

Diabetes Mellitus-Related Knowledge among University Students in Ajman, United Arab Emirates

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معرفة طلاب جامعة عجمان في دولة الإمارات العربية المتحدة بمرض السكري

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الملخص: تهدف هذه الدراسة إلى تقييم مدى معرفة وممارسات طلاب جامعة عجمان (في الإمارات العربية المتحدة) في الكليات التي لا تقع ضمن مجال العلوم الطبية حول داء السكري. الطريقة: تم توزيع استبيان مُجَرَّب سابقاً حول مدى المعرفة بداء السكري بين الطلاب المذكورين أعلاه، وتم تحليل المعطيات بواسطة برنامج (PASW) (شيكاغو، إلينوي، الولايات المتحدة الأمريكية، إصدار 18). النتائج: شملت الدراسة 168 طالباً جامعياً (47 طالباً و 121 طالبة)، وكان لدى 25% من المشاركين زيادة وزن أو بدانة، ومارس 27% منهم الرياضة بانتظام. وفيما يتعلق بمعرفتهم بداء السكري، كان 70% من المشاركين على علم بأن داء السكري يتميز بارتفاع مستوى السكر بالدم، وأن عامل الاختصار الرئيسي هو تاريخ المرض في العائلة. المتبر للدهشة بأن أكثر من نصف المشاركين يقلل يستطيعون ربط السمنة المفرطة وقلة النشاط البدني كعوامل إختطار تؤدي إلى داء السكري، أو أن يدركوا أن الشعور المفرط بالعطش وكثرة التبول وفقدان الوزن هي من أعراض المرض. مدى معرفتهم بمضاعفات داء السكري كالغرغرينا وفقدان الإحساس بالأطراف ومضاعفات الفم والأسنان والالتهابات المتكررة واحتمالية الإصابة بأمراض القلب كانت متوسطة. وكانت معرفة الطالبات بالمرض أعلى مقارنة بالطلاب. لم يلاحظ وجود اختلافات كبيرة في السلوك الصحي للمشاركين مع أو بدون تاريخ عائلي بداء السكري. الخلاصة: كشفت دراستنا أنه بالرغم من التعرض لمصادر المعلومات المختلفة، إلا أن مستوى معرفة المشاركين بداء السكري لم تكن كافية. لذلك نوصي بإشراك المهنيين في المجال الصحي في مجال التعليم من أجل تعزيز المعلومات المتعلقة بالصحة وجعلها جزء من نمط الحياة الصحية للطلاب.

مفتاح الكلمات: مرض السكري، المعرفة، أسلوب الحياة، الشباب البالغين، الإمارات العربية المتحدة.

ABSTRACT: Objectives: The aim of this study was to assess diabetes mellitus (DM)-related knowledge and practices among university students enrolled in non-health care related professional courses in the United Arab Emirates. **Methods:** A pre-tested questionnaire assessing the knowledge of DM was administered to the above-mentioned students. Data collected were transferred to PASW Statistics (Chicago, IL, USA, Version 18) and analysed. **Results:** Data on 168 university students (47 males and 121 females) were included in the analysis. Of the participants, 25% were overweight or obese and only 27% exercised regularly. Regarding their knowledge of DM, 70% knew that it is characterised by high blood sugar levels and identified family history as a major risk factor. Surprisingly, only just over half could link obesity and physical inactivity as risk factors for developing DM, or could identify an excessive feeling of thirst, frequent urination, and weight loss as symptoms. Knowledge of the complications of diabetes, including gangrene, loss of sensation in limbs, oral and dental complications, recurrent infections, and risk for cardiovascular disease got a moderate response. Knowledge of diabetes was found to be higher in females compared to males. No significant differences were observed in the health behaviour of participants with or without a family history of DM. **Conclusion:** Our study revealed that in spite of exposure to various sources of information, the participants' level of DM-related knowledge was not adequate. We recommend the engagement of health professionals in educational settings in order to enhance health-related knowledge and inculcate healthy lifestyle practices in students.

Keywords: Diabetes mellitus; Knowledge; Lifestyle; Young adult; United Arab Emirates.

ADVANCES IN KNOWLEDGE

The results of our study, though preliminary, reveal the following:

- Knowledge related to diabetes mellitus (DM) in the educated young adult population residing in the United Arab Emirates is limited.
- Gaps identified in young peoples' knowledge of DM provide directions for future research as well as for the planning of appropriate interventional measures.

