Awareness of General Population of Saudi Arabia toward Diabetic Complications

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Abstract

Objectives: Diabetes mellitus (DM) is a medical condition that induces hyperglycemia due to the lack of insulin production or intervention. With high prevalence of DM in Saudi Arabia, it is essential for the population to have adequate information and understanding of DM. We aimed to study the level of awareness among the general population towards diabetic complications and explore the relationship between level of awareness and different socio-demographic factors.

Methods: A cross-sectional study was conducted among the general population of Saudi Arabia in different regions between May – July 2021. Total enumeration method was used for including all the adult males and females who agreed to answer the questionnaire in this study. Self-administered questionnaire was used for data collection.

Results: A total of 508 participants completed the study of whom 67.5% were males. We found that 91.1% of the participants had good awareness about diabetic complications. The majority of the participants (93.9%) were diagnosed with DM or knew someone diagnosed with it. Approximately 78.4% of the participants thought that DM is a lifestyle disease and a higher percentage of them (84.1%) agreed that DM is a disease which needs to be monitored every 3-6 months. The most common identified complication was retinopathy (41.9%). We found that level of awareness of diabetic complications was significantly related to age (P=0.011), and also it was significantly related to the occupation (P=0.001).

Conclusion: This study revealed that the general level of awareness about diabetic complications among the general population of Saudi Arabia was good.

Key words: Diabetes mellitus, Complications, Saudi Arabia, Awareness

Introduction

Diabetes mellitus (DM) is a medical condition characterized by the persistent elevated level of blood glucose in a person due to underlying metabolic dysfunctions related to either insulin secretory pathways, aberrations in insulin mediated pathways or both (1,2). The disease is divided into five different types including type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes mellitus (GDM), monogenic diabetes mellitus and secondary diabetes mellitus. Among these types, the most commonly prevailing types are T1DM, T2DM and GDM (1).

According to the American Diabetes Association (ADA), DM can lead to risk of developing certain serious medical conditions including neurological disorders, eye diseases, skin problems, kidney disorders, cardiovascular conditions, hypertension, and stroke. The onset of these diabetic complications can be stopped or delayed with early diagnosis and with prompt treatment as early as possible (1,3).

The incidence and prevalence of DM have been observed in increasing trends as suggested by global reports estimating that more than 400 million people were living with DM in the year 2015. The prevalence of DM is expected to increase further and it is predicted that more than 600 million people will be affected with the condition by the year 2040 (4). Increasing trends in prevalence of DM would lead to an elevated global health burden because the prevalence of DM complications will also be increased. Moreover, health burden and quality of life may get significantly affected due to morbidity and mortality ratio associated with acute and chronic DM complications including coronary heart disease, end-stage renal disease (ESRD), retinopathy, lower extremity amputations and other neuropathies (5).

Most of the scientific literature regarding DM and associated complications is available for the developed countries. Despite the rising incidence of DM in developing countries, not much data is available regarding the prevalence, diagnostic markers, underlying causes, guidelines to measure the complications and mitigating practices for DM associated complications. It is necessary to collect and interpret the information regarding the DM complications in these regions of the world in order to design and implement policies for efficient control of DM prevalence and reduction of associated health burden (5,6).

In Saudi Arabia, the incidence of DM is worrisome as Saudi Arabia has been ranked to be seventh highest country in terms of DM prevalence. Around 7 million people in Saudi Arabia are estimated to be affected with DM while 3 million have been suspected with pre-diabetes (7). Despite the high prevalence of DM and associated risk of DMA complications in Saudi Arabia, poor public knowledge, attitude and practices have been reported in the Saudi population (8,9). Therefore, more efforts are required to gather the adequate information for designing policies and interventions for a better public response and behaviors towards DM and the risk of associated complications.

This study aimed to investigate the awareness of the general population of Saudi Arabia towards DM complications and their awareness of the relationship with different socio-demographic factors.

