

# Health and Safety Challenges on Construction Sites of Bauchi Metropolis

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**Abstract-** *The Construction industry is the most risky of all industries in terms of health and safety hazards. Construction workers on site should have the knowledge of health and safety and apply the knowledge while working on the site. The fact that a construction task or work environment is considered risky and hazardous does not mean that its susceptibility to accident and is not controllable; this largely depends on "Work station" which is humanly controllable. Safety records in most advanced countries have proven this to be true (Samuel, 2014). Death tolls, permanent disability, partial disability and some other severe environmental threats are on the increase due to collapse of buildings and major operational accidents. Statistics have indicated that at least 4% of construction workers have lost their lives or injured at their jobsites (Stephen Wright, 2016). Most construction site workers in developing countries like Nigeria do not follow the health and safety measures on sites. Bauchi state, having the literacy rate of just 34.1% (UNESCO, 2012) and due to the absence of strong legislation is considered a state that lacks health and safety culture. This research examines occupational health and safety challenges on construction sites within Bauchi metropolis and discovered construction workers were exposed to different health and safety hazards and this are attributed to non-compliance with guidelines on sites, ignorance and non-training of workers on health and safety including non-integration of improved methods of health and safety on construction sites. The study concluded that there is need to review health and safety practices, legislation, integration and application; and finally the need to make a financial allowance for all residual risk items.*

**Index Terms-** Challenges, Construction, Occupational Health, Safety, Sites

## I. BACKGROUND OF THE STUDY

Health and Safety is an inevitable aspect of construction due to its nature of being made up of the conglomerations of people from diverse backgrounds and disciplines with each individual's output determining the level of success to be recorded at each construction stage (Dodo, 2014). Occupational health and safety is an interdisciplinary area that involves protecting the health, safety and welfare of people in the work place (Kelajaiye, 2013), and others that may be affected directly or indirectly by the activities at the workplace. Construction site is a place where a building is being built or repaired (MacMillan Dictionary, 2017). The Nigerian construction industry is one of the largest markets of construction products in Africa. With over

140 million population, 969,000km<sup>2</sup> landmass and 5.6% Gross Domestic Product growth; the construction industry is responsible for an average of 5-7% improvement of the GDP growth and over 42% of the fixed capital formation over the last 4 decades (Olatunji and Bashorun, 2006). The importance of providing safe workplace has been reiterated by various related studies because of the intrinsic hazard and risk factors that undoubtedly underlie every work situation and their negative impact on a company's overall performance (Olutuase, 2014).

Health and safety is relevant to all branches of industry, it is particularly important for the construction industry. It has always. The construction industry has been identified with the highest occurrence rate of accidents compared to any other industry (Olatunji et al., 2007; Orji, Nwachukwu and Enebe 2016). In the recent past, death tolls, permanent disability, partial disability and some other severe environmental threat had increasingly been on the rise through collapse et al., 2007 of buildings and other major operational accidents (Orji, Nwachukwu and Enebe 2016).

Due to the nature of work, construction sector is considered very complex and dynamic. There are several phases in construction like viability, design, plan, execution, decommissioning, demolition and clearance. Similarly, plumbing, electrical wiring and carpentry are also linked with construction. Various contractors have different nature of work and different working protocols, and they work in same working area. Contractors often replace their workers and since it's an open environment, workers are prone to diseases (Hassan, 2012).

One in six fatal accidents at work occurs in a construction site (ILO, 2011). Although an analysis of the patterns and causation of accidents provides the basic information for safety planning. It is not sufficient for predicting when and where they will occur. Such prediction needs coordination with other branches of project management (Yi and Langford, 2006). The fact that a construction job or work environment is considered as highly risky and hazardous does not mean that its susceptibility to accident is not controllable – this largely depends on "work situation" which is humanly controllable. Hence, this research attempts to identify the health and safety challenges on construction sites and strategies that could be employed to produce the best practice guide for health and safety for the construction sites within Bauchi Metropolis.

