Diabetes-Related Knowledge and Preventative Practices Among Government Employees with Diabetes in Kuwait

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المعارف المتعلقة بالسكري والممارسات الوقائية بين الموظفين الحكوميين المصابين بالسكري في الكويت

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ABSTRACT: Objectives: Diabetes mellitus (DM)-related knowledge and preventative practices are vital for the successful management of this condition. In Kuwait, few studies have been conducted to evaluate the knowledge and preventative practices of DM patients. This study aimed to assess DM-related knowledge and preventative practices among government employees with DM in Kuwait and to examine associations between DM knowledge, preventative practices and other variables. **Methods:** This cross-sectional study was conducted in June 2015 and involved 345 employees with DM from 15 government ministries in Kuwait. A self-administered Arabic-language questionnaire was designed to assess DM-related knowledge and preventative practices based on the Diabetes Knowledge Test and the recommendations of the American Diabetes Association, respectively. **Results:** A total of 312 ministry employees agreed to participate in the study (response rate: 90.4%). The mean age was 45.6 ± 10.6 years. A total of 63.4% were male and 64.1% were Kuwaiti. The median DM knowledge score was 9 out of 14 and the median preventative practice score was 5 out of 14. High knowledge scores were significantly associated with education (β = 1.510; $P \leq 0.001$) and income (β = 0.896; $P \leq 0.001$). High preventative practice scores were significantly associated with income (β = 1.376; $P = 0.002$), DM duration (β = 0.919; $P = 0.026$) and knowledge scores (β = 1.783; $P = 0.015$). **Conclusion:** Government employees in Kuwait were found to have average DM knowledge and poor preventative practices. It is therefore imperative that policy-makers develop educational and health-promoting campaigns to target government employees with DM in Kuwait.

Keywords: Diabetes Mellitus; Knowledge; Primary Prevention; Lifestyle Risk Reduction; Health Education; Kuwait.

الملخص: الهدف: المعارف المتعلقة بالسكري والممارسات الوقائية امران مهمان لنجاح علاج المرض.في الكويت أجريت دراسات قليلة لتقييم المعارف والممارسات الوقائية لمرضى السكري. تهدف هذة الدراسة إلى تقييم المعارف والممارسات الوقائية لموظفي الحكومة المصابون بالسكري في الكويت وأختبار مدى ارتباطها بعوامل أخرى. **الطريقة:** أجريت هذة الدراسة المقطعية العرضية في يونيو 2015 وشملت على 345 موظفا حكوميا مصابون بالسكري في 15 وزارة في الكويت. تم تصمم استبيان ذاتي باللغة العربية لتقييم المعرفة بالسكري وطرق الوقاية منه مبني على أختبار المعرفة بالسكري وتوصيات الجمعية الأمريكية للسكري. **النتائج:** وافق 312 موظفا على المشاركة بالاستبيان (معدل الاستجابة: 90.4%). كان متوسط العمر 45.6 ± 10.6 سنه. و 63.4% من الذكور و 64.1% من الكويتيين. وسيط درجة المعرفة بالسكري كان 9 من 14 ومتوسط المعرفة بطرق الوقاية كان 5 من 14. النسب العالية للمعرفة بالسكري كانت مرتبطة بشكل كبير مع المستوى التعليمي (1.510 = β؛ $P \leq 0.001$) والدخل الشهري (0.896 = β؛ $P \leq 0.001$). بينما النسبة العالية للمعرفة بالسكري كانت مرتبطة بشكل كبير بالدخل (1.376 = β؛ $P = 0.002$)، ومدة الاصابة بالسكري (0.919 = β؛ $P = 0.026$)، ودرجة المعرفة.(1.783 = β؛ $P = 0.015$). **الخلاصة:** موظفو القطاع الحكومي المصابون بالسكري في الكويت لديهم مستوى متوسط للمعرفة عن مرض السكري ومستوى ضعيف للطرق الوقائية. لذلك يتحتم على صناع السياسات تطوير حملات تثقيفية وصحية تستهدف الموظفين الحكوميين المصابين بالسكري في الكويت.

