

Practicing versus None Practicing Self-Monitoring of Blood Glucose among Newly Diagnosed Type II Diabetes Mellitus

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Abstract:

Background: Diabetes is a worldwide growing serious health problem and causes significant morbidity and mortality. Self-monitoring of blood glucose has been accepted as an important instrument that empowers diabetic patients to maintain and achieve therapeutic goals.

Aim of this study was to compare practicing and none practicing Self-Monitoring of Blood Glucose among newly Diagnosed Type II Diabetes Mellitus as regard; patients' attitude, knowledge and compliance.

Design: A descriptive design was used in this study.

Setting: This study was conducted at the medicine outpatient clinics of Menoufia University Hospital and Shebien El-Kom teaching Hospital, Menoufia Governorate, Egypt.

Sample: A purposive sample of 180 adult patients newly diagnosed with type II diabetes mellitus was included in this study. Tools: I. Structured questionnaire was designed by researchers to collect patients' Socio-demographic data and medical history such as: age, gender, marital status, educational level occupation, family history, past medical history and Knowledge assessment was designed by to assess patients' basic knowledge about diabetes mellitus. II. Attitude scale; it is a Likert scale was developed to assess diabetic patients' attitude regarding their general health and disease progress. III. Compliance Assessment Questionnaire was designed to assess degree of diabetic patients' compliance regarding diet, exercise, medication, foot care and self-monitoring of blood glucose. Results: The current study revealed that 70% of blood glucose self-monitoring practicing group and only 45.6% of non- practicing group had satisfactory knowledge while 68.9% of practicing group and only 41.1% of non- practicing group had positive attitude and 66.7% of practicing group and only 23.3% of non-practicing group had good compliance for diabetes mellitus.

Conclusion: Practicing group of blood glucose self-monitoring resulted in increased knowledge satisfaction, positive attitude and good compliance toward diabetes mellitus than none practicing group.

Recommendations: Self-monitoring of blood glucose was an effective tool that implicated change in diabetic patients' knowledge, attitude and compliance toward diabetes. More awareness and education programs are needed for diabetic patients about the important role of blood glucose self- monitoring to achieve the desired therapeutic goals.

Keywords: Newly diagnosed type II Diabetes Mellitus - Self-monitoring of blood glucose

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I. Introduction

Diabetes is recognized by the World Health Organization and the International Diabetes Federation as a serious growing health problem and in the forthcoming 25 years, it is predicted to be one of the major fatal and mutilating diseases in the world^(1,2). In 2017, it was estimated that there were 246 million adults with diabetes throughout the world with an increase of more than 52 million since 2013⁽¹⁾. By 2025, the number of adults with diabetes is expected to rise to 380 million^(1,2).

Diabetes mellitus is accounting currently 5.2 % of all deaths worldwide. The world health organization (WHO) estimated prevalence of diabetes among adults in 2014 was 9% and predicts that there will be at least 350 million adult with Type 2 diabetes by 2030 with more than 80% of cases living in developing countries⁽¹⁾. The burden of diabetes is increasing globally, particularly in developing countries. It is predicted to become the seventh leading cause of death in the world by the year 2030⁽³⁾.

Diabetic patients are at increased risk for developing numerous complications, resulting in increased physical disability, increased health care costs, decreased life expectancy, and there is a growing trend toward developing type 2 diabetes mellitus (T2DM) at much earlier ages than before. Thus, individuals and health care systems will be forced to deal with the devastating complications for many years⁽⁴⁾. With its severe

complications and expensive treatments, diabetes has a profound impact on the physical, psychological, and financial well-being of individuals, their families, and the whole society⁽¹⁾.

Diabetes is a complex and burdensome disease that requires the diabetic patient to make numerous daily decisions regarding food, physical activity, and medications. It also necessitates the patient to be proficient in a number of self-management skills to be able to control the disease. Patients play a central role in diabetes care because of their daily responsibility for a large number of behavioral choices and activities⁽⁵⁾.

According to The American Diabetes Association, self-monitoring of blood glucose (SMBG) is considered an important component of diabetes care and is recommended for all insulin-treated patients⁽⁶⁾. It is also considered desirable in patients treated with sulfonylureas and in all subjects not achieving glycemic goals. Nevertheless, its role and optimal frequency in type 2 diabetes is still matter of debate^(6,7).

Self-monitoring of blood glucose has been recommended as a useful tool for improving glycemic control and is considered an essential component in treatment programs of insulin dependent diabetes mellitus patients, favoring dietary changes, physical activity and pharmacological therapy, including titration of insulin doses^(7,8). Nevertheless, despite the availability of the method and information, SMBG is still an underutilized strategy and most diabetic patients are unaware of the actions that must be taken in response to its results and do not adjust their treatment^(9,10,11).

Self-monitoring of blood glucose (SMBG) includes both assessment of the blood glucose concentration (self-measurement) as well as interpretation and responding to the readings (self-regulation)^(12,13). Self-Monitoring of Blood Glucose (SMBG) is an essential component in the treatment of diabetes mellitus, as it aid to achieve optimal glycemic control through assessing and improving the quality of diabetes control^(12,14).

All people with type II diabetes should be given the opportunity to learn about the value and skills required to perform SMBG as it applies to their specific needs. SMBG empowers individuals with diabetes to learn more about their diabetes and to make behavioral changes to improve their overall diabetes control⁽¹⁵⁾.

