

Effectiveness of a nursing intervention protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus

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Abstract: Diabetic patients often have inadequate knowledge about nature, risk factors and associated complications of diabetes and this negatively affect their attitudes and practices towards its care. **Aim:** examine the effectiveness of a nursing intervention protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin toward type 2 diabetes mellitus. **Subjects and Methods:** A convenient sample of 100 patients. This study was carried out in the diabetic out-patient clinics at Port Said general hospitals affiliated to the ministry of health, Egypt. **Tools:** four tools were utilized for data collection. **Tool I:** Interviewing questionnaire. **Tool II:** Morisky Medication Adherence Scale. **Tool III:** Health Belief Model Scale. **Tool IV:** glycosylated hemoglobin sheet. **Results:** most of the studied patients were female, less than half of them were at age group 40 to less than 50 years old, three fifths of them were unemployed, and one third of them were smokers. Highly statistically significant difference between pre and post intervention in all items of knowledge and in the total score after implementing the interventional nursing protocol, and negative correlation with statistical and highly statistical significant differences between the patients' total adherence score levels and their total glycosylated hemoglobin score in the pre-test and post-test. **Conclusion:** the interventional nursing protocol is an effective tool that implicated a significant change in type 2 diabetes mellitus patients' knowledge, medication adherence, health beliefs and glycosylated hemoglobin post implementing the protocol than pre protocol. **Recommendation:** continuous educational programs for diabetic patients for improving awareness.

Keywords: Glycosylated Hemoglobin, Health Beliefs, Medications Adherence, Nursing Intervention Protocol, Type 2 Diabetes Mellitus.

1. INTRODUCTION

Diabetes mellitus type 2 is a type of diabetes mellitus formerly referred to as non-insulin-dependent or adult-onset diabetes. It is caused by the body's ineffective use of insulin (WHO, 2014). The number of persons affected is expected to rise, reaching 552 million people worldwide with a comparable rise in complications and healthcare costs. Indeed, the worldwide prevalence of T2D is expected to increase from 382 million individuals (2013) to 417 million individuals by 2035 (International Diabetes Federation, 2015b). The Diabetic population in Egypt was estimated to be 7.5 million in 2013 and is projected to reach 13.1 million by the year 2035 (International Diabetes Federation, 2013). According to the Centre for Disease Control (CDC, 2014), 95 % of diabetic patients have type 2 diabetes mellitus.

Patient education, therefore, is considered as an essential tool to control DM. Effective DM education, with consequent improvements in knowledge, attitudes and skills, leads to better control of the disease, and is widely accepted to be an integral part of comprehensive DM care and management. On the other hand, lack of knowledge and awareness may lead to increased susceptibility to the development of diabetic complications, and potentially higher healthcare costs among patients with DM. Previous studies reported low level of knowledge on diabetes among the general population and especially among the newly diagnosed type 2 diabetes (T2D) patients (Saleh,et al ,2012 and Islam, et al, 2014)

Adherence is defined by the World Health Organization (WHO) as “the extent to which a person's behavior—taking medication, following diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider (WHO, 2003). Adherence to diabetes medications is an important factor in achieving good diabetes control and preventing mortality and morbidity (DiMatteo, 2014). There are various methods to assess medication adherence, of which, the Morisky Medication Adherence Scale (MMAS-8) is a widely used self-administered validated tool (Morisky,et al, 2008).

The health belief model (HBM) is by far most commonly used theory in health education and health promotion. The underlying concept of the HBM is that health behavior is determined by personal beliefs or perceptions about a disease and the available strategies to decrease its occurrence. Personal perception is influenced by the whole range of intrapersonal factors affecting health behavior, including: knowledge, attitudes, beliefs, experiences, skills, culture, and religion. HBM specifically suggests that people show good reactivity toward health when they feel they are in risk (Perceived Susceptibility), the risk is very serious (Perceived Severity) and change of behavior is beneficial for them (Perceived Benefits) and they can eliminate the barriers to health behavior (Perceived Barriers) (Hayden, 2014)

Glycosylated hemoglobin (HbA1c) is a useful index for measuring glycemic control (Noureddine,et al, 2014) which reflects the status of glycemic control over the previous three months. Glycemic status is categorized as good glycemic control if $HbA1c \leq 7\%$ and poor glycemic control if $HbA1c > 7\%$ (American Diabetes Association, 2015b). Glycemic control remains the major therapeutic objective for prevention of target organ damage and other complications arising from DM (Khattab,et al, 2010). For better glycemic control, American Diabetes Association recommends performing the HbA1c test at least twice a year in patients who have stable glycemic control and quarterly in patients whose therapy has changed or who are not meeting glycemic goals (American Diabetes Association, 2016a).