الكلمات المفتاحية: السكري؛ المعرفة؛ الوقاية الأولية؛ تقليل الاختطار عن طريق أنماط الحياة؛ التثقيف الصحي؛ الكويت.

Advances in Knowledge

- *The findings of this study revealed average diabetes mellitus (DM)-related knowledge and poor adherence to preventative practices among government employees with DM in Kuwait.*

Application to Patient Care

- *This study emphasises the importance of improving current DM knowledge and preventative practices among government employees with diabetes in Kuwait.*

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DIABETES MELLITUS (DM) IS AN INCREASINGLY prevalent economic burden worldwide.[1,2] A study conducted in Kuwait in 1998 estimated the prevalence of DM among adults to be 14.8%.[3] In 2013, another Kuwaiti study estimated the prevalence at 25.4% among adults, indicating it to be a major public health problem.[4] Well-designed educational programmes have been developed worldwide for patients with DM in order to improve their knowledge of this chronic condition as an essential aspect of promoting self-care and self-management behaviours.[5,6] High levels of DM-related knowledge have been associated with improved clinical outcomes, fewer complications and enhanced glycaemic control and quality of life.[7–10]

Several studies have been conducted worldwide to determine DM-related knowledge among different populations.[11–13] In Canada, a community telephone survey among adults in the general population revealed a low level of general DM knowledge.[11] Kheir et al. also reported relatively poor knowledge levels among 54 patients attending a diabetic clinic in Qatar; these findings were similar to those of a study of Saudi Arabian female patients with DM.[12,13] Interestingly, most studies have evaluated patients with access to DM-related healthcare services who would therefore be expected to have greater DM knowledge than patients in the general community.[2,7]

In 2004, a Kuwaiti study revealed low levels of DM knowledge among 5,114 people with diabetes attending 24 primary healthcare clinics, with only 9.7% demonstrating adequate knowledge.[7] In addition, the study reported that a younger age, higher levels of education and higher incomes were significantly associated with higher knowledge scores; however, the study did not assess preventative practices and their association with DM knowledge.[7] In 2013, research from the United Arab Emirates revealed that 31% of patients had poor DM knowledge and 72% had negative attitudes towards the disease, concluding that low levels of DM awareness were prevalent in the region.[14] However, a more recent study testing DM knowledge in Oman found that patients displayed satisfactory knowledge and good preventative practices, apart from low adherence to a regular exercise regimen.[15]

The objective of the current study was to assess levels of DM-related knowledge and adherence to preventative practices among people with DM employed in the Kuwaiti public workforce. In addition, the study also aimed to examine associations between these two variables and to identify associations with other factors. It was hypothesised that a higher DM knowledge score would be associated with greater adherence to preventative practices.

Methods

This cross-sectional study took place in June 2015 and included all 5,417 employees working at 15 government ministries in Kuwait. The Ministries of Defence, the Interior and Foreign Affairs were not included as permission from the authorities to screen employees at these sites could not be secured. Two doctors visited all of the employees working in each ministry building to screen all those with self-reported type 1 or type 2 DM. Only individuals who were government employees, those who claimed to have been diagnosed with type 1 or type 2 DM by a doctor and those who were fluent in Arabic were included in the study.

