



Awareness about diabetes mellitus among adolescents age group in Jeddah city, Saudi Arabia

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General Note



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ABSTRACT

Background: Diabetes mellitus is one of the global health problems that has been dramatically increase especially in developing countries and Saudi Arabia represents one of the highest rate country in the world incidence of the diabetes. Improving knowledge and awareness about life style, methods of prevention and management will help to decrease the incidence of developing DM and its complications. **Aim of the work:** This study aimed to determine, the level of awareness and knowledge regarding the type 2 diabetes and its complications. **Method:** An observational cross sectional study was performed on 787 adolescent participants through online-administrated structured questionnaire about the knowledge of risks and complications of DM applied online in a

Google form. *Results:* Among 787 participants interviewed, 410 (52.1%) were males and 377 (47.9%) were females. The mean (SD) age of participants was 17(1.50) years with more than half of them being males, (52.1%). Most of the participants (69%) were from government school and 18% of them had a family history of diabetes. Overall, correct knowledge was lowest for diabetes complications (29.32), it was lower for risk factors (34.0%) and symptoms for diabetes (36.13%). Less than 14% of them were able to respond correctly to diabetes is a condition of not enough insulin in blood. 18.2 % of the participants had family history of diabetes. According to overall scoring of knowledge section, 47% of the respondents had poor/no knowledge regarding various aspects of diabetes mellitus, 38.3% of respondents had fair knowledge while only (14.8%) had good knowledge. *Conclusion:* Students were less knowledgeable in exercise and dietary management issues but not in symptoms and complications of diabetes. Thus, education in diabetes is needed in order to make individuals more aware of the illness and take preventive measures.

Keywords: Awareness, Diabetes mellitus, adolescent

1. INTRODUCTION

Diabetes mellitus is one of the non-communicable diseases that considered as a large health problem worldwide and it is predicated to increase from 425 million up to 625 million in 2045 (Mahikul et al., 2019). It is classified into three main types (Type 1DM, Type 2 DM and Gestational diabetes), type 2 DM characterized by inability of the pancreas to secrete insulin or inability of the body to use insulin due to insulin resistance (Alanazi et al., 2018).

Saudi Arabia represents the seventh highest rate country in the world incidence of the diabetes (Saadia, 2010) which impose a large economic burden as likely to exceed \$0.87 billion (Alhowaish, 2013). International Diabetes Federation reported 3.852.000 cases of diabetes in Saudi Arabia in 2017 (Anon, 2019). This increase attributed to the high level of economic growth and development as population had remarkable change in their lifestyle which resulted in increasing non-communicable diseases (Saadia, 2010). Incidence of type 2 DM is affected by both modifiable (i.e. obesity, hypertension, physical inactivity, low fiber diet, diet rich in fatty acids, cigarette smoking, moderate alcohol consumption and emotional stress) (Rahati et al., 2014) and non-modifiable risk factors (i.e. age, family history of diabetes and race/ethnicity) (Hussain et al., 2006). Also is associated with acute and chronic complications, acute as diabetic keto-acidosis, hypoglycemia and hyperosmolar hyperglycemic state and electrolyte disturbance (Forohui & Wareham, 2014) while chronic complication such as micro-vascular and macro-vascular complications (diabetic neuropathy, retinopathy and nephropathy) (coronary artery disease and peripheral arterial disease) respectively (Li et al., 2019).

Control and prevention of DM is achieved by raising the level of awareness among population about risk factors and early detection of the disease through formulating national diabetes control programs (Garfield, 2003) and health education programs to change their life style by increasing physical activity, managing the body weight and avoiding unhealthy diet (Salem et al., 2019) take in consideration different ethnic and social group. Also, it is important for patients with DM to understand their medication for better control of their blood glucose level and management of their complications (Alanazi et al., 2018). The Saudi MOH and WHO created corporative strategy from 2006-2011 to promote healthy life style and providing health education programs and also another preventive strategy in 2013 (Alharbi et al., 2016) as MOH is responsible for health promotion, early detection and management of disease for free at population level (Alkhamis, 2012). For formulation a good preventive program for diabetes, it is important to obtain information and to investigate knowledge and awareness of public about risk factors responsible for development of diabetes and complication.

2. PATIENTS AND METHODS

This is an observational cross section study aimed to determine the level of awareness and knowledge regarding the type 2 diabetes and its complications. This was conducted over August 2019 to November 2019. This study was undertaken from the adolescents, in Jeddah city-Saudi Arabia, 787 participants were included. People who refused to participate in the study and who in completed questionnaires were excluded from the study. Ethical approval for this study was obtained from ethical review committee of the college (IHEC Ref No.: H-03-06112016) and (Protocol Identification: 009MP04102016). An online consent was received from the participants before their involvement.

