries, Capacity Building, Partnerships*

1. Introduction

Law (2009) claims that terrorism is as ancient as human culture and as recent as today's headlines. Some claim that people and groups have been using terrorism for years, while others argue that true terrorism has only existed for decades. Both camps are right up to a limit. Terrorists' weapons, strategies, and objectives change all the time, but some characteristics have remained consistent since the beginning. The United States has tried to define it in its legal code; however, every other American government entity has its definition. Under such circumstances then terrorism is identified by actors under the narrative of "I know it when I see it"

According to Hoffman (2006), "terrorism became popular during the French Revolution. In comparison to its predominant use, at that time terrorism had an absolutely solid appeal. The structure or régime de la terreur of 793–94 from which the English word came was adopted as a means to maintain order during the transient anarchical era of instability and upheaval that followed the uprisings of 789, and indeed many other revolutions. Hence, unlike terrorism as it is generally known today, to mean a revolutionary or anti-government operation conducted by non-state or subnational actors, the régime de la terreur was an instrument of governance wielded by the newly formed revolutionary state. It was intended to concentrate the new government's power by suppressing counter-revolutionaries, saboteurs, and all other dissidents that the new system viewed as 'enemies of the people.'"

The Committee of General Security and the Revolutionary Tribunal ("People's Court" in the modern vernacular) was thus bestowed broad powers of arrest and judgment, publicly sentencing to death by guillotine those convicted of treasonous (i.e., reactionary)

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crimes. In this manner, a powerful lesson was transmitted to all who might oppose the revolution or grow nostalgic for the ancient régime.

Scholars have made more emphasis on how terrorism works and how to combat it rather than what it is. However general characteristics that define terrorism include the following elements of traditional definitions; such as violence against innocent people, different methods of organization, the reliance on conspiratorial life, the use of fear, contact with the media, and so on.

The military option has over time been considered the most effective approach for fighting terrorism. However, transnational relations have brought several dynamics globally on counter-terrorism. Multi-lateral and bilateral relations of democracies in world politics with regards to terror groups have made it a matter of “your friends are our enemies.” This particularly was seen during the 1998 bombings by Al-Qaeda in Kenya and Tanzania for their friendly relations with the United States. Historically, Kenya has been recognized as ‘an island of peace’ however it has been a target of terror activities since its involvement in the Somali Civil War and its military action in Somalia (unilaterally) and eventually under Africa Union Mission in Somali (AMISOM). This led to a lot of criticism with calls for troop withdrawal to offer security in Kenya since clearly, the attacks were more at home than where the troops were. Perhaps, this is one of the reasons that show that the military option is not working in the case of Kenya’s action for counterterrorism. This then calls for diplomacy in counterterrorism measures.

Somalia and other East African Countries have been under deadly attacks by extremist groups for three decades now. Apart from clan rivalry in Somalia, terrorist organizations such as Harakat Shabab al-Mujahideen have been a major cause of instability in the country. The terrorist groups have been capitalizing on the weakness of the central government of Somalia. Al-Shabaab had captured and controlled significant parts of Mogadishu and Kismayo port. This was a major victory for them as they not only benefitted economically but their strength politically and socially grew. In 2011, with the help of AMISOM and Kenyan troops that later joined AMISOM, Somalia regained control over Mogadishu and Kismayo port. However, Al-Shabaab conducted even more attacks with over 500 attacks and about 150 of them in Kenya.

In April 2015 the militants would conduct a 15-hour siege at Garissa University College holding over 700 students hostages leading to the death of 148 people. In December 2019, a suicide truck bombing in Mogadishu killed 82 people and injured about 150 others. In a more daring attack, the US military base in Lamu-Kenya is attacked in January 2020 killing at least 3 US personnel. Al-Shabaab attacks Kenya with a demand for Kenya’s withdrawal from Somalia.

In response, governments have opted for military options with the use of drone strikes, special operations force with over half a billion-dollar spent on the training and equipping of AMISOM. Despite all these the attacks from terror groups still, go on. For a long-term approach to solving the problem of instability caused by these groups, the military option is not working. Most governments including the Somali government have downplayed the role of diplomacy in countering terrorism over time. With recent developments in how the terror groups operate transnational, it calls for cooperation with countries and diplomacy in approaching the groups. Kenya holds a no negotiating policy with the terrorist. When the two Cuban doctors were abducted in April 2020 by the Al-Shabaab who demanded a ransom of 1.5 million USD, Kenya realized the limitations of military action. It took the help of community elders from both Mandera in Kenya and Bulahawo in Somalia to negotiate for their release. This underpinned the importance of diplomacy.

Furthermore, despite Kenya’s troops in Somalia, the attacks in Kenya by terror groups have significantly increased. This shows the limitations of the military and calls for diplomacy to help in countering terrorism. Since diplomacy has traditionally been left to promote the state’s interest there is very limited literature explaining the role of diplomacy in counterterrorism.

The research analyzed the influence of diplomacy in countering terrorism focusing on IGAD countries’ diplomatic missions in Somalia.

2. Literature Review

The immediate goal of capacity building for counter-terrorism is to improve the national capacity to combat, investigate and prosecute terrorism, counter-terrorism funding and money laundering in Kenya more efficiently and comprehensively. With a long-term aim of reducing the incidence of terrorists, terrorism funding, and money laundering in Kenya. Any initiative aimed at enhancing Kenya's national capacity is achieved by strengthening the capacity of the NCTC.

Due to the nature of terrorism in the East African Region and Kenya, which on most occasion has targeted foreign interest, major efforts to counter-terrorism has been led and operated by donor funds and affected foreign interests. Therefore, most of the capacity-building programs are majorly funded by IGOs or international NGOs with regional initiatives still receiving support from the UN.

Technical organizations, foreign NGOs and local Civil Society Organizations (CSOs) are vital sources of professional knowledge and can serve as independent suppliers and implement a great deal of capacity building related to counterterrorism on the ground. CSOs are increasingly seen as autonomous and trustworthy partners by many donor states and other assistance providers and act as implementing agencies for a great deal of technical and other counterterrorism-related assistance.

CSOs' capacity-building activities and the capacity-building funding channeled into them provide many advantages over government-to-government assistance. The political sensitivities between an autonomous CSO and a recipient government, for instance, could be less than between two national governments. CSOs are also best suited to overcome the cultural and language differences that can hinder state-to-state preparation, which can draw experts from diverse cultural backgrounds and linguistic skills.

CSOs are therefore more agile, autonomous, and faster on their feet than governments and are therefore better able to respond to the recipients' sometimes-changing needs.

Capacity-building assistance is strengthened by bottom-up approaches rather than top-down policies on many counterterrorism-related problems, and local CSOs may help create support for other actors' capacity-building activities and ensure that they obtain the required follow-up attention to ensure that they are sustainable. Successful capacity-building initiatives enable both the assistance provider and the recipient to have local ownership and a long-term commitment.

CSOs, mostly permanently based in the region, have a competitive advantage over, for example, international donors or UN suppliers of technical assistance, who appear to have a small presence in the field.

The IGAD Capacity Building Program Against Terrorism (ICPAT), launched in June 2006, is an example of a groundbreaking collaboration on counter-terrorism capacity building between civil society (the Pretoria Institute for Security Studies [ISS]) and the government (the IGAD Member States and interested donor States). ICPAT, sponsored by European and other donors and administered by the ISS, is supervised by a steering committee consisting of IGAD member states.

A collaboration of both regional and international stakeholders, the initiative aims at capacity-building in the following five areas: (i) enhancing judicial measures; (ii) working to facilitate greater inter-agency counter-terrorism cooperation within individual IGAD member states; (iii) enhancing border control; (iv) providing training and exchanging knowledge and best practices; and (v) promoting pro-agency counter-terrorism coordination within IGAD member states; (iii) enhancing border control; member States of ICPAT admire and are deeply involved in the program for their technically based apolitical work.

3. Materials and Methods

The study was guided by the political theory of anarchism which relates to realism concept. A descriptive research design involving a mixed research approach of both qualitative and quantitative data was employed. The target population for this study was personnel of the diplomatic missions of IGAD countries in Somalia, namely, Kenya, Uganda, Ethiopia, Eritrea, Sudan, and Djibouti. From each mission, 6 officers were selected for data collection, namely, the head of mission, military attaché, political attaché, trade

attaché, and the administrative officer. An interview schedule was administered for the head of mission, while questionnaires were used for the rest of the officers. In addition to this personnel, IGAD’s secretary and the counter-terrorism officer in Somali’s foreign affairs ministry were selected for the administration of interviews. Quantitative data were analyzed using descriptive statistics and triangulated with qualitative data that was analyzed following the themes isolated in the interview schedules.

4. Results

The study entailed the inquiry on the influence of the Somalia-based IGAD countries diplomatic missions in capacity building for countering terrorism. The study consisted of a questionnaire item containing selected statements that measured the influence and rated on a 5-point Likert scale starting with 1- for strongly disagree and a maximum of 5 for strongly agree. The questionnaire participants were asked to rate their level of agreement with the statements. The collected data on the item was analyzed using descriptive statistics entailing frequencies and percentages and presented in Table 1.

Table 1 Diplomatic missions in capacity building for countering terrorism

		Strongly disagree	disagree	neutral	agree	strongly agree	Total
IGAD mission capacity building has created greater diplomacy	F	10	8	7	8	9	42
	%	23.8	19	16.7	19	21.4	100
IGAD mission capacity building has been inclusive	F	7	10	9	9	7	42
	%	16.7	23.8	21.4	21.4	16.7	100
IGAD mission has been on top level of involvement of the involved countries	F	9	7	10	9	7	42
	%	21.4	16.7	23.8	21.4	16.7	100
Capacity building needs in IGAD mission highly informed formation of CEPCVE	F	6	8	8	13	7	42
	%	14.3	19	19	31	16.7	100
CEPCVE inception has positively changed the capacity building of IGAD mission	F	6	9	8	10	9	42
	%	14.3	21.4	19	23.8	21.4	100

Table 1 shows that the majority of the participants (n=10, 23.8%) strongly disagreed with the statement “IGAD mission capacity building has created greater diplomacy”. However, the second-largest portion of the respondents (n=9, 21.4%) strongly agreed with the statement. This implied that there were variations in agreement with the statement. This was also affirmed through a portion of the respondents (n=7, 16.7%) indicating neutral with the statement. The findings were supported by the interview findings from one of the key informants. He noted;

Through IGAD mission, we have created a platform for capacity building among the staff. For instance, the training is conducted in groups irrespective of the country of origin. This helps in sharing ideas and knowledge from various countries hence an amplified training [KI 02].

The above statement shows that indeed there is the contribution of IGAD mission in capacity building with comes with the enhancing of diplomacy among participating countries.

Table 1 also shows that the majority of the respondents (n=10, 23.8%) disagreed with the statement “IGAD mission capacity building has been inclusive” while the other two equal portions of n=9 (21.4%) indicated neutral and agreed with the statement.

The table also shows that majority of the respondents 10(23.8%) were neutral with the statement “IGAD mission has been on top level of involvement of the involved countries”. Other portions of the respondents 9(21.4%) agreed and strongly disagreed with the statement. This was consistent with the interview results with the KIs where one noted;

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The involvement of IGAD mission depends on several factors. While some countries are fully involved, others are partial. For instance, countries close to Somalia re of great concern to the security of Somalia and thus need for them to be more active in the involvement [KI 01].

Table 1 also shows that majority of the respondents (n=8, 19%) in equal measures disagreed and remained neutral about a statement that Capacity building needs in IGAD mission highly informed the formation of CEPCVE.

However, the majority of the respondents 10(23.8) agreed that CEPCVE inception has positively changed the capacity building of the IGAD mission. This implies that the impact of the IGAD peace budling through the missions in Somalia is evident.

The study entailed an investigation of Somalia-based IGAD countries’ diplomatic missions in the promotion of partnerships for countering terrorism. The study involved a closed-ended questionnaire item with a task to rank the level of awareness of the statements among the respondents. The item was measured on a Likert-scale ranging between 1- not at all aware and 5- extremely aware. The findings are presented using Table 2.

Table 2 Somalia-based IGAD countries’ diplomatic missions in the promotion of partnerships

		not at all aware	slightly aware	somewhat aware	moderately aware	extremely aware	Total
Partnerships have been initiated and/or conducted by IGAD countries	F	8	10	9	7	8	42
	%	19	23.8	21.4	16.7	19	100
Funding partnerships promoted by the IGAD countries	F	9	12	10	6	5	42
	%	21.4	28.6	23.8	14.3	11.9	100
Partnerships promoted effectiveness by IGAD countries	F	12	8	10	6	6	42
	%	28.6	19	23.8	14.3	14.3	100
Partnerships have been affected by diplomatic disputes	F	10	8	10	6	8	42
	%	23.8	19	23.8	14.3	19	100
Personnel partnerships promoted by IGAD countries	F	12	8	10	6	6	42
	%	28.6	19	23.8	14.3	14.3	100

Table 2 shows that majority of the respondents 10(23.8%) were slightly aware about Partnerships have been initiated and/or conducted by IGAD countries. Equal portions of 9(18%) were not at all aware as well as extremely aware about the statement. This implies that there as divided views about the statement on the partnerships initiated. This could be informed by the differences in different job categories as well as missions.

Similarly, majority of the respondents 12(28.6%) indicated slightly aware about Funding partnerships promoted by the IGAD countries. Another portion of the respondents 10(21.4%) were somewhat aware of the statement. The table also shows that majority 12(28.6%) indicated that they were not at all aware about Partnerships promoted effectiveness by IGAD countries.

The quantitative findings depict the qualitative findings through the interviews with the mission heads where one KI noted;

The mission hardly focusses on bringing together countries. Instead, the focus is on accomplishing the objective set in Somalia, there are hardly association of the partnership between the countries to inform the effectiveness of the IGAD mission [KI 03].

In a different interview, the respondent indicated that it is only through partnerships that the essence and success of Amisom in Somalia has been met. He noted;

Was it not for the partnership among these countries to form Amisom, the Al-shabaab challenges facing Somalia would not have been curbed? The partnerships have helped the stakeholders to put together resources both financial and human to strengthen the fight against Al-shabaab [KI 01].

The majority of the respondents 10(23.8%) were neutral with the statement “Partnerships have been affected by diplomatic disputes” which implies that the disputes may not be a significant factor in the delivery of peacebuilding in Somalia. Moreover, an equal portion of the respondents 23.8% strongly disagreed with the statement. The table also revealed that the majority of the respondents strongly disagreed with the statement “Personnel partnerships promoted by IGAD countries”. This implies that the partnerships haven’t created a unique network for IGAD countries.

5. Discussions

From the study findings, there exist consistencies and contradictions with existing literature. The study found that the majority of the participants (n=10, 23.8%) strongly disagreed with the statement “IGAD mission capacity building has created greater diplomacy”. This is the reflection of Pesto (2010) who claims “Adequately and skillfully applying diplomacy is the key element that can integrate all anti-terrorism initiatives in a cohesive and connected whole.

The study also found that through the IGAD mission, we have created a platform for capacity building among the staff. The study also reported that the majority of the respondents (n=10, 23.8%) disagreed with the statement “IGAD mission capacity building has been inclusive” while the other two equal portions of n=9 (21.4%) indicated neutral and agreed with the statement. According to Connon and Simpson (2016), “the first principle of realism is that in foreign affairs, the state is the principal actor. Actors, for instance, people and organizations, exist, but their power is regulated.

The study also shows that the involvement of IGAD mission depends on several factors. While some countries are fully involved, others are partial. The study reported that the majority of the respondents (n=8, 19%) in equal measures disagreed and remained neutral about a statement that Capacity building needs in IGAD mission highly informed the formation of CEPCVE. According to Antunes and Camisão (2017), terrorist attacks engender a sense of injustice, creating an incentive for the purposeful recruitment of militants who are prepared to die to validate the goals of the terrorist organization, which is equally true for fighters within the area, as well as those exposed to the Al-Shabaab threat.

The study also found that the majority of the respondents 10(23.8%) were slightly aware of Partnerships that have been initiated and/or conducted by IGAD countries. Rosand, Miller and Ipe (2008) posit that in many respects, much more attention has been given to the comparatively few Western victims of terrorism in the sub-region of East Africa. The study reported that the majority of the respondents 12(28.6%) indicated being slightly aware of Funding partnerships promoted by the IGAD countries. The study also associated the efforts into bringing nations together as a hardly focused area. However, there were challenges in accomplishing the objective set in Somalia, there is hardly any association of the partnership between the countries to inform the effectiveness of the IGAD mission.

The study also reported that the majority of the respondents 10(23.8%) were neutral with the statement “Partnerships have been affected by diplomatic disputes”. This relates to existing studies including Ingram and Reed (2016) who opine that in the broadest sense, three variables, whether a single message or the larger campaign itself, is critical to optimizing the potential effect of strategic communication activities.

6. Conclusion

From the study findings through data collected using questionnaires as well as interviews, the study make the following conclusions;

That there is a great influence of Somalia-based IGAD countries’ diplomatic missions in capacity building for countering terrorism. This has been through the elements tagged on IGAD mission capacity building including being inclusive and highly informing the formation of CEPCVE.

The study concludes that the Somalia-based IGAD countries’ diplomatic missions influence the promotion of partnerships for countering terrorism. The key elements on interest in the influence of the diplomatic missions are partnerships that have been

initiated and/or conducted by IGAD countries, the funding partnerships promoted by the IGAD countries as well as partnerships that are directly influenced by diplomatic disputes. The study showed that the association of the partnership between the countries to inform the effectiveness of the IGAD mission is key.

7. Recommendations

As established on the findings of this study, the researcher developed recommendations that if implemented would further accelerate the influence of diplomacy in countering terrorism focusing on IGAD countries' diplomatic missions in Somalia.

1. The Amisom team and administration focus on creating greater Somalia-based IGAD countries' diplomatic missions through inclusive capacity building. By this, Amisom will be able to effectively counter-terrorism.
2. From the findings, the Amisom team can greatly influence the Somalia-based IGAD countries' diplomatic missions in countering terrorism through increased capacity building for its stakeholders.

