

Knowledge and Perception Regarding Diabetes Mellitus among Diabetic and Nondiabetic Populations in Jeddah, Saudi Arabia

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Abstract

Background: Diabetes mellitus (DM) is a chronic metabolic disease resulting from either a deficit in insulin secretion (type 1) or a function (type 2) that results in an increased level of glucose in the blood. Diabetes mellitus increases the risk for developing many serious complications including microvascular, macrovascular, decreased reproductive activity, and frequent infections. **Objective:** The aim of this study was to assess the awareness level regarding DM risk factors, symptoms, signs, management, and complications in both the diabetic and the nondiabetic population. **Method:** This cross-sectional, descriptive study was conducted among the general population of Jeddah, Saudi Arabia, in 2019. A total of 24 questions from a pre-piloted questionnaire were interpreted into Arabic. The questionnaire contained a series of questions arranged in four parts: Assessing DM general knowledge, risk factors, symptoms, and complications. **Result:** This study included 1324 participants; 52.5% were female. The largest age range among the participants (41.5%) was 15–23 years, followed by the 44–53 (18.8%) year age group. Regarding the questions answered correctly: a total mean score achieved by the whole population was 13.9 ± 3.6 out of 19 points ($73.9 \pm 19.3\%$). The diabetic participants achieved higher scores than the nondiabetics in each category. **Conclusion:** The study found that the largest gap in knowledge regarding DM is in the knowledge of its complications. The role of health education needs emphasis at all levels starting with schools and universities. This is in addition to general public health education, distributing knowledge through brochures and social media.

Keywords: Diabetes mellitus, Knowledge, perception, Jeddah, Saudi Arabia, nondiabetic, diabetic populations.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease that results from a deficit in insulin secretion (type one) or a function (type two) that results in an increased level of glucose in the blood, which can affect the patients. According to World Health Organization (WHO) statistics, in 2016, diabetes directly caused approximately 1.6 million deaths, and 14.4% of the total Saudi Arabian population had DM [1]. Additionally, in 2017, there were 3,852,000 cases of DM reported in Saudi, with a prevalence of 18.5% among adults.

According to the International Diabetes Federation (IDF), the prevalence of diabetes in Saudi

Arabia was 18.3% in 2020, which includes 4,275,200 adult patients.

Worldwide, 463 million people have diabetes, with 55 million people in the Middle East and North African region. That number is expected to increase over the coming years (reaching 108 million in 2045).

Regarding DM symptoms, type two DM tends to be asymptomatic for a long period of time; symptoms such as polydipsia, polyuria, and polyphagia occur more commonly in type one DM, while weight loss, tiredness and generalized body ache can occur in both types [2]. Prevention is better than cure, and complications can be prevented by early detection of

the symptoms and signs of the disease. Diabetes mellitus can result in different types of complications including microvascular (neuropathy, nephropathy, retinopathy) and macrovascular (coronary artery disease, peripheral arterial disease, and stroke), decreased reproductive activity, frequent infections, and slow wound healing [3]. It has been found that early detection of DM symptoms with better understanding and knowledge by the patients regarding the disease, risk factors, and management are important roles for preventing DM complications and improving the quality of life [3].

Numerous studies have resulted in sufficient knowledge of the participants regarding DM and its etiology, symptoms, treatment, and complications [4]. Notably, a major source of information about DM was found to be family members, friends and/or the internet; moreover, most of these participants had a high education degree (secondary school, university) [5, 6]. However, a recent systemic review study carried out in Saudi Arabia found that most of the articles, including the ones in our study, resulted in a poor level of information of the disease among DM patients in Saudi.³ Additionally, a gap in knowledge regarding DM was found in both diabetic and nondiabetic patients [7].

For the people who participated in these studies, there was a confusion surrounding the precise knowledge and awareness regarding DM; especially those who don't have DM disease [5]. Moreover, there is also a lack of such studies in Jeddah, Saudi Arabia. Therefore, the aim of our study was to assess the knowledge and awareness level regarding DM risk factors, symptoms, signs, management, and complications among diabetics and to compare the results with the nondiabetic population for understanding, prevention and better control of the disease.

MATERIALS AND METHODS

This cross-sectional, descriptive, survey-based study was approved by the Institutional Review Board (IRB) of King Abdulaziz University (KAU). The questionnaires were interpreted from English into Arabic. The study was conducted by distributing questionnaires to the general population of Jeddah in 2019. Jeddah, one of the largest cities in Saudi Arabia, is located in the western region of the country and has a population of 3.4 million.

