Adolescents' knowledge and awareness of diabetes mellitus in Kuwait

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Abstract *Background and aim:* Diabetes mellitus is a major public health problem in Kuwait. This study aimed to evaluate the awareness and the knowledge of diabetes in adolescent about the disease which, will be of a great help to reduce the risk of developing diabetes and its complications.
Methodology: A cross-sectional survey was done to evaluate the general knowledge of diabetes. The survey was introduced randomly to the students of 30 secondary public and private schools in Kuwait. The questionnaire was divided into eight main sections, with each section focusing on different aspects of diabetes mellitus, namely General knowledge about diabetes, Knowledge of risk factors of diabetes, Knowledge of symptoms, Knowledge on complications, Knowledge about treatment and available medications, Knowledge about lifestyle and non-medical measures, Things diabetics should not do, and Knowledge of management of diabetes.
Results: A total of 4333 students contributed. The main score obtained by the students was 63.2% of the maximum total score. For "General knowledge about diabetes" section's scores were 71.0%, "Knowledge of risk factors of diabetes" 63%, "Knowledge of symptoms and complications" 55.8%, "Knowledge about treatment and management" 62.7%, and "Knowledge of monitoring diabetes" 72.3%.
Conclusion: The students contributed in this study have good general information about diabetes except for a few areas. Our study will clarify these areas to help in designing educational programs to treat these deficiencies of knowledge about the disease and increase the awareness.
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1. Introduction

Diabetes mellitus (Type 1 and Type 2) is one of the most commonly encountered diseases by the healthcare professionals.[1] Worldwide, it was estimated that the prevalence rate among adults was 4% in 1995 and this is expected to increase to 5.4% by 2025. Compared to other parts of the world,

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Kuwait has a higher prevalence of diabetes.[2–5] In 2010 a study was done and showed that 20% of Kuwaiti population are diabetic. The complications associated with diabetes besides significant mortality are, diabetes-related morbidities such as diabetic retinopathy[6], neuropathy, and cardiovascular disease. These complications result in a significant morbidity and mortality rate which have placed a heavy financial burden on the society. Healthcare professionals as well as public policy makers are well aware of the public health impact of diabetes.[7]

Diabetes is a silent disease, many sufferers became aware that they have diabetes only when they develop one of its life-threatening complications. Knowledge of diabetes mellitus can assist in early detection of the disease and reduce the incidence of complications. This can be achieved by improving the knowledge of the general population of the disease at early stage of life.

The main objective of this study was to identify areas of weakness in knowledge regarding the disease and its presentation and complication which might require additional educational efforts in young adolescent. This knowledge would allow improvements of the current programs to address areas of knowledge deficiency and misconceptions, thus achieving maximum efficiencies with the finite resources devoted to adolescents. The awareness of adolescent about the disease can be of a great help to reduce the risk of developing diabetes in future.

2. Methodology

A cross-sectional survey was introduced to the students of secondary public and private schools in Kuwait. The instructions of the survey were explained to them before starting to answer the questions. The students must answer all the questions of the pre-tested questionnaire using a 'Yes', 'No' or 'Unsure' as the response. The questionnaire was divided into eight main sections, with each section focusing on different aspects of diabetes mellitus, namely General knowledge about diabetes (eight questions), Knowledge of risk factors of diabetes (four questions), Knowledge of symptoms (six questions), Knowledge on complications (five questions), Knowledge about treatment and available medications (two questions), Knowledge about lifestyle and non-medical measures (five questions), Things diabetics should not do (four questions), and Knowledge of management of diabetes (three questions).

The survey included 4333 secondary school students (2120 males and 2193 females) who were selected using the multistage stratified random sampling method. A total of 30 secondary schools were involved in this study. Five secondary schools were selected from each of the 6 governorates. Tow governorate schools, Arabic language (one male and one female), tow private Arabic language schools (one male and one female), and one private English language school (male and female).

The questionnaire was distributed to all students in level 11 and 12 in the selected schools.

Statistical analyses were performed using the Statistical Package for Social Sciences, version 20.0 (SPSS Inc., Chicago, USA). Data are presented as number (%) for categorical variables and mean (standard deviation) or median (range) for continuous variables.

