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Effectiveness of structured teaching program on improvement of diabetic patient's health information, treatment adherence and glycemic control

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Abstract: Background: Diabetes is a serious chronic disease. Uncontrolled diabetes and poor diabetic patients' knowledge can lead to a high morbidity and mortality. **The aim** of this study was to assess the effectiveness of structured teaching program on improvement of diabetic patient's health information, treatment adherence and glycemic control. ***Method:*** A quasi-experimental research design (pre posttest) was utilized on 72 diabetic patients at Minia University and general hospitals. **A** Structured Interview questionnaire about diabetic knowledge and treatment adherence. Glucose monitoring parameter (Glycated Hemoglobin & Random Blood Sugar**),**was monitored. ***Results:*** There was a highly a significant improvement in diabetic patients knowledge, treatment adherence and glycemic control post 1st and 2nd follow than pre application of teaching program. **Conclusion:** The diabetic teaching program would improve patient's knowledge about disease, treatment adherence and glycemic control. **Recommendations:** Nurses should emphasis to provide an teaching program tailored to each diabetic patient and increase their awareness about the importance of diabetic education to improve glycemic control.

Key Words: Teaching program, diabetes, health information, treatment adherence, glycemic control

INTRODUCTION

Diabetes may be a major reason behind morbidity and associated mortality, type 2 diabetes mellitus (T2DM) is the most common type of diabetes and characterized by insulin resistance, which may be combined with relatively reduced insulin secretion, the defective responsiveness of body tissues to insulin is believed to involve the insulin receptor. Preventing T2DM is feasible through understanding its determinants, especially obesity, poor nutrition, sedentary lifestyle and physical inactivity **(Alkhatib, & Tuomilehto, 2019)**. Within the early stage of T2DM, the predominant abnormality is reduced insulin sensitivity. At this stage, high blood glucose may be reversed by a variety of measures and medications that improve insulin sensitivity or reduce the liver's glucose production **(Holt et al., 2017).**

In Egypt, the Demographic and Heath Survey (DHS) 2015 estimated that around 4 in 10 of the individuals who had diabetes were eating a healthy diet, 13 percent of female and 15 percent of male were trying to lose weight or control their weight, and 2 percent of women and 7 percent of men were exercising. Only 2 percent of individuals who were diabetic (mainly men) said that they had stopped smoking in response to their condition **(Demographic and Health Survey (DHS), 2015).**

Type 2 diabetes is primarily due to lifestyle factors and genetics. variety of lifestyle factors are known to be important to the development of type 2 DM, including obesity, lack of physical activity, poor diet, stress, and urbanization. Dietary factors also influence the chance of developing type 2 DM. Consumption of sugar-sweetened drinks in excess is related to an increased risk. The kind of fats in the diet is additionally important; lack of physical activity is believed to cause 7% of cases **(Zimmet et al., 2016).**

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obesity, lack of physical activity, poor diet, stress, and urbanization. Dietary factors also influence the chance of developing type 2 DM. Consumption of sugar-sweetened drinks in excess is related to an increased risk. The kind of fats in the diet is additionally important; lack of physical activity is believed to cause 7% of cases **(Zimmet et al., 2016).**

Nurses play a significant role in healthcare in decision-making and fostering positive change in the facility to educate patients adequately **(Bradshaw, 2010)**. Nurses have important educating roles and responsibilities to improve knowledge of diabetic patients **(Aalaa et al., 2012).** The main aim of diabetic education is to change behavior and promote self-management of the condition **(Formosa et al., 2012).** Educated patients can positively affect the outcome of the disease, Indeed, through education patients can , optimize metabolic control including self-monitoring of blood or urine glucose, dietary practices, medicine administration, relieve the symptoms of the disease or handle with emergencies and disease-related exacerbations, prevent and manage complications such as micro-and macro-vascular complications, adopt of a more positive attitude to the disease, and support the clinician-patient relationship and plan of care including follow-up **(Demographic , 2015, and Seung, 2012)**.