## II. GLOBAL SITUATION OF HEALTH HAZARDS ON BUILDING CONSTRUCTION SITES

Construction has been regarded as the most hazardous place in which to work with a high level of health and safety risks (ILO, 2011; Smallwood et al., 2008). The International Labour Organization estimates that at least 60,000 fatal accidents happen in a year on construction sites around the world, which is one in six of all fatal work related accidents. Furthermore, it has been acknowledged that 25–40% of fatalities in the world's occupational settings are contributed to by construction (ILO, 2011). Based on fatality statistics, different countries show that the construction industry produces 30% of fatal industrial accidents across the European Union (EU), yet it employs only 10% of the working population. In the United States of America (USA) the sector accounts for 20% of fatal accidents and only 5% of employment, and in Japan construction fatalities account for 30-40% of industrial fatal accidents (ILO, 2011). In the developing world, the risks associated with construction work are much greater. Available data would suggest they are 3–6 times greater (Jason, 2008). In comparison with developed countries, construction sites in developing countries are ten times more dangerous.

### 2.1 Health and Safety Challenges in Developing Countries

Approximately 45% of the world's population and 58% of the population over 10 years of age belong to the global workforce, i.e. 60-70% of the adult male and 30-60% of the adult female population of the world (Chandrasekar, 2011). There is a wide variation in economic structures, occupational structures, working conditions, work environment, and the health status of workers in different regions of the world, in different countries and in different sectors of the economy. Therefore the mechanisation of the construction industry is not uniform throughout the world. However, as stated earlier, the construction industry plays a vital role in boosting the economy of any country, especially a developing country. It provides the infrastructure required for other sectors of the economy to flourish. Many studies, such as Coble and Haupt (1999) have shown that construction industry reflects the level of economic development within the country. The construction sector everywhere faces problems and challenges. However, in developing countries, these difficulties and challenges are present alongside a general level of socio-economic stress and a lower productivity rate when compared to developed countries (Ofori, 2000). Nevertheless it is generally believed that the construction industry is a good source of employment at various levels of skills, from a general labour to semi-skilled, skilled and specialist workforce. Other major areas that impact on this sector are lack of research and development, lack of trade and safety training, client dissatisfaction, and the continuously increasing construction costs (all of which result in less profitability).

Construction within developing countries often fails to meet the needs of modern competitive businesses in the marketplace and rarely provides the best value for clients and taxpayers (Datta, 2000). Additionally, this sector also demonstrates poor performance in respect of health and safety due to the absence of any stringent safety and construction laws. International labour organization (ILO, 1987) attributes the poor

health and safety records in construction projects within developing countries to:

- i. The high proportion of small firms and the high number of self-employed workers;
  - ii. The variety and comparatively short life of construction sites;
  - iii. The high turnover of workers;
  - iv. The large proportion of seasonal and migrant workers;
- Kartam et al. (1998) found that, in most developing countries, for example like India, there are no training programs for staff and workers; therefore, no orientation for new staff or workers is conducted; hazards are not pointed out; and no safety meetings are held. Employees are expected to learn from their own mistakes and experience.

In adopting different approaches to health and safety in developed and developing countries, two main differences can be identified. The first is the existence of legislation and its effective implementation; the second is hazard awareness. In developed countries, many safety acts and legislation exist and are implemented effectively. Nominated safety officers promote hazard awareness with the help of regular safety training sessions. In developing countries, however, safety rules barely exist at all; and when they do, they are inappropriate, ineffective, out-of date and based on conditions that prevailed while the country was still being colonised. Additionally, the regulatory authority is usually very weak in implementing rules effectively, and work hazards are either not perceived at all, or perceived to be less dangerous than they actually are (Larcher and Sohail, 1999; Hinze et al., 1999).