Management of diabetes greatly depends on the ability of the affected person to carry out self-care in his daily lives, and patient education is the corner stone to achieve this objective. Diabetes education and on-going diabetes support are considered an integral part of comprehensive diabetes care to achieve better control of diabetes (Bayat,et al, 2013 and Dube,et al, 2015)

2. SIGNIFICANCE OF THE STUDY

Diabetes is a chronic disease associated with high morbidity and mortality rate and is considered a major clinical and public health problem accounting for 5.1 million deaths worldwide Diabetic patients often have inadequate knowledge about the nature, risk factors and associated complications of diabetes and this negatively affect their attitudes and practices towards its care. Also, patient self-management education has an important role in preventing acute complications and reducing the risk of long-term complications (Dube,et al, 2015). In this study, we made an attempt to examine the effect of a nursing intervention protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus.

Aim of the Study: This study aimed to examine the effectiveness of a nursing intervention protocol concerning patients' knowledge medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus through:

- 1- Assess patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus pre-post interventional protocol
- 1- Develop the interventional nursing protocol concerning patients' knowledge , medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus
- 2- Implement the interventional nursing protocol immediately after pre-test assessment

3- Evaluate the effect of an interventional nursing protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus 3 month post interventional nursing protocol

Research Hypothesis:

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

H1. Patients who will be exposed to a nursing intervention protocol will have a higher post total mean knowledge scores.

H2. Patients who will be exposed to a nursing intervention protocol will have a high level score of medication adherence, health beliefs and very excellent level of glycemic control.

Research Design:

The quasi-experimental research design (one group pre post test) was utilized in the current study.

Setting:

This study was carried out in the diabetic out-patient clinics at Port Said general hospitals affiliated to the ministry of health as followed:

- 1- Port Said general hospital
- 2- Port Fouad general hospital
- 3- Alzohor general hospital

Subjects:

A convenient sample of 100 patients who met the inclusion criteria and came to the above mentioned settings in the period from the beginning of July 2018 to the end of December 2018.

Inclusion Criteria:

- Patients diagnosed with T2DM at least one year before.
- Patients over 18 years of age of both sexes.
- Patients who had complete medical records.
- Patients who were on prescribed DM medications for more than three months (to ensure familiarization with DM and the prescribed anti-hyperglycemic medications).
- Patients who were not taking any insulin injection therapy.

Exclusion criteria:

- Patients who are mentally incompetent.
- Patients who have verbal problems or have difficulty to respond to the instruments of the study (blind, hearing problem, senility).
- Morbid patients unable to communicate with the researcher

Tools of Data Collection- Data were collected by using four tools:

Tool I: Structured interview questionnaire:

It was developed by the researcher based on reviewing related literature. The tool was translated into Arabic language; it consisted of two main parts to assess the following:

Part I: Socio-demographic characteristics of the studied patients:

It included Personal data (name, age, sex, and marital status), socioeconomic data (occupation and education), smoking status and family history of diabetes .

Part II: Patients' Knowledge Assessment Questionnaire:

It was developed by the researcher based on reviewing related literature (Brown et al, 2015, Cameron et al, 2015, Carrier, 2016 & DeWit et al, 2016) to assess patients' knowledge regarding T2DM. It included (40) questions (one close ended and 39 multiple choice questions) about; definition, risk factors, acute and chronic complications, causes of diabetic coma and other questions related to T2DM.

Scoring system of patients' knowledge:

The answers of the patients were evaluated by using model key answers prepared by the researcher. Each correct answer was scored (1) and incorrect answer scored (zero). The total score for all questions related to knowledge was calculated according to the number of correct answers which was equal to (132) marks that represented (100%). patients' knowledge was categorized into two levels as following:

- **Satisfactory:** when the score was $\geq 60\%$ of the total score.
- **Unsatisfactory:** when the score was $< 60\%$ of the total score.

Tool II: Morisky Medication Adherence Scale (MMAS-8):

It was developed by Morisky et al. (2008) to assess medications adherence among type 2 diabetic patients. This scale was consisted of (eight) items that addressed specific medication taking behavior and adherence. The first 7 items had the response (yes) or (no), while the 8th item had 5- points Likert response.