Sample size was estimated using EPI INFO (Epidemiological Information Package) version (21) 3.5.3.statistical packages assuming that the frequency was (20%) at a confidence interval of 95 % and power of 80%. The Sample was conventional sample, selection of sample done randomly when sample size had been completed, the application form closed.

Data collection

The assessment of data was carried out by obtaining self-administrated structured questionnaire included questions about the knowledge of lifestyle, risk factors, symptoms, complication and methods of management of diabetes, applied in a Google form and had been loaded in the internet.

A pilot study was carried out (10% of the sample size (40 subjects) to evaluate the validity and reliability of the questionnaire applied on participants. Regarding this result some modifications and rearrangement of some questions were done. The results of this pilot study were not included in the final data analysis. Validation of the questionnaire was done using a back-translation technique. The original questionnaire was translated by an expert from English into Arabic and back translated by a bilingual individual. Self-administrated structured questionnaire obtained from Al-Hussaini and Mustafa (Al-hussaini & Mustafa, 2016).

(1) First part included socio-demographic characteristics as (Age, sex, nationality, education level, weight, height, physical activity and family history of DM)

(2) Second part included seven close-ended questions about the general knowledge of participants about diabetes (condition of high blood sugar, not enough insulin, body not respond to insulin, curable or not, occur in children, adolescent and adults, treatment by insulin and forbidden from eating carbs).

(3) The last parts included close-ended questions about the participants' knowledge regarding risk factors (obesity, pregnancy, family history and age above 40), symptoms (getting thirsty, frequent urination, weight drop, blurring vision, delayed wound healing and tiredness), complications (eye, kidney, heart problems, high blood pressure, loss of sensation and limb that require surgical removal) and methods of treatment (things should not be done and methods of monitoring).

Data Management

The Collected data were recorded then presented and analyzed using SPSS (Statistical Package for the Social Sciences) version 22.0 and Epi info for windows version 3.5.3. Data were represented in tables as frequencies and percentages. Chi square was used for qualitative data and t-test and ANOVA for quantitative data the results were considered statistically significant when the probability ($P < 0.05$) with confidence interval 95%.

3. RESULTS

Out of the 850 questionnaire distributed, 787 participants completed the questionnaires. Sixty three incomplete questionnaires were excluded. The non-response rate in this study was 7.4%. These 63 participants withdrew from the study due to the lengthy nature of the questionnaire and/ were in a hurry to leave the class for their other appointments. Table 1 represents the background information of studied population. Among 787 participants interviewed, 410 (52.1%) were males and 377 (47.9%) were females. The mean (SD) related to population age was 17 (1.54) years with more than half of them being males, (52.1%). Most of the participants (69%) were from government national school and 18 % of them had a family history of diabetes. Body Mass Index (BMI) was calculated and it was observed that 33.2% of the participants were overweight and 13.1% were obese. It is also observed that 50% were not doing any type of exercise.

Table 1 Background characteristics of participants (n = 787)

Variable		Frequency (n)	Percentage (%)
Gender	Male	410	52.1
	Female	377	47.9
Age	15	123	15.6
	16	176	22.4
	17	178	22.6
	18	135	17.2
	19	100	12.7
	20	75	9.5
	Mean (SD)	17 (1.50)	
Type of school	Government	544	69.1
	Private	243	30.9
Educational level	Grade 9	215	27.3
	Grade 10	175	22.2

	Grade 11	156	19.8
	Grade 12	241	30.6
Family history of DM	Yes	143	18.2
	No	644	81.8
Height	Mean (SD)	52.14Kg(7.9)	
Weight	Mean (SD)	158.94 Centimeter(8.4)	
BMI as per percentile			
Below 5 th percentile	Underweight	34	4.3
5 th – 85 th Percentile	Healthy weight	389	49.4
85 th – 95 th percentile	Overweight	261	33.2
95 th and above percentile	Obese	103	13.1
Activity/Exercise	1-3 days per week	218	27.7
	3-5 days per week	122	15.5
	More than 5 days per week	52	6.6
	No exercise at all	395	50.2

From Table 2, overall, knowledge was higher for diabetes treatment (65.9%) than for monitoring of diabetic condition (52.4%) and general knowledge of diabetes (45.66%). Overall correct knowledge was lowest for diabetes complications (29.32); it was lower for risk factors (34.0%) and symptoms for diabetes (36%). Less than 14% of them were able to respond correctly to diabetes is a condition of not enough insulin in blood. 18 % of the participants were known family history with diabetes.

