Practice and perception of self-management among diabetics in Taif, KSA: impact of medical factors

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Abstract

Background: Effective self-management of diabetes has long been acknowledged as essential in the maintenance of good glycemic control and prevention of diabetic complications.

Objectives: To assess practice and perception of diabetic patients regarding self-Management in Taif region as well as to collaret specific medical characteristics associated with their practice.

Subjects and methods: A cross-sectional study was conducted including diabetic patients, who attended the Family Medicine and Endocrinology clinics during regular day working hours (from 8:00 am – 4:00 pm) throughout January, 2011. They were recruited from four hospitals, belonging to Ministry of Defense and Aviation and Ministry of Health by stratified random sampling. An interview was conducted to determine subject's practice, regarding self-management, and potential factors influencing this practice and these practices of self-management using the SDSCA questionnaire.

Results: A total of 386 respondents were interviewed in the current study. Their age ranged between 20 and 70 years with a mean of 49.03±13.05. More than half of them were males (56.7%) with a male to female ratio of 1.3:1. The duration of diabetes mellitus was more than 8

years in 46.1% of the participants. More than one-third of participated diabetic patients were aware of their type of diabetes (38.9%) while less than one-third of them were aware of Haemoglobin A1c (29.3%). The highest level of practice was observed regarding compliance with medication (94.7%), while the lowest level of practice was detected regarding blood glucose testing (22.4%). Their practice regarding specific diabetic diet, practicing physical exercise and foot care were 41.7%, 41.2% and 53.4% respectively.

Conclusion: This study reflects the poor practice about the management plan of diabetic care particularly the non-pharmacological component of the plan. As it has been observed that compliance is better with medical aspects of the regimen (e.g. medications) than with life style aspects of the regimen (diet and physical exercise).

Keywords: Self monitoring; practice; compliance, Diabetes mellitus; Haemoglobin A1c

Running title: Self-Management among Diabetics

Introduction

One of the greatest challenges faced by the modern world is Diabetes mellitus (DM). The physical, social and economic factors involved in the management of diabetes are continuous strain for the health sector and the government Organization. [1] It is expected that approximately 366 million people will be affected by Diabetes mellitus by the year 2030. [2] Saudi Arabia is estimated to spend between 620 and 1,142 million International dollars. According to WHO records, almost one Saudi diabetes mellitus person is costing the government about $800 per month. The annual cost of treating diabetes in Saudi Arabia is about $9.6 billion. [3]

Diabetes mellitus is by far the most common metabolic disorder; it is due to insulin deficiency or inefficiency, which results in a state of hyperglycemia. The classification of diabetes mellitus given by The Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus in 1997 is universally adopted. [4] Type 1 diabetes appears as a result of autoimmune destruction of beta cells or may be idiopathic. The more common type 2 DM, affecting mostly adults manifests as a result of insulin resistance. The other specific types are impaired fasting glucose (IFG), impaired glucose tolerance (IGT), gestational diabetes and some genetic defects of Beta cells. The Glycosylated hemoglobin (A1c) is one of the best indicators of diabetes control. [4]

The benefits of tight blood glucose control in decreasing the incidence and progression of microvascular and macrovascular complications in type I and type II diabetes had been well established in the last two decades. So, the disease contributes to the development of peripheral neuropathy and nephropathy and is the leading cause of new blindness. In addition, patients with diabetes are two to four times as likely as non diabetics to have heart disease or stroke.[5]

However Stringent glycemic control reduces complications and health care costs for people with diabetes.[6]

The prevalence of diabetes varys widely worldwide. It has been shown that the prevalence of diabetes is constantly on the rise and this is believed to result from urbanization and socioeconomic developments, which are associated with rapid changes in lifestyle. [7]

The global prevalence of diabetes has reached 5%, with type 2 diabetes contributing 85-95% of all cases. In the Kingdom of Saudi Arabia (KSA), overall prevalence of DM in adults is 23.7 %.[9] With the increasing demand for better management of type 2 diabetes, attention has focused on the potential benefits of self-management of   diabetes. [9]

Unfortunately, diabetes-specific disease management support occurs inconsistently during outpatient visits, and information that patients receive is often poorly understood or does not take into account their values and life circumstances. [10] Despite the initial successful impact of oral medication, patients find it difficult to implement and sustain the treatment and lifestyle advice given by healthcare professionals. This may in part relate to traditional approaches to management in which patients are passive recipients of care. [11]

A cross-sectional study done in Najran, KSA showed that 56% of a total of 342 patients had adequate practice about the symptoms of hypoglycemia. Although it is well known that patients passively learn to recognize the symptoms once they suffer from it, it was noteworthy that almost half of them did not have adequate practice of the disease. [12] Similar finding has been reported from the Al-Qassim region. [13] In addition, patients with Diabetes mellitus often lack sufficient practice about their disease and thus frequently have poor self-management skills. Patients' ability to understand and carry out their individual treatment regimens is critical to the control of diabetes mellitus. [5] However, patients who know more about this disease often do

better than those who rely on drug therapy alone. Patients who work to make themselves healthy (for example, by exercising regularly or by losing weight) also do better. [5]

