Relationship between social determinants of health and quality of life in low income adults with diabetes in Lebanon

Ola Sukkarieh, Leonard E. Egede & Maya Bassil

Published online: 03 Feb 2023.

Submit your article to this journal

Article views: 755

View related articles

View Crossmark data

Taylor & Francis
Taylor & Francis Group

ORIGINAL RESEARCH

&OPEN ACCESS   Check for updates

Relationship between social determinants of health and quality of life in low income adults with diabetes in Lebanon

Ola Sukkarieh[a], Leonard E. Egede [b] and Maya Bassil [c]

aAlice Ramez Chagoury School of Nursing, Lebanese American University, Byblos, Lebanon; bDivision of General Internal Medicine, Department of Medicine, Medical College of Wisconsin, Milwaukee, WI, USA; cDepartment of Human Nutrition, College of Health Sciences, QU Health, Qatar University, Doha, Qatar

ABSTRACT

Background & objective: Global rates of type 2 diabetes (T2DM) are increasing, with the Middle East and North Africa (MENA) region having the second highest prevalence in the world. Populations from the MENA region, including Lebanon, are also witnessing massive waves of immigration to the western hemisphere. Limited data exist about how social determinants of health (SDOH) impact outcomes for T2DM in this population. Thus, the aim of this study was to assess the relationship between SDOH and quality of life (QoL) in Lebanese adults with T2DM.

Methods: Adults with T2DM (n = 300) were recruited from primary healthcare centers in Lebanon. Demographic characteristics and WHO QoL domains (physical health, psychological wellbeing, social relationships, and environment) were assessed. SDOH included socioeconomic, neighborhood/built environment, and psychosocial variables. Partially and fully adjusted regression models were used to test for associations between SDOH and QoL domains.

Results: Mean age of the participants was 60.3 years, 48% were women, 73% were married, and 64% had less than high-school education. Results from the fully adjusted regression models showed that psychosocial (i.e. adverse childhood experiences and depression), socioeconomic (i.e. employment, income, family size, insurance, financial status, and financial independence), and neighborhood/built environment (i.e. transportation, number of rooms in the household, and certain household items) variables were independent correlates of different QoL domains.

Conclusions: This study shows that psychosocial, socioeconomic, and neighborhood/built environment variables are differentially associated with different QoL domains, suggesting that SDOH factors are strongly associated with quality of life in low-income adults with T2DM in Lebanon.

Introduction

Diabetes is one of the most prevalent non-communicable diseases with significant health impact worldwide. The prevalence of diabetes has been increasing over time, more so in low- and medium-income countries compared to high-income countries [1]. In the Middle East and North African (MENA) region, 73 million adults were living with diabetes in 2021; this number is expected to rise to 95 million by 2030 [2]. Lebanon is a country in the MENA region with one of the highest diabetes prevalence, with current estimates standing at 12.9% [3].

The disease burden includes increased morbidity and mortality, as well as an impaired quality of life (QoL) [4]. According to the World Health Organization (WHO), QoL is an individual perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It has four main domains that include physical health, psychological health, social relationships, and the environment [5]. Several reports have shown that people with diabetes have lower QoL [6–8]. The need for lifelong self-care practices to effectively manage diabetes outcomes exerts significant behavioral and psychological stress on the patients. Furthermore, many patients are concerned about developing short-term and long-term complications associated with poor glycemic control [9]. As a result, psychological distress with negative consequence on QoL ensues.

While medical care targets the conventional diabetes risk factors like hyperglycemia, hypertension, and dyslipidemia, also identifying and addressing social determinants of health (SDOH) that act as barriers or facilitators in diabetes management have been shown to improve overall health [10]. The Center for Disease Control and Prevention (CDC) defines SDOH as the circumstances in which people are born, live, work, and age, as well as the healthcare system [11]. These include the socioeconomic circumstances, psychosocial factors, neighborhood environment, as well as the political, socioeconomic, and cultural drivers. Interventions that address individual-level and community-level SDOH lead to better diabetes management, diabetes control, and QoL [12]. Quality of life is directly related to socioeconomic status in people with diabetes, with higher QOL in younger age groups, men, and people with university degrees [13].

CONTACT Maya Bassil ✉ bassil.maya@qu.edu.qa Department of Human Nutrition, College of Health Sciences, QU Health, Qatar University; P.O. Box 2713, Doha, Qatar

In Lebanon, there is a growing demand for QoL data to conduct health economics analysis and to assess the impact of SDOH factors, such as employment, education, and access to health services. One study revealed that Lebanese adults with higher socioeconomic status had significantly better QoL compared to those of lower socioeconomic status [14]. Rapid urbanization, economic recession, sedentary lifestyles, poor dietary habits, and the resulting obesity are among the leading social causes of the diabetes epidemic, and these factors also have negative impact on QoL [15–17]. Additionally, a recent study of adults in Jordan and Lebanon found that diabetes had a negative impact on patients' QoL and satisfaction with their treatment [18]. This was linked to diabetes-related job loss and health-related work limitations, resulting in an economic burden [18].