Scoring system:

Each response of (Yes) was scored (zero) and response of (No) was scored (1) except item 5, in which the score was reversed (response of yes was scored as (1) and response of (no) was scored as (zero). For the 8th item, each response of (never /rarely) was scored as (1); each response of (once in a while) was scored as (0.75); each response of (sometimes) was scored as (0.5); each response of (usually) was scored as (0.25); and each response of (all the time) was scored as (0). The total score for patients' adherence to medication was categorized as the following:

- 8 = high adherence
- 6 < 8 = medium adherence
- < 6 = low adherence

Tool III: Health Belief Model (HBM) Scale:

It was developed by Given et al. (1983), on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, whereas the perceived susceptibility with (4 questions), perceived severity with (10 questions), perceived benefits with (6 questions), perceived barriers with (10 questions) to measure the beliefs of diabetic patients about their diabetes. The items were measured on a 5-point scale, ranging from strongly disagree to strongly agree

HbA1c%	Degree of Control
• ≤ 6	very excellent
• 7	excellent
• 8	good
• 9	fair
• 10	poor
• 11	very poor
• ≥ 12	extremely poor

Tool IV: glycosylated hemoglobin (HbA1c) sheet:

It was considered a biological marker of adherence that reflected the average of a person's blood glucose levels over the past 2-3 months. The HbA1c results and its relation to diabetes control were categorized by *Americans Diabetes Association* (2015) as follow

Association (2015) as follow

3. METHOD

• **Administrative and ethical consideration:** An official permission to conduct the study was obtained from the ethical committee of the faculty of nursing, dean of faculty of nursing, general hospitals director. Oral consents were obtained from patients who were informed about the purpose, procedure, benefits, nature of the study, follow-up and patients had the right to withdraw from the study at any time without any rationale. Confidentiality and anonymity of each patient were ensured through coding of all data and protecting the obtained data.

• **Tools development:** the first tool was developed by the researcher after extensive review of the relevant literature, while the second tool was developed by **Morisky et al. (2008)**, the third tool was developed by **Given et al. (1983)**, and the fourth tool were categorized by **Americans Diabetes Association (2015)**. All tools 1, 2, 3 were tested for content validity by five experts in medical surgical nursing field. According to their comments, modifications were considered and done to ascertain relevance and completeness

• **Reliability of tools**

Cronbach's alpha reliability test- retest for patients' knowledge assessment questionnaire, Morisky Medication Adherence Scale (MMAS-8), and Health Belief Model (HBM) Scale were (0.79, 0.80 and 0.82)

• **Pilot Study**

A pilot study was carried out on 10% of patients to test the applicability of the study and to test clarity of the designed questionnaires, as well as to estimate the time needed for each tool. The modifications were done for the used tools then the final form was developed. Patients of the pilot study were excluded from the study's subjects.

• **Field work**

Included two phases: implementation phase and evaluation phase.

Implementation phase

• This phase started by selecting patients who met the inclusion criteria and explaining the nature of the study as well as taking their approval to participate in the study prior to data collection.

• The patients' telephone numbers were obtained at the first time for contacting them at the evaluation phase in order to complete data collection process.

• Patients' sociodemographic data and patients' knowledge assessment questionnaire tools (tool I; part one and two) were filled in by the researcher; it had taken about 30-45 minutes to be filled in according to the health condition of every patient.

• Morisky Medication Adherence Scale (tool II) was filled in by the researcher and had taken 20 minutes for every patient.

• Health Belief Model (HBM) Scale (tool III) was filled in by the researcher. It had taken 30 minutes for every patient.

• glycosylated hemoglobin (HbA1c) sheet (tool IV) , this test results was obtained from the medial records for each patients pre test assessment and was tested again three month after the protocol application.

• The researcher developed a booklet in an Arabic language involved items concerning anatomy and pathophysiology of the DM, glycemic control of the DM, complications particularly hypoglycemic coma, its symptoms and its management, effect of diabetes on eye and foot, importance of adherence to treatment, diet plan, physical exercise and importance of regular follow up. Also prevention of diabetes and its complications particularly diabetic foot and hypoglycemic coma were included in the message. Different educational methods were used including writing boards, photographs, videos and printed handouts. All the educational materials were available in Arabic language .

• Teaching sessions were conducted for every patient individually. The booklet was handed for every patient and the contents of the booklet were explained over -5 sessions according to patients' condition with 45 minute for every session. The first teaching session included: the nature of the disease. The second one was about glycemic control and the third about adherent to therapeutic medication. The fourth teaching sessions regarding health believes model. Patients were allowed to ask questions in case of misunderstanding while listening and expressing interest for them.

- At the end of these sessions, the researcher emphasized the importance of follow up visits and informed them that they will be evaluated during this follow up visits after three months post sessions.
- Data collection and teaching sessions were conducted in morning shifts starting at July 2018 to the end of December 2018.