### 2.2 Occupational Health and Safety in Nigeria

Occupational health safety In Nigeria has been in existence and can be traced back to the slave trade period. According to Kalejaiye (2013), records show that the Medical Examination Board of the Liverpool Infantry introduced occupational health in Nigeria in 1789. Kalejaiye (2013) further reports that this board was saddled with the responsibility of promoting the health of the British slave dealer in Africa and also stated that the health service was established by Colonel Luggard (who was once the Governor-General of Nigeria) to care for the health and welfare of the colonial administrators and British soldiers; then, after many years, due to the poor working conditions of workers, occupational health services were introduced in some Nigerian industries, and the Occupational Health Legislation Act established. Kalejaiye (2013) asserts that due to the impact of increased mechanization on the health and welfare of workers, the occupational health unit in the Federal Ministry of Health and the Institute of Occupational Health in Oyo state Ministry of Health were established. Nigeria signed the Geneva Convention in 1981 (Adeogun & Okafor 2013), yet 32 years after, implementation of proceedings of the convention is insignificant. Adeogun & Okafor (2013) report that OSH in Nigeria is still at infancy; in the same way, Diogwu et al. (2012) and Okolie & Okoye (2012) maintain that OSH in Nigeria is poor. [as cited by (Nnedinma U. (2014)]

For instance, although there are no reliable accident data in Nigeria (Idoro 2008; Okolie & Okoye 2012), a study by Ezenwa (2001) over a 10-year period (1987-1996) of fatal injuries reported to the Federal Ministry of Labour and Productivity

(Inspectorate Division) shows that out of 3183 injuries reported, 71 were fatal. In fact between 1990 and 1994, the overall fatality rate as recorded by the Ezenwa (2001) is 22% of the above reported cases. This explains why Idoro (2011) in a study of 42 construction contractors in Nigeria, found that in 2006 the best safety record is 5 injuries per worker and 2 accidents per 100 workers. These records are high (Idoro 2011) whether compared to other countries or not. However, this is not a true representation of what obtains in Nigerian factories (Ezenwa 2001) because the records are worse than stated above, as the poor OSH regulatory system in the country does not encourage mandatory reporting of accidents (Ezenwa 2001; Idoro 2008), which OSH regulations require. However, Diugwu et al. (2012) blame the big gap in OSH in Nigeria on the dysfunctional health and safety laws in the country. As a result, all the sectors in the country are clearly unregulated (Diugwu et al. 2012).

**2.3 Occupational Health and Safety Legislation in Nigeria**

The Nigerian Federal Ministry of Labour And Productivity (Inspectorate Division) enforces occupational health and safety regulations while the national council for occupational safety and health will enforce the labour, Safety, Health and Welfare Bill of 2012. Before the above, the Factories Act of 1987 (now known as Factories Act of 1990), which Kalejaiye (2013) reports as a substantial revision of the Factories Act of 1958 (i.e. Colonial Legislation), the Workman’s Compensation Act of 1987, the Labour Act of 1990, the Workman’s Compensation Act of 2004, the Employee’s Compensation Act of 2011 (which repeals the Workman’s Compensation Act of 2004) were introduced; some of these laws are criticised as inadequate. For instance, the Factories Act of 1987 does not include the construction industry in the definition of its premises (Diugwu et al. 2012; Idoro 2008, 2011); consequently, the industry remains unregulated. Idubor & Osiamojie (2013); Okojie (2010) contend that the severities of penalties stipulated by OSH laws in Nigeria are insignificant; in that offenders are not deterred by the penalties.

