Original Article

Diabetes Knowledge Assessment among Type 2 Diabetic Patients

Ziyad O Alsugair[1], Mohammed M Alobaylan[1], Mohammed K Alharithy[1], Omar R Abdalgader[1], Ahmed A Bokhari[1], Khaled A Alswat[2]

[1]Medical Interns, Taif University School of Medicine, Taif, Saudi Arabia

[2]Department of Medicine, Taif University School of Medicine, Taif, Saudi Arabia

Kuwait Medical Journal 2018; 50 (3): 303 - 307

ABSTRACT

Objective: Diabetes mellitus (DM) is one of the major health problems worldwide. Health knowledge is a main factor in enhancing general health. The primary goal of this study was to assess the level of DM knowledge among a random sample of type 2 diabetic (T2D) patients and these patients' knowledge level in relation to glycemic control and complications.

Design: Cross sectional study

Setting: Diabetes outpatient clinic, Prince Mansour Military Hospital, Taif, Saudi Arabia

Subjects: We interviewed adult T2D patients who had routine follow-up visits between September 2015 and July 2016. Patients with type 1 or gestational DM were excluded.

Intervention: We used the revised Michigan Diabetes Knowledge Scale to assess the patients' diabetes knowledge.

Main outcome measures: Diabetes knowledge

Results: A total of 191 patients with T2D with a mean age of 57.2 ± 12.9 years were enrolled in the study; 54.5% were male, with a mean duration of diabetes for 12.8 ± 8.7 years. The mean diabetes knowledge score was 12.3 ± 3.3.

Compared to those who are considered to have poor knowledge, those with good knowledge tend to be younger ($p < 0.031$), are less likely to have microvascular complications ($p < 0.04$), and more likely to have a bachelor's degree ($p < 0.018$). The mean DM duration, body mass index, glycosylated hemoglobin, smoking, and physical inactivity appeared to be insignificant between different groups.

Conclusion: This study shows a high prevalence of poor DM knowledge which was positively associated with microvascular complications; however, glycemic control, weight, and/or lifestyle habits were not statistically different between groups.

KEY WORDS: diabetes mellitus, education, knowledge, Michigan, T2D

INTRODUCTION

Diabetes mellitus (DM) is one of the major health problems worldwide. In 1980, the prevalence was 4.1%, which increased significantly by 2014 to reach a prevalence of 8.5% for a total of 422 million patients[1]. A study that was conducted in 2004 showed a DM prevalence of 23.7% among the Saudi population with a male predominance[2]. A recent study estimated that 6.2% of the patients were unaware of their disease[3]. In a literature review about global DM, Saudi Arabia was ranked third with a prevalence of 16.8%[4].

It is well known that health knowledge is one of the main factors that contribute to enhancement of overall community health. A study in Saudi Arabia showed that patients with a chronic disease had more lifestyle changes such as a healthy diet and increase in physical activity, which could be attributed to an increase in educational levels[5]. Another review stated that collaborative health education is one of the best practice methods in the management of nutrition related chronic diseases such as type 2 diabetes (T2D)[6].

T2D is a lifelong disease that requires multifactorial management including diet, physical activity, drugs, and regular follow ups. A study published by the American Diabetes Association in 2005 showed that gaining more knowledge about diabetes and its complications has a ''significant benefit in regards to patient compliance to treatment and to decreasing complications associated with the disease''[7]. A study done in Singapore also demonstrated that diabetic

Address correspondence to:

Ziyad O Alsugair, Medical Intern, Taif University School of Medicine, Taif, Saudi Arabia. Tel: +966556702228, Email: zos7@windowslive.com

education has improved the actual practice in diabetic patients to better and more effective self-care[8]. The American Association of Clinical Endocrinologists states that the development of diabetic complications is mainly due to either a lack of understanding of the long- and short-term regulation of blood glucose level or lack of patient control of their blood glucose levels[9].

There is limited data about the level of knowledge among our T2D patients. The primary goal of this study was to assess the level of DM knowledge among a random sample of T2D patients and its relation to glycemic control and DM-related complications.

SUBJECTS AND METHODS

This cross-sectional study was conducted from September 2015 to July 2016. All subjects were T2D patients attending the Prince Mansour Military Hospital, Diabetes Center, Taif, Saudi Arabia. Type 1 diabetes and gestational DM patients were excluded. Participation was voluntary, and verbal consent was taken from each participant. The study was founded by Taif University and the Institutional Review Board at the Military Hospital reviewed the proposal and approved the research.