Evaluation phase:

Post implementation of the protocol, tool I part 2, tool II, III and tool IV were refilled in again. Evaluation of the effectiveness of a nursing intervention protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus was done by comparing the results pre and post the implementation of the protocol by using the same data collection tools after 3 months.

Statistical Analysis:

Data were summarized, tabulated, and presented using descriptive statistics in the form of frequency distribution, percentages, means and the standard deviations as a measure of dispersion. A statistical package for the social science (SPSS), version (20) was used for statistical analysis of the data, Quantitative data were presented as mean and standard deviation (SD), t-test was used to determine the differences. Qualitative data were presented as percentage (%). The significance of the observed difference was obtained at $p = .05$..

4. RESULTS

Table (1) A total of 100 males and females with type 2 diabetes were included in the study, 83% of the studied patients were female, 48.0% of them were at age group 40 to less than 50 years old, 87% of them were married, 30% of them were institutional level of education, 60% of them were unemployed, 30% of them were smokers, 70% of them were moderate socioeconomic level and 75% of them were positive family history

Table (2) shows a highly statistically significant difference between pre and post intervention results in all items of knowledge and in the total score after the implementation of a nursing intervention protocol

Table (3) Illustrates that there were highly statistically significant relation between pre and post nursing protocol concerning patients' adherence to medication therapy related questions 2, 3, and 4 whereas ($P < 0.001$), and there were highly statistically relation between pre and post a nursing protocol concerning total patients' adherence to whereas ($P < 0.001$)

Table (4) clarifies that there were improvement in the result of glycosylated hemoglobin test (very excellent < 6.5) post a nursing protocol (14%) compared to pre test (8%) and there were highly statistically differences between patients' total mean score of glycosylated hemoglobin pre and post a nursing protocol where $P < 0.001$.

Table (5) shows that, there was improvement in patients' total health belief model mean and SD post test a nursing protocol (28.7 ± 3.6) compared to pre test (21.1 ± 4.2) with highly statistical significant difference between pre and post-test, where $P < 0.001$.

Table (6) indicates that there was a positive correlation with highly statistical significant differences between the patients' total knowledge score levels and their total beliefs score levels in the pre-test and post-test, where ($p < 0.001$).

Table (7) illustrates that there was a positive correlation with statistical significant difference between the patients' total knowledge score levels and their total adherence score levels in the post-test, where ($p < 0.05$).

Table (8) indicates that there was a positive correlation with statistical significant difference between the patients' total adherence score levels and their total beliefs score levels in the post-test, where ($p < 0.05$).

Table (9) shows that there were negative correlation with statistical and highly statistical significant differences between the studied patients' total adherence score levels and their total glycosylated hemoglobin score in the pre-test and post-test, where ($p < 0.05$ and 0.001).

Table (10) clarifies that there were negative correlation with a statistical significant difference between the patients' total health beliefs score levels and their total glycosylated hemoglobin score levels in the post-test, where ($p < 0.05$).

Figure (1) shows that, there were improvement in satisfactory patients' total knowledge score post educational protocol (88%) compared to patients' total knowledge score pre a nursing protocol (12%) with highly statistical significant whereas $P < 0.001$.

Figure (2) illustrates that 16% of the studied patients' had high score level to medication adherence in the pre-test, while 57.5% of the them had high adherence to medication after a nursing protocol, whereas there was a highly statistical significant difference between pre and post-test, where $P < 0.001$.

TABLE 1: PATIENTS' SOCIO-DEMOGRAPHIC CHARACTERISTICS (N= 100)

Item	No.	%
Gender		
• Female	83	83%
• Male	17	17%
Age in years:		
• 20 < 40	20	20%
• 40-<50	48	48%
• 50-60	32	32%
(Mean ± SD 46 ± 11 years)		
Marital status		
• Married	87	87%
• single	3	3%
• Widowed	9	9%
• Divorced	1	1%
Educational Level		
• Illiterate	5	5%
• Read/write	20	20%
• Primary	20	20%
• Preparatory	4	4%
• Secondary	6	6%
• Institute (2 years)	30	30%
• University	15	15%
work		
• Unemployed	60	60%
• Employed	40	40%
smoking:		
• Smokers	30	30%
• Non smokers	70	70%
Socioeconomic Level		
• Low	25	25%
• Moderate	70	70%
• High	5	5%
Family history of diabetes		
• Positive	75	75 %
• Negative	25	25%

TABLE 2: PATIENTS' TOTAL KNOWLEDGE PRE POST A NURSING PROTOCOL (N=100)