A self-administered questionnaire was designed to collect sociodemographic data, medical history, levels of DM knowledge and adherence to preventative practices. For the items involving DM knowledge, a modified version of the Diabetes Knowledge Test was used.[16] These questionnaire items were previously translated into Arabic and validated in a Kuwaiti population by Al-Adsani et al.[7] For the knowledge items, each of 14 questions was scored as either 1 or 0 for correct and incorrect/missing responses, respectively, for a total score of 14. Scores of ≤6, 7–11 and ≥11 were considered to indicate low, average and high DM knowledge, repectively.[7] The preventative practice section of the questionnaire was developed based on the recommendations of the American Diabetes Association (ADA).[17] The preventative practice items were translated into Arabic and a panel of local diabetes experts confirmed the translated items to be appropriate for a Kuwaiti population. As with the knowledge items, the 14 preventative practice items were assigned a score of 1 or 0 for correct and inappropriate/missing responses, respectively, for a total score of 14. Scores of <5, 5–6 and ≥6 were deemed to indicate poor, average and high adherence to preventative practices, respectively. Education level was categorised based on the completion of various degrees as high (bachelor's degree or postgraduate diploma), average (diploma) or low (elementary, middle or high school certificates).

All collected data were crosschecked by inspecting the frequencies of the variables and correcting inaccurate values. Means, standard deviations, medians, ranges and proportions were used to present the variables, as appropriate. The 95% confidence interval for proportions was obtained using the binomial method with Stata® data analysis and statistical software, Version 13.0 (StataCorp LLC, College Station, Texas, USA). A Chi-squared test was used to assess the significance of associations between categorical

Table 1: Sociodemographic characteristics of Kuwaiti ministry employees with diabetes (N = 312)

Characteristic	n (%)
Age in years*	
≤40	86 (31.3)
41–49	87 (31.6)
≥50	102 (37.1)
Mean ± SD	45.6 ± 10.6
Gender†	
Male	196 (63.4)
Female	113 (36.6)
Nationality	
Kuwaiti	200 (64.1)
Non-Kuwaiti	112 (35.9)
Marital status‡	
Single	27 (8.7)
Married	265 (85.5)
Divorced/widowed	18 (5.8)
Place of residence	
Kuwait City	83 (26.6)
Hawalli	113 (36.2)
Farwaniya	58 (18.6)
Mubarak Al-Kabeer	30 (9.6)
Al-Ahmadi/Al-Jahra	28 (9.0)
Education level‡	
Low	77 (24.8)
Average	82 (26.5)
High	151 (48.7)
Monthly income in KD§	
<1,000	133 (43.8)
1,000–2,000	114 (37.5)
>2,000	57 (18.8)

SD = standard deviation; KD = Kuwaiti dinar.
*Total dataset for this variable was 275 due to missing data for 37 subjects. †Total dataset for this variable was 309 due to missing data for three subjects. ‡Total dataset for these variables was 310 due to missing data for two subjects. §Total dataset for this variable was 304 due to missing data for eight subjects.

Table 2: Clinical characteristics of Kuwaiti ministry employees with diabetes (N = 312)

Characteristic	n (%)
DM duration in years*	
≤3	100 (34.6)
4–10	105 (36.3)
>10	84 (29.1)
Median (range)	6.0 (0.1–36.9)
Comorbidities†	
High cholesterol	162 (59.8)
High blood pressure	145 (53.5)
Diabetic retinopathy	68 (25.1)
Diabetic foot problems	47 (17.3)
Diabetic kidney disease	19 (7.0)
Heart attack	12 (4.4)
Stroke	9 (3.3)
Number of DM complications	
0	211 (67.6)
1	61 (19.6)
2	29 (9.3)
3	11 (3.5)
Smoking status†	
Current smoker	74 (24.6)
Previous smoker	50 (16.6)
Nonsmoker	177 (58.8)
BMI in kg/m²§	
≤25.00	42 (14.8)
25.01–30.00	110 (38.9)
≥30.01	131 (46.3)

DM = diabetes mellitus; BMI = body mass index.
*Total dataset for this variable was 289 due to missing data for 23 subjects. †Percentages for this variable add up to more than 100% as some subjects may have reported multiple comorbidities. Total dataset for this variable was 271 due to missing data for 41 subjects. ‡Total dataset for this variable was 301 due to missing data for 11 subjects. §BMI was calculated from self-reported height and weight measurements. Total dataset for this variable was 283 due to missing data for 29 subjects.

variables. Knowledge and preventative practice scores were used as outcome variables for the binary logistic regression models. Odds ratios were calculated from the binary logistic regression analysis. For multivariate logistic regression, the analysis was adjusted for age, gender and other factors found to be significantly associated with each outcome during the crude analysis; as such, age, gender, education and income were adjusted in the knowledge model, while age, gender, income and smoking status were adjusted in the preventative practice model. Pearson's correlation coefficient was used to evaluate the relationship between knowledge and practice scores and a simple linear regression analysis was used to assess the strength of the unadjusted association between the two variables. A P value of <0.050 was considered the cut-off value for significance.

