Diabetes Self-Care Activities (Diet & Exercise) and Adherence to Treatment: A Hospital –Based Study among Diabetic Male Patients in Taif, Saudi Arabia

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Abstract: Diabetes mellitus is a complex disorder that requires constant adherence to certain lifestyle measures and medication to achieve good glycaemic control. The main aim of this study was to measure adherence to self- care practices (diet, exercise and medication) among diabetic patients and to identify predicators of adherence. A hospital-based study was conducted in King Abdul Aziz Specialized Hospital, Taif, KSA during June – October 2013. Convenient method of sampling was adopted, whereby all adult (≥ 18 years) male diabetic patients were recruited. Data was collected through face-to-face interview method using structured questionnaire. Data was processed using the software Statistical Package for Social Science (SPSS) (Version 21). Overall 378 patients were eligible; 191 (50.5%) > 50 years old and nearly two third had secondary or university education. Overweight and obese patients constituted more than two third of the respondents. Generally adherence to diet, exercise was found to be low. Multivariate analysis showed that only presence of other diseases {adjusted OR 2.8 (1.3-6.0), P = 0.011} and marital status {adjusted OR 3.4 (1.0-11.7), *P* = 0.049} were found to be significantly associated with adherence to diet. Patients' age was the only predicator for patients' commitment to practicing exercise {adjusted OR 4.7(1.3-17.8), *P* = 0.020)}. Non adherence to medication was found to 80.6 % (n=305). In conclusion non-adherence to the studied self-care practices was suboptimal. Proper and continuous health education accompanied with patients' motivation may improve patients' adherence.

Keywords: Diabetes, self-care activities, diet, exercise, medication, adherence.

1. INTRODUCTION

The prevalence of diabetes is high among the Saudi population and represents a major clinical and public health problem [1]. Diabetes mellitus is a complex disorder that requires constant adherence to certain lifestyle measures and medication to achieve good glycaemic control [2].

Self-care management was defined as "an evolutionary process of development of knowledge or awareness by learning to survive with the complex nature of the diabetes in a social context" [3, 4]. In diabetic patients there are seven essential self-care behaviors associated with good clinical outcome. These are healthy eating, being physically active, monitoring of blood sugar, adherence to medications, good problem-solving skills, healthy coping skills and risk-reduction behaviors [5]. Several demographic, psychological, social, health care provider and medical system, and disease- and treatment-related factors potentially related to patients compliance [6].

Several studies conducted a round the world showed that adherence to self-care practices was sub-optimal. Zhou *et al.* [7] identified deficits in diabetes related knowledge and self-care practices among the majority of patients with uncontrolled blood glucose. Researchers found that knowledge of diabetes self-care and knowledge of cardiovascular complications increase as the knowledge of diabetes increases [8]. Thomas *et al.* [9] identified perceived difficulty taking part in exercise, feelings of tiredness, lack of time and lack of local facilities as main reasons for non adherence to exercise among diabetic patients. Barriers to adherence to healthy diet include; the cost, small portion sizes, support and family issues and quality of life and lifestyle issues [10].

Although researches have been published on self-care practices from different regions there is a limited data available on this topic in Saudi Arabia. Assessing patients self-care behaviors and identification of the factors that influence no-adherence to these practices will help in the designing of interventions aimed at improving patients clinical outcomes. Therefore, this study was conducted to measure adherence to self-care practices (diet, exercise and medication) and to identify patients, background factors associated with adherence to these behaviors among patients with type -2 diabetes.

2. METHODS

A cross- sectional hospital-based study was conducted in King Abdul Aziz Specialized Hospital, Taif, KSA during June – October 2013. Convenient method of sampling was adopted, whereby all adult (≥

