

THE EFFECTIVENESS OF DIABETES MELLITUS KNOWLEDGE AMONG DIABETIC IN HIGH SCHOOL STUDENTS AT MAKKAH AL-MOKARRAMAH IN SAUDI ARABIA 2021: A CROSS SECTIONAL STUDY

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Background:

Diabetes is a major, non-communicable disease with increasing prevalence globally and will be the seventh leading cause of death worldwide by 2030 as estimated by the WHO report in 2011. Saudi Arabia is considered to be one of the highest countries in the Middle East for the incidence of diabetes mellitus. Type 2 diabetes affects the most productive midlife period but has also started to appear in younger age groups. Type 2 diabetes is now increasingly diagnosed among adolescents and young adults, data are lacking regarding knowledge about diabetes mellitus among school students in Saudi Arabia but it is a potentially preventable disease through a combination of lifestyle modification and pharmaceutical treatment. Adopting a healthy lifestyle, including healthy diet choices and exercise habits, plays a critical role in the prevention and control of type 2 diabetes and has been associated with lower risk of type 2 diabetes. Saudi adolescents are at a high risk of developing diabetes as many suffer from obesity, a sedentary lifestyle and hereditary

diabetes. In 2004, almost a quarter (23.7%) of the Saudi population was diagnosed with T2DM; this was 10 times the number of diabetic individuals in 1980.6 The occurrence of T2DM has been linked to the high rate of overweight adults (35.5%) in the Saudi population and the number of overweight and obese Saudi adolescents is high among both genders. **Aim of the study:** To assess the effectiveness of diabetes mellitus knowledge among diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021. **Method:** cross sectional study conducted among high school students at Makkah, during the March to May, 2021, the Sample size of diabetic high school students. Our total participants were (500). **Results:** most of the participants (41.0%) were in the age group more than 16 years, the data ranged from(12.25-17.5) by mean \pm SD(15.75 \pm 3.112),the majority of them were male (56.%) level of education the majority of participant are secondary level were(65.0%). **Conclusion:** The level of knowledge of high school students had limited and inadequate knowledge about type 2 diabetes and some of them possessed various misconceptions about this particular chronic disease. Health authorities and school authorities in the region should offer special efforts to improve the level of knowledge of the high students through regular health education campaigns. Diabetes Day should be celebrated in all schools and workshops and lectures given by professionals in collaboration with Ministry of Health on this day. **Keywords:**Diabetes mellitus, effectiveness, knowledge, high, school, students, Saudi Arabia.

1.Introduction:

Type 2 diabetes is now increasingly diagnosed among adolescents and young adults. [1] Diabetes mellitus, commonly referred to as diabetes, is a metabolic disorder that is characterized by high blood glucose levels over a prolonged period. [2] International Diabetes Federation stated that people with diabetes is expected to increase from 171 million in 2000 to 578 million in 2030 globally.[3] In July 2020, the number of people with diabetes is calculated to be almost 463 million worldwide. [4]

Saudi Arabia is considered to be one of the highest countries in the Middle East for the incidence of diabetes mellitus. Data are lacking regarding knowledge about Diabetes mellitus among secondary school students in Saudi Arabia [5]

The youth are the future of a country and are considered dynamic human capital that plays a vital role in nation-building. If students adopt sedentary lifestyles and are inclined to fast food and irregular eating habits, then there is a lot of probability of suffering from being overweight, obese, and, consequently, type 2 diabetes mellitus (T2DM) at a young age[6]

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 school students of the disease at early stage of life. Diabetes is a growing global health problem that affects an estimated 463 million adults worldwide[7].

Low knowledge about diabetes coupled with high disease prevalence is common in low-resource countries. It is essential to evaluate and update the knowledge, education and awareness of the diabetes especially among secondary school students, because in future they are going to avoid the diabetic complications and health problem of diabetes[8] The incidence of Type 2 diabetes mellitus has tremendously increased globally in the last 20–30

years. It is basically due to changes in people's lifestyle by introducing fast foods, carbonated and energy drinks, and reduced energy expenditure by manual hard work or regular exercise.[9] T2DM in youth has also proven to be more aggressive than T2DM that presents in adulthood. In the treatment options for Type 2 Diabetes in Adolescents and Youth (TODAY) study.[10]

The Middle East has the highest prevalence of diabetes of any world region, and Saudi Arabia has one of the highest prevalence rates of any country in the Middle East. A reported 18.5 percent of Saudi Arabian adults have diabetes, and the prevalence is increasing [11]. As a response to this growing public health concern, the Saudi Arabian Ministry of Health has included a diabetes education and awareness campaign as part of its 2030 Vision initiative [12].