All subjects completed a five-section interview that included personal data, methods of management, DM complications, health-related social habits, and a diabetes knowledge scale. Anthropometric measures were taken in addition to blood pressure and body mass index (BMI). Recent lab work results were collected from files using the subjects' medical record numbers. We considered those who reported monthly income ≥ 4000 US dollars as high income, and those reporting monthly income < 1335 US dollars as low income.

We also collected data about diabetes-related complications. We considered those with a history of retinopathy, nephropathy, or neuropathy to have microvascular complications and those who had a history of coronary artery disease or stroke to have macrovascular complications.

We used the revised Michigan Diabetes Knowledge Scale to assess the patients' diabetes knowledge. It contains 20 statements about diabetes, and the participants were asked to indicate whether each statement is true, false, or did not know. The participants who didn't use insulin were asked only 18 out of 20 statements, while those on insulin completed all 20 statements. If a patient answered > 13 of 20 questions (or > 12 of 18) correctly, they were considered to have good awareness. If the patient answered < 12 of 20 questions (or < 11 of 18) correctly, they were considered to have poor awareness, while those answering > 65% of the questions were considered to have good diabetes knowledge.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 20. Frequencies and percentages were used for each variable; the Chi-squared test was used to study the relationship between variables and the T-test was used to compare between means.

RESULTS

A total of 191 T2D patients were enrolled in the study. The mean age was 57.2 ± 12.9 years; 54.5% were male, and patients had a mean diabetes duration of 12.8 ± 8.7 years and mean BMI of 31.5 ± 5.4 kg/m^2 (Table 1). Most of the participants were married, and 50.8% were considered low income with low levels of education consisting of high school or less. The most common complication was microvascular, and most patients had undergone a recent follow-up clinic

Table 1: Baseline characteristics of the whole cohort

Baseline characteristics (N= 191)	
Mean age (years)	57.2 ± 12.9
Male (%)	54.5
Mean diabetes duration (years)	12.8 ± 8.7
Mean BMI (kg/m^2)	31.5 ± 5.4
Mean waist circumference (cm)	108.4 ± 17.8
Mean systolic blood pressure (mmHg)	133.2 ± 22.3
Mean diastolic blood pressure (mmHg)	76.3 ± 10.5
Mean diabetes knowledge score	12.3 ± 3.3
Hypoglycemia (%)	36.6
Microvascular complications (%)	77
Macrovascular complications (%)	13.3
Patients who had a clinic visit within the last 6 months (%)	96.9
Socioeconomic	
Single/divorced (%)	6.8
Married (%)	93.2
Bachelor degree or higher (%)	12.6
Low income (%)	50.8
High income (%)	6.3
Medications	
Metformin (%)	82.2
Sulfonylurea (%)	36.1
Thiazolidinediones (TZDs) (%)	2.1
DPP-4 inhibitors (%)	18.8
Insulin (%)	69.1
Statin (%)	72.3
Laboratory data	
Fasting glucose (mmol/L)	10.2 ± 4.7
HbA1c (%)	8.85 ± 2.4
Total cholesterol (mmol/L)	4.5 ± 1.1
LDL (mmol/L)	2.7 ± 0.9
HDL (mmol/L)	1.04 ± 0.3
Triglyceride (mmol/L)	1.7 ± 0.98
ACR	12.5 ± 39.8
Calculated GFR (ml/min/1.73 m2)	86.3 ± 23.9
Lifestyle habits	
Sedentary lifestyle (%)	55
Active smoking (%)	12.6
Duration of smoking for the smokers (years)	12.1 ± 16.2

BMI: body mass index; HbA1c: glycosylated hemoglobin; LDL: low-density lipoprotein; HDL: high-density lipoprotein; ACR: albumin/creatinine ratio; GFR: glomerular filtration rate

visit. Metformin was the most commonly prescribed medication in addition to insulin and statin.

