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The prevalence and predictors of self-care behaviours among type 2 diabetic patients in two Iraqi provinces

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A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** The link between health beliefs and health behaviours, which includes changing diet, exercise, regular self-medication, self-monitoring of blood glucose, investigation and examination programmes, helps in raising the level of social health awareness, as well as focuses on the individual's role in being responsible for his health.
Objectives. To evaluate self-care activities among patients with type 2 diabetes mellitus in the Wasit and Dhi-Qar provinces.
Material and methods. This analytic cross-sectional study was directed at patients with type 2 diabetic mellitus. The sample was collected from patients who visited Diabetes and Endocrinology centres in the Wasit and Dhi-Qar provinces. Data was collected via a questionnaire based on the "Arabic Summary of Diabetes Self-Care Activities" (A-SDSCA), which consisted of questions related to self-management.
Results. The results were based on the analysis of 404 samples of patients previously diagnosed with type 2 diabetes mellitus. Only 75 (18.6%) had controlled blood glucose. The best self-care practice was diet, with a mean score ± SD (3.17 ± 2.43), followed by testing blood sugar (2.83 ± 2.19). The most frequent advice received from health givers was to follow a meal plan with low-fat contents, which was mentioned by 90.6% of the patients. The participants with the lowest educational level were less likely to undertake appropriate self-management for diabetes (p = 0.026).
Conclusions. The educational level was the significant predictor of self-care behaviours among patients with type 2 diabetes mellitus. It is necessary to increase health education to manage diabetes and change lifestyle through healthcare organisations, as well as through the use of social media.
Key words: type 2 diabetes mellitus, self-care, diabetic diet, exercise, blood glucose self-monitoring.

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Background

Diabetes is the most common chronic metabolic disease and is a global health problem, affecting more than 425 million people worldwide in 2017, and this number is expected to reach 578 million in 2030 and around 700 million in 2045 [1]. Diabetes is expected to rank number seven among the leading causes of fatality in 2030. The world prevalence rate has also increased among adults who are over 18 years of age, and around 541 million are at higher risk of getting diabetes because of their impaired glucose tolerance. The prevalence rate registered a faster rise in countries with middle and low incomes due to population growth, urbanisation, increased life expectancy and obesity due to a sedentary life [2].

Type 2 diabetes mellitus constitutes about 90% to 95% of cases of diabetes patients and occurs most of the time in those older than 40 years of age [3]. It is a significant cause of blindness, kidney failure, heart attacks, strokes and amputations. Most deaths due to diabetes occur before the age of 70 year. Diabetes imposes high direct and indirect costs on healthcare systems and imposes an economic burden on the patient and society [4], and the majority of the costs are associated with the long-standing complications of the disease, for example stroke (CVA) and coronary heart disease (CHD) [5].

The fatality rate from diabetes globally increased over the years and caused 4.2 million deaths during the year 2019. In the Middle East and North Africa, diabetes caused 373,557 deaths in around 21 states, including Iraq [3, 6].

In Iraq, there are 1.4 million people registered to be living with diabetes, and type 2 diabetes mellitus (T2DM) cases range from 8.5% to 13.9% [7]. Even so, due to inadequate available epidemiological studies regarding diabetes mellitus (DM), it is challenging to recognise the real prevalence of DM in Iraq, as well as the best valuable management plan for those patients.

Healthcare professionals ask people with diabetes to perform many self-care behaviours, which include changing diet, exercising, regular self-medication, insulin administration, self-observing of blood glucose, insulin dose adjustment, regular review and investigation and examination programmes. Most of the time, these behaviours are not adhered to, although their importance is understood by the patient. The results of studies have shown that lack of interest in self-care behaviours among diabetics may be the major cause of disappointment in the health programmes applied to DM, and supporting self-care will provide beneficial outcomes such as improved health and quality of life, increased patient satisfaction, reduced healthcare costs, improved symptom management and increased life expectancy [8, 9].