References

- Antunes, S., & Camisão (2017). Realism. In S. McGlinchey, R. Walters, & C. Scheinpflug (Eds.), *International Relations Theory* (pp. 19-21). e-International Relations. <https://www.e-ir.info/publication/international-relations-theory/>
- Antunes, S., & Camisão, I. (2021). *Introducing Realism in International Relations Theory*. E-International Relations. Retrieved 1 March 2021, from <https://www.e-ir.info/2018/02/27/introducing-realism-in-international-relations-theory/>. Castillo, E. (2009). Process optimization: *A statistical approach*. *Journal of Quality Technology*, 40(2), 117-135
- Boyd, C. G. (2001, September 12). *Vulnerable to Hate*. The Washington Post. <https://www.washingtonpost.com/archive/opinions/2001/09/12/vulnerable-to-hate/488b9f4e-2d57-4e18-b5a8-7cf3283efde7/>.
- Castillo, E. (2009). Process optimization: *A statistical approach*. *Journal of Quality Technology*, 40(2), 117-135
- Connon, I. L. C., & Simpson, A. (2016). Critical Geography: An Introduction. In S. McGlinchey, R. Walters, & C. Scheinpflug (Eds.), *International Relations Theory* (pp. 110-116). e-International Relations. <https://www.e-ir.info/publication/international-relations-theory/>
- Chih, Y. Y., & Zwikael, O. (2015). Project benefit management: A conceptual framework of target benefit formulation. *International Journal of Project Management*, 33(2), 352-362.
- Center on Global Counter-Terrorism Cooperation. (2007). Implementing the United Nations General Assembly's Global Counter-Terrorism Strategy in the Asia-Pacific (pp. 5-15, Rep.). Global Center on Cooperative Security. doi:10.2307/resrep20391.8
- Global Counterterrorism Forum-East Africa Region Working Group. (2019). Regional Counter-Terrorism Centres of Excellence in East Africa. Global Counterterrorism Forum.
- Hoffman, B. (2006). *Inside Terrorism* (2nd Ed.). New York: Columbia University Press, p. 43.
- Ingram, H., & Reed, A. (2016). (Rep.). International Centre for Counter-Terrorism. Retrieved December 4, 2020, from <http://eresources.mku.ac.ke:2055/stable/resrep17480>
- Kombo, D. K. and Tromp, D. L. A. (2009). Proposal and Thesis Writing: *An Introduction*. Nairobi: Pauline publication Africa Don Bosco printing.
- Mc Morrow, A. (2017). Post-structuralism. In S. McGlinchey, R. Walters, & C. Scheinpflug (Eds.), *International Relations Theory* (pp. 59-61). e-International Relations. <https://www.e-ir.info/publication/international-relations-theory/>
- Mugenda, O. & Mugenda, A. (Revised 2003) *Research Methods; Quantitative & Qualitative approaches*, African Centre for Technical Studies, Nairobi, Kenya.
- Pesto, H. (2010). The Role of Diplomacy in the Fight Against Terrorism. *Connections*, 10(1), 64-81. Retrieved March 1, 2021, from <http://www.jstor.org/stable/26326234>

- Price, E. (2013). Selected Dissertations and Theses on Terrorism, Counterterrorism and Political Violence, 1980 – 2013 (available in full-text). *Perspectives on Terrorism*, 7(6), 166-202. Retrieved December 4, 2020, from <http://eresources.mku.ac.ke:2055/stable/26297072>
- ROMANIUK, P. (2010). Institutions as swords and shields: Multilateral counter-terrorism since 9/11. *Review of International Studies*, 36(3), 591-613. Retrieved December 4, 2020, from <http://eresources.mku.ac.ke:2055/stable/40783287>
- Rosand, E., Millar, A., & Ipe, J. (2008). Civil Society and the UN Global Counter-Terrorism Strategy: Opportunities and Challenges (pp. 16-19, Rep.). Global Center on Cooperative Security. doi:10.2307/resrep20282.8
- Rosand, E., Millar, A., & Ipe, J. (2009). Download citation. Retrieved March 01, 2021, from <https://www.tandfonline.com/action/showCitFormats?doi=10.1080%2F10246029.2009.9627532>.
- Warburg, G. (2010). *Middle Eastern Studies*, 46(2), 307-312. Retrieved March 2, 2021, from <http://www.jstor.org/stable/20720664>

Strategies for Performing Educational Projects: Use of Monitoring and Evaluation Plan and Tools

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Abstract: There exists an immediate necessity for a well-organized monitoring and evaluation procedure across the country in the Kenyan county government structure and the increasing monetary decentralization concerning to growth policies, projects, and programmes (Phiri, 2015). In reference to Kumar, Kumar, and Vivekadhish (2016), data shows there are actual challenges in realizing the eventual aim of the various ventures in Kiambu County. The absurdity is that there are still occurrences of project disappointment in Kiambu, given an agreement within and between scholars that appropriate monitoring and evaluation influence the degree to which a project attains its main intended aims. The purpose of the study was to analyze the influence of the monitoring and evaluation plan and tools on the performance of education projects funded by the Kiambu County Government. The study was guided by change theory and realistic evaluation theories. The study used descriptive design. The study was conducted within Kiambu County with a sample size of 96 participants. The study used questionnaires and interviews to collect data. The study revealed that an express impact of monitoring and evaluation exists as monitoring is described in basic terms as overseeing the project while implementation takes place. Deductions can be made from this research that monitoring and evaluation strategy is the summary of design of the project which primes the impact of school county funded project success. To speed-up the success of projects, the researcher recommended formulating and implementing an exclusive monitoring and evaluation strategy.

Keywords: *Strategies, Educational Projects, Monitoring and Evaluation, M&E Plans, M&E Tools*

I. Introduction

Each educational institution has an obligation to monitor the efficiency of the services being delivered to its young people and children. Several things ought to be considered when measuring the efficiency of an educational institution. These include factors such as safety and health, financial control, turnout, employee development, child safeguarding, ethos, cooperation with other development organizations and, of course, the curriculum, teaching and learning. The better the collective comprehension of the nature and purpose of these fundamental undertakings, the higher is the probability that every employee was aware of and appreciate the significance of their own roles in maintaining, assuring and refining the standards (Glasgow Education Services, 2013).

Glasgow Education Services (2013) notes, in a bid to achieve endless perfection in standards of education, institutions of learning have to participate in a complete range of quality procedures. The basic ones consist of planning with regard to development, the execution of institutions of learning improvement strategies, monitoring and assessment and ongoing expertise improvement of staff. Every one of these procedures must have, as the very center of their purpose, enhancing the quality of training and learning

so that each child and the young person may attain to the limit of his or her potential. In this context, it is obvious that particular significance must attach to monitoring and assessing the quality of training and learning.

Due to the importance attached to M&E in projects implementation, studies have been done across the world to focus on some issues influencing their success. From the global angle, for example, China has been known and is still known today to be among the best-performing countries in their M&E process as a tool of performance in both the public and private sector (UNDP, 2015). According to PASSIA (2013) in their report on the performance of sanitation projects construction in central elementary school, several factors determined their success. Among the major cited factor was the M&E process as implemented by the government management bodies, the contractors and the school leaders. In the report, over 230 teachers filled-out a questionnaire that required them to break down some of the factors they felt had an influence on the M&E process. In a chi-square test, a calculated value of 35.1, 24.1, 43.9, and 54.1 were found against the critical value of 9.49 for factors like stakeholders' participation, financial resources, and attitudes towards M&E by staff members and training and M&E education to members. The same factors have been cited to influence the performance of monitoring and evaluation in school infrastructural ventures implementation in New Delhi India today by Work (2015).

There exists an immediate necessity for a well-organized monitoring and evaluation procedure across the country in the Kenyan county government structure and the increasing monetary decentralization concerning to growth policies, projects, and programmes (Phiri, 2015). In reference to Kumar, Kumar, and Vivekadhish (2016), data shows there are actual challenges in realizing the eventual aim of the various ventures in Kiambu County. Similarly, in reference to the assessment of the financial reports for the period ended 30 June year 2016, the Kiambu County auditor general executive several numbers of projects didn't meet the stakeholder's expectations, the projects include the following: the construction and rehabilitation of lavatory block in Githunguri ECD center. This points to the failed Monitoring and evaluation systems in the projects. M&E helps in tracking down the progress of such projects to ensure effectiveness.

In 2014, the classroom floor was refurbished tiles as a substitute to laying out a 40mm thick hard wearing grade terrazzo, there was no proof of approval for the charge of materials, toilet painting exposed poor workmanship resulting from this anomaly. It has not been possible to check if the value for money used throughout the year that ended 30 June 2016, an additional venture was on refurbishment and rehabilitation of Gachie Early Childhood Development Nursery school that was given to service provider on 2nd December year 2014 at a total budget of 1,961,200. The records showed that a disbursement worth Kshs1,053, 788 was already actualized by 12th January year 2016, though a checkup carried out on the progress of the project showed that the construction work was not complete. In reference to Mwangi, Nyang'wara and Ole Kulet (2015), construction of two classrooms and a lavatory block at Kahembeta Secondary School, however, the construction of the two classrooms was done the toilets were left not complete and the veranda area wasn't done, additionally, the contractor was not in the site during the inspection in October 2016 (Fiscal statement of government county executive of Kiambu, 2016). The absurdity is that there are still occurrences of project disappointment in Kiambu, given an agreement within and between scholars that appropriate monitoring and evaluation influence the degree to which a project attains its main intended aims. The purpose of the study was to analyze the influence of the monitoring and evaluation plan and tools on the performance of education projects funded by the Kiambu County Government.

II. Literature Review

Most scholars, for example, Chitkara, and Kohli (2008) recognize that project evaluation and monitoring should be exercised at the very beginning of the project planning, a few argues that it ought to be set after the planning phase of the project. Nyonje et al (2012). Regardless of these differences, majority of the scholar, agrees that planning the venture should include comprehensive details of how it should be evaluated (Cleland and Ireland, 2007).

Vivekadhish, Kumar and Kumar (2016) point out that monitoring and evaluating career progress is a "way of looking at, investigating, following as a change of pace to meet the indicated principles used in the plan". The authors further clarify that monitoring produces, measuring progress and project current position. Performance reports make available the tails of presentation of activities in terms of scope, system, assets, cost, quality, as well as risk, that may be utilized as functions in several programs. Viewing and viewing activities may be fundamental to a variety of players, as well as experienced factions, as it can make certain that proximity of efforts is re-introduce several attempts by a money related component showing two or three locations (Stevens and Kanie, 2016). The ace outlined three vital id for emphasizing on the evaluation and assessment of performance of the board through creative evaluation. The three points of view join the power of the monitoring, the alignment strategies of the M&E categories and engagement organizations. These three viewing conditions are developed in the 2-3-2-1 outline review.

Kanine and Stevens (2016) indicated that anywhere the power of monitoring and assessment is localized or connected to the quality of basic expression work, thought should be done. They also made it clear that monitoring and assessment units ought to be seen as grateful contributors and ought to have the choice to formalize their expansion work so that monitoring and assessment executives require flexible inputs to back their legitimacy (Kanie and Stephens, 2016). It suggests that the spectator system ought to be developed achieved a specific goal of having a greater impact on shaping its thinking. Empowered for M&E social events, a variety of factors are often playing part in refining the visibility of the merger, including re-examining to see progress, the number of people evaluating the experimental program, the amount of understanding to consider cost over performance, (Kanie and Stephens 2016).

Opinions necessitate undeniable monitoring and assessment points under the design outlining, possible, recognition and support requirements. It is very important, when coming up with monitoring and evaluation structure to identify the framework, plans, and modifications that was used to see to it M&E requirements (Chaplowe, 2008). There is a distinct distinction from the tools used to assist managers of the project with planning and controlling of the project need activities for example: selection of the venture and risk management tools and procedures; tools for project implementation and strategies; project management tools for execution; venture management; monitoring and control tools and processes.

The logical framework (Logframe), seen by the hundred, tools of the most widely used tool and techniques for planning and viewing experiences. The Log structure further is a physical integration that is the interaction of all the governments and non-governmental organizations that are progressively successful. It is a structure that uses M&E indicators all the time to perform sequentially as we perceive the expected risks. The expected structure in this way reflects the area used when using the M&E structure in Chaplowe, (2008). In addition, it works respectfully with other instruments of monitoring and assessment (Jaszczolt, 2010).

Brunner (2010) also require that it continue with the use of the Log framework taking into account two or three variables. You agree that the Log Frames Approach has not been disabled by experts. Apart from the way various providers perceive the points and their shortcomings; that watendodels has technologies that have a tendency in society to look at a specific area that can backfire such as opposing and revitalizing neighborly acquisition, combined effort, and possessions (so it is important to encourage and lie around decorators, particularly supervisors, to change their comprehension of log plots) or whether they continue to utilize it. Myrick (2013) observes that the business-to-business approach to M&E management is completely ineffective, and ultimately, masters may be forced into extraordinary measures to implement either a log case or a silent M&E management strategy. Therefore, whatever process is used, the basic principles of M&E intended to be achievable, performance limits, available locations and special announcements should be applied to the plan. The benefits of the Log Line combine comprehension and adequacy in data collection, record and determination. The M&E apparatus includes performance indicators, logical framework, theory-based evaluation, formal surveys, and rapid appraisal methods, and many others. The choice of the instruments is dependent on required data, accessories as well as costs to be incurred (World Bank, 2002).

Apart from the two basic data gathering strategies which are the normal one and less formal method (Nabris, 2002). However, formal processes have a high demand for uninterrupted legitimacy and quality, as well as reviews, hands-on ideas, and straight checks. A less formal meaningful detail is a symbol, and as the requirements are very close to the end. They include field visits, as well as informal social issue. In order to improve the capability of M&E framework, the evaluation and assessment system and planning should be established as a fundamental element (Nabris, 2002).

III. Materials and Methods

The study was guided by change theory and realistic evaluation theories. The study used descriptive design to describe the M&E in county sponsored school projects. The study was conducted within Kiambu County with a target population of 240 stakeholders in the teaching fraternity and school projects' implementation phase (Kiambu County). The sample size entailed 96 participants including and the County Executive Committee Member (CEC) (40% of the population). The study used questionnaires to collect data from the in-house audit team, the Education management team, the Ward administrators (WA) and use interviews to collect the data from the Executive Committee Member (CEC). The questionnaire was piloted in Gatanga - a sub county of Muranga County. The pilot data was used to examine validity and reliability of the tool. Data analysis employed descriptive statistics using SPSS version 24.0.

IV. Results

Demographics of the Questionnaire respondents

The study collected data on the demographics of the questionnaire study participants to determine their status based on their age, gender, level of education as well as encounters with their current employer at the Kiambu County Government. The data was analyzed and presented using Table 1.

Table 1 Demographics of the Questionnaire respondents

Item	Category	F	%
Gender	Male	50	64.94
	Female	27	35.06
Age	a) Below the age of 35	10	12.99
	b) 36 to 45 years	19	24.68
	c) 46 years to 55 Years	32	41.56
	d) Above 55 years	16	20.78
Highest level of education	a) Post-graduate Level	10	12.99
	b) Graduate	45	58.44
	c) Higher College	20	25.97
	d) Secondary	2	2.597
Experience with current employer	a) 1 year and under	20	25.97
	b) Between 1-5 years	25	32.47
	c) More than 5 years	32	41.56

Effect of the monitoring and evaluation plan on the performance of education projects funded by the Kiambu County Government

This study investigated the impact of the monitoring and evaluation plan on how education projects funded by the Kiambu County Government performed through analyzing their project lifetime as well as the aims of the monitoring and evaluation department since the inception of the counties after declaring the 2010 constitution in Kenya.

Period of existence and primary objective of the M&E Department

The M&E department and its units for this study existed between the periods of less than 2 years to above 8 years as shown in table 2 below. The primary objective of the school funding project was to improve the quality of literacy and numeracy instruction for girls and boys in Early Child Development Education and Vocational training programs in Kiambu county. On the average, the staffs have been on the school funding project for a period of 2 years.

Table 2 Period of existence of M&E department and its units

	Frequency	Percentage (%)
Less than 2yrs	2	3.1
2-3	2	3.1
4-5	5	6.2
6-7	14	18.8
8 & above	53	68.8
Total	77	100.0

Table 2 shows that the majority of the M&E units 53(68.8%) in Kiambu county have existed since over 8 years ago. The implications affirm how such units must have been established or been in existence before the promulgation of the 2010 constitution that brought about the legal administrative boundaries of counties in Kenya.

Monitoring and Evaluation roles and responsibilities

This survey further examined what influences of M&E plans by collecting data on M& E roles and responsibilities. The findings are presented in Table 5. Each of those who took part in this study participated in monitoring and evaluation interventions at different levels depending on their job positions within the assessed programs. Among these participants were project managers whose roles revolved around the conception and execution of the exact activities, the teams from the Information Communication Technology departments as well as those from the Management Information System organization, networking and advocacy officers and administrators and logisticians.

Table 3 up next represents the duty distribution within the interventions where the implementers included management officials who coordinate Information Communication Technology, employees who carry out the information gathering and record-keeping, corporate officers as well as officers in charge of communication, governance, and planning.

Table 3 Role of respondents in the school funded projects Project

Category of M&E planning team	Roles	Frequency	Percentage (%)
Project Management team members	Conceptualization and project planning	5	21.8
	ICT/ MIS coordination		
	Liaison and communication	4	
	Administration & logistics	4	
Project M&E staffs	Data collection and documentation	3	15.6
	ICT/ MIS coordination	4	
	Liaison and communication	5	

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Project officers	Conceptualization and project planning	9	34.5
	Data collection and documentation		
	Liaison and communication	7	
	Administration & logistics	8	
		2	
Consultants	Conceptualization and project planning	4	28.1
	Data collection and documentation		
	ICT/ MIS coordination	7	
	Liaison and communication	8	
		3	
Total		77	100.0

Table 3 illustrates how most of the participants 26 (34.5%) worked as project officers in the planning for supervising and assessing county school-sponsored ventures. In this, their roles included conceptualization and project planning, gathering information, recording, networking and corporation, advocacy, and planning. Within this table is also other staff 22(28.1%) who worked as consultants in the planning of supervision and assessment of the county school-sponsored engagements.

Elsewhere, in a different investigation, the survey, found that all the participants representing 100% (n=77) showed knowledge of the supervision and assessment plots of the various interventions. Despite the fact that preparations and strategy for these plots were not inclusive of the ideas of everyone, participants quickly grasped the idea following an assessment training. It was noted that it was the institution executing the project which also formulated this M&E scheme immediately following the unveiling of the County School Funding project. The production of such resources was affected by the availability of funds for the implementation of actions, the readiness as well as the capability of the personnel in implementing outlined action points within the M&E framework like gathering and analyzing information, the practicability of the listed action points, the workplan of the intervention and viability of the stated deadlines, issues around ethics, and any apparent risks.

Additionally, the participants clearly explained the major constituents of these M&E schemes as including the project purposes, pointers/gauges, foundational information, and goals. Others outlined on the list were explanations on pointers, routines for gathering information, periodic evolutionary report preparations for every pointer, how the information would be verified, mechanisms for report preparations, task allocations to individuals and a budget line for the whole process.

In the same sense, the participants were questioned on if they thought the M&E schemes assisted implementers to better conceptualize the prospects of the interventions and all (n=77) representing 100% gave an affirmative. Also, the participants expressed their thoughts that monitoring, and evaluation plans greatly impact how interventions are executed at 8.2 out of 10.

Largely, therefore, it is acceptable to conclude that enough effort was placed on achieving outputs, outcomes, and impact of the project. The implication is M&E frameworks are formulated for providing a roadmap for the interventions and actions of any project. M&E frameworks also help in stalking the achievements at every stage of the project.