The enforcement processes require issuing of warning or notices to offenders, after which the lower level of enforcement, which includes the sealing of a defaulting factory, takes place (Okojie 2010). Regrettably, this is not practicable in Nigeria in that the resources required are under estimated and not made available. In affirmation, Okojie (2010) stated that the sealing of premises, which is a form of enforcement rarely, happens in Nigeria. Also, Adeogun & Okafor (2013) note that unhealthy exposures to risks of workers in organizations make it evident that OSH laws are not enforced in Nigeria. The argument therefore is that there should be daily inspection of workplaces by the factory inspectors and monthly reports to the Federal Ministry of Labour and Productivity (Okojie 2010), but this is farfetched. Equally important, a study by Diogwu et al. in 2012, shows that majority of construction workers in Minna, Nigeria (if not in the whole country) are not aware of the body responsible for enforcing OSH regulations in the industry. In the study, about 79.5 % of the respondents could not identify the correct body responsible for OSH enforcement in Nigeria. This suggests lack of knowledge as per OSH and its ineffective enforcement. Granted that there is proper enforcement of the OSH regulations across Nigerian industries, the workers will be aware, as they must have heard of or seen the enforcement taking place. In view

of these highlighted deficiencies, it is pertinent to further examine the key issues to enforcing OSH regulations in Nigeria; thus, the subsequent section addresses this.

**2.4 Regulating Authorities**

Safety and welfare regulation of Nigeria’s factories decree of 1987, the industrial safety and welfare regulations were prompted by the necessity to control standard of performance in the industry (Mahmud, 2012).The control was necessary because of the prevalent conditions in the industry. The regulation defining the standard of performance in the industry in Nigeria is the same for all other industries i.e. the factories decree of 1987 (Kolo, 2015).In Nigeria, shortly before our independence, the condition in the factories was very bad except in a few expatriate factories and to arrest the situation before it led to a national disaster, the federal government decided to introduce in 1955, the first Nigeria’s Factories act which made provision for safety health and welfare in factories safety, health and welfare in factories (Belel, 2012).

**2.5 Role of Health, Safety and Environment Department**

Role of HSE Department Work-associated health, safety and environment (HSE) comprise the communal, cerebral and corporal comfort of labourers, their dependents and the society. In order to achieve these collaborations and contribution among government, workers, trade unions and other bodies is required. Less consideration has been given to work-related health, safety and environment concerns, but it would cost immensely if ignored. Understanding and ability to protect ourselves, our loved ones, community and the surrounding that we so much rely upon for existence is the key thing to have. Lives of labourers and their relatives, community, proprietors and state might get affected seriously by work-related accidents and diseases (Kirby & Hurst, 2004). Table 1 illustrates effects of work-related accidents on individuals, community and government.

**Table 1. Work-Related Effects of Accidents**

Affecters	Effects
<b>I.</b> Workers and his family	i. The grief and suffering of the injury or sickness, ii. The loss of salary, iii. The conceivable loss of a job, iv. Treatment costs
<b>II.</b> Community	i. Seeing a adored and praised-worthy individual suffering from an injury or ailment, ii. anxiety and tension, iii. Time and effort to look after for the person, iv. Financial damages and hardship, Loss of life
<b>III.</b> Employer	i. Payment for task not done, ii. treatment and compensation expenditures,

	<ul style="list-style-type: none"> <li>iii. Repair or replacement of damaged machinery and equipment,</li> <li>iv. Decrease or a provisional halt in production,</li> <li>v. High training expenditures and administration costs,</li> <li>vi. Potential decline in the quality of work,</li> <li>vii. Negative impact on morale of other worker</li> </ul>
<b>IV. Government</b>	<b>i. Decrease in Gross National Product (G.N.P)</b>

Source: ILO, 2004

These days, many companies have HSE departments as a part of their organizational structure or administrative wings. The chief objectives of HSE departments in any organizations are to reduce work-associated health, safety and environmental accidents and diseases. Some responsibilities of HSE departments are mentioned in table 1. These responsibilities are assigned to curtail environmental, occupational health and safety, community health and safety, construction and decommissioning, and sustainable development issues at work site.