The link between health beliefs and health behaviours is of increasing importance in terms of physical and mental health,

because it helps in raising the level of social health awareness, as well as focuses on the individual's role in being responsible for his health, as this will lead to an awareness of risk factors that determine our choices of activities which we use to face this disease [10]. Self-efficacy also constitutes a strong determinant of the choices that individuals make in their daily lives. People who have a high level of self-efficacy do better and maintain higher rates of activity and perseverance, while those who have a low level of self-efficacy feel low self-confidence and reluctance to do and accomplish tasks. Therefore, self-efficacy is one of the main determinants of the practice of healthy behaviours, which is the individual's belief in his ability to practice healthy behaviours [11]. Even though prodigious steps have been run in the management of DM through out the recent years, some patients have still complained of complications and uncontrolled blood sugar as a result of inadequate self-care behaviours [12]. In addition, related studies on this subject were very limited. Thus, the current study's objective was to assess the prevalence and the significant predictors of self-care practice among a sample of Iraqi patients diagnosed with type 2 DM.

Material and method

Study design

This is an analytic-type cross-sectional study carried out among patients diagnosed with type 2 diabetes mellitus. The sample was collected from patients in two Iraqi governorates located in the southeast of Iraq (Wasit and Dhi-Qar). Patients who visit the Diabetes and Endocrinology centres in the Wasit and Dhi-Qar provinces were included. Data was collected from December 2021 to July 2022.

Sampling and sample size

Consecutive sampling was used for this study. The sample size was assessed based on an equation for a cross-sectional study [13]:

$n = Z^2 P (1 - P) / d^2$,

where n = sample size, d = precision (0.05), Z = Z statistic for a level of confidence of 95%, P = expected prevalence or proportion = 14% [14]. The minimal needed sample size for data collection in this study was 372 after multiplication by 2 due to the non-random type of sample.

Inclusion criteria

All patients who were diagnosed with type 2 DM for at least 3 months, those above 18 years of age and who can speak Arabic were included in the study.

Exclusion criteria

Patients with special needs and disabilities and those with acute conditions preventing them from participating or answering questions were excluded.

Data collection tool

Data was collected using a validated questionnaire derived from previous studies with some modifications [15, 16]. This questionnaire consisted of three parts: The first part is socio-demographic data like age, gender, weight, height, duration of DM, level of glycosylated haemoglobin (HbA_{1C}), level of education, occupation, place of living, smoking status, marital state, perceived social class and type of drug used for DM.

The second part is the "Arabic Summary of Diabetes Self-Care Activities" (A-SDSCA) version 1.0, which consisted of questions related to self-management including four subscales: diet (consisting of 2 issues), exercise (consisting of 2 issues), blood sugar checks (consisting from 2 issues) and foot care (consisting of 2 issues). Each issue was answered by ticking one of the numbers from 1–7 according to the number of days they performed the self-care activities. The A-SDSCA scale was scored in different steps, including calculating the mean of responses for each item, the mean for each subscale and finally the mean of the total A-SDSCA scale. The higher the mean value, the better the self-care activity.

The third part included questions about the healthcare team's advice about their self-care. These include 3 sections regarding diet (5 items), exercise (4 items) and blood sugar testing (3 items). All were answered with yes or no, which were described in frequencies.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) software version 26 was used for entering and analysing the data. Categorical data was presented by frequencies and percentages, while numerical data by mean and standard deviation. The independent samples *t*-Test and one-way ANOVA test were used to assess the difference in means between two and more than two groups in appropriate. Multiple logistic regression was also used to find the predictors. The *p*-value was considered significant when it was equal to or less than 0.05.

Ethical consideration

The ethical agreement before starting the study was gained from the College of Medicine at Wasit University. All the patients were told about the aim of the study, and their voluntary participation was guaranteed. All patients gave their verbal consent before they started filling out the questionnaire. All patients were informed that their data was used for research purposes only, with no identifying information being collected.

