The Effect of Diabetes on Health-Related Quality of Life in Emirati Patients

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Keywords

Diabetes · Health-related quality of life · Quality of life · Emirati nationals · Short form-36 questionnaire

Abstract

Background: Diabetes mellitus (DM) is known to negatively affect quality of life (QoL), yet very few studies have been done on QoL of patients with diabetes in the United Arab Emirates population. **Objectives:** The aim of this study was to assess the impact of DM on health-related QoL (HRQoL) of patients with diabetes of Emirati nationality. **Methods:** Two hundred and forty Emirati patients with diabetes, treated at the Dubai Diabetes Center, were randomly selected and interviewed using the Short Form-36 questionnaire to assess HRQoL domains. Appropriate statistical measures were performed to associate HRQoL domains with diabetes-related factors. **Results:** HRQoL satisfaction scores for physical and mental health domains were very high for the majority of participants. Male participants ranked significantly higher median scores in all HRQoL domains than females (77.36 vs. 65.28, $p = 0.004$). There was a significant ($p < 0.001$) negative correlation between diabetes duration and the total averaged score for all sub-domains, and significant ($p < 0.001$) negative correlations between glycated hemoglobin percentage (HbA1c%) and all sub-domains of HRQoL. Patients

without complications had significantly better scores in all HRQoL sub-domains than patients suffering from any complications. Median total HRQoL score for those with neuropathy compared to those without neuropathy was 63.9 versus 82.6 ($p < 0.001$), for nephropathy was 43.6 versus 72.5 ($p < 0.001$), for retinopathy 50.7 versus 76.0 ($p < 0.001$), for ischemic heart disease 54.1 versus 77.3 ($p < 0.001$), and for cerebrovascular disease 36.7 versus 72.4 ($p < 0.001$). Multiple regression showed 3 significant predictors for the total averaged score from all HRQoL sub-domains; these were age ($p = 0.007$), HbA1c% ($p < 0.001$), and the number of complications related to DM ($p = 0.001$). **Conclusion:** HRQoL in Emirati patients with diabetes was significantly associated with the presence of diabetes-related complications, glycemic control, and age of the patient. The assessment of QoL in patients with diabetes can be a valuable measure for the healthcare providers to assess patient's well-being.

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Introduction

Diabetes mellitus (DM) is one of the most challenging health problems with a worldwide estimated age-adjusted prevalence of 8.3% in adults aged 20–79 years in 2019, which is predicted to rise to 9.6% in 2045 [1]. In United

Arab Emirates (UAE), the age-adjusted prevalence of diabetes in 2019 was estimated to be 16.3% (13.6–19.2) [1].

Several studies have demonstrated that diabetes has a negative impact on the overall health-related quality of life (HRQoL) and its sub-domains [2–6]. One study reported a better quality of life (QoL) among men with diabetes than women in terms of satisfaction with the treatment regimen, missing less work and fewer leisure activities because of their diabetes [4]. In the same study, men were also found to report less symptoms of depression or anxiety [4]. The same research group reported that diabetes-related QoL was found to be better in those of higher educational status and among the employed relative to the unemployed [5]. Duration of diabetes has been shown to be negatively associated with QoL [6]. Furthermore, HRQoL was reported to be worse among patients with diabetic complications than those without diabetes complications [3]. Moreover, An Australian study concluded that the prevalence of depression in the diabetic population was higher than that in the nondiabetic population [2]. Clearly, measuring HRQoL and identifying the variables affecting it are essential guides toward intervention strategies tailored to improve the HRQoL of patients with diabetes.

The UAE has undergone rapid economic and social changes over the last few decades with a consequent increased burden of chronic diseases including obesity, diabetes, and other cardio-metabolic problems [7]. The adoption of new dietary habits and a sedentary lifestyle, as well as rising levels of stress due to progressive urbanization may have contributed to the rise in diabetes prevalence [8]. The aim of this study was to assess the impact of DM and related factors on HRQoL in patients with Emirati nationality.