Health providers developed formal programs to teach patients with chronic disorders what they need to know and do to make their health as good as it can be. These programs are called self-management programs because patients are taught to manage more of their health themselves. [6]

Self-management interventions defined as programs that helped patients actively participate in monitoring their conditions or in decisions related to managing their conditions [6] (i.e., the nutritional management, describing the diabetes disease process and treatment options, physical activity into lifestyle, Utilizing medications blood sugar mentoring, foot care …etc.). [14]

Because effective diabetes self-management support requires a complex series of assessments and instructions, patients often require additional support and communication outside of the traditional clinician visit. [10] Effective self-management of diabetes has long been acknowledged as essential in the maintenance of good glycemic control and prevention of diabetic complications. [15]

The importance of self-management skills in diabetes care has been stressed by the American Diabetes Association (ADA) and the Veterans Health Administration (VHA). Patients' ability to understand and carry out their individual treatment regimens is critical to the control of diabetes mellitus. To promote self-management, the treating institution should develop a statement of short-term and long-term goals specific to each patient's needs. These goals should include the patient's medication use, nutrition plan, lifestyle, monitoring requirements, annual comprehensive dilated visual examination, and podiatry care. [5]

Effective self management is considered the cornerstone of successful diabetic control, and self monitoring of blood glucose may have a role in this. [16, 17] So, there is a need for all health professionals to rethink current approaches to the concept of self management in chronic disease management including diabetes. The growing shortage of both doctors and nurses, together with the fact that diabetes account for a rising proportion of the workload of all health professionals, means that it is not feasible to continue providing care without promotion of self-management. [1]

Guidelines on the recommended frequency and timing of self-management vary among international diabetes associations, and patients are often unaware of actions they should take in response to SMBG. [18] ADA recommends that patients' knowledge of the self-management responsibility be assessed annually. [5]

Self monitoring can be used in conjunction with appropriate therapy as part of integrated self-management. Thus the recommendation to self monitor appears in guidance to doctors, although its clinical benefit remains inconclusive. [17] Self monitoring of blood glucose (SMBG) also represents a large component of management costs in other countries. Improvements in hemoglobin $A1_c$ levels are associated with reduced rates of long term complications from diabetes. Although these improvements may lead to gains in quality adjusted life expectancy and generate savings within the healthcare system, self monitoring has opportunity costs, as the funds allocated could potentially be used to finance other aspects of the management of non-insulin treated type 2 diabetes. It is therefore important to establish whether self monitoring represents a cost effective use of resources. [9]

Although self monitoring of blood glucose concentrations is widely advocated by healthcare professionals for patients with type 2 diabetes mellitus, there is conflicting evidence

as to its value. Self monitoring might contribute to management in two ways. Firstly, it might improve glycaemic control by reinforcing beneficial self management behaviors and compliance with medication. Secondly, the process of monitoring and the immediate feedback it provides on glycaemic control might affect patients' experience and determine attitudes to their diabetes and satisfaction with treatment. [13, 19] For type 2 diabetes, there is still no firm agreement among diabetes health professionals and in the research literature about the role and value of self monitoring.

Despite the lack of conclusive evidence of an association between self monitoring of blood glucose and glycaemic control (even in large scale observational studies with heterogeneous groups of patients and findings that self monitoring may lead to anxiety), clinical practice guidelines often promote self monitoring by patients with type 2 diabetes. They stress that it can be useful in preventing hypoglycemia and adjusting medications, medical nutritional therapy, and physical activity. They often refer to research that supports self-monitoring. [17]

A study of diabetics in Qassim region, Saudi Arabia revealed that the status of self-management among diabetic subjects is modest and calls for a health strategy to improve it. [13]

This study aimed to assess practice and perception of diabetic patients regarding self-Management in Taif region as well as to collaret specific medical characteristics associated with practice that may affect patients perceptions regarding diabetes self-management.

Subjects and methods

A cross-sectional study was conducted at Al Hada Armed Forces Hospital, Prince Mansour community Hospital, which are belonging to Ministry of Defense and Aviation as well as King AbdulAziz and King Faisal Hospitals, which are belong to Ministry of Health. Taif Region, Saudi Arabia. Taif is a city in the Makkah Province of Saudi Arabia at an elevation of

1700 meters above sea level, on the slopes of the Al-Sarawat mountains. It has a population of 987914 (2010 census). [20] It has 11 hospitals that provide both secondary and tertiary care services.

This study included Saudi diabetic patients Types 1 and 2), who attended the Family Medicine and Endocrinology clinics during regular day working hours (from 8:00 am – 4:00 pm) throughout January, 2011 provided that their age ranged between 20 and 70 years.