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18 years) male diabetic patients on medical treatment were recruited. Verbal informed consent was obtained. Newly diagnosed patients and those who refused to participate were excluded. Data was collected through face-to-face interview method using structure questionnaire. The questionnaire was divided into three parts. The first part was designed to collect data on patients' background characteristics (age, residence, marital status, employment status, educational level, monthly income, presence of other disease, time since diagnosed with diabetes, type of current medication). The WHO classification of BMI was used to classify the patients as underweight (BMI <18.5 kg/ m^2), normal (BMI 18.5-24.9 kg/ m^2), overweight (BMI 25.0-29.9 kg/ m^2), and obese (BMI $\geq$ 30 kg/ m^2) [11]. Part two of the questionnaire was composed of four questions to investigate the patients' self-care activities (general diet 2 questions and exercise 2 questions) derived from the questionnaire developed by Toobert *et al.* [12] (Summary of Diabetes Self-Care Activities – (SDSCA). The Arabic translation of these questions was done previously by Aljohani [13]. The translation process was done through standardized methodology and tested for reliability and validity by the same author in another part of the country. Patients were considered adherent to healthy diet if admitted adherence for seven days and non-adherent if they did not. In practicing specific exercise or participating in 30 minutes physical activity the patients were considered adherent to this measure if they admitted participation for $\geq$ 5 days and non-adherent if they did this activity for < 5 days. Part three was designed to assess patients' adherence to treatment. Medication non-adherence was measured using the self-reported 4-item Morisky scale [14] which assesses patients' forgetfulness about taking medications, carelessness about taking medications, stopping medication when feeling better and stopping medication when feeling worse. Questions were answered as 'yes' and 'no' and scored one point for 'yes' and zero point for a 'no' response. Scores were summed to give total score, ranging from 0 to 4. Non-adherence was defined as a score greater than zero.

Data was processed using the software Statistical Package for Social Science (SPPS) (Version 21). Descriptive statistics were used to describe all variables. Mean and standard deviation (SD) were calculated for continuous variables. Frequency and percentage were calculated for categorical variables. Patients' background characteristics which showed significant association on bivariate analysis with both diet and exercise activities were fitted into multiple logistic regression model to determine the independent predicators for the studied diabetes self -care practices. *P* values of < 0.05 were considered statistically significant.

3. RESULTS

3.1. Patients' Background Characteristics

Overall 378 patients were eligible; of them 219 (57.9%) aged 40-65 years and 61(16.1%) were > 65 years. Patients who were living in the town were 307 (81.2%) and nearly two third had either secondary or

Table 1: Patients' Background Characteristics

Background characteristic	Frequency	Percent
Age		
≤50 years	187	(49.5%)
>50 years	191	(50.5%)
Residence		
Town	307	(81.2%)
Outside town	71	(18.8%)
Body mass index (kg/m^2)		
Underweight	6	(1.6%)
Normal	118	(31.2%)
Overweight	158	(41.8%)
Obese	96	(25.4%)
Marital status		
Married	283	(74.9%)
Unmarried	95	(25.1%)
Educational level		
Secondary & above	248	(65.6%)
Below secondary	130	(34.4%)
Employment status		
Working	198	(52.4%)
Not working	180	(47.6%)
Level of income (SR)		
< 5000	128	(33.9%)
5000-10000	159	(42.1%)
>10000	91	(24.1%)
Smoking		
Smoker	101	(26.7%)
Non –smoker	191	(50.5%)
Ex-smoker	86	(22.8%)
Co-morbidity		
Yes	205	(54.2%)
No	173	(45.8%)
Duration of diabetes		
≤ 5 year	128	(33.9%)
>5 years	250	(66.1%)
Type of medication		
Oral hypoglycemic	179	(47.4%)
Insulin	124	(32.8%)
Combined	75	(19.8%)
Total	378	100

university education. Patients suffering from other chronic diseases were 205 (54.2%), of them 173 (84.4%) were hypertensives and 110 (53.7%) were hyperlipidemics. Regarding body mass index, overweight and obese patients constituted more than two third of the respondents. Obesity significantly increased with patients' age (*P* = 0.011), in married more than single (*P* = 0.004) and among patients suffering from other chronic diseases (*P* = 0.010). Nearly two third of the patients diagnosed with diabetes for > 10 years and 179(47.4%) were on oral hypoglycemic agents. Table **1** shows patients' background characteristics.

3.2. Diabetes Self–Care Activities

Responding to the question "on average over the past month, how many days per week you followed your eating plan", out of the patients 327 (86.5%) admitted that their adherence was < 7days and only 51(13.5%) complied for 7 days {mean number of days 2.65± (2.48)}.

