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Original Research

The socio-demographic and lifestyle characteristics associated with quality of life among diabetic patients in Lebanon: a cross-sectional study

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Abstract

Objective: Diabetes mellitus (DM) is a chronic non-communicable endocrine disease that has a considerable impact on both the health and quality of life (QoL) of patients. This study aimed to investigate the sociodemographic factors associated with the quality of life among the Lebanese population with DM. **Methods:** A cross-sectional study that enrolled 125 diabetic patients aged ≥18, was conducted between January and June of 2021. The validated Arabic version of the Audit of Diabetes-Dependent Quality of Life (ADDQoL) questionnaire is utilized by all patients to measure the quality of life (QoL). A logistic regression was then performed. **Results:** The life domains "freedom to eat" and "freedom to drink", were the most negatively impacted by diabetes. According to the multivariate analysis monthly income OR 3.4, 95 % CIs 1.25 –9.6, P = 0.017, educational level (OR) 0.2, 95 % CIs 0.07 –0.89, HbA1c (OR) 7, 95 % CIs 1.5 –32.35, and FBG [odds ratio (OR) 1.01, 95 % (CIs) 1.004 -1.021, P = 0.005] were independently associated with impaired QOL. **Conclusion:** The study showed that diabetes generally had a negative impact on QoL. The findings also suggest that certain sociodemographic factors, such as monthly income and educational level along with clinical parameters like HbA1c, might be associated with a lower quality of life among Lebanese diabetic patients.

Keywords: ADDQoL; diabetes mellitus; sociodemographic; quality of life; health status; Lebanon

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INTRODUCTION

Diabetes mellitus (DM) is a non-communicable endocrine disease characterized by hyperglycemia associated with metabolic abnormalities in carbohydrate, fat, and protein metabolism.[1] Diabetes is considered one of the major threats to global health and development in the 21st century worldwide since it is projected to affect around 700 million adults by the year 2045 according to the international diabetes foundation.[2] Based on the most recent data about diabetes in Lebanon, the prevalence of diabetes is estimated to be around 12.9% which diagnoses 529,900 people with diabetes.[3]

The quality of life (QoL) is an important aspect of any disease management and it is described by the WHO as: "an individual's perception and their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and concerns".[4] WHOQOL-BREF was derived from data collected using the WHOQOL-100. It produces scores

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for four domains related to quality of life: physical health, psychological, social relationships and environment. It also includes one facet on overall quality of life and general health. Given its chronic nature, DM in the long term can negatively impact key aspects of patients' wellbeing. This will compromise the quality of life and will often lead to its deterioration in both type 1[5,6] and type 2 diabetic patients.[7-13] A nine-country cross-sectional type 2 diabetes study, investigated factors associated with (QoL It is crucial to identify the predicting factors that might potentially hinder the quality of life of diabetic patients. Various sociodemographic variables relating to age, gender, marital status, educational level, occupation, and income are found to affect the quality of life of patients with diabetes.[9,14-16]

Diabetes-related factors are also shown to affect the QoL and these include the diabetes severity (indirectly shown by the duration of diabetes, number of complications, and glycemic control), treatment types (insulin use versus oral hypoglycemic drugs), treatment compliance, and hypoglycemic episodes.[17-21] This paper reviews the published, English-language literature on self-perceived quality of life among adults with diabetes. Quality of life is measured as physical and social functioning, and perceived physical and mental well-being. People with diabetes have a worse quality of life than people with no chronic illness, but a better quality of life than people with most other serious chronic diseases. Duration and type of diabetes are not consistently associated with quality of life. Intensive treatment does not impair quality of life, and having better glycemic control is associated with better quality of life. Complications of diabetes are the most important disease-specific determinant of quality of life. Numerous demographic and psychosocial factors influence quality of life and should be controlled when comparing subgroups. Studies of clinical and educational interventions suggest that improving patients' health status and perceived ability to control their disease results in improved quality of life. Methodologically, it is important to use multidimensional assessments of quality of life, and to include both generic and disease-specific measures. Quality of life measures should be used to guide and evaluate treatment interventions. Poorly controlled hyperglycemia put the patient at risk of micro and macro-vascular complications, which are reported to lower the quality of life as well.[7,22-24] In addition, diabetes-related emotional distress and other comorbidities have also impacted the quality of life of diabetic patients.[25,26]