Through the interviews with the Executive Committee Members (ECM), the study revealed that there was sufficient planning for follow-ups and assessments of the school county-funded projects. One noted:

It is within the documentation that every project has a guided monitoring and evaluation plan. It is therefore important that under every project funded by the county government, project monitoring and evaluation plans are in order and as required [KI 002]

Effect of the Monitoring and Evaluation tools on the performance of education projects

The mechanisms and equipment useful for taking information, storing, analyzing, and preparing reports for the project were considered important. All the 77 participants representing 100% agreed that there were such procedures in place, for example that

information was taken and stored in the project information catalogue for the project since the ground-breaking reports and statistics, on-going supervision reports and so forth. The information catalogue was utilized for drawing required data at any point and also for producing trajectories on the project course which advised any changes to be made for better outcomes.

Additionally, 72 participants representing 94% of all, stated that they had taken part actively in gathering information during varied periods whereas 24 persons representing 31% of the participants declared that they carry out frequent information cleansing where they check to remove some information. This category also stated that they keep abreast with quality of the information periodically in order to analyze the information and produce reports. Again, those who took part in gathering the information clarified that the process added value to their knowledge in terms of what the intervention expected since, during the activity, tendencies were visible on how various targets were to be met along the implementation period.

Averagely, how data management mechanisms impact the way projects perform was ranked 7.8 out of 10 by those who took part in the study. This implied that there was a higher impact of the data mechanisms. Nonetheless, this rating was below compared the impact of monitoring and evaluation mechanisms such as the M&E strategies and competencies on how the interventions performed.

V. Discussions

The findings of the current study show how monitoring and evaluation procedures such as M&E strategies, skills, equipment, and the involvement of relevant partners impact the success of the project either as a person or as a team. Strategic M&E refers to procedural planning of the project funds in a more organized manner with the aim of excelling its purposes (Faniran, Love and Smith 2000). Examining the influence of monitoring and evaluation plans on the performance of projects was one of the objectives of the current research. Results have shown that monitoring and evaluation of the County School Funding project remained directed by the M&E strategies that were formulated soon after the project inauguration, as advised by Gray (2009). The consequence of the findings explains the fact that project implementers possess the necessary competencies for procedural organization of the project funds so that they are used to succeed the project goal. As explained by Nuguti, (2009), the recognition of required information while carrying out a project and also the pointers of success of the project are central in any monitoring and evaluation strategy. It was seen that all the participants at 100% declared their familiarity with the monitoring and evaluation strategy that worked in the project consisting of the pointers to success. Alcock (2009) advises that in the process of monitoring and evaluation, clear information gathering itineraries as well as clarity in role distribution for the implementers must be drawn. Likewise, this research confirmed that information gathering itineraries and clear distribution of the responsibilities for monitoring and evaluation were specified in the monitoring and evaluation strategies in preparation of the success of the project. Such are in line with monitoring and evaluation study results explained by various previous works in the literature review section.

In general, a monitoring and evaluation strategy provides a clear framework of the causal expectations that highly affect the outcome of the project, including how the items in the log frames relate for instance the activities, inputs, outputs, outcomes, and impact (Mackay 2007; Alcock 2009; Nuguti 2009). The current research established the growing of project logical frameworks by the County School Funding projects detailing with clarity the pointers to success, any root conventions that highly determine the success of the project and the expected correlation between elements of the log frame like the inputs, events, outputs, outcomes, and impact. Equally, such procedures made sure that the strategies outlined in the project monitoring and evaluation strategy was realizable, attainable, and practical for the success of the project.

Moreover, these results were in line with Dvir et al. (2003) who suggested the centrality of project objectives in formulating monitoring and evaluation strategies for all the activities and roles. The reason is that the strategies are drawn directly from the objectives of the project. While developing the project monitoring and evaluation frameworks, each of the objective is described,

before designing how they could be achieved which are usually produced as the monitoring and evaluation strategies and utilized for assessing the success of the objectives (Dvir et al., 2003).

VI. Conclusion

This study reveals that an express impact of monitoring and evaluation exists as monitoring is described in basic terms as overseeing the project while implementation takes place. Evaluation on the side is described as assessing and providing judgments of how the project has performed against the already formulated aims and goals. Hence, it is the monitoring and evaluation process only that provides an effective analysis of the performance as well as any suggested that must be implemented to enhance the success of the project. Authoritatively therefore, central monitoring and evaluation procedures surveyed must be implemented for optimum outcomes.

Deductions can be made from this research that monitoring and evaluation strategy is the summary of design of the project which primes the impact of school county funded project success. Engaging in a project that do not have a project monitoring and evaluation strategy refers to interventions lacking all the central components of M&E like organization, pointers to success that help in tracking success, information gathering instruments or plans, role distribution for implementers, as well as frameworks and methodologies for analyzing data. As such, project implementation remains difficult to conduct required monitoring and evaluation activities if such a framework is missing.

Any monitoring and evaluation strategies outlines required capabilities, funds as well as information for monitoring growth and success of the project. It moves on to outline the program and procedures of gathering information, duty allocation for the staffs working in the project. When projects utilize the monitoring and evaluation strategy, capability breaches are quickly recognized, and trainings are organized to fill the same customized to meet specific needs. Additionally, monitoring and evaluation strategies are used to develop exclusive data management systems for the project. According to this research, monitoring and evaluation can only impact the success of the project if the monitoring strategy must presently direct the engagements of the project in terms of action mechanisms of the project so as to be conversant with targets.

VII. Recommendations

Monitoring and evaluation strategies from the results of this research showed a great correlation with project success for school county-funded projects. To speed-up the success of projects, the researcher recommended formulating and implementing an exclusive monitoring and evaluation strategy. In addition, results discovered that skills in monitoring and evaluation are brought about by ensuring training and capability enhancement for the staff implementing the project thereby securing and driving their knowledgeability on project deliverables, goals, and targets.

References

- Abdulkadir, H. S. (2014). *Challenges of implementing internal control systems in Non-governmental Organizations (NGO) in Kenya: A case of Faith-Based Organizations (FBO) in Coast Region*. *Journal of Business and Management*, Vol.16(3), PP 57-62.
- Achola, P. P., & Pillai, V. K. (2016). *Challenges of primary education in developing countries: Insights from Kenya*. Routledge.
- Altbach, P. (2015). Higher education and the WTO: Globalization run amok. *International Higher Education*, (23).
- Asuga, G. N., Scevak, J., & Eacott, S. (2016). Bringing a'Local'Voice to a'Universal'Discourse: School Leadership Preparation and Development in Kenya. *International Studies in Educational Administration (Commonwealth Council for Educational Administration & Management (CCEAM))*, 44(1).
- Chih, Y. Y., & Zwikael, O. (2015). Project benefit management: A conceptual framework of target benefit formulation. *International Journal of Project Management*, 33(2), 352-362.

- Glasgow Education Services (2013). *Monitoring as part of the quality framework*. Extracted from www.glasgoweducationservices.org
- Hussain, S., Fangwei, Z., Siddiqi, A., Ali, Z., & Shabbir, M. (2018). Structural Equation Model for Evaluating Factors Affecting Quality of Social Infrastructure Projects. *Sustainability*, 10(5), 1415. doi:10.3390/su10051415
- Kamau, C. G., & Mohamed, H. B. (2015). *Efficacy of monitoring and evaluation function in achieving project success in Kenya: A Conceptual Framework*. *Science Journal Of Business And Management*, 3(3), 82-94.
- Kumar, S., Kumar, N., & Vivekadhish, S. (2016). *Millennium development goals (MDGS) to sustainable development goals (SDGS): Addressing unfinished agenda and strengthening sustainable development and partnership*. *Indian journal of community medicine: Official Publication of Indian Association of Preventive & Social Medicine*, 41(1), 1.
- Kusters, K., Buck, L., de Graaf, M. et al. (2018). Participatory Planning, Monitoring and Evaluation of Multi-Stakeholder Platforms in Integrated Landscape Initiatives. *Environmental Management* 62, 170–181 (2018). <https://doi.org/10.1007/s00267-017-0847-y>
- Mwangi, J. et al (2015). Factors affecting the effectiveness of monitoring and evaluation of constituency development fund projects in Kenya: A Case of Laikipia West Constituency. *IOSR Journal of Economics and Finance (IOSR-JEF)*, 6(1), 2321-5925.
- Mwangu, A. W., & Iravo, M. A. (2015). How monitoring and evaluation affects the outcome of constituency development Fund Projects in Kenya: a case study of projects in Gatanga Constituency. *International Journal of Academic Research in Business and Social Sciences*, 5(3), 13-31.
- Mwanzia, J. S., & Strathdee, R. C. (2016). *Participatory development in Kenya*. Routledge.
- Ogolla, F., & Moronge, M. (2016). Determinants of effective monitoring and evaluation systems of government funded projects: a case of Nairobi County. *Strategic Journal of Business & Change Management*
- PASSIA. (2013). *Civil Society empowerment: Monitoring an Evaluation* www.passia.org/seminars/2002/monitoring.htm (Accessed on 21/4/2011)59.
- Phiri, B. (2015). *Influence of monitoring and evaluation on project performance: A Case of African Virtual University, Kenya*. University of Nairobi.
- Stevens, C., & Kanie, N. (2016). *The transformative potential of the sustainable development goals (SDGs)*.
- Umugwaneza, A., & Warren, K. J. (2016). Role of monitoring and evaluation on project sustainability in Rwanda. A case study of Electricity Access Scale-Up and Sector-Wide Approach Development Project (EASSDP). *European Journal of Business and Social Sciences*, 5(07), 159-177.
- UNDP, (2015). *Handbook on Monitoring and Evaluation for Results*. UN: Millennium Development Goals Report 2015.
- Waithera and Wanyoike (2015). *Influence of project monitoring and evaluation on performance of youth funded agribusiness projects in Bahati Sub-County*.
- World Bank (2002). Monitoring & Evaluation: some tools, methods and approaches. *The World Bank, Washington, D.C.*
- Yusuf Muchelule, at al. (2015) Correlation between Monitoring and Evaluation and Performance of Social Development Projects in Bunyala Sub County, *International Journal of Innovative Research and Development*. Vol.4, Issue4
- Zaman, U., Nawaz, S., Tariq, S., and Humayoun, A. (2019). Linking transformational leadership and “multi-dimensions” of project success: Moderating effects of project flexibility and project visibility using PLS-SEM. *International Journal of Managing Projects in Business*, Volume 13, Issue 1.

Civil Military Cooperation (CIMIC) As A Strategy For Security Stabilization Operations: Case Of Lamu County, Kenya

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Abstract- This study sought to assess the role of civil military cooperation in security stabilization of Lamu County. It was grounded on Deutsch's theory on cooperation and competition and employed a descriptive research design. The researcher targeted the community leaders, ward administrators, religious leaders and officials from the security agencies and humanitarian actors. Stratified, simple and purposive sampling was adopted such that the final sample size was 132 respondents who took part in the study. Primary data was sourced from interviews and open-ended questions while secondary data was sourced from books and journals. Content analysis was conducted on qualitative data while descriptive analysis was done on quantitative data. The results revealed that the factors that led to the adoption of CIMIC approach included continued instability in the county, collapse of lines of communication, economic sabotage, existence of locals who were sympathetic to the terrorists and the presence of youth gangs. The study also found that some of the CIMIC activities undertaken by the multiagency teams included liaison activities, quick impact projects (QIPs), and outreach programs. On the effectiveness of CIMIC approach the study found out that it had aided in opening up lines of communication, strengthened the relationship between the various security actors, re-built the social lifestyle of the people, economic empowerment, and led to the creation of a safe region through rooting out gangs and criminal elements as well as increased instances where residents willingly shared key information. It was also found out that there was reduction in crime rates, free movement and improved growth and development of the county. The study concluded that the use of civil military cooperation approach had led to peace, security and stability in Lamu County. The study recommended that all the stakeholders from the multi-agency team should continue with operations in the region to further strengthen security situation in Lamu County, Kenya

Index Terms- Civil -Military Cooperation, Security and Stabilization, Liaison Activities, Outreach Programs, Peace Actors

I. INTRODUCTION

Regions that are characterized by insecurity are often left behind in terms of development, growth and advancement. This is because the people and its leaders concentrate on finding peace and stability (Albro & Ivey, 2014). Many approaches are used in trying to resolve the conflicts and bring lasting peace such as the use of military force which was a favored approach. But as the complexity of the conflicts expanded, the use of military force was limited since it could not fully solve the security issues and bring lasting stability to the conflicted areas. This led to adoption of alternative approaches and the use of civilian actors who tried to find solutions without the use of force. The military and civilian component worked to stop the conflicts and stabilize regions but through different approaches. This interaction between the two groups is what birthed the concept of Civil-Military Cooperation (CIMIC).

CIMIC concept describes the relationships between civilian and military personnel as they work together to resolve conflicts and stabilize unstable regions. Friend (2020) noted that CIMIC came about due to the complex issues that were associated with wars and conflicts. Bannelier-Christakis (2016) share that CIMIC approach is a great tool that can be used in the modern world based on interferences and complications in the present environment. The concept as a tool is ideal in conflict and post-conflict stabilization operations (Liaw, Guido De Oliveira, Idrus & Talib, 2019). The civil military cooperation concept was developed by NATO and it was first applied in the Balkans and involved the formulation of common goals and pathways during its implementation process (Welch, 2019).

Civil military cooperation (CIMIC) activities remain one of the most important elements of stabilization operations within a conflict prone area and an essential capacity of information operations. The CIMIC concept has been applied in different regions including Afghanistan in routing out terrorists and rebuilding of the nation; Lithuania in handling the provincial reconstruction teams (PRT); and in Malaysia when handling natural disasters. Regionally, it has been adopted in post-Gaddafi era in Libya, tackling Boko Haram in Nigeria, and also in South

Sudan and Somalia. In all the regions that CIMIC has been adopted, the results have been varying with some achieving paramount peace and stability while others continue to experience instability.

Within East Africa, Somalia has continually suffered from attacks by the Al-Shabaab terror group and in the year 2010 the Kenya Defense Forces (KDF) launched operations in the Country with a view of degrading the terrorist group and liberate the area. This resulted in the infiltration of the elements to the neighboring countries including Kenya. The Al Shabab concentrated their attacks in the larger North Eastern region, part of the Coastal region and Nairobi City (Kimari & Ramadhan, 2017). In the coast province, the major attacks were staged in Lamu County since it harbors the Boni Forest which is a conducive hide-out and training base for the newly recruited members. Major attacks were concentrated in the Mpeketoni area which led to the death and maiming of many innocent Kenyans. This led to the launch of the multi-agency operation by the Government of Kenya code named 'Operation Linda Boni' in the year 2015 which was aimed at liberating the Lamu County from Al-Shabaab.

The operation was CIMIC centered and involved various security agencies within the County. Wanjiku (2020) shared that military action alone cannot resolve the issue of terrorism in any region such as Lamu County and therefore recommended the participation of local residents and other civil organizations of local and international decent. Assessing CIMIC approach in Lamu County will bring a clearer picture of workings of this specific approach, based on the fact that the region has seen operations conducted by the Kenya Defence Forces (KDF), the National Police Service (NPS), National Security Intelligence Service (NSIS), National Youth Service (NYS) and the provincial administration. This study therefore examined CIMIC approach as a strategy in enhancing security stabilization and the focus was the Lamu County where several CIMIC activities have been conducted in the Al-Shabaab infested region.

II. 2.0 STATEMENT OF THE PROBLEM

Since the commencement of 'Operation Linda Nchi' in Somalia, the Al-Shabaab group reacted by penetrating the porous Kenyan border. The militant group later launched several terror attacks, kidnappings and destruction of property in different regions within the country. In the coastal region, the rampant insecurity cases have had a negative effect on the socio-economic well-being of the locals. Wanjiku (2020) noted that the Al-Shabaab terrorists had mingled with the locals and one of the ways of defeating their agenda was to work with the locals who would help in identifying and flushing out the terrorists.

This led to the launching of an operation code named 'Operation Linda Boni' by the Kenyan Government in the year 2015, whose sole aim was to flush out the Alshabaab militants from the Boni enclave. The operation was CIMIC centered and was meant to last for 90 days. However, despite massive funding and support, the operation have been characterized by poor coordination, mistrust between the local community members and infighting between the various actors with the Alshabaab militants continuing to control sections of the Boni Forest and using it to

launch attacks in the region even in areas occupied by the locals and across the nation (Jowell, 2018).

Questions are therefore raised on the suitability and effectiveness of the CIMIC approach towards attaining peace and security in Lamu County. This study assessed the use of civil military cooperation (CIMIC) strategy in the quest for securing and stabilizing Lamu County. The focus of the study was to look at the activities and effectiveness of the CIMIC strategy in attaining its mandate.

III. 3.0 PURPOSE OF THE STUDY

The purpose of the study was to investigate the use of civil military cooperation as a strategy in security stabilization in the operations in Lamu County.

The study sought to answer these research questions:

- i) What factors led to the adoption of civil military cooperation approach in the security stabilization of Lamu County?
- ii) Which civil military cooperation activities have been applied in Lamu County?
- iii) How is the civil military cooperation effective in security stabilization in Lamu County?

IV. 4.0 LITERATURE REVIEW

4.1 Theoretical Review

Deutsch's Theory on Cooperation and Competition

This theory was developed by Morton Deutsch (1949) whose basic concept is based on two ideas that relate to the type of inter-dependence of the agenda of the people within a certain situation and the action that they take. At any singular time, the goal interdependence can either be positive or negative. For positive interdependence, it relies on probability of attaining the goal for an individual such that it is correlated to other people's chances of attaining the goal. On the negative inter-dependence, it is such that the probability of attaining the goal has a negative relation to chances of others attaining the same goal.

The theory operates on the fact that different people's goals are interlinked and Deutsch (2011) noted that positive inter-dependence can be as a result of joint attainment of goals by a group of people. This can be done through resource searching and sharing, working together to overcome the hurdles and splitting the workload to different sections of the work group. The group is affected by the personality of each person in the group and the socio-cultural orientation. Alternatively, the cooperation of the work group can be affected by socio-psycho processes with elements like substitutability, cathexis, and inducibility. Substitutability works to avoid duplication of roles and actions, hence creation of task specialization; Cathexis is based on developing favorable bonds or cliques that can create nepotistic angle and Inducibility is conforming to the viewpoint of others and losing individual contributions that are unique (Tjosvold, Wong, Chen & Li, 2012). This weakens and fractures the group cohesiveness and deteriorates it.

The concepts identified in the theory guide the interactions of civil actors, humanitarian actors and the military forces while working to stabilize any conflicting region. It explains how CIMIC approach can best be adopted to improve interrelations and attain the goal of stabilizing and securing a war-torn region. Thus, the theory guides the different stakeholders assigned to play different roles in securing and stabilizing Lamu County.