While studies show that lifestyle-based diabetes interventions are effective at improving individual outcomes, changes in diabetes outcomes at the population level have not been observed, and inadequate attention to the critical role of SDOH has been proposed as a possible explanation for this dichotomy [12]. Understanding SDOH and QoL in people with diabetes could lead to more tailored and targeted intervention strategies to improve health outcomes. In addition, many individuals from the MENA region, including Lebanon have immigrated or been displaced to Europe and North America due to political unrest and/or economic crises. There is a need for research to understand the social risk factors that impact disease in this population to inform healthcare programs for immigrant communities with diabetes from the MENA region [19]. Thus, the aim of this study was to assess the relationship between SDOH and QoL in Lebanese adults with T2DM. We hypothesized that SDOH including socioeconomic, neighborhood/built environment, and psychosocial would be associated with domains of QoL including physical health, psychological wellbeing, social relationships, environment, and perceptions of health.

Materials and methods

Study population and procedure

A total of 300 participants with type 2 diabetes mellitus (T2DM) were recruited from primary healthcare centers (PHCs) in Beirut (capital), Mount Lebanon (industrial governorate), and North Lebanon (industrial and agricultural governorate), using convenience sampling. Participants were recruited from patients that were present at the PHCs at the time of data collection, or were scheduled through appointments made by phone calls, and those interested were provided an explanation of the study prior to being consented. Inclusion criteria included being a Lebanese adult (more than 18 years of age), clinically diagnosed with T2DM and able to communicate in Arabic. Subjects were excluded if they showed mental confusion on interview, or they had reported alcohol or drug abuse/dependency, dementia, active psychosis, or acute mental disorders. Minimal number of subjects were excluded accounting for less than 5% of the overall sample size. After providing written consent, participants were asked to fill out study questionnaires. The study was approved by LAU institutional review board (IRB) (#LAU.SAS.MB2.24 September 2018).

Data collection

Demographics

Demographic characteristics were collected using a self-reported questionnaire. These included age in years (expressed both as a continuous variable and categorical 18–49, 50–64, 65–94), sex (as a dichotomous male/female), marital status (as a dichotomous married/not married), education level (as a dichotomous < or ≥ high-school graduate), employment status (as a dichotomous employed/not employed), monthly household income in USD (< $500; $500 – $1499; ≥$1500; not reported), availability of health insurance (as a dichotomous Yes/No), and confidence in filling medical forms (as a dichotomous Yes/No).

Quality of life

Quality of life (QoL) was assessed using the World Health Organization Quality of Life-BREF (WHOQOL-BREF) scale. It includes 26, five-point Likert scale questions and assesses four quality of life domains: physical health (7 items), psychological wellbeing (6 items), social relationships (3 items), and environment (8 items). The physical health domain comprises questions such as 'to what extent do you feel that physical pain prevents you from doing what you need to do?,' while the psychological domain assesses the psychological wellbeing and includes items like" to what extent do you feel your life to be meaningful?". One example from the social relationship domain asks, 'how satisfied are you with your personal relationships?,' and another from the environment domain inquires 'how satisfied are you with the condition of your living place?' The mean score for each domain is multiplied by 4 to make domain scores comparable with the scores used in the full version of the World Health Organization Quality of Life Scale (WHOQOL-100), with higher scores indicating higher quality of life. There are also two items that are examined separately and scored using the same five-point Likert scale; question 1 asks about an individual's overall perception of quality of life and question 2 asks about an individual's overall perception of their health. The Arabic version of the questionnaire was validated in an Arab population [20] and showed sound psychometric properties; the intra-class correlation for the test-retest statistic and the internal consistency values for the full questionnaire and the domains had a

Cronbach's alpha ≥ 0.7 [20] .

Social determinants of health

Socioeconomic status variables

Socioeconomic attributes of the participants were determined using self-reported questionnaires. Family size, number of individuals with financial independence, number of persons per bedroom and number of rooms in the households were reported as continuous data. Categorical variables were financial status (Comfortable have more than enough to make ends meet, have enough to make ends meet, do not have enough to make ends meet), and accommodation status (as a dichotomous owned/rented).

Psychosocial variables

The Arabic version of the Diabetes Fatalism scale (DFS-Ar) was used to assess diabetes fatalism defined as 'a complex psychological cycle characterized by perceptions of despair, hopelessness, and powerlessness' and associated with poor

glycemic control [21]. It is a 12-items questionnaire (DFS12) with three subscales; emotional distress, perceived self-efficacy, and spiritual coping [21]. Higher scales indicate higher fatalism [21]. DFS-Ar was validated by the research team, where Cronbach's alphas for the subscales emotional distress, spiritual coping, and perceived self-efficacy were 0.87, 0.85, and 0.89, respectively [22].