Albeit the QoL is considered one of the cornerstone aspects of diabetes management, it is unforeseeable in the most updated treatment guidelines for diabetes. In fact, the guidelines have mainly focused on achieving adequate glycemic control, preventing the occurrence of devastating complications, and minimizing the risk of concomitant comorbidities.[27] Greater attention in this context has been given towards improving the QoL, and several tools have been utilized to assess patients' QoL perception in clinical practice. Both generic and diabetes-specific QoL tools have been depicted.[28-31]clinical settings and clinical trials. Using data from the WHOQOL-BREF field trials, the objectives of this work are to examine the performance of the WHOQOL-BREF as an integrated instrument, and to test its main psychometric properties. The WHOQOL-BREF is a 26-item version of the WHOQOL-100 assessment. Its psychometric properties were analysed using cross-sectional data obtained from a survey of adults carried out in 23 countries (n = 11,830 Recent recommendations include shifting to disease-specific rather than generic scales as it has been shown to be inadequate in capturing the impact of improvement in management and care among diabetic patients.[32]

Among the disease-specific tools that were designed to assess the quality of life, the Audit of Diabetes Dependent Quality of Life (ADDQoL) instrument is the most comprehensive tool as it covers all the domains that are affected by diabetes.[33] Different studies evaluated the QoL among diabetic patients using the latest 19-item ADDQoL questionnaire and reported impaired QoL among diabetic patients.[9,14,34-37] In recent years, research into diabetes has gained significant traction. Diabetes distress was documented in different countries where in UK it was reported that around one quarter of adult's experience diabetes distress, or even severe diabetes distress at any given time.[38,39] Similar rates are reported elsewhere in Europe, Australia, and the USA.[38-42]

Various studies were conducted in Lebanon among diabetic patients one which assessed the effectiveness of the collaborative practice between community pharmacists and physicians in DM management, another which evaluated the clinical implication of statins on blood glucose levels among hospitalized patients.[47,48] However, only one study assessed the QoL and investigated the influence of different factors including concomitant diseases state and diabetes treatment. This study concluded a significant negative impact of DM on the QoL of Lebanese patients.[45] Patients' sociodemographic characteristics can importantly predict the QoL in DM. This study aimed to evaluate the correlation between sociodemographic factors and QoL among diabetic patients in Lebanon.

METHODS

Study design and participants

This cross-sectional study was conducted between January and June of 2021. A snowball sampling technique was used to enroll diabetic patients from governorates all over Lebanon (Beirut, Mount Lebanon, North, South, and Beqaa). The questionnaire was created on Google Forms and was shared on social media (WhatsApp, and Facebook) for self-administration in accordance with the COVID-19 lockdown imposed by the Lebanese government. The study link was circulated and sent to patients with diabetes. Diabetic patients (type 1 or type 2 diabetes mellitus) 18 years and above, were considered eligible for enrollment in the study. Excluded were women with a history of gestational diabetes, patients with functional disorders of the thyroid or the adrenal glands, and patients on psychoactive medications, thyroid hormones, and corticosteroids.

Sample size calculation

The CDC's Epi info software was used to calculate the required minimal sample size. Considering a prevalence of 7.9% of DM in Lebanon,[46] a minimum sample size of 112 patients was required to allow for a study power of 80%, and a confidence interval of 95%.

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Ethical aspects

The study protocol was approved by the Research and Ethics Committee of the School of Pharmacy at the Lebanese International University. Participation was voluntary and informed consent was obtained from all participants before filling out the questionnaire. Privacy and confidentiality of participants were warranted as personal identifiers were not tracked. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Questionnaire and variables

The questionnaire was initially prepared from already validated scales and was tested on a small group before study conductance for accuracy. The collected responses were not considered in the final analysis. The questionnaire encompassed a section on the socio-demographic and socioeconomic characteristics including age, gender, marital status, body mass index (BMI), work type, educational level, dwelling region, smoking, and drinking habits in addition to the household crowding index (number of rooms and the number of persons living in the house excluding the kitchen and bathrooms).

Questions about diabetes-related factors such as diabetes type, age at diagnosis, antidiabetic therapy, and number of years since diagnosis, were included. The remaining evaluated factors were clinical parameters and included: fasting blood glucose (FBG), glycosylated hemoglobin (HbA1c), low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol, triglycerides (TG), systolic blood pressure (SBP), and diastolic blood pressure (DBP).

