

ASSESSMENT OF KNOWLEDGE ABOUT THE ROLE OF DIET REGIME AND PHYSICAL EXERCISE TO CONTROL DIABETES AMONG TYPE 2 DIABETIC PATIENTS IN KHARTOUM STATE, SUDAN

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ABSTRACT

Background: Non-communicable diseases, particularly diabetes mellitus, represent a global worldwide threat, being highly prevalent and cause a wide range of disabilities, morbidity and mortality.

Aims & Objective: The objective of the study was to explore knowledge about the role of diet regime and physical exercise to control diabetes among Sudanese type 2 diabetic patients in Khartoum State and determine factors associated with it.

Materials and Methods: This was a cross-sectional health facility-based study. Using a modified Diabetes Care Profile questionnaire, type 2 diabetic patients of more than 18 years of age and having diabetes for at least 1 year attending two selected specialized diabetic care centers and one endocrinology referred clinic were interviewed. The study sample was 306. Data was analyzed using SPSS software.

Results: A total of 310 patients were enrolled, of whom 289 patients were interviewed. Mean age was around 55 years and 54% were females. The proportions found to have excellent knowledge levels about diet regime were 62.3%; about physical exercise were 51.2%. Self-care knowledge levels were found to be significantly associated with age, educational level, being employed, and having health education about DM before.

Conclusion: Diabetes health education and social support are important determinants of diabetes self-care related knowledge. Strategies should focus on training of physicians and health-care providers on all aspects of diabetes-related knowledge. Efforts are needed to improve the socioeconomic status of diabetics and educate them for better control of the disease.

Key Words: Diabetic Mellitus; Dietary Regime; Khartoum; Knowledge; Physical Exercise

Introduction

According to the World Health Organization (WHO) "Heart disease, stroke and diabetes mellitus (DM) alone are estimated to reduce growth domestic product (GDP) between 1 to 5% per year in developing countries experiencing rapid economic growth".^[1] Life expectancy in middle-aged patients is reduced by 5 to 10 years.

The prevalence of diabetes worldwide is reaching epidemic proportions, currently more than 150 million and is expected to reach 300 million by 2025.^[2]

In Sudan, non-communicable diseases (NCDs) are emerging as a major health problem and are estimated to account for 44% of all deaths. Of these, DM accounts for two percent.^[3] However, due to the weak health information system and lack of researches accurate statistics are lacking. Elbagir et al found a prevalence of 8.3% while studying a tribal community.^[4] According to the NCDs risk factors' survey in Khartoum State the prevalence of DM ranges between 1 and 15% and averages 4%.^[5] According to the 2006 Sudan Household Survey, the prevalence of DM was 12.7% in the northern states.

Diabetes self-care, also called diabetes self-management, includes personal actions to manage diabetes mellitus, treat it, and prevent disease progression.^[6] It includes many activities, mainly eating healthy diet, self-monitoring of blood glucose levels, adherence to prescribed medication, regular physical exercise, and taking measures to reduce long-term diabetes complications.^[7]

Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviours, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life.^[8]

Several studies discussed diabetes education programs and their effectiveness. A systematic review by Norris et al in 2001 documented the effectiveness of type 2 patients self-management education, particularly in the short term.^[9] Kaur et al studied knowledge and self-care

practices of diabetics in Chandigarh, India, and recommended reorienting and motivating health personnel in educating diabetics about self-care.^[10]

The hypothesis was that Type 2 diabetic patients attending diabetic care centers in Khartoum State, Sudan, have inadequate knowledge regarding the role of diet regime and physical exercise to control diabetes.

The specific objectives of this study were to assess knowledge about the role of diet regime and physical exercise to control diabetes among type 2 diabetic patients in Khartoum State, Sudan, and to determine factors associated with knowledge.

Materials and Methods

This was a facility-based cross-sectional study conducted in two specialized diabetic care centers (Jabir Abu El Izz and Xenam Hospital diabetic care centers) located in El Khartoum El Kubra locality and a referred endocrinology clinic in Omdurman Military Hospital located in Omdurman El Kubra locality, Sudan.