APPLICATION TO PATIENT CARE

- *Early adulthood is a time when lifestyle behaviours and practices are adopted. Assessment of DM-related knowledge and lifestyle practices can help to identify gaps in knowledge and therefore areas for future interventions.*
- *The adoption of healthy lifestyle practices by young adults can help to reduce the burden of non-communicable diseases, including DM, on society.*

RESearch indicates that diabetes mellitus (DM) has become an epidemic in many parts of the world.¹ It is an increasing public health concern and among the leading causes of death and disability.² Type 2 DM (T2D) is now increasingly diagnosed among adolescents and younger adults, but it is a potentially preventable disease if its risk factors are identified early and avoided.^{3,4} Hence, it is crucial that young people be well-informed about the risk factors for the development of DM, as well as preventive measures.

The known major risk factors for the development of T2D include obesity, a family history of the disease, and a sedentary lifestyle.⁵ Family history is a major non-modifiable risk factor that is closely linked to the expression of DM. Not only does it represent an inherited genetic susceptibility, but also represents shared environmental factors that include cultural values and practices, such as food choices and exercise habits.⁶

Overweight and obese adults are at an increased risk for a wide range of chronic diseases including DM, cardiovascular diseases (CVDs), hypertension, dyslipidaemia, gall bladder disease, and cancer.⁷ Long-term treatment and prevention of obesity in adults includes healthy diet and exercise. Behavioural interventions designed to facilitate maintenance of these lifestyle changes throughout a person's life play a very important role in the control of obesity.^{8,9} Among the adult population, leisure time physical activity is a critical factor in the prevention and control of DM, and has been associated with lower rates of T2D.^{10,11}

Knowledge forms a basis for the adoption of good health-related practices. Schools and colleges are some of the best places to implement programmes which will increase knowledge and awareness about lifestyle-related diseases, healthy nutrition, and the importance of physical activity. Several studies have been conducted among medical students to assess their clinical knowledge of DM.¹² Studies have also been conducted among the general population to

assess their knowledge of DM.¹³ However, to the best of our knowledge, no study has specifically targeted the young adult population.

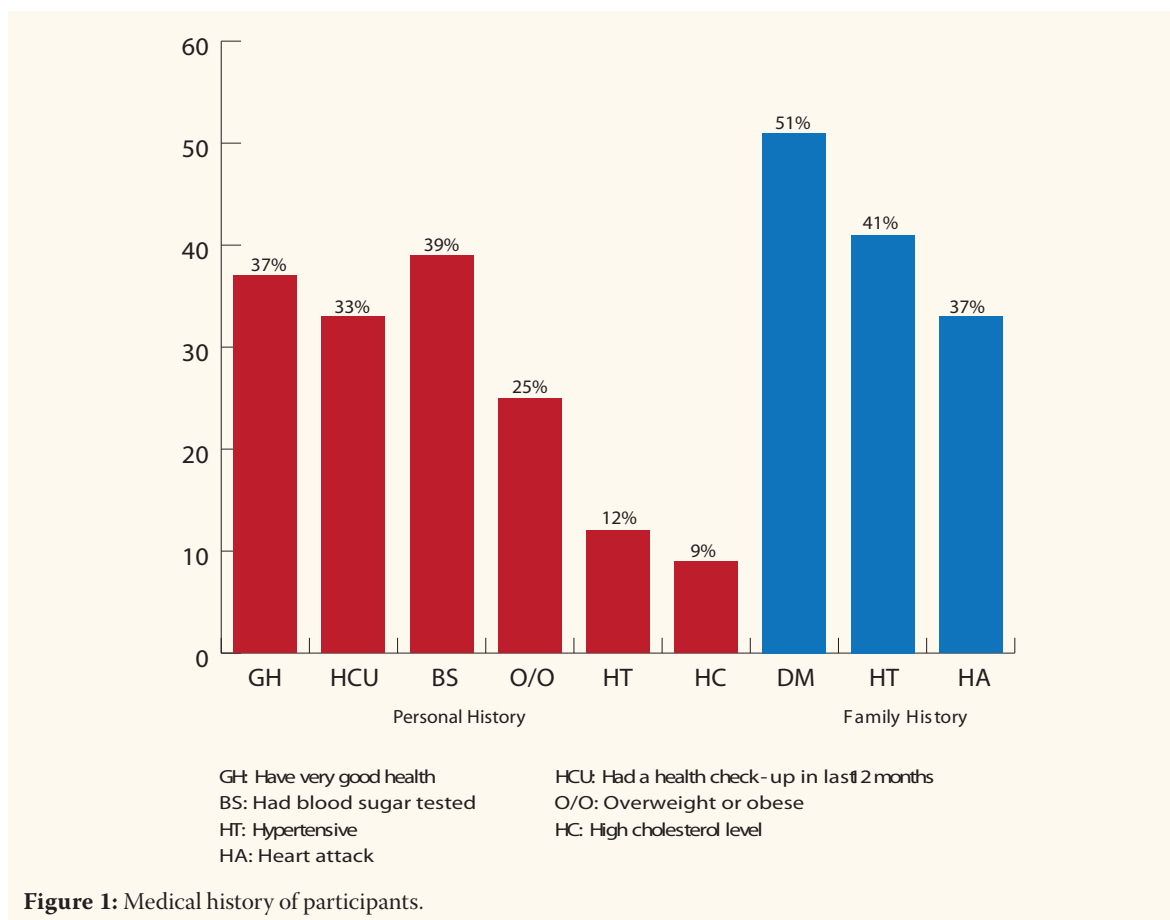
The objectives of this study were, first, to evaluate knowledge and practice among university students regarding DM, and, second, to assess differences in knowledge and practice regarding DM with respect to gender and family history of DM. The results of this study, by identifying areas of knowledge deficiency, will assist in developing health education programmes for young adults.