Diabetes education has an impact on diabetes treatment. Benefits of diabetes education are mainly observed in terms of patient self-care and metabolic control of diabetes. However, studies that would clearly demonstrate the impact of education on pharmaceutical adherence, satisfaction with treatment, and quality of life in type 2 diabetes patients are still lacking **(Świątoniowska et al., 2019)**. Thus this study started to ascertain the effectiveness of structured teaching program on improvement of diabetic patients, health information, treatment adherence and glycemic control

Significance of the Study:

Egypt is the nation with the ninth biggest population of diabetics in the world. According to IDF, there have been 8.2 million diabetic patients in Egypt in 2017, it is expected that this number will bounce up to 13.1 million by 2035. Among all diabetic cases, 90% are T2DM mellitus **(Omar et al., 2018).**

In Egypt, the Demographic and Health Survey (DHS) 2015 estimated that around 4 in 10 of the individuals who had diabetes were eating a healthy diet, 13 percent of women and 15 percent of men were trying to lose weight or control their weight, and 2 percent of women and 7 percent of men were exercising. Only 2 percent of individuals who were diabetic (mainly men) said that they had stopped smoking in response to their condition **(DHS, 2015).** Diabetics need to have adequate knowledge, skills and positive attitudes to successfully manage diabetes every day **(Parsons, etal., 2017& Escalada, et al., 2016).**

According to statistical office and hospital records in Minia University Hospital and general hospital during the period of 2016:2017 that the admission office have most patients with DM complications with high incidence such as (diabetic coma were 150 patient, neurovascular problems were 250 patient.…..etc.) that result in prolonged hospital length of staying, So for these reasons mentioned above this study was applied to measure effectiveness of structured teaching program on improvement of diabetic health information, (nutrition, exercise, medication adjustment……etc aims to improve their knowledge about diabetic disease, their adherence with treatment and their glycemic control.

Aim of the Study:

The aim of this study was to:
Assess the effectiveness of structured teaching program on improvement of diabetic health information, treatment adherence and glycemic control.

Research Hypothesis:

To fulfill the aim of the study, the following hypotheses were formulated:

H1: Diabetic patient's health information, treatment adherence will be better post exposure to structured teaching program than pre.
H2: Diabetic patients' glycemic level will be controlled post exposure to teaching program than pre.

Study variables:

The independent variable in this study was structured teaching program while the dependent variables were: patient's knowledge about disease, adherence with treatment and glycemic control.

Method:

Study Design:

Quasi experimental research design (pre posttest) was utilized to fulfill the purpose of this study.

Setting:

This study was carried out at outpatient clinic at Minia University and General Hospitals

Subjects:

A purposive sample of 72 adult type II diabetic patients ,male and female patient, patients age of (18 - 65) years, duration of diabetic disease more than one year, with no cerebrovascular acident.

Sample size:

Sample size is calculated by using the **Isaac, Bell, & Micheal (1982)** formula which is computed as (N= n x 30 / 100(N = sample size
n = Total number of diabetic patients admitted at Minia University Hospital during the period 2016:2017.
N = 240 x 30 / 100 = **72** patient total study sample. During period from April 2018 to January 2019.

Study tool:

A Structured Interview questionnaire about diabetic knowledge and treatment adherence. As well as glucose monitoring parameter cover the following parts:

Part 1: Patient socio-demographic characteristics: it includes items related to demographic characteristics of patient such as (age, sex, occupation, level of education,).
Part 2: **Patient medical data**: it includes details of the diabetes disease such as(duration of DM, treatment type, frequency of follow-up, had previous hospitalization for

DM, smoker, previous education related to diabetic disease management, and source of knowledge about diabetic disease management).

Part 3:*Diabetes Knowledge interview questionnaire* .It developed by the researcher based on extensive review of literature [**Prianka, M., et al., (2010), Lemes dos Santos, et al., (2014), Fitzgerald, et al., (2015), Maretha R., et al., (2018)**]

Scoring system: The Total score 33 grad, score of one was given for correct answer and score of zero for incorrect answer, and categorized as the following:

Good knowledge: was considered if scoring more or equal than ≥ 75% of total score (25:33 correct answer).

Fair knowledge: was considered if scoring from 60% to less than < 75% of total
score (20 : < 25 correct answer).

Poor knowledge: was considered if scoring less than < 60% of total score(< 20 correct answer).

Part 4: ***Assessment Scale for Treatment Adherence in Diabetes Mellitus*****"** which adopted and developed by **Demirtaş and Akbayrak, (2017**).This scale with 5 item Likert type, the participants reflect the degree of their attitude related to the statement content. The scale consists of these grades in the form of 1= certainly agree, 2 = agree, 3 = partially agree, 4 = disagree and 5 = certainly disagree, score of 5 was accepted as indication of an unfavorable attitude and 1 as a favorable attitude. The scale includes13 items containing positive attitudes and 17 items containing negative expressions:

Items including positive expressions: item No.(1,3,5,8,13,15,16,17,19, 23,25, 26, 29). Items including negative expressions: item No.(2, 4, 6, 7, 9, 10, 11, 12, 14, 18, 20, 21, 22, 24, 27, 28, and 30).