Compliance of diabetic patients with medical advice is essential for controlling the disease. Compliance is defined as the extent of patient's adherence to a medical advice, prescribed course of treatment and the degree to which the patient completing a treatment regimen, taking medications correctly and following recommended behavioral changes to prevent complications⁽¹⁶⁾.

Compliance with a prescribed therapeutic regimen can reduce morbidity and mortality where information given to patients increases their knowledge and understanding about their illness, which are usually concentrated on the prescribed therapeutic regimen including, medication administration, dietary changes, exercises, foot care, eye examination and blood pressure monitoring^(16,17). Knowledge about diabetes mellitus and appropriate attitude are vital to reduce the incidence and morbidity associated with DM⁽¹⁷⁾. Some of the reasons for the low use of glucometers include cost, denial; as patients do not want to know, doctors do not recommend SMBG, results are not acted upon and pain⁽¹⁸⁾.

Nurses have a key role in education and advocacy, educate patients on what affects glucose levels, why they need to carry out SMBG, and how to interpret and act on the results. The nurse must understand the patient's condition determine if there are any conditions present that could affect the reading before performing SMBG to be able to interpret results correctly. She must also determine patient's understanding of the procedure and purpose for monitoring blood glucose level⁽¹⁹⁾.

Significance of the study

Egypt had been estimated to be the ninth country in the prevalence of diabetes. Recent changes in physical activity and dietary patterns have promoted the development of diabetes but if different preventive and control activities are not adopted, by the year 2025, more than 9 million Egyptians (13% of the population above 20 years old) will have diabetes⁽²⁰⁾.

The magnitude of the estimated number of deaths due to diabetes is similar to the combined deaths from several infectious diseases like HIV/ AIDS, malaria, and tuberculosis that are ranked as top public health priorities⁽⁴⁾. There is an increased concern about the rising wave of type II diabetes and its associated complications in the Arabic speaking countries (East Mediterranean, Arabic peninsula, and Northern Africa) as these regions have some of the highest rates of diabetes in the world⁽²¹⁾.

Self-monitoring of blood glucose has a critical part in diabetes management because of its many benefits as it promotes personal responsibility and provides opportunities for better glycemic control. It allows easy detection of blood glucose extremes, helping to reduce blood glucose fluctuations. It also helps both patient and healthcare provider to make informed decisions and can help reduce microvascular and macrovascular complications⁽²²⁾.

Aim of the study

The aim of this study was to compare practicing and none practicing Self-Monitoring of Blood Glucose among Newly Diagnosed Type II Diabetes Mellitus as regard; patients' attitude, knowledge and compliance.

Research questions

1. Is there a relationship between practicing of SMBG and patient's knowledge about diabetic mellitus?
2. Is there any relationship between practicing of SMBG and patient's attitude toward diabetes mellitus?
3. Is there any relationship between practicing of SMBG and patient's compliance toward diabetic patients?
4. Is there any relationship between practicing of SMBG and sociodemographic characteristics of diabetic patients among both study groups?
5. Is there any significant relationship between knowledge and sociodemographic Characteristics of diabetic patient among both study groups?
6. Is there any association between the current study variables and each other?

II. Subjects and Method

Design: A descriptive design was used to fulfill the aim of the study.

Setting: This study was conducted at the medicine outpatient clinics of Menoufia-University Hospital and Shebien El-Kom Teaching-Hospital, Menoufia-Governorate, Egypt.

Sampling technique and sample size

A purposive sample of 180 diabetic patients diagnosed with type II diabetes mellitus. The sample size was calculated using Epi. Inf. 6 computer software program to be 180 patients taking into consideration that the medicine outpatient clinics in both the University and Shebien El-Kom-Teaching hospitals serve about 1800 patients with type II diabetes per month. Statistical level of significance at 0.05% with a confidence level 95% (error=5 %) and a study power of 80% (error=10%).

The selected sample was divided into two groups each group consisted of 90 patients; **a)** Practicing SMBG group (**b)** non-practicing SMBG group.

Inclusion criteria:

- Adult
- Male or female
- Newly diagnosed with type 2 diabetes mellitus (diagnosis since less than one year).
- Diabetic patients who are willing to participate
- Practicing SMBG or not.

Exclusion criteria:-

- Type one diabetes mellitus Patients.
- Non- clinic attendants type 2 diabetic mellitus patients.
- Severe ill or complicated patients.
- Psychologically disturbed patients.

Instruments; I:Structured questionnaire

It was designed to include: **A)** Patients' Socio-demographic data such as: age, gender, residence, marital status, educational level occupation and monthly income **B)** Questions related to patients' medical history such as family history of DM, if there are any other associated diseases and date of diagnosis.

C. Knowledge assessment questionnaire; a structured questionnaire was designed by researchers in seven multiple choice questions to assess patients' basic knowledge about diabetes mellitus such as; definition, causes, signs and symptoms, treatment, complications, suitable diet and exercises.

Scoring system for knowledge assessment questionnaire:

Answers obtained from studied diabetic patient were checked with a model key answer. The question scored as the following: Complete correct answer takes "two", while the incomplete answer takes "one" and a wrong answer or don't know takes "zero". The total score was converted into percentage and interpreted as follows: less than 50% is considered unsatisfactory and 50% or more is considered satisfactory knowledge level.

II. Attitude scale; it is a 5 points Likert scale was developed by^[23] and translated into Arabic, it consisted of nine statements, to assess diabetic patients' attitude regarding diabetes, their general health and disease progress. The Likert Scale was rated from 1 to 5, with (1) strongly disagree, (2) disagree, (3) Neutral, (4), agree and (5) strongly agree.