Results

The results of this study were based on the analysis of 404 samples of patients previously identified with type 2 diabetes mellitus.

The socio-demographic characteristics of the study participants showed that the mean age (SD) of participants was 50.96 (13.38) years, with a minimum age of 20 and a maximum of 85 years. As shown in Table 1, males represented 66.1% (n = 267) of the participants. Regarding the educational characteristics of the patients, more than half (n = 212, 52.5%) had no education or primary school, and 28.2% (n = 114) had higher education and college. The majority of patients were from the Wasit province (n = 256, 60.9%), while 39.1% (n = 158) were from the Dhi-Qar province. Nearly two-thirds of the participants lived in the city (n = 263, 65.1%) while only 5% (n = 20) lived in subdistricts.

Around three-quarters were married (n = 304, 75.2%). In addition, 35.9% (n = 145) had governmental jobs while 45.5% (n = 184) were unemployed. Moreover, 48.3% (n = 195) of the study participants mentioned that they have medium income, followed by 40.3% (n = 163) with low income. The mean duration and standard deviation of the disease were 7.40 (5.53) years. After classification into groups, the table shows that 31.4% (n = 127) of the study participants have had diabetes for 8 years and more, 34.9% (n = 140,) have had diabetes for 5–8 years, and 32.7% (n = 141) have had diabetes for less than 4 years.

Regarding the treatment, more than half of the patients (n = 242, 59.9%) were on oral anti-diabetic drugs, 18.1% (n = 73) were on insulin, and only 6.7% (n = 27) were on just nutritional therapy. Moreover, regarding HbA_{1c} levels, only 18.6% (n = 75) had controlled blood glucose, and 23.3% (n = 94) did not know their levels of HbA_{1c}.

For body mass index (BMI), the mean was 26.33 (5.69) kg/m^2. 5.7% (n = 23) were underweight, and 32.2% (n = 130) were of normal weight, while the remaining were overweight and obese.

Table 1. Frequency of socio-demographic charcacteristics of the 404 diabetic patients

Socio-demographic variables		Frequency	Percentage
Age (years)	equal or less than 40	96	23.8
	41–60	203	50.2
	above 60	105	26.0
Gender	male	267	66.1
	female	137	33.9
Educational level	no education or primary school	212	52.5
	intermediate or secondary	78	19.3
	college and higher education	114	28.2
Province	Wasit	246	60.9
	Dhi-Qar	158	39.1
Place of living	city	263	65.1
	district	121	30.0
	subdistrict	20	5.0
Marital status	married	304	75.2
	single	57	14.1
	divorced or widow	43	10.6
Job	governmental	145	35.9
	free employee	75	18.6
	unemployed	184	45.5
Perceived monthly income	good	46	11.4
	medium	195	48.3
	low	163	40.3
Smoking status	current smoker	241	59.7
	ex-smoker or not	163	40.3
Type of treatment	oral antidiabetic drugs	242	59.9
	insulin	73	18.1
	combined	62	15.3
	only nutritional	27	6.7
Duration of disease (years)	equal or less than 4	141	32.7
	5–8	140	34.9
	more than 8	127	31.4
HbA_{1c}	controlled	75	18.6
	uncontrolled	235	58.2
	do not know	94	23.3
BMI category	underweight	23	5.7
	normal	130	32.2
	overweight	172	42.6
	obese	79	19.6

The mean score of self-care activity scales and the binary outcome of participants according to the American Diabetes Association (ADA) recommendations [15] are presented in Table 2. This shows that the participants demonstrated a higher mean for the two diet items about following a diet plan. Around 169 (41.8%) participants were incapable to deal with their diet, 232 (57.4%) did not exercise sufficiently, 75.7% did not use to observe their blood glucose frequently, and 43.8% were careless about the required foot care.

Table 3 presents a distribution of the extension question recommended by healthcare providers. The majority (90.6%) of the participants mentioned they were told to follow a meal plan with low fat, followed by 86.9% who were instructed to frequently test their blood sugar. A high percentage (77.5%) were notified about performing low-level exercises like daily walking.