**Table 2. Responsibilities of HSE Department**

Areas of Interest	Responsibilities
<b>I. Environmental</b>	<ul style="list-style-type: none"> <li>i. Water Conservation,</li> <li>ii. Hazardous Materials Management,</li> <li>iii. Waste Management Noise Control, Contaminated Land and Remediation,</li> <li>iv. Air Emissions and Ambient Air Quality,</li> <li>v. Energy Conservation,</li> <li>vi. Wastewater and Ambient Water Quality</li> </ul>
<b>II. Occupational Health &amp; Safety</b>	<ul style="list-style-type: none"> <li>i. Personal Protective Equipment (PPE),</li> <li>ii. Special Hazard Environments,</li> <li>iii. Monitoring,</li> <li>iv. General Facility Design and Operation, Communication and Training,</li> <li>v. Physical Hazards Protection,</li> <li>vi. Chemical,</li> <li>vii. Hazards Protection,</li> <li>viii. Biological Hazards Protection,</li> <li>ix. Radiological Hazards Protection</li> </ul>
<b>III. Community Health</b>	<b>i. Traffic Safety,</b>

<b>&amp; Safety</b>	<ul style="list-style-type: none"> <li>ii. Transport &amp; handling of Hazardous Materials, Disease Prevention,</li> <li>iii. Emergency Preparedness and Response,</li> <li>iv. Water Quality and Availability,</li> <li>v. Structural Safety of Project Infrastructure,</li> <li>vi. Life and Fire Safety (L&amp;FS)</li> </ul>
<b>IV. Construction &amp; Decommissioning</b>	<ul style="list-style-type: none"> <li>i. Environment,</li> <li>ii. Occupational Health and Safety,</li> <li>iii. Community Health and Safety</li> </ul>
<b>V. Sustainable Development</b>	<ul style="list-style-type: none"> <li>i. Reduction in Carbon footprint,</li> <li>ii. Reduction in Energy footprint,</li> <li>iii. Reduction in Water footprint,</li> <li>iv. Conducting Lifecycle assessment,</li> <li>v. Industrial symbiosis</li> </ul>

Source: World Bank, 2007

### III. METHODOLOGY

The study area is Bauchi metropolis in Bauchi state of Nigeria, it was chosen because of high rate of professionals and construction activities. Kothari (2004) descriptive research gives an accurate profile of respondents, events or satiations while explorative design involve search of literature that are relevant to the objectives and provide qualitative information on developmental issues on views. Therefore, this research used survey in collecting data about health and safety challenges on construction sites.

#### 3.1 Data Sources:

Primary data was sourced using a structured questionnaire in this research. Secondary data sources for this study are: journals, published/unpublished articles, conference scripts, textbooks and the World Wide Web (websites).

#### 3.2 Sampling Method and Sample Size:

This research is exploratory; hence, a nonprobability purposive sampling technique was used for this study as is in line with the work of Oresegun (2009). A total of 50 questionnaires were distributed to core building professionals (respondents) which includes Architects, Builders, Structural Engineers and Quantity Surveyors that are either practicing as construction site engineers or project managers in construction contracting firms in Bauchi Metropolis. They composed of two parts; part one sought to depict the demographic information of the respondents while part two was designed based on the objectives of the study.

The questions were a mixture of open ended and close ended questions.

Likert scale was used as a measurement scales in the questionnaire presented to respondents. It was adopted to assess the respondents' experience judgment on the health and safety challenges on construction sites. Moreover, the study measured the feelings of the respondents for a given item on rated scale using 1-to-5 response scale from strongly agreed to strongly disagreed.

The data obtained was thoroughly screened and analysed. Statistical Package for Social Sciences was used as a tool for data analysis in this study using descriptive analysis through mean and standard deviation.

metropolis. The overall responses success rates were determined using the formula for computing questionnaires success rate (Inuwa, 2014).  $\text{Questionnaire success rate} = (\text{Questionnaires received} \times 100) / (\text{Questionnaires administered})$ .

The research recorded an overall questionnaire response rate of 94% out of 100% from the questionnaire administered a total of 50 questionnaires in the study area but the filled and returned questionnaires were 47 and used for analyses; this response rate seems to be justifiable to measure its variables in the field of construction industry. The result of a survey could be considered as biased and of little value if the response was lower than 30-40% as in Usman *et al.*, (2012). Therefore, the study recorded an overall questionnaire response rate of 94% which indicate an unbiased and significant value.