Attitude scale scoring system:

The total attitude score was ranged from 5 to 45.

The negative attitude (<60%) with score ranged from 5 to less than 27
the positive attitude (≥60) with score ranged from 27 to 45 or more.

III. Compliance Assessment Questionnaire; was designed by researchers to assess degree of diabetic patients' compliance regarding diet regimen, exercise, medication, foot care and self-monitoring of blood glucose. It was designed into three categories; I. no compliance was given (0), II. Partial Compliance was given (1) and III. Complete Compliance was given (2). The total compliance scores ranged from 0-12 points, they were evaluated as follows

- 1- Poor compliance (< 50%) (With scores ranged from 0-5)
- 2- Fair compliance (50-75%) (With scores ranged from 6-9).
- 3- Good compliance (>75%) (With scores ranged from 10-12).

All instruments were designed by researchers (except tool III was adopted) after careful reviewing of related literatures then were written in simple Arabic language.

Procedure for data collection

- Study period: This study was conducted during the period starting from May 2017 to the end of August 2017.
- **Approval:** an official permission to carry out the study was obtained from the responsible authorities; faculty of Nursing, Menoufia University, by the researcher to the administrators of University and Shebien El-Koam Teaching hospitals, where the data were collected to conduct the study after an explanation of the purpose of the study.
- **Ethical consideration:** protection of patient's rights, an oral consent was obtained from each patient to participate in the study. Initially, the researchers introduced themselves to all participants then, they were informed with aim and purpose of the study. Participants were assured that their participation in the study was voluntary and that they could withdraw from the study or could refuse to participate in the study. Anonymity and confidentiality of the information gathered was ensured.

Instruments development:

Validity; Instruments were reviewed and tested for validity by 5 experts in Medical-Surgical nursing and community health nursing, modification were done accordingly to ascertain relevance and completeness.

Reliability: The internal consistency of the questionnaires was calculated using Cronbach's alpha coefficients. Test-retest was used. The Cronbach's alpha of the questionnaire was 0.87 indicate good reliability.

Pilot study: It was conducted on 10% of the study sample to evaluate the developed tools before starting the actual data collection. The pilot sample was not included in the total sample of the research work to ensure stability of the answers. Based on the results of the pilot study, modifications, and rearrangement of some questions were done. It also helped to estimate the time needed to fill in all data collection tools.

The time taken for filling in each questionnaire was about 15 minutes. Subjects who agreed to participate in the study are requested to complete the required tools after distributing it to them, with instructions about its filling. This was repeated in each place of the study setting. The researchers were present all the time with participants to clarify any ambiguity.

Statistical Analysis:

Data analysis was carried out using Statistical Package for the Social Sciences, version 22 software. Descriptive statistics were performed in the form of frequencies and percentage test. Analytic statistics were obtained using χ^2 test to assess the association between SMBG practice and other categorical factors and p-value <0.05 was considered statistically significant while highly significant difference was considered if $P < 0.001$.

III. Results

Table (1) Showed that 50 % of SMBG practicing group their age ranged from 30-<40 years old while 45.6% of non-practicing group their age ranged from 40-<55 years old. Regarding gender, 72.2% of practicing group was female, while 57.8% of non-practicing group were male. Concerning level of education, 51.1% of practicing group and only 23.3% of non-practicing group had university education while 62.2% of non-practicing group lived in rural area and only 32.2% of practicing group lived in rural area.

Table (2) demonstrated that there were statistically significant differences between blood glucose Self-monitoring among both study groups in all knowledge items regarding diabetes mellitus.

Figure 1: showed that 70% of practicing group and only 45.6% of non- practicing group had satisfactory knowledge about diabetes mellitus while, there is statistically significant difference between both study groups concerning total knowledge score as $p < 0.001$.

Table (3): this table displayed the relationship between diabetic patients' attitude and self-monitoring of blood glucose among both practicing and non-practicing groups. As noticed in this table, there was statistically significant difference between both study groups concerning SMBG and patients' attitude regarding their general health and disease progress.

Figure 2: showed that more than half of practicing group (68.9%) and only 41.1% of non- practicing group had positive attitude toward diabetes mellitus. There was statistically significant difference between both study groups concerning total attitude score as $p < 0.001$.

Table (4): this table displayed the relationship between diabetic patients' compliance toward diabetes mellitus and self-monitoring of blood glucose among both practicing and non-practicing groups. It demonstrated that there was statistically significant difference between both study groups regarding all compliance items and self-monitoring of blood glucose.

Table (5). It showed that there were statistically significant relationships regarding age, gender, occupation and monthly income in practicing group and patient's knowledge level as p values were $P = 0.021, < 0.001, 0.032$ & < 0.001 respectively. Also, it demonstrated that there were statistically significant relationships regarding age, educational level and monthly income in non-practicing group and patient's knowledge level as p values were $P = < 0.001, < 0.001$ & 0.012 respectively.

Figure 3: shows that more than half of the SMBG practicing group (66.7%) and only 23.3% of the non-practicing group had good compliance toward diabetes mellitus also, the figure illustrated that there was statistically significant difference between both study groups concerning total compliance score as $p < 0.001$.

Table 6: Proved that there was positive association between patient's knowledge level and patient's compliance regarding diabetes mellitus among both study groups as $P < 0.001$.

Table 7: Illustrated that that there was positive association between patient's attitude level and patient's compliance regarding diabetes mellitus among both study groups as $P < 0.001$.