The second section consisted of the ADDQoL instrument. The Arabic version was used in this study after obtaining approval from the copyright holder.[47] The ADDQoL is a valid and reliable tool that allows for individualized QoL assessment in diabetic patients.[33] The ADDQoL consists of two domains. The first domain assesses the patients' present QoL (range +3 to -3), and the second domain assesses diabetes-dependent QoL (range -3 to +1). Lower scores on both parts indicate poorer QoL. Additional 19 domains cover the following life domains: leisure activities, working life, journeys, holidays, physical health, family life, friendship, and social life, personal relationship, sex life, physical appearance, self-confidence, motivation, people's reactions, feelings about future, financial situation, living conditions, dependence on others, freedom to eat and freedom to drink. For each of the 19 lifestyle domains, the participant is asked to rate the impact of diabetes (range -3 to +1) and to rate its importance (range 0 to +3). The impact rating is then multiplied by the importance rating, yielding the weighted impact score (WI) for each domain. The sum of all weighted ratings divided by the number of applicable domains yields the average weighted impact (AWI) score ranging from -9 which represents maximum negative impact of diabetes, to +3 which represents maximum positive impact of diabetes.

Statistical analysis

Data analysis was performed using IBM Statistical Package for the Social Science software (SPSS version 23.0). Descriptive statistics were used to describe patient characteristics, with frequencies and percentages for categorical variables and mean ± standard deviation for continuous variables and interquartile range is used for data that is not normally distributed.

The chi-square or Fisher's exact tests were used for categorical variables, and student T-test or Mann Whitney tests were used for continuous variables as appropriate. To identify factors associated with poorer quality of life, a logistic regression was conducted taking the ADDQoL AWI score continuous as the dependent variable. Independent variables that showed a p-value $p < 0.2$ in the bivariate analysis were entered in the multivariable model. Results were reported as adjusted odds ratio (ORa) with 95% confidence interval (95% CI). A p-value < 0.05 was considered statistically significant, with an acceptable margin of error = 5%.

RESULTS

Sociodemographic and socioeconomic characteristics of participants

A total of 125 diabetic patients was included. The median age of the sample was 54 years ranging from 18-60 years, 52.8% were females, and 40.3% were overweight. Most of the participants had type 2 DM 82 (65.6), with the majority 75 (60%) that had diabetes duration of 0-10 years. The minority of patients were smokers (24% cigarette smokers and 16.8% water-pipe smokers), and only 4% were alcoholic. With respect to the past medical history, 43.4% had a history of cardiovascular disease, followed by hypertension (27.6%), and dyslipidemia (10.5%). The sociodemographic and socioeconomic factors are summarized in Table 1.

Clinical parameters of the participants

Patients had a mean ± standard deviation (SD) FBG of 140.58 ± 56.03 and a mean HbA1c of 7.19 ±1.49. Regarding lipid panel, patients had a mean total cholesterol of 182.1 ±55.8 along with a mean LDL of 120.8 ± 43.6, mean HDL of 48.42 ± 14.22, and mean TG of 182.19 ±74.23. With respect to blood pressure values, the mean SBP was 128.55 ± 12.9 and mean DBP was 100.45 ±125.9. The laboratory tests are summarized in table 2.

ADDQoL

The AWI score ranged from −8.67 to 0.06 on a defined range from −9 to +3 with a mean of -1.9±1.87. The median ADDQOL score was calculated at −1.42. Then lower quartile cutoff was calculated at −2.4, 94 (75.2%) patients with type 2 DM reported an ADDQOL score above −2.4 (better QoL), and 31 (24.8 %) patients had an ADDQOL score of −2.4 or less (lower QoL). The score of the first domain of the ADDQoL ranged from −3.0 to 3.0 with a mean of 0.39 ± 0.95, and the score of the second domain ranged from −3.0 to 1.0 with a mean of −1.41 ± 1.04. Overall, around 58.4% of the patients perceived their current QoL as below "good" and 81.6% of them thought that if they didn't have diabetes their QoL would improve to different extents (Figure 1).

Diabetes had the greatest impact on "freedom to eat" (mean impact rating: -1.6 ±0.99), followed by "freedom to drink" (mean impact rating: -1.4 ± 1.1) and had the least impact on "people's reaction" (mean -0.4 ± 0.8). "Family life" was rated

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Table 1. Sociodemographic characteristics of the study population