Total number of Saudi diabetic patients in Taif city was estimated to be about 200000, This figure was calculated based on findings of Al-Nozha, et al (2004), who reported that prevalence of diabetes among Saudi population was about 24% .[9]

Sample size of the current study was calculated assuming that 70% of diabetic patients are not adherent to any self-management approach.[21-23] At 95% confidence interval and 5% worst acceptable limit, the estimated sample size was 323 using Epi-Info version (3.3.2). The number was increased to 400 to compensate for drop outs.

Using Stratified random sampling technique (proportional allocation) was used to select study participants. Hospitals at Taif city were stratified according to level of health care service they are providing. Taif city includes 2 tertiary care hospitals (i.e., AlHada belongs to Ministry of Defense and King AbdulAziz belongs to Ministry of Health) and 2 other hospitals providing secondary health care services (i.e., Prince Mansour belongs to Ministry of Defense and King Faisal belongs to Ministry of Health) in addition to several primary health care centers/clinics and private hospitals and polyclinics. Diabetes clinics at tertiary and secondary health care hospitals were selected as study sites. Proportional allocation method was applied to determine number of study participants based on number of diabetes clinics at each site and estimated number of patients attending these clinics. There was only one clinic at Al Hada, King

AbdulAziz and Prince Mansour hospitals. However, there are 2 diabetes clinics at King Faisal Hospital. Accordingly, the required sample from each studied hospital was as follows: (Al-Hada = 88 patients, Prince Mansour= 88 patients, King Abdulaziz = 88 patients and King Faisal= 136 patients. At each site, patients were selected by systematic random sampling technique, where every 3rd eligible patient was asked to voluntarily participate in the study till the required sample was reached. At the study sites (i.e., clinics of Armed Forces Hospital and King Abdul-Aziz Specialist Hospital), during regular day hours from 8.00 am-4.00 pm and during four weeks period were asked to participate in the study.

An interview administered questionnaire was utilized for data collection. Data collected by the researcher in each hospital. The questionnaire included the following information: sociodemographic characteristics of the patients and their practice and perceptions regarding self-management, diet, exercise, blood sugar mentoring, foot care and taking medications. The SDSCA questionnaire (Appendix 1) developed by Toobert et al. (2000) [24] measured diabetes self-care behavior of participants. The SDSCA is a brief self-report questionnaire of diabetes self-care management assessing the following aspects of the diabetes regimen: general diet, specific diet (e.g. fruits, vegetables...etc), exercise, blood glucose testing, foot care, medication and smoking. The scale includes 11 core items. Respondents reported on the frequency with which they have completed these activities over the preceding 7 days. The instrument used an 8-point Likert scale (0-7) which represents the number of days per week. Scores were calculated separately for each of the regimen areas. A sample item was "On how many of the last 7 days did you test your blood sugar?" The SDSCA assessed personal levels of self-care and did not measure adherence or compliance to the diabetes regimen. The SDSCA is probably the most

widely used self-report instrument for measuring diabetes self-management in adults. [24] The questionnaire was proved to be reliable and valid.

Approval of the Research and Ethics Committee at Taif Armed Forces Administration to conduct the study was obtained. Written informed consent have been obtained from every patient.

Statistical analysis

Data were collected and analyzed using SPSS version 16. The following statistics were applied: Descriptive statistics: number, percent, means, median and standard deviation. Analytic statistics: Since the variables were abnormally distributed, non-parametric statistical tests were applies. Mann-Whitney test was applied to compare 2 independent quantitative variables and Kruskal-Wallis test to compare more than 2 independent quantitative variables. Significance was determined at p value ≤ 0.05.

Results

The study included 386 diabetic patients. Table (1) presents their demographic characteristics. Their age ranged between 20 and 70 years with a mean of 49.03±13.05. More than half of them were males (56.7%) with a male to female ratio of 1.3:1 The majority of them were married (82.9%), have enough income (80.1%) and private house (76.7%). Almost one-quarter of patients were illiterate (23.3%) while 18.7% were university graduated. Forty-two percent were unemployed and 26.2% were retired.

From figure (1), it is obvious that the duration of diabetes mellitus was more than 8 years in 46.1% of the participants. More than one-third of participated diabetic patients were aware of their type of diabetes (38.9%) as illustrated in figure (2) while less than one-third of them were

aware of Haemoglobin A1c (29.3%) as obvious from figure (3). In 63.7% of patients, diabetes

was accompanied by other co-morbid chronic diseases. Hypertension represents 37% of them as

shown in figure (4).