Methods

A cross-sectional survey using a pre-tested, self-administered, structured questionnaire was conducted in March 2011. The questionnaire was administered to students enrolled in non-health care related professional courses in a university in Ajman, UAE. Students who were willing to complete the questionnaire were selected by the "convenience sampling" method. Explanations were given about the objectives of the study and how to complete the questionnaire. Ethical approval was obtained from the Ethics and Research Committee of the authors' institution. Written permission was also obtained from the officials of the university to conduct this study on their students. Participation was anonymous and voluntary, and verbal consent was acquired from each participant. All the study participants were assured full confidentiality of the data collected.

A structured questionnaire with closed-ended questions was developed after an extensive literature search and based on the studies of Aljoudi *et al.*, Mohieldein *et al.*, and Wee *et al.*¹³⁻¹⁵ The validity of the questionnaire's content was tested through a review process with professors in the subject, and a socio-psychologist. The statements in the questionnaire were assessed by the panel to ensure that they covered the study's objectives.

The questionnaire was pre-tested on a group of 10 university students to identify any problems



related to question design, flow, or interpretation. Following the pilot study, identified inconsistencies and inaccuracies were corrected. The data obtained during the pilot study were excluded from the analysis.

The participants were required to answer the questionnaire using 'Yes', 'No', or 'Unsure'. The questionnaire was divided into the following seven sections: 1) socio-demographic characteristics—including age, sex, height, weight, and education; 2) students' medical history—including a personal and family history of DM, hypertension, hypercholesterolaemia, and heart attack; 3) knowledge of DM—including risk factors, symptoms, and complications; 4) health behaviours and practices of participants; 5) perceived beneficial behavioural changes—participants were asked to select those which they thought would prevent DM; 6) perceptions of non-diabetic participants about diabetes with statements like *"If I am going to get diabetes, there is not much I can do about it."*; *"People who make a good effort to control the risks of developing diabetes were much less likely to develop diabetes."*; *"If I don't change my life style*

behaviors, such as diet or exercise, I am at risk of developing diabetes over the next 10 years.", and 7) participants were asked to select all sources from which they obtained their information.

Data were analysed using the Statistical Package for the Social Sciences (SPSS, Chicago, Illinois, USA, Version 19). Participants with DM were excluded from the analysis. Categorical variables were described by frequency analysis. The chi-square test of significance was used to assess the association between gender and knowledge and practices. Also, descriptive statistics were compared between those with and without a family history of DM. Comparisons were considered to be statistically significant at $P \leq 0.05$. As we anticipated a study sample involving a narrow range of ages, we did not sub-analyse our data with respect to age.