The study was carried out during the period of January and February months of the year 2013G. The study population was type 2 diabetes mellitus patients, both males and females, of more than 18 years of age and having diabetes for at least one year attending the study facilities during the study period. They were from different Sudanese tribes and ethnic groups.

The sample size was estimated using the following equation from the WHO practical manual^[11]:

$$N = \frac{\left[Z_{\left(1-\frac{\alpha}{2}\right)} + Z_{(1-\beta)} \right]^2 \times P(1-P)}{d^2}$$

Where, N: sample size; Z: reliability coefficient ($z = 1.96$ at 95% confidence interval); P = the proportion of type 2 diabetic patients having good self-care in Khartoum State, Sudan. As there were no previous large studies on this topic as far as the investigator knows, therefore P has been considered 0.5 (50%); $d = 0.08$, i.e. absolute precision of 8% (i.e. a range of prevalence of good diabetes self-care 42% - 58%); Type I error (α) was considered 0.05; and type II error (β) 0.2 (i.e. a power of 80%).

The sample size was calculated as 306. From the selected facilities, all patients who were available during the day in five working days of January and February 2013 and

accepted to participate in the study were interviewed.

Data was collected using Diabetes Care Profile questionnaire. It is a questionnaire containing open- and close-ended questions developed by the Michigan Diabetes Research and Training Center. It was modified and used after obtaining permission from the aforementioned center. It was translated and modified accordingly to suit local community in Sudan. The questionnaire was already validated by the Michigan Diabetes Research and Training Center, USA.^[12] It was reviewed by two consultants of Community Medicine and one consultant in DM before and after translation to Arabic language and some questions were modified. It was also validated through a pilot study.

The questionnaire consisted of four main parts: the first asks about personal information (socio-demographic characteristics), the second about health status, the third explores knowledge about diabetic self-care represented by the following indicators: (1) Knowledge about diet regime in the control of DM; (2) Knowledge about the role of physical exercise in the control of DM; and the fourth and final part is about diabetic self-care practice. It was filled by interviewing type 2 diabetic patients by the investigator himself under standardized conditions after taking their informed consent.

A Pilot study was conducted in Bahri specialized diabetic care center located in Khartoum North locality among type 2 diabetics to test the modified questionnaire and it was further modified accordingly. Those diabetics were not included in the study.

Data was checked for accuracy and completeness. All data were coded and entered into the SPSS statistical software program version 16 (SPSS Inc., Chicago, IL, USA) and analyzed using appropriate statistical tests. A p-value of <0.05 was considered as statistically significant. Descriptive summary measures were obtained. Logistic regression analysis was used to determine factors associated with knowledge about diet regime and the role of physical exercise.

The dependent variables were: (1) Knowledge about diet regime coded as, 1 = excellent + good; 2 = poor + I don't know; (2) Knowledge about role of physical exercise coded as, 1 = excellent + good; 2 = poor + I don't know.

The independent variables entered into the model were: residence, age, gender, nationality, marital status, educational level, current occupation, DM duration, DM

in family, DM complications in family, death of a family member due to DM or its complications, reported current health status, having a DM complication, health insurance, health education about DM, having a chronic disease, blood sugar testing, record result of blood sugar test, who helps you to care for DM.

Ethical clearance was obtained from University of Medical Sciences and Technology (UMST) ethical committee. Approval was obtained from Ministry of Health, Khartoum State and other relevant administrative bodies involved. Informed voluntary written consent was obtained from participants. Confidentiality was ensured (no names on questionnaires). After each interview, participants were educated about the concept of diabetes self-care and its methods and benefits.

Results

A total of 310 patients were recruited, 150 were from Jabir Abu El-Izz Specialized Diabetic Center, 125 from specialized diabetic center in Xenam Hospital and 35 from the endocrinology referred clinic of Omdurman Military Hospital. Of those recruited, 306 responded (98.71%) and four refused to be interviewed (1.29%). Of those responded, 17 were excluded because they did not meet inclusion criteria (5.56%) giving 289 patients.

