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Health literacy levels in patients with type 2 diabetes in an affluent Gulf country: a cross-sectional study

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ABSTRACT

Objectives To identify health literacy levels in patients with type 2 diabetes mellitus in the United Arab Emirates (UAE).

Intervention Nationwide cross-sectional survey.

Setting and participants Individuals with type 2 diabetes mellitus attending outpatient diabetes clinics in all emirates of the UAE were surveyed between January 2019 and May 2020. Out of 832 patients approached, 640 met the inclusion criteria and agreed to participate.

Outcome variables The outcome variable of interest was the health literacy level, which was measured using the Eastern-Middle Eastern Adult Health Literacy 13 Questionnaire. The association of health literacy level with age, gender and education was conducted using the X^2 test.

Results Only 11% of respondents had adequate health literacy levels. Age and education were directly correlated with health literacy levels. Patients under age 50 years had statistically significant higher rates of marginal (106 of 238, 44.5%) and adequate literacy (67 of 238, 28.2%, p<0.001) than the older population. Participants with bachelor's or postgraduate degrees also had significantly higher adequate health literacy levels (24 of 79, 30.4%, p<0.001).

Conclusions The low health literacy levels found in outpatients with diabetes may be a major challenge to optimising diabetes care in the UAE. In addition to health services strategies, targeted educational and behavioural interventions for the older population and those with less formal education are necessary.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first study of health literacy levels in patients with type 2 diabetes mellitus in the United Arab Emirates (UAE), a country with a high prevalence of diabetes.

⇒ The Eastern-Middle Eastern Adult Health Literacy 13 Questionnaire used in this study was developed in the UAE and has shown high-validity evidence in the UAE population.

⇒ Only individuals attending outpatient appointments were surveyed. Community-based surveys or studies of patients who are hospitalised with diabetes complications may yield different results.

⇒ Because of the cross-sectional nature of the study, it is not possible to establish a causal relationship.

BACKGROUND

Type 2 diabetes mellitus (T2DM) is a complex and chronic disease that can cause substantial morbidity and mortality.[1] T2DM is a risk factor for cardiovascular and cerebrovascular disease and if not controlled, it can lead to serious complications and disabilities, including blindness, limb amputation and kidney disease.[2] The economic costs of T2DM and its complications are also considerable. In the USA, the total direct and indirect cost of diagnosed T2DM is estimated to be over $300 billion.[1] Despite health system efforts at prevention and early diagnosis, the prevalence of T2DM is increasing globally. The rise is even greater in developing countries, where urbanisation and transition to sedentary lifestyles and energy-dense diets have led to dramatic increases in obesity and lifestyle-related diseases.[3 4] This is evident in many countries of the Middle East.

The United Arab Emirates (UAE) is a small Gulf country with a multicultural and diverse population of approximately 10 million.[5] Over the past several decades, the prevalence of pre-diabetes and T2DM has risen sharply among UAE nationals and expatriates alike.[6] Currently, it is estimated that 30% and 23% of the UAE adult population has pre-diabetes and T2DM, respectively, placing the country among the nations with the highest burdens of disease.[6] It is estimated that an additional 6.6%–14.6% of UAE residents have undiagnosed diabetes.[7] As the prevalence of diabetes in the country is expected to increase sharply by 2040, decreasing diabetes-related morbidity and mortality is a major public health concern.[5] In response to the high prevalence of T2DM and the rising burden of obesity and metabolic syndrome, which continue to fuel the diabetes epidemic,[4] the UAE government has made substantial financial and resource

investments in healthcare in general, and in diabetes care in particular.[8 9] These include the increased recruitment of diabetes health professionals, the development of specialised diabetes centres, such as the Imperial College London Diabetes Centre, and community-based awareness, prevention and education initiatives.[8 9] Yet, despite these strategies, research shows that patients with T2DM in the UAE continue to have low levels of medication adherence and poor glycaemic control, resulting in high rates of comorbidities and diabetes-related complications.[10–12]