4.2 Empirical Literature Review

Factors Leading to Adoption of CIMIC Approach

Civil-Military Cooperation approach is applied in conflict ridden regions to try and resolve the conflicts and bring lasting peace. Grigorov (2017) alludes that analysis of the operations conducted in Kosovo, Afghanistan and Iraq gives a clear indication of the complex nature of current conflicts. CIMIC approach has been adopted in solving complex conflicts and looking at the situation in Lamu County, the presence of sympathizers and the availability of an expansive hide out within the Boni Forest, complicates the conflict, thereby calling for amicable ways of solving the conflict.

Enschede (2011) notes that most of the modern conflicts being experienced around the globe stem from non-military causes and its resolution will need proper coordination and cooperation, enhanced liaison and compromises that require both the military and civilian actors to work together towards solving them. De Coning (2016) further emphasizes that the complexity of the conflicts in the current societies stem from non-military reasons and as such cannot be resolved by military force. He emphasizes, hence the need to incorporate the humanitarian actors and local community components. The civil-military interaction has become central in contemporary peace processes and operations.

Rietjens (2016) share that when lasting peace, coordination and stability of a region has failed to be achieved by the various actors; then, adopting CIMIC approach and interaction that is informed by policy, practices and development doctrines, can achieve the set goals. CIMIC is ideal where there are fault lines like Travis (2018) noted in the American forces where fault lines were on ethics, identity and expertise. The civil-military cooperation approach is needed across the globe because of the increase in natural disasters like eruptions, cyclones, flooding and earthquakes and man-made disasters like terrorist attacks. Khisa and Day (2020) shared that the military is working to develop the economic and social aspects of the local communities hence incorporation of the civilians and humanitarian actors in solving the issues that the society is facing. The challenges facing Lamu County will need the military component and other security agencies like the National Police Service to work together towards achieving peace in the region.

Civil Military Cooperation Activities

In any situation where there are post-conflict operations, Dusman and Zupancic (2012) noted that it requires joint efforts from various players to achieve stability. The stakeholders in these efforts should include local and foreign actors, government and non-governmental institutions, locals and business communities; each of which should play different roles and responsibility. He

further noted that their activities should range from stabilization, rehabilitation, reconstruction, peace building and development with their success heavily relying on cooperation and coordination of all actors. Jenny (2001) noted that CIMIC ensures that military forces and the civilian actors complement each other. Cooperation is needed when both actors are involved in rescue missions, infrastructure reconstruction, provision of medical aid through medical camps and joint trainings for self-defense in potentially violent regions.

Stubbs (2004) shared that civil-military cooperation approach helps in minimizing civil interference and on the other hand maximizing civil support. It also covers combat military missions, peace-keeping missions by NGOs and local authorities. The Romanian CIMIC Handbook (2012) identifies three basic functions of CIMIC; maintenance of the connection among the different actors; the provision of support to civilian actors and provision of support to the military forces. CIMIC according to Grigorov (2017) may take various forms including but not limited to civil military coordination, humanitarian aid, emergency response program, transition initiatives, joint civil military operations and security training. The military commanders can also work with the local leaders to designate protection zones for the locals like schools, worship centers and hospitals. There is also need for information sharing between the various actors to enhance effectiveness.

CIMIC activities also include, the protection of the civilians and provision of life saving aid. The US Army in Afghanistan worked with the host government to restore infrastructure that had been destroyed by the Taliban and Al Qaeda. Allard (2012) noted that US Marines and Army units gave humanitarian aid to locals in Somalia and at the same time got information that helped them to institute the tribal consuls which worked to distribute food and other necessity goods to the people. Lang'at (2018) shared that CIMIC activities witnessed in Somalia stem from the international community promoting peace and stability by stopping the terror activities of the Al-shabaab. In Kenya during the post-election violence period, several CIMIC activities were launched that included medical camps, mediation talks and distribution of food and water, and borehole drilling. Odhiambo (2020) recommends that for KDF to improve its reputation and foster better relations, they should continue with various humanitarian activities like construction projects, peacekeeping and negotiations between conflicting parties, chaplaincy and disaster management.

Effectiveness of Civil Military Cooperation Approach in Security Stabilization

Failing to gain the local populations' support and goodwill during any mission can lead to failure and catastrophic consequences. Dusman and Zupancic (2012) revealed that tensions were created between the military and NGOs in the Lithuanian, Slovenian and Estonian cases, based on military using the hierarchical administrative method, while the NGOs were using the horizontal approach. Allard (2012) stated that CIMIC when properly used, can be a force multiplier by enrolling the support of locals such as the case of US forces in Somalia. Owino (2020) revealed that the KDF unit had fostered a good relationship by engaging in economic development activities within Eldoret

town, including tree planting, conducting medical camps, provision of learning materials for schools and drilling water projects. There were also sporting activities, and non-official visitation to military graduation ceremonies that resulted in strengthened coordination and cooperation with the local communities.

Onditi (2015) shared that poor relations between the civilians and military forces made the African standby forces (ASF) unable to respond to various emergencies as they took longer to make decisions. Furthermore, Leff (2009) noted that pure military and police force actions failed to quell the violence and insecurity of the pastoralists war along the Kenya-Sudan-Uganda border. The governments' response was forceful disarmament exercises that led to distrust amongst the security forces and the local communities. This case shows the value of security forces working with the civilians and local peace actors in handling conflicts and disagreements.

Ligawa (2018) revealed that attacks led by Al-Shabaab on the AMISOM bases raise questions on capacity and abilities of AMISOM in delivering on its mandate. Employing purely military strategies, slowed down the peace building process in Somalia and

hence the need to engage the common Somali man. There is also need to empower the local security system and incorporate humanitarian actors. An effective civil-military relation is based on coordination and cooperation efforts by all components. Conflicts can be resolved by participation of all actors including local community members and its leadership. Onditi, Okoth and Matanga (2016) shared that peace support operations and peace-building activities can only yield lasting results whenever all players are brought on board.

4.3 Conceptual Framework

The conceptual framework shown illustrates the relationship between independent and dependent variables of the current study. The factors that led to adoption of CIMIC approach and CIMIC activities including the civil military liaison activities, civil assistance activities and the CIMIC outreach programs and the effectiveness of CIMIC approach are independent study variables. While the dependent variable is security stabilization whose indicators include reduced crime levels, freedom of movement and peaceful social coexistence amongst the populace. This study is expected to cause improved security situation hence improving the day-to-day life of the locals.

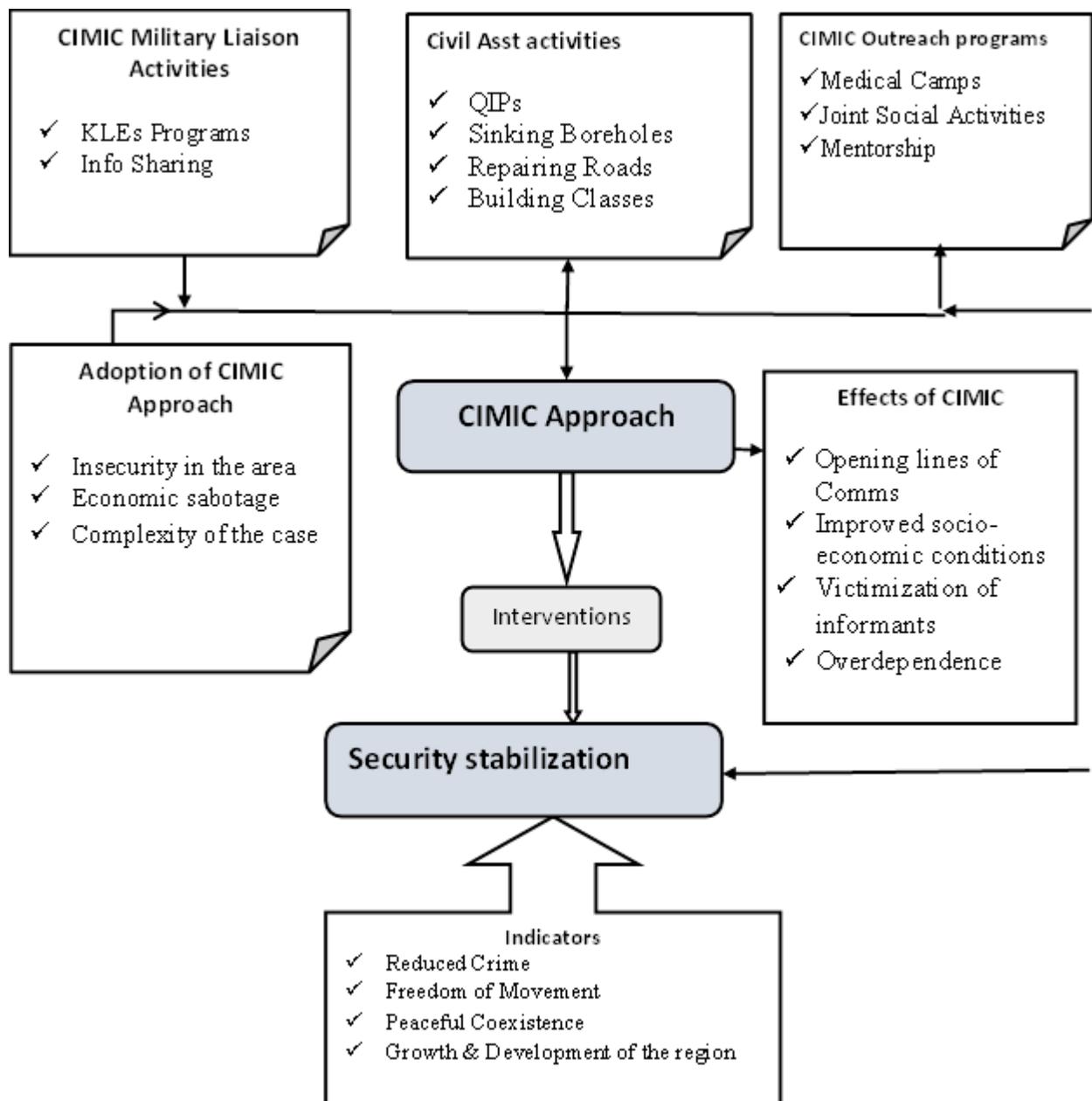


Figure 1: Conceptual Framework

V. 5.0 RESEARCH METHODOLOGY

The descriptive research design was adopted as it was ideal in describing the CIMIC approach and the activities undertaken by different actors when securing and stabilizing Lamu County. The study population was comprised of all the 37, 963 households in Lamu County as per the 2019 KNBS census. The researcher targeted 34 community leaders, 14 ward administrators, 10 religious leaders and official representatives from the humanitarian actors and security agencies in Lamu County. Stratified sampling technique was adopted as it arranged the population as per their role. Simple sampling was employed in selecting respondents who took part in the study while purposive sampling was used to select the security officers who had led operations in Lamu County and those who had pertinent information.

Primary data was collected using questionnaires and interview guides which produced both qualitative and quantitative data. Secondary data was sourced from books, journals and other electronic materials. The researcher conducted the interviews and used two research assistants to distribute and collect the questionnaires. Qualitative data from the open-ended questions and interviews were analyzed using content analysis by arranging the data in themes. While quantitative data was analyzed descriptively and obtained means,

frequencies and percentages. This was done using SPSS version 25.0 system and the findings were presented in charts, discussions and tables.

VI. 6.0 FINDINGS AND DISCUSSIONS

Table 1: Factors Leading to Adoption of CIMIC Approach

Variable	Mean	SD		D		N		A		SA		Std. Dev.
		F	%	F	%	F	%	F	%	F	%	
Collapse of the lines of communication	3.981	2	2.2	9	10.2	12	13.6	23	26.1	42	47.7	.790
Economic sabotage by the Al-Shabaab militants	3.777	0	-	10	11.3	3	3.4	61	69.2	14	15.9	1.053
Continued terror attacks like laying of explosives	4.011	0	-	5	5.6	0	-	35	39.7	48	54.5	.908
Presence of sympathizers among the local residents	3.569	10	11.3	15	17	12	13.6	23	26.1	28	31.8	.813
Total	3.834											.891

SD –Strongly Disagreed; D –Disagree; N-Neutral; A- Agree and SA- Strongly Agree

The findings showed that respondents agreed to continued terror attacks being the number one reason for the adoption of CIMIC approach, followed by collapse of lines of communication, economic sabotage and lastly existence of sympathetic local residents. Other reasons included the presence of the extensive

Boni Forest as a hide-out for the terror group and the fear and brutality of the security forces which has seen the local residents’ side with the militants. Divisive political interests and presence of religious extremists and youth gangs were also cited.

Table 2: Civil Military Cooperation Activities

Variable	Yes		No		Total	
	F	%	F	%	F	%
Liaison Activities						
Key leadership engagement programs	38	43.1	50	56.8	88	100
Information sharing	61	69.2	27	30.6	88	100
Quick Impact projects						
Sinking of boreholes	23	26.1	65	73.8	88	100
Repairing/Building of roads	14	15.9	74	84	88	100
Building of schools/churches/mosques	69	78.4	16	18.1	88	100
Outreach programs						
Medical camps	85	96.5	3	3.4	88	100
Joint social activities	53	60.2	35	39.7	88	100

The results showed that the three main areas of CIMIC activities included liaison activities, quick impact projects and outreach programs. Other activities include escorting of public transport buses when kidnappings cases were on the rise, protecting locals during large gatherings like church services, mosque, schools and hospitals, provision of humanitarian aid

including distribution of food, water and clothing to the victims of insecurity and terror activities and also conduct of rescue missions. The military also helped to airlift residents during flooding especially to people stuck in remote areas and also provision of tutorial services in the county schools.

Table 3: Effectiveness of Civil Military Cooperation on Security Stabilization

Variable	Mean	SD		D		N		A		SA		Std. Dev.
		F	%	F	%	F	%	F	%	F	%	

CIMIC approach led to opening communication lines	3.702	0	-	5	5.6	11	12.5	27	30.6	45	51.1	.765
The relationship between all actors is needed under CIMIC approach	4.300	0	-	0	-	0	-	54	61.3	34	38.6	1.014
The informants are victimized for sharing info with security agents	3.689	4	4.5	7	7.9	19	21.5	41	46.5	17	19.3	.980
The social lifestyle of the people is affected by CIMIC approach	3.225	19	21.5	11	12.5	5	5.6	20	22.7	33	37.5	.889
Securing of Lamu County overdepends on security agents from different agencies	4.019	8	9.0	4	4.5	9	10.2	55	62.5	12	13.6	.972
Economic empowerment relies on a secure and stable county	4.426	0	-	14	15.9	16	18.1	42	47.7	16	18.1	1.204
Total	3.893											.970

SD –Strongly Disagreed; D –Disagree; N-Neutral; A- Agree and SA- Strongly Agree

The presence of a multi-agency team in the county had made the Al-Shabaab abandon their hide-out and bases within the Boni forest. Night movement by public buses had resumed with minimal requirement for armed police escorts. The CIMIC activities had also resulted in reopening of lines of

communication, improved social lifestyle and economic empowerment of the people as well as improved information sharing between the various actors.

Table 4. Security and Stability in Lamu County

Variable	Mean	SD		D		N		A		SA		Std. Dev.
		F	%	F	%	F	%	F	%	F	%	
Crime rates have reduced in Lamu County	4.201	0	-	16	18.1	22	25.0	35	39.7	17	19.3	.812
Public transport system can move freely	3.984	0	-	21	23.8	34	38.6	24	27.2	9	10.2	.973
All diverse entities in Lamu co-exist	3.417	5	5.6	16	18.1	14	15.9	35	39.7	18	20.4	1.108
The county has seen growth and development	3.429	10	11.3	10	11.3	1	1.1	28	31.8	39	44.3	.773
Total	3.757											.916

SD –Strongly Disagreed; D –Disagree; N-Neutral; A- Agree and SA- Strongly Agree

The findings showed that there was remarkable reduction in crime levels, freedom of movement through the use of public transport system and resumption of economic activities in the County. The residents' ability to trade and move freely had led to growth and development of the county. The people from different tribes and races are peacefully coexisting and working in harmony. Local and international peace actors have also helped to secure the county through engaging locals, opening communication channels to share information and awareness creation through education forums. These efforts have borne fruit in terms of peace, security and stability in Lamu County.

VII. 7.0 CONCLUSIONS

The study concludes that the reason behind the adoption of the civil military cooperation approach in Lamu County was as a result of the complexity of the conflict. The complexities stem from existence of sympathizers, deep-rooted radicalization, deteriorating insecurity with continued terror attacks and the

failure of other approaches to secure and stabilize the region. The study also conclude that the three categories of civil military cooperation activities implemented in Lamu County included engagement in liaison activities through information sharing, leadership engagement forums and provision of escort services; the quick impact projects which included repairing of roads, construction of schools, churches and mosques and the sinking of boreholes; and finally the outreach programs that included medical camps and joint social activities.

On the effectiveness of civil military cooperation on the security stabilization of Lamu County, the study concluded that the approach has had a positive and rewarding effect towards the stabilization of the county. The effect is such that there is reduced rate of terror activities, free movement of people and goods, peaceful co-existence of people from diverse background and economic growth and development in the county. The study further concludes that CIMIC activities had improved relations between the locals and security agencies where residents can comfortably share vital security information with the security

agencies. In general, the study made the conclusion that the use of civil military cooperation (CIMIC) approach had led to the realization of improved peace, security and stability in Lamu County.

VIII. 8.0 RECOMMENDATIONS

Based on the findings, the study makes the following recommendations to different stakeholders such as the government, security agencies, NGOs and the general public. The national and county government should sensitize and conduct awareness programs to the residents on the dangers of insecurity in order to reduce cases of radicalization and sympathizers. The multi-agency teams should be encouraged to involve more locals in the planning and implementation phases so as to build trust and enhance cooperation. The national government should deploy sufficient manpower, equipment and other resources to respond quickly to any arising insecurity issues. The study further recommends that appropriate laws and guidelines be enacted to fill the gaps on existing laws touching on radicalization and sympathizers' scenarios.

REFERENCES

[1] Albro, R., & Ivey, B. (2014). Introduction: military cultural capacity after Afghanistan. In *Cultural Awareness in the Military: Developments and Implications for Future Humanitarian Cooperation* (1-14). Palgrave Pivot, London.

[2] Allard, K. (2012). *Somalia Operations: Lessons Learned*. (National Defense University Washington DC InstFor National Strategic Studies)

[3] Bannelier-Christakis, K. (2016). Military interventions against ISIL in Iraq, Syria and Libya, and the legal basis of consent. *Leiden Journal of International Law*, 29(3), 743-775.

