Higher Life Expectancy for Diabetes Patients with Facebook Awareness

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Abstract- Diabetes is a fatal chronic disease that grounds for many side effects, deaths, and low quality of life for millions of adults in the present globe. Continuing care and awareness of the disease helps to maintain reasonable control over the condition and prevent complications. The patient often receives such attention only at a medical clinic or doctor's visits. Hence, it is essential to identify alternatives for people aware of diabetes. Here we use Facebook as a popular social network site to create a better quality of life for diabetes awareness patients. The study was carried out on a Facebook group on 565 diabetes patients who registered in Embilipitya base hospital non-communicable disease clinic and 100 patients were selected randomly for the analysis. The majority of the patients' age between 35 years and 45 years. Patients were divided into two groups randomly (50 per each); control and normal, and data were gathered. The independent t-test was used to test for differences between two groups, and a paired sample t-test was used to confirm the difference. Results revealed the positive impact of the Facebook health awareness program on controlling LDL cholesterol, fasting blood sugar, and body weight. Also, the factors have a strong relationship with the Facebook awareness program. However, there is no impact on blood pressure (systolic and diastolic) from the program. The awareness program and the number of referring times of Facebook impact significantly controlling fasting blood sugar levels, body weight, and LDL cholesterol levels. This would be better to explain to improve the quality of life of diabetes patients. Future research directions need to explore why social network awareness program does not affect the control of high blood pressure, which is another important factor in maintaining a higher life expectancy for diabetic patients.

Index Terms- Chronic disease, Diabetes patients, Facebook awareness, Quality of Life

I. INTRODUCTION

People are eager for seeking health-related information using different types of social networks especially Facebook (FB). Looking for instructions or assistance on a variety of illnesses from health professionals, connecting people with similar experiences, being aware of treatment-related issues, or understanding the physician diagnosis are foremost activities obtained via social networks [1]. Devastating admiration of Facebook as a social network site is rapidly growing along with over 2.7 billion monthly active users in the present globe and many health professionals and patients are among these users [2]. Many physicians have now started significantly to embrace most of the social networks, either formally or informally in recent years for professional or personal purposes such as health education and knowledge sharing, communicating with patients, or tracking the progress of patients [3, 4]. Diabetes is a devastating chronic disease that requires constant medical attention and continuous awareness of the patient to reduce the risk of long-term disability and prevent complications [5]. Furthermore, there is a significant correlation between cholesterol levels and blood pressure values in patients with type 2 diabetes, and it has been found that elevated LDL-cholesterol levels in these patients are associated with an increased risk of cardiovascular disease [6]. Factors such as diabetes mellitus (DM), high blood pressure, and left vertebral hypertrophy, which contributes to the development of high risk of cardiovascular disease, have been shown to change linearly with obesity and Body Mass Index (BMI) increases [7]. However, the worst-case scenario is more than half of people with diabetes are not diagnosed [8].

Petrovski et al. described that social media, such as Facebook, can be used as a tool to help insulin pump therapy, a standard medical treatment method, to manage glucose in adolescents with type 1 diabetes successfully [9]. According to Shaya et al., social networks' involvement has enabled patients to lower Glycated Hemoglobin (HbA1c) and fasting blood glucose levels by improving and integrating their existing interpersonal networks [10]. Diabetes patients and those passionate about their patients' care and well-being can exchange health information related to people with diabetes through social networking sites to gain better knowledge, support, and connection. Although many people use Facebook to exchange health information, little is known about the authenticity and importance of the information exchanged and the potential health consequences for Arabic-speaking patients and their relatives [4]. Recent research claims that social networking sites serve as a way of thinking about positive change. But this can be a strength and a weakness when trying to make a difference through integrated interventions in a situation where social networks users' expectations are very unfair or inconsistent. However, such initiatives may have intangible benefits that are difficult to quantify in terms of cost-effectiveness. [11].

Thus, providing more accurate and scientific health information through Facebook is vital to gaining better knowledge, support, and connectivity for diabetes patients. It can also help to build trust with diabetics and their loved ones. Accordingly, this research study attempts to ascertain how people with diabetes can achieve a higher life expectancy by controlling their blood sugar and cholesterol levels, high blood pressure, and BMI.