A total score was calculated by adding the scores for all 37 questions after giving score 1 for correct answer and 0 for wrong or not sure answers. We excluded the students who marked all questions as "Yes" or all as "No". Domain scores were also calculated for the 5 domains: general knowledge, risk factors, symptoms and complications, treatment and management, and monitoring.

3. Results

3.1. Demographics of respondents

As shown in Table 1, a total of 4333 students answered the questionnaire. 271 responses were not included in the analysis due to poor answers (all questions were marked as "Yes" or all marked as "No"). A total of 4062 questionnaires were included in the analysis, 1955 (48.1%) were male and 2107 (51.9%.) were female. 116 (2.9%) students were diabetic and 1888 (46.5%) students had family history of diabetes (a member of his/her family with diabetes). There was no significant difference in the overall correct answer of younger (age 15–17 years) students with that of older (age 18–20 years) students (62.8% vs 64.5%, $p = 0.628$ by independent t-test).

3.2. Overall Knowledge Level

Table 2 shows the responses of the participants for different items of the questionnaire. The lowest percentage of correct answer was for "Diabetes is a condition of the body not responding to insulin" (40.4%) in the general knowledge section, "Pregnancy" (32.3%) in risk factors section, "Loss of sensation in arms and legs" (41.7%) in complications section, and "Diabetics should not wear tight shoes" (34.3%) in lifestyle section. The distribution of total score obtained (out of 36) is shown in Fig. 1. The distribution was negatively skewed with a mean of 25.0 and standard deviation of 7.1.

Table 1 Demographic characteristics of respondents ($n = 4062$).

Characteristics	Number (%)
Gender	
Male	1955 (48.1)
Female	2107 (51.9)
Nationality	
Kuwaiti	1991 (49.0)
Non-Kuwaiti	2071 (51.0)
Age in years	
15	111 (2.7)
16	1277 (31.4)
17	1996 (49.1)
18	568 (14.0)
19	79 (1.9)
20	31 (0.9)
Diabetic	
No	3946 (97.1)
Yes	116 (2.9)
Family history of diabetes	
No	2174 (53.5)
Yes	1888 (46.5)

Table 2 Responses of the participants for different items of the questionnaire ($n = 4062$).

Questions	Correct (%)	Wrong (%)	Unsure (%)
General knowledge of diabetes			
Diabetes is a condition of high blood sugar	85.1	6.8	8.1
Diabetes is a condition of not enough insulin in blood	63.6	12.4	24.0
Diabetes is a condition of the body not responding to insulin	40.4	22.5	37.1
Diabetes is non-contagious	84.2	7.8	8.0
Diabetes is not curable	72.7	15.4	11.9
Diabetes occur in children, adolescents, and adults	89.3	4.0	6.7
Insulin is a hormone in blood which controls blood sugar	60.9	10.7	28.4
Insulin is available as a drug for diabetic patients	71.3	7.4	21.3
Risk factors			
Family history of diabetes	78.4	10.0	11.6
Age above 40 years old	62.2	15.7	22.1
Obesity	78.9	8.4	12.7
Pregnancy	32.3	29.9	37.8
Symptoms			
Constant feeling of thirst	63.6	13.9	22.5
Frequent urination	82.6	7.4	10.0
Weight loss despite normal appetite	48.9	21.1	30.0
Blurred vision	49.9	20.4	29.7
Slow heeling of cuts and wounds	51.6	17.3	31.1
Tiredness and weakness	69.2	9.7	21.1
Complications			
Decaying limbs that require surgical removal	43.2	18.9	37.9
Eye problems	49.7	19.6	30.7
Kidney problems	55.0	14.8	30.2
High blood pressure	57.9	14.6	27.5
Loss of sensation in arms and legs	41.7	20.2	38.1
Medications available			
Tablets and capsules are available for the control of diabetes	68.7	12.2	19.1
Insulin injections are available for the control of diabetes	79.9	6.2	13.9
Lifestyle and non-medical measures			
Diabetics should carry sweets when they are out	63.2	20.6	16.2
Diabetics should exercise regularly	73.6	10.0	16.4
Diabetics should have a low fat and high fiber diet	72.4	9.1	18.5
Diabetics should care for their toes and feet	59.6	14.5	28.9
Diabetics should have good weight control	74.1	7.7	18.2
Things diabetics should not do			
Diabetics should not donate blood	56.1	17.3	26.6
Diabetics should not smoke	62.6	16.5	20.9
Diabetics should not wear tight shoes	34.3	26.2	39.5
Diabetics should not skip meals when busy	45.2	25.2	29.6
Monitoring of diabetic condition			
Diabetics should test their blood sugar regularly	87.0	4.1	8.9
Diabetics should go for regular eye check-up	47.8	22.2	30.0
Diabetics should go for regular check-up	80.1	4.6	13.3