The mean diabetes knowledge score was 12.3 ± 3.3. The mean fasting glucose was 10.2 ± 4.7 mmol/L and the mean HbA1c was 8.85 ± 2.4%. Fifty-five percent of the patients had a sedentary life style, and 12.6% were actively smoking with a mean duration of smoking for 12.1 ± 16.2 years. Fifty-four percent of the patients were considered to have good diabetes knowledge (Table 2). Compared to those who are considered to have poor knowledge, those with good knowledge tend to be younger (p = 0.031), were less likely to have microvascular complications (p = 0.04), and more likely to have a bachelor's degree or higher (p = 0.018). The mean diabetes duration, BMI, waist circumference, fasting glucose level, glycosylated hemoglobin (HbA1c), active smoking, and physical inactivity appeared to be insignificantly different between the groups. Lipid profile and systolic blood pressure were better in the good knowledge group, but not statistically significant.

Compared to the poor knowledge group, those who were considered to have good knowledge were significantly more likely to know that HbA1c did not reflect the average blood glucose level over the past week, exercise had an effect on blood glucose, and diet soft drinks shouldn't be used to treat hypoglycemia (Fig 1).

Table 2: Baseline characteristics based on revised Michigan Knowledge Questionnaire score

Characteristics	Good Knowledge	Poor Knowledge	P value
Baseline characteristic			
Number of patients	100	91	n/a
Mean age (years)	55.3 ± 12.5	59.4 ± 13.1	0.031
Male (%)	56	52.8	0.652
Mean diabetes duration (years)	13.1 ± 9	12.5 ± 8.4	0.605
Mean BMI (kg/m^2)	32 ± 5.2	31 ± 5.7	0.183
Mean waist circumference (cm)	107.6 ± 13.6	109.2 ± 21.5	0.545
Mean systolic blood pressure (mmHg)	132.2 ± 18.2	134.5 ± 22.4	0.437
Mean diastolic blood pressure (mmHg)	77.4 ± 11.5	75 ± 9.1	0.128
Mean diabetes knowledge score	14.8 ± 1.6	9.6 ± 2.6	0.000
Hypoglycemia (%)	39	34.1	0.474
Microvascular complications (%)	71	83.5	0.04
Macrovascular complications (%)	12	14.6	0.616
Patients who had a clinic visit within the last 6m (%)	98	95.6	0.343
Socioeconomic			
Single/divorced (%)	6	7.7	0.535
Married (%)	94	92.3	
Bachelor degree or higher (%)	18	6.6	0.018
Low income (%)	43	59.3	0.57
High income (%)	6	6.6	
Medications			
Metformin (%)	82	82.4	0.631
Sulfonylurea (%)	33	39.6	0.346
Thiazolidinediones (TZDs) (%)	1	3.3	0.308
DPP-4 inhibitors (%)	18	19.8	0.753
Insulin (%)	76	61.5	0.18
Statin (%)	67	78	0.089
Laboratory data			
Fasting glucose (mmol/L)	10.1 ± 4.7	10.4 ± 4.7	0.62
HbA1c (%)	8.9 ± 2.5	8.8 ± 2.3	0.797
Total cholesterol (mmol/L)	4.4 ± 1.1	4.6 ± 1.1	0.2
LDL (mmol/L)	2.6 ± 0.9	2.7 ± 0.9	0.333
HDL (mmol/L)	1 ± 0.3	1.1 ± 0.2	0.786
Triglyceride (mmol/L)	1.7 ± 1	1.8 ± 1	0.569
ACR	14.2 ± 39	10.7 ± 40.9	0.563
Calculated GFR (ml/min/1.73 m^2)	84.8 ± 26.1	88.1 ± 21	0.346
Lifestyle habits			
Sedentary lifestyle (%)	52	58.2	0.799
Active smoking (%)	12	13.2	0.554
Duration of smoking for the smokers (years)	11.1 ± 14.7	13.1 ± 17.6	0.654

BMI: body mass index; HbA1c: glycosylated hemoglobin; LDL: low-density lipoprotein; HDL: high-density lipoprotein; ACR: albumin/creatinine ratio; GFR: glomerular filtration rate