Methods

This cross-sectional study was conducted in different regions in Saudi Arabia during the months of May to July 2021. The study population was recruited from the general public population. Both male and female adult Saudi residents from any nationality who agreed to participate in the study, who can read, and who have a social media account, were recruited. EPI info program was used to calculate the sample size, based on 95.0% confidence interval, 5.0% margin of error and the total population of Saudi Arabia. The estimated sample size calculated was 384 and was adjusted to 422 to compensate for 10.0% non-response rate. The study was conducted using an online self-administered questionnaire via Google Form. The generated link was shared randomly on social media (namely, Facebook, WhatsApp, Telegram, and Twitter). The aim of this study was clearly explained in the user interface. A validated questionnaire was used which was prepared based on previous studies. The questionnaire contained socio-demographic characteristics of the participants like age group, gender, nationality, and residence. The questionnaire also included questions regarding public awareness towards diabetic complications in Saudi Arabia. A common grading method was used for each variable in the questionnaire: 2 points for correct option, 0 for the incorrect answer and 1 for neutral. After data collection, a participant who correctly answered 75.0% or more of the questions (12 or more points out of 16) was considered as having good awareness and practice about DM and its complications while a participant who correctly answered less than 75% of the questions (less than 12 points out of 16) was considered as having poor awareness and practice about DM and its complications.

The questionnaire was validated in a pilot study over a sample of 20 participants whose responses were not included in this study. Some modifications were carried out accordingly to ensure clarity and easy understanding of the questions. A convenience non-probability sampling technique was employed to collect the data from the participants. Data was coded, entered, and analyzed using the IBM's statistical package for social science (SPSS) version 23. Categorical variables were expressed in the form of number and percentage (No. & %). Chi-square ($\chi 2$) test was used to examine the association between level of awareness and practice about DM and its complications and different socio-demographic characteristics of the study participants.

Ethical approval was obtained from the research ethics committee of Qurayyat Health Affairs under registration number H-13-s-071. All the participants were volunteers who were asked to do their best. All data was kept confidential, used only for research purposes and only anonymous aggregated data is released.
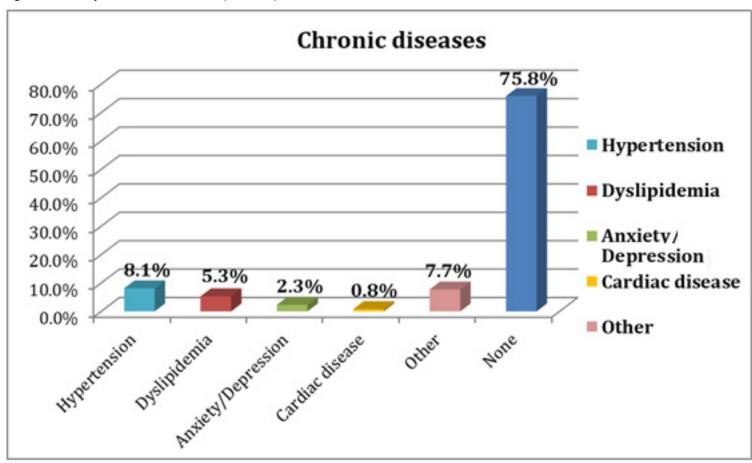
Results

A total of 508 participants took part in our study; the majority of them were males (67.5%) and the rest were females (32.5%). The distribution of their age was as follows: 18 to 25 years (18.3%), 26 to 35 years (30.3%), 36 to 45 years (18.5%) and > 45 years (32.9%). Most of the participants were Saudi Arabian nationals (94.7%) and only 27 (5.3%) of them were other nationalities. Regarding their highest level of education, 322 (63.4%) of the participants had completed their bachelor's degree, 129 (25.4%) had completed their secondary school studies, 31 (6.1%) had other educational qualifications, 17 (3.3%) had completed their intermediate school studies and 9 (1.8%) had primary education. The majority of the participants were employed (50.2%), 98 (19.3%) had other occupation, 73 (14.4%) were retired, 71 (14%) were unemployed and only 11 (2.2%) had a private business. The characteristics of the participants are shown in Table 1.