Material and Methods

Study Population

This study was carried out through a cross-sectional approach at the Dubai Diabetes Center, one of the Dubai Health Authority specialized centers for diabetes. The participants were selected through a systematic sampling approach from the records of the Emirati patients visiting the center during the center's working hours each week for 6 months. Based on the diabetes national prevalence (20–79 years) published by the International Diabetes Federation, the minimum sample size was calculated to be 192 individuals [1]. The following formula was used $n = p(p-1)(Z/E)^2$ with the proportion $p = 14.6\%$, $z = 1.96$ (corresponding to a confidence level of 95%) and the margin of error $E = 5\%$. However, to increase the study power, a sample size of 250 was decided. The researcher approached 256 Emirati patients with diabetes, who were randomly selected, and asked them to participate in the study. Out of them, 240 patients agreed to complete the interview with a response rate

of 93.75%; and seeing that 240 exceeded the calculated minimum sample size, no other patients were selected.

Ethical approval for the study was obtained from the local Institutional Review Board at Dubai Health Authority. An informed consent was obtained from all subjects prior to their participation in the study.

Data Collection

To ensure a rigorous research process and guarantee the confidentiality of the disclosed information, the data were collected through a separate and private face-to-face interview with each participant by the same researcher. Participants filled their answers to the questionnaire by their own. However, for participants who were unable to write down their answers by themselves, the researcher helped them to write the answer exactly as spoken by the participants without modifications. Sociodemographic data including gender, age, educational level, marital status, and employment status were recorded. Data on the type and duration of diabetes, and the presence of diabetes-related complications were also collected.

HRQoL was assessed using the Arabic version of the Short Form-36 Standardized Questionnaire (SF-36) [9]. The SF-36 health survey is a survey of patients' health based on individuals' own perception of their health status and functioning. The SF-36 was developed with great attention to issues of reliability and validity [10]. The Arabic version as well was tested for reliability and validity and proved equivalent to the English version through its use in several studies [10].

The SF-36 Questionnaire consists of 36 questions that are scaled to measure 8 physical and mental health concepts: physical functioning; role limitations due to physical health problems; bodily pain; general health perceptions; vitality; social functioning; role limitations due to emotional problems; and general mental health. Each scale is directly transformed into a 0–100 scale on the assumption that each question carries equal weight [11]. The lower the score the more disability, and the higher the score the less disability, that is, a score of zero is equivalent to maximum disability and a score of 100 is equivalent to no disability [11].

Statistical Analysis

Data distribution in all continuous variables in the study as well as for the HRQoL scores was found to be not normal using Kolmogorov-Smirnov Test. Central tendency values are therefore given as median and interquartile range. Comparisons between groups were made using the Mann-Whitney test, χ^2 test, or Kruskal-Wallis H test. Spearman's correlation coefficient test was used to study the correlation between continuous variables and the HRQoL scores. Multiple linear regression test was also used to study the relationship between independent variables and the overall HRQoL scores. Statistical significance was defined as $p < 0.05$. Statistical analysis was performed using SPSS, version 21.

Results

The sociodemographic characteristics of the subjects show that the median age of participants was 51.0 (40.3–60.0) years, there were more females (53.7%) than males

Table 1. Sociodemographic characteristics of the study participants

Variables	Frequency (n = 240)
Age, years	
<18	7 (2.9)
18–24	10 (4.2)
25–59	162 (67.5)
≥60	61 (25.4)
Gender	
Female	129 (53.7)
Male	111 (46.3)
Marital status	
Married	178 (74.2)
Without partner*	55 (22.9)
Children <18 years	7 (2.9)
Educational level	
Illiteracy	39 (16.7)
Primary school	35 (15.0)
Intermediate school	37 (15.9)
Secondary school	53 (22.7)
College/higher diploma/bachelor	61 (25.4)
Higher education (Master/PhD)	7 (2.9)
Employment status	
Employed	142 (59.2)
Unemployed	81 (33.8)
Student	17 (7)

Data are n (%). * Without partner = adult single, divorced, or widow.

(46.3%), most of the participants were married (74.2%) and 59.2% were employed (Table 1). Most participants had type II diabetes (74%) and 42.5% have been living with DM for >10 years (Table 2). The overall median of disease duration among participants was 9.0 (7.0–13.0) years. Seventy percent of the participants suffered from diabetes-related complications, of which the most common was neuropathy (68%), and ischemic heart diseases (30.8%). Even though cutoff ranges for glycated hemoglobin (HbA1c) percentage are still being debated, for the purpose of this study, glycemic control through (HbA1c) was divided into 3 groups: excellent control ($\leq 7\%$), fair control (7–8%), and poor control ($\geq 8\%$) [12]. The median for HbA1c percentage in the study was 8.0 (7.0–10.0), and 41.7% of the participants had poor HbA1c.