II. METHOD

A quantitative analyzing method was undertaken to assess Facebook's efficiency (FB) posts that can be used to increase the health level of diabetes patients in publicly available FB discussion groups. The research was undertaken between 1st June 2019 and 31st May 2020 and carried out on the Facebook group on diabetes patients registered on EMBILIPITYA base hospital non-communicable disease clinic. The 565 diabetes patients were registered, and 100 patients were selected randomly for the analysis of that clinic; and in most of the patients between 35 and 45 age. Patients were divided into two groups randomly (50 per each); control and normal. Data were collected under the following variables for the two separate groups (control and normal) before posting FB awareness messages to obtain the pre-survey analysis.

1. Low Density Lipoprotein (LDL) amount - mg/dl
2. Fasting Blood Sugar (FBS) amount - mg/dl
3. Blood pressure (Systolic/Diastolic)
4. Bodyweight

The awareness program through Facebook was conducted within eight months. The frequency of referencing the Facebook comments by each patient was counted using a cookie file. At the end of eight months, data were collected again from all patients under the above variables to obtain the post-survey analysis.

III. ANALYSIS

Preliminary analysis was obtained for both groups to get the idea about the difference (pre-survey mean – post-survey mean) comparing the control group and the normal group. The data set was tested using the Anderson Darling Normality test and the p-value is less than 0.005. This emphasizes that the data set is normally distributed. Hence, the parametric test can be applied to the data set. Further, the Independent t-test was applied (Control vs Normal groups) to evaluate the impact of awareness program for controlling LDL, FBS amount, BP (Systolic), BP (Diastolic), and body weight. A Paired t-test was conducted (for the Control group) to evaluate the significance of results given by the independent t-test. Also, the Pearson correlation coefficient was calculated between the number of times a Facebook health awareness page is used, and the positive difference between pre and post-survey results of the control group to fit the impact model. Finally, the relationship between number of referring times of the Facebook health awareness program by patients and the controlling amount of parameters is shown with a regression model.

IV. RESULTS AND DISCUSSION

The authenticity and responsibility of health information are essential when transmitting people with diabetes through Facebook. Accordingly, Table 1 shows the exact values for each factor presented by the World Health Organization [12].

Table 01
Recommendation for metabolic and non-metabolic targets

	Good	**Borderline**	**Poor**
Total Cholesterol (mg/dL)	<200	200 – 250	>250
Triglycerides (mg/dL)	<150	150 – 200	>200
HDL Cholesterol (mg/dL)			
Male	>45	35 – 45	<35
Female	>55	45 – 55	<45
LDL Cholesterol (mg/dL)	<100	100 – 130	>130
Body Mass Index (kg/m^2)			
Male	<25.0	25.0 – 27.0	>27.0
Female	<24.0	24.0 – 26.0	>26.0
Blood Pressure (mm/Hg)			
Systolic	<120	--	--
Diastolic	<80	--	--

Fasting Blood Sugar			
Pre-meal glucose (mg/dL)	<100	80 – 120	<80 or >140
Bedtime glucose (mg/dL)	<110	100 – 140	<100 or >160
HbA_{1c} (%)	<6	<7	>8

Source: *Guidelines for the prevention, management, and care of diabetes mellitus – WHO, 2006*

Based on those clinical values presented by the World Health Organization and following guidelines set by the American Diabetes Association [13], health information was created to communicate to patients in this study. Here are some of the health information that was created and sent for diabetes patients.

"You can live a healthier life by reducing starchy and fatty foods as much as possible and eating vegetables, herbs, and half-ripe fruits. Ask your doctor about the amount and timing of meals"

"Exercising at least 30 minutes a day can lead to a healthier lifestyle"

"Reducing alcohol use and avoiding smoking keeps you healthy and protects you from heart disease"

"Controlling your weight gain as much as possible and maintaining a weight appropriate for your height can protect you from high blood pressure. It can help you get rid of heart diseases"

"Get clinical records of your blood sugar and cholesterol levels, blood pressure, and weight at least every two months. It helps to maintain your health and get the right medicine with the appropriate dosage"

"Ask your family doctor about the correct diet patterns and exercise routines. If your well-being accordingly, you will be able to live a long and healthy life."