In Table 4, the four subscales of diabetic self-care practices were demonstrated in association with socio-demographic features. There was a significant relationship between gender and diet ($p = 0.002$) and exercise ($p < 0.001$). Females tended to have better diet control, while males exercised more than females. There was also a significant relationship between the province in which the patient lived and diet ($p < 0.001$), exercise

Table 2. Positive responses and mean scale and subscale score for self-care activity among type 2 DM patients							
Subscale/item	**Binary outcomes**			**Item scores** (days/week)**		**Subscale scores** (days/week)**	
	No. of days/week activity achieved*	Respondents		**Mean**	**SD**	**Mean**	**SD**
		n	**%**				
Diet						3.17	2.43
Following a healthy meal plan	≤ 2	169	41.8	3.11	2.49		
Following an meal plan?	≥ 3	235	58.2	3.24	2.46		
Exercise						2.07	1.87
Participation in physical activity	≤ 2	232	57.4	2.31	2.317		
Participation in a specific exercise	≥ 3	172	42.6	1.85	1.972		
Checking blood glucose						2.81	1.79
Testing blood sugar	≤ 4	306	75.7	2.72	2.24		
Testing blood sugar as recommended by a healthcare provider	≥ 5	98	24.3	2.82	2.32		
Foot care						2.83	2.19
Checking the foot	≤ 2	177	43.8	2.87	2.29		
Inspection of the inside of shoes	≥ 3	227	56.2	2.81	2.39		
Overall						2.72	1.35

*American Diabetes Association guideline, **Scale range from 0 to 7, *n* = number, SD = standard deviation.

Table 3. Frequency distribution of the extension question recommended by healthcare providers				
Health caregivers' instructions	**Yes**		**No**	
	n	**%**	***n***	**%**
Stick to a low-fat diet	366	90.6	38	9.4
Follow a complex carbohydrate diet	336	83.2	68	16.8
Lose weight by decreasing the intake of calories	330	81.7	74	18.3
Eat lots of food high in dietary fibre	347	85.9	57	14.1
Received advice about my diet	348	86.1	56	13.9
Low-level exercise daily	313	77.5	91	22.5
20 minutes of exercise at least 3 times a week	293	72.5	111	27.5
Make exercise a daily routine	302	74.8	102	25.2
Received advice about exercise	285	70.5	119	29.5
Using a device to test blood sugar	337	83.4	67	16.6
Test your urine for sugar	238	58.9	166	41.1
Blood sugar testing instructions	351	86.9	53	13.1

Table 4. Mean differences in scores among the study participants						
Variables		**Mean scores (standard deviation)**				
		Diet score	**Exercise score**	**Blood sugar testing**	**Foot care**	**Total score**
Gender	male	2.89 (2.22)	2.33 (1.80)	2.87 (2.05)	2.96 (2.05)	2.76 (1.31)
	female	3.73 (2.70)	1.59 (1.90)	2.58 (2.48)	2.59 (2.43)	2.62 (1.42)
p*		0.002	< 0.001	0.237	0.130	0.331
Province	Wasit	2.64 (1.77)	2.28 (1.56)	3.26 (1.80)	2.90 (1.60)	2.77 (1.11)
	Dhi-Qar	4 (3.02)	1.76 (2.23)	2 (2.55)	2.74 (2.88)	2.63 (1.65)
p*		< 0.001	0.012	< 0.001	0.520	0.331
Smoking status	current	3.28 (2.54)	1.92 (1.95)	2.53 (2.29)	2.66 (2.33)	2.60 (1.39)
	ex or not	3.02 (2.24)	2.31 (1.72)	3.13 (2.03)	3.10 (1.93)	2.89 (1.27)
p*		0.289	0.043	0.007	0.041	0.034
Perceived monthly income	good	3.30 (2.76)	1.85 (1.96)	2.85 (2.48)	3.17 (2.40)	2.79 (1.51)
	medium	3.15 (2.16)	2.35 (1.87)	3.06 (2.15)	2.97 (1.99)	2.88 (1.29)
	low	3.17 (2.63)	1.82 (1.79)	2.40 (2.15)	2.59 (2.34)	2.49 (1.34)
p*		0.926	0.019	0.018	0.138	0.022