Table (1): Demographic characteristics of the participated diabetic patients (n=386)

| Socio-demographic variables	No.	%
Age in years		
≤50	200	51.8
>50	186	48.2
Range	20-70 years	
Mean ±(SD)	49.03± 13.05	
Gender		
Male	219	56.7
Female	167	43.3
Marital status		
single	66	17.1
Married	320	82.9
Educational level		
Illiterate	90	23.3
Elementary	92	23.8
Intermediate/secondary	132	34.2
University	72	18.7
Job		
Civil servant	58	15.0
Military	42	10.9
Private sector	4	1.0
Student	19	4.9
Retired	101	26.2
Unemployed	162	42.0
Housing		
Private	296	76.7
Rent	90	23.3
Income		
Enough	309	80.1
Not enough	77	19.9
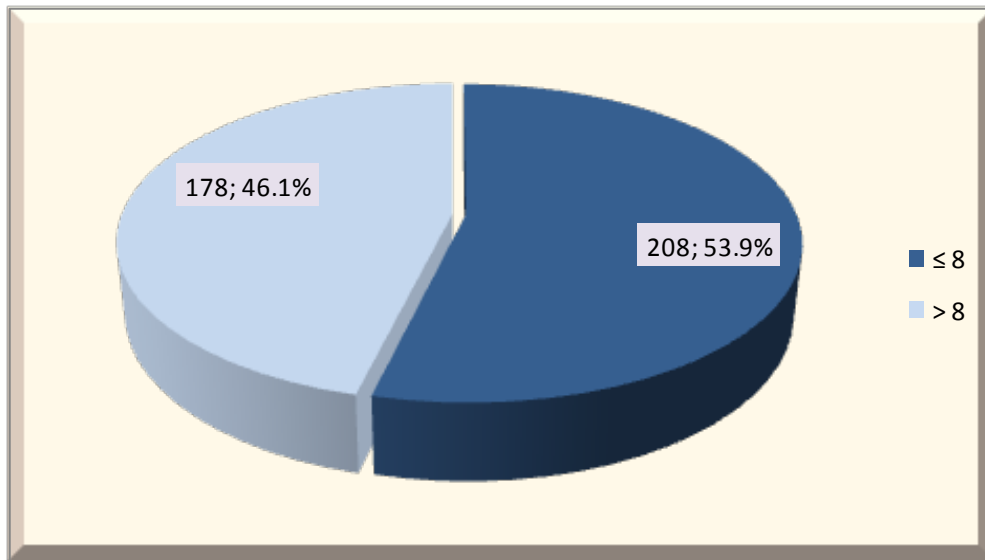
Figure (1): Duration of diabetes in years among participants.
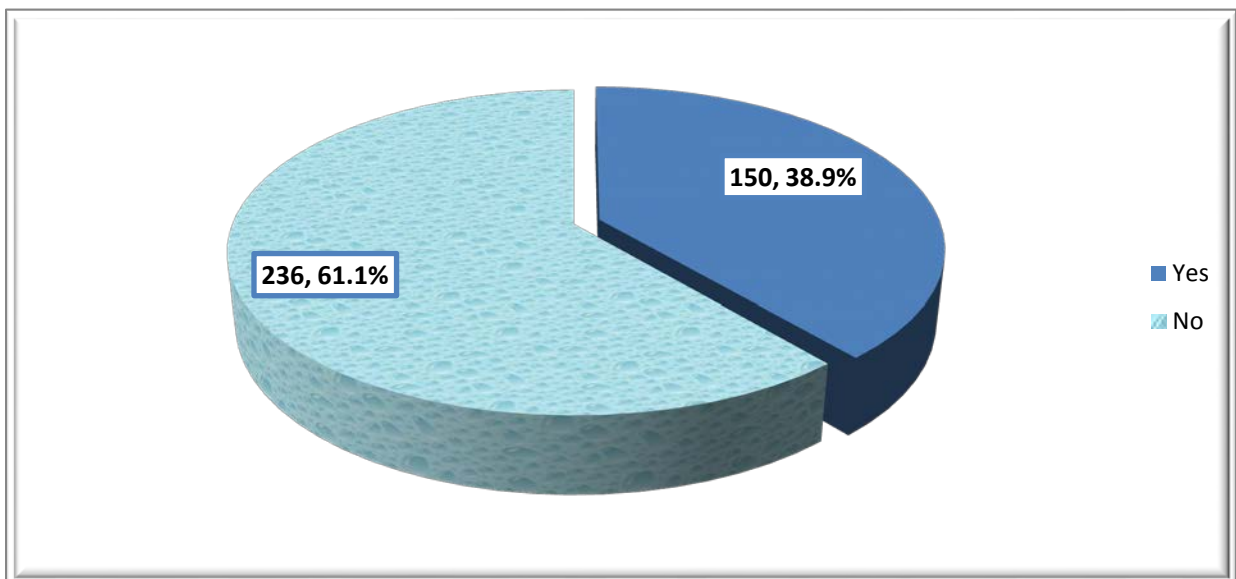