#### IV. PRESENTATION OF RESULTS AND ANALYSIS

Referring to Table 3 below, study administered 50 questionnaires to construction professionals within Bauchi

**Table 3. Questionnaires Distribution Responses**

Locations	Total distribution of Questionnaires	
	Distributions	Retrieved
BS Multi Project Ltd	20	19
Akmaz Const. Ltd	10	8
Mailo Const. Ltd	5	5
NM Const. Ltd	5	5
Imabat Const. Ltd	10	10
<b>Total</b>	<b>50</b>	<b>47 (94%)</b>

Source: Authors Field Work, 2017

#### 4.1 Data Analysis for the General Information of Respondents

This section conveyed information regarding the general information of the respondents which covers: Professional background, academic qualification, years of company in operation and years of experience in construction.

According to Buys (2004) in Inuwa (2014) analysis of such data assists the researcher immensely to ensure that all the variables that may have an influence on the correctness of the data have been analyzed. This by implication ensures that the respondents used for a study are appropriate sample for the intended universe or domain of content (Pallant, 2001).

#### 4.1.1 Area of Specialization of Respondents

Referring to Table 4 below depicts the area of specialization of the respondent; the result shows the five core professionals in building industry. The Architects with 31.9% representing 15 respondent, Quantity surveyors with 12.8% representing 6 respondents, Building Engineer with 21.3% representing 10 respondent, Civil Engineer with 23.4% representing 11 respondent each and Estate Surveyor with 10.6% representing 5 respondent respectively as shown below;

**Table 4. Area of Specialization of Respondents**

Profession	Frequency	Percentage (%)	Cumulative Percent
Architect	15	31.9	31.9
Quantity surveyor	6	12.8	53.2
Building Engineer	10	21.3	66.0
Civil Engineer	11	23.4	76.6
Estate Surveyor	5	10.6	100.0
<b>Total</b>	<b>47</b>	<b>100.0</b>	

Source: Authors Field Work, 2017

**4.1.2 Academic Qualification of the Respondents**

Referring to Table 5 below shows the data analysis of the respondent with respect to their educational qualification, the majority of the respondents possess B.sc/HND with 51.1% representing 24 respondents, MSc with 31.9% each representing

15 respondents and 12.8% representing 6 respondent have postgraduate Diploma (PGD) qualification. The least qualification is National Diploma (ND) with 4.3% representing 2 respondents.

**Table 5. Educational Qualifications**

Profession		Frequency	Percentage (%)	Cumulative Percent
Valid	M.sc	15	31.9	31.9
	PG.D	6	12.8	44.6
	B.sc/ H.ND	24	51.1	95.8
	ND	2	4.3	100.0
Total		47	100.0	

Source: Authors Field Work (2017)

**4.1.3 Years of Experience of Respondents**

Referring to Table 6 below depicts the frequency and percentages of the respondents in terms of years of experience in construction industry, (1-5) years have 25.5% representing 12 respondents, (6-10) years have 36.2% representing 17

respondents, (11-15) years have 17.0% representing 8 respondents, (16-20) years have 8.5% representing 4 respondents and over (20 and above) years have 12.8% representing 6 respondents within the study area respectively as shown below;

**Table 6. Years of Experience**

Years of Experience		Frequency	Percentage (%)	Cumulative Percent
Valid	1-5	12	25.5	25.5
	6-10	17	36.2	61.7
	11-15	8	17.0	78.7
	16-20	4	8.5	87.2
	20 and above	6	12.8	100.0
Total		47	100.0	

Source: Authors Field Work, 2017

**4.1.4 Years in Business**

Referring to Table 7 below depicts the frequency and percentages of the respondents in terms of years of experience in construction industry, (1-5) years have 31.9% representing 15 respondents, (6-10) years have 34.0% representing 16

respondents, (11-15) years have 17.0% representing 8 respondents, (16-20) years have 2.1% representing 1 respondents and over (20 and above) years have 10.6% representing 5 respondents within the study area respectively as shown below;