Variable		N=125
Age (median in years)		54 years
Gender	Females	66 (52.8)
	Males	59 (47.2)
Body Mass Index	Normal	35 (28.2)
	Overweight (25-29.99)	50 (40.3)
	Obese (≥ 30)	39 (31.5)
Marital status	Unmarried	47 (37.6)
	Married	50 (62.4)
Employment status	Unemployed	78 (62.4)
	Employed	47 (37.6)
Work type	Medical	10 (8)
	Non-medical	115(92)
Educational level	School	51 (40.8)
	High school	18 (14.4)
	University	56 (44.8)
Monthly income	<675,000 L.L	50(40)
	675,000-1,500,000 L.L	30 (24)
	1,500,000 – 3,000,000 L.L	25 (20)
	>3,000,000 L.L	20 (16)
Dwelling region	Beirut	23 (18.4)
	Mount Lebanon	40 (32)
	South Lebanon	27 (21.6)
	Nabatieh	23 (18.4)
	Beqaa/North Lebanon/Baalbek-Hermel	12 (9.6)
Residence area	Urban	66 (52.8)
	Rural	59 (47.2)
Household crowding index		1.11 ± 0.55
Past medical history	Cardiovascular disease	33 (43.4)
	Dyslipidemia	8 (10.5)
	Hypertension	21 (27.6)
	Others	14 (18.4)
Diabetes type	Insulin-dependent diabetes mellitus	37 (29.6)
	Non-insulin dependent diabetes mellitus	88 (70.4)
Number of years since diagnosis	0-10 years	75 (60)
	>10 years	50 (40)
Age at diagnosis		38.88 ±18.6
Antidiabetic therapy	Insulin	24 (26.1)
	Non-insulin	68 (73.9)
Cigarette smoking	Yes	30 (24)
Number of smoked cigarettes per day		18 ± 14.55
Duration of smoking cigarettes		24 ± 11.8
Alcohol consumption	Yes	5 (4)
Water-pipe smoking	Yes	21 (16.8)

±: standard deviation

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Table 2. Laboratory assessment for clinical parameters	
Variable	
Fasting blood glucose	120 (110;150)
Glycosylated Hemoglobin	7.19 ±1.49
Total cholesterol	182.1 ±55.8
Low density Lipoprotein	120.8 ± 43.6
High density lipoprotein	45(39;56)
Triglycerides	160 (131;220)
Systolic blood pressure	128.55 ± 12.9
Diastolic blood pressure	100.45 ±125.9

Data that are normally distributed are showed as mean ± standard deviation and data that is not normally distributed are represented as Median (interquartile range).

as the most important domain (mean 2.6 ±0.6) while "people's reaction" was rated as the least important (mean 1.00 ± 0.96). After calculating weighted impact (WI) score, "freedom to eat" (mean -3.7 ±2.8), followed by "freedom to drink" (mean -3.2 ± 3), were the most affected QoL domains, while "people's reaction" (mean -0.9 ± 2.06) was the least affected QoL domain. The greatest use of NA (non-applicable) option was for "working life" (49.6% of the total sample), followed by "sex life" (47.2%), "holidays" (42.4%), "personal relationships" (30.4%), and "family life" (2.4%). The distribution of responses and the weights assigned to the impact ratings are shown in Table 3.

Bivariate analysis of the socio-demographic and clinical parameters associated with QoL

The results of the bivariate analysis showed a significant association between the ADDQoL score (as continuous) and the following variables: fasting blood glucose (FBG) (p<0.001), glycosylated hemoglobin (HbA1c) (p <0.001), total cholesterol (p=0.04) and the knowledge score (p=0.03). In addition, body mass index, employment status, educational level, monthly income, household crowding index, smoking waterpipe, past medical history, diabetes type, diabetes duration, antidiabetic therapy and LMAS (2 mod) were all eligible to be entered in the multivariable analysis. The results of the bivariate analysis are shown in Table 4.

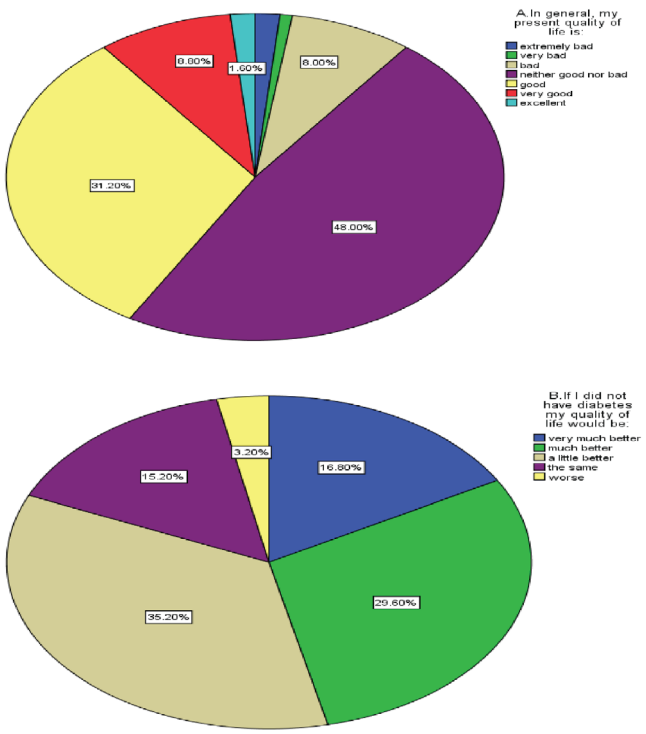

Figure 1. Analysis workflow for the identification of factors that influence the pharmacist's role in the COVID-19 pandemic