Health-care workers play a central role in providing education about diabetes prevention, diagnosis, and management to patients and their families. Identifying possible gaps in knowledge among these rising professionals may enable improved preparation for patient care in the coming years as Saudi Arabia seeks to reduce its epidemiological and economic burden from diabetes.[13]

The study aimed to assess the level of knowledge of diabetes mellitus among secondary school students at the Makkah in Saudi Arabia .

1.2 Literature Review

The most of systematic review has shown that there is generally low knowledge among diabetic secondary school students, about the risk factors and its complications among the Saudi population and secondary school students in particular. also reported that youth with T2D were more likely to have been exposed to maternal diabetes or obesity in utero than no diabetic control youngsters. Most diabetes mellitus patients had low to moderate knowledge scores in Riyadh, Jeddah, Al Hasa, Al-Khobar, and Mecca. Also unexpectedly, health professionals in Saudi Arabia also had low knowledge scores about diabetes mellitus especially type 2. [14]

The results of one study in the US showed that secondary school students knowledge in the diabetes was not enough and also knowledge level of different medical groups such as general practitioners, specialists, internal medicine residents and medical students had significant differences with each other[15,16]

In Bahraini study, it was reported an average knowledge of secondary students[17] similar results were reported by other secondary studies [18]. In a study from Turkey about knowledge and attitude of secondary students and teachers toward DM complications, it was found that the secondary students and teachers had adequate knowledge of diabetes mellitus complications [19].

The results of one study in the Kuwait showed that 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.[20]

Two studies carried out in the United Kingdom by Christie et al[21] and Deeb,[22] reported better education among diabetic patients improves their ability to control the disease, resulting in better patient outcomes and reduced complications. Therefore, increasing

knowledge and awareness of diabetes mellitus in the population will contribute to better community health outcomes. Increased knowledge about diabetes mellitus is needed for patients to optimize their lifestyles and improve their medication habits to get the optimum benefits and delay the onset of long-term complications. Education is also essential to help diabetes mellitus patients' families cope with the necessary lifestyle modifications and provide psychological and dietary support. Therefore, improving knowledge and awareness about diabetes mellitus among secondary school students is imperative, given the prevalence of the disease in Saudi Arabia. Public health centers are considered the best place to provide health education interventions for citizens and student both with and without diabetes mellitus.

According to results of study in the Kuwait, 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. In this study show 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.[23]

1.3.Rationale:

The level of knowledge of a considerable number of high school students regarding DM was inadequate, and some of them possessed various misconceptions about this particular chronic disease. Quality of life (QoL) indicators are solid predictors of an individual's competence to maintain long-term health, well-being and productivity. Improved quality of life has been regarded as a key goal of all healthcare interventions including diabetes mellitus management programs. Reported that diabetes mellitus and its complications drain a substantial portion of the national healthcare budget in Saudi Arabia, hence, it is important to know the level of quality of life of diabetes patients against the huge spending from the national budget Diabetes mellitus.

1.4 Aim of the study:

To assess the effectiveness of diabetes mellitus knowledge among diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021.

1.5 Objectives:

- An increasing trend in the prevalence of type 2 diabetes has been observed among high school students however little is known about effectiveness of diabetes mellitus how informed students are of its existence
- The effectiveness of diabetes mellitus knowledge among diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021.

2. Methodology:

2.1 Study design:

This study is cross-sectional study was conducted among 500 diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021

2.2 . Study Area

The study has been carried out in the city of Makkah Al-Mokarramah. Makkah is the holiest spot on Earth. It is the birthplace of the Prophet Mohammad and the principal place of the pilgrims to perform Umrah and Hajj. It is located in the western area in Kingdom of Saudi Arabia and called the Holy Capital. Contains a population around 2 million. This study has been conducted in high school students at Makkah around Makkah in the accordingly the Sample size is (500) the secondary school students (male and female).

2.3 Study Population

The study has been conducted regarding the high school students at Makkah Al-Mokarramah in Saudi Arabia 2021, during the March to May, 2021 .