**Table 7. Years in Business**

Years of Experience		Frequency	Percentage (%)	Cumulative Percent
Valid	1-5	15	31.9	31.9
	6-10	16	34.0	66.0
	11-15	8	17.0	87.2
	16-20	1	2.1	89.4
	20 and above	5	10.6	100.0
Total		47	100.0	

Source: Authors Field Work 2017

## 4.2 Data Analysis for the Research Objectives

### 4.2.1 To assess the causes of accidents in construction sites

One of the major objectives is aimed at assessing the causes of accidents in construction sites within Bauchi metropolis. The study employed the used of literature searched and analysis in achieving the stated objectives. Twenty causes were identified of which fifteen practices were finalized after a pilot study was conducted. Referring to Table (8) below shows that all the causes are effective but excessive noise, poor construction materials arrangement and tiredness are averagely effective which shows that they rarely cause accidents on construction site in the study area.

While the rest of the causes are the most frequent causes of accident on construction site having the highest mean score values, meaning that almost all the respondents are familiar with them in the study area and agreed with Alhajeri (2011).

Furthermore, for assessing the causes of accidents on construction site, the respondents were asked to assess the causes of accidents on construction site using the following scale; strongly dis agreed = 1; Dis agreed = 2; Neutral = 3; Agreed = 4; Strongly Agreed = 5. As illustrated in Table 8, the effectiveness ranked in order of mean scored value. In order to answer the research question of the objective, the study set out to determine the most effective causes of accident on construction site as perceived by the respondents in the study area. The practices were analyzed descriptively based on the responses of the respondents using Mean-score and Ranking. The Mean-scored ranges from (2.98-4.32); hence, showing the level of effectiveness of causes of accident. Referring to table 8 below shows that the lack of warning system is the most effective causes of accident on construction site in the study area having the highest Mean value 4.32 and ranked 1<sup>st</sup>, followed by negligence having the mean value 4.30 and ranked 2<sup>nd</sup>, failure to follow safety rules with mean value 4.26 was ranked 3<sup>rd</sup>, while the less effective ranking as perceived by the respondents was Excessive noise with mean value 2.98. Therefore, by implication the mean scored by the respondents vindicated that more than 80% of the practices are effective considering the study area.

Referring to Table 8 below shows the mean values in maximum of 4.32 and minimum of 2.98 for the causes of accident on construction site. The implication of these values shows that the assessment was above a score of three in the five point Likert scale. This vindicated that, the practices in the study area generally recognized and admitted the practices as effective in construction sites. The top three ranked from the assessment causes of accident on construction site in table 8 below are;

- i. Lack of warning system (4.32)
- ii. Negligence (4.30)
- iii. Failure to follow safety rules (4.26)

While the least three ranked from the practices of cost management in table x above are;

- i. Excessive noise (2.98)
- ii. Tiredness (3.96)
- iii. Poor construction materials arrangement (3.96) respectively.

**Table 8. Causes of accident on construction site**

Variables	N	Mean	Std. Deviation	Ranking
Improper use/defective tools and machines	47	3.98	1.032	12
Negligence	47	4.30	0.778	2
Excessive noise	47	2.98	1.310	15
Dropping/ throwing from high rise projects	47	4.11	0.759	9
Tiredness	47	3.96	0.859	13
Poor Construction materials arrangement	47	3.96	0.779	13
Faulty with scaffold	47	4.13	0.969	4
Unsafe working conditions and practices	47	4.13	0.824	4
Failure to follow safety rules	47	4.26	0.896	3
Alcohol intake	47	4.13	0.947	4
Lack of use of personal protective equipment	47	4.13	0.947	4
Transient workforce	47	4.04	0.833	11
Incorrect work procedure	47	4.13	0.850	4
Lack of safety signboards on site	47	4.11	0.787	9
No warning system	47	4.32	0.755	1