3.3. Knowledge Level for individual section

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 63.2%. The percentage correct answer was highest in knowledge of monitoring section (72.3%) followed by general knowledge section (71.0%) and the lowest was in knowledge of risk factors section.

Additional analysis of the data was carried out to identify the questions with percentage of correct responses less than overall average, 63.2% (Table 4). Eighteen questions had a percentage lower than the average, two from general knowledge section, two from risk factors, three from symptoms, five from complication, one from lifestyle and non-medical management, four from things diabetics should not do, and one from monitoring.

3.4. Knowledge Level of diabetic participants

The total score and the sub scores for different sections for diabetic subgroup ($n = 116$) are described in Table 5. The overall correct answer of diabetic students was higher than that of the non-diabetic students (67.5% vs 63.1%), but the difference was
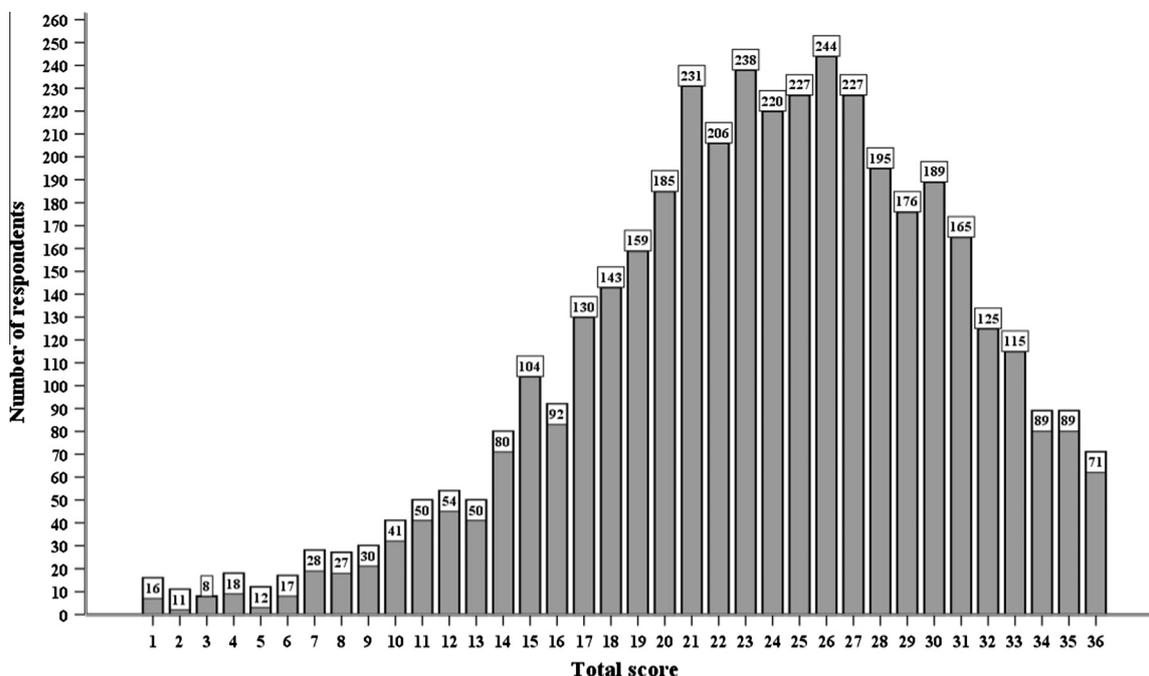
Figure 1 Distribution of total scores.