Table 8: Indicated that there was positive association between patient's knowledge level and patient's attitude level regarding diabetes mellitus among both study groups as $P < 0.001$.

Table (1) Distribution of Sociodemographic characteristics of diabetic patients for both SMBG practicing and non-practicing groups (n=180)

Sociodemographic characteristics	Self-monitoring blood glucose			
	Practicing group (90)	(%)	Non-practicing group (90)	(%)
Age (years)				
20 – <30	18	20.0	22	24.4
30 – <40	45	50.0	27	30.0
40 – <55	27	30.0	41	45.6
Gender				
Male	25	27.8	52	57.8
Female	65	72.2	38	42.2
Marital status				
Single	13	14.4	16	17.8
Married	64	71.1	60	66.6
Divorced	8	8.9	5	5.6
Widowed	5	5.6	9	10.0
Educational level				
Read and write	6	6.7	9	10.0
Basic	9	10.0	27	30.0
Secondary	29	32.2	33	36.7
University	46	51.1	21	23.3
Occupation				
Employed	42	46.7	31	34.4
Housewife	28	31.1	24	26.7
Dealer	12	13.3	20	22.2
Handicraftsman	8	8.9	15	16.7
Residence				
Rural	29	32.2	56	62.2
Urban	61	67.8	34	37.8

Monthly income				
Insufficient	32	35.6	46	51.1
Sufficient	58	64.4	44	48.9

*Significant

Table 2: Relationship between patients' knowledge and blood glucose Self-monitoring (n=180).

Knowledge items	Blood glucose Self-monitoring				χ^2	P value
	Practicing group (90)	(%)	Non practicing group (90)	(%)		
Definition					14.896	<0.001*
Don't know	8	8.9	21	23.3		
Incomplete answer	19	21.1	31	34.4		
Complete answer	63	70.0	38	42.2		
Signs & symptoms					13.377	<0.001*
Don't know	11	12.2	19	21.1		
Incomplete answer	23	25.6	41	45.6		
Complete answer	56	62.2	30	33.3		
Risk factors					17.772	<0.001*
Don't know	7	7.8	16	17.8		
Incomplete answer	18	20.0	37	41.1		
Complete answer	65	72.2	37	41.1		
Suitable diet for DM					15.437	<0.001*
Don't know	13	14.4	19	21.1		
Incomplete answer	21	23.3	43	47.8		
Complete answer	56	62.2	28	31.1		
Complications					7.782	0.020*
Don't know	18	20.0	22	24.4		
Incomplete answer	45	50.0	27	30.0		
Complete answer	27	30.0	41	45.6		
Prevention					8.417	0.015*
Don't know	9	10.0	17	18.9		
Incomplete answer	28	31.1	39	43.3		
Complete answer	53	58.9	34	37.8		
Management of DM					16.831	<0.001*
Don't know	13	14.4	15	16.7		
Incomplete answer	18	20	35	38.9		
Complete answer	59	65.6	40	44.4		

*Significant

Figure 1: Distribution of total knowledge scores for both study groups

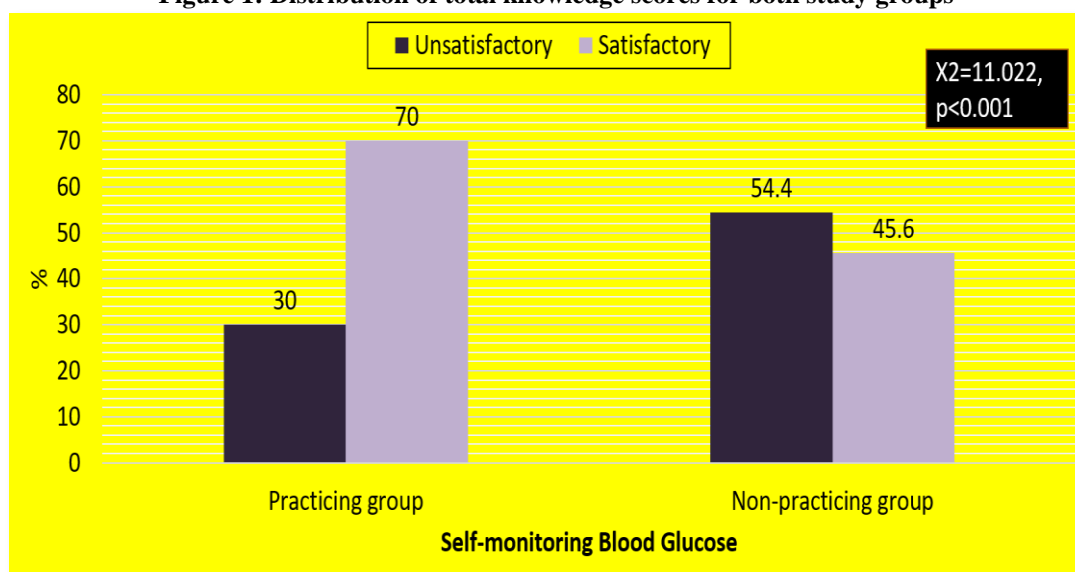


Table 3: Relationship between diabetic patients' attitude regarding and SMBG (practicing and non-practicing group)