From participants' self-reported height and weight, body mass index (BMI) was calculated. A respondent with a BMI of 25 to 29.9 was regarded as overweight and one with a BMI ≥ 30 was considered obese.¹⁶

Table 1: General knowledge of diabetes mellitus (DM), risk factors, symptoms and complications, in which participants were asked to select either “yes”, “no”, or “unsure” as a response.

| General knowledge of DM | Percentage of correct responses |
|--|---------------------------------|
| Diabetes is a condition of high blood sugar | 70 |
| Diabetes is a condition of inadequate insulin action * | 54 |
| Diabetes is non-contagious * | 67 |
| Diabetes is curable | 65 |
| Insulin is required for some diabetic patients | 79 |
| Diabetes is a disease affecting the pancreas * | 46 |
| There are several types of diabetes * # | 57 |
| Can diabetes be prevented/delayed? * | 74 |
| Diabetes is a long-term disease | 72 |
| Diabetes is related to lifestyle | 67 |
| Knowledge of risk factors for DM | |
| Family history # | 71 |
| Obesity | 55 |
| Decreased physical activity # | 53 |
| Age above 40 years old # | 44 |
| Pregnancy (delivering a baby of more than 4 kg) | 23 |
| Race/ethnicity | 19 |
| Excessive consumption of sugar | 57 |
| Knowledge of Symptoms of Diabetes | |
| Excess feeling of thirst | 56 |
| Excess urination | 58 |
| Unexplained weight loss # | 49 |
| Excessive eating | 36 |
| Blurred vision | 39 |
| Slow healing of cuts and wounds | 59 |
| Tiredness and weakness | 69 |
| Burning feet | 39 |
| Joint stiffness/pain | 52 |
| Knowledge of Complications of Diabetes | |
| Eye problems | 54 |
| Kidney problems * | 57 |
| Pain in joints | 55 |
| Loss of sensation in arms and legs * | 48 |

| | |
|--|----|
| Gangrene in limbs requiring surgical removal * | 29 |
| Cardiovascular disease | 40 |
| Oral and dental complications | 37 |
| Recurrent infection * | 29 |
| Psychological problems | 28 |
| High blood cholesterol/lipids | 56 |
| Erectile dysfunction/loss of libido* | 28 |

*Significant difference seen between genders ($P = \leq 0.05$)

#Significant difference between participants with and without a family history of diabetes ($P = \leq 0.05$)

Results

A total of 182 students returned completed questionnaires. Pre-existing DM was found in 7.7% of the participants. To make this study more meaningful, they were excluded from the study and analysis was done on the remaining 168 participants. Among the study sample, 121 were females and 47 were males of various ethnic groups. The majority of the participants was between 18 and 24 years of age and had been living in the UAE for more than 10 years, indicating that they had received their secondary schooling in the UAE.

The data regarding the medical history of participants are shown in Figure 1. Surprisingly, major health-related issues like overweight and obesity (25%), hypertension (12%), and hypercholesterolaemia (9%) were self-reported by these young adults. A very high prevalence of family histories of DM (51%), hypertension (41%), and heart attack (33%) was also reported.

Table 1 shows participants’ general knowledge of DM, including its risk factors, symptoms and complications. Of the total, 65% felt that DM was curable. Although 74% thought that the development of DM can be prevented or delayed, only 44% knew that the risk increases as people age. An excessive feeling of thirst, frequent urination, and weight loss were identified as symptoms by almost half of the participants. Knowledge of diabetic complications, including loss of sensation in limbs, oral and dental complications, recurrent infections, and an increased risk of CVD also got a moderate positive response.

