

Diabetes Self-Management: A Key to Better Health-Related Quality of Life in Patients with Diabetes

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Significance of the Study

- Diabetes mellitus is an increasing health problem in Kuwait. It has a lot of implications for the quality of life of patients with diabetes. Little is known about this problem in Kuwait from a public health perspective. The findings of this study will help to fill the gap in knowledge about adult patients with diabetes in Kuwait and might enhance the future implementation of diabetes self-management programs.

Keywords

Diabetes · Diabetes self-management · Health-related quality of life

Abstract

Objective: The aims of this study were to assess health-related quality of life (HRQOL) among adult patients with diabetes attending primary health care diabetes clinics in Kuwait and to examine the factors associated with the HRQOL of patients with diabetes. **Methods:** This cross-sectional study was conducted among 503 patients with diabetes attending 26 primary health care diabetes clinics in Kuwait. A self-administered questionnaire on participants' socio-demographic and clinical characteristics, in addition to the Diabetes Self-Management Questionnaire (DSMQ) to assess patients' diabetes self-management (DSM), was used. The

SF-12 was employed to assess the HRQOL, producing the following 2 outcomes: physical health composite (PHC) and mental health composite (MHC). **Results:** The mean age of participants was 52 ± 0.8 years, and 53.1% were males and 49.0% were Kuwaitis. The median DSM sum score was 6.5. Male patients with diabetes showed a significantly better median DSM sum score than female patients with diabetes. The overall median score of HRQOL was 61.7/100, with a better median PHC versus MHC score of quality of life (66.7/100 and 56.7/100, respectively). Multivariate analysis revealed a significant direct association between DSM and better primary health composite and MHC scores. It also showed that female gender and reporting 2 or more diabetic complications were significantly associated with a poor PHC. **Conclusions:** Kuwaiti patients with diabetes showed a modest level of HRQOL. Patients' DSM, gender, and diabetes complications were significant independent correlates to HRQOL. Ap-

praisal of the HRQOL of patients with diabetes as an essential component of diabetes management in clinical settings is suggested. Further studies to examine the impact of good DSM on HRQOL improvement are needed.

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Introduction

Diabetes cases are continuing to increase in number and significance globally, parallel to changing lifestyles characterized by reduced physical activity and increased obesity [1]. It is being increasingly recognized that the impact of chronic illnesses, such as diabetes, and their treatments must be assessed in terms of patients' quality of life (QOL) [2, 3]. The estimated global prevalence of type 2 diabetes rose from 4.7% in 1980 to 8.5% in 2014 [1]. Global estimates of the International Diabetes Federation (IDF) reported that in 2015 there were 415 million diabetic adults, and 9.1% of them (35.4 million) were in the Middle East and North Africa [4].

The diabetes-related premature annual mortality is estimated to be 5 million deaths due to preventable complications of diabetes [4]. Moreover, diabetes has managed to impose a clinical burden and economic strain on individual and societal levels. This economic burden comprises both direct costs due to the use of medical and health care services and indirect costs resulting from loss of productivity and disability. Globally, the health care expenditure for patients with diabetes has been found to be 2- to 3-fold higher than that for patients without diabetes [4].

There is a growing interest in the study of health-related QOL (HRQOL) among patients with diabetes [5]. HRQOL has been defined as the effect of an illness on a patient, as perceived by the patient, it yields information complementary to medical or epidemiological data, and it is often used as an outcomes measurement [6]. QOL has also been characterized as the ultimate goal of all health interventions [6]. This reflects the increasing appreciation of the vital role of the emotional burden in addition to the physical distress of hypoglycemia or hyperglycemia and/or diabetes complications in the lives of patients with diabetes [7]. For instance, to prevent long-term complications and to preserve a better QOL in patients with diabetes, it is crucial for every patient to obtain knowledge on the impact of his/her disease on his/her related QOL and the determinants of it. People with diabetes in general have a worse QOL compared to those with no chron-

ic illness. Moreover, diabetes-related complications are the most important disease-specific determinants of QOL [8]. Every diabetic patient has a unique lifestyle and his/her QOL is affected not only by their diabetes status, accompanied by complications or not, but also by some demographic variables and psychosocial factors [5]. The reciprocity between diabetes and diabetes-related QOL is well documented in previous studies as the latter can strongly affect a diabetic person's responsibility to actively operate his/her diabetes self-management (DSM) [5, 9]. Furthermore, a body of literature has evidenced the crucial role of diabetic self-management in terms of regular glycemic monitoring, appropriate diet, and physical activity [10]. A positive association between high levels of perceived QOL and good glycemic control has been reported [5].