Patients' attitude regarding DM	Self-monitoring of blood glucose				χ^2	(p)
	Practicing	(%)	Non	(%)		

	group (90)		practicing group (90)			
1-I am fully informed of my health conditions						
Strongly disagree	8	8.9	31	34.4	38.161	<0.001*
Disagree	15	16.7	27	30.0		
Neutral	5	5.6	9	10.0		
Agree	28	31.1	15	16.7		
Strongly agree	34	37.8	8	8.9		
2- At present, I am still confident in managing my diabetes					26.355	<0.001*
Strongly disagree	13	14.4	27	30.0		
Disagree	9	10.0	24	26.7		
Neutral	4	4.4	7	7.8		
Agree	25	27.8	19	21.1		
Strongly agree	39	43.3	13	14.4		
3- A routine follow-up for diabetes every 1 or 2 months would help to stay healthy					21.149	<0.001*
Strongly disagree	12	13.3	26	28.9		
Disagree	7	7.8	21	23.3		
Neutral	3	3.3	5	5.6		
Agree	32	35.6	18	20.0		
Strongly agree	36	40.0	20	22.2		
4- There is a high possibility of developing diabetes complications in future					13.123	0.014*
Strongly disagree	23	25.6	18	20.0		
Disagree	30	33.3	10	11.1		
Neutral	3	3.3	5	5.6		
Agree	15	16.7	26	28.9		
Strongly agree	19	21.1	31	34.4		
5-It is not difficult for to find the time to go to the doctor for diabetes follow-up					28.010	<0.001*
Strongly disagree	7	7.8	25	27.8		
Disagree	5	5.6	20	22.2		
Neutral	8	8.9	5	5.6		
Agree	41	45.6	23	25.6		
Strongly agree	29	32.2	17	18.9		
6-I am able to choose foods that are best for my health					14.711	0.005*
Strongly disagree	14	15.6	25	27.8		
Disagree	8	8.9	19	21.1		
Neutral	2	2.2	5	5.6		
Agree	37	41.1	23	25.6		
Strongly agree	29	32.2	18	20.0		
7-I am able to maintain a healthy eating pattern					30.608	<0.001*
Strongly disagree	8	8.9	31	34.4		
Disagree	12	13.3	22	24.4		
Neutral	5	5.6	7	7.8		
Agree	34	37.8	19	21.1		
Strongly agree	31	34.4	11	12.2		
8- I miss some doses of medication for diabetes sometimes					16.941	0.002*
Strongly disagree	30	33.3	10	11.1		
Disagree	23	25.6	18	20.0		
Neutral	3	3.3	5	5.6		
Agree	19	21.1	31	34.4		
Strongly agree	15	16.7	26	28.9		
9- I could exercise at least 3 times a week to improve blood glucose					38.144	<0.001*
Strongly disagree	8	8.9	24	26.7		
Disagree	7	7.8	29	32.2		
Neutral	6	6.7	8	8.9		
Agree	38	42.2	17	18.9		
Strongly agree	31	34.4	12	13.3		

*Significant

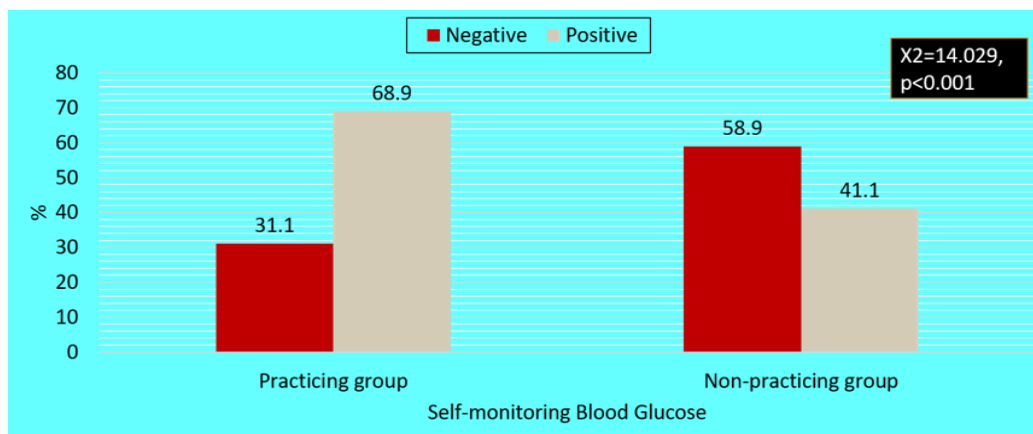


Figure 2: Distribution of total attitude scores for both study groups

Table 4: Compliance of diabetic patients between practicing group and non-practicing group of SMBG

Items of compliance	Self-monitoring of blood glucose					
	Practicing group (90)	(%)	Non practicing group (90)	(%)	χ^2	P value
Compliance with dietary regimen						
No Compliance	12	13.3	37	41.1		
Partial Compliance	24	26.7	32	35.6		
Complete Compliance	54	60.0	21	23.3	28.418	<0.001*
Compliance with exercise program						
No Compliance	19	21.1	34	37.8		
Partial Compliance	28	31.1	41	45.6		
Complete Compliance	43	47.8	15	16.7	20.212	<0.001*
Compliance with Medication regimen						
No Compliance	9	10.0	17	18.9		
Partial Compliance	28	31.1	39	43.3		
Complete Compliance	53	58.9	34	37.8	8.417	0.015*
Compliance with foot care						
No Compliance	12	13.3	29	32.2		
Partial Compliance	34	37.8	37	41.1		
Complete Compliance	44	48.9	24	26.7	13.058	<0.001*
Compliance with eye examination						
No Compliance	23	25.6	28	31.1		
Partial Compliance	20	22.2	43	47.8		
Complete Compliance	47	47.8	19	21.1	20.766	<0.001*
Compliance with blood pressure monitoring						
No Compliance	13	14.4	34	37.8		
Partial Compliance	32	35.6	27	30.0		
Complete Compliance	45	50.0	29	32.2	13.266	<0.001*