A total of 1324 adults participated in our study. We collected data from October to November 2019. First, we took electronic questionnaire consents to fill in the survey, and then we distributed the survey to the general population in different locations malls, restaurants and parks across different age groups, after taking their approval to participate in our study. We collected the data using an electronic survey and assessed the participants for their knowledge using a

scoring system based on marks we assigned to every question.

In order to decrease any potential sources of bias, we avoided leading questions, using medical terms and using difficult language to understand. There were a total of 19 questions from a pre-piloted questionnaire. The questionnaire contained a series of questions arranged in four parts: Assessing DM general knowledge, risk factors, symptoms and complications. The general knowledge questions included the following: "Is DM a condition of high blood sugar?" "Is DM an infectious disease?" "Is DM a disease related to insulin?" and "Is DM a curable disease?" (four questions).

There were three questions regarding the risk factors of obesity, old age, and family history. There were three questions regarding the symptoms, including thirst, frequent urination, and tiredness. Finally, there were nine questions regarding complications: Influence on the movement of extremities, slow wound healing, influence on reproductive activity, foot gangrene, retinopathy, nephropathy, heart disease, foot ulcers, and frequent infections. We also recorded demographic characteristics and sources of information.

Inclusion Criteria:

- Jeddah city residents.
- Participants 16 years of age and older.
- Diabetic and non-diabetic participants were both included.

Exclusion Criteria:

- Participants who work/live outside Jeddah.
- Pregnant women.
- Participants who did not give consent.
- Any Missing data

Statistical Analysis

We performed the statistical analyses using SPSS version 25.0. We applied frequency to all of the qualitative data, including gender, education degree, job, source of information, and diabetic and nondiabetic participants. We applied the mean \pm standard deviation to all of the correct answers of the participants. We used the *t*-test and one-way ANOVA to determine the relation between the correct answers with nationality and age ranges. We considered *P* values <0.05 significant.

RESULT

Demographic data of the participants

Our study included 1324 participants, 52.5% were female. Ninety-nine percent were Saudi and the remaining were non-Saudi. The largest age range among the participants was 15–23 years (41.5%), followed by the age range of 44–53 years (18.8%).

Nearly two-thirds (73.6%) of the participants had a college degree. Table 1 shows the details of the demographic data. Approximately one-fifth (19.9%) of the participants had DM, and approximately half of those had type 2 DM (10.8% of the total participants). The main sources of information were social media (32.7%), followed by relatives/friends (29.1%), doctors (28.7%), and the rest consisted of books, research studies, and personal experience (9.5%).

General knowledge regarding DM

The mean score \pm SD of the correct answers regarding general knowledge about DM was 3.1 ± 0.81 out of a total score of 4, as shown in Table 3. Females were significantly ($P < 0.05$) more likely to score higher in general knowledge, except regarding hyperglycemia, where no significant difference was found, and regarding DM being treatable, whereas, males (only 40.1%) were more likely to know that it is (Table-2). Older people and retired people had significantly higher average scores ($P < 0.001$) of correct answers, students were less likely to answer correctly as compared to unemployed people, those working in healthcare or elsewhere, and retired people. Too few illiterate people participated (three participants) to comment on their answers.

Knowledge of risk factors and symptoms

The mean scores \pm SD of the correct answers (out of a total score of 3 for each) regarding knowledge about DM risk factors were 2.5 ± 0.7 ; they were 2.4 ± 0.9 for symptoms, as shown in Table 3. There was a statistically significant difference between genders in knowledge regarding DM risk factors and symptoms ($P < 0.05$); females were more likely to answer correctly,

except to the question of whether older age was a risk factor. The percentages of correct answers ranged between 66.6 and 94.5% (Table 2). Older and retired people and those with higher education had a significantly higher average ($P < 0.05$) of correct answers, except in risk factor knowledge, where age did not produce a difference, and in symptoms knowledge, where educational level did not produce a difference either. Students were less likely to answer risk factor questions correctly, as compared to unemployed people, those working in healthcare or elsewhere, and retired people.

Knowledge of DM complications

A total of nine questions were asked, the mean score \pm SD of the correct answer 5.9 ± 2.5 pertaining to DM complications, females were again significantly more likely to answer correctly, except regarding diabetic nephropathy and peripheral neuropathy or weakness, where the males answered more correctly ($P < 0.05$) (Table 2). Older, illiterate, and retired people all had a significantly higher average ($P < 0.001$) of correct answers; students were less likely to answer correctly compared to unemployed people, those working in healthcare or elsewhere, and retired people.