The demands on individuals with T2DM are complicated by the fact that the disease requires extensive self-care education and management. There is a large body of literature that suggests that health literacy (HL) is an important, non-clinical factor that impacts diabetes outcomes.[13 14] HL is defined as the ability to obtain, process and understand basic health information to best manage one's health and make appropriate health decisions.[15] Diabetes-related HL skills include not only following verbal and written information from a multidisciplinary healthcare team often comprised of a physician, diabetic educator and dietitian, but also include reading medication labels and educational brochures, understanding medication dosages, interpreting food labels, discerning blood glucose levels and calculating insulin dosages.[16 17] In Arab patients with diabetes, disease-related knowledge correlated with better medication adherence and glycaemic control.[18] However, several studies have documented that the levels of diabetes knowledge among patients in the UAE are disconcertingly low and have not changed over the past two decades.[10 19] Given the rapidly increasing prevalence of diabetes in the UAE and the limited studies on HL in the UAE population, we conducted a nationwide cross-sectional survey to assess HL levels in UAE residents with T2DM attending outpatient clinic appointments. We sought to answer the following research questions:

1. What is the overall HL level of the population of patients with T2DM receiving care in outpatient clinics in the UAE?
2. Are there any demographic characteristics that correlate with HL levels in this patient population?

As studies have shown that patient HL levels can be improved with intervention,[20 21] having a better understanding of the patient populations' HL levels is important to healthcare professionals and policymakers to better design and implement initiatives for diabetes prevention and to optimise patient care.

METHODS AND MATERIALS
Study design and setting
A cross-sectional survey was conducted across all seven emirates in the UAE between January 2019 and May 2020. Independent variables contributing to HL included gender (male, female), age (categorised into greater than 50 years and 50 years or younger), education (categorised into not completing secondary education, high

school level education, and bachelor's or postgraduate degree) and nationality (categorised as Gulf Cooperation Countries (GCC) inclusive of patients from Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE and other nationalities, including patients from Africa, Asia, Europe, the Americas and the non-GCC Middle East Arabs). The dependent variable, HL, was categorised as inadequate, marginal or adequate.

Multilingual physicians recruited participants from outpatient waiting areas of diabetes clinics in public and private hospitals and primary health centres in the UAE. Inclusion criteria mandated that survey respondents be residents or citizens of the UAE, at least 18 years of age, as confirmed by their national identification cards, with a confirmed diagnosis of T2DM. Participants were also expected to understand and answer the survey questions and provide written informed consent. Patients with other serious comorbidities, such as cancer, were excluded from the study. After obtaining informed consent, physician researchers conducted face-to-face interviews with the participants and recorded their responses on an iPad. We used the Strengthening the Reporting of Observational studies in Epidemiology checklist for cross-sectional studies in preparing this manuscript.[22]

Survey questionnaire
The Eastern-Middle Eastern Adult Health Literacy 13 Questionnaire was used in this study because it was developed in the UAE and has shown high-validity evidence in the UAE population.[23] It is short, easily administered and available in the most prevalent languages in the UAE: Arabic, Hindi, Urdu, Tagalog and Malayalam. The survey consists of 13 items within 4 domains that represent activities in which patients interact with the healthcare system, including completing medical forms, reading patient information materials, navigating the healthcare system and differentiating medications. A 5-point Likert scale was used to assess participant responses, ranging from 1=never to 5=always. The total mean score ranged from 13 to 65 for each participant, with 1–26 (never/rarely) correlating with inadequate HL, 27–39 (sometimes) representing marginal HL and 40–65 (most of the time/always) indicating adequate HL. A patient with adequate HL levels has the ability to obtain, process and understand basic health information in order to make appropriate health decisions.[15] The overall Cronbach's α reliability score for all 13 items for the survey tool was 0.846. The Cronbach's α for each domain was 0.76 for reading and understanding patient information, 0.779 for completing medical forms, 0.986 for differentiating medications and 0.969 for navigating the health system.