Scoring system:

Good adherence*:* was considered if scoring = **(13)** grade in positive expressions items, and if scoring = **(85)** grade in negative expressions items.

Moderate adherence*:* was considered if scoring **= (14:64)** grade in positive expressions items, and if scoring = **(18-84)** grade in negative expressions items.

No Adherence*:* was considered if scoring = **(65)** grade in positive expressions items, and if scoring = **(17)** grade in negative expressions items.

Part 5: ***"Glycated hemoglobin test (HbA1c) and random blood sugar (RBS) levels:***

- (**HA1c**) with the reference level **≤ 7%** over the past 3 months (**American DiabetesAssociation, 2018**), with scoring system as the following:

Optimal level: was considered if HbA1c≤7%
Fair level: was considered if HbA1c > 7–8%
Poor level: was considered if HbA1c >8%

(**RBS**) with the reference level <140 **(American Diabetes Association, 2018)**, with scoring system as the following:

Optimal level: was considered if RBS <140 mg/dl
Fair level: was considered if RBS = 140-180 mg/dl
Poor level: was considered if RBS > 180mg/dl

Educational program about Diabetes "Booklet": The researcher was implementing the educational **program** about Diabetes "Booklet": that was formulated by researcher after extensive literature review (**Evert et al.,2013;Powers et al.,2013; Thom et al.,2013; Raebel et al.,2014; Funnell et al.,2015; Phillips et al., 2015; and American Diabetes Association2017)** and revised by experts. This Booklet contain knowledge about diabetes(definition, sign and symptoms, causes, complication, how to prevent complication, medication, nutrition, exercise, and glycemic control). The researchers used simple language to suit the level of patients, with motivation and reinforcement to enhance learning. A copy of the handout booklet that was written in Arabic language offered for each study participant to use it as future reference. It was developed and supported with photos and illustrations to help patients and families to understanding the content of the booklet.

The content and validity were done to identify the degree to which the used tools measure what was supported to measured. The developed tools was tested by Jury committee consist of five academic experts in field of thesis (staff of medical and surgical nursing at faculty of nursing in Minia and Assiut university). Each of the experts is an active participant in their particular environment and together they offered a complete assessment of the content and face validity of the instruments. All jury members (100%) agreed that current study tools were valid and relevant with the aim of the study.

Pilot study: After having the ethical approval and permission to access the hospital, a pilot study was conducted on 10% of participants whom included in the study to test the clarity of tools and estimate the time required for fulfilling it. Based on result of the pilot study no modification or refinements were done and the participants included to the actual sample.

Tool Reliability*:* were designed in final format and tested for reliability by using, cronbach's alpha coefficient test (0.96, 0.71 and 0.68) respectively.

Ethical Consideration:

An official permission to conduct the study was obtained from the ethical committee in the Minia Faculty of Nursing, Dean of nursing faculty and the Manager of Minia University Hospitals, Minia General Hospital and agreement from Egypt academic for research center and technology at Minia University to carry out this study. Oral permission was obtained by the researchers from the patients and anonymity and confidentiality was applied by coding of all data and protecting the obtained data. Subjects were informed that obtained data will not be included at any further researches without a second oral consent. Each involved subject was informed about the purpose, procedure, benefits and nature of the study and that he /she had the right to withdraw from the study at any time without any rational, then oral consent were obtained.

The researcher prepared the teaching places, teaching aids and media (computer, picture, handouts). Teaching program was conducted through discussion, Knowledge was provided in 2 sessions, the duration of each session ranged from 30:45 minutes or according to the level of understanding of every patient. The first session started by theoretical part about knowledge related to meaning of DM, types, sign and symptom, causes, and complications. The second session concerning with the practical part about how to prevent complication, medication, nutrition, exercise, and

glycemic control. One patient's family member attended the sessions to help him/her follow the health teaching program at home in addition every patient was given an illustrated booklet.