Table 2 Correct responses of participants on knowledge of diabetes

Questions	n	%
General knowledge of diabetes		45.66
Diabetes is a condition of high blood sugar	540	68.6
Diabetes is a condition of not enough insulin in blood	104	13.2
Diabetes is a condition of the body not responding to insulin	235	29.9
Diabetes is not curable	344	43.7
Diabetes occur in children, adolescents, and adults	423	53.7
Insulin hormone replacement is the only treatment for diabetes	351	44.6
Insulin hormone in blood which controls blood sugar	483	61.4
Diabetic patients are forbidden from eating Carbs and sweets in their diet plan	395	50.2
Risk factors		34.0
Family history of diabetes	143	18.2
Age above 40 years old	367	46.6
Obesity	339	43.1
Pregnancy	221	28.1
Symptoms		36.13
Thirst Feeling multiple times during day	246	31.3
Increase frequency of urination	210	26.7

Weight loss despite normal appetite	311	39.5
Blurred vision	294	37.4
Slow healing of cuts and wounds	316	40.2
Tiredness and weakness	328	41.7
Complications		29.32
Eye problems	284	36.1
Kidney problems	189	24.0
Heart problems	154	19.6
High blood pressure	168	21.3
Loss of sensation in arms and legs	276	35.1
Decaying limbs that require surgical removal	313	39.8
Treatment available		65.9
Tablets and capsules are available for the control of diabetes	488	62.0
Insulin injections are available for the control of diabetes	549	69.8
Lifestyle		41.48
Do You Believe that a Diabetic patient should keep his/her weight controlled?	456	57.9
Diabetics should exercise regularly	318	40.4
Do you think diabetic patient should avoid soft drinks and instead of that increase the amount of water consumption	299	38.0
Diabetics should care for their toes and and hygiene	219	27.8
Should diabetic eats food rich with high fibre and low fat diet?	341	43.3
Things diabetics should not do		42.82
Diabetics should not donate blood	187	23.8
Diabetics should not smoke	423	53.7
Diabetics should not wear tight shoes	328	41.7
Diabetics should not skip meals when busy	356	45.2
Do you think Diabetic should take insulin at same place every-time	385	48.9
Do you think diabetics should carry sweet when they are outside	343	43.6
Monitoring of diabetic condition		52.4
Diabetics should test their blood sugar regularly	518	65.8
Diabetics should go for regular eye check-up	307	39.0

Table 3 lists for each section the maximum score, mean, standard deviation, median of total score and the average percent correct answer for each section. The overall average correct answer was 53.2%. Figure 1 shows the respondents claiming to have Knowledge regarding Diabetes. According to overall scoring of knowledge section, 47% of the respondents had poor/no knowledge regarding various aspects of diabetes mellitus, 38.3% of respondents had fair knowledge while only (14.8%) had good knowledge.

Table 3 Maximum possible score, mean, standard deviation, median and answers of the respondents claiming to have knowledge regarding diabetes

Section	Maximum possible score	Mean	Standard deviation	Median	Poor knowledge	Fair knowledge	Good knowledge
General knowledge	7	4.9	1.9	5	53.7%	42.1%	11.6%
Life style	5	3.1	1.1	3	34.5%	38%	27.5%
Risk factors	4	2.8	0.9	3	34.4%	43.2%	22.4%

Symptoms and complications	12	6.65	2.8	8	50.9%	38.8%	10.3%
Treatment and management	2	1.46	0.7	2	48.7%	33.7%	15%
Things diabetes should not do	8	5.7	1.8	5	60%	33.9%	26.1%
Total	38	24.61	9.2	26	47.03%	38.28%	14.82%