Sampling method and sample size
A recent study found that overall adequate HL in the adult UAE population to be approximately 22%.[24] Based on this, the minimum sample size required for this study was estimated to be 610 participants. Previous experience

Table 1 Demographics of participants in the UAE outpatient diabetes clinics (N=2349)

Demographic variable	n (%N)
Gender	
Men	309 (48.3)
Women	331 (51.7)
Age (years)	
18–30	62 (9.7)
31–50	176 (27.5)
51–65	234 (36.6)
66–75	168 (26.2)
Education	
No secondary education	203 (31.7)
High school	358 (55.9)
Bachelor's/postgraduate degree	79 (12.3)
Nationality	
GCC	280 (43.7)
Arab (non-GCC)	141 (22.1)
Asia	138 (21.6)
Europe/North America	44 (6.9)
Africa	37 (5.8)

GCC, Gulf Cooperation Countries; UAE, United Arab Emirates.

indicated a 25% survey non-response rate, which was compensated.[25]

Data analysis

Categorical variables included gender, age, education (categorised as no secondary education, high school diploma, and bachelor's or postgraduate degree) and nationality (country of origin categorised as GCC, Arab world (non-GCC), Asia, Europe and North America, and Africa). Data were analysed using SPSS Statistical Software V.27. The association of the dependent variable (HL level) with the independent variables was conducted using the X^2 test. We used ordinal regression since the dependent variable is ordinal (inadequate, marginal, adequate). All independent variables that showed statistical significance in X^2 test were included in the ordinal regression.

Patient and public involvement

There was neither patient nor public involvement in this study.

RESULTS

Out of 832 patients approached, 640 met the inclusion criteria and agreed to participate (77% response rate). Participant demographics are listed in table 1. Most patients were over the age of 50 years (402 of 640, 62.8%). One-third (203 of 640, 31.7%) of participants did not have any secondary education; 12.3% (79 of 640) had college or postgraduate degrees. Over half of the patients (280 of 502, 55.8%) were from the GCC.

Overall, 11% of the surveyed population of outpatients with T2DM had adequate HL levels. Further analysis to determine the association between sociodemographic variables and HL levels revealed that less than 5% (10 of 309, 3.2%) of the surveyed population of men with T2DM possessed adequate HL. Women patients with diabetes possessed approximately six times higher (61 of 331, 18.4%, p<0.001) adequate HL levels, when compared with men (table 2). Surveyed men, however, had higher levels of marginal HL than women (232 of 309, 75.1% vs 55 of 331, 16.6%, p<0.001). Men also had significantly lower levels of inadequate HL when compared with women participants (67 of 309, 21.7% vs 215 of 331, 65%, p=0.001). Age above 50 years impacted HL levels, with 54% of participants above the age of 50 years demonstrating inadequate literacy levels. Patients younger than age 50 years had statistically significant higher rates of marginal (106 of 238, 44.5%) and adequate (67 of 238, 28.2%, p<0.001) HL (table 2). Education was also directly

Table 2 Association between health literacy levels and sociodemographic factors (N=640)

Variable	Group	Inadequate		Marginal		Adequate		Total	
		n	%N	n	%N	n	%N	n	P value
Gender	Male	67	21.7	232	75.1	10	3.2	309	<0.001
	Female	215	65	55	16.6	61	18.4	331	
Age group	≤50	65	27.3	106	44.5	67	28.2	238	<0.001
	>50	217	54	181	45	4	1	402	
Education	No secondary education	111	54.7	82	40.4	10	4.9	203	<0.001
	High school	143	39.9	178	49.7	37	10.3	358	
	Bachelor's/postgraduate degree	28	35.4	27	34.2	24	30.4	79	
Nationality	GCC	132	47.1	120	42.9	28	10	280	Not significant
	Others	109	49.1	85	38.3	28	12.6	222	

GCC, Gulf Cooperation Countries.