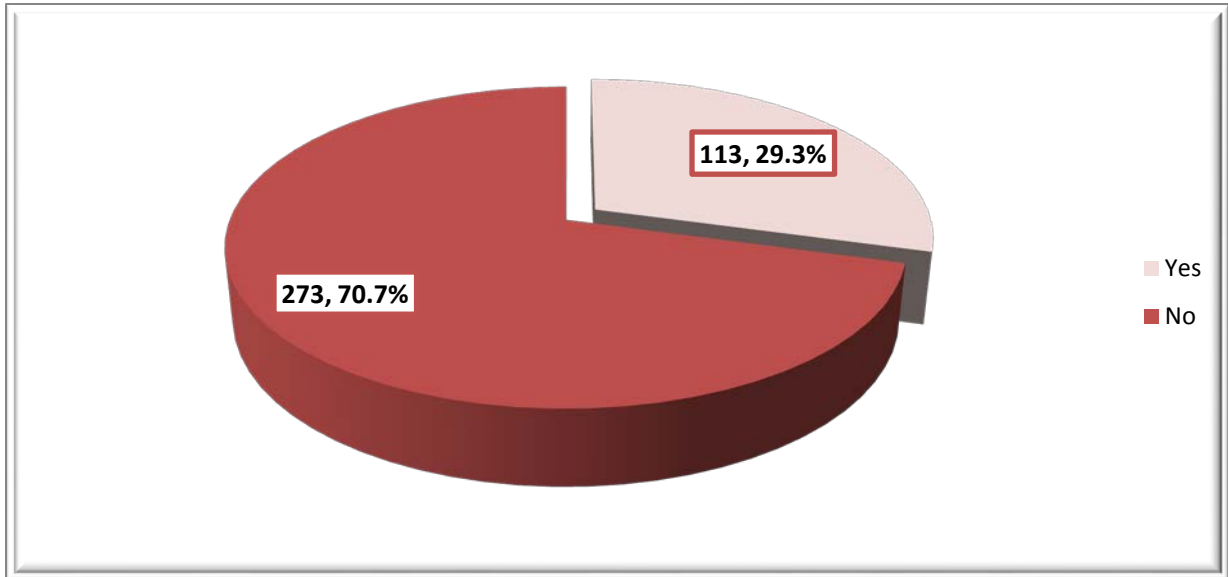**Figure (2): awareness of patients about their type of diabetes.**

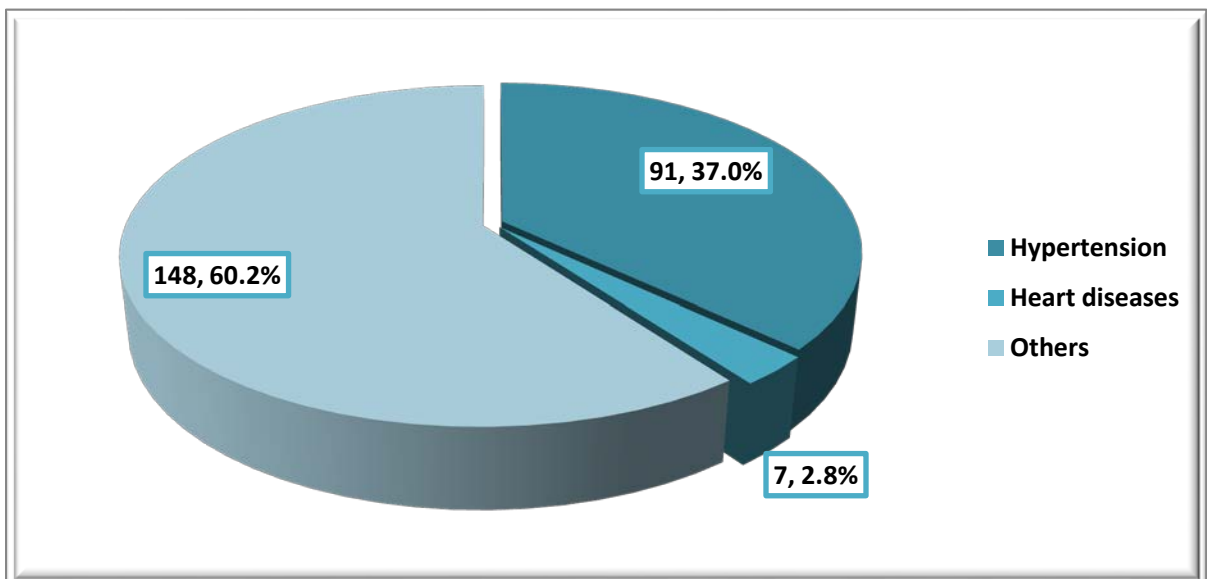**Figure (3): Distribution of diabetic patients according to their awareness of hemoglobin A1c.**

Figure (4): History of chronic diseases among participants.