Table 3 Maximum possible score, mean standard deviation, median, and average correct answer (%) for each section ($n = 4062$).

Section	Maximum possible score	Mean	Standard deviation	Median	Average correct answer (%)
General knowledge	8	5.7	1.9	6	71.0
Risk factors	4	2.5	1.1	3	63.0
Symptoms and complications	11	6.1	2.8	6	55.8
Treatment and management	11	6.9	2.8	7	62.7
Monitoring	3	2.2	0.9	2	72.3
Total score	37	23.4	7.0	24.0	63.2

not statistically significant by independent t-test ($p = 0.226$). The percentage of correct answer for the knowledge of risk factors section and monitoring section were a little less than that of all participants. Also, there were thirteen questions identified percentages lower than the average percentage of correct answer for the diabetic group, 67.5% (Table 6).

We did a stratified analysis on the responses of the question "Pregnancy as risk factor" which scored the lowest percentage of correct answer. The correct answer in female group was 41.2%, in males 22.7%, in diabetic females 41.9%, and in diabetic males 32.9%.

4. Discussion

Overall, the results showed that the students had an average level of knowledge of diabetes although there were areas of shortage. Students performed best in the general knowledge section and worst in symptoms and complications of diabetes section.

4.1. General knowledge on diabetes mellitus

In Table 3, students scored on average more than 63.2% in each section of the questionnaire. This average was lower than

expected, since students at this level are expected to have more information about diabetes.

The results showed that students had good general knowledge of the disease. 89.3% knew that there are different types of diabetes affecting different ages. This could be explained by the high percentage of diabetes in Kuwait.[5]

The knowledge of pathophysiology of diabetes was poorly understood with regard to insulin. Only 40.4% of the participating students knew that diabetes could be due to the body not responding to insulin.

Although the level of knowledge was good, still emphasizing on the need of more knowledge at this age would be very important for early detection and diagnosis of the disease.

4.2. Risk factors

In this section the students scored fairly good except for one question was poorly scored. Only one third of the students knew that pregnancy is a risk factor and that pregnant women may become diabetic through pregnancy. In light of this result, it is interesting to know that a similar study was done in Singapore,[8] where the respondents were randomly selected. Their ages ranged between 16 and 60 years old with different levels of education. The respondents had also similar score

Table 4 Questions with percent correct answer less than overall average, 63.2% (n = 4062).

	%
General knowledge	
Diabetes is a condition of the body not responding to insulin	40.4
Insulin is a hormone in blood which controls blood sugar	60.9
Risk factors	
Pregnancy	32.3
Age above 40 years old	62.3
Symptoms	
Weight loss despite normal appetite	48.9
Blurred vision	49.9
Slow heeling of cuts and wounds	51.6
Complications	
Loss of sensation in arms and legs	41.7
Decaying limbs that require surgical removal	43.2
Eye problems	49.7
Kidney problems	55.0
High blood pressure	57.9
Lifestyle and non-medical management	
Diabetics should care for their toes and feet	59.6
Things diabetics should not do	
Diabetics should not wear tight shoes	34.4
Diabetics should not skip meals when busy	45.2
Diabetics should not donate blood	56.1
Diabetics should not smoke	62.6
Monitoring	
Diabetics should go for regular eye check-up	47.8

of ignorance regarding the possibility of getting diabetes through pregnancy. Although our results are not different than other populations result, it is still alarming and effort should be taken toward educating female student regarding pregnancy induced diabetes. Where according to the culture in Kuwait and also the middle east, marriage at this age is common.

4.3. Symptoms and complications

The results showed that the students had fairly reasonable knowledge of the familiar and known common symptoms of diabetes (63.6% for thirst and 82.6% for frequent urination). However, only one half of the students knew that diabetes can result in weight loss, impaired vision (impaired vision is not early complication) and delay in wound healing. Where these symptoms are very important since they may progress into sever complications.

This shows that their knowledge about symptoms was not enough as compared to their age and education level. Since early recognition of symptoms may help in early detection of the disease leading to prompt treatment.

Students knowledge of the complications associated with diabetes was also low. About half of the students did not know that diabetes can progress to affect different organs in the body leading to deterioration in their function.