2.4.1 Selection criteria:

3.4.1 Inclusion criteria

- High school students at Makkah.
- All nationalities

3.4.2 Exclusion criteria :

No specific exclusion criteria.

2.5 Sample size

High school students at Makkah around .

The sample size has been calculated by applying Raosoft sample size calculator based on (The margin of error: 5%, Confidence level: 95%, and the response distribution was considered to be 20%) accordingly the Sample size is (500) the secondary school students (male and female) after official communication with the school's dean.in the Makkah and adding 10 more to decrease margin of error. After adding 5% oversampling, the minimum calculated sample has been 500. Computer generated simple random sampling technique was used to select the study participants.

2.6 Sampling technique:

Systematic random sampling technique is adopted. After that, by using random number generator, then simple random sampling technique has been applied to select the schools. Also, convenience sampling technique will be utilized to select the participants in the study. By using systematic sampling random as dividing the total students by the required sample size; (500).

2.7 Data collection tool

The self-administered questionnaire is designed based on previous studies and frameworks to assess the level of knowledge and awareness of DM among high school students in Makkah . The questionnaire has been developed in English. The questions were first pre-tested and were revised and finalized after it has been pilot tested. Before completing the survey, participants were required to indicate their consent using a forced response question followed by the survey questionnaires. The survey is estimated to take 10 min to complete .

To collect the information, a set of questions were constructed and developed. All questions were closed-ended, with tick boxes provided for responses; participants answered the questionnaires from the March to May, 2021, the period of study in 2021.

The questionnaire consisted of questions that

First part General and Socio demographic information. These variables included contact data (email or mobile phone number),(age, gender, Sources of information). Other variables were education level, economic level.

A questionnaire has been developed that had Socio demographic data and questions related to knowledge and awareness respectively. The two senior faculty members checked the questionnaire's validity and comprehension, and it was revised according to their suggestions. A pilot study has been conducted on 20 secondary students to check the questionnaire's understanding and responses further, and its Cronbach's alpha was 0.75. The results of the pilot study were not included in the final analysis.

The level of knowledge has been categorized into "adequate" and "inadequate" as per each topic/question, and also as per each response/answer. Data entry and analysis were carried out using the Statistical Package for the Social Sciences. Pearson's Chi-square tests were performed to explore if there is any significant association between the knowledge and awareness level of the high school students and their (i) gender, (ii) age, and (iii) level of education.

2.8 Data collection technique:

Researcher has been visits the selected high school after getting the approval from the ministries of health and education. The researcher has been obtained permission from high school director and participants.

After the arrival of the participants has been explained the purpose of the study to all participants attending.

2.9 Study Variables

Variables of the study

Dependent variable.

- Knowledge of diabetic high school students.

Independent variables.

- Age, gender, Sources of information, other variables were education level, economic level.

2.10 Data entry and analysis:

The Statistical Package for Social Sciences (SPSS) software version 27.0 has been used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-Square tests (χ^2) to test for the association and the difference between two categorical variables were applied. A p-value ≤ 0.05 has be considered statistically significant.

2.11 Pilot study

A pilot study has been conducted in the same sector due to the similarity to the target group using the same questionnaire to test the methodology of the study. As a feedback, the questionnaire has been clear and no defect has been detected in the methodology

2.12. Ethical considerations

Permission from the Makkah joint program of Saudi pediatric residency program has been obtained. Permission from the Directorate of health and education, verbal consents from all participants in the questionnaire were obtained. All information was kept confidential, and a result has be submitted to the department as feedback .

2.13 Relevance & Expectations:

Knowledge among diabetic high school students. The researcher expects from the study, effectiveness of Knowledge among diabetic high school students

2.14. Budget: Self-funded

3. Results

Table 1 Distribution of demographic data(age, gender, Level of education, economic level, Sources of information) in our study(n=500)

	N	%
Age		
12-14.	175	35
14-16	120	24
>16	205	41
Range	12.25-17.5	
Mean±SD	15.75±3.112	
Gender		
Female	220	44
Male	280	56
Level of education		
Intermediate	175	35
Secondary	325	65
Economic level		
Low	155	31
Medium	145	29
High	200	40
Sources of information about DM		
Booklets and brochures	55	11
Mass media	75	15
Own personal experience	140	28
Educational films	40	8
Medical education in health centers and hospitals	190	38