Practice of diabetic patients

Figure (5) illustrates the mean percentage of practice of diabetic patients regarding different desired self-care behavior. The highest level of practice was observed regarding compliance with medication (94.7%) while the lowest level of practice was detected regarding blood glucose testing (22.4%). Their practice regarding specific diabetic diet, practicing physical exercise and foot care were 41.7%, 41.2% and 53.4% respectively.
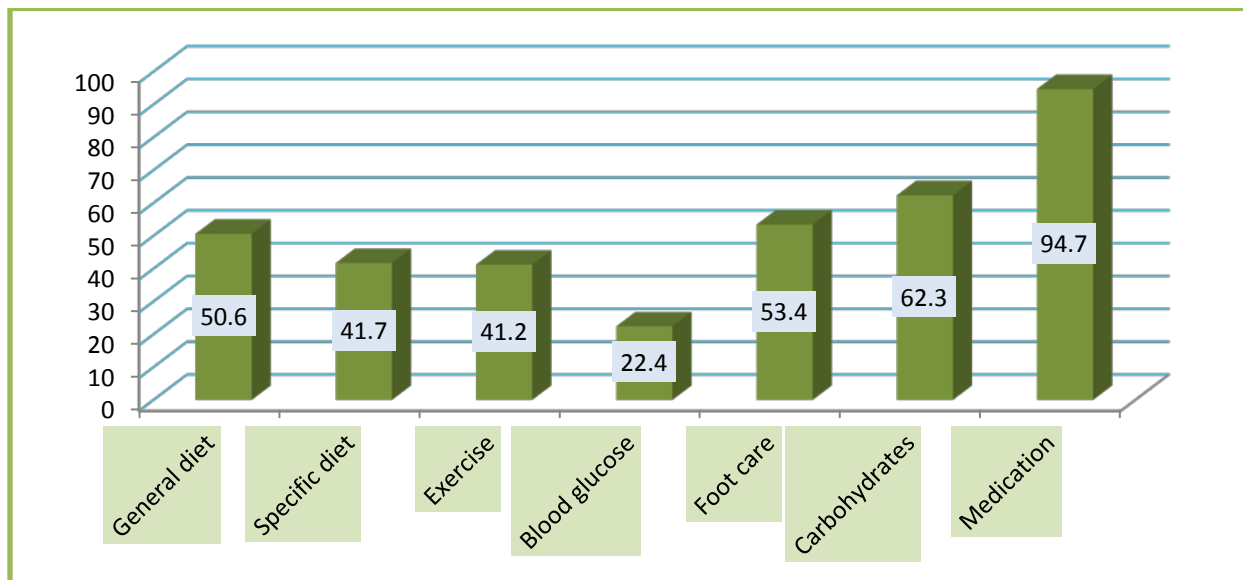
Figure (5): The mean percentage of practice of diabetic patients regarding different aspects of DM.

Medical factors affecting practice of diabetic patients for general diet advice

As shown in table (2), no statistical significant differences were reported between mean percentage of adherence to general diet among the studied patients and years of DM, knowledge about DM, knowledge about HBA1c and having other chronic diseases (p > 0.05).

Table (2): Medical factors affecting practice of diabetic patients for general diet advice

Variables	General diet		Test of Significance	P Value
	Mean % (SD)	Median%		
Years of DM **<8** (n=208)	47.08±40.81	50.00		
>8 (n=178)	54.78±39.91	57.14	1.73	0.083*
Know of DM No (n=236)	50.15±41.85	57.14		
Yes (n=150)	51.38±38.48	57.14	0.06	0.952*
Know of HBA1C No (n=273)	48.43±41.34	50.00		
Yes (n=113)	55.94±38.17	64.29	1.42	0.155*
Other chronic No (n=140)	55.00±38.61	60.71		
Yes (n=246)	48.14±41.45	50.00	1.32	0.187*

* Mann-Whitney test

Medical factors affecting practice of diabetic patients for specific diet advice

As displayed in table (3), patients who reported having good knowledge about DM were more adherent to specific diet than those who do not have enough knowledge (p=0.02). Moreover, patients who know about HA1c were more adherent to specific diet recommendations than those who do not know about it (p=0.048). Patients without other chronic conditions were significantly more adherent to specific diet than patients who are complaining of other chronic conditions (p=0.02).

Table (3): Medical factors affecting practice of diabetic patients for specific diet advice

Variables	Specific diet		Test of Significance	P Value
	Mean% (SD)	Median%		
Years of DM <8 (n=208)	40.21±27.13	35.71		
>8 (n=178)	43.50±27.16	42.86	1.16	0.247*
Know of DM No (n=236)	39.19±26.77	35.71		
Yes (n=150)	45.71±27.37	50.00	2.33	0.020*
Know of HBA1C No (n=273)	40.06±27.26	35.71		
Yes (n=113)	45.76±26.60	50.00	1.98	0.048*
Other chronic No (n=140)	45.77±25.33	50.00		
Yes (n=246)	39.43 ±27.94	35.71	2.41	0.016*

* Mann-Whitney test

Medical factors affecting practice of diabetic patients for physical exercise advice

Table (4) shows that knowledge about HA1c and absence of other chronic conditions are significantly related to more adherence to exercise recommendations among the studied patients (= 0.001 and 0.03, respectively). Patients with no other chronic conditions were more significantly adhere to exercise recommendations than those who are complaining of other chronic conditions (p=0.032).