Table 3: Associations between diabetes-related knowledge* and sociodemographic characteristics among Kuwaiti ministry em-ployees with diabetes (N = 312)

Characteristic	Mean DM knowledge score ± SD	P value	β† (95% CI)	P value
Age in years				
≤40	8.2 ± 2.2		-	-
41–49	8.3 ± 2.0	0.740	0.095 (-0.5–0.7)	0.761
≥50	8.5 ± 2.2		0.162 (-0.5–0.8)	0.610
Gender				
Male	8.2 ± 2.3		-	-
Female	8.4 ± 1.9	0.440	0.347 (-0.2–1.0)	0.230
Nationality‡				
Kuwaiti	8.2 ± 2.1		-	-
Non-Kuwaiti	8.5 ± 2.2	0.240	0.153 (-0.5–01)	0.620
Marital status				
Married	8.4 ± 2.2		-	-
Single	7.6 ± 2.4	0.227	0.885 (-0.1–1.9)	0.077
Divorced/ widowed	8.3 ± 2.0		0.970 (0.0–2.4)	0.170
Place of residence				
Kuwait City	8.1 ± 2.3		-	-
Hawalli	8.7 ± 2.2		0.524 (-0.2–1.2)	0.110
Farwaniya	8.4 ± 2.0	0.067	0.521 (-0.2–1.3)	0.180
Mubarak Al-Kabeer	7.4 ± 2.2		-0.854 (-1.8–0.0)	0.061
Al-Ahmadi Al-Jahra	8.4 ± 1.6		0.333 (-0.6–1.2)	0.470
Education level				
Low	7.5 ± 2.1		-	-
Average	7.9 ± 2.2	<0.001§	0.313 (-0.4–1.0)	0.387
High	9.0 ± 1.9		1.510 (0.9–2.1)	<0.001
Monthly income in KD				
<1,000	7.9 ± 2.1		-	-
1,000–2,000	8.5 ± 2.2	<0.001§	0.521 (0.0–1.1)	0.060
>2,000	9.3 ± 1.9		0.896 (0.2–1.6)	<0.001

*DM = diabetes mellitus; SD = standard deviation; CI = confidence interval; KD = Kuwaiti dinar. *Knowledge levels were assessed using an Arabic version of the 14-item Diabetes Knowledge Test.[7,16] †Difference in mean score. ‡Adjusted for age, gender and education level (income was not included due to the collinearity of this variable). §Using a Chi-squared test.*

This study was approved by the Kuwait Ministry of Health and the Ethical Committee of the Kuwait Institute for Scientific Research. Written consent was obtained from all of the participants prior to their enrollment. All subjects were informed that their participation was voluntary and that any data collected would remain anonymous and confidential.

Results

Of the 5,417 employees screened, 345 (6.4%) reported having previously received a DM diagnosis; of these, 312 agreed to participate in the study (response rate: 90.4%). A total of 29 employees (0.3%) had type 1 DM while 283 (90.7%) had type 2. The mean age was 45.6 years. Most participants were of Kuwaiti nationality (64.1%), male (63.4%) and had a high education level (48.7%) and a low monthly income (43.8%) [Table 1]. The median DM duration was 6.0 years and the most prevalent comorbidities were high cholesterol levels (59.8%), high blood pressure (53.5%) and diabetic retinopathy (25.1%). According to self-reported height and weight measurements, many individuals were either overweight (38.9%) or obese (46.3%) [Table 2].