Table 1: characteristics of the participants (n = 508)

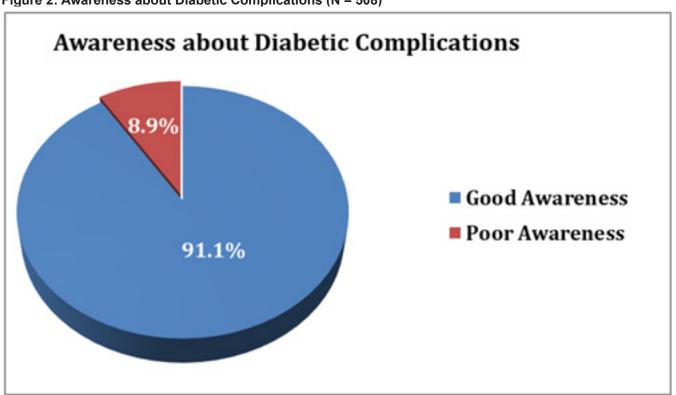| Variable	Categories	Frequency	Percent
Gender	Male	343	67.5%
	Female	165	32.5%
Age in Years	18-25	93	18.3%
	26-35	154	30.3%
	36-45	94	18.5%
	More than 45	167	32.9%
Nationality	Saudi	481	94.7%
	Non-Saudi	27	5.3%
Educational Level	Primary	9	1.8%
	Intermediate	17	3.3%
	Secondary	129	25.4%
	Bachelors	322	63.4%
	Other	31	6.1%
Occupation	Employed	255	50.2%
	Unemployed	71	14%
	Retired	73	14.4%
	Private business	11	2.1%
	Other	98	19.3%
Are you a diabetic patient?	Yes	86	16.9%
	No	422	83.1%
If yes, which type of DM do you have?	Type 1 DM	21	24.4%
	Type 2 DM	51	59.3%
	Gestational DM	2	2.3%
	Others	12	14%

A total of 86 (16.9%) participants were diabetic patients of whom 24.4% were type 1 and 59.3% were type 2. The remaining had gestational diabetes (2.3%) and other types of diabetes (14%). Comorbidities among the study participants included: hypertension (8.1%), other diseases (7.7%), dyslipidemia (5.3%), anxiety depression (2.3%) and cardiac disease (0.8%) while 385 (75.8%) had no chronic disease, as shown in Figure 1.

Figure 1: History of chronic diseases (N = 508)

The mean awareness score was 13.6 ± 1.8 points. We found that 463 (91.1%) participants had good awareness about diabetic complications while only 45 (8.9%) had poor awareness as shown in Figure 2.

Figure 2: Awareness about Diabetic Complications (N = 508)

Out of the 508 participants, 93.9% were diagnosed with diabetes mellitus or knew someone diagnosed with it. About 78.4% of the participants thought that diabetes is a lifestyle disease and a higher percentage of them (84.1%) agreed that DM is a disease which needs to be monitored every 3-6 months.

In addition, 84.3% knew that DM can affect multiple systems (namely a multi-systemic disorder). "Uncontrolled DM can cause multiple complications", the vast majority of the participants (96.1%) agreed with this statement and a similar proportion of the participants (96.7%) knew that monitoring DM can help to reduce the chance of these complications' occurrence. Participants were asked to identify Diabetic complications; only 184 (36.2%) of them correctly identified them without adding any other wrong answers. Retinopathy was the most selected (41.9%) followed by erectile dysfunction (35.8%), kidney disease (35.6%), foot ulcer (35.4%), myocardial infarction (22.6%), neuropathy (22%) and stroke (13.6%). Few participants thought that liver failure and pneumonia (16.5% and 5.7% respectively) could occur as a complication of diabetes. Furthermore, the majority of the participants (89.8%) agreed that diabetics should at least check complications of diabetes once every year. 373 (73.5%) of the participants thought that there is a lack of awareness regarding diabetic complications in Saudi Arabia.