Table 3 Determination of marginal and adequate health literacy in the patient population with diabetes using the ordinal regression (OR) model

		Estimate	SE	Wald	df	Significance	95% CI Lower bound	95% CI Upper bound	OR
Threshold	(Health literacy=marginal)	0.581	0.282	4.235	1	0.040	0.028	1.135	
	(Health literacy=adequate)	3.255	0.316	105.88	1	<0.001	2.635	3.875	
Location	(Gender=male)	1.057	0.165	41.07	1	<0.001	0.734	1.381	2.9
	(Gender=female)	0[a]	—	—	0	—	—	—	1.0
	(Age=≤50 years)	1.461	0.192	57.93	1	<0.001	1.085	1.837	4.3
	(Age=>50 years)	0[a]	—	—	0	—	—	—	1.0
	(Education=no secondary education)	−0.196	0.298	0.43	1	0.511	−0.780	0.388	0.82
	(Education=high school)	−0.202	0.262	0.59	1	0.439	−0.715	0.310	1.2
	(Education=bachelor's and postgraduate degree)	0[a]	—	—	0	—	—	—	1.0

a signifies reference

correlated with HL levels, with participants holding bachelor's or postgraduate degrees possessing significantly higher adequate HL levels (24 of 79, 30.4%, p<0.001) than participants with high school degrees (10.3%) or individuals without secondary education (4.9%). Patient nationality did not correlate with HL levels.

The ordinal regression was used to analyse the dependent variable of HL at three levels (inadequate, marginal and adequate) (table 3). The Nagelkerke pseudo-R^2 for the model was 0.20, indicating that 20% of the dependent variable (HL) variation could be predicted by the independent variables (gender, age and education) included in the model. The model containing all predictors was statistically significant (p<0.001) for age and gender, but not for education (table 3). This demonstrates that the model is able to distinguish between respondents with inadequate, marginal and adequate levels of HL. Age and gender were statistically significant positive predictors of the dependent variable. Despite women having significantly higher levels of adequate HL, male participants were likely to have 2.9-fold higher overall HL than female participants. The younger population of patients with T2DM (<50 years old) was likely to have 4.3-fold higher HL, when compared with individuals with diabetes above the age of 50 years. To assess the model's goodness-of-fit, Pearson X^2 test and deviance were used. X^2 statistics showed a level of significance of p<0.001; deviance with level of significance p<0.001 suggesting a good fit of the model on the available data.

DISCUSSION
Summary of main findings
In this nationwide cross-sectional study of individuals attending outpatient diabetes clinics in the UAE, we found that the majority of adult patients with T2DM possess marginal and inadequate HL levels, with the lowest levels among individuals above the age of 50 years and those with limited formal education.

Comparison with findings from previous research
These findings are consistent with other international studies, which have found high inadequate HL levels in patients with chronic diseases, and specifically diabetes.[26 27] Research has also shown that older patients with diabetes may have the lowest HL levels.[28 29] A study of patients with diabetes in Japan reported that older age and lower educational attainment were correlated with lower HL rates.[28] This finding is concerning given the high disease burden in the older UAE population.[30 31] Targeted initiatives are needed to increase diabetes knowledge and self-management in the older UAE community. Programmes should limit the use of written educational materials, which are unlikely to be understood or beneficial in this group, and instead provide focused educational interventions for a population with limited HL.

Our study found a gender HL gap, with men having higher overall HL levels. Traditional gender roles in the UAE more often put men in the workplace and with increased social interactions, perhaps availing men of more health-related information. Studies, however, have not conclusively found a link between gender and HL. It is notable that more women in our study had higher levels of adequate HL. Research from other countries has found that women have higher healthcare utilisation and

may be more experienced in navigating the healthcare system.[32 33] In addition, women often serve as primary care-givers, facilitating healthcare for their children, parents and older family members. This increased interaction and familiarity with the health system may explain the higher percentage of women in the study with adequate HL levels.[32 33] Future research is needed to better understand potential gender-based HL differences in the UAE.