Table 1 shows that most of the participants (41.0%) were in the age group more than 16 years follow by the (35.0%)were in the age 14-16 years and the data ranged from(12.25-17.5) by mean ±SD(15.75±3.112),the majority of them were male (56.%) while female(44.0%),also regarding level of education the majority of participant are secondary level were(65.0%) while intermediate were(35.0%). Regarding the economic level the majority of participant high economic level were(40.0%). While sources of information most of participants from Medical education in health centers and hospitals were (38.0%) while Own personal experience were (28.0%)

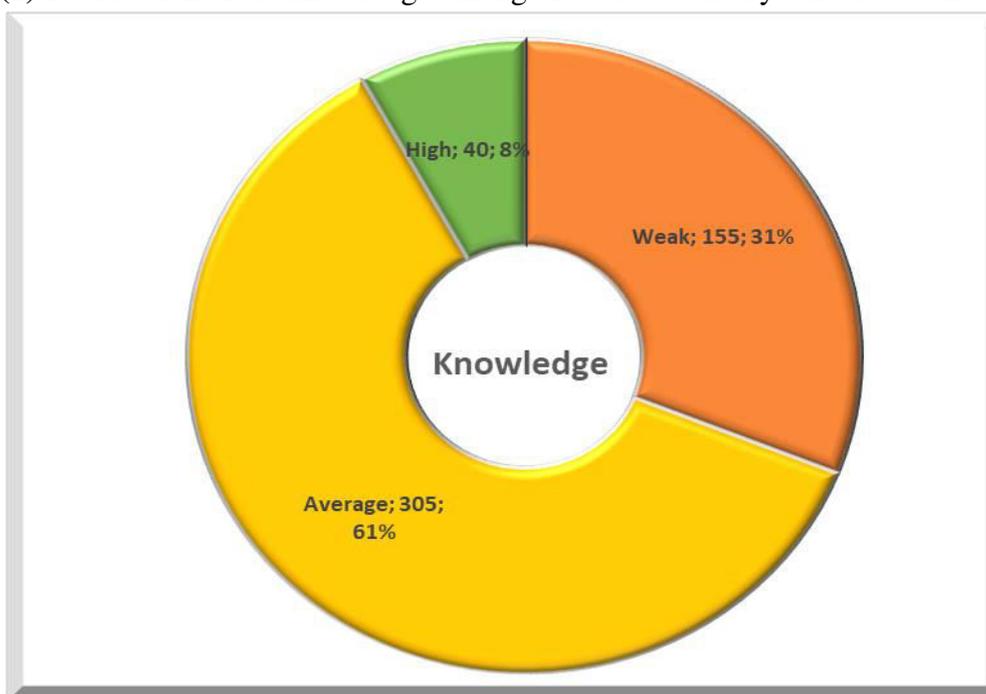
Table(2) Distribution of the knowledge among diabetic high school students

	Knowledge		Score	
	N	%	Range	Mean±SD
Weak	155	31	4-13.	9.011±2.314

Average		305	61		
High		40	8		
Total		500	100		
Chi-square	X²	211.9			
	P-value	<0.001*			

Table 2 Regarding knowledge of the participant toward diabetes mellitus study results show the majority of participant had average information were(61.0%) while weak knowledge were(31.0%) the data ranged from(4-13) by mean ±SD(9.011±2.314).

Figure (1) Distribution of the knowledge among diabetic secondary school students



Table(3) Distribution of the knowledge among diabetic high school students and the demographic data(age, gender, Level of education, economic level)

		Knowledge						Chi-square	
		Weak		Average		High		X ²	P-value
		N	%	N	%	N	%		
Age	12-14.	95	61.29	74	47.74	6	3.87	78.550	<0.001*
	14-16	12	7.74	98	63.23	10	6.45		
	>16	48	30.97	133	85.81	24	15.48		
Gender	Female	66	42.58	126	81.29	28	18.06	11.995	0.002*
	Male	89	57.42	179	115.48	12	7.74		
Level of education	Intermediate	47	30.32	115	74.19	13	8.39	2.581	0.275
	Secondary	108	69.68	190	122.58	27	17.42		
Economic level	Low	87	56.13	59	38.06	9	5.81	67.199	<0.001*
	Medium	32	20.65	101	65.16	12	7.74		
	High	36	23.23	145	93.55	19	12.26		