Table (4): Medical factors affecting practice of diabetic patients for physical exercise advice

Variables	Physical exercise		Test of Significance	P Value
	Mean% (SD)	**Median%**		
Years of DM <8 (n=208)	41.86±31.91	50.00		
>8 (n=178)	40.41 ±35.73	42.86	0.85	0.397*
Know of DM No (n=236)	38.32±34.05	50.00		
Yes (n=150)	45.71 ±32.72	50.00	1.77	0.077*
Know of HBA1C No (n=273)	37.65±33.81	35.71		
Yes (n=113)	49.75 ±31.94	50.00	3.28	0.001*
Other chronic No (n=140)	45.51±30.26	50.00		
Yes (n=246)	38.73 ±35.32	46.43	2.15	0.032*

* Mann-Whitney test

Medical factors affecting practice of diabetic patients for blood glucose testing advice

Table (5) shows that knowledge about DM, knowledge about HBA1c and having other chronic

conditions are significantly associated with better adherence to blood glucose testing (p< 0.05).

Table (5): Medical factors affecting practice of diabetic patients for blood glucose testing advice

Variables	Adherence to blood glucose testing		Test of Significance	P Value
	Mean%± SD	Median%		
Years of DM <8 (n=208) >8 (n=178)	22.91±32.69 21.79±32.11	7.14 7.14	0.38	0.703*
Know of DM No (n=236) Yes (n=150)	14.35±25.71 35.05±37.47	0.00 21.43	6.19	<0.001*
Know of HBA1C No (n=273) Yes (n=113)	17.40±28.80 34.45±37.20	0.00 21.43	4.61	<0.001*
Other chronic No (n=140) Yes (n=246)	34.16±28.37 30.89±18.99	14.29 0.00	3.23	0.001*

* Mann-Whitney test

Medical factors affecting practice of diabetic patients for medication advice

As shown in table (6), only years of DM are statistically significant with adherence with medication recommendations although the mean percentage of adherence is generally above 90%.

Table (6): Medical factors affecting practice of diabetic patients for medication advice

Variables	Medication		Test of Significance	P Value
	Mean % (SD)	**Median%**		
Years of DM				
<8(n=200)	91.64±24.73	100.00	3.59	<0.001*
>8 (n=177)	98.22±12.05	100.00		
Know of DM				
No (n=232)	95.69±18.25	100.00	0.85	0.369*
Yes (n=145)	93.20±22.66	100.00		
Know of HBA1C				
No(n=265)	93.75±21.84	100.00	1.72	0.086*
Yes (n=112)	97.07±14.87	100.00		
Other chronic				
No (n=136)	96.01±17.88	100.00	0.87	0.384*
Yes (n=241)	94.01±21.20	100.00		

* Mann-Whitney test

Medical factors affecting practice of diabetic patients about foot care

As shown in table (7), only having knowledge about HA1c is significantly associated with more adherence to proper foot care (p=0.002).

Table (7): Medical factors affecting practice of diabetic patients about foot care

Variables	Foot care		Test of Significance	P Value
	Mean% (SD)	Median%		
Years of DM <8(n=208) >8 (n=178)	50.24±44.28 57.14 ±42.45	50.00 50.00	1.60	0.110*
Know of DM No (n=236) Yes (n=150)	53.81±44.28 52.81±42.45	50.00 50.00	0.23	0.822*
Know of HBA1C No(n=273) Yes (n=113)	48.93±43.73 64.29 ±41.25	50.00 100.00	3.13	0.0028
Other chronic No (n=140) Yes (n=246)	52.86±44.18 53.75±43.25	50.00 50.00	0.25	0.804*

* Mann-Whitney test

Medical factors affecting practice of diabetic patients about carbohydrate diet

As shown in table (8), no statistical significant association between adherence to carbohydrate diet and years of DM, knowledge about DM, knowledge about HBA1c and having other chronic condition (p>0.05).

Table (8): Medical factors affecting practice of diabetic patients about carbohydrate diet

Variables	Carbohydrate diet		Test of Significance	P Value
	Mean% (SD)	Median%		
Years of DM ＜8(n=208)	60.99±41.19	71.43	0.33	0.745*
＞8 (n=178)	63.80±40.21	85.71		
Know of DM No (n=236)	62.47±41.77	85.71	0.56	0.578*
Yes (n=150)	62.00±39.13	71.43		
Know of HBA1C No(n=273)	59.97±41.55	71.43	1.33	0.183*
Yes (n=113)	67.89±38.21	85.71		
Other chronic No (n=140)	65.92±38.15	85.71	0.90	0.369*
Yes (n=246)	60.22±42.04	71.43		

* Mann-Whitney test

Discussion

The importance of glycaemic control in the management of DM has been highlighted by the Diabetes Control and Complications Trial, [25] which found an approximately 50% to 70% reduction in the risk for retinopathy, nephropathy and neuropathy when there was intensive therapy for type 1 DM. Similar dramatic reductions in the risk of microvascular complications in type 2 DM were found in the United Kingdom Prospective Diabetes Study.[26] However, the standard of care for DM is suboptimal in most clinical settings. [27-29]

It is documented that the best performance in self-management is achieved when patients with diabetes have a high degree of practice of diabetes management, positive attitudes toward diabetes, strong self-efficacy for self-management and perceptions of good social support. [30] In the present study, diabetic patients had insufficient level of practicing different desired self-care behavior such as testing blood glucose (22.4%), following special diet (41.7%), importance of physical exercise (41.2%) and foot care (53.7%). The high level of practice was reported only in compliance with medication (94.7%). These results were not consistent with Kamel and his colleagues (2003) in a study conducted in Egypt and concluded that almost all patients had high level of knowledge towards different desired self-care behavior. [31] The discrepancy between the two studied may be explained in the view of the difference in the tools used in measuring patients` practice about different items of self-care behavior. Similar to our findings, poor level of knowledge and self-care reported from Al-Qassim, [13] the Eastern Province, [32] and Najran [12] in KSA.