Kuwait has a population of approximately 4.2 million, of which nationals account for 30%. Kuwait has the third highest prevalence of diabetes in the world [4], with a prevalence of 20.0% among adults aged between 20 and 79 years. In addition, the largest proportion of patients with diabetes in Kuwait is aged below 60 years, contrary to what occurs in most high-income countries [4]. In Kuwait, the IDF reported that the average annual cost per person with diabetes is estimated to be USD 2,040 [4]. Accordingly, the overall health expenditure required for almost 400,000 cases of diabetes in Kuwait in 2015 is predicted to be USD 816 million [4]. This figure is expected to rise with the continuous increase in the incidence of diabetes. Furthermore, diabetes accounts for 4% of the total deaths in Kuwait [11].

The HRQOL among patients with diabetes mellitus type I among children and adolescents has been studied [12]; however, no similar studies among adult patients with type II diabetes in Kuwait have been reported. Accordingly, the premise of this study was to assess HRQOL among adult patients with diabetes attending primary health care diabetes clinics in Kuwait and to examine the factors associated with it. We hypothesized that patients with diabetes who have good DSM should theoretically enjoy a better HRQOL than those who have poor DSM. This study aimed to contribute to the growing literature on HRQOL and provide clinicians and policy makers in Kuwait with additional insights about predictors of HRQOL in patients with diabetes. This may help in designing strategies to improve the QOL of patients with diabetes in Kuwait.

Methods

Study Design and Study Population

This cross-sectional study was conducted among diabetic patients attending primary health care centers. A stratified random sample method was employed to have a representative sample of diabetic patients from the 6 governorates in Kuwait. From a list of a total of 81 diabetes clinics in all governorates, a random number of diabetes clinics proportional to the number of clinics in each governorate was selected. We hypothesized that the number of diabetes clinics in each governorate would reflect the population density and the load of patients in the corresponding governorate. Twenty-six diabetes clinics were randomly selected, comprising 32.1% of the total number of primary health care diabetes clinics in Kuwait. Completed questionnaires from 503 patients with diabetes were collected, with an overall response rate of 79.8%. The rejection rate was due to refusal of the patients to spend time filling out the questionnaire in the clinics.

Ethical Considerations

This study was approved by the Health Sciences Center Ethics Committee for Research in the Faculty of Medicine of Kuwait University. Written informed consent was provided by each participant prior to their voluntary participation, after comprehensive explanation of the study objectives and assurance of confidentiality.

The Study Tool

A self-administered anonymous questionnaire that included 21 items was used. The questionnaire was divided into 5 sections. The first section (8 questions) contained the socio-demographic characteristics of our subjects. The second section (9 questions) included clinical characteristics such as duration of disease, type of diabetes, type of medication, and presence of any diabetes complications (e.g., retinopathy, nephropathy, neuropathy, and diabetic foot ulcers/amputations). Data about the most recent HbA1C, height, and weight were obtained from the patients' records in the clinic.

The third section of the questionnaire (2 questions) covered the presence of diagnosed comorbidities such as hypertension, cardiovascular diseases, high blood cholesterol, cancers, history of stroke, and chronic respiratory diseases. The fourth section comprised the Diabetes Self-Management Questionnaire (DSMQ) to assess patients' self-management behaviors related to their diabetes control status in the 8 weeks preceding the study. The test has a high reliability (Cronbach $\alpha = 0.84$) and a high validity compared to other scales [13]. The DSMQ incorporates 16 items which are scored on a 4-point Likert scale from 0 (does not apply to me) to 3 (applies to me very much). Nine items of the questionnaire required reverse scoring on a total score of 0–48, with the higher score indicating more effective self-management behavior. The scores were transformed to a score from 0–10 for ease of interpretation. The original English questionnaire was translated to Arabic. Back translation was done to confirm accuracy and precision. In addition, the questionnaire was pretested to ensure exactness and fidelity meaning.