Patients' knowledge	Total Score Mean ± SD		X ²	P
	Pre test	Post test		
Definition of diabetes	2.13 ±0.97	2.23 ±0.82	5.709	<0.001**
Risk factors of DM	2.98 ±1.3	3.13 ±1.00	8.645	<0.001**
Short-term complications	1.30 ±0.93	2.81 ±0.52	3.498	<0.001**
Long-term complications	2.79 ±1.66	3.62 ±0.71	3.351	<0.001**
Causes of diabetic coma	1.38 ±0.69	1.85 ±0.41	4.295	<0.001**
Which coma is more serious?	0.32 ±0.47	0.77 ±0.42	5.209	<0.001**
Hypoglycemia				
Symptoms of hypoglycemia	3.85 ±2.19	4.55 ±1.38	5.632	<0.001**
Causes of hypoglycemia	1.99 ±1.01	2.09 ±0.93	5.521	<0.001**
How to deal with hypoglycemia	1.89 ±1.16	3.16 ±1.02	7.715	<0.001**
Hyperglycemia				
Symptoms of hypoglycemia	2.42 ±1.55	3.87 ±1.11	4.397	<0.001**
How to deal with hypoglycemia	1.21 ±1.24	2.98 ±0.95	5.447*	<0.001**
Diabetes control	2.55 ±1.52	3.32 ±1.07	4.798	<0.001**
Precautions to avoid foot problems	4.42 ±2.38	5.13 ±1.45	7.088	<0.001**
Diabetic Diet				
Foods contain carbohydrates	2.55 ±1.51	2.79 ±1.26	4.601	<0.001**
Foods contain proteins	2.30 ±1.65	4.17 ±1.09	3.201	0.002*
Foods contain fats	1.34 ±0.96	2.81 ±0.44	3.252	0.002*
Foods should be avoided	2.11 ±1.25	3.89 ±0.93	3.609*	<0.001**
Foods should be consumed	1.05 ±0.60	1.92 ±0.27	3.560*	<0.001**
Physical Activity				
Best types of physical activity	1.10 ±1.13	3.42 ±0.84	4.186	<0.001**
Precautions during physical activity	1.60 ±2.14	3.96 ±2.03	8.288	<0.001**
checking blood sugar level	2.08 ±1.57	4.55 ±1.48	8.361	<0.001**
Time of Examinations				
Eye fundus examination	0.71 ±0.3	1.00 ±0	2.327	0.022*
Glycosylated hemoglobin	0.08 ±0.27	0.66 ±0.48	7.778	<0.001**
urine examination	0.04 ±0.19	0.62 ±0.49	8.098	<0.001**
Daily Foot Care	3.85 ±2.17	6.42 ±1.12	7.655	<0.001**
Total Knowledge	69.8±20.9	102.3±22.1	10.213	<0.001**

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

TABLE (3) PATIENTS' ADHERENCE TO MEDICATION THERAPY PRE AND POST A NURSING PROTOCOL (N=100).

Item	Pre test				Post test				X ²	P
	Yes		No		Yes		No			
	No	%	No	%	No	%	No	%		
1-Do you sometimes forget to take your diabetic medication?	20	20	80	80	12	12	88	88	8.846	0.003*
2-Over the past 2 weeks, were there any days when you did not take your diabetic medications?	30	30	70	70	14	14	86	86	21.964	<0.001**
3-Have you stopped taking medications without telling your doctor, because you felt worse when you took it?	34	34	66	66	6	6	94	94	16.047	<0.001**
4-When you travel or leave home, do you sometimes forget to bring along your diabetic medications?	32	32	68	68	2	2	98	98	15.763	<0.001**
5-Did you take your diabetic medication yesterday?	30	30	70	70	10	10	90	90	6.163	0.013*
6-When you feel like your diabetes is under control, do you sometimes stop taking your medicine?	28	28	72	72	12	12	88	88	3.944	0.047*
7-Do you ever feel hassled about sticking to your diabetes treatment plan?	25	25	75	75	8	8	92	92	7.759	0.005
8-How often do you have difficulty remembering to take all your medications? (Please circle the correct number)	No.		%		No.		%		11.814	0.008*
Never/Rarely.....4	52		52		76		76			
Once in a while...3	14		14		20		20			
Sometimes.....2	30		30		3		3			
Usually.....1	4		4		1		1			
Range	0.25-8				1.25-8				12.082	<0.001**
Mean ± SD	10.6±4.0				14.6±2.6					

Not Significant P >0.05 *Significant P < 0.05 **Highly Significant P < 0.001

TABLE 4: PATIENTS' TOTAL MEAN SCORE OF GLYCOSYLATED HEMOGLOBIN PRE AND POST A NURSING PROTOCOL (N=100).