Most patients were from El Khartoum El Kubra (48.1%), females (54%), Sudanese (99.7%) and were married (83.7) with mean age of 54.95 + 12.06 (1SD) years as shown in Table 1. Most patients attended up to high secondary school (28.4%), with 27.3% attended up to Assas level (Primary & intermediate). They were mostly housewives (45.3%). Those working were mostly doing private business (47; 16.2%).

Duration of diabetes among the study population was 1 to 5 years at most. Most diabetics had a positive family history of DM (177; 61.2%) and 67 (23.2%) had a family history of complications of DM (Table 2). About 19% of diabetics (56) had a family member who died of diabetes or its complications. The most common reported complication among the study population was feet problems (16.6%) followed by eye problems (13.1%).

The knowledge of the role of diet regime in the control of DM was determined by asking the patients about their knowledge of: types of food eaten, frequency of eating, practicing any specific diet regime, and recommended types of food for diabetic patients.

Table-1: Socio-demographic characteristics of the study population (N = 289)

Socio-demographic characteristic		No.	%
Residence	El Khartoum El Kubra	139	48.1
	Bahri El Kubra	40	13.8
	Omdurman El Kubra	50	17.3
	Other States	60	20.8
Age group (years)	25 - 49	98	33.9
	50 - 64	120	41.5
	≥ 65	71	24.6
	Mean age ± 1 SD	54.95 + 12.06	
Gender	Male	133	46
	Female	156	54
Marital Status	Single	25	8.7
	Married	242	83.7
	Widow/widower	19	6.6
Educational Level	Divorce	3	1
	Illiterate (no education)	37	12.8
	Khalwaha (Quran pre-school)	21	7.3
	Assas (Primary & intermediate)	79	27.3
	High secondary	82	28.4
	University/higher education	70	24.2
Current Occupation	Private business	47	16.2
	Government civil service	21	7.3
	School/university teacher	21	7.3
	Retired/unemployed	45	15.6
	Housewife	131	45.3
	Others	24	8.3

Table-2: Duration, family history of diabetes and its complications among the study population (N = 289)

Characteristics	No.	%	
Duration of Diabetes	1 -5 years	105	36.3
	More than 5 - 10 years	87	30.1
	More than 10 years	97	33.6
Family History of DM	Yes	177	61.2
	No	112	38.8
Family history of DM complications	Yes	67	23.2
	No	222	76.8
Family member died of DM or its complications	Yes	56	19.4
	No	233	80.6
Diabetic complications reported by patients*	Atherosclerosis	8	2.8
	Stroke	1	0.3
	Renal failure	1	0.3
	Eye problems	38	13.1
	Feet problems	48	16.6
	Other complications	3	1
Do not have complications	206	71.3	

* Total is not mutually exclusive

Table-3: Knowledge about the role of diet regime and physical exercise in the control of DM among type 2 diabetic patients (N = 289)

Knowledge level	No.	%	
Knowledge about the role of diet regime	Excellent	180	62.3
	Good	99	34.3
	Poor	10	3.4
Knowledge about the role of physical exercise	Excellent	148	51.2
	Good	121	41.9
	Poor	20	6.9

Table-4: Logistic regression of significant factors associated with knowledge about the role of diet regime in the control of DM

Variables	B coefficient	S.E. of B	p-value	OR	95% CI of OR	
					Lower	Upper
Age	0.077	0.03	0.011	1.08	1.018	1.145
Health education	1.716	0.737	0.02	5.56	1.313	23.555
Constant	-7.103	2.44	0.044	-	-	-

Table-5: Logistic regression of significant factors associated with knowledge about the role of physical exercise in the control of DM

Variables	B coefficient	S.E. of B	p- value	OR	95 % CI of OR	
					Lower	Upper
Educational level	-0.455	0.187	0.015	0.635	0.44	0.916
Current occupation	2.174	1.05	0.038	8.794	1.123	68.896
Constant	-5.196	2.184	0.017	-	-	-

Most patients had excellent level of knowledge on the role of diet regime in the control of DM (180; 62.3%) as shown in Table 3. However, still 3.4% had poor knowledge of the role of diet regime in the control of DM.