*Significant

Table5. Association between sociodemographic Characteristics and patient’s knowledge level and among both study groups(n = 180)

Patient's Sociodemographic Characteristics	Patient's Knowledge Level									
	Practicing group					Non-Practicing group				
	Unsatisfactory (n=27)		Satisfactory (n=63)		Chi square test χ^2	Unsatisfactory (n=27)		Satisfactory (n=63)		Chi square test χ^2
	n	%	n	%		n	%	n	%	
Age (years)					$\chi^2=7.743$ P=0.021*					$\chi^2=16.419$ <0.001*
20 – <30	10	37.0	8	12.7		16	32.7	6	14.6	
30 – <40	9	33.3	36	57.1		6	12.2	21	51.2	
40 or more	8	29.6	19	30.2		27	55.1	14	34.1	
Gender					$X^2=14.835$ <0.001*					$X^2=0.981$ 0.322
Male	15	55.6	10	15.9		26	53.1	26	63.4	
Female	12	44.4	53	84.1		23	46.9	15	36.6	
Marital status					0.459 0.928					1.529 0.676
Single	4	14.8	9	14.3		7	14.3	9	22.0	
Married	19	70.4	45	71.4		35	71.4	25	61.0	
Divorced	3	11.1	5	7.9		3	6.1	2	4.9	
Widowed	1	3.7	4	6.3		4	8.2	5	12.2	
Educational level					3.289 0.349					31.440 <0.001*
Read and write	2	7.4	4	6.3		7	14.3	2	4.9	
Primary	4	14.8	5	7.9		25	51.0	2	4.9	
Secondary	11	40.7	18	28.6		13	26.5	20	48.8	
University	10	37.0	36	57.1		4	8.2	17	41.5	
Occupation					8.821 0.032*					0.533 0.912
Employer	7	25.9	35	55.6		18	36.7	13	31.7	
Housewife	13	48.1	15	23.8		13	26.5	11	26.8	
Dealer	3	11.1	9	14.3		11	22.4	9	22.0	
Handicrafts man	4	14.8	4	6.3		7	14.3	8	19.5	
Monthly income					24.975 <0.001*					6.359 0.012*
Insufficient	20	74.1	12	19.0		31	63.3	15	36.6	
Sufficient	7	25.9	51	81.0		18	36.7	26	63.4	

*Significant

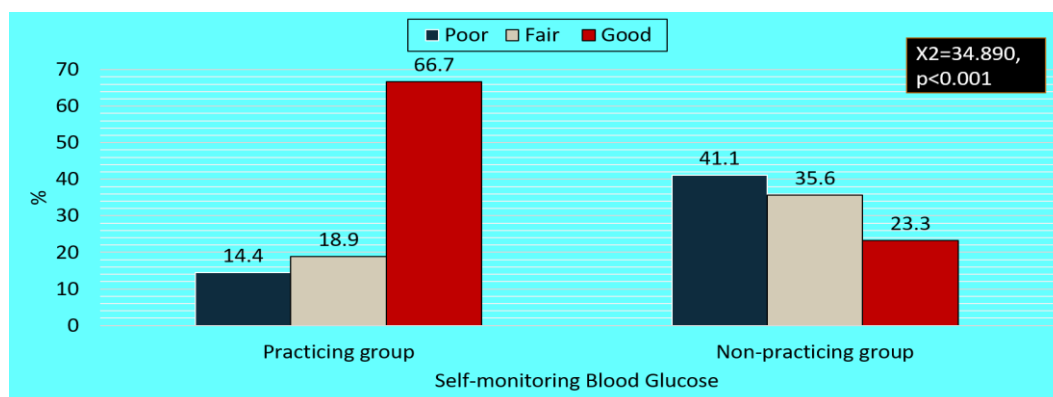


Figure 3: Distribution of total compliance scores for both SMBG practicing and non-practicing groups

Table6. Association between patients' compliance toward diabetes mellitus and Patient's Knowledge Level

Compliance	Patient's Knowledge Level								χ^2	p-value
	Practicing group				Non-practicing group					
	Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory			
	N	%	n	%	n	%	n	%		
Poor	10	37.0	3	4.8	28	57.1	9	22.0	64.609	<0.001*
Fair	7	25.9	10	15.9	16	32.7	16	39.0		
Good	10	37.0	50	79.4	5	10.2	16	39.0		

*Significant

Table7. Association between Patient's CoImplianceLevel and Patient's Attitude toward diabetes mellitus

CoImpliance	Patient's Attitude level								χ^2	p-value
	Practicing group				Non-practicing group					
	Negative		Positive		Negative		Positive			
	N	%	n	%	n	%	n	%		
Poor	9	32.1	4	6.5	29	54.7	8	21.6	60.490	<0.001*
Fair	8	28.6	9	14.5	18	34.0	14	37.8		
Good	11	39.3	49	79.0	6	11.3	15	40.5		

Table8. Association between Patient's Attitude level and patients' Knowledge toward diabetes mellitus

Attitude	Patient's Knowledge level								χ^2	p-value
	Practicing group				Non-practicing group					
	Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory			
	n	%	n	%	n	%	n	%		
Negative	6	22.2	22	34.9	36	73.5	17	41.5	24.500	<0.001*
Positive	21	77.8	41	65.1	13	26.5	24	58.5		

*Significant

IV. Discussion

Diabetes mellitus is a chronic disease, which needs continuous care all over the diabetic patient's life^[24]. Self-monitoring blood glucose allows knowing blood glucose level at any time and helps prevent the consequences of very high or very low blood sugar. Monitoring also enables tighter blood sugar control, which decreases the long-term risks of diabetic complications^[25].