Eyes and limbs related complications had the lowest scores. Thus, it is very important to educate students at early stages about diabetes complications. This will help them to encourage their diabetic relatives and friends to comply with treatment in order to avoid some of the complications associated with diabetes such as loss of vision, limb amputation.

4.4. Knowledge of treatment and management

The students had fairly good knowledge about the types of treatment available. However, knowledge of availability of insulin as a drug was higher than oral hypoglycemics. This could be due to "Insulin" being a familiar word.

It was interesting to find out that the percentage of students who knew about insulin injection was higher than those who knew that the lack of insulin is a cause of diabetes. This result was also found in the study done in Singapore.[8]

Exercise, low fat diet and weight control are well known as healthy lifestyle. Therefore, student knowledge regarding the lifestyle of person with diabetes was fairly good.

However, the students lacked the importance of "feet and toes care" because this is considered as more specific information.

Around half of the students thought that diabetics should not donate blood. According to the Canadian Diabetes Association, a person with diabetes that is treated by diet or oral medications may be eligible to donate blood unless treated with insulin.[9]

Finally the importance of having meals on time and not skipping any one should be clarified to students. Since this could lead to hypoglycemic attack.

4.5. Knowledge of monitoring of diabetic condition

Students showed good knowledge about monitoring blood sugar and the regular check-up.

However, through all the questionnaires they did not know that the complication of diabetes can involve both the eyes and the limps. Thus, eye and foot care remains the main issues to highlight.

Table 5 Maximum possible score, mean, standard deviation, median, and average correct answer (%) for each section for diabetic subgroup (n = 116).

Section	Maximum possible score	Mean	Standard deviation	Median	Average correct answer (%)
General knowledge	8	6.6	1.9	7.0	82.5
Risk factors	4	2.3	1.5	3.0	57.1
Symptoms and complications	11	6.9	2.8	7.0	63.2
Treatment and management	11	7.0	3.1	7.0	63.6
Monitoring	3	2.2	1.1	3.0	71.8
Total score	37	25.0	7.1	26.5	67.5

Table 6 Questions with percent correct answer less than overall average, 67.5%, diabetic subgroup (*n* = 116).

	%
Risk factors	
Pregnancy	36.2
Age above 40 years old	57.8
Obesity	62.9
Complications	
Kidney problems	44.8
High blood pressure	45.7
Loss of sensation in arms and legs	46.6
Eye problems	50.0
Decaying limbs that require surgical removal	51.7
Lifestyle and non-medical management	
Diabetics should not wear tight shoes	39.7
Diabetics should not skip meals when busy	43.1
Diabetics should not smoke	50.0
Diabetics should not donate blood	50.9
Monitoring	
Diabetics should go for regular eye check-up	55.2

Diabetes is a global issue. Kuwait is among the high prevalence countries (20%) and has been ranked 5th. This suggests that one-fifth of the studied sample would be diagnosed in the future as diabetic. Taking into consideration this high prevalence of diabetes, it is highly recommended to increase the knowledge about diabetes in young ages.[10–14]

Our studied sample represents the end of educational level before university. This is an important period of time where you can still influence the knowledge of the student. But once they get to university they need to depend on themselves to get the knowledge through the media, diabetic friends or family members.

5. Conclusion

Our study showed that the students had an average level of knowledge of diabetes although there were areas of shortage. Their knowledge about symptoms and complications of diabetes and management of diabetes is inadequate. Taking into consideration the high prevalence of diabetes in Kuwait, it is highly recommended to elaborate the knowledge about diabetes in young ages. Our studied population represents the end of educational level before university. Some students may not continue higher education and most of the students will continue their higher education in non-medical fields where no more information about diabetes will be gained. So it is highly recommended that Ministry of Education improves the curriculum to include the areas of weakness. Also encourage students' contribution in different activities related to

diabetes such as doing project, posters and seminars. World Diabetes Day should be celebrated in all schools and workshops and lectures given by professionals in collaboration with Ministry of Health on this day are recommended to increase the level of awareness of diabetes.

Conflict of interest

All the authors stated that there is no conflict of interest in this study.

Acknowledgment

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