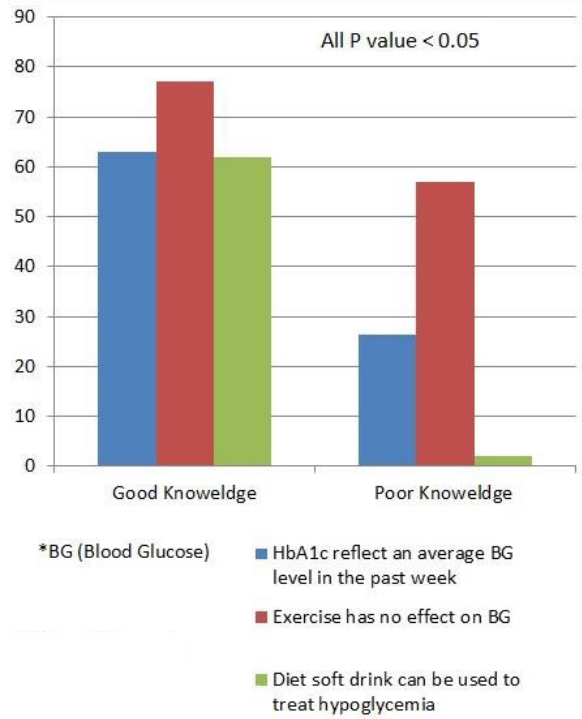

Fig 1: Percentage of correct answers (those who chose False as an answer for the above listed questions)

Partial correlation adjustment for age, income, gender, BMI, educational level, T2D duration, DM management, smoking, exercise, and marital status showed non-significant negative correlations between revised Michigan Knowledge Questionnaire score and either HbA1c and waist circumference, but there was a non-significant positive correlation with BMI (Table 3).

Table 3: Partial correlation done adjusting for age, income, educational level, T2D duration, managements, smoking, exercise and marital status

Characteristics	Diabetes Knowledge score
HbA1c	r = -0.052 p = 0.491
Waist Circumference	r = -0.033 p = 0.565
BMI	r = 0.095 p = 0.200

BMI: body mass index; HbA1c: glycosylated hemoglobin

DISCUSSION

Fifty-two percent of our T2D patients have good knowledge about diabetes. Other studies from different parts of the world have found a higher prevalence of poor knowledge among DM patients despite using different knowledge scores[10–12]. Another study conducted in Riyadh, Saudi Arabia showed that the majority of DM patients (72%) had a moderate level of knowledge[13]. Our assessment tool did not have a moderate knowledge category, but if it did, we would have found that the majority of our patients have moderate knowledge, since the mean score was 12.3, which is border line between good and poor knowledge.

Our findings did not show any relationship between gender and knowledge level. Recent study results showed better knowledge among females, but other studies showed better knowledge among males, and another study showed insignificant differences, which were similar to our result[10,11,13,14]. It seems likely that DM knowledge was related to education level and age rather than gender.

With regard to age, our study showed that participants with good knowledge significantly tended to be younger. Other studies' data agreed with our results[14,15]. Also, Alaboudi *et al* showed that younger patients tend to have better knowledge; however, it was not statistically significant[10]. This is likely because younger patients are more inclined to have access to the modern health resources and be more familiar with new technology, unlike older participants.

Our data showed that poor knowledge was associated with higher prevalence of microvascular complications. A recent study showed that 75% of the screened diabetics were aware that DM can cause eye disorders[16]. Another one showed that highly educated patients tend to see an ophthalmologist regularly[17]. This seems to prove that knowledge improves compliance and disease-specific awareness improves overall self-care.

Our data showed no significant association between knowledge and HbA1c levels. Several previous studies showed either weak correlation or no significant association[10,16,18–21]. A Singaporean prospective cohort showed a statistically significant improvement in the HbA1c in an intervention group after education, compared to the control group[22]. This is likely because of the variable sample size in each study.

Our findings showed that a high level of education is positively associated with the knowledge score, and this finding agrees with several published studies[10,11,15,16,22,23].

Our strengths included using a standardized validated questionnaire, comprehensive medical history, and inquiries about many related variables. Our weaknesses included single center and small sample size.

CONCLUSION

This study shows a high prevalence of poor knowledge which was positively associated with microvascular complications; however glycemic

control, weight, or lifestyle habits weren't statistically different between groups.