In which the researcher was follow up for studied participants two times 1st follow up (post 1st 3 months) and 2nd follow up (post 6 months) from the implementation of teaching program using part 3,4 and 5 of tool to evaluate the impact of nursing teaching program for diabetic patients on their knowledge about disease, adherence with treatment and glycemic control.

Statistical design:

Data were summarized, tabulated, and presented using descriptive statistics. Statistical package for the social science (SPSS), version (20) was used for statistical analysis of the data, quantitative data were expressed in the form of means and standard deviations as a measure of dispersion while qualitative data presented as frequency distribution. Chi square and fisher exact were used to compare qualitative data and One way ANOVA test and independent sample t test used for quantitative data. Correlation between variables was assessed Fisher's Exact test is a way to test the association between two categorical variables.

Table (1): Socio-demographic characteristics of the studied Participant:-

Characteristics	**Study group N=72 N.**	**%**
Age		
18 - < 30 yrs	7	9.7
30 - < 50 yrs	26	36.1
50 - 60 yrs	39	**54.2**
Mean ± SD	51.9 ± 10.14	
Sex		
Female	52	**72.2**
Male	20	27.8
Education		
Illiterate	27	**37.5**
Read and write	13	18.1
Primary and secondary	25	34.7
University	7	9.7
Occupation		
Work	23	31.9
Not work	49	**68.1**
Family income according to subject expression:		
Enough	31	43.1
Not enough	41	**56.9**

Table 1: Show that out of 72 of total study participants were their age around 50 years the majority of them were females .Regarding to educational level about more than third (37.5%) were primary.

Table 2: Medical Data of studied participant

Data	**Study Participants N=72 N.**	**%**
Duration of DM		
1-<5 years	34	47.2
5-10 years	38	**52.8**
Treatment of DM		
Oral	50	69.4
Insulin	8	11.1
Both	14	19.4
Follow up		
Monthly	36	50
More than one month	32	44.4
Weekly	4	5.6
Previous hospitalization		
Yes	8	11.1
No	64	**88.9**
Previous training		
No	58	**80.6**
Yes	14	19.4

Source of information		
Family or friends	22	30.6
Hospital health team	28	**38.9**
Mass media	22	30.6
Smoking		
No	64	**88.9**
Yes	8	11.1

Table 2: Shows that more than half of the studied participants have duration of disease 5-10 years, with oral diabetic treatment, frequent follow up monthly, and no previous hospitalization. Majority of participants had previous training about diabetic management. Regarding to source of health information was from hospital health. Most of study participants were not smoking.

Table (3): level of diabetic health information among studied participant no.72:

Items	**Participant evaluation**			**Fisher exact**	**P-Value**
	Pre-educational program	**post-educational program**			
		1st follow up	**2nd follow up**		
	N. (%)	**N. (%)**	**N. (%)**		
Poor	72(100%)	3(4.2%)	2(2.8%)	0. 0 97.1 102.8	0.0 **0.001*** **0.001***
Fair	0	8(11.1%)	3(4.2%)		
Good	0	61**(84.7%)**	67**(93.1%)**		

* Statistical significant difference (P < 0.05)** Highly statistical significant difference (P < 0.001)

Table 3: Shows that all have poor diabetic knowledge (100%) pre application of educational program. On other hand studied participants had good diabetic knowledge in 1st and 2nd follow up (84.7%, 93.1%) respectively after application of educational program with statistical significant .

Table (4): Treatment adherence among studied patients:

Treatment adherence among expression among studied participate		**Participant evaluation**			χ^2	**P-Value**
		Pre-educational program	**post-educational program**			
			1st follow up	**2nd follow up**		
		N. (%)	**N. (%)**	**N. (%)**		
Positive expression	**Good**	0	29(40.3%)	39(54.2%)	19.9 32.7 0.0	0.0 **0.001*** **0.001***
	Moderate	72(100%)	43(59.7%)	33(45.8%)		
	No	0	0	0		
Negative expression	**Good**	0	0	0	0.0 1.007 1.007	0.0 0.3 0.3
	Moderate	71(98.6%)	72(100%)	72(100%)		
	No	1(1.4%)	0	0		

χ^2Chi-square test ** highly Statistical significant difference (P < 0.001)

Table 4 Shows that all participants (100%) had moderate adherence to diabetic treatment pre application of educational program while in the 1st and 2nd follow up after application of educational protocol (40.3%and 54.2%) respectively became good adherence. Also there is a highly statistically significant difference between pre and post teaching program.