The mean DM knowledge score was 8.33 ± 2.20 (median score: 9) and the mean preventative practice score was 5.62 ± 2.60 (median score: 5). Only 6.1% of participants had high levels of DM-related knowledge, with the remaining 74.0% and 17.6% demonstrating average and low knowledge levels, respectively. Specifically, knowledge questions regarding diet, the treatment of low glucose levels and the nature of the glycated haemoglobin (HbA1c) test were answered correctly by less than half of the participants (range: 24.4–47.4%). While 49.4% of the participants claimed to attend follow-up appointments with their doctors every three months or more often, 18.9% of the patients indicated that they did not attend regular follow-up appointments with their doctors or only did so on an annual basis.

Between 63.8–73.4% of participants reported owning a glucometer and checking their cholesterol levels regularly. Moreover, between 40.4–51.9% of the participants indicated that they adhered to recommended guidelines related to kidney function and micro-albuminuria testing and knew their latest HbA1c level, visited a dietician, controlled their blood glucose levels and underwent eye examinations and regular checkups. Of the participants, 31.7% reported appropriately examining their feet, 23.3% reported exercising regularly, 19.9% underwent HbA1c testing and 11.9% had regular diabetic neuropathy examinations. A total of 32.3% and 20.5% of the subjects, respectively, indicated that they checked

Table 4: Associations between preventative practices* and sociodemographic factors among Kuwaiti ministry employees with diabetes (N = 312)

Characteristic	Mean preventative practice score ± SD	P value	β[†] (95% CI)	P value
Age in years				
≤40	5.7 ± 2.6		-	-
4–49	5.3 ± 2.3	0.296	-0.343 (-1.1–0.4)	0.382
≥50	5.9 ± 2.8		0.475 (-0.3–1.3)	0.243
Gender				
Male	5.5 ± 2.7		-	-
Female	5.9 ± 2.4	0.196	0.603 (0.0–1.3)	0.094
Nationality[‡]				
Kuwaiti	5.8 ± 2.6		-	-
Non-Kuwaiti	5.4 ± 2.5	0.196	-0.514 (-1.3–0.2)	0.172
Marital status				
Married	5.7 ± 2.6		-	-
Single	5.5 ± 2.7	0.862	-0.262 (-1.5–1.0)	0.681
Divorced/widowed	5.4 ± 2.3		-1.04 (-2.8–0.7)	0.254
Place of residence				
Kuwait City	5.9 ± 2.9		-	-
Hawalli	5.6 ± 2.5		-0.092 (-0.9–0.7)	0.831
Farwaniya	5.1 ± 2.2	0.294	0.022 (-0.9–1.0)	0.962
Mubarak Al-Kabeer	6.2 ± 2.9		0.409 (-0.8–1.6)	0.494
Al-Ahmadi/Al-Jahra	5.3 ± 2.5		-0.186 (-1.4–1.0)	0.751
Education level				
Low	5.5 ± 2.7		-	-
Average	5.3 ± 2.7	0.183	-0.587 (-1.5–0.3)	0.195
High	5.9 ± 2.4		0.193 (-0.6–1.0)	0.633
Monthly income in KD				
<1,000	5.3 ± 2.5		-	-
1000–2000	5.7 ± 2.6	0.012	0.657 (0.0–1.3)	0.057
>2,000	6.5 ± 2.4		1.376 (0.5–2.3	0.002

SD = standard deviation; CI = confidence interval; KD = Kuwaiti dinar.

Preventative practices were assessed using a 14-item Arabic-language questionnaire based on the recommendations of the American Diabetes Association.[17] †Difference in mean score. ‡Adjusted for age, gender and smoking status.