Table (3) show that is a significant relation between knowledge and demographic data regarding age (increase in >16 follow by age 14-16) in the average respectively were (85.81%,63.23%), $X^2=78.550$ and $P\text{-value} < 0.001$. Regarding gender In our study a significant relation between knowledge and gender the majority of our participants were noticed in female more than male with in the average were (81.29%), $X^2=11.995$ and $P\text{-value} = 0.002$. Regarding Level of education show that no significant relation between knowledge and Level of education (increase in secondary in the average were (122.58%), $X^2=2.581$ and $P\text{-value} = 0.275$. Also regarding the economic level show that a significant relation between knowledge and economic level (increase in the high income participants in the average were (93.55%), $X^2=67.199$ were and $P\text{-value} = 0.001$.

Figure (2) Distribution of the knowledge among diabetic high school students and the demographic data (age, gender, Level of education, economic level)

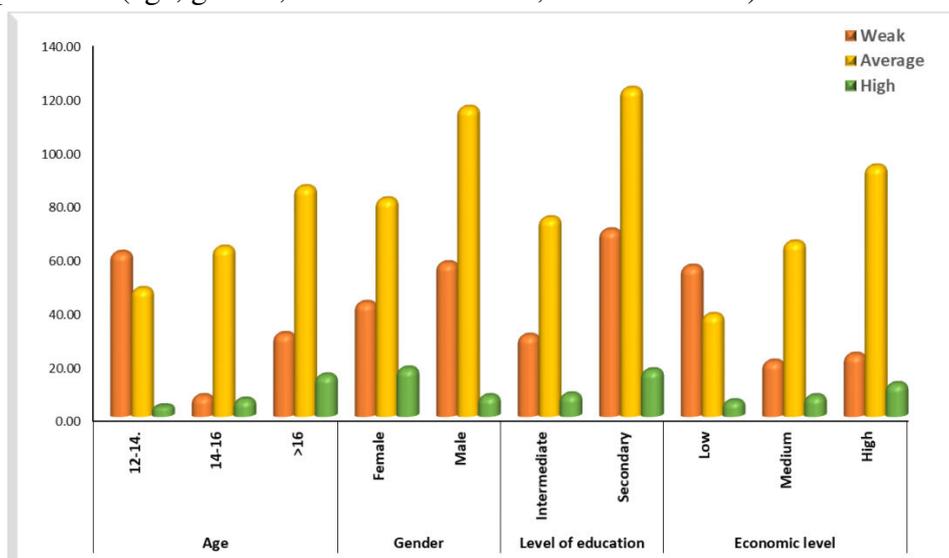


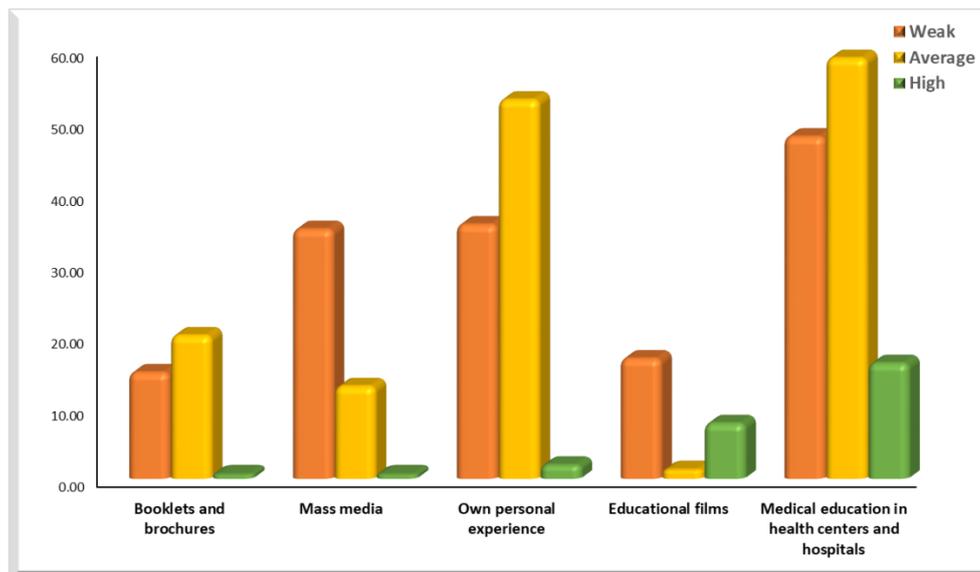
Table (4) Distribution of the knowledge among diabetic high school students and the Sources of information about DM (Booklets and brochures, Mass media, Own personal experience, Educational films, Medical education in health centers and hospitals)