Out of the patients 344(91.0%) over the last week adhered to a healthy eating plan for ≤ 7days, compared to only 34(9.0%) admitted adherence for 7 days, {mean number of days 2.07± (2.33)}.

As shown in Tables **2** & **3** on bivariate analysis multiple patients' background characteristics were found to be significantly associated with adherence to healthy eating plan for seven days during the last month or during the last seven days. However; on multivariate analysis only presence of other diseases {adjusted OR 2.8 (1.3-6.0), P = 0.011} and marital status {adjusted OR 3.4 (1.0-11.7), *P* = 0.049} were found to be significantly associated with following a healthy eating plan for seven days during the last month and adherence to healthful eating plan during the last seven days respectively.

Regarding participation in at least 30 minutes of physical activities during the last seven days, 274 (72.5%) of the patients practiced this activity for < 5 days compared to 104(27.5%) admitted ≥ 5days participation, {mean number of days 2.64± (2.48)}. Out of the patients 357(94.4%) did not participated in a specific exercise session during the last seven days compared to only 21(5.6%) did this activity for > 5days

Table 2: Predicators of Following a Healthful Eating Plan for Seven Days During the Last Month

Background characteristic	Following a healthful eating plan during the last month		n	Univariable analysis		Multi-variable analysis	
	<7days	7days		Crude OR (95% CI)	P value	Adjusted OR (95%CI)	P value
Age							
≤50 years	93.0	7.0	187	1	0.000		
>50 years	80.1	19.9	191	3.3(1.7-6.8)			
Residence							
Town	88.6	11.4	307	1	0.015		
Outside town	77.5	22.5	71	2.3(1.2-4.4)			
Marital status							
Unmarried	92.6	7.4	95	1	0.049		
Married	84.5	15.5	283	2.3(1.0-5.3)			
Educational level							
≥Secondary	90.3	9.7	248	1	0.003		
< secondary	79.2	20.8	130	2.4(1.3-4.4)			
Employment status							
Working	89.4	10.6	198	1	0.087		
Not working	83.3	16.7	180	1.7(0.9-3.0)			
Co-morbidity							
No	94.2	5.8	173	1	0.000	1	0.011
Yes	180	20.0	205	4(2.0-8.4)		2.8(1.3-6.0)	
Duration of diabetes							
≤ 5 year	91.4	8.6	128	1	0.050		
>5 years	84.0	16.0	250	2(1.0-4.1)			

Table 3: Predicators of Following a Healthful Eating Plan During the Last Seven Days

Background characteristic	Following a healthful eating plan during the last seven days		n	Univariable analysis		Multivariable analysis	
	<7days	7days		Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age							
≤50 years	94.7	5.3	187	1	0.017		
>50 years	87.4	12.6	191	2.5(1.2-5.5)			
Residence							
Town	90.9	9.1	307	1	0.859		
Outside town	91.5	8.5	71	0.9(0.4-2.3)			
Marital status							
Single	96.8	3.2	95	1	0.031	1	0.049
Married	89.0	11.0	283	3.8(1.1-12.6)		3.4(1.0-11.7)	
Educational level							
≥Secondary	94.0	6.0	248	1	0.007		
< secondary	85.4	14.6	130	2.7(1.3-5.4)			
Employment status							
Working	193.9	6.1	198	1	0.040		
Not working	87.8	12.2	180	2.2(1.0-4.5)			
Co-morbidity							
No	94.8	5.2	173	1	0.021		
Yes	87.8	12.2	205	2.5(1.1-5.6)			
Duration of diabetes							
≤ 5 year	91.4	8.6	128	1	0.566		
>5 years	84.0	16.0	250	1.3(0.6-2.7)			

Table 4: Predicators of Participation in at Least 30 Minutes of Physical Activity