[4] De Coning, C. (2016). *Civil-Military Interaction: rationale, possibilities and limitations*. *Effective Civil-Military Interaction in Peace Operations* (11-28). Springer, Cham

[5] Deutsch, M. (1949). A theory of co-operation and competition. *Human relations*, 2(2), 129-152

[6] Deutsch, M. (2011). A theory of cooperation-competition and beyond. *Handbook of theories of social psychology*, 2, 275

[7] Dusman, A., & Zupančič, R. (2012). *Civil-military Cooperation in Conflict and Post-conflict Operations: Learning from the Lithuanian, Slovenian and Estonian Experiences*. Akademinė leidyba.

[8] Friend, A. H. (2020). *Creating Requirements: Emerging Military Capabilities, Civilian Preferences, and Civil-Military Relations* (Doctoral dissertation, American University)

[9] Grigorov, G. (2017). Emergence and development of civil-military cooperation. In *International Conference Knowledge-Based Organization-Sciend* 23(1), 119-123

[10] Jenny, J. (2001). Civil-military cooperation in complex emergencies: Finding ways to make it work. *European Security*, 10(2), 23-33.

[11] Johnson, D. W., & Johnson, R. T. (2011). *Intellectual legacy: Cooperation and competition*. In *Conflict, interdependence, and justice* (41-63), Springer, New York, NY

[12] Jowell, M. (2018). The unintended consequences of foreign military assistance in Africa: an analysis of peacekeeping training in Kenya. *Journal of Eastern African Studies*, 12(1), 102-119.

[13] Khisa, M., & Day, C. (2020). *Reconceptualising Civil-Military Relations in Africa*. *Civil Wars*, 22(2-3), 174-197.

[14] Kimari, B., & Ramadhan, R. (2017). Trends of Violent Extremist Attacks and Arrests in Kenya, January-November 2017. *CVE*

[15] Lang'at, H. K. (2018). *Impact Of Civil-Military Cooperation On The Conflict Of Somalia 2012-2016* (Doctoral dissertation, University of Nairobi).

[16] Leff, J. (2009). Pastoralists at war: Violence and security in the Kenya-Sudan-Uganda border region. *International Journal of Conflict and Violence (IJCV)*, 3(2), 188-203.

[17] Liaw, J. O. H., Guido De Oliveira, W. L., Idrus, S. A. S., & Talib, N. F. M. (2019). The Impacts of Civil-Military Cooperation Programmes on Human Security and Peacekeeping in Timor-Leste. *International Journal of Business and Management*, 3(6), 16-22.

[18] Ligawa, W. O. (2018). *AMISOMs Influence Towards Peace-building in Somalia* (Doctoral dissertation, MMUST)

[19] Odhiambo, E. O. S. (2020). The 9th Battalion Kenya Rifles and Civil Relationship in Socio-Economic Development in Eldoret. *Asian Journal of Social Sciences, Arts and Humanities* 4 (3), 57-71.

[20] Onditi, F. O. (2015). *Civil-Military Relations and Peace-Support Capacity: A comparative Study of the Eastern and West African Standby Forces*. Unpublished Ph. D thesis, Masinde Muliro University of Science and Technology

[21] Onditi, F., Okoth, P. G., & Matanga, F. K. (2016). The quest for a multidimensional African standby force. *African Conflict and Peace-building Review*, 6(1), 69-88

[22] Owino, R. M. (2018). *Terrorism And Its Effect on People's Socio Economic Ways of Life: A Case Study of Lamu County* (Doctoral dissertation, University of Nairobi).

[23] Rietjens, S. (2016). *Civil-Military Interaction: From Practice to Theory*. In *Effective Civil-Military Interaction in Peace Operations* (275-290). Springer, Cham

[24] Stubbs, B. B. (2004). *Smarter Security for Smaller Budgets: Shaping Tomorrow's Navy and Coast Guard Maritime Security Capabilities*. Center for Strategic and Budgetary Assessments, 1(12)

[25] Tatham, P., & Rietjens, S. (2016). Integrated disaster relief logistics: a stepping stone towards viable civil-military networks? *Disasters*, 40(1), 7-25.

[26] Tjosvold, D., Wong, A., Chen, N. Y., & Li, W. (2012). Theory of cooperation and competition in Chinese societies: accomplishments and challenges. *Handbook of Chinese Organizational Behavior* (1-560), Edward Elgar Publishing

[27] Travis, D. S. (2018). Discovering the fault lines in American civil-military relations. *Armed Forces & Society*, 44(4), 731-747.

[28] Wanjiku, J. W. (2020). *Effectiveness of Counter-terrorism Strategies in the Horn of Africa Region-a Case Study of Lamu County* (Doctoral dissertation, University of Nairobi)

[29] Welch, C. E. (2019). *Emerging Patterns of Civil-Military Relations in Africa: Radical Coups d'Etat and Political Stability*. In *African Security Issues: Sovereignty, Stability, and Solidarity* (126-139). Routledge

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Using Homophone Games To Improve Pronunciation Performance For Non-English Majors

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Abstract - Improving English pronunciation is a crucial issue for any learners of English, including Vietnamese students. However, developing students' pronunciation, especially non-English majors in a non-native country like Vietnam, faces many difficulties, one of which is insufficient time devoted to in-class pronunciation activities due to the neglect of pronunciation aspects in English teaching and examination systems. The study aims to improve non-English majors' pronunciation performance in a regional teacher education university in Vietnam through the use of homophone games as well as to assess the impact of homophone games on the pronunciation performance of non-English majors. 40 students from the Faculty of Mathematics in the university were invited to participate in this two-month experimental research. An English pronunciation test before and after the intervention was given to collect data about students' initial and final level of pronunciation performance. A questionnaire was distributed to the 20 students in the experimental group as a subordinate research instrument for the investigation of students' attitudes towards homophone games. The findings show that the application of homophone games has greatly supported the process of improving students' pronunciation skills and students' feedback regarding the use of homophone games is relatively positive. These results may encourage instructors of English as a foreign/ second language to make greater efforts to design and introduce homophone games as well as other pronunciation activities for the improvement of this fundamental aspect.

Index Terms - homophone games, pronunciation performance, pronunciation activities

I. INTRODUCTION

Nowadays, English is widely regarded as a global language with the largest number of users thanks to its coverage in many fields such as health, business, technology, communication, and education. In recent years there has been a revolutionary change in English language education in Vietnam in that the language has been made a compulsory subject in schools. More critically, teaching focus has also been shifted from language knowledge emphasis to practical use and authentic communication in the workplace and the community. Therefore, the "neglected aspect" in language teaching and learning in Vietnam, pronunciation, has gained more attention in English education in school.

Pronunciation has a complex process and a lot of students struggle with pronunciation performance. Those who have good pronunciation will have an advantage in learning English, whereas students who strain with pronunciation will have a harder time learning this second language (Gilakjani, 2016, p.1). Moreover, numerous teachers think that teaching pronunciation is complicated and pedestrian for students (Harmer, 2001); additionally, speaking skills are sometimes not a required part of basic exams. The current way of teaching and learning foreign languages is still in the direction of studying for exams, not for learning to use, so it is difficult to achieve the desired effect.

It is well-recognized that many students who learn English as a second language, Vietnamese learners included, have trouble pronouncing words. Performing pronunciation might be challenging for certain learners. Ramelan (1977) affirmed that the degree of resemblance between the two languages influences the degree of difficulty in learning the second language. Regarding the English lexicon, there are several words that are differently written but they are pronounced similarly. As a consequence, there are students who may mispronounce those homophones due to their difference in spellings or may misunderstand the meaning of the words owing to their similar pronunciation.

The present study aims to improve non-English majors' pronunciation performance by introducing a range of homophone games in a pronunciation course within 8 weeks in the second semester of the academic year 2021-2022. Furthermore, it has investigated the effectiveness of the games on students' pronunciation performance as well as the participants' attitudes towards the application of such activities in English instruction.

II. LITERATURE REVIEW

2.1. The concept of pronunciation

Pronunciation is one of the important aspects of English language instruction. In oral communication, every sound, stress, and intonation may convey a meaning or meanings. Therefore, it is significant that second language (L2) learners should be mindful of pronouncing words as when they are mispronounced, they can be misinterpreted and more seriously can distort communication.

According to Oxford Advanced Learner's Dictionary (2005, p. 1164), pronunciation is "the way in which the language of a particular word or sound is pronounced". Pronunciation refers to the production of sounds that we use to make meaning. It includes attention to the particular sounds of a language (segments), aspects of speech beyond the level of the individual sound, such as intonation, phrasing, stress, timing, rhythm (suprasegmental aspects), how the voice is projected (voice quality) and, in its broadest definition, attention to gestures and expressions that are closely related to the way we speak a language. Absolutely, pronunciation is one essential element in English learning, which requires learners to master in order to become competent speakers of the language.

Nevertheless, acquiring eligible pronunciation is a complex task in L2 learning for not only students but also the teacher since the both are non-native speakers, who have to remember all pronunciation rules as well as practice the system in a non-native community, which obviously presents a lot of obstacles to the learning process. Accordingly, it is indispensable that the teacher adopts a critical role in improving their L2 students' pronunciation by employing various activities for pronunciation practice.

2.2. The concept of homophones games

Harmer (2001) states; "Games are a vital part of a teacher's equipment, not only for language practice but they also provide for the therapeutic effect they have. They can be used at any stage of a class to provide an amusing and challenging respite from other classroom activities and are especially useful at the end of a long day to send students away feeling cheerful about their English class" It is believed that game is a play or competition to give the students a chance to learn, practice or review specific language material and it is beneficial in terms of activating students and helping them remember knowledge better.

Homophone is a term used in semantic analysis to refer to words that have the same pronunciation but differ in meaning. Homophone is a type of homonym. Homophony is illustrated from such pairs as threw/through and rode/rowed. When there is ambiguity on account of this identity, a homophonic clash or "conflict" is said to have occurred (Crystal, 1991).

Homophone game is a game that naturally follows homophone dictation and can be used to help the students practice and remember homophones. This game also helps to highlight some sounds that may be particularly difficult for students to hear and write.

Various homophone games have been suggested by Case (2017) and Pratiwi (2019); among those there were several games were selected to be conducted in the study, including:

- Slap board
- Homophones search races
- Homophone reacts
- Homophones same or different pair work
- Find the homophone
- Homophones are not reaction
- Name the homophone
- Choose the correct homophone
- Which homophone is it?
- Correction homophone
- Hidden Homophone
- Make your own homophone
- Homophone crossword puzzle

III. METHODOLOGY

3.1 Research design

This experimental research was conducted among 40 non-English majors at the Faculty of Mathematics in a regional teacher education university in Vietnam within 8 weeks. There was a random selection of the subjects, and the pre and post-tests were distributed to both experimental and control groups to collect information about their pronunciation performance before and after the

intervention. At first, 40 participants were invited to take the pre-test to investigate the initial level of their pronunciation performance. Then the 20 volunteer students in the experimental group joined an 8-week pronunciation course in which homophone games were conducted in every lesson and exercises on words with similar sounds were assigned to students as homework for consolidation of in-class practice. After the experiment, the post-test was given to both groups to determine whether there were differences in students' pronunciation performance and if there existed improvements in the pronunciation ability of the experimental group. Finally, a questionnaire was distributed to the experimental group to collect information about their attitudes towards the use of homophone games.

3.2 Participants

A group of 40 Mathematics education freshmen at a local teacher training university was selected to participate in the study. At the age range of 18-20, those high school graduates are expected to hold B1 level in the Common European Framework of Reference for Languages as indicated in the outcomes of the high school academic program. Yet, their current proficiency level was estimated at A1 with a lot of difficulties in English pronunciation, grammar, and vocabulary as well as a lack of confidence in English communication.

3.3. Data collection instruments and procedures

This study employed two research instruments of tests and questionnaires.

Tests were used to measure competence, knowledge, intelligence, and ability of talent which was possessed by individuals or groups to collect data. In the present study, a pronunciation test was conducted twice to gather quantitative data on students' pronunciation skills before and after the intervention. The pre and post-tests shared the same format: Students were required to record their pronouncing 24 selected words at A1 and A2 levels. The students' scores were collected and analyzed to compare the mean scores in the two tests and to find out how the homophone games affect students' pronunciation performance.

In addition, a questionnaire was given at the end of the 8-week treatment to examine students' attitudes towards homophone games used for practicing pronunciation skills. The questionnaire sought to investigate the feelings of the participants toward the treatment, the homophone games they preferred and their assessment of the effectiveness of the experimental course in improving pronunciation ability.

IV. RESEARCH RESULTS ANALYSIS AND DISCUSSION

4.1. Students' pronunciation performance before and after the pronunciation course with the inclusion of homophone games

Table 1. The classification of students' scores on pre-test

No	Classification	Score	Experimental group		Control group	
			Frequency	Proportion	Frequency	Proportion
1	Excellent	85-100	1	5%	1	5%
2	Good	60-84	4	20%	3	15%
3	Fair	50-59	2	10%	3	15%
4	Poor	36-49	8	40%	9	45%
5	Very poor	0-35	5	25%	4	20%
Total			20	100%	20	100%

Participants' average initial score

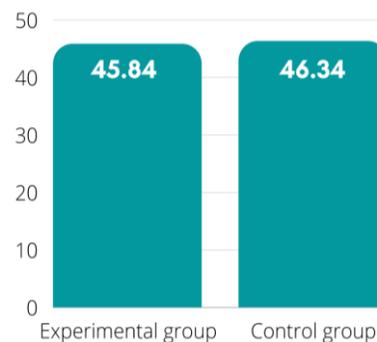


Figure 1. Participants' initial average score

Students' initial pronunciation scores of the experimental and control group is displayed in Table 1 and Figure 1. It can be seen that there was not much difference in students' pronunciation performance in both groups, which was shown in the participants' average scores of 45.84 and 46.34 for the experimental and control group, respectively. It is worth noting that the percentage of students with poor and very poor pronunciation accounted for roughly one-third of both groups and there was a very small proportion of the participants who could pronounce words correctly.

Table 2. The classification of students' scores on post-test

No	Classification	Score	Experimental group		Control group	
			Frequency	Proportion	Frequency	Proportion
1	Excellent	85-100	7	35%	3	15%
2	Good	60-84	10	50%	2	10%
3	Fair	50-59	3	25%	5	25%
4	Poor	36-49	0	0%	9	45%
5	Very poor	0-35	0	0%	1	5%
Total			20	100%	20	100%

Participants' average score after the research period

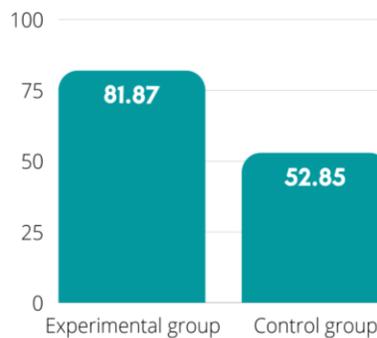


Figure 2. Participants' average scores after the research period

Table 2 and Figure 2 illustrate students' pronunciation scores after the research period. As seen in the table and the figure, there was a significant difference in the mean scores between the experimental and control groups. Specifically, the average score of the participants in the 8-week pronunciation course was almost one and a half times that of the control group (81.87 compared to 52.85). It is also noticeable that the number of students in the experimental group who achieved "Good" and "Excellent" pronunciation grades tripled those in the control group. Moreover, there were no more students in the experimental group to be classified as "Poor" and "Very Poor" but the figure for the control group kept basically unchanged.

Participants' average score before and after the research period

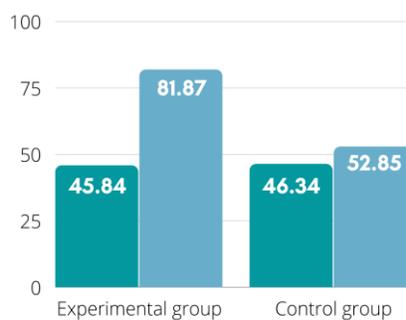


Figure 3. Participants' average score before and after the research period

The bar chart showed that there were distinct differences between pre-test and post-test scores of students' pronunciation tests in both groups. It is obvious that there was a remarkable change in the experimental group's post-test results with a growth of 36.03 out of 100 while the test scores of the control group remained steady with a minor increase of 6.51. It could be inferred that students' participating in the pronunciation course with the application of homophone games have gained some fundamental benefits in their pronunciation improvement.

4.2. Students' feedback on homophone games

Table 3. Students' feedback on Homophone games

Categories	Questions	Mean	Level of agreement
Participants' feelings about the Homophone games	1. Did you find interest in improving your pronunciation ability through playing homophone games	4.65	Strongly agree
	2. Did you find playing homophone games is an easy way to improve your pronunciation ability	4.50	Strongly agree
Participants' assessment of the effectiveness of homophone games in improving pronunciation ability	3. Do you find the homophone games effective in improving your pronunciation ability?	4.45	Agree
	4. Do you improve your pronunciation ability after the experimental course?	4.35	Agree
Participants' expectations for the experimental course	5. Did the experimental course cover the content you were expecting?	4.15	Agree

Table 3 depicts students' feedback on homophone games in terms of their feelings, their assessment of the effectiveness and the expectations for the experimental course. As shown in the table, overall, the participants gave positive feedback about homophone games. Starting with learners' feelings about homophone games, the mean score for the first question was 4.65, indicating that students strongly agreed that homophone games were an interesting pronunciation learning activity. Furthermore, a similar rating was given to statement 2 with a mean score of 4.50, showing that students strongly agreed that playing homophone games was an easy way for them to improve their pronunciation skills. In regard to participants' assessment of the effectiveness of homophone games in improving pronunciation ability, the mean score of statements 3 and 4 were 4.45 and 4.30 respectively, which meant the participants agreed that homophone games were effective in improving their pronunciation ability and they also found their pronunciation performance improved after the experimental course. Concerning participants' expectations for the experimental course, the mean score given was 4.15, which suggested students agreed that the experimental course covered the content they were expecting.

Students' preferences for the homophone games were described in Figure 4 as illustrated below.

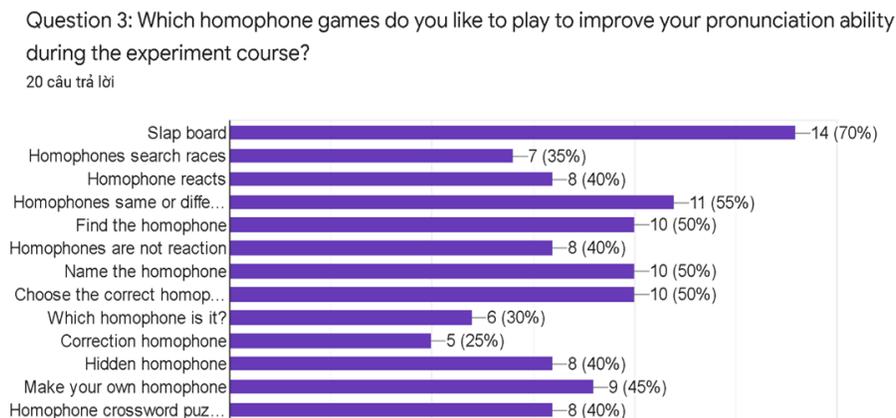


Figure 4. Participants' report of their favorite homophone games

Generally, participants in the experimental course showed some degree of their liking for the homophone games organized during the course. To be more specific, *slap board*, was the most favorite game with the majority of the rates. This was followed by *homophones same or different pair work*, *find the homophone*, *name the homophone*, and *choose the correct homophone* with the proportion being in the vicinity of 50%. By contrast, the figure for correction homophone was just 25%, making it the least popular game.