Glycosylated Hemoglobin	Pre test		Post test		X ²	P
	No	%	No	%		
• <6.5 (very excellent)	8	8	14	14	3.036	0.081
• ≥ 6.5 % (poor)	92	92	86	86		
Total	6-14		5-11		5.517	<0.001**
• Range	6-14		5-11			
• Mean ± SD	9.5±1.7		7.9±1.2			

Not Significant P >0.05 *Significant P < 0.05 **Highly Significant P < 0.001

TABLE 5: PATIENTS' HEALTH BELIEF MODEL (MEAN ±SD) PRE AND POST A NURSING PROTOCOL (N=100)

Health Belief Model	Mean ±SD		X ²	P
	Pre test	Post test		
Perceived Susceptibility	5.4 ±1.4	7.5 ±0.8	6.862	<0.001**
Perceived Severity	5.6 ±1.3	7.1 ±1.2	4.949	<0.001**
Perceived Benefits	5.8 ±1.7	7.2 ±1.3	4.249	<0.001**
Perceived Barriers	4.3 ±1.8	6.9 ±1.4	10.783	<0.001**
Total Health Belief Model	21.1 ±4.2	28.7 ±3.6	10.080	<0.001**

Not Significant P >0.05 *Significant P < 0.05 **Highly Significant P < 0.001

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TABLE 6: CORRELATION BETWEEN THE PATIENTS' TOTAL KNOWLEDGE SCORE AND THEIR TOTAL BELIEFS SCORE LEVELS PRE AND POST A NURSING PROTOCOL (N=100).

Items		Total Knowledge Score Level	
		r	P
Total Beliefs Score Level:	Pre-test	0.425	< 0.001**
	Post-test	0.679	< 0.001**

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

TABLE 7: CORRELATION BETWEEN THE PATIENTS' TOTAL KNOWLEDGE SCORE AND THEIR TOTAL ADHERENCE SCORE LEVELS PRE AND POST A NURSING PROTOCOL (N=100)

Items		Total Knowledge Score Level	
		r	P
Total Adherence Score level:	Pre-test	0.242	0.282
	Post-test	0.375	0.031*

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

TABLE 8: CORRELATION BETWEEN THE PATIENTS' TOTAL ADHERENCE SCORE AND THEIR TOTAL BELIEFS SCORE LEVELS PRE AND POST A NURSING PROTOCOL (N=100)

Items		Total Adherence Score Level	
		r	P
Total Beliefs Score:	Pre-test	0.074	0.655
	Post-test	0.396	0.002*

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

TABLE 9: CORRELATION BETWEEN THE PATIENTS' TOTAL ADHERENCE SCORE AND THEIR GLYCOSYLATED HEMOGLOBIN SCORE LEVELS PRE AND POST A NURSING PROTOCOL (N=100).

Items		Total Adherence Score	
		r	P
Glycosylated hemoglobin Score:	Pre-test	-0.420	0.002*
	Post-test	-0.654	0.001**

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

TABLE 10: CORRELATION BETWEEN THE PATIENTS' TOTAL BELIEFS SCORE AND THEIR GLYCOSYLATED HEMOGLOBIN SCORE LEVELS PRE AND POST A NURSING PROTOCOL (N=100).

Items		Total Beliefs Score	
		r	P
Glycosylated hemoglobin Score:	Pre-test	0.079	0.986
	Post-test	-0.382	0.022*

Not Significant $P > 0.05$ *Significant $P < 0.05$ **Highly Significant $P < 0.001$