Self-monitoring of blood glucose is not an addition to treatment regimen, but it is one of the important diabetes mellitus treatment tools. But the first essential step is that the nurse has to identify and study predisposing factors like; patient's knowledge, attitude, compliance and different socio-demographic characteristics which has a great effect on enhancing the diabetic patients own abilities to carry out self-care through empowering them for better control of the disease^[26,27]. The aim of this study was to compare practicing and none practicing self-monitoring blood glucose among newly Diagnosed Type II Diabetes Mellitus as regard; patients' attitude, knowledge and compliance.

Answering the first research question, is there a relationship between practicing of Self-monitoring of blood glucose (SMBG) and patient's knowledge about diabetic mellitus? The current study revealed that there was a statistically significant difference between blood glucose Self-monitoring among both study groups in all knowledge items regarding diabetes mellitus as $p < 0.001$. In addition, it demonstrated that more than two thirds of practicing group compared to less than half of non- practicing group had satisfactory knowledge about diabetes mellitus. This study finding was similar to^[28] in Saudi Arabia; who studied " Self-monitoring of blood glucose among diabetic patients attending Al-Eskan Primary Health Care Center in Makah Al-Mukarramah city, and found that majority of SMBG practicing group had good knowledge about diabetes mellitus while only one third of practicing group don't had good knowledge".

The current study results were also, supported by the results of^[29], in Nigeria entitled "Effect of self-monitoring of blood glucose on glycemic outcome among type II diabetic patients, they reported that a significant association was observed between Control (non-SMBG) group and intervention (SMBG group) and found that about more than three quarters of intervention (SMBG) group had good knowledge". This may be attributed to the practicing of blood glucose self-monitoring can motivate patients to become more active participants in their own care and curious to know all the information about diabetes mellitus to maintain good general health.

Answering the second research question, is there a relationship between practicing of Self-monitoring of blood glucose (SMBG) and patient's attitude toward diabetes mellitus? The current study results indicated that there was a statistically significant difference between both study groups concerning SMBG and patients' attitude regarding their general health and disease progress. In addition, the present study concluded that more than three fifths of the practicing group compared to less than half of the non- practicing group had positive attitude toward diabetes mellitus. Our study finding is in consistent with the results of the study carried out by^[30] in Vadodara, their study entitled "Knowledge and Attitude on Self-Monitoring of Blood Glucose (SMBG) Among Diabetic Patients Belongs to Waghodia, Taluka, Vadodara. They reported that the overall attitude score for intervention group of SMBG was adequate attitude compared with control group". As well as the current study finding is in agreement with that of a similar study conducted in Oman by^[31], who studied "Self-monitoring of blood glucose level among diabetic patients in Muscat, Oman. They found that more than two thirds of performing SMBG group had positive attitude while only one quarter of the not performing SMBG

group had positive attitude regarding their diabetes and disease progress". That discrepancy between results may be due to the differences in the individual characteristics of patients or might be due to educational background of studied participants.

Answering the third research question, is there a relationship between practicing of Self-monitoring of blood glucose (SMBG) and patient's compliance toward diabetic mellitus? The current study revealed that there was a statistically significant difference between blood glucose Self-monitoring among both study groups in all compliance items regarding diabetes mellitus as $p < 0.001$. In addition, the present study results clarified that more than two thirds of practicing group compared to less than one quarter of non-practicing group had good compliance regarding diabetes mellitus. This result agreed with ^[32], in China, who studied "Compliance to self-monitoring of blood glucose among patients with type II diabetes mellitus and its influential factors. They reported that the majority of study group who practiced self-monitoring of blood glucose had good compliance compared to control group who don't practice SMBG, the majority of them had poor compliance regarding diabetes mellitus". While the present study findings contradicted with ^[33], in U.S.A who studied "Effect on compliance acceptability of blood glucose self-monitoring and (HbA) of a self-monitoring system developed according to patient's condition. They found no relationship between compliance to diabetes and practicing SMBG". This discrepancy between our study results and the others' may be attributed to the methodological differences.

Answering the fourth research question, is there any significant relationship between practicing of Self-monitoring of blood glucose (SMBG) and sociodemographic characteristics of diabetic patients among both study groups? The current study revealed that there were statistically significant relationships regarding age, gender, residence and monthly income among both study groups and Self-monitoring of blood glucose. Regarding age the current study results revealed that half (50 %) of the practicing group their age between 30-40 while less than half (45.6%) of non-practicing group their age between 40-55. Concerning gender our study results concluded that about three quarters (72.2%) of the practicing group were females and more than half (57.8%) of non-practicing group were males. In addition, concerning level of education this study showed that more than half (51.1%) of practicing group and only less than one third (23.3%) of non-practicing group had university education. While regarding residence the current study results illustrated that more than two third (62.2%) of non-practicing group lived in rural area and only about one third (32.2%) of practicing group lived in rural area. As regards to the monthly income, this study demonstrated that more than two third (64.4%) of practicing group and more than half (48.9%) of non-practicing group have sufficient monthly income. This finding is in agreement with ^[34], "who studied sociodemographic determinants of management behaviour of diabetic patients. Part I, behaviour of patients in relation to management of their disease. They stated that younger age newly diagnosed patients were likely to be more educated". The current study results were congruent with ^[35] "they studied structured vs. unstructured self-monitoring of blood glucose in type II diabetes, they found there is significant relationship between patients' demographic characters and SMBG as ours" while current study results were in contrast with ^[36,37] "they found no significant relationship between diabetic patients' sociodemographic characteristics and self-monitoring of blood glucose (SMBG)". These variations between our results and other studies may be attributed to geographical and cultural differences between each study subjects and settings.