Multivariable analysis

When considering the AWI score as the dependent variable, the multivariable analysis showed that having medium monthly income versus no-income (β=-0.9, p=0.03), having high FBG (β=-0.009, p=0.001), having high HbA1c (β =-0.45, p<0.001) and having dyslipidemia (β =-1.7, p<0.014) were negatively associated with QoL. On the other hand, type II diabetes (β=0.77, p=0.034) and oral intake of antidiabetic therapy versus (β=1.2, p=0.012) were positively associated with better QoL as reflected in Table 5.

Table 3. Results for the 19 life domains			
Domain	**Impact rating**	**Importance rating**	**Weighted impact scores (WI)**
Leisure activities	-1.07 ± 1.02	1.5 ± 0.9	-1.9 ±2.4
Working life	-0.6 ± 0.9	2.5 ± 0.7	-2.01 ± 2.7
Journeys	-0.7 ± 0.9	1.6 ± 0.88	-1.4 ±2.1
Holidays	-0.8 ± 0.9	2.09 ± 0.7	-1.8 ± 2.3
Physical health	-1.04 ± 0.99	2.1 ±0.8	-2.4 ± 2.7
Family life	-0.7 ± 0.9	2.6 ±0.6	-2.1 ±2.7
Friendship and social life	-0.5 ± 0.8	2.1 ±0.8	-1.3 ±2.3
Personal relationship	-0.59 ± 0.8	1.9 ±0.9	-1.4 ±2.4
Sex life	-0.8 ± 1	2.06 ± 0.7	-1.9 ±2.6
Physical appearance	-0.8 ±1.05	2 ± 0.9	-2.01 ±2.8
Self-confidence	-0.6 ±0.9	2.4 ± 0.6	-1.6 ±2.5

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Motivation	-0.7 ±1.01	2.2 ± 0.7	-1.9 ± 2.8
People's reaction	-0.4 ± 0.8	1.3 ± 0.9	-0.9 ± 2.06
Feelings about future	-0.8 ±0.9	2.04 ± 0.7	-1.9 ±2.4
Financial situation	-0.5 ± 0.8	2.1 ±0.7	-1.1 ±2.09
Living conditions	-0.6 ± 0.8	2.1 ± 0.7	-1.5 ± 2.2
Dependence on others	-0.5 ± 0.8	1.9 ± 0.9	-1.2 ±2.3
Freedom to eat	-1.6 ±0.99	2.1 ±0.8	-3.7 ±2.8
Freedom to drink	-1.4 ± 1.1	1.8 ±1	-3.2 ± 3

Impact rating (conditions without diabetes): −3, very much better; −2, much better; −1, a little better; 0, the same; +1, worse.

not at all important; 1, somewhat important; 2, important; 3, very important Weighted impact score ¼ impact rating (−3 to +1) × importance rating (0–3) ¼ −9 (maximum negative impact of diabetes) to +3 (maximum positive impact of diabetes)

DISCUSSION

This is the first national cross-sectional study in Lebanon that aimed to evaluate the impact of sociodemographic factors and clinical parameters on QoL among diabetic patients in Lebanon. Our study revealed that a considerable proportion of the Lebanese patients believed that diabetes had a negative impact on their QoL. We also highlighted the major findings on the contributing factors associated with lower QoL which were: FBG, HbA1c, educational level and monthly income.

Assessment of quality of life

This original study not previously conducted in Lebanon, showed that the mean AWI score is higher (somewhat better QoL) compared to that obtained in the SIMPLIFY cross-sectional study that was performed on an adult population in Lebanon and Jordan.[45] However, our findings indicate that more than half of the patients perceived their current QoL as below "good" and the majority thought that if they didn't have diabetes, their QoL would improve to different extent. This is consistent with Atallah et al. findings.[45] This could mean that most patients have the feeling that their QoL is altered because of having diabetes.

Our findings on the 19 domains of life reflect that "freedom to eat" was the most negatively affected by DM. These findings were consistent with other studies conducted in different countries.[7,9,13,14,23,24] a nine-country cross-sectional type 2 diabetes study, investigated factors associated with QoL.