The total mean score for correctly answered questions for DM general knowledge, risk factors, symptoms, and complications was 13.9 ± 3.6 (Table 3). Females, those diagnosed with DM, older participants, illiterate people, and those with higher education had higher total scores on average, as compared to their peers ($P < 0.001$). Among all of the participants, 39.8% scored >15 out of 19 and 6.3% scored 19 out of 19.

Table 1: Demographic data of the participants

Gender Number (Percentage %)			
	Male <i>n</i> = 629 (47.5%)	Female <i>n</i> = 695 (52.5%)	Total
Age			
15–23	378 (60.1%)	171 (24.6%)	549 (41.5%)
24–33	108 (17.2%)	91 (13.1%)	199 (15%)
34–43	38 (6%)	109 (15.7%)	147 (11.1%)
44–53	45 (7.2%)	204 (29.4%)	249 (18.8%)
54–65	44 (7%)	104 (15%)	148 (11.2%)
>65	16 (2.5%)	16 (2.3%)	32 (2.4%)
Education			
Illiterate	0 (0%)	3 (0.4%)	3 (0.2%)
School	100 (15.9%)	114 (16.4%)	214 (16.2%)
College	484 (76.9%)	490 (70.5%)	974 (73.6%)
Higher Education	45 (7.2%)	88 (12.7%)	133 (10%)
Job			
Unemployed	14 (2.2%)	171 (24.6%)	185 (14.0%)
Student	399 (63.4%)	177 (25.5%)	576 (43.5%)
Public/Private	134 (21.3%)	160 (23%)	294 (22.2%)
Healthcare	29 (4.6%)	37 (5.3%)	66 (5%)
Retired	53 (8.4%)	150 (21.6%)	203 (15.3%)

Table 2: Number (%) of participants who answered correctly

Gender Number (Percentage %)			
	Male <i>n</i> = 629 (47.5%)	Female <i>n</i> = 695 (52.5%)	Total
General Knowledge			
Is DM associated with high blood sugar?	483 (76.8%)	531 (76.4%)	1014 (76.6%)
Is DM a treatable disease?*	252 (40.1%)	202 (29.1%)	454 (34.3%)
Is DM an infectious disease?*	591 (94%)	685 (98.6%)	1276 (96.4%)
Is DM a disease related to insulin?*	561 (89.2%)	656 (94.4%)	1217 (91.9%)
Risk Factors			
Heritable*	471 (74.9%)	574 (82.6%)	1045 (78.9%)
Obesity*	579 (92.1%)	662 (95.3%)	1241 (93.7%)
Old age*	475 (75.5%)	522 (75.1%)	997 (75.3%)
Symptoms			
Thirst*	442 (70.3%)	594 (85.5%)	1036 (78.2%)
Frequent urination*	561 (89.2%)	657 (94.5%)	1218 (92%)
Tiredness*	419 (66.6%)	500 (71.9%)	919 (69.4%)
Complications			
Effect on movements of extremities*	418 (66.5%)	422 (60.7%)	840 (63.4%)
Slow wound healing*	521 (82.8%)	654 (94.1%)	1175 (88.7%)
Effect on reproductive activity	353 (56.1%)	386 (55.5%)	739 (55.8%)
Foot wounds and gangrene*	459 (73%)	563 (81%)	1022 (77.2%)
Retinopathy*	456 (72.5%)	600 (86.3%)	1056 (79.8%)
Nephropathy	352 (56%)	417 (60%)	769 (58.1%)
Heart disease and hypertension*	373 (59.3%)	337 (48.5%)	710 (53.6%)
Foot ulcers and diabetic foot*	426 (67.7%)	542 (78%)	968 (73.1%)
Frequent infections*	250 (39.7%)	345 (49.6%)	595 (44.9%)

* Statistically significant ($P < 0.05$)**Table 3: Mean scores based on diabetes status**