Answering the fifth research question, is there any significant relationship between patient's knowledge and sociodemographic characteristics of diabetic patients among both study groups? The current study illustrated that there were statistically significant relationships regarding age, gender, occupation, educational level and monthly income. Regarding subjects' age, the present study results clarified that more than half (57.1%) of practicing group had satisfactory knowledge level and their age were between 30-40 years, while more than half (51.1%) of non-practicing group had unsatisfactory knowledge level and their age were between 40-55 years. More over concerning gender the present study revealed that almost of the practicing group had satisfactory knowledge level and were females (87.1%), while more than half (53.1%) of non-practicing group had unsatisfactory knowledge level and were males. In addition, the current study findings illustrated that regarding occupation approximately two thirds (55.6%) of practicing group had satisfactory knowledge level and were employers, while more than one third (36.7%) of non-practicing group had unsatisfactory knowledge level and were employers. Concerning educational level our study concluded that approximately two thirds (57.1%) of practicing group had satisfactory knowledge level and were university educated, while more than one third (51%) of non-practicing group had unsatisfactory knowledge level and were primary educated. In addition, regarding monthly income the current study findings illustrated that more than three quarters (81%) of practicing group had satisfactory knowledge level and had sufficient income, while more than two thirds (63.3%) of non-practicing group had unsatisfactory knowledge level and had insufficient income.

The current study results were congruent with ^[34], "who stated that younger age newly diagnosed patients were likely to be more educated thus were keen to have more new skills to struggle against their disease". This study results were also in agreement with ^[38,39], "they reported a significant positive relationship

between the level of knowledge and the educational level, working status and the social class; illiterates and those not working and of low social classes were more likely to have lower level of knowledge compared with literates, working and those belonging to high class. This was in the same line with ^[40]; they found that knowledge related to disease improved with a corresponding increase in the level of education and socioeconomic status and with working status. Those of a higher educational level and of a better socioeconomic standard have a greater probability of obtaining knowledge from books and other sources such as mass media. They have no barriers in communicating with the health care team, and they may grasp knowledge correctly. However these findings were in contrast with ^[41], "who revealed that all participants had lack of knowledge about medication and diet to manage their diabetes effectively regardless of the time since diagnosis".

In addition, the current study results were in dissimilarity with ^[42] "who ascertained that the patients' residence affected their level of knowledge as those living in the rural areas had significantly lower level of knowledge compared with those living in urban areas". This discrepancy between the present study results and the other studies results' may be attributed to the methodological, cultural background and geographical differences.

Answering the sixth research question, is there any significant association between the current study variables and each other? The current study findings illustrated that there is a positive association between patients' knowledge level and compliance level regarding diabetes mellitus among both study groups. These result are in accordance with that of the study conducted by ^[43,44,45] in Nigeria, Libyan Arab Jamahiriya and Omani pilgrims to Mecca respectively "They all found nearly similar results; that intervention SMBG group had good knowledge and adequate compliance level regarding diabetes mellitus than Control group (non-SMBG) which indicated positive association between level of knowledge and level of compliance". This similarity between our findings and those studies might be justified by common share of the cultural background of diabetic patients with these countries despite the geographic variation and ascertain that knowledge plays an important role to promote patient's compliance to control diabetes.

Regarding association between patients' attitude and compliance level toward diabetes mellitus among both SMBG (practicing and non-practicing) groups; the present study illustrated that there was a positive association between patients' attitude and compliance level as $P < 0.001$. This finding was in congruence with ^[46], who studied "Assessing the Knowledge, Attitude and Compliance of Diabetes Mellitus among Diabetes Patients in Dhaka City, Bangladesh. They found a positive association between compliance and attitude of diabetic patient". This result was in contrast to that of ^[47] in New Zealand who studied "An Assessment of Attitudes, compliance, and outcomes of Patients with Type II Diabetes". They found that no association between attitude and compliance regarding diabetes between performing blood glucose regularly and not performing blood glucose". The apparent discrepancy between results can be explained by higher level of perceptions noted among SMBG performing group and may be related to methodological differences in the tools used for assessing patient's compliance.

Concerning the association between diabetic patients' knowledge and attitude regarding diabetes mellitus among both study groups; the present study revealed that there was a positive association between level of knowledge and level of attitude as $P < 0.001$. This result agreed with ^[27] in Pakistan, who studied "Knowledge, Attitude and Practice of Blood Glucose Monitoring in Rural Area among Diabetic Patients. They reported a significant relation between knowledge and attitude". This finding indicated that information plays an important and effective role in positively changing the patient's attitude.

V. Conclusion

Self-monitoring of blood glucose was an effective tool that implicated change in diabetic patients' knowledge, attitude and compliance toward diabetes mellitus if it was an integral part of the patient's treatment regimen.

Recommendations

- More awareness and education programs are needed for diabetic patients about the important role of blood glucose self- monitoring to achieve the desired therapeutic goals.
- Health care providers should include SMBG in the patient's treatment regimen.
- Further research on a larger sample is needed using a multidisciplinary approach to cover different settings not only hospitals.

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