Table (5): HA1c level among studied participants pre & post teaching program:

HA1c Level	Participant evaluation			Fisher exact	P
	Pre-teaching program	post-teaching program			
		1st follow up	2nd follow up		
	N. (%)	N. (%)	N. (%)		
Optimal level	0	10(13.9%)	58(80.6%)	1.4 23.7 77.3	0.4 **0.001*** **0.001***
Fair level	12(16.7%)	43(59.7%)	12(16.7%)		
Poor level	60(83.3%)	19(26.4%)	2(2.8%)		

F on-way-ANOVA test ** highly Statistical significant difference (P < 0.001)

Table 5: It's clear from the above table that there was an increased in patient's control of HA1c after application of teaching program (in the 1st and 2nd follow up) than pre application of teaching of program, there was about 83.3% of study participants with poor HA1c level and 59.7% post 1st follow up became fair level and 80.6% became optimal level post 2nd follow up.

Table (6): RBS level among studied participants pre & post teaching program RBS:

RBS	Participant evaluation			Fisher exact	P-Value
	Pre-teaching program	post-teaching program			
		1st follow up	2nd follow up		
	N. (%)	N. (%)	N. (%)		
Optimal level	3(4.2%)	24(33.3%)	61(84.7%)	9.1 21.9 70.2	0.01* 0.001* 0.001*
Fair level	8(11.1%)	19(26.4%)	9(12.5%)		
Poor level	61(84.7%)	29(40.3%)	2(2.8%)		

F on-way-ANOVA test ** highly Statistical significant difference (P < 0.001)

Table (7): Correlation between diabetic knowledge, treatment adherence and glucose monitoring parameter pre-post application of teaching program (n=72):

Items		Knowledge score		
		Pre-teaching program	post-teaching program	
			1st follow up	2nd follow up
		N. (%)	N. (%)	N. (%)
Adherence to diabetic treatment	r	0.21	0.50	0.41
	p	0.06	0.006*	0.009*
HA1C	r	0.26	0.51	0.35
	p	0.008*	0.003*	0.002*
RBS	r	0.25	0.50	0.50
	p	0.007*	0.006*	0.001*

DISCUSSION

Diabetic patients need to have adequate knowledge, skills and positive attitudes to successfully manage diabetes every day **(Parsons, et al., 2017)**. Treatment adherence among patients with type 2 diabetes mellitus (T2DM) is strongly influenced by the level of knowledge of the patient, his misconceptions, beliefs and inaccurate assumptions on the matter **(Campbell, 2012)**. Adherence to treatment of diabetes mellitus is to improveglycemic control and therefore decrease morbidity and death associated to uncontrolled diabetes and reduce the effective cost of the disease **(Albuquerque, etal., 2015).**

Health education is a process that bridges the gap between health information and health practice. In this respect the current study was aimed to assess the impact of nursing teaching program for diabetic patients on their knowledge about disease, adherence with treatment and glycemic control. The findings were discussed for significant improvements in all previous these three aspects and to assure the study hypotheses regarding the impact of the nursing teaching program.

The present study showed that there were an improvement in diabetic knowledge in 1st and 2nd follow up after application of teaching program than pre application this assure a positive impact of teaching program that applied for diabetic patients in this study.

This result confirmed by **Arafa et al., (2019)** who found in their study that T2DM patients' knowledge in South Egypt was insufficient. However, hospital-based awareness program led to a remarkable improvement in patients' knowledge, also agree with **Chawla et al., (2019)** who cited in their study that there was a significant increase in mean knowledge score of cases compared to controls at the final follow-up (P = 0.004).

Moreover in the same line with **Akhter, et al., (2017**) they noted that after the educational intervention, the patients answered more questions correctly, in particular with regard to knowledge on eating sweets, drinking, normal sugar levels, and impact of being overweight on insulin and HbA1c activity, overall, 60% of patients improved their knowledge after the educational intervention.

As well this finding was in agreement with **Taha et al., (2016)**, who reported that patients' knowledge about DM was generally low at the pre-guidelines phase, and the posttest showed significant improvements in all aspects of patients' knowledge about DM, reaching 100.0% satisfactory knowledge in almost all aspects. **Finally** supported with **(Selea et al., 2011),** who cited that patients with type 2 diabetes who received printed educational materials showed improvement in terms of knowledge on the disease and metabolic control of diabetes**.**

Concerning to treatment adherence the study participants was had good treatment adherence in the first and second follow up after application of teaching program than pre, this improvement was due to the participants attending current studied educational session and acquiring sufficient knowledge about diabetes sign &symptoms, complication, medication, nutrition and exercise, that all encourage them to be more compliance to medication, taking diabetic diet as prescribed and performing suitable exercise with using our educational booklet and this reflect of educational program on patients adherence to treatment.