Note, Scale: 1.00–1.80 = very ineffective, 1.81–2.60 = ineffective, 2.61-3.40 = averagely effective, 3.41-4.20=effective, 4.21-5.00=very effective

Source: Authors Field Work, 2017

**4.2.2 To Evaluate the Current Improved Methods of Integrating Health and Safety Practice Within Construction Sites.**

The second objective of this study is aimed at evaluating the current improved methods of integrating health and safety practice within construction sites of Bauchi metropolis. The study employed the used of literature searched in achieving the stated objective. More than fifty (50) methods were identified of which fifteen (15) [see: table 9] were finalized after a pilot study was conducted. Referring to table 9 shows that the five most effective methods of integrating health and safety in the study area are; Keeping a register and record of all accidents, Review health and safety practices regularly and share with employees, Making a financial allowance for all residual risk items and almost all the methods were agreed by the respondents but only undertaking training for subcontractors and workers, establishing a health and safety committee were less effective. This shows that careful attentions need to be pay on those particular ones and has agreed with (Kelajaiye, 2013).

**Table: 9 Methods of Integrating Health and Safety**

Variables	N	Mean	Std. Deviation	Ranking
Establish a Health and safety Committee at company level	47	4.15	0.751	13
Adopt Health and Safety regulations for in and off site work	47	4.36	0.705	3



Appoint Health and Safety officers	47	4.28	0.800	11
Implement health and safety at all stages of the project	47	4.30	0.623	9
Devise training programs and identify training needs for all staff	47	4.15	0.691	13
Identify and manage health and safety risks and hazards present within any activities of the business	47	4.32	0.755	6
Keep a risk register.	47	4.30	0.720	9
Assign appropriate actions for project team members against each risk item	47	4.19	0.900	12
Make a financial allowance for all residual risk items	47	4.36	0.870	3
Keep a register and record of all accidents	47	4.53	0.747	1
Ensure sub-contractors used to carry out jobs on behalf of the company do carry out a risk assessments relevant to the job	47	4.36	0.764	3
Review health and safety practices regularly and share with employees	47	4.49	0.655	2
Use of first Aid in companies	47	4.32	0.695	6
Site visitation by authorities	47	4.32	0.837	6
Undertaking training for subcontractors and workers	47	4.13	0.924	15
Valid N (list wise)				

Source: Authors Field Work, 2017

## V. RECOMMENDATION AND CONCLUSION

### 5.1 Recommendations

The following are the recommendations are made base on this research findings:

- i. First aid box should be provided in case of minor injuries and a stand-by ambulance is stationed in case of major injuries.
- ii. Standards for material and labour based on current forms of materials and labour should be established that is suitable to the industry.
- iii. There should be special focus on training for all categories of industry participants by all professional bodies at industry levels.
- iv. Contractor selection should be based on individual's capability regarding safety issues.
- v. Construction workers should be motivation should be looked into and be enlightened on the dangers associated with construction activities.
- vi. Warning systems should be provided on construction sites.
- vii. Provision of Health and Safety insurance of workers and facilitate the payment benefits related to Health and Safety insurance for them.

### 5.2 Conclusion

The research discovered that the respondents were exposed to different health and safety hazards and this were attributed to lack of complying with health and safety guidelines and ignorance. There is need to improve safety management through effective and sustainable measures, health and safety training, regular workplace, supervision and establishment of active and functional occupational health and safety programmes that are essential to guard the health and safety condition of workforce on construction sites.

It may be concluded that effective Health and Safety practices for employees in

Nigerian construction industries are yet to be fully appreciated and implemented among construction firms. As such, it may be recommended that appropriate authorities should not only tighten the enforcement of Health and Safety practices but should also foster mechanisms to audit Health and Safety practices in the construction industry for continual improvements because employees are the greatest assets.

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