The fifth section of the questionnaire embodied the short form of the HRQOL SF-12 to evaluate HRQOL and is derived from the SF-36 [14]. The SF-12 showed a high validity and was found to be a robust and an adequate substitute for the original longer form, i.e., SF-36 [14, 15]. The questionnaire administers coherent and valued

insight into patients' perspective of the impact of disease on their daily lives. The reliability of the Arabic version of the questionnaire has been documented in previous studies [16, 17]. The SF-12 tool assessed the patients' perceived health status and generated 2 major domains, i.e., physical health composite (PHC) and mental health composite (MHC). Each parameter was scored from 0 to 100, where higher scores reflected a better QOL. Data was collected during a period of 3 months from January 1 to March 31, 2017.

Statistical Methods

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS, version 24; IBM, USA). For descriptive analysis, frequencies were calculated for categorical variables, means (SD) were calculated for normally distributed continuous variables, and medians (IQR) were calculated for continuous variables that were not normally distributed. The normality of the distribution of continuous variables was examined using the Shapiro-Wilk test. As the PHC and MHC total scores were skewed, medians (IQR) were calculated. The body mass index (BMI) was calculated by dividing the weight in kilograms by the square of the height in meters. The WHO categories of BMI (i.e., BMI ≤ 18.5 , underweight; BMI = 18.5–24.9, normal; BMI = 25.0–29.9, overweight; and BMI ≥ 30.0 , obese) were considered. HbA1C levels were classified according to the Global Diabetes Community of the UK as poor (≥ 9.0), moderate (7.0– <9.0), or good (<7.0).

To examine the association between the outcome variables (PHC and MHC) and the independent variables, nonparametric tests such as the Spearman correlation test, the Mann-Whitney *U* test, and the Kruskal-Wallis *H* test were calculated.

In order to examine the association between the outcome variables and the independent characteristics of the respondents (socio-demographic and clinical characteristics and DSM) after ruling out the effect of confounders, a logistic regression model was used. The PHC and MHC total scores were divided according to the median into 2 groups. Participants who scored less than or equal the median were categorized as "poor" and scored "1," while those who scored more than the median were categorized as "good" and scored "0." $p < 0.05$ and 95% CI were considered statistically significant.

Results

Socio-demographic and Clinical Characteristics of the Participants

The socio-demographic and clinical characteristics of the participants are presented in Table 1. The mean age of the patients was 52.1 ± 10.8 years; 53.1% of them were male, and 49.0% were Kuwaitis. The majority of the patients were married (93.8%) and 20.7% held university degrees. Almost half of the participants were employed (49.1%), and 24.2% reported a monthly income of more than KWD 1,000 (KWD 1 = USD 3.3). Moreover, 19.5% reported smoking with a mean duration of 26.7 ± 11.5 years and a mean number of daily smoked cigarettes of 20.4 ± 14.0 . Almost half of the respondents reported hav-

Table 1. Socio-demographic and clinical characteristics of diabetic patients attending clinics in Kuwait