Out of the 100 patients who participated in the study, 50 patients placed under the control group were included in the Facebook health awareness program. They were encouraged to use the health information communicated through Facebook and to follow the instructions contained therein. Mean under LDL, Fasting Blood Sugar amount, BP (Systolic), BP (Diastolic), and body weight variables were calculated for the data according to both groups using post and pre-survey separately. Mean differences between post and pre-survey were calculated (difference = pre-survey mean – post-survey mean). Table 2 illustrated the means and differences made at the end of the survey.

Table 02
Mean differences

Group	**Control**			**Normal**		
	Pre	***Post***	***Difference***	***Pre***	***Post***	***Difference***
LDL	156.86 (mg/dL)	150.04 (mg/dL)	6.82 (mg/dL)	155.48 (mg/dL)	155.02 (mg/dL)	0.46 (mg/dL)
Fasting Blood Sugar	102.20 (mg/dL)	94.98 (mg/dL)	7.22 (mg/dL)	96.02 (mg/dL)	99.32 (mg/dL)	-3.3 (mg/dL)
BP (Systolic)	114.76 (mm/Hg)	117.56 (mm/Hg)	-2.8 (mm/Hg)	115.80 (mm/Hg)	118.52 (mm/Hg)	-2.72 (mm/Hg)
BP (Diastolic)	80.38 (mm/Hg)	79.80 (mm/Hg)	0.58 (mm/Hg)	80.20 (mm/Hg)	80.16 (mm/Hg)	0.04 (mm/Hg)
Body Weight	87.34 (kg)	74.74 (kg)	12.6 (kg)	90.42 (kg)	92.94 (kg)	-2.52 (kg)

The mean difference between post and pre-survey under the control group is significantly higher than the normal group for LDL amount, Fasting Blood Sugar amount (FBS), and body weight. The results revealed an impact on controlling LDL amount FBS amount with the Facebook health awareness program. Further, the result confirms that Facebook has impacted controlling body weight with its health

awareness program. However, these results show that Facebook's health awareness program has not affect Blood Pressure (Systolic or Diastolic) control.

The analysis was carried out in advance with the Anderson Darling Normality test, and the results show that the *p*-value is less than 0.05. This means the data set behaves in the normal distribution. Hence, the parametric tests such as independent t-test, paired t-test, and regression analysis can be applied for further evaluation.

The two-sample independent *t*-test was applied to the difference to test the positive impact of the Facebook awareness program by comparing control and normal groups. Also, the test was conducted under a 0.05 significant level defining the following hypothesis.

$$H_0 : \mu_{Control} = \mu_{Normal} \quad \text{VS} \quad H_1 : \mu_{Control} > \mu_{Normal}$$

Table 03
Two-sample independent t-test results

	Group	N	Mean	St-Dev	SE-Mean	Estimate for difference	95% lower bound for difference	*t*-value	*p*-value
LDL	Control	50	6.82	1.92	0.27	11.3600	5.9045	3.49	0.001
	Normal	50	-4.50	22.9	3.20				
FBS	Control	50	7.22	2.06	0.29	10.5200	9.9351	29.91	0.000
	Normal	50	-3.30	1.39	0.20				
BP (S)	Control	50	-2.80	10.1	1.40	-0.080000	-3.398052	-0.04	0.516
	Normal	50	-2.72	9.89	1.40				
BP (D)	Control	50	0.58	3.93	0.56	0.540000	-0.802102	0.67	0.253
	Normal	50	0.04	4.15	0.59				
Weight	Control	50	12.60	1.70	0.24	15.1200	14.5953	47.86	0.000
	Normal	50	-2.52	1.45	0.20				

The results given in Table 3 revealed that the Facebook awareness program positively impacted (*p*-value < 0.05, H_0 is rejected, Mean of the control group is greater than normal group) controlling LDL amount, FBS amount, and body weight. However, the Facebook awareness program has no impact (*p*-value > 0.05, H_0 is accepted, both groups of Mean values are equal) controlling Blood pressure (Systolic and Diastolic).