When compared to males, females had better general knowledge of DM and its complications; however, there was no significant difference

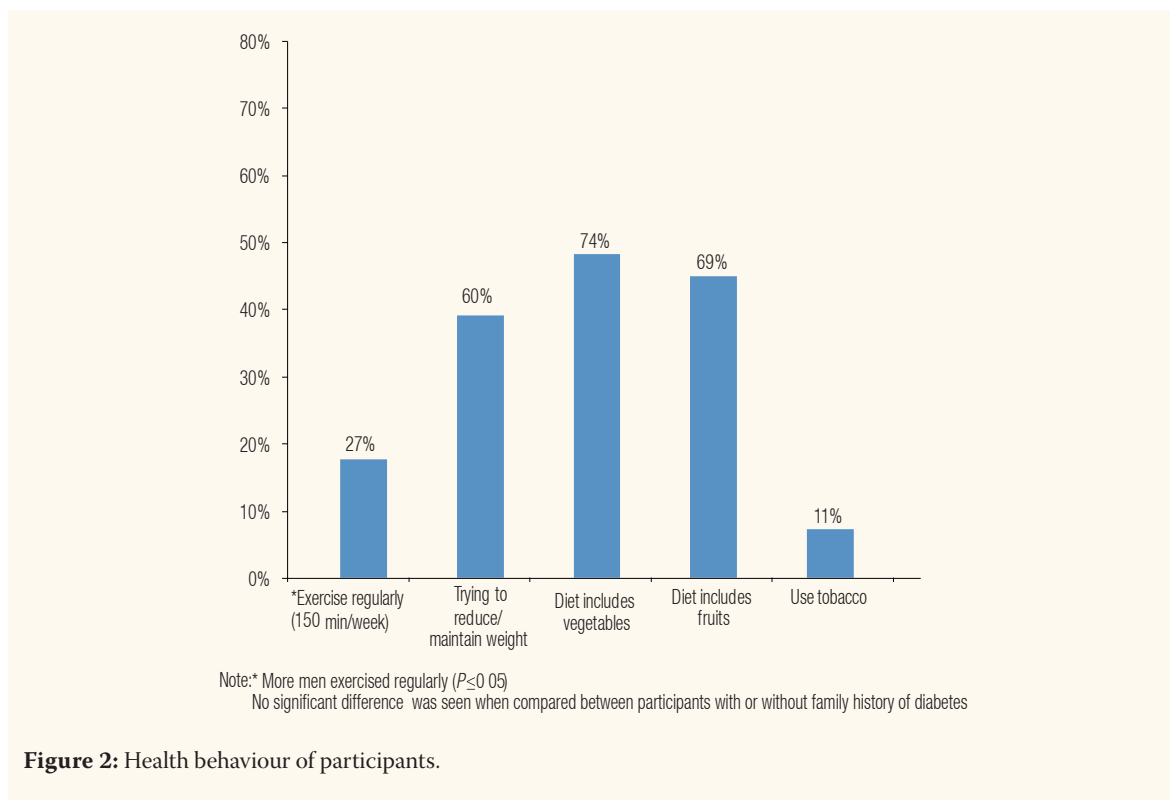


Figure 2: Health behaviour of participants.

between the sexes in terms of the knowledge of risk factors or symptoms. Not surprisingly, participants with a family history of DM had significantly higher knowledge of the risk factors for DM.

The health behaviour and practices of participants are illustrated in Figure 2. Though the dietary habits were good, very low levels of physical activity were reported among these young adults. In spite of a campaign to discourage smoking in the UAE, approximately 11% of the subjects were smokers. There was no significant association between health behaviours and practices with regards to gender or a family history of DM. Males reported exercising more regularly than females.

Compared to males, a significantly higher number of the female participants had correct perceptions of behavioural changes likely to prevent DM such as increased physical exercise, increased consumption of vegetables and fruits, and avoiding too many sweet foods in the diet [Figure 3]. There was no significant association between students having a family history of diabetes and their perception of beneficial behavioural changes.

The non-diabetic participants were divided in their viewpoints about preventive care, with half of them feeling that if they were going to develop DM, then there was not much they could do about

it, and the other half perceiving that people who make a good effort to control the risks of developing DM were much less likely to develop the disease. Half of these non-diabetic participants agreed with the statement *“If I don’t change my life style behaviours, such as diet or exercise, I am at a risk of developing diabetes over the next 10 years”*, and so were planning to make changes in their life style behaviours in the near future. These changes, they believed, would lower their chances of developing DM.

Students were using, to varying extents, many different sources of information to gain knowledge regarding DM. The majority of the participants got their information from friends and relatives (75%), television and the Internet (70%), newspapers, books and magazines (64%). Health professionals and their talks and seminars (50%) were the least identified sources of information. The majority of participants (75%) thought that more information was needed and considered media to be the best mode to convey the information to the public.