	Frequency		Frequency
<i>Socio-demographic characteristics</i>		<i>BMI</i>	
Age		Normal	64 (13.8)
21–45 years	124 (24.9)	Overweight	161 (34.6)
46–55 years	188 (37.8)	Obese	240 (51.6)
>55 years	186 (37.3)	Family history	
Mean age (\pm SD), years	52.06 \pm 10.8	Yes	363 (72.2)
Gender		No/does not know	140 (27.8)
Male	267 (53.1)	Medications	
Female	236 (46.9)	Oral only	315 (62.7)
Nationality		Insulin only	64 (12.7)
Kuwaiti	246 (49.0)	Oral and insulin	108 (21.5)
Non-Kuwaiti	256 (51.0)	Others (diet only/none)	15 (3.1)
Marital status		HbA1C	
Single	31 (6.2)	Good (<7.0)	110 (25.3)
Ever married	472 (93.8)	Moderate (7.0–<9.0)	171 (39.4)
Education level		Poor (\geq 9.0)	153 (35.3)
Less than high school	216 (43.0)	Mean value (\pm SD)	8.498 \pm 2.32
High school and diploma	183 (36.3)	Diabetes complications ^a	
University and higher	104 (20.7)	Retinopathy	226 (44.9)
Family monthly income		Neuropathy	221 (43.9)
<500 KWD	213 (42.7)	Nephropathy	53 (10.5)
500–1,000 KWD	165 (33.1)	Foot ulcers	39 (7.8)
1,001–1,500 KWD	121 (24.2)	Diabetes hospitalization/amputation	85 (16.9)
Employment status		Diabetes complications	
Unemployed	149 (29.7)	0	163 (32.4)
Employed	246 (49.1)	1	147 (29.2)
Retired	106 (21.2)	2 or more	193 (38.4)
Smoking		Comorbidities ^a	
Yes	98 (19.5)	Hypertension	249 (49.5)
Mean duration of smoking (\pm SD), years	26.66 \pm 11.54	High cholesterol	286 (56.9)
Mean cigarettes/day (\pm SD), <i>n</i>	20.36 \pm 13.96	Heart disease	70 (13.9)
No	404 (80.5)	Others	280 (55.7)
<i>Clinical characteristics</i>		Comorbidities	
Type of diabetes		0	97 (19.3)
1	46 (9.1)	1	124 (24.7)
2	249 (49.5)	2 or more	281 (56.0)
Does not know	208 (41.4)		
Duration of diabetes			
<5 years	152 (31.3)		
5–10 years	176 (34.1)		
\geq 11 years	169 (34.6)		

Values are presented as numbers (%) unless otherwise stated. The total number of patients was 503. BMI, body mass index. ^a Percentages may add up to more than 100 due to reporting of more than 1 health problem.

ing diabetes type 2, while 41.4% did not know the type of their diabetes.

Table 1 also shows that about 34.0% of the participants reported a duration of diabetes of 5–10 years, while 35.0% reported a duration of 11 years or longer. Obesity was detected in 51.6% of the participants, and 34.6% were overweight. A positive family history of diabetes (in the father, the mother, or siblings) was reported by 72.3% of the respondents. Oral medication was the main line of treat-

ment for most of the patients (62.7%). The mean HbA1C level was 8.5 \pm 2.32, and 35.3% had poor HbA1C levels (\geq 9.0). In addition, retinopathy and neuropathy were the most frequently reported diabetes complications (44.9 and 43.9%, respectively), while 32.4% of the participants did not report any complications. Furthermore, 19.3% of the participants did not report any comorbidities, while hypertension and high blood cholesterol were reported by 49.5 and 56.9% of the respondents.

Table 2. PHC HRQOL scores according to socio-demographic and clinical characteristics of diabetic patients attending clinics in Kuwait