HRQoL Scores

The different items in the SF-36 questionnaire had different scales, most had a 5-Likert scale rating from poor to excellent, but some had only a 3-Likert scale, and others were yes/no questions. All questions were recorded on a 0–100 range [11]. Then, participants were classified into 5 groups with regard to their averaged scores for each of

Table 2. Clinical characteristics of the study participants

Variable	Frequency (n = 240)
Type of diabetes	
Type 1	53 (22.1)
Type 2	178 (74.2)
Gestational	9 (3.8)
Diabetes duration, years	
<6	37 (15.4)
6–10	101 (42.1)
>10	102 (42.5)
Diabetes complications, n	
None	72 (30)
1	77 (32)
≥2	91 (37.9)
Diabetes complications	
Neuropathy	165 (68.8)
Retinopathy	44 (18.3)
Nephropathy	17 (7.1)
Ischemic heart disease	74 (30.8)
CVA	12 (5.0)
HbA1c	
Poor range	105 (43.7)
Good range	87 (36.3)
Excellent range	48 (20.0)

Data are n (%). CVA, cerebrovascular accident; HbA1c, glycated hemoglobin.

the 2 main domains of health (physical and mental) and for each of the 8 sub-domains (physical functioning, body pain, general health, role physical, vitality, social functioning, role emotional, and mental health). The classification into the 5 groups was as follows: 0–19 for “poor,” 20–39 for “fair,” 40–59 for “good,” 60–79 for “very good,” and 80–100 for “excellent.”

For the physical health domain in general, the average score for nearly half the participants (46.2%) was excellent, while only 2.5% felt they had poor physical health. Congruently, the mental health domain averaged score for 41% of participants was excellent (Table 3). When averaging the scores for HRQoL sub-domains, it became obvious that 38.5 and 36% of diabetic patients participating in the study felt that their poor health affected their physical and emotional role in life, respectively, to a great extent.

Association between Sociodemographic Characteristics and the HRQoL Averaged Scores

There is a significant difference ($p < 0.001$) in averaged HRQoL scores for the physical and mental health domains between the participants in relation to education.

Table 3. Distribution of the participants according to HRQoL scores

Domains and sub-domains	HRQoL scores				
	poor (0–19)	fair (20–39)	good (40–59)	very good (60–79)	excellent (80–100)
Physical health domain	8 (2.5)	36 (15.1)	52 (21.8)	34 (14.3)	110 (46.2)
Physical functioning	11 (4.6)	23 (9.6)	31 (12.9)	33 (13.7)	142 (59.2)
Role physical	92 (38.5)	6 (2.5)	6 (2.5)	6 (2.5)	130 (54.0)
Body pain	19 (7.9)	20 (8.4)	25 (10.5)	54 (22.6)	121 (50.6)
General health	6 (2.5)	25 (10.4)	56 (23.3)	98 (40.8)	55 (22.9)
Mental health domain	8 (2.9)	21 (8.8)	66 (27.6)	47 (19.7)	98 (41.0)
Social functioning	7 (2.9)	21 (8.8)	19 (7.9)	75 (31.3)	118 (49.2)
Role emotional	86 (36.0)	12 (5.0)	6 (2.5)	132 (55.0)	4 (1.9)
Vitality	5 (2.1)	19 (7.9)	52 (21.7)	84 (35.0)	80 (33.3)
Mental health	6 (2.5)	12 (5.0)	49 (20.4)	86 (35.8)	87 (36.3)

Data = *n* (%). HRQoL, health-related quality of life.

Fig. 1. Correlation between HbA1c (%) and total average score for HRQoL. HbA1c, glycated hemoglobin; HRQoL, health-related quality of life.

Patients with college or higher degrees had the highest median scores for physical health domain and mental health domain, with the illiterate group reporting the lowest scores for physical and mental health domains (Table 4). In relation to employment status, the median scores of the unemployed were significantly lower than the scores of students and employed subjects in the physical health domain and the total score ($p < 0.001$), but not in the mental health domain ($p = 0.058$).

Male patients, as compared to females, had higher scores in both HRQoL domains; physical health ($p = 0.02$); and in mental health ($p = 0.003$). Similarly, in the total score, male patients had higher score than females ($p = 0.004$).