Background characteristic	Participation in at least 30 minutes of physical activity		n	Univariable analysis	
	< 5 days	≥5days		Crude OR (95% CI)	P value
Age					
>50 years	78.0	22.0	191	1	0.016
≤50 years	66.8	33.2	187	1.8(1.1-2.8)	
Residence					
Outside town	54	23.9	71	1	0.455
Town	71.7	28.3	307	1.2(0.7-2.3)	
Marital status					
Single	774.7	25.3	95	1	0.571
Married	71.7	28.3	283	1.2(0.7-2.0)	
Educational level					
< secondary	82.3	17.7	130	1	0.002
≥Secondary	67.3	32.7	248	2.3(1.3-3.8)	
Employment status					
Not working	77.8	22.2	180	1	0.029
Working	67.7	32.2	198	1.7(1.0-2.7)	
Co-morbidity					
Yes	79.0	21.0	205	1	0.002
No	64.7	35.3	173	0.5(0.3-0.8)	
Duration of diabetes					
>5 years	77.2	22.8	250	1	0.004
≤ 5 year	63.3	36.7	128	2.0(1.2-3.1)	

Table 5: Predicators of Participation in a Specific Exercise Session

Background characteristic	Participation in a specific exercise session		Total	Univariable analysis		Multivariable analysis	
	<5day	≥5days		Crude OR (95% CI)	P value	Crude OR (95% CI)	P value
Age							
>50 years	98.4	1.6	191	1	0.003	1	0.020
≤50 years	90.4	9.6	187	6.7(1.9-23.0)		4.7(1.3-17.8)	
Residence							
Outside town	95.8	4.2	71	1	0.589		
Town	94.1	5.9	307	1.4(0.4-4.9)			
Marital status							
Single	90.5	9.5	95	1	0.06		
Married	95.8	4.2	283	0.4(0.2-1.0)			
Educational level							
< secondary	97.7	2.3	248	1	0.059		
≥Secondary	92.7	17.3	130	3.3(0.9-11.5)			
Employment status							
Not working	96.1	3.9	180	1	0.184		
Working	92.9	7.1	198	1.9(0.7-4.8)			
Co-morbidity							
No	90.8	9.2	173	1	0.007		
Yes	97.6	2.4	205	0.2(0.1-0.7)			
Duration of diabetes							
>5 years	96.0	14.0	250	1	0.07		
≤ 5 year	91.4	8.6	128	2.3(0.9-5.5)			

per week. Similarly on bivariate analysis multiple patients' background were found to be significantly associated with practicing exercise as a self-care measure and patients' background characteristics as shown in Tables **4** & **5**. Multivariate analysis showed that patients' age was the only predicator for patients' commitment to practicing exercise {adjusted OR 4.7(1.3-17.8), P = 0.020).

The prevalence of non adherence to medication was found to 80.6 % (n=305). No single patients' background variable was found to be associated with patient's compliance to treatment.

4. DISCUSSION

The results of demographic characteristics of the recruited patients in the current study revealed that younger and middle-aged are mostly affected with diabetes than elderly ones. In a survey conducted to determine the prevalence of diabetes among Saudi population, the mean (SD) age for onset of diabetes in males was found to be 57.5 (13.1) years [15]. Generally Asians develop diabetes at younger ages compared to Western populations [16].

Nearly 80% of the recruited patients were permanently residents in the city. The increased prevalence of diabetes was found to be associated with migration and urbanization. For example; among Omani population a high prevalence of diabetes, obesity, hypertension and high cholesterol was documented, particularly among urban-dwellers and older individuals [17]. In contrary to these findings a recent study conducted among Greenland Inuit impaired fasting glycaemia was found to be low among urban population [18].

In Saudi Arabia, obesity is becoming one of the most important public health problems [19]. Overweight and obesity affect more than 75% of the total population in Saudi Arabia [20]. Among adult Saudi male; middle age, lower education and joblessness were found to important predicators for obesity [21]. Slightly > 25% of the patients participated in the study were obese and > 40% of them was classified as overweight. In contrary to this finding Ayele *et al.* [22] reported low rate of obesity (5.9%) and overweight (27.0%) among diabetic Ethiopian patients. The observed variation in the results between the two

studies may be attributed to the difference in socioeconomic status between the populations in the two countries.

Another important finding was the coexistence of hypertension and diabetes among > 45% of participants. Salman & Al-Rubeaan [23] investigated the incidence of hypertension and associated factors In Saudi with type 2 diabetes patients. They identified incidence rate of 17.2/100 person-years, with older age, male gender, higher BMI, diabetes duration of < 5 years and retinopathy being strong predicators of hypertension development.