	PHC ^a			PHC ^a	
	median (IQR)	<i>p</i> value		median (IQR)	<i>p</i> value
<i>Socio-demographic characteristics</i>			<i>Complications of diabetes</i>		
Age		0.222	0	79.17 (30.21)	<0.001
21–45 years	72.92 (41.67)		1	75.00 (41.67)	
46–55 years	66.67 (41.67)		2 or more	50.00 (45.83)	
>55 years	66.67 (54.17)		<i>Comorbidities</i>		
Gender		<0.001	0	75.00 (37.50)	<0.001
Male	79.17 (37.50)		1	70.83 (41.67)	
Female	58.33 (50.00)		2 or more	62.50 (50.0)	
Nationality		0.092	<i>Duration of diabetes</i>		
Kuwaiti	62.50 (45.83)		<5 years	75.00 (45.83)	0.050
Non-Kuwaiti	70.83 (45.83)		5–10 years	66.67 (50.00)	
Marital status		<0.001	≥11 years	66.67 (45.83)	
Married	70.83 (45.83)		<i>Family history</i>		
Not married	54.17 (45.83)		Yes	70.83 (45.83)	0.309
Educational level		0.072	No	62.50 (50.00)	
Less than high school	66.67 (54.17)		<i>Types of medications</i>		
High school and diploma	66.67 (37.50)		Oral only	75.00 (43.75)	<0.001
University and higher	70.83 (41.67)		Insulin only	58.33 (41.67)	
Family monthly income		0.002	Oral and insulin	56.25 (46.88)	
<500 KWD	70.83 (48.96)		<i>BMI</i>		
500–1,000 KWD	62.50 (45.83)		Normal	83.33 (33.33)	<0.001
>1,000 KWD	75.00 (37.50)		Overweight	75.00 (41.67)	
Employment status		<0.001	Obese	62.50 (45.83)	
Employed	75.00 (44.79)		<i>HbA1C</i>		
Unemployed/retired	62.50 (50.00)		Good (<7.0)	70.83 (51.04)	0.005
Smoking		0.093	Moderate (7.0–<9.0)	75.00 (41.67)	
Yes	70.83 (46.88)		Poor (≥9.0)	62.50 (50.00)	
No	66.67 (45.83)		<i>DSM</i>		
<i>Clinical characteristics</i>			<i>r_s</i>	0.306	<0.001
Type of diabetes		0.005	PHC, physical health composite; HRQOL, health-related quality of life; BMI, body mass index; DSM, diabetes self-management.		
1	62.50 (47.92)		^a Median = 66.67 (IQR 45.8).		
2	75.00 (37.50)				
Does not know	62.50 (54.17)				

HRQOL and Participants' Characteristics

The associations between participants' socio-demographic and clinical characteristics and the PHC score of QOL are presented in Table 2. The median PHC score was 66.67 (IQR 45.8) and the median MHC was 56.67 (IQR 26.7). Males showed a significantly better QOL than females (79.2 vs. 58.3, respectively; $p < 0.001$). Married participants enjoyed a significantly better PHC of QOL (70.8 vs. 54.2, respectively; $p < 0.001$) than nonmarried respondents. In addition, the PHC was the highest among the richest participants (income greater than KWD 1,000/month) compared to those with the lowest earnings (income less than KWD 500/month) (75.0 vs. 70.8; $p = 0.002$). Moreover, employed participants showed a better

PHC than unemployed subjects (75.0 vs. 62.5, respectively; $p < 0.001$).

Patients with type 2 diabetes reported a significantly better median PHC score (i.e., 75.0) compared to those with type 1 diabetes (i.e., 62.5; $p = 0.005$). Furthermore, there was a significant gradual indirect association between the number of diabetes complications and the median PHC score. Patients with no complications scored the highest (i.e., 79.2) compared to those with >3 complications (i.e., 50.0; $p < 0.001$). The same pattern of association applied also to the number of comorbidities among patients with diabetes, as demonstrated in Table 2. Those with no comorbidities had a higher PHC score than those with >3 comorbidities (75.0 vs. 62.5, respectively; $p <$

Table 3. MHC HRQOL scores according to socio-demographic and clinical characteristics among diabetic patients attending primary health care clinics in Kuwait