Table 5: Associations between preventative practices* and clinical characteristics among Kuwaiti ministry employees with diabetes (N = 312)

Characteristic	Mean preventative practice score ± SD	P value	β[†] (95% CI)	P value
DM duration in years				
≤3	5.0 ± 2.2		-	-
3–10	6.0 ± 2.6	0.006	0.805 (0.0–1.6)	0.037
>10	6.0 ± 2.9		0.919 (0.0–1.7)	0.026
Number of DM complications				
0	5.6 ± 2.4		-	-
1	5.7 ± 2.8		0.328 (-0.5–1.1)	0.411
2	5.9 ± 3.3	0.781	0.446 (-0.8–1.7)	0.473
3	6.3 ± 2.3		0.989 (-0.7–2.7)	0.261
Smoking status				
Current smoker	4.8 ± 2.6		-	-
Previous smoker	5.9 ± 2.6	0.005	-0.999 (-1.8–0.0)	0.019
Nonsmoker	5.9 ± 2.5		-0.199 (-1.1–0.7)	0.671
BMI in kg/m²[‡]				
≤25.00	5.8 ± 3.1		-	-
25.01–30.00	5.6 ± 2.6	0.839	-0.179 (-1.1–0.8)	0.709
≥30.01	5.5 ± 2.3		-0.083 (-1.0–0.8)	0.859
Knowledge level[§]				
Low	4.6 ± 2.7		-	-
Average	5.8 ± 2.5	<0.001	0.713 (0.0–1.6)	0.092
High	6.9 ± 2.6		1.783 (0.4–3.2)	0.015

SD = standard deviation; CI = confidence interval; DM = diabetes mellitus; BMI = body mass index.

Preventative practices were assessed using a 14-item Arabic-language questionnaire based on the recommendations of the American Diabetes Association.[17] †Difference in mean score. ‡Adjusted for age, gender and income. §Knowledge levels were assessed using an Arabic version of the 14-item Diabetes Knowledge Test, with scores of ≤6, 7–11 and ≥11 indicating low, average and high knowledge levels, respectively.[7,16]

their blood glucose regularly and took the HbA1c test appropriately.

In the crude analysis, education level and income were significantly associated with high DM knowledge (P <0.001 each). Although both nationality and place of residence were significantly associated with income, these factors did not have a significant

impact on knowledge scores [Table 3]. Only income was significantly associated with higher preventative scores (*P* = 0.012), even after adjusting for age and gender [Table 4]. Knowledge score was the only significant factor associated with high preventative practice scores in both the crude and adjusted analyses (*P* <0.050) [Table 5].

Discussion

This cross-sectional study assessed the level of DM knowledge and adherence to ADA-recommended preventative practices among government employees with DM in Kuwait.[17] The estimated prevalence of diabetes in the sample (6.3%) was much lower than that estimated for the general population (25.4%); this may be due to the fact that younger and geriatric individuals were omitted from the current study.[4] In addition, individuals in Kuwait with severe diabetes are usually exempted from work and so were not included in the study population. The characteristics of the current sample also differed from the general population in terms of nationality, gender and education; according to the 2011 national census, Kuwaitis represented only approximately one-third of the total population, there was a preponderance of males (56.7%) due to the presence of male immigrant workers and only 15.9% of the population had a high education level.[18]

In the current study, the mean DM knowledge score was slightly lower than that noted in a previous study involving patients with type 2 DM attending diabetes clinics in Kuwait, although both mean scores fell within the average range (8.33 versus 8.93).[7] To some extent, this finding is to be expected as the current sample was recruited from a community setting and therefore included individuals who did not attend regular follow-up appointments with healthcare practitioners and would accordingly have less knowledge of their condition. However, it should be noted that participants in the current study were younger (mean age of 45.6 versus 55.6 years), more highly educated (48.7% versus 4.4% with a university education) and had a lower disease severity (32.4% versus 57% with DM-related complications) than those of the previous study.[7] Nevertheless, it is alarming that only 6% of participants in the current sample had high levels of DM-related knowledge, revealing a considerable knowledge gap. Moreover, less than half of the participants could correctly answer several specific knowledge questions, particularly those regarding diet, the treatment of low glucose levels and the nature of the HbA1c test; these results are comparable to those reported previously.[7]