Table 2: Awareness about Diabetic Complications (n = 508)

Awareness	Yes		No
Do you know someone diagnosed with diabetes mellitus	477 (93.9%)		31 (6.1%)
	Agree	**Disagree**	**I don't know**
Do you think diabetes is a lifestyle disease?	398 (78.4%)	57 (11.2%)	53 (10.4%)
DM is a disease which needs to be monitored every 3-6 months.	427 (84.1%)	21 (4.1%)	60 (11.8%)
DM is a multi-systemic disorder which can affect multiple systems.	428 (84.3%)	35 (6.9%)	45 (8.8%)
Uncontrolled DM can cause multiple complications.	488 (96.1%)	3 (0.6%)	17 (3.3%)
Monitoring DM can help to reduce the chance of the complications.	491 (96.7%)	2 (0.4%)	15 (2.9%)
Diabetic patients should at least check for diabetic complications once every year.	456 (89.8%)	22 (4.3%)	30 (5.9%)
Do you think we have lack of awareness regarding Diabetic complications here in Saudi Arabia?	373 (73.5%)	84 (16.5%)	51 (10%)

3.

The level of awareness of diabetic complications was significantly associated with age (P = 0.011), participants aged more than 45 years had higher level of awareness compared to other age groups, and it was significantly related to the occupation (P = 0.001). A higher percentage of participants with other than the stated occupations had good awareness when compared to the remaining occupational groups. On the contrary, gender, nationality and educational level did not have any significant impact on diabetic complications awareness, as the calculated P values were recorded 0.837, 0.333 and 0.911 respectively, as shown in Table

Table 3: Factors associated with awareness about diabetic complications (the percentages were calculated within each studied group)

| Variable | | Level of Awareness | | | | P value |
| | | Good | | Poor | | |
		N	%	N	%	
Gender	Male	312	91%	31	9%	0.837
	Female	151	91.5%	14	8.5%	
Age in Years	18-25	85	91.4%	8	8.6%	0.011
	26-35	131	85.1%	23	14.9%	
	36-45	88	93.6%	6	6.4%	
	More than 45	159	95.2%	8	4.8%	
Nationality	Saudi	437	90.9%	44	9.1%	0.333
	Non-Saudi	26	96.3%	1	3.7%	
Educational Level	Primary	8	88.9%	1	11.1%	0.911
	Intermediate	16	94.1%	1	5.9%	
	Secondary	117	90.7%	12	9.3%	
	Bachelors	295	91.6%	27	8.4%	
	Other	27	87.1%	4	12.9%	
Occupation	Employed	232	91%	23	9%	0.001
	Unemployed	56	78.9%	15	21.1%	
	Retired	70	95.9%	3	4.1%	
	Private business	10	90.9%	1	9.1%	
	Other	95	96.9%	3	3.1%	

Discussion

The past studies indicate the ever increasing threat of diabetes in Saudi Arabia (10,11). According to the Saudi Arabian Ministry of Health, DM was reported to affect 0.9 million people in 1992 (10). This number increased dramatically to 2.5 million people in 2010, which constitutes a 2.7 times increase in the incidence rate within 18 years only (10). According to a study done in 2013, Saudi Arabia comes in the Top 10 countries with a higher prevalence of DM (23.9%) (10). Due to the increased incidence and prevalence rates of diabetes in Saudi Arabia more attention and awareness are needed especially about recognizing the early symptoms of DM complications. It is important in order to help us in early identification of diabetic complications. Findings of our study will help assess overall awareness and to shed light on areas of awareness deficiency and misconception which help in targeting health education efforts and is helpful for health educators to plan for future awareness programs which will prevent the onset of diabetes or postpone the complications in the population.

The prevalence of diabetes mellitus among the study participants was found to be 16.9%. The same result was obtained in a study conducted in Saudi Arabia among the Riyadh population by Alanazi et al.(11) and in another study conducted among the Tabuk population by Mirghani et al.12, which were 16.7% and 16.5% respectively.

In the current study, the mean awareness score was 13.6 ± 1.8 points. We found that 463 (91.1%) participants had good awareness about diabetic complications while only 45 (8.9%) had poor awareness. A lower level of awareness was reported among type 2 diabetic patients in Alahsa, Saudi Arabia by El Sheikh et al.(10) who found that 54.6% of the patients had good awareness level regarding diabetes and its complications. This difference in level of awareness may be attributed to the difference in the used assessment tool and types of questions used in the questionnaire. Due to the rapid increase in the number of people with type II diabetes worldwide, which comprises 90%-95% of all cases of DM(11), more attention and awareness are needed especially for those patients to help in curbing the crisis.