The results of this study also revealed that "freedom to drink is the second most negatively affected domain by DM. This was also reported by Bak et al.[37] as well as Krzemińska et al.[48] Therefore, this shows that diabetic patients exert certain limitations in food and drink intake. Hence, the introduction of diabetes management programs directed at good diet could possibly help improve their QoL along with their glycemic control.

The study also showed that the highest response rate of "non-applicable" was for "working life" domain. This might be justified by the fact that most of the participants were women, and a lot of Lebanese women are unemployed housewives.

Table 4. Bivariate analysis of the socio-demographic characteristics associated with quality of life score

Variable		Average weighted impact score (AWI)* (continuous)	p-value
Age		Rho=-0.5	0.57
Gender	Male	59 (-1.8± 1.99)	0.69
	Female	66 (-1.96 ± 1.7)	
Body Mass Index	Normal	35 (-2.12 ± 2.3)	0.198
	Overweight	50 (-1.5 ±1.6)	
	Obese	39 (-2.1± 1.6)	
Marital status	Unmarried	47 (-1.899±2.1)	0.98
	Married	78 (-1.9 ± 1.7)	
Employment status	Unemployed	78 (-1.91 ± 1,7)	0.95
	Employed	47 (-1.89 ±2.08)	
Employment status	Student	17 (-1.57 ± 1.88)	0.253
	employed	47 (-1.89 ± 2.0)	
	Unemployed	43 (-2,2 ±1.89)	
	Retired	18 (-1.4±0.97)	
Work type	Medical	10 (-1.79 ± 1.75)	0.97
	Non-medical	115 (-1.9 ± 1.88)	

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Dwelling region	Beirut	23 (-1.9 ±2.4)	0.45
	Mount Lebanon	40 (-1.9 ±1.6)	
	South Lebanon	27 (-2.06 ± 2.03)	
	Nabatieh	23 (-1.38 ± 1.19)	
	Beqaa/Baalbak/North Lebanon	12(-2.2 ±2.22)	
Residence area	Rural	59 (-1.7 ± 1.59)	0.35
	Urban	66 (-2.04 ±2.09)	
Educational level	School	51 (-2.0 ± 1.7)	0.23
	High school	18 (-2.07 ± 1.8)	
	University	56 (-1.7 ±2.0)	
Monthly income	<675,000L.L	50 (-1.63 ± 1.57)	0.083
	675,000-1,500,000L.L	30 (-2.57 ± 2.0)	
	1,500,000 – 3,000,000L.L	25 (-1.7 ±2.11)	
	>3,000,000L.L	20 (-1.7 ± 1,8)	
Household crowding index		Rho =-0.13	0.126
Smoke cigarettes	Yes	30 (-2.22 ± 2.46)	0.38
	No	95 (-1.8 ±1.6)	
Number of smoked cigarettes per day		Rho=-0.03	0.86
Duration of smoking cigarettes		Rho=0.06	0.78
Drink alcohol	Yes	5 (-2.6 ±3.44)	0.97
	No	120 (-1.8 ± 1.7)	
Smoke Water pipe	Yes	21 (-2.27 ± 2.07)	0.21
	No	104 (-1,8 ±1.8)	
Past medical history	Cardiovascular dx	33 (-1.8 ± 1.8)	0.16
	Dyslipidemia	8 (-3.5 ± 2.7)	
	Hypertension	21 (-1.8 ± 1.1)	
	Others	14 (-1.7 ± 1.7)	
Cardiovascular disease	No	32 (-2.07 ± 1.8)	0.75
	Yes	44 (-1.9 ±1.83)	
Dyslipidemia	No	65 (-1.8 ±1.6)	0.45
	Yes	11 (-2.73± 2.71)	
Hypertension	No	50 (-2.05 ± 2.07)	0.66
	Yes	36 (-1.88 ±1.18)	
Other diseases	No	50 (-1.92 ± 1.83)	0.53
	Yes	26 (-2.13 ± 1.79)	
Diabetes type	Type 1	37 (-2.44 ± 2.4)	0.083
	Type 2	88 (-1.67 ± 1.51)	
Diabetes duration	0-10	75 (-1.7 ± 1.88)	0.20
	>10	50 (-2.16 ± 1.8)	
Age at diagnosis		Rho=0.08	0.32
Antidiabetic therapy	Insulin	24 (-2.9 ± 2.5)	0.199
	Non-insulin	68(-1.7 ±1.76)	
Systolic Blood Pressure			0.46
Diastolic Blood Pressure			0.7
Fasting blood glucose			<0.01 Rho=-0.44 N=103