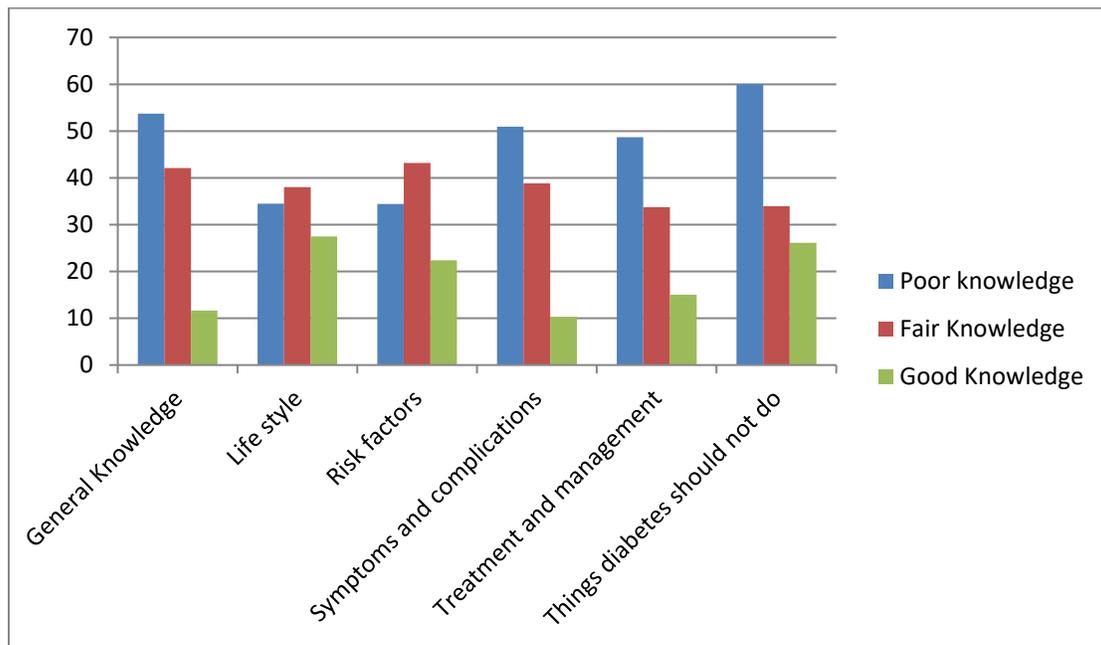


Figure 1 Knowledge of participants about diabetes

Factorial MANOVA was performed to determine whether demographic and lifestyle variables influenced participants' knowledge. Significant differences were found for gender, study level, family history, maintaining healthy eating and engaging in physical exercise, but not for level of study. However, there were no interaction effects amongst these demographic variables and the lifestyle variables for general as well as specific knowledge diabetes. Thus, interactions effects were not reported. Gender – There was gender difference in the knowledge diabetes treatment as females were more knowledgeable than males ($p = .001$). However, there was no gender difference in students' general and specific knowledge of diabetes and diabetes symptoms and complications. Level of study – Significant differences were found in the level of knowledge and awareness of students based on their discipline of study for the general and specific measures of diabetes as follows; general knowledge and awareness of diabetes ($p = .0001$), diabetes symptoms, ($p = .001$), diabetes treatment, ($p = .0001$) and diabetes complication, ($p = .0001$).

4. DISCUSSION

Overall, findings showed that although on average, about half of the participants made correct answers, the lack of knowledge and related awareness presented in specific measures. Participants had more knowledge of diabetes treatment than diabetes symptoms and complications. This is consistent with studies that have reported lack of knowledge and awareness of diabetes in for instance, Omani adults (Alshafae et al., 2008) and Jordanians students (Alsarayra & Khalidi, 2012), but contrary to findings of above average knowledge of diabetes, in a student population in Iraq (Mohammed et al., 2018) and among civil servants in Nigeria (Agu et al., 2014).

One of the reasons related to the finding is that the targeted population thinks logically for the applied questions, for example several of the questions focused on diet and exercise, which are obvious guidelines for most health issues/clinical illnesses. This logical thinking is clearly present in lower number of correct answers in specific diabetic medications, and related insulin injections, regular blood testing, foot complications and low blood glucose. Thus, although participants had more knowledge and awareness of diabetes treatment, this may have been as a result of about half of the questions focusing on diet and exercise. Regarding the whole

questions, the focus of correct answers were on dieting, wound and cuts, treatment, weight management and normal controlled blood sugar levels.