	Diabetic (<i>n</i> = 199, 14.8%) Mean ± SD	Nondiabetic (<i>n</i> = 1142, 85.2%) Mean ± SD	Total (<i>n</i> = 1341) Mean ± SD	<i>P</i> value
General knowledge (4 marks)*	3.3 ± 0.8	3.1 ± 0.8	3.1 ± 0.8	<0.001
Risk factors (3 marks)	2.5 ± 0.7	2.5 ± 0.7	2.5 ± 0.7	0.75
Symptoms (3 marks)*	2.6 ± 0.7	2.4 ± 0.9	2.4 ± 0.9	<0.001
Complications (9 marks)*	7.1 ± 2.3	5.7 ± 2.5	5.9 ± 2.5	<0.001
Total (19 marks)*	15.4 ± 3.2	13.6 ± 3.7	13.9 ± 3.7	<0.001

* Statistically significant ($P < 0.05$)**Table 4: Mean scores for correct answers regarding general knowledge, risk factors, symptoms, and complications**

	General Knowledge	Risk Factors	Symptoms	Complications	Total
Total possible score	4 marks	3 marks	3 marks	9 marks	19 marks
Mean ± SD	3.1 ± 0.81	2.47 ± 0.71	2.39 ± 0.86	5.94 ± 2.52	13.92 ± 3.62
Score as percentage of maximum	77.5 ± 20.6	82.4 ± 24	79.5 ± 29.2	65.8 ± 28.2	73 ± 19.3

DISCUSSION

Multiple studies have estimated the awareness among diabetics and nondiabetics regarding DM complications. One of the studies was carried out to assess the knowledge, attitude, and practice of diabetic retinopathy amongst the diabetic patients of Saudi Arabia; it found that most of the patients (75.6%) were aware of diabetes complications of the eyes.⁸ However, a cross-sectional study carried out in the Arar region with 702 participants showed that knowledge about DM complications was relatively low; only 24.5% were

aware of retinopathy, and only 8.3% knew about the retinopathy, loss of vision, low sensation, or numbness in the extremities.⁹ With these considerations, we asked our participants a total of 19 questions. The findings of this study provided insight into the level of awareness regarding DM in various categories of the Saudi population. The total mean score achieved by the whole population was 13.9 ± 3.6 points out of a total achievable score of 19 points ($73.9 \pm 19.3\%$). The scores in each category were as follows: General knowledge, 3.1 ± 0.8 points out of 4 points ($77.5 \pm$

20.6%), risk factors knowledge, 2.5 ± 0.7 points out of 3 points ($82.4 \pm 24\%$), symptoms knowledge, 2.4 ± 0.9 points out of 3 points ($79.5 \pm 29.2\%$), and complications knowledge, 5.9 ± 2.5 points out of 9 points ($65.8 \pm 28.2\%$). The level of knowledge was highest in risk factors, followed by that of symptoms, and general knowledge. The least level of knowledge was regarding the complications of DM.

In examining the difference in knowledge between diabetics and nondiabetics, it was noteworthy that diabetics achieved higher scores compared to nondiabetics overall ($P < 0.001$) as well as in each category, except in the knowledge of risk factors, where the difference between the two groups was not statistically significant ($P = 0.75$).

Age appeared to play a linear role. The older the participant, the more likely he or she was to answer the questions correctly. We also looked at the difference in knowledge between males and females. A higher number of females correctly answered questions regarding whether DM is an infectious disease and if it is related to insulin. They were more knowledgeable regarding risk factors and symptoms of DM as well. The females also correctly answered more questions related to complications of DM such as slow wound healing, DM foot, retinopathy, and frequent infections. In comparison, the male participants were more likely to correctly answer questions about DM being a treatable disease and complications such as neuropathy and cardiovascular disease.

When it came to occupation, the students scored the lowest in all categories and healthcare workers scored the highest, followed by retired individuals, government/private sector employees, and the unemployed. The scores were higher among those who had attained or were pursuing higher education and university degrees, as compared to school students.

CONCLUSION

Based on our data, we determined that the largest gap in knowledge regarding DM is in the knowledge of its complications, especially infections, cardiovascular disease, impotence, nephropathy, and neuropathy. Surprisingly, only approximately one-third of the participants answered that DM is a treatable disease. The population that is more likely to benefit from better education regarding DM includes younger individuals, males, students, and nondiabetics. The role of health education needs emphasis at all levels, starting with schools, colleges, and universities. There is additional scope for improvement with general public health education in the form of the distribution of knowledge through brochures, media, and social media, and by arranging public forums and increasing awareness regarding access to health education through the Ministry of Health websites, which are available to all. Further studies are recommended to address the gap

in knowledge in younger individuals and nondiabetics people.

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Criteria for inclusion in the authors

- Works in medical field
- Willing to provide support when needed
- actively participate in manuscript writing

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