Diet is considered the backbone of any management plan for diabetes mellitus in its self-care component and the American Diabetic Association emphasizes this issue. [26] This study indicated that mean percentage of following a special diet was 41.7%. This study was not exception among other studies conducted by Kamel [31] and Muninarayana [15] in this regard that reported compliance to diet ranged from 59.7% -63%. These results were in agreement with Khattab and his colleagues in a study conducted in Saudi Arabia (2010) [23] and reported that compliance with appointments and drugs was much better than compliance with diet.

Physical exercise is another important part in managing patients with diabetes mellitus because it improves insulin action in both types of the disease. [33] In spite of the importance of physical exercise, it has a low score in the current study (41.2%). These results were in common

with Khattab study (2010).[23] This also concurs with some eastern[29] and western studies of the world,[34] where it has been observed that compliance is better with medical aspects of the regimen (e.g. medications) than with life style aspects of the regimen (diet and physical exercise).

Kattab and his colleagues (2010) have emphasized an important issue on reporting that poor performance of diabetic patients in this aspect of the life style of Saudi population as a whole. [23] In agreement with that, the low results in the present study and the above mentioned studies denoting existing of barriers to follow the world-wide recommendations regarding life style modification that leads eventually to achieving favored self-care behavior and optimal outcome of diabetic program.

Regarding home testing of urine and blood sugar, the practice of diabetic patients was very low in the current study. (The mean percentage was 22.4%). These results were in consistent with others done in Saudi Arabia,[12] where only 6% of patients were performing urine sugar testing (dipstick method) regularly at home. Although education regarding this is routinely given to all new diabetics admitted to the hospital. We found females performing the tests more significantly than males, possibly because most women in Saudi Arabia are housewives and have enough time to perform these types of tests, whereas most males are working away from home. Those of younger age and higher educated more significantly performed blood testing, probably due to technical difficulties encountered in using the glucometer at home.

Regarding the compliance with medications, in agreement with Kamel et al., (1999)[35] who reported that more than three quarters (78.3%) of the studied diabetic patients adhered well to the medical treatment prescribed, the obtained results of the current study concluded that the mean percentage of diabetic patients` practice about their medications was 94.7%. Also, the

results of the present study were close to those obtained from a study conducted in Alexandria, Egypt (1997) by Shama [36] who found that 78.3% of diabetic patients were classified as having very good behavior regarding compliance with medications. In another study conducted in Ismailia city, Egypt (2003),[31] it was concluded that 89% of the diabetic patients have never forgot taking their medications or have forgot to take their medications sometimes.

These results almost go with Hussein (1999) [37] who stated that about 62.9% of studied diabetics were sticking to prescribed drug regimen. Also, the results were in agreement with Kravitz et al., (1993) [38] who reported that 91% of their patients took medications as prescribed. In addition, Anderson and Fitzgerald (1995) [39] reported an even higher rate of compliance with medication regimen. This considerable level of compliance with medications might be referred to diabetics` perception about drugs as the most important item in the diabetes management that might be on the expense of non-pharmacological items.

Health education is one of the areas which needs to be addressed immediately.[7] DM has been cited as a model disease in which patient education makes a big difference.[40] Home monitoring of blood glucose and urine testing for glucose[13] are considered major requirements for long-term glycemic control, thereby postponing, if not avoiding, long-term complications. Diabetics have to make very important and crucial decisions daily.

This study is not without limitations. The first is the conduction of the study in one setting (CDC at Prince Sulman Armed Forces hospital) in Tabuk ignoring other institutions which could have different economic conditions and socio-cultural characteristics. Thus, generalization of the results and conclusion is questionable. Secondly, its cross-sectional design, which precludes evaluation of the temporality and causality of the observed relationships. Finally, the date collected through interviewing patients, so it carries limitations associated with

all verbally administered surveys including recall bias, verbal misunderstandings, and the influences of participant and interviewer interaction.

In summary, this study reflects the poor knowledge and awareness about the management plan of diabetic care particularly the non-pharmacological component of the plan. It has been observed that compliance is better with medical aspects of the regimen (e.g. medications) than with life style aspects of the regimen (diet and physical exercise). Thus, immense need to direct more attention of physicians towards the non-pharmacological component of the management plan of diabetic care.

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