Table 4. Mean differences in scores among the study participants						
Variables		Mean scores (standard deviation)				
		Diet score	Exercise score	Blood sugar testing	Foot care	Total score
Age (years)	≤ 40	2.84 (2.00)	2.03 (1.57)	2.92 (2.06)	2.49 (1.89)	2.57 (1.07)
	41–60	3.21 (2.48)	2.29 (1.99)	2.65 (2.21)	3.07 (2.29)	2.80 (1.44)
	> 60	3.41 (2.65)	1.72 (1.83)	2.87 (2.33)	2.70 (2.21)	2.68 (1.38)
*p***		0.235	0.042	0.530	0.076	0.353
HbA_{1c}	controlled	3.46 (2.53)	2.03 (2.07)	3.19 (2.55)	2.42 (2.37)	2.77 (1.46)
	uncontrolled	2.84 (2.08)	2.23 (1.70)	3.16 (1.95)	3.01 (1.79)	2.81 (1.17)
	unknown	3.79 (2.97)	1.73 (2.05)	1.45 (2.02)	2.74 (2.84)	2.43 (1.61)
*p***		0.003	0.092	< 0.001	0.104	0.063
Duration of disease (years)	≤ 4	3.17 (2.52)	2.20 (1.95)	2.88 (2.36)	2.63 (2.36)	2.72 (1.47)
	5–8	3.00 (2.10)	2.24 (1.68)	3.04 (1.95)	2.76 (1.81)	2.76 (1.15)
	> 8	3.37 (2.64)	1.76 (1.93)	2.36 (2.24)	3.15 (2.34)	2.66 (1.41)
*p***		0.469	0.072	0.035	0.132	0.838
Educational level	primary or no education	2.97 (2.59)	1.79 (1.78)	2.54 (2.15)	2.76 (2.24)	2.51 (1.32)
	secondary	3.79 (2.59)	2.42 (1.89)	2.83 (2.35)	3.38 (2.46)	3.11 (1.49)
	college and higher	3.12 (1.88)	2.39 (1.93)	3.16 (2.17)	2.62 (1.82)	2.82 (1.23)
*p***		0.037	0.004	0.052	0.046	0.002

*Independent *t*-Test, **one-way ANOVA.

Table 5. Multiple regression for associated variables as predictors for the total mean score				
Predictors	B	Standard Error	Beta	*p*
No formal education or primary school	-0.326	0.145	-0.121	0.026
Current smoker	-0.218	0.139	-0.079	0.117
Low monthly income	-0.196	0.149	-0.071	0.190
Controlled blood sugar	0.019	0.173	0.006	0.911

$F = 3.83$, $p = 0.004$, $R^2 = 0.037$.

($p = 0.012$) and the blood sugar testing ($p < 0.001$). Patients from Wasit had higher means relative to Dhi-Qar for the three associated mentioned subscales except for diet. Smoking showed a significant association with exercise ($p = 0.043$), blood sugar testing ($p = 0.007$) and foot care ($p = 0.041$). Both the total scale and the sub-scale were higher among patients who never smoked or quit smoking, except for diet, which represented a slight difference. Monthly income was another risk factor and was significantly associated with exercise ($p = 0.019$) and blood sugar testing ($p = 0.018$). Patients who perceived they had good and medium monthly income exercised and tested their blood sugar levels more. Age had a significant relationship with exercise only ($p = 0.042$). Those who were over 60 years of age demonstrated lower exercise than other age groups. HbA_{1c} level was significantly related to diet ($p = 0.003$) and blood sugar testing ($p < 0.001$). Patients with an unknown level of HbA_{1c} had higher mean diet scores. Those with controlled blood sugar were interested in checking their glucose level more than others.