Correlation between Risk Factors and HRQoL Sub-domains

The relationship between age, diabetes duration, HbA1c%, and the median HRQoL scores for the sub-domains was examined using Spearman's Correlation Coefficient Test. A weak negative and significant correlation was detected between age and 3 physical health sub-domains of HRQoL (Table 5). However, mental health sub-domains showed a weak positive and significant correlation with age ($r_s = 0.149$, $p = 0.021$). Moreover, diabetes duration was significantly correlated with the averaged total score for all HRQoL items ($r_s = -0.221$, $p < 0.001$). Again, the correlation was weak and negative implying

that the longer a patient suffers from diabetes, the lower his QoL becomes. The correlation between HbA1c% and the average score for each HRQoL sub-domain was found to be highly significant and negative (Fig. 1).

DM Complications Affecting HRQoL

Median scores for the 2 main domains and for the total of all sub-domains were significantly higher for participants with no complications than for those with complications. These results were repeated for each of the following diabetes-related complications: neuropathy, nephropathy, retinopathy, heart disease, and stroke, showing a very significant outcome, which is that the presence of diabetes complications significantly lowers QoL (Table 6).

Most HRQoL Predictors

A multiple regression model was employed to investigate whether sociodemographic factors or diabetes-related factors affect the QoL of patients with diabetes the most. Age was a significant predictor with a positive standardized coefficient beta value, ($p = 0.007$) (Table 7), implying that the older a participant was, the better a total score for QoL was reported. Furthermore, HbA1c% ($p < 0.001$) and number of complications ($p = 0.001$) were both significantly negative predictors for the total averaged HRQoL scores, indicating that the more the HbA1c% is or the higher the number of complications is the lower the total averaged HRQoL score for all sub-domains becomes.

Discussion

The present study, which evaluates HRQoL in Emirati patients with DM using SF-36 Arabic version, has shown that most of the participants were satisfied with their QoL in general. Nevertheless, higher HbA1c% and presence of diabetes complications were significantly associated with worse physical and mental health, whereas age and duration of diabetes were mainly negatively associated with physical health. Using multiple regression analysis, age, glycemic control measured as HbA1c%, and number of diabetes complications were found to be significant predictors for HRQoL in these patients.

Similar results have been shown recently in a large Swedish study using SF-36. The study included over 4,900 participants with both type 1 and type 2 diabetes, where patients with high-risk HbA1c ($>8.6\%$) had lower levels of HRQoL in most of domains [13]. Another study

Table 7. Factors related to HRQoL in patients with diabetes

Predictors	β (95% CI)	p value
Age	0.269* (0.107–0.661)	0.007
Diabetes duration	–0.068 (–0.717 to 0.223)	0.317
HbA1c (%)	–0.321* (–5.224 to –1.927)	<0.001
Gender	–0.021 (–5.612 to 3.872)	0.718
Education level	0.09 (–0.296 to 2.365)	0.127
Employment status	0.153 (–0.834 to 10.872)	0.092
Type of diabetes	–0.082 (–9.312 to 2.246)	0.230
Complications, n	–0.273* (–7.562 to –1.887)	0.001

HbA1c, glycated hemoglobin; HRQoL, health-related quality of life.

showed that patients who had worse glycemic control measured as HbA1c% reported a negative impact of diabetes on their QoL [14].

In our study, the majority of the patients showed high satisfaction with their QoL in general, which is consistent with the UAE's Health and Well-Being Report done by Philips Center [15]. This may be attributed to the social and economic welfare of the country including the free of charge medical care and treatment they regularly receive. A possible explanation, among others, is the religious connectedness which is common in the region. Previous studies on patients with diabetes and other diseases have shown that religion is among factors that are positively related to QoL [16].

In our study, we have shown that patients with diabetes having a college or higher degree had higher HRQoL than those with lower levels of education. This result is similar to what previously have been shown in a previous study [17]. Glasgow et al. [17] have shown that patients (86% had type 2 diabetes) with college education or higher had, statistically significant, better QoL than those who had lower education. Less education was among factors related to lower QoL [17]. Another supported study has shown that patients with diabetes, who graduated from college, were significantly less likely than those with less education to report symptoms of psychological disturbance consistent with the presence of a clinical disorder [18]. This may indicate that patients with higher education have better knowledge about their diabetes, as well as better compliance and self-care, and thus lower complications' risk.