According to the two-sample independent t-test, LDL amount, FBS amount, and body weight can be controlled via the Facebook health awareness program. To evaluate the result's significance, the paired sample t-test was conducted on the control group under LDL amount, FBS amount, and body weight (BW) by considering pre-and post-survey. Also, the test was conducted under a 0.05 significant level defining the following hypothesis.

$$H_0 : \mu_{LDL} = 0 \quad \text{VS} \quad H_0 : \mu_{LDL} < 0$$

$$H_0 : \mu_{FBS} = 0 \quad \text{VS} \quad H_0 : \mu_{FBS} < 0$$

$$H_0 : \mu_{BW} = 0 \quad \text{VS} \quad H_0 : \mu_{BW} < 0$$

Table 04
Paired-sample t-test results

	Survey (group – Control)	N	Mean	St-Dev	SE-Mean	95% upper bound for mean difference	*t*-value	*p*-value
LDL	post	50	150.040	22.141	3.131	-6.36383	-25.07	0.000
	pre	50	156.860	22.285	3.152			
	difference	50	-6.8200	1.92396	0.27209			

FBS	post	50	94.980	11.771	1.665	-6.73082	-24.74	0.000
	pre	50	102.200	11.323	1.601			
	difference	50	-7.2200	2.06319	0.29178			
BW	post	50	74.7400	14.1491	2.0010	-12.1964	-52.34	0.000
	pre	50	87.3400	14.0837	1.9917			
	difference	50	-12.6000	1.70230	0.24070			

The results given in Table 4 revealed that the positive impact of controlling LDL amount, FBS amount, and body weight by the Facebook awareness program is significant (p-value < 0.05, H_0 is rejected, and Mean is less than 0).
The number of times a Facebook health awareness page is used by the group members in the control group was counted using the cookie file. Then, the Pearson correlation coefficient was calculated between the number of times a Facebook health awareness page is used, and the positive difference between pre and post-survey results of the control group and interpret the correlation coefficients. Also, the hypothesis was defined below and tested with the p-value. If the p-value is less than 0.05, the hypothesis is rejected at a 0.05 significant level. When the correlation coefficient is in the range 0.0 – 0.3, there is no positive or negative correlation, 0.3 – 0.5, there is a weak positive or negative correlation, and 0.5 – 1.0; there is a strong positive or negative correlation.

$$H_0 : \rho = 0 \quad \text{VS} \quad H_1 : \rho \neq 0$$

Figure 01
Correlation results

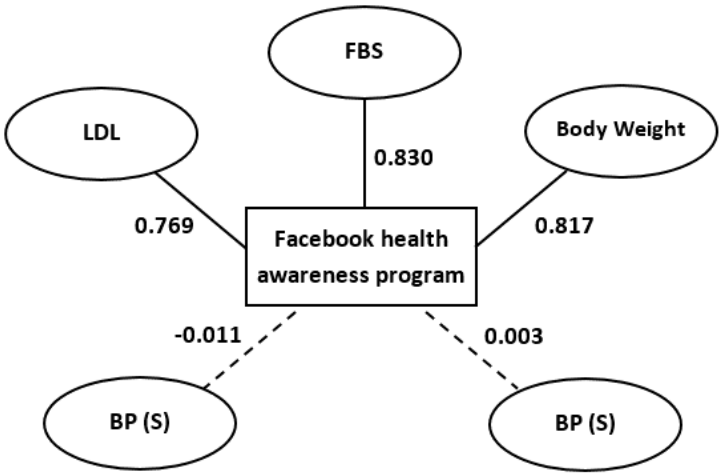
Correlations: Referring Times, LDL, FBS, BP (S), BP (D), Body weight

	Referring Times	LDL	FBS	BP(S)	BP(D)
LDL	0.769 0.007				
FBS	0.830 0.000	-0.077 0.004			
BP(S)	-0.011 0.937	-0.029 0.844	0.032 0.825		
BP(D)	0.003 0.983	0.049 0.735	-0.102 0.483	0.048 0.738	
Body Weight	0.817 0.000	-0.147 0.008	-0.114 0.001	0.063 0.164	-0.114 0.231

Cell Contents: Pearson correlation
P-Value

The results given in Figure 1 revealed that controlling LDL, FBS, and body weight (ρ >0.5 and close to 1, *p*-value<0.05, and H_0 rejected) have a strong relationship with the Facebook awareness program. However, controlling BP (S) and BP (D) (ρ<0.5 and close to 0, p-value >0.05, H_0 not rejected) have no relationship with the Facebook awareness program. Further, the impact model (Figure 2) can be represented with their relationships as follows.