Table 3 also shows the knowledge of the role of physical exercise in the control of DM. This was determined by asking the patients about their knowledge of: practicing any specific sport or other forms of physical exercise, frequency of practice, and the recommended daily duration of physical exercise for diabetic patients. About half of them (148; 51.2%) had an excellent level of knowledge on the role of physical exercise in the control of DM. Still 20 diabetics (6.9%) had poor knowledge about the role of physical exercise in the control of DM.

Factors that were found to be statistically significantly associated with knowledge about the role of diet regime to control DM were age and having health education about diabetes mellitus before (Table 4). Diabetic patients who were young and middle aged were significantly 1.080 times more likely to have excellent and good knowledge about the role of diet regime to control DM than elderly diabetics (OR = 1.080 ; 95% C. I. 018 – 1.145; p = 0.011). Similarly, diabetics who had health education about DM before were about six times more likely to have excellent and good knowledge about the role of diet regime to control blood sugar than those who did not have health education before (OR = 5.560 ; 95% C.1.313 – 23.555; p = 0.020).

Factors that were found to be statistically significantly associated with knowledge about role of physical exercise to control DM were educational level and current occupation (Table 5). Diabetic patients who have higher level of education and those who are currently working were significantly having excellent and good knowledge about the role of physical exercise to control DM compared to diabetics who have low level of education and those who are unemployed or retired (p = 0.015 and 0.038 respectively).

Discussion

Most patients were from El Khartoum El Kubra. This finding is quite relevant to Khartoum population.

However, 60 patients (20.8%) were from outside Khartoum State, reflecting that many patients prefer to be treated in Khartoum State although many of these patients come to Khartoum State only for follow-up visits. Most of the patients in the study population were elderly, reflected by a mean age of around 55 years. This poses greater challenges, as the impact of NCDs, according to the WHO, is two to three times greater for older people in low- and middle-income countries than for people in high-income countries.^[13] Females were slightly more than males (54% to 46% respectively).

Most of the patients were married (83.8%). This might cause extra financial burden over them as they have more obligations towards their families and subsequently have more monthly expenditures.

The majority of patients in the studied sample were housewives (45.3%). This is expected as most were females (54%), although few of them were working. Also many patients were either retired or unemployed. This can be explained by the higher mean age of the studied sample, which is around 55 years. However, this may have negative impacts on the practice of self-care as diabetes poses a high financial burden on them.

Among the study sample, most had duration of diabetes of 1 to 5 years (36.3%), and a positive family history of diabetes (61.2%). In this study, the duration of diabetes was not found to be significantly associated with knowledge. This finding, however, was not consistent with other studies, where, JIA et al found that those having diabetes for more than 10 years were more likely to be knowledgeable about diabetes self-care.^[14] Wu et al and Yekta et al also found significant association between self-care behaviour and duration of diabetes among a studied sample of type 2 diabetics in Taiwan and Iran respectively.^[15,16] History of complications or death in family members due to DM were not significantly associated with knowledge of the role of diet or physical exercise to control DM.

Overall, knowledge levels among patients in the study sample were acceptable, being good to excellent for both the role of diet regime and physical exercise in the control of DM. This result is consistent with Hawthorne and Tomlinson study who found that 72% of Pakistani Moslems at the Manchester Diabetes Centre had adequate knowledge of diabetic diets.^[17] However, other studies showed poor control of DM. Rubin et al showed that participants who entered the program with high levels of emotional well-being or good self-care patterns

or glycaemic control tended to change little, if at all, at later measurements. On the other hand, people who entered the program with low levels of emotional well-being or with poor self-care patterns or glycaemic control improved substantially.^[18] Westaway et al. reported that only 8% of African South African diabetics achieve optimal metabolic control (HbA1C 7%), with 25% achieving acceptable metabolic control (HbA1C 8%).^[19] Assal et al found that knowledgeable patients receiving regular counselling are more likely to maintain better glycaemic control.^[20]