ACKNOWLEDGMENT
Conflicting of Interests: None
Funding: None

REFERENCES

1. WHO, media center, diabetes fact sheet, http://www.who.int/mediacentre/factsheets/fs312/en/ on 25/8/2016
2. Al-Nozha MM, Al-Maatouq MA, Al-Mazrou YY, Al-Harthi SS, Arafah MR, Khalil MZ, *et al*. Diabetes mellitus in Saudi Arabia. Saudi Med J 2004; 25:1603–1610.
3. Al-Rubeaan K, Al-Manaa H, Khoja T, Ahmad N, Al-Sharqawi A, Siddiqui K, *et al*. The Saudi Abnormal Glucose Metabolism and Diabetes Impact Study (SAUDI-DM). Ann Saudi Med 2014; 34:465-475.
4. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 2010; 87:4–14.
5. Sharaf F. Impact of health education on compliance among patients of chronic diseases in Al Qassim, Saudi Arabia. Int J Health Sci (Qassim) 2010; 4:139–148.
6. WHO. The report of second meeting of the Global Forum on Noncommunicable Disease Prevention and Control convened in Shanghai; China. 4–6 November 2002.
7. Heisler M, Piette JD, Spencer M, Kieffer E, Vijan S. The relationship between knowledge of recent HbA1c values and diabetes care understanding and self-management. Diabetes Care 2005; 28:816-822.
8. Tham KY, Ong JJ, Tan DK, How KY. How much do diabetic patients know about diabetes mellitus and its complications? Ann Acad Med Singapore 2004; 33:503–509.
9. Bruce DG, Davis WA, Cull CA, Davis TM. Diabetes education and knowledge in patients with type 2 diabetes from the community: the Fremantle Diabetes Study. J Diabetes Complications 2003; 17:82-89.
10. Islam SMS, Niessen LW, Seissler J, Ferrari U, Biswas T, Islam A, *et al*. Diabetes knowledge and glycemic control among patients with type 2 diabetes in Bangladesh. Springerplus 2015; 4:284.
11. Murugesan N, Snehalatha C, Shobhana R, Roglic G, Ramachandran A. Awareness about diabetes and its complications in the general and diabetic population in a city in southern India. Diabetes Res Clin Pract 2007; 77:433-437.
12. Abahussain NA, El-Zubier AG. Diabetes knowledge among self reported diabetic female teachers: alkhobar, Saudi arabia. J Family Community Med 2005; 12:43–48.
13. Al-Aboudi IS, Hassali MA, Shafie AA. Knowledge, attitudes, and quality of life of type 2 diabetes patients in Riyadh, Saudi Arabia. J Pharm Bioallied Sci 2016; 8:195–202.
14. Bani IA. Prevalence, knowledge, attitude and practices of diabetes mellitus among Jazan Population, Kingdom of Saudi Arabia (KSA). Journal of Diabetes Mellitus 2015; 5:115-122.
15. Aljoudi AS, Taha AZA. knowledge of diabetes risk factors and preventive measures among attendees of a primary care center in eastern Saudi Arabia. Ann Saudi Med 2009; 29:15–19.
16. Al Zarea BK. Knowledge, attitude and practice of diabetic retinopathy amongst the diabetic patients of AlJouf and Hail province of Saudi Arabia. J Clin Diagn Res 2016; 10:NC05–NC08.
17. Fenwick EK, Xie J, Rees G, Finger RP, Lamoureux EL. Factors associated with knowledge of diabetes in patients with type 2 diabetes using the diabetes knowledge test validated with Rasch analysis. PLoS One 2013; 8:e80593.
18. Al-Qazaz HKh, Sulaiman SA, Hassali MA, Shafie AA, Sundram S, Al-Nuri R, *et al*. Diabetes knowledge, medication adherence and glycemic control among patients with type 2 diabetes. Int J Clin Pharm 2011; 33:1028–1035.
19. Beeney LJ, Dunn SM. Knowledge improvement and metabolic control in diabetes education: approaching the limits? Patient Educ Couns 1990; 16:217–229.
20. Coates VE, Boore JR. Knowledge and diabetes self-management. Patient Educ Couns 1996; 29:99–108.
21. He X, Wharrad HJ. Diabetes knowledge and glycemic control among Chinese people with type 2 diabetes. Int Nurs Rev 2007; 54:280–287.
22. Tan AS, Yong LS, Wan S, Wong ML. Patient education in the management of diabetes mellitus. Singapore Med J 1997; 38:156-160.
23. Berikai P, Meyer PM, Kazlauskaite R, Savoy B, Kozik K, Fogelfeld L. Gain in patients' knowledge of diabetes management targets is associated with better glycemic control. Diabetes Care 2007; 30:1587–1589.