	MHC ^a			MHC ^a	
	median (IQR)	<i>p</i> value		median (IQR)	<i>p</i> value
<i>Socio-demographic characteristics</i>			<i>Complications of diabetes</i>		
Age		0.325	0	60.00 (20.83)	<0.001
21–45 years	56.67 (25.00)		1	56.67 (32.50)	
46–55 years	53.33 (26.67)		2 or more	50.00 (30.0)	
>55 years	53.33 (30.00)		<i>Comorbidities</i>		
Gender		0.011	0	56.67 (23.33)	0.009
Male	56.67 (20.00)		1	56.67 (23.33)	
Female	50.00 (33.33)		2 or more	53.33 (31.67)	
Nationality		0.676	<i>Duration of diabetes</i>		
Kuwaiti	56.67 (23.33)		<5 years	56.67 (29.17)	0.201
Non-Kuwaiti	53.33 (27.50)		5–10 years	53.33 (23.33)	
Marital status		0.142	≥11 years	53.33 (28.33)	
Married	56.67 (26.67)		<i>Family history</i>		
Not married	50.00 (26.67)		Yes	56.67 (23.33)	0.635
Educational level		0.176	No	53.33 (30.00)	
Less than high school	53.33 (30.00)		<i>Types of medications</i>		
High school and diploma	56.67 (26.67)		Oral only	56.67 (26.67)	0.007
University and higher	56.67 (26.67)		Insulin only	53.33 (20.00)	
Family monthly income		0.435	Oral and insulin	50.00 (30.83)	
<500 KWD	53.33 (33.33)		<i>BMI</i>		
500–1,000 KWD	53.33 (30.00)		Normal	56.67 (23.33)	0.092
>1,000 KWD	56.67 (20.00)		Overweight	56.67 (23.33)	
Employment status		0.010	Obese	53.33 (30.00)	
Employed	56.67 (25.00)		<i>HbA1C</i>		
Unemployed/retired	53.33 (33.33)		Good (<7.0)	56.67 (28.33)	0.041
Smoking		0.768	Moderate (7.0–<9.0)	56.67 (25.00)	
Yes	56.67 (24.17)		Poor (≥9.0)	50.00 (29.17)	
No	56.67 (26.67)		<i>DSM</i>		
<i>Clinical characteristics</i>			<i>r_s</i>	0.217	<0.001
Type of diabetes		0.067	The total number of patients was 503. MHC, mental health composite; HRQOL, health-related quality of life; BMI, body mass index; DSM, diabetes self-management. ^a Median = 56.67 (IQR 26.7).		
1	53.33 (33.33)				
2	56.67 (26.67)				
Does not know	53.33 (24.17)				

0.001). Additionally, a disease duration of less than 5 years was associated with a high PHC (i.e., 75.0) compared to a longer disease duration.

Patients on mixed (oral and insulin) therapy had the lowest median PHC score (i.e., 56.3) relative to those who were using oral medications only (i.e., 75.0; $p < 0.001$). In addition, BMI had an indirect significant association with PHC. Obese patients with diabetes had a median PHC score of 62.5 compared to 75.0 for overweight patients and 83.3 for normal patients with diabetes ($p < 0.001$). Taking the HbA1C measurement into account, those with poor control (≥ 9.0) had low PHC scores (62.0; $p = 0.005$). Furthermore, the Spearman correlation showed a

positive association between PHC and DSM total scores ($r_s = 0.31$; $p < 0.001$).

The association between participants' MHC of QOL and their socio-demographic and clinical features is presented in Table 3. Males and employed participants showed a better MHC than females and unemployed/retired participants (56.7 vs. 50.0, $p = 0.011$, and 56.7 vs. 53.3, $p = 0.01$). Regarding participants' clinical features, there was a significant gradual indirect association between the number of diabetes complications and the median MHC score. Patients with no complications scored the highest, with a median MHC of 60.0, compared to those with >3 complications, whose median score was

Table 4. Logistic regression of significant factors associated with poor PHC and MHC of QOL among diabetic patients attending clinics in Kuwait

QOL	Subgroup, <i>n</i>	Crude OR for poor QOL			Adjusted OR for poor QOL ^a		
		OR	95% CI	<i>p</i> value	OR	95% CI	<i>p</i> value
<i>PHC</i>							
Gender							
Male	267	1.0	reference group		1.0	reference group	
Female	236	2.76	1.92–3.97	<0.001	1.84	1.16–2.91	0.010 ^b
Diabetes complications							
0	163	1.0	reference group		1.0	reference group	0.005 ^c
1	147	1.42	0.89–2.24	0.137	0.94	0.53–1.65	0.818
2 or more	193	3.85	2.47–5.99	<0.001	2.10	1.21–3.65	0.008
DSM (sum score)	503	0.916	0.89–0.94	<0.001	0.93	0.90–0.96	<0.001 ^d
<i>MHC</i>							
DSM (sum score)	503	0.95	0.93–0.98	<0.001	0.95	0.92–0.98	<0.001