Duration of disease only had a significant relationship with blood sugar testing ($p = 0.035$). Patients who were diagnosed with diabetes for 5–8 years had slightly higher mean blood sugar testing levels than those with other durations of the disease.

The educational level of participants was significantly associated with diet ($p = 0.037$), exercise ($p = 0.004$) and foot care ($p = 0.046$). A higher mean of sub-scores was shown in patients who completed secondary school education.

The regression analysis for multiple characteristics of the participants and self-management scores is shown in Table 5. The associated variables, like level of education, monthly income, smoking and glucose control, can significantly predict total management scores with a $p = 0.004$. Smokers, low monthly income and participants with controlled blood sugar had little impact on the total mean score of self-management.

The only significant predictor was patients with no formal education or primary school education, who were less likely to undertake appropriate self-management behaviours for diabetes ($p = 0.026$).

Discussion

As an indicator of good glycaemic control, the HbA_{1c} level was less than 7 mmol/L [17] in around one-fifth of the sample in the current study. This finding was in accordance with another study in Saudi Arabia, in which Al-Hussein found that patients with controlled blood sugar totalled 21% and had HbA_{1c} levels of < 7 mmol/L [18]. Another study done by Johani Kendall and Snider found a percentage of 15% with an HbA_{1c} level of less than 7.3 mmol/L [15].

The majority of patients with poor diabetic control even mentioned their adherence to their treatment as recommended by specialist doctors. Furthermore, one-fifth of the participants who had a good glycaemic index indicated that medication is not the only solution for adequate management of type 2 DM.

Concerning self-care management, while more than half of participants reported following a meal plan 3 or more days per week, 41.8% reported as being unable to manage their diet or to adhering to a healthy meal plan for only 2 days or less during the week. This may give a clue about the strong relations and social connections between Iraqi families and friends who

gather around the dining table each social occasions, such as wedding parties, birthdays or even funerals. This made them skip the diet and eat a large amount of traditional fatty food instead. This is just as likely to occur in some Asian regions, such as the Philippines, where people consume rice with high carbohydrates in large quantities [19]. Even in Arab countries, traditional societal and community behaviours may play a role in preventing patients with type 2 DM to follow a diet plan for diabetes management.

Less than half of the patients in this study said they exercised more than 3 times a week. This 42.6% was less than that reported by Asian researchers [19], while in China, a slightly similar percentage (40%) of participants kept continuous exercise practices throughout the week [20]. In a Korean study, the percentage was slightly higher than half (54%) of the type 2 DM participants who routinely exercised throughout the week [21].

The reason behind not exercising among our patients may be related to their ages, as more than one-quarter of them were above 60 years of age. It may also be due to general physical decline or ill health, and they might not be able to engage in regular exercise. However, the hot climate in Iraq is much more likely to be a reason, which restricts even simple exercises like walking. Iraqi people also tend to prevent old age patients from moving or doing any sport or exercise, which is unlike Asian culture, in which older people are familiar with healthy exercises, such as yoga [22].

The mean days per week that self-care activities were practiced in this study was less than 3 days per week, which is less than the United States [23] and slightly similar to Jordan, which shares the same culture and circumstances as Iraq [24].

In the Jordanian study, around 19% of the sample never followed a diet plan, and 68% of the participants did not attain the healthy recommendations compared with the 57.4% in this research [24]. On the other hand, only one-quarter of the Iraqi patients in this study checked their glucose level more than 5 times weekly, while more than one-third (38%) of the participants in Jordan did this. Another study among type 2 DM Iraqi samples found that 64.2% habitually measured their glucose level [25].