Regarding the statement "Uncontrolled DM can cause multiple complications", the vast majority of the participants (96.1%) agreed with the statement. A lower percentage was reported by Aljofan et al.(13) who found that 47.0% of the respondents knew that uncontrolled diabetes will lead to affect other organs; however, the remainder either did not believe (20.0%) or did not know that uncontrolled diabetes can affect other organs (33.0%).

Most of the participants agreed that diabetes is a lifestyle disease (78.4%) and 96.7% knew that monitoring DM can help to reduce the chance of these complications' occurrence. A similar result was obtained by El Sheikh et al.(10) who reported that 91.5% of the study's participating patients agreed that lifestyle and dietary modifications reduce DM complications, while 87.7% said that DM control reduces its related complications.

Our study showed that when participants were asked to identify diabetic complications, retinopathy was the most selected (41%.9) followed by erectile dysfunction (35.8%), kidney disease (35.6%), foot ulcer (35.4%), myocardial infarction (22.6%), neuropathy (22%), and stroke (13.6%). Relatively similar results were obtained by Aljofan et al.(14) who found that 24.5% of those who knew the effect of diabetes on health, thought that diabetes will lead to eye disease, 28.0% believed it affects the kidneys, 26.0% listed foot ulcers and 20.0% only believed that diabetes can cause heart problems. A higher level of awareness about diabetic complications was reported in another two studies carried out by El Sheikh et al.(10) and Fatani et al. (14). El Sheikh et al.(10) reported that the most known diabetic complications by patients were diabetic retinopathy (91.6%), vision loss (90.8%), peripheral neuropathy (80.2%), and chronic renal diseases (36.9%). Fatani et al.(14) found that the mostly recognized complications of diabetes mellitus were as follows in order: eye disease (72.9%), diabetic foot (71.2%), renal disease (56.2%), peripheral neuropathy (53.8%), sexual impairment (42.5%), heart disease (40.1%), high blood pressure (33.1%), sudden death (20.4%), and cerebrovascular disease (18.7%). This difference in the recognition of the diabetic complications may be attributed to the difference in study populations since our study was carried out among the general population while the other two studies were among diabetic patients.

The level of awareness of diabetic complications was significantly related to age (P = 0.011); participants aged > 45 years had the highest level of awareness. The result we found goes in line with the study carried out by Alanazi et al.(11), in Riyadh, Kingdom of Saudi Arabia (KSA), which found that there was a significant statistical relationship between the age and level of knowledge regarding the complications of T2DM (p-value = 0.028). Younger participants had a higher level of awareness regarding complications of DM type 2 than older age groups.

Furthermore, level of awareness of diabetic complications was significantly related to the occupation (P = 0.001) ; a higher percentage of participants with other than the stated occupations had good awareness when compared to the remaining occupational groups. Gender, nationality, and educational level did not have any significant impact on diabetic complications awareness, as the calculated P values were recorded as 0.837, 0.333 and 0.911, respectively. This result was contrary to a study carried out by El Sheikh et al.(10) who reported that good awareness was detected among 61.2% of patients with a university level of education compared to 42.7% of those with an educational level below secondary, with recorded statistical significance (p = 0.011).

This study provides informative data about awareness of diabetic complications and included a large sample size as the estimated sample size was 384 and the included

sample was 508, thus we can generalize the result for the general public. However, one of the limitations for this study is there is no question about the region of residence of the participants so the sample may not be representative of the studied region.

Conclusion

This study revealed that the general level of awareness about diabetic complications among the general population of Saudi Arabia was good. The majority of the participants (91.1%) correctly completed more than 75.0% of the awareness questions. We noticed that there is a knowledge gap in the recognition of organs that may be affected by diabetes mellitus. Health authorities should employ special efforts to improve the level of knowledge and awareness toward diabetic complications which in turn may help diabetic patients to improve self-knowledge and recognition of early signs and symptoms of DM complications, and this will prevent further deterioration, which will improve life quality and increase life expectancy for those patients.

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