PHC, physical health composite; MHC, mental health composite; QOL, quality of life; DSM, diabetes self-management. ^a Below the median of each total score of PHC or MHC. ^b Model 1: adjusted for age, gender, marital status, family monthly income, and employment status. ^c Model 2: adjusted for covariates in model 1 and number of complications, number of comorbidities, duration of diabetes, types of medication, BMI categories, and levels of HbA1C. ^d Model 3: adjusted for covariates in model 2 and the DSM sum score.

50.0 ($p < 0.001$). The same applied to those with comorbidities, whereas those with no comorbidities had the highest median MHC score compared to those with >3 comorbidities (56.7 vs. 50.0, respectively, $p = 0.009$).

As for the types of medications, patients on mixed therapy (oral and insulin) had a significantly lower median MHC score of 50.0 relative to those who were using oral medications only (i.e., 56.7). Taking the HbA1C measurement into account, those with poor control (≥ 9.0) had the lowest MHC score (i.e., 50.0) compared to those with good control (<7.0 ; $p = 0.041$). In addition, a positive significant correlation was seen between MHC and DSM total scores ($r_s = 0.22$; $p < 0.001$).

The DSM median transformed sum score (out of 10) was 6.5 among all of the participants. However, male patients with diabetes had a significantly better DSM median sum score than female patients with diabetes (6.46 and 6.25, respectively; $p = 0.012$).

Multivariate Analysis of Significant Factors Correlated with HRQOL

The logistic regression of significant factors associated with poor physical and mental composites of QOL among patients with diabetes attending PHC clinics is depicted in Table 4. For the PHC of QOL, female patients with diabetes had 1.84 times higher odds of reporting a poor PHC than male patients with diabetes (95% CI = 1.16–2.91; $p = 0.01$). Also, patients with diabetes who reported

suffering from 2 or more diabetes complications had 2.1 times higher odds of having a poor PHC relative to those who did not develop any diabetes complications (95% CI = 1.21–3.65; $p = 0.008$). The multivariate analysis also showed that DSM was significantly indirectly associated with PHC and MHC of QOL. One unit increase in the DSM sum score was associated with a 93% decrease in the risk of reporting a poor PHC (95% CI = 0.90–0.96) and a 95% decrease in the risk of reporting a poor MHC (95% CI = 0.92–0.98) of QOL, with a p value of <0.001 for each composite of QOL.

Discussion

This cross-sectional study amid 503 patients with diabetes attending primary health care diabetes clinics in Kuwait revealed that the participants had a modest level of PHC of QOL (median = 66.7/100), which was better than the MHC (median = 56.7/100) of QOL. This finding is similar to an earlier cohort study on the impact of the diagnosis of diabetes on HRQOL, which concluded that there is a statistically significant and progressive negative decline in the overall HRQOL in all treatment groups, with no change in measures of overall mental HRQOL [18]. Furthermore, many previous studies indicated that a negative mental health component of HRQOL is usually observed immediately after diagnosis, but this resolves as

the patient gains more experience with treating the disease [19]. In general, diabetes represents a psychological burden that has the capacity to adversely affect individuals emotionally and socially in the long-term [18]. Although our findings indicated a better physical than mental component, there is increasing evidence that PHC scores decline as people age [20]. In contrast, another study conducted among diabetic patients living in Australia with chronic kidney disease (CKD), a diabetes complication, indicated that the mental health component of QOL was better than the physical health component in both males and females [21]. The study concluded that patients with diabetes who developed more advanced CKD had significantly lower HRQOL mean scores across the physical health composite summary, and the decline in HRQOL was apparent well before dialysis had commenced. This justifies the contradicting results of our study as only 10.5% of our patients reported kidney problems.