4.2. Discussion

That the proportion of non-English majors' low scores in the pronunciation pre-test greatly outweighed that of the high scores could potentially reflect unsolved long-lasting problems related to English teaching and learning in Vietnam in general and in that mentioned university in particular. It seems that the teaching of pronunciation, despite a more emphasis in four language skills in English language education in Vietnam (which accordingly drives more focus on pronunciation), still does not achieve desirable learning outcomes. Vietnamese accented English, as Cunningham (2009, 2013) claimed, is still considered unintelligible for native English-speaking listeners and even for Vietnamese listeners, which to some extent produces some challenges for Vietnamese learners of English in effective and authentic communication.

The findings of the present research are congruent with those of previous studies by Alim (2014) and Kiswindari (2018), in that homophone games could significantly improve students' pronunciation. Students' pronunciation post-test scores in these researches gain a noticeable increase in comparison with their pre-test scores, proving that homophone games employed in the experimental course or action project have positive effects on students' pronunciation performance.

Furthermore, this study has attempted to explore students' attitudes towards the use of homophone games, which has not been the focus of much research in the field. Students' appreciation and positive feedback of those activities for the development of pronunciation performance indicate comprehensive benefits of homophone games on students' pronunciation ability. The results have again clarified the shared belief in a large body of research in language education that motivation and attitude have great roles in raising the proficiency and efficiency of the students in language learning (Oroujlou and Vahedi, 2011; Naiman et al., 1978). On that account, it is crucial that L2 teachers should apply efficient strategies and techniques in language classes in order to promote positive motivation and attitude among the students to learn languages and raise the proficiency of students. Additionally, students' encouraging feedback towards the effectiveness of the employment of homophone games on the improvement of students' pronunciation could suggest the application of homophone games as a critical learning tool in a language class and further conducts of such activities in the teaching of pronunciation.

V. CONCLUSION

This experimental research was undertaken at a regional teacher training university in Vietnam and has illustrated the effectiveness of homophone games in improving non-English majors' pronunciation. Results of the study suggest that students' pronunciation has considerably improved after an 8-week course of pronunciation training where homophone games were employed for students' practice of words with similar sounds. Analysis of participants' feedback indicates that using homophone games in pronunciation instruction helps increase students' interest in learning as well as their ability to pronounce words correctly. Those findings would encourage L2 teachers to apply and promote more initiatives in their language teaching for better achievement of students' learning outcomes as well as for stimulation of their interests in language learning.

REFERENCES

- 1) Alim, A (2014). *Improving Students Pronunciation Thought Homophone Game at Second Academy Year in SMAN I Pasui Enrekang*. STAIN Parepare: Unpublished Skripsi, p. 49.
- 2) Case, A. (2017). *Fun Homophones Activities*. Englishclub: TEFL Articles. <https://www.englishclub.com/efl/tefl-articles/homophone/>.
- 3) Cunningham, U. (2009). *Phonetic correlates of unintelligibility in Vietnamese Accented English*. In FONETIK 2009 The XXIIth Swedish Phonetics Conference.
- 4) Cunningham, U. (2013). *Teachability and learnability of English pronunciation features for Vietnamese-speaking learners*. In E. Waniek-Klimczak & L. R. Shockey (Eds.), *Teaching and Researching English Accents in Native and Non-native Speakers* (pp. 3–14). Berlin, Heidelberg: Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-642-24019-5>
- 5) Gilakjani, Abbas Pourhosein. (2016). *English Pronunciation Instruction: A Literature Review*. International Journal Research in Education 1(1), 1.
- 6) Harmer, J. (2001). *The Practice of English Language Teaching*. London: Longman.

- 7) Kiswindari, C. (2018). *Improving the Students' Pronunciation through Homophone Games at the Second Grade Students of Sma Asuhan Daya Medan*. Pendidikan Bahasa Inggris.
- 8) Naiman, N., Frohlich, M., Stern, H.H. and Todesco, A. (1978). *The Good Language Learner*. Toronto, Ontario: Ontario Institute for Studies in Education.
- 9) Oroujlou, N. and Vahedi, M. (2011). "Motivation, attitude, and language learning", *Procedia - Social and Behavioral Sciences* 29 (2011), 994 – 1000.
- 10) Pratiwi, A. (2019). *The Use of Homophone Game to Improve Students' Pronunciation at the Seventh Grade of MTs Negeri 2 Sidenreng Rappang*. English program Tarbiyah Faculty state Islamic Institute (IAIN) parepare.
- 11) Ramelan. (1977). *English Phonetics*. Semarang. IKIP Semarang Press, p.9.
- 12) Zirawaga, Victor Samuel. (2017). *Gaming in Education: Using Games as a SupportTool to Teach History*. Journal of Education and Practice, 8 (15), 56

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Healthcare Workforce And Performance Of Sub-County Hospitals In Makueni County, Kenya

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Abstract- Purpose of the study: The study sought to assess the effect of healthcare work force on performance of sub-county hospitals in Makueni County, Kenya.

Research Problem: The Kenyan public healthcare sector suffers from inefficient provision of healthcare services, characterized by long queues in facilities, inadequate referral system, few physicians to handle patients, high cost of services and medicines and long distances to facilities.

Research Methodology: The study used descriptive study research design and its population of 535 staffs and targeted 228 respondents. Simple random sampling was applied in selecting the participants who filled the self-administered questionnaires by the research assistants. The collected data was analyzed using descriptive, correlation and regression analysis.

Findings: The results from correlation analysis indicate that there is an association between healthcare workforce and performance. Model summary showed that 62.4% of changes in performance of the sub-county hospitals were based on healthcare workforce. The regression results revealed that healthcare workforce is positively and significantly related to performance of the sub-county hospitals in Makueni County ($\beta = 4.753$, $t = 3.547$, $p = .000$).

Conclusion: The study concluded that performance of their health facility had improved in terms of low turn-around time, patient-centered services, high satisfaction and retention of patients. The correlation analysis established that healthcare workforce had positive and significant effects to performance of the sub-county hospitals in Makueni County, Kenya.

Recommendations: Healthcare facilities must have competent, skilled and experienced workforce and the management are advised to provide education and training programs for improved productivity. The study also recommends to the health facilities to take care of the needs of the workforce which will motivate them and increase their commitment levels, resulting in high performance.

Index Terms- Healthcare workforce, staffing levels, remuneration, continuous education, performance

I. INTRODUCTION

Health delivery systems work with the sole aim of enabling all citizens to access and receive healthcare services where and when needed. The quality of service delivered must meet the standards set by internationally recognized health bodies. In Kenya, the Ministry of Health (MOH) has classified facilities as public facilities managed by government, private facilities operated as profit-making enterprises, and those managed by other bodies including Faith-based Organizations (FBOs) and Non-Governmental Organizations (NGOs) both local and international (Kimanzi, 2020). A well-performing healthcare system is one that is responsive to the needs and expectations of the population, as shared by the World Health Organization (WHO).

Performance in the health sector is measured in terms of outcomes, effectiveness and quality of services, easy access to facilities, systems and personnel, clinical quality and appropriateness of the care, responsiveness, equity and productivity (Olusola, Onafeso, Ajiola & Adelabu, 2020). Attaining high performance relies on components including organizational resources, health information systems, health workforce, accessing essential medicines, financing and leadership (Achoki, Hovels, Masiye, Lesego, Leufkens & Kinfu, 2017). Performance also largely depends on well-trained, skilled and knowledgeable health personnel and the staffing numbers must be sufficient (Cantor & Poh, 2018). It also tells how well or poorly an organization is doing in terms of covering its expenses, expanding its operations and improving its outcomes.

Studies have linked healthcare workforce to performance such as Hamzah and See (2019) in Malaysia, noting that technical efficiency of the staff determined the performance of the pharmacy services. In Ghana, Diop, Awoonor-Williams, Ofose and Williams (2019) linked quality of service delivered to the healthcare professionals and their distribution across the healthcare system. While in Kenya, Ayah, Ongore and Agwanda (2018) noted hospitals that followed the standard operating policies and procedures and had availed skilled health workers had

shown a decline in perinatal mortality rate. Stephen and Bula (2017) mentioned that healthcare performances were strongly affected by human resource management practices that had aspects like training of workforce, the recruitment, compensation and performance management practices.

Abate, Dereje, Hirvonen and Minten (2020) shared that healthcare sector is a service industry, therefore, quality service delivery to the patients need well-trained and qualified personnel. The personnel are at the core of proper functioning of the health department and covers different cadres of workers including doctors and nurses, specialist and pharmacists, technologists and even homecare givers. There are two categories of workforce covering the non-medical personnel such as administrators, security and cleaning staffs and the medical personnel who diagnose and treat the patients. Stephen and Bula (2017) noted that diseases keep evolving and new diseases and ailment are discovered all the time, therefore, the health workers must have information on managing the ailment, treatment procedures and handling the diseases. Effective service delivery is also linked to staffing levels and as shared by Miseda, Were, Murianki, Mutuku and Mutwiwa (2017) the volume of healthcare workers is essential based on health sector being a service industry. Without enough staff it is impossible to serve patients in a timely manner. The healthcare workforce must also be remunerated well according to their job group, effort and time used in service delivery.

The performance measure is based on the industry and company products, such that when it comes to the health sector; performance is about delivering quality services to the patients. Ayah, *et al.* (2018) considered that performance in the health sector is about declining mortality rates, the average hospital stay and bed occupancy rates. Other elements include costs of treatment and drugs, patient room turnover rate and utilization of medical equipment. Arumona, Erin, Onmonya and Omotayo (2019) mentions that performance is about general health of the populations, quality of clinical care, appropriate, responsive, equity and productive care and health outcomes from treatment. Therefore, the performance of sub-county hospitals was a measure of the health outcomes, the timeliness of services as based on turnaround time between requested service and when it is delivered and patient-centered services, such that the hospitals go out of the way to serve its patients and try to meet their specific preferences in care giving.

The Makueni County in Kenya offers a unique opportunity to study the influence of healthcare workforce on health performance due to their demonstrated strong commitment to the attainment of high performance in the health sector (Ndunda, 2017). Consequently, most of the public health facilities in Makueni County have embraced the automation of processes hence it will be easy to trace its health performance across all its units and departments. This study focused on Makueni County as one of the leading performers in healthcare to explore what it has done to attain the same and hence emulated by other counties and public health facilities. The study sought to find the association between healthcare workforce and performance in sub-county hospitals in Makueni County.

II. STATEMENT OF THE PROBLEM

The Kenyan public healthcare sector suffers from inefficient provision of healthcare services, characterized by long queues in facilities, inadequate referral system, few physicians to handle patients, high cost of services and medicines and long distances to facilities (Gitobu, Gichangi & Mwanda, 2018). Healthcare professionals complain of poor salaries, delayed pay and bad working conditions that result in low rated performance in the facilities and sector. Makueni County is among the counties with their own medical cover - Makuenicare that covers up to 93% of the residents. Although, there are still some populations left out of the cover and face challenges in financing health care costs. There is need to investigate more on performance as based on resources and specifically healthcare workforce. The challenges of performance in healthcare sector and facilities create a need for new research and thus, the study investigated on healthcare work force and performance of sub-county hospitals in Makueni.

III. RESEARCH OBJECTIVE

To examine the effect of healthcare work force on performance of sub-county hospitals in Makueni County, Kenya.

IV. LITERATURE REVIEW

Theoretical Review

Resource- Based View Theory

It was proposed by Penrose (1959) and further expanded and popularized by Wernerfert (1984) and Barney (2001). The theory proposes ways in which specific firm resources can be exploited, increase gains and yields and competitiveness for the firm. The resources that gain competitive edge for the firms must be those that cannot be imitated and that can be identified by the efforts of the managerial team in an organization. The deployment of a set of valuable resources both the tangible and intangible ones that are at the disposal of a firm is the cornerstone of the resource-based view which is regarded as an instrument of competitive advantage. According to Hitt, Carnes and Xu (2016) in the theory, the firm resource, capacity and capability are the key aspects leading to gaining of competitive edge. The theory also helps in creating a clear understanding regarding the approaches of strategic management. Organizations that are seeking to gain competitive advantages through improved performance must then invest in their inputs. In the study scenario, the sub-county hospitals as a means of improving their performance must seek resources such as healthcare workforce. Resource based view theory is crucial as it delivers customer satisfaction, quality products and efficiency in the firm processes. The theory was applied to support the association between healthcare workforce and improve performance of the sub-county hospitals.

Balanced Scorecard Model

It was established by Robert Kaplan and Nolan Norton in the 1992 that details elements of performance measurement and the model had a mixture of financial and non-financial measures. The model suggests a comprehensive report and a summary that captures information on the organizational strategy. The balanced scorecard model offers a good platform to executives in a

company to assess performance in a more effective and efficient way. The model covers four perspectives namely; financials, customers, internal business processes, and learning and growth (Nørreklit, Kure & Trenca, 2018).

The financial viewpoint covers the returns that a firm gain from the investment made into an idea or concept. Financial measures include elements like revenues, earnings, sales, profit margins and growth of customer numbers (Hakkak & Ghodsi, 2015). On the second viewpoint of client/customer perspective, is about clients rating the services that they receive, and values gained. Firms develop strategies as per tastes and preferences of customers and in healthcare it is about patient-centered services. The third viewpoint is on internal business processes that cover the actions, strategies and activities that organizations use to become successful (Banabakova & Georgiev, 2018). The internal processes in the sub-county hospitals work to efficiently to deliver timely and quality healthcare services. Learning and growth viewpoint considers a system for improvement of employee skills, knowledge and experiences. This is done through healthcare workers receiving continuous medical trainings to enable them deliver high quality, efficient and effective services to the patients. Thus, the model is relevant in exposing how the viewpoints align on healthcare workforce, capacities and competencies leading to improved performance in the sub-county hospitals in Makueni, County.

New Public Management Theory

This is a public sector management theory proposed by Osborne and Gaebler in 1992. The theory's main concern is making governments more efficient and responding to public needs using techniques that are commonly used by the private sector. The public management includes processes that can either be formal or informal that guide human interactions in the quest of achieving firm objectives. In the book by Radnor, Osborne and Glennon (2016), the authors developed ten principles namely; financial control, conducting audits, customer orientation, responsiveness, de-regulation of labor markets, command and control mode of functioning, transparency and accountability, monitoring and evaluation, encouraging entrepreneurial management and using new forms of corporate governance. These principles assume that however much indispensable the government is, it does not have to automatically act like one. Applicability of this theory in the present study is to assess how human capital interacts to deliver quality services and positively influence the performance. The focus is conversion of patients to clients and making them aware of their rights and quality of care they should receive. It is covering the contribution of healthcare workers towards performance in the sub-county hospitals. The theory uses the input of workforce to ensure quality delivery of health services in public health facilities.

Empirical Review

Wamalwa (2017) study was on healthcare workers job satisfaction as influenced by health approaches. It was a case study of tier three public hospitals in Busia, County, Kenya. The study concentrated on establishing whether advancing careers, autonomy in health financing, employee motivation and working environment and conditions affected job satisfaction among the health workers in the county referral hospital and 6 sub-county

hospitals in Busia County. The respondents were healthcare workers in the hospitals and after analysis the findings showed that the healthcare workers used their abilities well and they had opportunities for career advancement. Majority of the healthcare workers did not have financial autonomy and did not receive recognition for exemplary performance and there was no link between performance and pay package received. Further study results show that promotion boosted staff morale and work environment led to job satisfaction. The study noted the need for training and reward for employee's performance, completing of the initiated building projects and ensure supply of all resources.

Kitur (2019) conducted a study on healthcare human resource capacity building initiatives and effect on sustaining HIV/AIDS services in the Siaya County Hospital. The Siaya County has a highest HIV prevalence record and hence the need for improvement in HIV care to reach the unmet target groups in terms of identification, linkage and viral suppression. The successful management of HIV is based on healthcare workers that are competent but the county faces acute shortage of staffs. There is also uneven distribution for these few competent staff across the health facilities in the nation. The focus of the study was on human resource capacity building initiatives with elements like knowledge, skills, competencies and numbers, and their influence in contract for engagement, remuneration packages, the adopted performance appraisals working conditions and turnover rates. Findings showed that the staff numbers were low in any specialized skill-set and competencies and formal trainings helped fill the capacity gaps. Results also indicated that contracts, payment, appraisals and work environment determined the staff retention rates.

Kenya (2016) studied the management style, use of IT services, training of staff and frequency of drug supplies and their influence on delivery of services with Nairobi's public hospitals. The researcher collected data from staff working in four public hospitals within Nairobi City County. The findings showed that training levels of healthcare workers had the biggest impact to service delivery at 97% of the respondents agreeing to it. Use of information systems, delegation of assignments and management of the hospitals led to improved service delivery. The researcher found out that there were gaps in the hospital management and the healthcare workers' needs were not taken into consideration which led to strikes. There was no full implementation of information technology in all departments and staff had not been trained to adapt to changes in technology and diagnostic methods. Unavailability of drugs in the healthcare facilities meant that the patients visiting the public health facilities were required to purchase drugs from the outside the facility. All these factors led to poor service delivery and decreased the effectiveness of the treatment received and recovery of the patients.

Oluoch-Aridi, Smith-Oka, Milan and Dowd (2018) study was on mistreatment of women during childbirth in peri-urban settings through the perception and experience of both the mother and the healthcare provider. The maternal deaths occurring within the health system during the delivery and labor time and women have reported poor experiences and abuse by the healthcare workers. The researcher interviewed women and healthcare workers and results showed that the female patients faced mistreatment as evidenced by being verbally abused, being neglected, discriminated and abandoned and also facing physical

abuse. The health staff revealed that the health system was weak and fragmented and the policy supporting free maternity services was poorly crafted leading to mistreatment of women. The study recommends for county governments to allocate sufficient resources that will improve the healthcare staffing levels, improve maternal health services and ensure women-centered services.

Chesoli, Schuster, Okelo and Omotayo (2018) conducted a study on how to strengthen care delivery in the primary healthcare facilities. The study was based on the perspectives of facility managers during immunization programs in Kenya, who manage the facility and offer frontline clinical activities. The aim of the study was on adoption and leverage of human resource factors for improving immunization programs and strengthening the primary healthcare delivery in Western Kenya region. Some of

the human resource factors under consideration were motivation, workload effects on immunization and how to address the workload. The study results showed that high workload led to reduced vaccination of children and the workload was due to low clinical staff levels. There was poor client counseling occasioned by the low staffing levels and hiring of more staff was noted as a remedy to high workload, motivation and immunization coverage. Frequent visits by the supervisors and acting on the feedback are important for improving program effectiveness. The study concluded by stating that there was a need to increase the staff numbers, introduce financial incentives and create strategies for supervisory visits and acting on the feedback.