Age was found to be significantly associated with better knowledge about the role of diet regime to control blood sugar (OR=1.08, p=0.011) and with more practice of sports or any form of physical exercise on regular basis (OR=1.037, p=0.002). Young and middle aged diabetics were significantly more likely to have good knowledge about the role of diet regime to control blood sugar than elderly diabetics. This finding is consistent with Adibe et al who studied diabetes self-care knowledge among type 2 diabetics in South-Eastern Nigeria in 2009.^[21] They showed that knowledge of diabetes self-care was associated with sex, age, educational status, and years with diabetes. Younger patients (18-35 years) were more likely to be knowledgeable. Most of the patients were of good literacy, as they attended either up to Assas, high secondary school or beyond that. This should have a good implication, as they are expected to have good levels of knowledge, which subsequently should positively affect their self-care practice.

Having education about DM before was significantly associated with better knowledge about the role of diet regime to control blood sugar (OR=5.560, p=0.02). Most patients reported that they were educated before, with the most prevalent reported source being their treating doctors. This is an interesting finding, as it indicates that most of our doctors do educate their patients during their visits. Only 9.7% of the patients reported that they did not receive any health education about DM before. Bruce et al in the Fremantle Diabetes Study, which was done in Australia, stressed the importance of diabetes education programs on increasing diabetes-related knowledge.^[22] Otero et al in a quasi-experimental study evaluated the knowledge that diabetic patients have about their disease before and after implementing a Diabetes Education Program and found that it increased significantly.^[23] A meta-analysis by Ellis et al also confirmed that patient education interventions modestly improved glycaemic control in adults with diabetes.^[24]

Rubin et al examined the effect of diabetes education on self-care, metabolic control, and emotional well-being among 165 diabetics in Johns Hopkins Diabetes Center, USA and found that it can promote long-term benefits in self-care, metabolic control, and emotional status if the program is specifically designed to provide these benefits.^[18] Torres et al evaluated an educational program for type 2 diabetic patients in Brazil and found that it dropped HbA1c levels, and resulted in improved self-care and self-management practices.^[25]

Educational level was found to be significantly associated with better knowledge about the role of physical exercise (OR=0.634, p=0.015). Employment is found to be significantly associated with knowledge about the role of physical exercise to control blood sugar (OR=8.794, p=0.038), with employed patients having better knowledge. In contrast to our findings, Ruggiero et al explored diabetes self-management in a large U.S. population and found that employed individuals had lower self-management levels than retired individuals or homemakers.^[26] Again Xu et al studied self-management practices of Chinese Americans with type 2 diabetes and found that individuals who were employed were less likely to engage in diabetes self-management than those who were retired.^[27] However, Bai et al found self-care behaviour scores were significantly influenced by different gender, education level, and economic status among a sample of older diabetics in southern Taiwan.^[28] Also Barrett et al studied the role of gender and income on the patterns in physical activity behaviours among people with type 2 diabetes in Alberta, Canada and found those from the highest income group participate in more leisure time physical activity (LTPA) than low- or middle-income groups.^[29] Educational status was found to be associated with diabetes self-care knowledge; patients who attended primary school were least likely to be knowledgeable.^[21]

Conclusion

This study showed that levels of diabetes self-care knowledge about the role of diet regime and physical exercise in the control of DM among type 2 diabetic patients were good to excellent. Self-care knowledge levels among studied diabetics were found to be significantly associated with age, educational level, being employed, and having health education about DM before.

Strategies should focus on training of physicians and health-care providers on all aspects of diabetes-related

knowledge and improving their communication skills as they were found to be the cornerstone for diabetes self-care knowledge among Sudanese diabetic patients. Continuous monitoring and follow-up of diabetic patients is essential to make sure that knowledge is translated into better practices to improve wellbeing of diabetics and prevent complications. Further studies are needed to evaluate perceived barriers in knowledge and practice of diet control and physical exercise for diabetics.

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