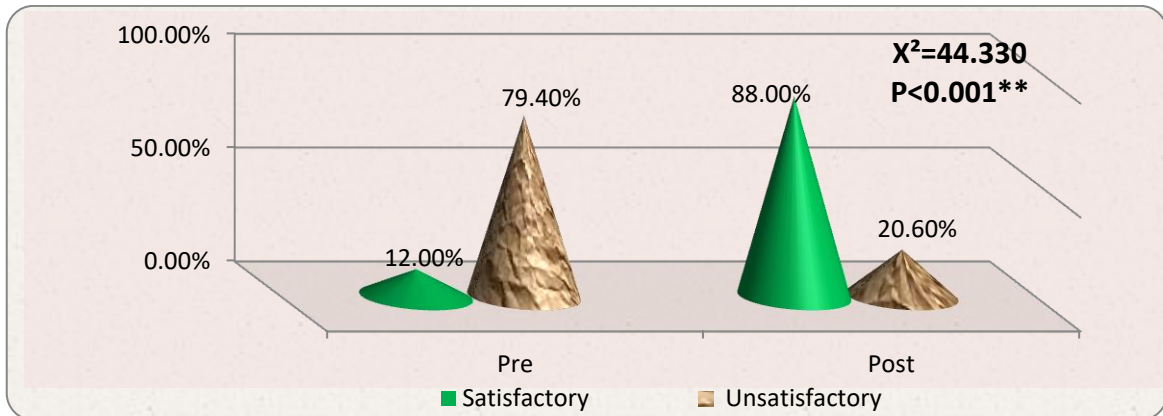
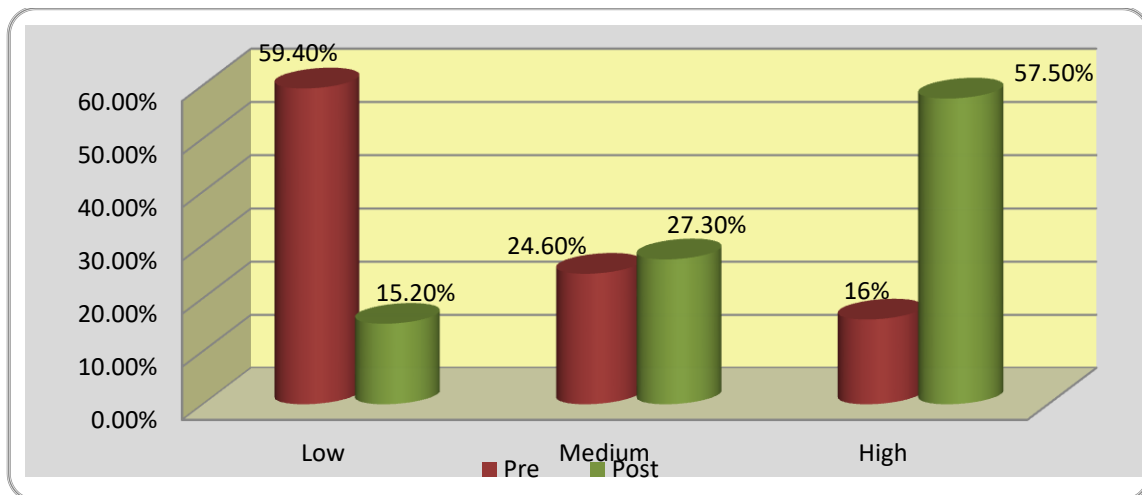


FIGURE (1): SATISFACTORY PATIENTS' TOTAL KNOWLEDGE SCORE PRE- POST A NURSING PROTOCOL (N=100)



****Highly Significant $P < 0.001$**

FIGURE (2): PATIENTS' LEVEL OF ADHERENCE TO MEDICATION THERAPY PRE-POST A NURSING PROTOCOL (N=100)

5. DISCUSSION

Diabetes is a major global public health problem affecting the quality of life of affected population that could lead to poor health outcomes of individuals, families and communities. Its impact affects social and economic outcomes, including costing millions of health care budgets of nations across the world and good education and self-care, patients can prevent or delay many complications of type 2 diabetes mellitus (T2DM) and lead to full productive lives (Kassahun, et al., 2016).

The importance of patients' education and promoting self-care has been recognized as a key component in chronic disease management and improving patient outcomes. One component of self-care is adherence to often complicated medication regimes. Good adherence is associated with reduced risk of diabetes complications, reduced mortality and economic burden (Tippu, et al., 2016). Therefore, the current study aimed to examine the effect of a nursing intervention protocol concerning patients' knowledge, medications adherence, health beliefs and glycosylated hemoglobin (HBA1c) toward type 2 diabetes mellitus.

The result of the current study revealed that, most of the studied patients were female, less than half of them were at age group 40 to less than 50 years old, the majority of them were married, less than one third of them were institutional level of education, three fifths of them were unemployed, one third of them were smokers, less than three quarters of them were moderate socioeconomic level and three quarters of them were positive family history.

However, the current study results revealed that, there was highly statistically significant difference between pre and post protocol intervention results in all items of knowledge and in the total score after the implementation of a nursing protocol; this result reflect that education can enhance the knowledge for diabetic patients and the success of the protocol and attributed to the process of education, interactions followed during its implementation and to the fact that it was custom tailored to patients' needs that always needed to be supported and motivated by the health care provider. This result was concordant with similar study carried by **Rashed et al. (2016)** and **Hassan (2012)** who found that the mean score of knowledge before the educational intervention was increased after conducting the educational intervention. Furthermore, the majority of the studied patients had satisfactory total knowledge score post educational protocol compared to the minority of them pre educational protocol with highly statistical significant differences.