Conceptual Framework

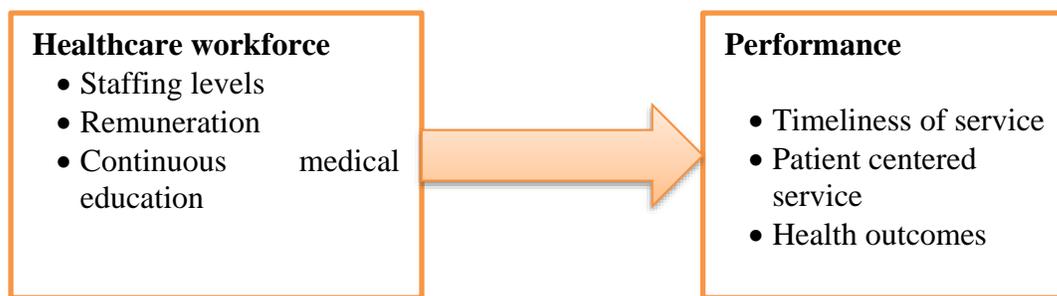


Figure 1: Conceptual Framework

RESEARCH METHODOLOGY

The study adopted descriptive study research design and targeted healthcare workers in the nine public health facilities in Makueni County. The respondents included 535 staffs in the position of medical doctors, clinical officers, nurses, laboratory technologists, and pharmaceutical technologists. Using the Taro Yamane (1967) formula a sample of 228 respondents was reached as calculated at 95% confidence level and 5% precision level. The respondents were selected using simple random sampling technique. Primary data was collected using structured questionnaires and the tools were physically administered by the research assistants. The collected data was entered into SPSS version 25.0 and Ms. Excel for analysis that was descriptive,

correlation and regression. The findings were presented in figures, tables and discussions.

RESEARCH FINDINGS AND DISCUSSIONS

Response Rate

The researcher administered 228 questionnaires in the nine sub-county hospitals in Makueni County. 166 respondents filled the tool and returned them, making the response rate of 72.8% and as per the Mugenda and Mugenda (2003) stipulation a response rate of 70% and above is fit for use in research. Therefore, the obtained 72.8% response rate in this study is ideal and fit for use. This is shown in Table 1

Table 1: Response Rate

Response Rate	Frequency	Percent
Response	166	72.8%
Non-Response	62	27.1%
Total	228	99.9%

Source: Survey Data (2022)

Descriptive Analysis Results

Healthcare Workforce

The study assessed the effect that healthcare workforce has on performance of sub-county hospitals in Makueni County, Kenya. The results are as shown in Table 2:

Table 2: Healthcare Workforce

Statement	Mean	Std. Dev.
Staffing levels in my department are sufficient	3.699	1.125
Competent employees are hired	4.295	0.732
There is rotation of staff in the department	4.403	0.660
Service delivery points have been automated at department level	4.084	0.890
The time taken by patients in the department has reduced	3.897	1.012
The process of service delivery is well understood	4.295	0.707
All staff have knowledge on the use of PPEs	4.208	0.797
Number of trainings have increased compared to last year	4.186	0.710
Employees participate in continuous medical education	4.265	0.795
Employee performance is measured every quarter	4.163	0.841
Employees are rewarded for their performance	4.138	0.965
Employee's needs are well taken care of	4.192	0.808
Improving employee commitment, morale or both is part of the product development strategy adopted by the facility	4.144	0.948
Overall Score	4.151	

Table 2 shows that the overall score for the means is at 4.151 where the respondents agreed that healthcare workforce affected performance in the sub-county hospitals. Just as Wamalwa (2017) noted that human resources are a valuable resource and driver for delivery of healthcare. The highest mean score was on rotation of staff per department at 4.403 and standard deviation for the responses at 0.660. The respondents also agreed that competent employees had been hired with mean of 4.295 and SD of 0.732 and the service delivery process is well understood at mean of 4.295 and variation in responses at 0.707. This is also shared by Kitur (2019) who revealed that competent healthcare workers led to successful management of HIV patients.

Low mean score was observed for statement on reduction in the time taken by patients to receive treatment at mean score of

3.897 and standard deviation of 1.012. On staffing levels being sufficient had means of 3.699 and standard deviation of 1.125; an indication that many respondents had contrary response on sufficiency of staff numbers. This sentiment is also shared by Chesoli, *et al.* (2018) human resource factors like motivation and workload affected the quality of services given to the patients and the time taken in the facility.

Performance

Factors affecting the performance of the sub-county hospitals in Makeni County were examined and the results are presented in Table 3.

Table 3: Performance

Statement	Mean	Std. Dev.
There is a patient service delivery charter in the facility	4.331	0.616
The turn-around-time for patients in the hospital has reduced significantly	3.668	1.124
Standard Operating Procedures (SOPs) are available	4.240	0.817
There is long-term patient retention	3.813	1.104
There is increased patient satisfaction	4.096	0.847
The organization is focused on continuous improvement	4.319	0.696
The staffs deliver patient-centered services	4.283	0.737
The facility has been accredited	4.393	0.691
There are increased health promotion programs	4.018	0.856
There is an increase in number of people seeking preventative health services	4.156	0.713
Overall Score	4.129	

Table 3 has the analysis on performance of the sub-county hospitals with overall mean score found to be 4.129. The high mean score of 4.331 and SD of 0.616 for presence of patient delivery service charter, followed by focus of the facility towards continuous improvement with mean score of 4.319 and response variation of 0.696. Just as Santarsiero, *et al.* (2019) revealed that performance in hospitals looks at stability of the facilities and capacity to deliver quality healthcare services where and when needed. The services should also be able to alleviate pain and suffering in the patients. Furthermore, Manyazewal (2017)

conveyed the need for healthcare services that focus on the patients and Ayah, *et al.* (2018) noted the need for proper utilization of medical equipment.

Low mean scores were recorded as respondents agreed that there is retention of patients for long term period with mean score of 3.813 and standard deviation of 1.104 and there is significant reduction of the turn-around-time for patients in the hospitals at mean of 3.668 and standard deviation of 1.124. Similar sentiments were shared by Ndunda (2017) who noted that there was need for many healthcare workers to reduce their workload and improve on

wait time before patients are served. Manyazewal (2017) also noted that performance is about effective, efficient and timely service provision.

The study sought to establish the strength of the association between healthcare workforce and performance and the Pearson correlation coefficient was computed at 95% confidence level.

Correlation Analysis Results

Table 4: Correlation Matrix

	Performance of sub-county hospitals		Healthcare workforce	
Performance of sub-county hospitals	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	166		
Healthcare workforce	Pearson Correlation	.714	1	
	Sig. (2-tailed)	.000		
	N	166	166	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The findings shown in Table 4 indicate that healthcare workforce had strong and positive relations to performance of the sub-county hospitals with r value of 0.714 and p-value of 0.000.

The study sought to determine whether healthcare workforce influenced the performance of the sub-county hospitals in Makueni County. The results are shown below:

Regression Analysis Results

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.699 ^a	.552	.624	3.24065

a. Predictors: (Constant), Healthcare workforce

The analysis revealed that the coefficient of correlation is at 0.699 which implies that the relation between the variables is positive and significant. The adjusted R is at 0.624 which means that 62.4% of changes in performance of the sub-county hospitals

can be traced to healthcare workforce. The remaining residual effect of 37.6% of performance is determined by other factors.

Table 6: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	117.503	1	117.503	46.371	.001 ^b
	Residual	415.691	164	2.534		
	Total	533.194	165			

a. Dependent Variable: Performance of healthcare facilities

b. Predictors: (Constant), Healthcare workforce

The ANOVA results shown in the Table 6 show that F calculated is greater than the F critical (46.371 > 2.660) showing the model is fit and p-value is at 0.001 which is less than standard of 0.05 an indication of positive link. The healthcare workforce

significantly influences performance in the sub-county hospitals in Makueni County.

Table 7: Regression Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	T	
1	(Constant)	5.841	3.126		1.868	.000
	Healthcare Workforce	4.753	1.340	.105	3.547	.000

a. Dependent Variable: Performance of healthcare facilities

The Resulting Equation takes this form:

$$Y = 5.841 + 4.753X_1 \text{ Healthcare workforce} \dots\dots\dots (I)$$

Where Y = Performance and X₁ = Healthcare workforce

Table 7 shows that at constant the performance of sub-county hospitals in Makueni County is at 5.841 and a unit increase in healthcare workforce result in performance increasing by 4.753. The healthcare workforce had significant effect to performance of the sub-county hospitals in Makueni County since 0.00 < 0.05. Just as Kenya (2016) revealed that healthcare workers capacity improvement through trainings led to huge impacts on service delivery.

V. CONCLUSION

Majority of the respondents agreed that performance of their health facility had improved in terms of low turn-around time, patient-centered services, high satisfaction and retention of patients. There was continuous improvement at the health facilities based on service delivery charters and standard operating procedures and health promotion programs. The study concluded that hiring competent and knowledgeable staffs, having adequate numbers of staffs in every department led to improved performance. When the hospitals took care of the needs of the employees and they were rewarded for working hard, the motivation and commitment levels rose and positively impacted performance of the overall hospitals. From the correlation analysis, it was established that healthcare workforce had positive and significant effects to performance of the sub-county hospitals in Makueni County, Kenya.

VI. RECOMMENDATIONS

The study found and concluded that healthcare workforce improve performance of hospitals. Therefore, sub-county hospitals are advised to have competent and sufficient numbers of healthcare workers. The healthcare facilities must provide their workers with education and training programs to increase their knowledge and skills that result in improved productivity. There is also need to reward best performing healthcare workers as a motivation and encouragement to other staffs. The study recommends that for higher outcomes, the health facilities must be able to take care of the needs of the workforce which will motivate them and increase their commitment levels.

REFERENCES

[1] Abate, G. T., Dereje, M., Hirvonen, K., & Minten, B. (2020). Geography of public service delivery in rural Ethiopia. *World Development*, 136, 105133

[2] Achoki, T., Hovels, A., Masiye, F., Lesego, A., Leufkens, H., & Kinfu, Y. (2017). Technical and scale efficiency in the delivery of child health services in Zambia: results from data envelopment analysis. *BMJ open*, 7(1), 012321

[3] Arumona, J., Erin, O., Onmonya, L., & Omatayo, V. (2019). Board financial education and firm performance: Evidence from the healthcare sector in Nigeria. *Academy of Strategic Management Journal*, 18(4), 1-13.

[4] Ayah, R., Ongore, D., & Agwanda, A. T. (2018). Measuring the effectiveness of maternal delivery services: a cross-sectional and qualitative study of perinatal mortality in six primary referral hospitals, Kenya. *F1000-Research*, 7(732), 732

[5] Banabakova, V., & Georgiev, M. (2018). The role of the Balanced Scorecard as a tool of strategic management and control. *Ijasos-International E-Journal of Advances in Social Sciences*, 4(10)

[6] Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of management*, 27(6), 643-650

[7] Cantor, V. J. M., & Poh, K. L. (2018). Integrated analysis of healthcare efficiency: a systematic review. *Journal of medical systems*, 42(1), 1-23

[8] Chesoli, R. N., Schuster, R. C., Okelo, S., & Omatayo, M. O. (2018). Strengthening care delivery in primary care facilities: perspectives of facility managers on the immunization program in Kenya. *International journal of health policy and management*, 7(12), 1130

[9] Diop, B. Z., Awoonor-Williams, K., Ofosu, A., & Williams, M. J. (2019). Understanding the Allocation of Public Personnel Across Government Health Facilities in Ghana. *International Growth Centre, London School of Economics*, 3 (1) 1-31

[10] Gitobu, C. M., Gichangi, P. B., & Mwanda, W. O. (2018). The effect of Kenya's free maternal health care policy on the utilization of health facility delivery services and maternal and neonatal mortality in public health facilities. *BMC pregnancy and childbirth*, 18(1), 1-11

[11] Hakkak, M., & Ghodsi, M. (2015). Development of a sustainable competitive advantage model based on balanced scorecard. *International Journal of Asian Social Science*, 5(5), 298-308.

[12] Hamzah, N.M., & See, K. F. (2019). Technical efficiency and its influencing factors in Malaysian hospital pharmacy services. *Health care management science*, 22(3), 462-474

[13] Hiitt, M. A., Carnes, C. M., & Xu, K. (2016). A current view of resource-based theory in operations management: A response to Bromiley and Rau. *Journal of Operations Management*, 41(10), 107-109.

[14] Kasanga, B., Muthoni, E., & Oluoch, M. (2019). Status of Health workers Knowledge on Maternal and Neonatal Health related to Service Delivery in Makueni County (Dissertation, KeMU)

[15] Kenya, B. O. (2016). Factors influencing service delivery in public hospitals: A case of Nairobi County, Kenya (Doctoral dissertation, University of Nairobi).

[16] Kimanzi, L. M. (2020). Universal Health Care on Health and Welfare of Residents of Makueni County: A Case Study of Mbooni Sub County Hospital, Makueni County (Dissertation, MUA).

[17] Kitur, G. (2019). Health Care Human Resource Capacity Building Initiatives Influencing Sustainability of HIV/AIDS Services at Siaya County Referral Hospital, Kenya (Doctoral dissertation, University of Nairobi)

[18] Miseda, M. H., Were, S. O., Muriangi, C. A., Mutuku, M. P., & Mutwiwa, S. N. (2017). The implication of the shortage of health workforce specialist on universal health coverage in Kenya. *Human resources for health*, 15(1), 1-7

[19] Ndunda, P. M. (2017). Total Quality Management and Operational Performance of Public Health Facilities in Makueni County (Doctoral dissertation, University of Nairobi)

[20] Nørreklit, H., Kure, N., & Trencu, M. (2018). Balanced scorecard. *The international encyclopedia of strategic communication*, 1-6

[21] Oluoch-Arudi, J., Smith-Oka, V., Milan, E., & Dowd, R. (2018). Exploring mistreatment of women during childbirth in a peri-urban setting in Kenya: Experiences and perceptions of women and healthcare providers. *Reproductive Health*, 15(1) 18-43

[22] Olusola, A., Olusola, B., Onafeso, O., Ajiola, F., & Adelabu, S. (2020). Early geography of the coronavirus disease outbreak in Nigeria. *GeoJournal*, 1-15.

[23] Osborne, D., & Gaebler, T. (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector* (494-494)

[24] Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley & Sons Inc. Penrose, E. T, 1, 1-23.

[25] Radnor, Z., Osborne, S., & Glennon, R. (2016). *Public management theory. In Handbook on theories of governance*. Edward Elgar Publishing

[26] Stephen, S. O., & Bula, H. (2017). Human resource management practices and quality of health care service delivery at Jaramogi Oginga Odinga teaching and referral hospital, Kenya. *Human Resource Management*, 10(10), 126-140.

- [27] Wamalwa, E. (2017). Influence of Health Approaches on Job Satisfaction Among Healthcare Workers: A Case of Tier 3 Public Hospitals in Busia County, Kenya (Doctoral dissertation, University of Nairobi).
- [28] Wernerfelt, B. (1984). Resource-based view of the firm. Strategic management journal, 5(2), 171-180

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Process and Practices improvement of Antenatal Care Clinic at a Maternity Care Hospital in Sri Lanka during COVID-19 Pandemic

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ABSTRACT

Introduction: Among healthcare settings, antenatal clinics play a pre-dominant role, as it provides essential health care during pregnancy. This research project was an interventional study implemented in De Soysa Maternity Hospital (DMH) with the aim of improving process and practices of Antenatal Care (ANC) clinic during the COVID-19 pandemic.

Methods: The research adopted mixed methods. The antenatal clinic procedure was mapped and gaps were assessed. A pregnant women's satisfaction survey, desk reviews, key informant interviews (KIIs) and a checklist were used. Proportions, percentages and means were calculated for quantitative data and the z test for percentages was applied as appropriate. The p-value <0.05 was considered as significant. Narrative analysis was done for qualitative data.

Results: The existing clinic procedure was complicated and time consuming. The mean waiting time was recorded as 144 minutes per visit in the pre-intervention phase. Based on the process map it was identified that pregnant women were not properly directed within the ANC clinic, scanning unit was located away from the clinic, sample labeling was done by nurses manually and waiting numbers were called by the attendants with an additional effort made to organize the pregnant women. Pregnant women's satisfaction on selected attributes of measures taken to COVID-19 risk mitigation, waiting time and antenatal education provided were 61.5%, 37.1% and 47.5% respectively. Pregnant women are highly satisfied about the facility available and the care provided by the health staff. Post intervention survey of pregnant women and KIIs showed that satisfaction of pregnant women increased significantly at the level of p <0.00. The mean waiting time reduction was significant at the level of p <0.00 and recorded mean time was 100 min per visit.

Conclusion: Process modifications, introduction of COVID-19 risk mitigation protocol and modified antenatal education

procedures were best interventions which successfully solved the gaps identified in existing process and practices. Study recommends introducing a computerized system to reduce the manual workload carried out by the staff and health staff should be provided training opportunities to strengthen the healthcare provided. **Key words:** Antenatal Care Clinic, COVID-19 pandemic, Antenatal education, waiting time, Interventions

I. INTRODUCTION

The antenatal care (ANC) is defined as the care provided by skilled health-care professionals to pregnant women to ensure the best health conditions for both mother and the baby during pregnancy. Women are advised to start ANC at her gestational age less than 12 weeks. During ANC, initial history taking and physical examination followed by periodic screening and diagnostic testing, serial examinations, carefully observing trends of various objective measurements and mother's emotional adjustment to pregnancy are carried out in antenatal clinics (WHO, 2017). Pregnancy is a crucial time for healthy behavior and parenting skill improvement. Good ANC contributes to good health throughout the life cycle for both women and her baby.

Objective of antenatal clinics are;

- Maintenance of health of mother during pregnancy
- Promote physical, mental and social well-being of mother and child
- Ensure delivery of full-term healthy baby
- Decrease maternal and infant mortality and morbidity
- Screening for conditions and diseases such as anemia, sexually transmitted infections, human immunodeficiency virus infections, mental health problems
- Early detection of high-risk cases and minimizes risks by taking appropriate management
- Teach the mother about childcare, nutrition, sanitation, and hygiene
- Prevent development of complications through health

education, adequate nutrition, exercise and vitamin intakes (Lincetto et al., 2006).