Figure 02
The impact model



Due to the above-mentioned correlation, the regression model was fitted by considering the number of referring times of Facebook as the dependent variable. Because of the use of the Facebook health awareness program, the amount of value controlling of each variable; LDL, FBS, BP (S), BP (D), and Bodyweight were considered as independent variables. Analysis of variance output is used to test the overall goodness of fit of the model. This test measures how well the model describes the reference frequency, as shown in the hypothesis.

$$H_0: b_{const.} = b_{LDL} = b_{FBS} = b_{BP\ (S)} = b_{BP\ (D)} = b_{BW} = 0 \quad VS$$

$$H_1: \textit{at least one } b_{value} \textit{ is not equal to zero}$$

Figure 03
Correlation coefficients of the regression analysis

Regression Analysis: Referring Times versus LDL, FBS, BP (S), BP (D), Body weight

The regression equation is
Referring Times = - 2.09 + 0.885 LDL + 1.57 FBS - 0.0718 BP (S) + 0.312 BP (D) + 4.74 Body weight

Predictor	Coef	SE Coef	T	P
Constant	-2.092	5.566	-0.38	0.709
LDL	0.8845	0.2883	3.07	0.004
FBS	1.5714	0.2695	5.83	0.000
BP (S)	-0.07183	0.05437	-1.32	0.193
BP (D)	0.3123	0.1409	2.22	0.632
Body weight	4.7406	0.3301	14.36	0.000

S = 3.82109 R-Sq = 83.4% R-Sq (adj) = 81.5%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	5	3231.57	646.31	44.27	0.000
Residual Error	44	642.43	14.60		
Total	49	3874.00			

The results are given in Figure 3, further explain that *p*-value = 0.000 (<0.05) in the analysis of variance, and therefore H_0 is rejected, so there is a correlation between the reference time and at least one of the independent variables (LDL, FBS, BP (S), BP (D) or

Bodyweight). Then the Likelihood Ratios test is used to evaluate the significance of individual coefficients in the model, and the relevant hypothesis was defined as follows.

$$H_0: b_i = 0 \quad VS \quad H_1: b_i \neq 0 \quad Where\ i = 0, 1, 2 \ldots$$

The individual *p*-values of LDL, FBS, and Bodyweight were less than 0.05, therefore H_0 is rejected at a 0.05 significant level. Hence, it was concluded that the LDL, FBS, and Bodyweight become significant in the given regression equation. Finally, the proposed regression equation can be defined as follows.

$$\textbf{Number of Facebook Referring Times} = 0.8845\ \textbf{LDL} + 1.5714\ \textbf{FBS} + 4.7406\ \textbf{Body weight}$$

V. CONCLUSION

The objective of the undertaken study is to examine the awareness program and the number of referring times of Facebook impact significantly controlling fasting blood sugar levels, body weight, and LDL cholesterol levels. This research study is exclusive due to its outcomes conclude the use of Facebook awareness program for controlling LDL cholesterol, fasting blood sugar, and Bodyweight have an affirmative impact on higher life expectance for diabetes patients. The foremost benefit of this health awareness program is continuous education about diabetes mellitus, maintaining a healthy life, and expecting a long life of patients and their relatives who care for them. This research study is exceptional because it enables patients to calculate their LDL, FBS, and Bodyweight based on the number of referring times of the Facebook awareness program using the proposed equation. Hence, this research study has significant practical implications for motivating diabetes patients to keep up their life well-being. Future work is required to find the reasons why this awareness program was unable to impact for controlling Blood Pressure of the patients.

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