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Glycosylated Hemoglobin			<0.01 Rho=-0.5 N=94
Total cholesterol			0.04 Rho=-0.27 N=51
Low Density Lipoprotein			0.35
High Density Lipoprotein			0.54
Triglycerides			0.32
Emotional distress score (continuous)			0.87
Emotional distress score (2 modalities)	Little to no distress	50 (-1.99 ± 2.01)	0.65
	Mod- high distress	75 (-1.8 ± 1.7)	
Emotional distress score (3 modalities)	Little or no distress	50 (-1.99 ±2.01)	0.88
	Mod distress	37(-1.89 ± 1.85)	
	High distress	38 (-1.79 ±1.72)	
Physician distress (continuous)			0.80
Physician distress (2 mod)	Little to no distress	93 (-1.91 ± 1.8)	0.95
	Mod-high distress	32 (-1.88 ± 1.9)	
Physician distress(3 mod)	Little or no distress	93 (-1.91 ± 1.8)	0.36
	Mod distress	18 (-1.5 ± 1.06)	
	High distress	14 (-2.2 ± 1.8)	
Regimen distress (continuous)			0.71 Rho=0.03
Regimen distress (2 mod)	Little to no distress	63 (-2.0 ± 1.91)	0.56
	Mod-high distress	62 (-1.8 ± 1.8)	
Regimen distress (3mod)	Little to no distress	63 (-2.00 ± 1.91)	0.81
	Mod distress	31 (-1.7 ±1.50	
	high distress	31 (-1.8 ±2.11)	
Interpersonal distress (continuous)			0.66 Rho=0.4
Interpersonal distress (2 mod)	Little to no distress	92 (-1.99 ± 1.98)	0.35
	Mod-high distress	33 (-1.64 ± 1.4)	
Interpersonal distress (3 mod)	Little	92 (-1.99 ± 1.9)	0.81
	Mod distress	23 (-1.6 ± 1.5)	
	High distress	10 (-1.6 ± 1.4)	
Total dds score			0.67 Rho=0.03
Total DDS (2 mod)	Little to no distress	73 (-1.9 ± 1.89)	0.6
	Mod high distress	52 (-1.8 ± 1.8)	
Total DDS (3 mod)	Little to no distress	73 (-1.9 ± 1.89	0.8
	Mod distress	33 (-1.6 ± 1.7)	
	High distress	19 9-2 ±2.12)	
Knowledge score			0.43 Rho=-0.07
Knowledge score (2 mod)	Below median	52 (-1.5 ± 1.27)	0.03
	Above median	73 (-2.1 ± 2.1)	
Attitude/ practice score			P value=0.55 Rho=0.05

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Attitude/ practice score (2 mod)	Below median	46 (-1.80 ± 1.55)	0.66
	Above median	79 (-1.96 ±2.04)	
LMAS continuous			0.9
LMAS (2 mod)	Below median	58 (-2.1 ± 2.3)	0.13
	Above median	54 (-1.6 ± 1.2)	
DPC continuous			0.7
DPC (2 mod)	Below median	63 (-2.04 ± 1.9)	0.41
	Above median	62 (-1.7 ± 1.7)	

*Dependent variable: Average Weighted impact (AWI) score reflecting the quality of life.

Predictors with p-value <0.25 were eligible to be entered in the linear regression: body mass index, employment status, educational level, monthly income, household crowding index, smoke water pipe, past medical history, diabetes type, diabetes duration, antidiabetic therapy and LMAS (2 mod).

Table 5. Linear regression taking the Quality of Life score as the dependent variable

Variable		Unstandardized B (95% CI)	Standard error	Standardized ß	**P value**
Fasting Blood Glucose		-0.009(-0.015, -0.004)	0.003	-0.317	**0.01**
Glycosylated Hemoglobin		-0.45 (-0.62, -0.28)	0.08	-0.48	**<0.01**
Diabetes type	Type 1	Reference			**0.03**
	Type 2	0.77 (0.058; 1.49)	0.36	0.189	
Antidiabetic therapy	Insulin	Reference			**0.01**
	Non-insulin	1.2 (0.27; 2.1)	0.47	0.26	
Monthly income	<675,000 L.L	Reference			
	675,000-1,500,000 L.L	-0.9 (-1.7; 0.08)	0.42	-0.21	**0.03**
	1,500,000 – 3,000,000 L.L	-1.4 (-1.04; 0.75)	0.45	-0.03	0.7
	>3,000,000 L.L	-0.07 (-1.04; 0.9)	0.49	-0.014	0.8
Past medical history	Cardiovascular dx	Reference			
	Dyslipidemia	-1.7 (-3.13; -0.36)	0.69	-0.29	**0.01**
	Hypertension	-0.03 (-1.01 ;0.95)	0.49	-0.008	0.94
	Others	0.04 (-1.08; 1.1)	0.56	0.009	0.94