In the history of Sri Lanka, the health of its people has been a major concern of its government including maternal care. Accordingly Sri Lanka has achieved remarkable success in maternal health care compared to other nations with similar economic status. The lowest Maternal Mortality Rate (MMR) was recorded in Sri Lanka among the South Asian Countries and it was 39 per 100,000 live births in 2019 (FHB, 2019). It was noted that 95.5% of pregnant women in Sri Lanka receive

prenatal care and 100% of births are attended by skilled health workers (DCS, 2014).

Once the nation achieves a desired level of health care indicators in maternal care, the fine tuning with quality, patient empowerment, patient participation, patient centeredness and customer friendly health care delivery becomes the next priorities. These concepts are highly promoted in recent years in developed countries, as approaches to improve the healthcare quality (Castro, 2016). Long waiting time, limited attention paid on patients' feedback have been major drawbacks in many Sri Lankan governmental healthcare settings. Furthermore, the recent COVID-19 pandemic disrupted the quality of the ANC as well (Beach, 2006). Recent studies have revealed that COVID-19 pandemic has aggravated perinatal anxiety and depressive symptoms among pregnant women which leads to increase in the caesarean section rate (Priyadarshanie, 2017). Provision of special support to pregnant women during COVID-19 pandemic has challenged the existing procedures in health care settings. Therefore, alternative protocols are invited to carry out the routine healthcare services in a strategic way (Pitale, 2020).

De Soysa Maternity Hospital (DMH) is an earliest landmark in maternity care in Sri Lanka and it was established in 1879 as the 1st maternity hospital in Sri Lanka (Haththotuwa, 2012). During the recent past, time base implementation has occurred gradually. It is an ideal setting to be developed as a state of art maternity care center. Analysis of existing performance of ANC process and practices in DMH was fundamental for the improvement of service delivery to convert it into supra role model in ANCs amidst the pandemic.

I. METHODS

The project is an interventional study carried out from February 2021 to August 2021. The study setting was DMH and conducted in three phases including, pre-intervention (phase I), intervention (phase II) and post-intervention (phase III).

The tools used for the study included the following;

(1) A pregnant women's survey

Interviewer administered questionnaire was used for the pregnant women satisfaction survey regarding antenatal care clinics and the process and practices of its provision. The questionnaire was initially prepared in English, after reviewing relevant literature on Likert scale rating. Finalized questionnaire was then translated into Sinhala and Tamil and re-translated into English to ensure the consistency. The questionnaire was pre tested and validated. The questionnaire consisted of the following attributes with a five-point Likert scale rating.

- Provision of antenatal education during clinic sessions
- Availability of basic facilities
- Care provided by the health staff
- Waiting time

- Measures taken for COVID-19 risk mitigation

Considering a 5% non-response rate, 404 pregnant women were recruited for the survey. Systematic random sampling technique was used to identify the sample. Random sampling was based on the antenatal clinic register in a 3 days sampling interval and eligible 50-60 pregnant women were interviewed per day until the sample size was fulfilled. Eligible pregnant women were interviewed until the sample size was fulfilled. The interviews were done adhering to the COVID-19 guidelines.

(2) Key Informant Interviews (KIIs) were held with;

- Medical officer, ANC
- Senior registrar, ANC
- Sister of ANC
- Few nursing officers, ANC

(3) The desk review of secondary data to obtain pregnant women information and basic statistics. Following documents were assessed.

- Antenatal clinic register
- Annual health bulletin of DMH

(4) The checklist was developed and used to obtain the entry and exit times of the clinic visits

Exclusion criteria;

1. Pregnant mothers in 3rd trimester; as they would not be available for post intervention assessment.
2. Mothers for their first clinic visit; as they were unfamiliar with the clinic setting.

In phase I, the process of antenatal care clinic was studied extensively and mapped. Detailed information was gathered regarding the current process and practices by KIIs and gaps were identified in the existing process and practices. Pregnant women's satisfaction was measured using the questionnaire. Clinic entry time and exit time were noted using the checklist. Suitable interventions were developed and implemented during phase II. It included process modification (rearrangement of patient flow, introduction of colour code system for sample labeling, introduction of digital number calling system and re-organizing of scanning facility in the clinic), introduction of clinic schedule with an appointment basis system and providing antenatal education through distant antenatal health programmes such as provision of leaflets and study materials and telecasting learning videos during clinic sessions.

Same tools were used to gather the data in phase III.

Data gathered from the checklist, questionnaires and desk review of records were analyzed from IBM SPSS (2021) software and a narrative analysis was done for KIIs.

To calculate the level of pregnant women satisfaction on each attribute, very dissatisfied and dissatisfied were amalgamated as dissatisfied and satisfied and very satisfied were considered as satisfied. Individuals with neutral rating responses were excluded.

Z test for proportions was used to measure effectiveness of the applied interventions. P value <0.05 was considered as the level of significance.

Ethical clearance was obtained for the study and the administrative clearance was taken from the relevant authorities. Written consents were obtained from the participants.

II. RESULTS

Socio-Demographic factors

Demographic characters of the pregnant women selected for the study are as follows,

Table 1: Demographic characteristics of the pregnant women selected for the survey

	Variable	Feature	Frequency (n=404)	Percentage %
1	Age years	>20	7	1.7
		21-30	190	47
		31-40	158	39
		41-50	49	12.3
2	Parity	1 st	124	30.7
		2 nd	183	45.3
		3 rd	62	15.3
		4 th <	35	8.7
3	Education level	Not formal	8	2
		Primary	21	5.2
		O/L	166	41.1
		A/L	183	45.3
		Higher	26	6.4
4	Employment status	Unemployed	282	69.8
		Employed	122	30.2
5	Monthly income LKR	> 30,000.00	162	40.1
		30,001.00-50,000.00	215	53.2
		50,001.00-70,000.00	27	6.7
		>70,001.00	0	0

Based on the process map (Figure 1) and KIIs following gaps were identified in the indicated areas in the current process map.

A: Pregnant women were not properly directed within the ANC clinic.

Sample labeling and documentation were done by nurses manually

B: Scanning unit located away from the clinic

C: Waiting numbers were called by the attendants with an additional effort to organize the pregnant women in clinic

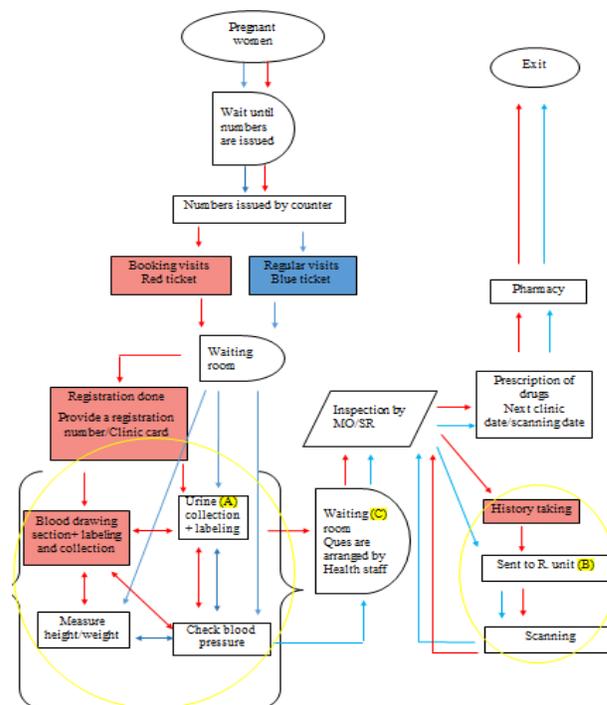


Figure 1: Process map of antenatal care clinic at De Soysa Maternity hospital at the pre-intervention

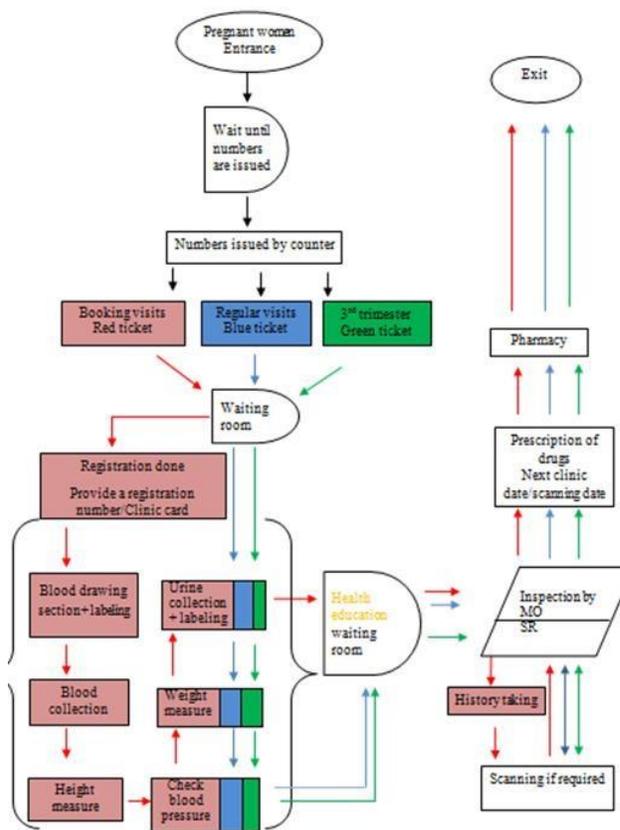


Figure 2: Modified process map of antenatal care clinic at De

Soysa Maternity hospital at the post-intervention

Table 2: Pregnant women’s satisfaction on selected attributes of ANC

	Attribute	Phase	Satisfied (n=404)	Significance (z-test, p)*
1	Antenatal education	Pre	192 (47.52%)	Z=-3.172 P=0.001
		Post	237 (58.66%)	
2	Facility available	Pre	305 (76.49%)	Z=-1.261 P=0.207
		Post	320 (79.2%)	
3	Care provided by the health staff	Pre	337 (83.42%)	Z=-0.875 P=0.378
		Post	346 (85.64%)	
4	Waiting time	Pre	150 (37.12%)	Z=-14.650 P=0.00001
		Post	352 (87.12%)	
5	Measures taken for COVID-19 risk management	Pre	250 (61.88%)	Z=-7.769 P=0.00001
		Post	347 (85.89%)	

Pregnant women’s satisfaction on selected attributes was given in Table 2. The lowest satisfaction was identified regarding antenatal education given (47.52%), waiting time (37.12%) and the measures taken for COVID-19 risk mitigation (61.88%). All lowest level attributes were significantly improved after the intervention at p<0.0001 significance level except facility available and care provided by the health staff.

Figure 2 was developed based on the average results obtained.

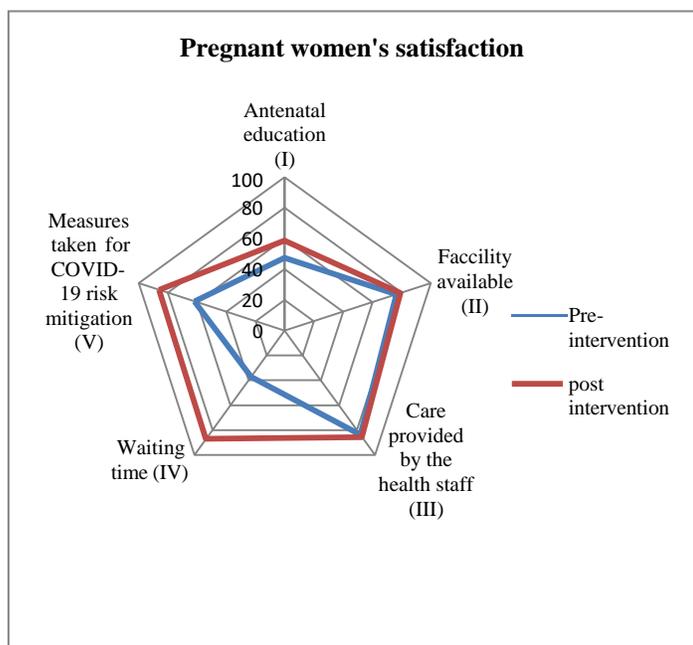


Figure 3: Radar diagram on pregnant women satisfaction at pre and post intervention phases on selected attributes of ANC

Table 3: Waiting time per clinic visit

Mean time per visit Phase I	Mean time per pregnant mother Phase II	Significance (z-test, p)* P value
144 min	100 min	Z=3.3788 P=0.00072

Waiting time at phase I was recorded as 144 minutes and at phase III it was recorded as 100 minutes. The waiting time reduction has been significant at the level of p< 0.001.

III. DISCUSSION

Process Mapping (PM) is an important tool in identifying complex processes and it clearly indicates the existing gaps. Development of PM is involved with multiple phases including planning and process identification, data and information gathering, map generation, analysis and taking forward for process improvement. PMs were reported from a wide range of healthcare settings (Antonacci, 2018). The process map of ANC at DMH revealed that the current clinic process was very complicated and time consuming. Major areas were identified where the complicated issues arose and the time consuming.

Patient flow analysis is very significant in healthcare settings as it provides important inputs in applying numerous approaches to improve the efficiency of the processes (Ammari, 1991). In DMH, clinic procedure was streamlined with effective utilization of the existing space at the intervention. This facilitated on

Waiting time is a dynamic feature which is sensitive for many factors. Within the same healthcare setting, waiting time can be different based on the nature of the visit (Almomani & Alsarheed, 2016). As per the literature, waiting time has been a top most challenge in improving the quality of service in most of the government healthcare settings in Sri Lanka. Late Medical Officer (MO) arrival issues and early arriving patients have been identified as major issues for long waiting time in most of Sri Lankan healthcare settings (Priyadarshanie et al., 2017). However in DMH, it was noticed that most of came on time to their duty but early arrival was common before the intervention.

COVID-19 pandemic challenged the existing procedures in health care settings and alternative protocols are invited to carry out the routine healthcare services in a different ways (Pitale, 2020). Requesting time lapse appointments for ANC has become more prominent during COVID-19 pandemic in healthcare settings in many countries (Du, 2020). The newly introduced clinic schedule with appointment based system effectively managed the congestion at the clinic and it was much convenient for the staff to manage the pregnant women within the space adhering to the basic COVID-19 guidelines. Furthermore, it was a good intervention to manage high risk pregnant women as well.

This approach also prevented the early arrivals of pregnant

women and effectively reduced the pregnant mother congestion in the clinic while maintaining the social distance.

It has found that the patient care given by the public sector healthcare setting is very good when compared with the private sector. Limited resources and lower adaptability to the technology are two major limitations identified in public sector healthcare settings (Rannan-Eliya, 2015). In DMH, still conventional methods were used for number issuing, sample labelling, data entering and waiting number calling. Applied interventions saved time and improved the satisfaction of both pregnant women and the health staff. The additional effort made to organize the pregnant women in the queue was reduced with the establishment of the digital waiting number calling system.

Antenatal education programs do a great service in promoting ANC (Myer & Harrison, 2003). In Sri Lankan context, use of the internet as a source of antenatal education is very poor (1.6%) and the major resource person is the midwife or the ANC classes conducted in clinics (90.3%). It has found that pregnant women have lower confidence about their deliveries due to lack of antenatal education as the pandemic has affected access to regular health education channels (Patabendige, 2021). Provisions of antenatal education through distance learning techniques were very effective according to pregnant women.

IV. CONCLUSION

Overall the study showed that there is a significant improvement in pregnant women's satisfaction on measures taken for COVID-19 risk mitigation, waiting time and antenatal education provided except facilities available and the care provided by the health staff. Waiting time was significantly reduced Therefore the outcome evaluation shows that the intervention implemented had been successful in improving the process and practices of the antenatal clinic at DMH.

This study recommends introducing e-health system for DMH ANC clinic for pregnant women information management and implementing a method to measure the feedback of the pregnant mothers at the clinic which would be a better approach for customer centered care which was not addressed by the intervention. Data obtained from satisfactory surveys will facilitate identifying major quality defects in the existing process.

REFERENCES

- [1] World Health Organization. (2017). *WHO recommendations on antenatal care for a positive pregnancy experience*. Available from: <https://www.who.int/publications/i/item/9789241549912>

- [2] Lincetto, O., Mothebesoane-Anoh, S., Gomez, P., & Munjanja, S. (2006). Antenatal care. *Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa*, 55-62.
- [3] Family Health Bureau. (2019). *Statistics*. Government of Sri Lanka. <https://fhh.health.gov.lk/index.php/en/statistics>
- [4] Department of census and statistic. (2014). *Performance report of the department of census and statistics for the year 2014*. Government of Sri Lanka. Available from: <https://www.parliament.lk/uploads/documents/paperspresented/performance-report-department-of-census-and-statistics-2014.pdf>
- [5] Castro, E. M., Van Regenmortel, T., Vanhaecht, K., Sermeus, W., & Van Hecke, A. (2016). Patient empowerment, patient participation and patient-centeredness in hospital care: a concept analysis based on a literature review. *Patient education and counseling*, 99(12), 1923-1939.
- [6] Beach, M. C., Saha, S., & Cooper, L. A. (2006). *The role and relationship of cultural competence and patient-centeredness in health care quality* (Vol. 36). New York, NY: Commonwealth Fund.
- [7] Priyadarshanie, R. A. D. R., Sudasinghe, S. R. S. N., & Wedage, D. M. E. (2017). Impact of the Quality of Non-Clinical Services on Patients' Satisfaction: A Study of Colombo South Teaching Hospital, Sri Lanka. In *4th International Conference on Contemporary Management*.
- [8] Pitale, D. L. (2020). Antenatal care during the COVID-19 pandemic. Available at SSRN 3719067.
- [9] Haththotuwa, R., Senanayake, L., Senarath, U., & Attygalle, D. (2012). Models of care that have reduced maternal mortality and morbidity in Sri Lanka. *International Journal of Gynecology & Obstetrics*, 119, S45-S49.
- [10] Antonacci, G., Reed, J. E., Lennox, L., & Barlow, J. (2018). The use of process mapping in healthcare quality improvement projects. *Health Services Management Research*, 31(2), 74-84.
- [11] Ammari, N., Abu Zahra, N., & Dreesch, N. (1991). Streamlining clinic management. In *World health forum 1991*; 12 (4): 479-482.
- [12] Almomani, I., & Alsarheed, A. (2016). Enhancing outpatient clinics management software by reducing patients' waiting time. *Journal of infection and public health*, 9(6), 734-743.
- [13] Rannan-Eliya, R. P., Wijemanne, N., Liyanage, I. K., Dalpatadu, S., de Alwis, S., Amarasinghe, S., & Shanthikumar, S. (2015). Quality of inpatient care in public and private hospitals in Sri Lanka. *Health Policy and Planning*, 30(suppl_1), i46-i58.
- [14] Myer, L., & Harrison, A. (2003). Why do women seek antenatal care late? Perspectives from rural South Africa. *Journal of midwifery & women's health*, 48(4), 268-272.
- [15] Patabendige, M., Gamage, M. M., & Jayawardane, A. (2021). The potential impact of COVID-19 pandemic on the antenatal care as perceived by non-COVID-19 pregnant women: women's experience research brief. *Journal of Patient Experience*, 8, 2374373521998820.

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