Interestingly, in this study, female gender was a significant predictor of a poor PHC of HRQOL in patients with diabetes relative to men. This might be related to better DSM among males than females, as the study revealed. In addition, cultural differences might influence women's access to health care. Kronfol [22] reported that "concepts such as gender-based or gender-sensitive care are being integrated into health strategies in the Arab region." This finding is in accordance with an earlier study on the main predictors of HRQOL in Chinese patients with type 2 diabetes, which showed that female gender is associated with a poorer HRQOL versus male gender [23]. The same finding has also been confirmed by previous studies among patients with diabetes in Turkey [24], and in Saudi Arabia [25] among patients with type 1 and type 2 diabetes. On the other hand, other socio-demographic factors, such as age, marital status, educational level, and income, were not found to be significantly correlated to HRQOL among patients with diabetes in this study. These results are similar to those from Nordic countries and showed that these factors are not specific to diabetes HRQOL [26].

An important finding of this study is that an increasing number of diabetes complications are a significant predictor of a poor HRQOL. This study revealed that development of 2 or more diabetes complications was associated with substantial impairment in patients' PHC of QOL. This finding is in agreement with the results of several previous studies. For example, in the USA, a study on lower-extremity complications in patients with diabetes found that the majority of patients lack the understanding of basic diabetic foot care as well as its compli-

cations which can evolve from uncontrolled type 2 diabetes. The effect of the development of diabetic foot on patients' health related QOL is well documented [27]. Moreover, previous studies have documented poor HRQOL in patients suffering from diabetic complications, such as neuropathy, CKD, and retinopathy [28, 29]. Complications can be largely prevented by education on DSM, which is an essential component that could aid in the improvement of health outcomes [28]. In addition, Rubin and Peyrot [6] systematically analyzed a body of literature on diabetes and QOL to further show that female gender and number of diabetes complications were associated with considerable deterioration in patients' HRQOL [6].

Proper DSM among patients with diabetes was an independent significant factor associated with a better HRQOL. This result is similar to that of an earlier study that emphasized the positive impact of DSM on the QOL of patients with diabetes [30].

Although obesity showed a significant association with poor PHC on the bivariate level of analysis, this association was not observed after adjustment for other covariates. This finding in contrast to the study conducted by Timar et al. [28], who found a significant association between obesity and HRQOL. The classification of 86.2% of participants in our study as overweight and obese might explain this contradictory result.

This study emphasizes the crucial role of DSM on HRQOL among patients with diabetes. This highlights the importance of physicians' role in increasing the awareness of glycemic control and monitoring. Additionally, the substantial effect of DSM on HRQOL implicates a critical role of primary health care clinics in educating patients on the basics of good glycemic control along with adoption of a healthy lifestyle as the basis for a better HRQOL. Moreover, avoiding the development of microvascular and macrovascular complications which augment the deterioration of HRQOL through optimum glycemic control signifies and stands for the imperative role of promoting DSM among patients with diabetes.

This study had some limitations. It did not include immobile patients with diabetes with severe complications who could not attend the diabetes clinics. This might have led to overestimation of the overall HRQOL results. In addition, a high percentage of participants did not know their type of diabetes, which will affect the ability to determine the association between types of diabetes as a predictor of the outcome. Finally, as this is a cross-sectional study, a causal relationship of significant factors could not be established.

Conclusions

Diabetic patients attending primary health care clinics in Kuwait reported an overall modest level of HRQOL with better PHC than MHC. Patients' DSM, gender, and diabetes complications were significantly associated with HRQOL. Appraisal of patients with diabetes' QOL is suggested to be an essential component of diabetes management in clinical settings, along with medical treatment. The importance of awareness programs about diabetes in

general with a particular emphasis on proper practice of DSM should not be ignored. Health planners of diabetes management, diabetologists, policy makers, and family physicians ought to put in place holistic diabetes management strategies and enforce the promotion and implementation of proper DSM to prevent the development of diabetes complications. More studies to examine the impact of good DSM on HRQOL improvement separately by gender and by type of diabetes are needed.

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