Moreover, the current study revealed that there was highly statistically relation between pre and post nursing protocol concerning total patients' medications adherence whereas the majority of patients improved medication forgetfulness post the protocol compared pre the protocol intervention. This indicated that forgetfulness was one of the serious factors that impeded the patient from adhere to the medication prescribed. Medication adherence was significantly improved after implementation of the educational protocol whereas only less than one fifth of the patients had a high score level in the pre-test, while in the post-test; it was improved to be more than half had a high score level in the post-test.

From the researcher point of view, health education is not an addition to treatment, but it is one of the treatment tools that has a great effect on enhancing the diabetic patients own abilities to carry out self-care through providing adequate knowledge changing their attitude, and empowering them with skills that are essential for better control of the disease. The result was supported with **Al-Haj Mohd et al., (2016)** who study concerning the improvement adherence to medication in adults with diabetes in the United Arab Emirates". They revealed that there was a significant increase in the adherence levels in the post stage of the intervention.

Also, there was improvement in patients' total health belief model mean and SD post test a nursing protocol compared to pretest with highly statistical significant difference between pre and post-test, this may be that the nursing protocol was effective and improved perceptions regarding susceptibility, severity, benefits and barriers of the adherence to treatment. The success of the protocol could be attributed to improving patients' knowledge which affected their perceptions positively. The result with supported by **Bayat et al. (2013)**, and **Vahidi et al., (2015)** who study the effects of education based on extended health belief model in type 2 diabetic patients and study the effects of educational program based on the health belief model on self-efficacy among patients with type 2 diabetes referred to the Iranian Diabetes Association

Furthermore, there were improvement in the result of glycosylated hemoglobin test (very excellent <6.5) post nursing protocol compared to pretest and there were highly statistically differences between patients' total mean score of glycosylated hemoglobin pre and post nursing protocol. This result proved that there was a significant improvement in controlling HBA1c among the patients after application of a nursing protocol. This due to health education is considered to be essential in the overall care of patients with type 2 diabetes mellitus (T2DM)

This finding was in agreement with **Rashed et al. (2016)** who carried out a study " Diabetes Education Program for People with Type 2 Diabetes: An International Perspective", and **Zibaenezhad et al. (2015)** who carried out a study " The Effect of Educational Interventions on Glycemic Control in Patients with Type 2 Diabetes Mellitus". They found that the mean HBA1c was decreased significantly after the educational interventions compared to the pre educational interventions.

On the other hand, there was a positive correlation with highly statistical significant difference between the studied patients' total knowledge score level and their total beliefs score levels before and after the implementation of the nursing protocol. This may be due to diabetes education and on-going diabetes support are considered an integral part of comprehensive diabetes care to achieve better control of diabetes

This study supported by the study done by **Hartzler,et al ,(2014)** who study the evaluation of Jamaican Knowledge of Diabetes and Health Beliefs. Also there was a positive correlation with statistical significant difference between the studied patients' total knowledge score levels and their total adherence score levels after the implementation of the protocol. Moreover, there was a positive correlation with statistical significant difference between the studied patients' total adherence score levels and their total beliefs score levels after the implementation of the program. All of the above

proved that improving patients' knowledge toward their disease and therapeutic regimen might positively affect their beliefs regarding therapeutic regimen which in turn improved their adherence, and supported by **Sweileh et al. (2014)** who mentioned that beliefs in one's medications and diabetes related knowledge were significantly associated with adherence.

Furthermore, there were negative correlations with statistical and highly statistical significant difference between the patients' total adherence score and their total HBA1c score after implementing the program. This meant that with increasing levels of medication adherence, good glycemic control was achieved. This finding was in agreement with **Ahmed et al. (2015)** who found a negative statistical significant correlation between level of knowledge and HBA1c in his study. The result of the study revealed that there was a negative correlation with a statistical significant difference between the patients' total health beliefs regarding adherence to therapeutic regimen score levels and their total HBA1c score levels after the implementation of the program. This meant that with increasing levels of patients' health beliefs towards adherence to therapeutic regimen, good glycemic control was achieved.

6. CONCLUSION

The current study concluded that there were improvement in type 2 diabetes mellitus patients' knowledge, medication adherence, health beliefs and glycosylated hemoglobin score post implementing the interventional nursing protocol than pre interventional nursing protocol. Also, there were highly statistically significant difference between pre and post intervention in all items of knowledge and in the total score after implementing the interventional nursing protocol, and negative correlation with statistical and highly statistical significant differences between the patients' total adherence score levels and their total glycosylated hemoglobin score in the pre-test and post-test

7. RECOMMENDATIONS

The following recommendations are made on the basis of the findings of the present study .

- 1-Continuous educational programs for diabetic patients for improving awareness.
2. The study can be conducted for the large samples of diabetic patients
- 3- A similar study can be conducted in different setting.

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