Diabetic patient at increased risk of cardiovascular disease (2- to 3-fold) compared with non diabetic ones with dyslipidemia one of the major risk factors contributing to the increased incidence of these diseases [24]. Nearly 30% of the participants were suffering from hyperlipidemia.

The prime aim of this study was to measure self care practices; diet, exercise and adherence to treatment plan. Self report approach was adopted in this study to investigate the three domains as it is practical and cost-effective method despite it is often seen as undependable [25]. Overall patients' adherence to the three studied self- care practices was worse.

Researches proved significant association between patients' compliance status to healthy diet and fasting blood sugar [26]. The results showed that only 13.5% complied for 7 days during the last month to their eating plan {mean number of days 2.65± (2.48)} and 9.0% of them admitted adherence for 7 days in the last week, {mean number of days 2.07± (2.33)}. In contrast Guo *et al.* [27] among Chinese diabetic patients reported a high mean number of days [4.86 ± (2.18)] adherence to general diet with significant difference between patient with diabetes education and those who were not educated about the disease. Non-adherence to dietary requirement may be attributed to poor self-discipline, lack of information and tendency to eat out [28]. Multivariable analysis showed that adherence to general diet was significantly associated with co-existence of hypertension and hyperlipidemia. This was considered as a positive finding. Adherence to diet may help in controlling these diseases with the consequence of reduction in the rate of morbidity and mortality associated with these abnormalities. Similarly Tol *et al.* [29] noted a significant relation between adherence to diet and co-morbidity among other factors. Family and social support are important aspects of adherence to diabetes management [30]. In the current study patients' marital status was also identified as a predictor to adherence to diet. Comparatively in the above mentioned study [29] no relation was noted between marital status and adherence to self-care practices.

Aerobic and resistance training performed regularly have many benefits as it acutely improve insulin action, help in the management of blood glucose levels, lipids, blood pressure, decrease the cardiovascular risk, decrease mortality rate , and increase the quality of life [31]. The results obtained in the current research showed that to some extent participation in at least 30 minutes of physical activity was better than participation in a specific exercise session. Comparatively Nelson *et al.* [32] reported no regular physical activity among 31% of individuals with type 2 diabetes and 38% less than recommended levels of physical activity. The only factor that was found to be associated with participation in specific exercise session was patients' age, as patients < 50 years were nearly five times practiced this activity compared to > 50 years aged ones. In contrary to this in another recent study younger were found to be less adherent to healthy diet, medication intake, blood glucose checking, foot care and exercise compared to older patients [33].

The results of the assessment of patients 'adherence to the prescribed treatment in the current study showed that non-adherence was prevalent among 80.6% of the interviewed patients, with no significant association between patients' background characteristics and adherence to treatment. In contrast, other researchers identified association of several factors with patients' compliance to treatment; like increasing age, male gender, education, low level of monthly income and a longer duration of diabetes [34]. The variations in the results between the two studies may be attributed to the difference in the methods used for assessment of patients' compliance or due to the difference in the background characteristics of the studied populations.

Analysis of the association of patients' factors and how it affects their adherence to self -care practices is important. However, the influence of others factors cannot be ignored. In the hospital where the study was conducted, the specialized health care services were expected to be accompanied with proper health education. This is important as researchers found that diabetic patients who received specialist care reported

better self- care practices better than those received generalist care [35].

There were some limitations in the study. The study sample was recruited from one hospital and only males were interviewed this limit the generalizability of the result to the entire diabetic population. Future researched may include representative sample diabetics from all regions in the country. Patients' adherence to self- care practices were obtained by self report method, this may subject the data to recall bias.

CONCLUSION

This study demonstrated that non-adherence to the studied self-care practices; diet, exercise and adherence to medication were suboptimal. Marital status and co-existence of hypertension and hyperlipidemia were found to be associated with adherence to diet, while adherence to exercise was associated significantly with younger age. Proper and continuous health education accompanied with patients' motivation is needed to increase the level of commitment to the studied self-care activities.

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