Furthermore, the "sex life" domain had a high non-response rate, this could be explained by the cultural sensitivity of the topic. Similar results were also reported by Tietjen et al.[14]

Influence of glycemic control on QoI

Our results showed a negative association between glycemic control and QoL: the higher the FBG and HbA1c levels, the lower the QoI. Similar findings were reported by Yazidi et al. in a study performed among type 1 diabetic patients in which patients with an HbA1c ≥ 9.3% had an impaired QoL.[49] The relation between uncontrolled glycemic levels and lower quality of life can be interpreted by the fact that uncontrolled diabetes is associated with co-morbidities mainly microvascular ones that can have substantially reduced QoL.[50]

Influence of antidiabetic therapy on QoI

Our findings indicated that patients on insulin treatment had bad QoL compared to patients on non-insulin therapy which is with accordance with what was reported by other studies.[13,51] Our results can be explained by the fact that insulin use is associated with complications manifested by weight gain, increased hypoglycemia, and restricted dietary patterns.[52] In addition, use of insulin requires frequent self-monitoring of blood glucose and the associated worry about hypoglycemia risk which impair the QoL.

Influence of comorbidities on QoL

Our findings indicate that dyslipidemia is negatively associated with QoL among diabetic patients consistent with the findings from another study.[53] The results can be explained by the fact that comorbid conditions will be associated with physical deterioration and symptom development which complicate the disease and exert a profound impact of the QoL.[54]

Effect of monthly income on QoL

Our results showed that patients with medium monthly income had impaired QoL which can be explained by the fact that patients with of medium monthly income report usually impaired general health status, lack of moral support, and irregular follow-up with health-care professionals.[55]

Strengths and limitations

This was the first national study that shed the light on the association of sociodemographic and clinical parameters with the QoL among Lebanese diabetic patients. The study included patients from all over Lebanon and utilized the ADDQoL

questionnaire, a disease-specific instrument that measures the quality of life in specific, potentially relevant areas of people's lives. Our results are consistent with those reported by authors of studies performed in other countries.

However, our study has some limitations. The interpretation of the associations is not causally related due to the cross-sectional design of the study. The snowball sampling may be associated with selection bias. Though this bias is minimized as the study enrolled patients from districts all over Lebanon. Some self-reported data such as the age at diagnosis, diabetes duration, and clinical parameters (HbA1c, LDL, HDL, TG, BP) could be subject to information bias as it depended on the participant recalled information. The study is also limited by the relatively small sample size. Although patients participated from different dwelling regions, though they might not be representative of the entire Lebanese areas, which can hinder generalizing the results to the entire Lebanese population. Finally, the ADDQOL is a valid and reliable tool, nonetheless, it is not validated among Lebanese diabetic patients and the scoring system might be a source of biased since the questionnaire is self-administered. Future work will validate the ADDQOL as a tool for practice and research in Lebanon.

CONCLUSION

The study showed that diabetes generally had a negative impact on QoL. Findings of this study highlight the importance of reducing diabetes-related distress which can be targeted on different levels. Raising diabetes education, minimizing disease complications, and controlling glycemic levels increase self-efficacy and assist people with diabetes to achieve good quality of life. The findings also suggest that certain sociodemographic factors along with certain uncontrolled clinical parameters might be associated with a lower quality of life among Lebanese diabetic patients.

AUTHORS CONTRIBUTIONS

Conceptualization: Diana Malaeb, Diana Dakroub; Methodology: Diana Dakroub; Formal analysis: Fouad Sakr; Writing- original draft preparation: Diana Dakroub, Fouad Sakr; Investigation: Mariam Dabbous, Jana Hammoud, Aya Rida, Aya Ibrahim, Nada Dia, Hala Fahs; Writing- reviewing and editing: Mariam Dabbous, Jana Hammoud, Aya Rida, Aya Ibrahim, Nada Dia, Hala Fahs; Supervision: Diana Malaeb, Souheil Hallit

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CONFLICTS OF INTEREST

Nothing to disclose.

TRANSPARENCY STATEMENT

The manuscript is an honest, accurate, and transparent account of the study being reported; no important aspects of the study have been omitted; and any discrepancies from the study as planned (and, if relevant, registered) have been explained.

DATA AVAILABILITY STATEMENT

Data is available on request from the authors.

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