Poor HL has been associated with lower diabetes knowledge, medication adherence, glycaemic control, self-care and self-efficacy.[15 34–36] Recent studies have directly examined the role of HL in diabetes management. Kim and colleagues reported the results of a randomised controlled trial conducted to determine the effectiveness of a short-term HL education intervention, consisting of didactic classes, phone counselling and blood glucose home monitoring, that was delivered to Korean Americans with uncontrolled T2DM.[37] Over the course of the 12-week intervention, participants demonstrated continually improving and sustained HL rates. Moreover, improved HL was significantly associated with improved self-management skills, which ultimately improved glucose levels and patient-reported quality of life.[37] A recent randomised controlled trial compared a nurse coaching intervention with usual care and found higher self-efficacy and physical activity in the intervention group.[38] Studies have also shown a positive association between the number of follow-up appointments with a physician and patient adherence.[39] Therefore, implementing programmes that enhance collaborative care, focus on the patient–physician interaction and foster patient empowerment can ultimately improve patient adherence to treatments and self-care behaviours.[34–36]

Implications for clinical practice, health policy and future research

Our findings have many policy implications. Current health system reforms, including the recruitment and training of specialised health professionals and development of state-of-the-art diabetes centres in the UAE over the past 20 years, have not substantially improved diabetes prevalence or outcomes in the country.[10 40] A study of patients with T2DM in the UAE revealed that the prevalence of one or more diabetic complications was over 80% at the time of initial diagnosis, and increased with age, reaching 94.4% in patients over 65 years.[10] There are several possible explanations. First, diabetes knowledge has not been shown to depend on systems factors or physician specialty, but rather on the availability of structured educational programmes provided by the health facilities.[18 41] This availability of educational interventions may not have kept pace with the sharp rise in diabetes incidence and prevalence in the country. The multicultural, multilingual population of the UAE creates an additional challenge for health education initiatives. Finally, current programmes may not be optimally designed for a population with poor HL. As such, strategies to improve health services should be complemented by efforts to improve HL in the population. Also, it has been shown that educational activities that merely provide health knowledge may not be sufficient to improve self-care behaviours.[42] Incorporating psychological and behavioural components can potentiate self-efficacy and improve self-management behaviours. These approaches should target older individuals and those with lower education levels, as these populations have lower HL rates.

Our findings also have implications for medical education and clinical practice. Medical education in the UAE focuses heavily on acute disease management, with limited attention to prevention and biopsychosocial models of care. Medical students and residents require additional training on patient-centred communication techniques to help them develop and improve skills for effective interactions with patients with low HL. Professional development activities are needed for physicians at all career levels to best integrate universal HL precautions during all patient interactions. These include using simple language rather than medical terminology, explaining information in small and easily understandable portions, and frequently checking for patient understanding.

Strengths and limitations

Strengths of this study include a large, nationwide sample size and the use of an HL tool designed for and validated in the UAE population. Our findings have several limitations. First, results are based on patient responses using an instrument originally designed to measure global HL, rather than disease-specific HL. Some researchers have proposed that inconsistencies in studies of the impact of HL on clinical outcomes in patients with diabetes may be due to the lack of diabetes-specific HL assessment tools.[43] Bias may have been introduced by surveying patients attending outpatient appointments. Community-based surveys or studies of patients who are hospitalised with diabetes complications may yield different results. Nonetheless, to develop awareness and prevention interventions, it is important to understand the HL levels of the large and growing outpatient population with diabetes. Also, inherent to any cross-sectional survey design, only correlations can be established. Further studies are needed to determine if there is a causal link between HL and diabetes outcomes in the UAE. Finally, data collection continued during the early months of the COVID-19 pandemic, prior to stay-at-home mandates and wide-scale implementation of telehealth visits in the UAE. Although we do not feel that the pandemic had an impact on the study, it is possible that some patients avoided elective outpatient appointments early in the pandemic, potentially skewing data collection.

CONCLUSION

In a country with a high prevalence of T2DM, the low HL levels found in outpatients with diabetes may be a major challenge to optimising diabetes care. In addition to health services strategies, educational interventions that

also include a behavioural and psychological approach are necessary to enhance diabetes self-management. Improving HL may also positively impact diabetes self-care and behaviours, leading to better clinical outcomes. Targeted initiatives for the older population and those with less formal education are necessary.

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