Sources of information about DM	Knowledge						Chi-square	
	Weak		Average		High		X^2	P-value
	N	%	N	%	N	%		
Booklets and brochures	23	14.84	31	20.00	1	0.65	86.144	<0.001*
Mass media	54	34.84	20	12.90	1	0.65		
Own personal experience	55	35.48	82	52.90	3	1.94		
Educational films	26	16.77	2	1.29	12	7.74		
Medical education in health centers and hospitals	74	47.74	91	58.71	25	16.13		

Table (4) show that is a significant relation between knowledge and Sources of information about DM while $X^2=86.144$ and $P\text{-value} = 0.001$, regarding Booklets and

brochures (increase in average were(20.0%). Regarding Mass media in our study the majority of our participants were noticed in average weak were (34.84%). Regarding Own personal experience show that increase in average were(52.90%), regarding the Educational films show that increase in the weak were(16.77%), regarding the Medical education in health centers and hospitals show that increase in average were(58.71%)

Figure (3) Distribution of the knowledge among diabetic high school students and the Sources of information about DM



4. Discussion

There may be a gap between knowledge of diabetes of diabetes all participants in our study were the students of secondary school, the study aimed To assess the effectiveness of diabetes mellitus knowledge among diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021, objectives of the study To assess the effectiveness of diabetes mellitus knowledge among diabetic in high school students at Makkah Al-Mokarramah in Saudi Arabia 2021. This is the first study to assess the level of knowledge among diabetic high school students in Makah. In the present study, the male students were more participants than female students and the large majority of participants were in the age range more than 16 years old representing of all participants, in our result show most of the participants were in the age group more than 16 years follow by the age 14-16 years the majority of them were males ,also regarding level of education the majority of participant are high level . The economic level the majority of participant medium economic . While sources of information most of participants from Medical education in health centers flowed by while own personal experience. The highest percent of students secondary education , while the least percent had Intermediate education degree. In a Jordanian study[24] there was dominancy in male and young age participants. A study from Turkey showed that 50% of participant students were males [25] . A study from Ghana [26] showed more prevalence of males and married teachers and those with age of 30-39 years old and 1-5 years of experience. Most of in Ghana study participants showed a moderate level of knowledge not

similar to our results reported. In Bahraini study, it was reported an average knowledge and awareness of students[27]

Our study findings are similar to a number of previous study results that showed an inadequate level of knowledge and awareness of diabetes mellitus among the respondents in Saudi Arabia [28]. Al-Aboudi et al.[29] reported that 15% of the study participants in Riyadh had inadequate knowledge of DM, while 72% had moderate knowledge, the respondents in Dammam were found to obtain low scores regarding knowledge and attitudes toward diabetes mellitus. In another survey by Al Malki et al. [30], in light of this result, it is interesting to know that a similar study was done in Singapore [31], similar a Chinese study reported inadequate knowledge of diabetes and its related factors among college students.[32]

In a study, Baig et al (2015) revealed similar trends of having poor knowledge regarding DM in KAU students.[33]

A study by Al-Maskari et al. among patients with diabetes mellitus reported that age and gender were related to diabetes mellitus Practices, and observed a higher Practices score among males than females ($p < 0.001$). That study also found there was a significant difference between knowledge scores of postgraduate (19.67) and undergraduate (14.74) respondent ($p < 0.001$) [34]. Similarly, a study by Islam et al. showed significant associations for all demographic variables (including diabetes mellitus status) with awareness scores [35];

Another study was carried out exclusively among secondary school students in Riyadh by Al-Mutairi et al [36].

5. Conclusion

Health authorities and school authorities in the region should offer special efforts to improve the level of knowledge through regular health education campaigns about DM, particularly for school students, school teachers, and parents of the school students. Simultaneously, incorporation of health education messages about major chronic diseases into textbooks and school curriculum will provide opportunities for increasing awareness of school students regarding DM. Our study concluded that the level of knowledge of a considerable number of high school students regarding DM was inadequate, and some of them possessed various misconceptions about this particular chronic disease.

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