Compliance with medication was reasonable in both studies and was found to be higher in Jordan (91% versus 78.4%) than Iraq [24, 25]. These findings agreed with other studies carried out in some developed countries, which discovered a general preference for people to take medications for any health issue because it is simpler than changing their behaviours [26, 27]. Another Iraqi study among diabetic patients showed that 90.6% of patients were compliant with their diabetic therapy [28].

Regarding the explanatory variables and due to the heterogeneousness characteristics of patients with type 2 DM in different places and countries, it is important to define whether any subgroups in the population are more or less likely than others to engage in self-care activities. The results of this study show that Iraqi patients who were older, male or low-income earners were less likely to practice specific self-care activities generally. While males were more likely to exercise, females obtained higher rates of managing their diet. We can justify this because of many conditions in Iraqi society that give greater freedom to males than females, as in many Middle Eastern societies.

Females may have better adherence to healthy eating than men due to being more conscious of the diet content and calories [29]. They are responsible for food preparation inside the home and thus can control what they eat and follow a diet plan. Females were also unsurprisingly found to adhere to their doctors' advice about diabetes self-management, as they are dealt with as a dependent group in society [22].

The results of the current study showed that about half of the individuals with a primary education level and their economic conditions are weak and that is more likely due age group that is classified as elderly and who do not have a monthly income enough due to retirement. This is consistent with references that confirm that type 2 diabetes occurs above the age of forty [30].

Those above the age of 60 were the least likely to practice self-care activities. This could be due to physical body deterioration or poor general health, while younger patients reported more awareness of the complications of diabetes, better posture and health, and thus can do more self-care activities.

Regarding monthly income, those with low income practiced self-care activities the least. This could be due to the high costs of glucose device measures, medicines, etc. Low income has been distinguished globally as an obstacle to attaining different healthy activities related to self-management practices, such as checking blood glucose [31]. This limits patients' ability to access required healthcare services and secure particular equipment. It also affects patients' involvement in life stress, which is associated with increased poor health and death [32]. For example, not all diabetic patients with low income had a glucometer, and most of them were not able to regularly go to a healthcare centre due to many factors like work timetables, not being able to tolerate visiting private clinics and expensive transportation costs.

Those patients who had better glucose level control reported more adherence to diet control and regularly testing of their blood sugar. The same was reported for those with higher formal education, who were more prone to care for their diet and manage their exercise, while those who had secondary or less education levels were more likely to care for their foot, i.e. the education level is strongly related to the level of self-care behaviours, which will increase patients' belief in self-care efficacy [33, 34]. A low level of education proved to be a significant predictor of self-care activities among type 2 DM patients.

As to smoking, those who quit smoking or were non-smokers were more related to exercise, diet and foot care levels compared to smokers, which could be due to more realisation of the threat (susceptibility to exposure and distress) than others, and this may predict the self-care behaviours in these patients. Regarding the region of patients, those from outside the city centre showed greater management of their diet compared to those who lived in or near the city centre. This could be due to the urban lifestyle and food hazards, making it a big challenge to maintain healthy eating behaviours.

Limitations of the study

The study has several strengths, such as recording the patient's information through direct interviews, which reduces random or incorrect data by the individuals. Even for the patients who cannot read and write, the researchers read the questions and wrote the answers for them. In this way, all educational levels were included in the study. However, there are also some potential limitations, such as that information regarding individualised glycaemic control targets could not be collected as this was not documented in the participants' medical records. The study population was also mostly from Wasit and Dhi-Qar. Therefore, it is difficult to extrapolate the study findings to Iraqi populations residing in other geographical areas or cities of the country.

Conclusion and recommendations

Self-management of diabetes is currently considered a challenge, as proper education and strict adherence to medical guidelines are important for proper diabetes management and avoiding future complications. The significant predictor in this study for self-care practice in patients with type 2 DM was educational level.

Because of the obvious increase in cases of diabetes in our country and the whole world, it is necessary to increase health education to manage diabetes and change lifestyles through the activation of the role of family physicians in healthcare organisations, organising media campaigns and using social media.

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