The current study evaluated levels of DM knowledge using a modified version of the Diabetes Knowledge Test.[16] A previous study using the same assessment tool found that age, smoking status, number of DM-related complications and DM duration were significantly associated with DM knowledge scores.[7] These associations were not observed in the current study, possibly because the ages of the participants spanned a relatively narrow range, smoking was more infrequent and the sample was derived from a community setting and therefore had fewer complications. Al-Qazaz *et al.* reported a significant association between diabetes knowledge and education levels among 505 type 2 diabetics in a tertiary institute in Malaysia; this finding was consistent with that observed in the current study.[8] Overall, education and income levels seem to be factors which are unaffected by selection bias.

Adherence to preventative practices is important to reduce the risk of developing DM-related complications, such as neuropathy, nephropathy and retinopathy.[9] High preventative practice scores were associated with both income and education levels in the current study. In general, individuals with higher education levels and incomes have increased general knowledge regarding their health and greater access to health facilities, which often translates to greater DM-related knowledge and adherence to preventative practices.[2,19] Similarly to a previous study conducted in India, high knowledge scores were significantly correlated with preventative practice scores in the present study, suggesting that people who are more aware of the disease and its associated complications are more likely to adhere to recommended preventative practices.[20] Another study reported significantly lower levels of adherence to preventative practices among newly diagnosed patients, indicating an association with DM duration.[9] Greater adherence to preventative practices has also been reported among nonsmokers, which is appropriate as such individuals tend to be more health conscious than smokers.[21]

In the current study, the median preventative practice score was 5, indicating that participants followed only approximately one-third of the preventative practices recommended by the ADA.[17] Critically, only 32.3% of the current sample reported regularly an unsatisfactory level of adherence to recommended guidelines among 5,000 subjects with DM visiting a tertiary hospital in South Korea; however, 84.9% of patients reported having undergone an HbA1c test in comparison to only 20% of participants in the current study.[9] This difference could be due to the fact that DM patients recruited from a tertiary hospital

probably received more detailed information about the importance of achieving glycaemic control and had closer contact with their healthcare providers. However, less than 46% of the Korean sample adhered to guidelines about lipid profiles, renal function testing, and eye examinations, which is comparable to the findings of the present study.[9]

The findings of the current study indicate the need for extensive educational and health-promoting DM campaigns in the Kuwaiti community, with special outreach tactics to target individuals of a lower socioeconomic status.[22] Moreover, healthcare providers caring for diabetics (such as diabetes educators, primary care doctors and diabetes specialists) should be made aware that members of the general public may demonstrate average DM-related knowledge and poor adherence to preventative practices. In addition, healthcare providers should implement various screening and monitoring tests, including HBA1c, micro-albuminuria, diabetic retinopathy and diabetic peripheral neuropathy tests; this will not only improve DM management but may also positively affect their patients' DM-related knowledge levels and adherence to preventative practices. To this end, healthcare providers should educate all patients and encourage preventative practices such as daily blood sugar measurements and exercise schedules.[14,15,23]

A major limitation of the current study was that the sample was not representative of the general Kuwaiti population; it is therefore expected that the results would differ from those of a more representative sample. Similar to other research, the data in this study were self-reported and subject to expectation bias.[24] These findings may overestimate the level of adherence to preventative practices and underestimate the severity of DM cases. Finally, the current study did not address different patient- and health system-related barriers to adherence for recommended preventative practices.[17,25]

Conclusion

This study found that a community sample of government employees in Kuwait with either type 1 or type 2 DM demonstrated average DM-related knowledge levels and poor adherence to recommended preventative practices. These findings are alarming even considering the potential for estimation error due to sample bias. There is therefore an urgent need for healthcare providers and policy-makers in Kuwait to design, implement and promote various DM prevention strategies targeting diabetic government employees, in particular those of lower socioeconomic status.

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