Regarding diabetes-related complications, the results of the present study analysis showed that patients without diabetic complications had significantly better scores in

all HRQoL sub-domains than patients with one or more complications. Our results are similar to results shown by many studies conducted on diabetes and QoL, where both presence of diabetic complications and the severity of diabetic complications were associated with lower QoL [14, 18–23]. In our study, the number of complications also affected HRQoL. This result is consistent with a study shown that when compared to patients with diabetes who had no complications and those with 1 complication, patients with 2 or more complications had significantly higher risk of lower HRQoL scores in the following sub-domains: physical functioning, role of physical health, role emotional, energy, emotional, social, pain, general health, and health change [24]. In the same study, significant differences were also observed in patients with 2 or more complications on all subscales of HRQoL except energy, when compared to patients with 1 complication [24].

As expected, age in our study was among the factors strongly related to HRQoL. Older age seems to be negatively and significantly correlated to a number of HRQoL sub-domains (physical functioning, role limitations due to physical health, and body pain). This is similar to results in many other studies, where age has been shown to affect HRQoL mainly physical health, both in patients without diabetes [25, 26], and in those with diabetes [27–29]. This may be explained by increased risk prevalence of comorbidities, in particular diabetes complications, which affect patients' physical and mental health, and thus their QoL. Furthermore, we have shown in our study that male participants had higher HRQoL scores in both physical and mental health than female participants. This is similar to findings in previous studies where women with diabetes report worse HRQoL scores and higher impact of diabetes on daily life than men [30].

Study Limitations

One limitation of our study is the low number of participants relative to the prevalence of DM in the region. All participants in the study were Emirati patients and expatriate residents were not included; thus, the study does not represent all patients with diabetes living in UAE rendering comparison in HRQoL between the 2 groups not possible in this study. The study was conducted at a tertiary diabetes center, which may lead to an over presentation of patients with longer duration and more complications. Comorbidities other than diabetes-related complications were not included in the results analysis, which might be a limitation to the study. Another study limitation was the low educational level in most participants,

which made it very difficult for them to understand some questions and might have led to some response bias. SF-36 questionnaire used in our study is not diabetes specific. However, SF-36 is widely used and valid HRQoL measurement tool for different diseases including diabetes.

Conclusion

Despite the majority of the study participants being satisfied with their QoL in general, worse glycemic control, older age, and the presence of diabetes-related complications were related to worse physical and mental health, and thus lower HRQoL, in Emirati patients with DM. With a high prevalence of diabetes in the UAE, there are many aspects that need to be considered in order to achieve a comprehensive approach for the management of DM, and exploring HRQoL might be a valuable measure for the evaluation of these patients.

Recommendations

This research provides a picture of the effect of DM on HRQoL of UAE Nationals, specifically in the Emirate of Dubai. Based on the study results, comprehensive management plans for diabetes are recommended to minimize the outcomes of DM and improve the QoL of diabetic patients. Since the effectiveness of diabetes management is to a large extent dependent on the patient himself, it is important to help diabetic patients minimize psychological distress and unnecessary impairment of QoL by providing up to date management of diabetes and continuous support by the diabetes team in order to improve patients adherence and minimize the risk of diabetes complications. Finally, while the results of the present study are very useful, the data in this study were obtained from one of the richest cities in the UAE (Dubai) and were limited only to UAE Nationals. Data from other cities and regions in the UAE and from expatriates should be included in future research to test the HRQoL across a larger span of participants. Moreover, it is recommended that future studies examine additional environmental and social factors in more depth, to determine if they impact significantly on the QoL and health status of diabetic patients.

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Statement of Ethics

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Ethical approval for the study was obtained from the local Institutional Review Board at Dubai Health Authority (MRC-SR-05-2014-01). All participants signed an informed consent prior to their participation in the study. Ethical standards were adhered to throughout this study.

Conflict of Interest Statement

All authors declare that they have no conflicts of interest.

Funding Sources

There are no funding sources to declare.

Author Contributions

All authors contributed to the conception of the survey data analysis and manuscript writing.

Data Availability Statement

The data that support the findings of this study are not publicly available because they contain information that could compromise the privacy of research participants; however, they are available from the corresponding author Zainab Al-Abadla OR Data sharing committee upon reasonable request.

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