While the lowest score go for specific questions, which the targeted population may only have knowledge of if he/she has a member in family or a close friend having diabetes; or they were discuss about things not associated to diabetes. This lack of knowledge in diabetes symptoms is consistent with findings reported by Al Shafae et al. (2008) that most participants in their study lacked knowledge about basic symptoms of diabetes. Contrary to reports of low knowledge of diabetes management in a Pakistan sample (Gillani et al., 2018), in the present study, more than two-thirds of the participants had more knowledge and awareness of diabetes treatment. Demographic variables, such as sex, level of study, family history of diabetes, and lifestyles variables such as maintaining healthy eating and engaging in physical exercise, determined the students' knowledge and awareness of diabetes. Females had more knowledge and awareness of diabetes treatment than males, but they did not differ in their knowledge and awareness of diabetes symptoms and complications. This is consistent with findings of dos Santos, dos Santos, Ferrari, Fonseca, and Ferrari (2014) (Dos santos et al., 2014) who reported women are more knowledge about awareness of diabetes than men. However antithesis to the findings that men were more knowledgeable about diabetes than women (Deepa et al., 2014, Fezeu et al., 2010, Gillani et al., 2018), and reports of no difference between Nigerian males and females (Agu et al., 2014). Presumably, women proclaim more knowledge in diabetes management because half of the questions were centralized on diet and exercise, and females have been reported to be more conscious about diet and weight loss issues (Brennan et al., 2010, Thackray et al., 2016).

Family history had an influence on students' knowledge of diabetes. Students who are having a family history of diabetes had more background on diabetes management and its awareness rather than people are not having a family history. This may be because the former probably live with or interact with family members who have been diagnosed and are on treatment. They are therefore likely to learn from their family members, which may increase their level of knowledge and awareness of type 2 diabetes. Sometimes also, those diagnosed with diabetes may caution family members (without diabetes) about their predisposition to the illness. This could make the latter more cautious and willing to learn about the illness, knowing that they may be vulnerable to the illness. This finding is consistent with the findings of (Al Sarayra et al., 2012) who reported the influence of family history on the knowledge and perception of diabetes, with two-thirds of the Jordanian students having good knowledge about diabetes. However, family history of diabetes amongst a Nigeria sample has been unrelated to their knowledge of diabetes (Agu et al., 2014).

Students who proclaim having a healthy eating are more knowledge about awareness of type 2 diabetes than those who are not on a healthy eating. This might be as a result a better knowledge they have of diabetes complications; otherwise they are not aware of diabetes symptoms and management. A prospective clarification is that students who proclaim a healthy eating might be aware of the outcomes/illnesses associated with unhealthy eating, otherwise not about the symptoms and management of illnesses, such as diabetes mellitus. The findings also showed better general knowledge and awareness of type 2 diabetes for students who engaged in physical exercise than those who did not, though this difference did not reflect in the specific measures of diabetes knowledge and awareness. Again, this difference in general knowledge and awareness may have resulted from students' high knowledge in diet and exercise as indicated above.

Consequently, students have several knowledge of diabetes awareness, as this was not sufficient and thence, they need to have suitable education. With the increase in the prevalence of diabetes worldwide, education and preventive programs will go a long way to reduce prevalence, as over time, these younger adults become older adult. Participant reported that they obtained information mostly from newspapers and magazines and then from lectures and seminars, thus, these sources of information should be targeted during education.

Limitation

There are some limitations to this study. First, students from only few schools of Jeddah were studied, thus, the findings cannot be generalized to the entire population of Jeddah students. Second, the lengthy nature of the questionnaires as mentioned by some participants may have caused them to complete the questionnaires in haste. Some participants even withdrew from the study as a result. Future studies can consider reducing the items on the scale. Finally, the inadequate self-report of participant's weight and height did not make it possible for their BMI to be calculated and reported. Thus, future studies should consider measuring participants' weight and height as part of the data collection process.

5. CONCLUSION

Despite the increase in the prevalence of diabetes, knowledge of diabetes continues to be poor. A significant number of students lacked knowledge of diabetes, especially on specific questions related to the illness. Students were less knowledgeable in exercise and dietary management issues but not in symptoms and complications of diabetes. The fact that the level of study produced

differences in type-2-diabetes knowledge and awareness, suggests how education can make a difference in creating knowledge and awareness. Thus, education in diabetes is needed in order to make individuals more aware of the illness and take preventive measures. Unless individuals are educated about the symptoms and risk factors, the prevention of diabetes will be very much unlikely or will be an illusion. If individuals have little knowledge about the symptoms of diabetes more people with high sugar levels may go undiagnosed. They may be diagnosed opportunistically (by accident) and their condition may have become worse at that point, making them more susceptible to diabetes complications. Considering that participants were conveniently sampled for the study and not randomly sampled, finding cannot be generalized to all students of Jeddah city.

Authors Contribution Statement

Dr. Khamrunissa wrote the research proposal with support of all authors and conducting review of literature, where Dr. Khamrunissa analyzed these data and necessary inputs were given towards the designing of the manuscript. All authors were collecting the research data, entering the research data and discussed the methodology and results and contributed to the final manuscript.

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