Discussion

The prevalence of T2D is increasing, even in younger age groups, including teenagers and children.^{3,17}

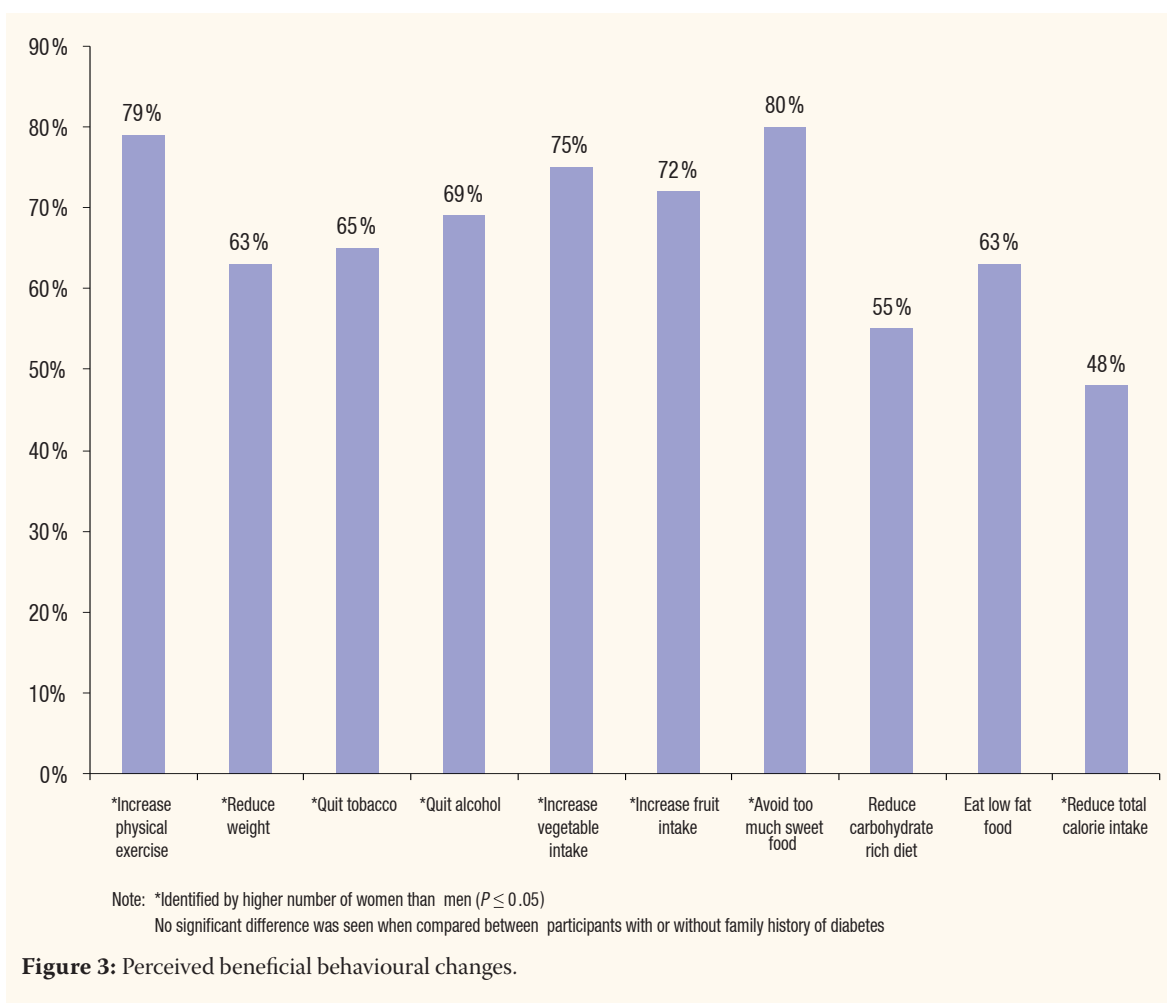


Figure 3: Perceived beneficial behavioural changes.