Our findings were in the same line with **Awodele & Osuolale, (2015**), who mentioned in their study that the overall improvement in adherence rate of 86.8% was observed after educational interventions. This findings were disagree with study by **Sontakke, et al., (2015)**, who observed that, 74% of diabetic patients had low adherence to treatment, 26% had medium adherence whereas none of the patients showed high adherence. Also in contrast with **(Sankar, et al., 2013)** who found in their study that nearly three fourths of patients had poor adherence to the medication with a mean score of 3.57 ± 1.67.

As regard HbA1c, results showed that there was an achieved to optimal level of glycemic control of HbA1c (≤ 7%) among majority of study participant after application of teaching programin (1st and 2nd follow up) than pre application. These improvement of HbA1c level as a result of participant' understanding the importance of medication, diet, and physical exercise compliance. These finding was congruent with **AL-Shahrani, et al., (2018),** who demonstrates that the values of HbA1c were significantly decreased after the successful completion of the health education program. Also our result in the same line with **Figueira AL.G, et al., (2017),** who showed a mean reduction by 0.36% in the glycated haemoglobin levels after educational intervention. Finally agree with **Liu, et al., (2014)**, who observed in his study a significant reduction in HbA1C level referred to dietary education program.

Our study revealed that study participants was reached to optimal level of RBS (<140 mg/dl) after application of teaching program than pre. These results were indicated increasing DM knowledge regarding treatment adherence was affect on study participant's positive attitude then improving levels of RBS reduction. Close to this result a study by **Abdo, N.M., & Mohamed, M., (2010)** who found that a statistically significant improvement in the subjects mean levels of RBS after application of educational message. **In contrast, Selea et al., (2011)** who concluded that up to 15% reduction in RBS level for T2DM was achieved after six months of printed material diabetic education.

In the present study, it has been noticed that there was a positive fair correlation between diabetic knowledge of the study participant and HA1c and RBS pre application of teaching program, and a positive moderate correlation between diabetic knowledge and adherence to treatment, HA1C and RBS, in 1st and 2nd follow-up after application of teaching program. These reflect a high compliance of study group to educational booklet. This is consistent with (**Brazilian Society of Diabetes, 2016)** which stated that the WHO presents education to chronic patients asan option to promote compliance, through motivation and personal training to use cognitive and behavioural strategies that facilitate adherence behaviors.

With this regard our finding matched with similar study by **Figueira, ALG.,(2017)** who mentioned that the tutorial interventions seem to possess positively contributed to the participants' knowledge about DM, the medication treatment adherence and therefore the glycated hemoglobin rates. Also agree with **(Kassahun*etal.*, 2016)**who found a correlation between poor glycemic control, low diabetic knowledge and level of medication adherence. Finally these results disagree with the study by **(Nazir et al., 2016)** who reported that there was negative association reported between HbA1c, treatment adherence and diabetes-related knowledge among T2DM patients in Pakistan.

These result agrees with (**Karaoui, et al., 2018**) who mentioned that the patient's level of education being significantly related to the diabetes knowledge score. Also previous results agree with **(Ntaate, 2015)** who reported that level of education were shown to significantly affect the patients' knowledge positively. Finally within the same line with **Abdo, & Mohamed, (2010)** who found in their study a significant positive relationship between the level of patient knowledge and the educational level.

CONCLUSION

Diabetic knowledge of the study group markedly improved after application of educational program than pre .Also, improvement in treatment adherence, and control of (HA1c & RBS) after application of educational program than pre education .

Finally, the present study has demonstrated a positive fair correlation between diabetic knowledge score and HA1c and RBS pre application of educational protocol, and a positive moderate correlation between diabetic knowledge score and adherence to treatment, HA1C and RBS, in 1st and 2nd follow-up after application of educational program.

RECOMMENDATIONS

Increase patient awareness about the importance of diabetic education to improve glycemic control to prevent developing complications .Nurses should emphasis to provide an educational program tailored to each diabetic patient. Organizing education sessions in diabetic health centers, and making an annual plan for each patient for his/her education.

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