By changing diet, increasing physical activity, and improving lifestyle, 80% of T2D cases can be prevented.¹⁷ However, without effective prevention and control programmes, the incidence of T2D will continue to escalate globally. The World Health Organization (WHO) estimates that, globally, deaths caused by DM and other non-communicable diseases will increase by 17% over the next decade.¹⁸ Measures need to be taken to prevent DM from developing in communities; this will be possible only by increasing the general public’s awareness of DM. The present study was therefore conducted to estimate DM-related knowledge among university students. This will help in identifying the gaps in their knowledge and practices, which can then be addressed in prevention programmes which target schools, colleges, and universities.

In spite of the high prevalence of a family history (51%) among the study’s participants, their level of knowledge regarding DM cannot be considered sufficient, especially since the study involved an educated population. Also disturbing

is the fact that 30% of the participants did not know that DM is a disease of high blood sugar levels or that family history is a risk factor. Almost half of the participants did not know that obesity and decreased physical activity were the major modifiable risk factors for the development of the disease. This level of knowledge is much lower than that reported in the Saudi non-diabetic, mixed educational level population, where 62.3% had this knowledge.¹⁴ In another study from Singapore, 67.7% had positively identified obesity and physical inactivity as risk factors.¹⁵ Studies conducted in the USA also reported low levels of general knowledge of DM among African-Americans and Hispanic adults, with only a quarter of them identifying obesity and physical inactivity as risk factors.^{19,20} More than half of the participants felt that DM is curable, with the same misconception reported in other studies as well.^{14,15} However, we think that this may not be a misconception but rather a confusion between the terms “treatable” and “curable”.

Sedentary lifestyle and obesity are the most

important modifiable contributors to the prevalence of DM, hypertension, and coronary artery disease.^{21,22} Lack of exercise is a serious concern, as only 27% of our study population mentioned that they exercised for 150 minutes per week. Similar low levels of physical activity have been reported among several other college student populations including one in Kuwait.^{23,24} A study conducted among college students in the USA reported that only 38% of them exercised regularly.²⁵ Lack of time, lack of exercise facilities (especially for women), and an extremely hot climate are the main reasons reported for low levels of physical activity among Kuwaiti college students. The same may also be applicable to our study population. The low level of physical activity has resulted in unhealthy BMIs, with 25% of the participants being overweight or obese. Increased levels of obesity among the university students also have been reported in other studies.^{26,27}

Several studies have reported that individuals who have even one family member with DM are more likely to have healthier diets—consuming more fruits and vegetables and less fat or simple sugars; engage in regular physical activity; and get screened for T2D—compared to those with no family history.^{6,28,29} The health belief model also explains the relationship between a family history of T2D and the individual's preventive behaviour.³⁰ However, contrary to these studies, our sample showed that a high prevalence of DM in families was not statistically associated with perceptions of beneficial behavioural changes or healthy behaviours of these young adults. Nonetheless, almost 75% of the participants thought that discontinuing the use of alcohol and tobacco would be beneficial for their health. Although many perceived increased physical activity as a beneficial change for protection against DM, the majority had not translated the belief into practice. The most interesting finding of the study is that females are more knowledgeable about DM compared to males, as a higher number of females correctly identified the behavioural changes beneficial for the prevention of DM.

The media is actively participating in increasing people's awareness regarding DM. A large amount of medical information is available on the World Wide Web, and present day students can access it easily as use of the Internet has increased dramatically. The results of this study present a general picture of university students' knowledge of

DM. Should it be considered adequate or is further intervention needed? In our opinion, university students' knowledge is unsatisfactory and more efforts should be made to increase it, as students do not actively seek out this information themselves.

The limitations of our study stem from the use of a questionnaire to assess the perceptions of university students, because there is the possibility that we have omitted some components of a specific context. As ours was a convenience sample, the participants may have been more health-conscious than students unwilling to complete the questionnaire. Another limitation is the use of self-reported data and the assumption that participants responded honestly and accurately. We are aware that our sample size is small and may not be representative of the university student population throughout the UAE.

Conclusion

A large number of university-level students are at a higher risk of developing DM in their lifetime due to low levels of physical activity, high BMI, lack of knowledge regarding the disease, and its high prevalence in their families. Students are also uninformed about the fact that DM can be prevented or delayed. We recommend that health professionals become involved in educational settings to enhance health-related knowledge and inculcate healthy lifestyle practices among students. Institutes of higher education can also help to promote physical activity and healthy eating behaviours.

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DECLARATION

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

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