Adverse Childhood Experience (ACE) is the extent to which the individual experienced childhood maltreatment and is linked to various adult adverse health outcomes [23]. It was assessed in this study using the 10-item ACE scale including childhood maltreatment including psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. The 10-item ACE scale includes 10 discrete binary items (no/yes) Four or more ACEs was typically observed as the threshold marking high ACE exposure linked to significantly increased likelihoods of adverse adult health outcomes. Measures were shown to be significantly interrelated and correlated (Cronbach's alpha of 0.88) [24]. The questionnaire was translated to, and back translated from, Arabic [25] in the present study, and then piloted for ease of comprehension. Two different experts in the field who are fluent in Arabic and English languages conducted the translation and back-translation.

PHQ-9, a brief questionnaire that assesses each of the 9 DSM-IV criteria for depression, was used in the present study [26]. The score for each item ranges from '0' (not at all), to '3' (nearly every day). Total scores classified depression as; non to minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), or severe (20–27) [26]. The Arabic version of the PHQ-9 showed good item consistency reliability (Cronbach's alpha = 0.88) [27]. Neighborhood/built environment variables

Food insecurity is defined as the 'limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.' [28]. It is known to impair diabetes management and health outcomes [29]. It was assessed in the present study using the US Household Food Security Survey Module: Six-Item Short Form [30] that was translated to and back translated from Arabic [25]. Two different experts in the field who are fluent in both Arabic and English languages conducted the translation and back-translation. Total scores classified food security as; high or marginal (0–1), low (2–4), or very low (5–6). An Arabic scale derived from the same questionnaire revealed good internal validity and reasonable reliability (item in-fits from 0.73 to 1.1) [31].

Other variables related to the neighborhood/built environment were collected using self-reported questions. Household facilities including Electricity, Drinking water, Television, Cable subscription, Telephone, Air conditioner, transportation, Heater, Wireless-internet subscription, Computer, Refrigerator, were reported as dichotomous (Yes/No), while mean of transportation included public transportation, car, and/or walking.

Statistical analysis

Continuous variables were reported as mean ± SD, and included quality of life domains, age, family size, financial independence, number of persons per bedroom, number of rooms, psychosocial variables, and food insecurity. Categorical variables expressed as percentages, comprised age, sex, marital status, education, employment, income, health insurance, confidence in filling medical forms, and neighborhood/built environment variables. Partially adjusted linear regression models were used to examine the relationship between demographic characteristics including age, sex, marital status, education, employment status, monthly income, insurance, and confidence in filling out health forms and domains of QoL (physical health, psychological wellbeing, social relationships, environment, overall perception of quality of life, and overall perception of health). Subsequently, fully adjusted linear regression models were used to examine the independent relationships between SDOH variables (socioeconomic, psychosocial, and neighborhood/built environment) and domains of QoL (physical health, psychological wellbeing, social relationships, environment, overall perception of quality of life, and overall perception of health) adjusting for demographic characteristics (age, sex, marital status, education, employment status, monthly income, insurance, and confidence in filling out health forms). Primary outcomes were domains of QoL (physical health, psychological wellbeing, social relationships, environment, overall perception of quality of life, and overall perception of health); primary independent variables included SDOH variables (socioeconomic, psychosocial, and neighborhood/built environment); and covariates included age, sex, marital status, education, employment status, monthly income, insurance, and confidence in filling out health forms. Thus, the fully adjusted model examined independent relationships of both SDOH variables and sociodemographic variables on the primary outcomes, while the partially adjusted linear regression models only assessed independent relationships of the sociodemographic variables on the primary outcomes. Data were analyzed using Stata v.16 [32], with significance set at $p < 0.05$ (two-tailed).

Results

Characteristics of study participants

Sample demographics are presented in Table 1. Mean age was 60.3 years (SD = 12.1), 48% were women, 73% were married, 64% had less than high-school education, 55% were unemployed, 61% had household monthly income below $1500 USD indicative of a low socioeconomic status. The mean scores out of 20 for the different QoL domains were 12.9 (SD = 3.1) for physical health, 13.2 (SD = 3.0) for psychological health, 13.0 (SD = 3.3) for social relationships, and 12.0 (SD = 2.6) for environment.

Table 2 presents the social determinants of health. Average family size and financially independent family members were 4.5 and 2 members, respectively. Approximately 62% of participants did not have enough to make ends meet, 64% rented and 34% owned a house. For psychosocial variables, mean diabetes fatalism (DFS12), adverse childhood experience (ACE), and depression (PHQ9) were 35.7 (SD = 7.9), 0.6 (SD = 1.1) and 7.2 (SD = 5.1), respectively. For neighborhood/built environment, mean food insecurity score was 1.0

Table 1. Sample demographics and quality of life (n = 300).

	M ± SD or %
Age	60.3 ± 12.1
Age (years)	
18–49	17
50–64	49.7
65–94	33.3
Sex	
Female	48
Male	52
Marital status	
Married	73
Not married	27
Education (years)	
< high school grad	63.8
≥ high school grad	36.2
Employment	
Employed	44.7
Unemployed	55.3
Household Income	
<500 USD	30.3
500 USD – 1499 USD	30.7
≥1500 USD	10
Not reported	29
Health Insurance	
Yes	46.8
No	53.2
Confident in filling out health forms	
Yes	28.8
No	71.2
Quality of life (WHOQOL-BREF)	
Physical health	12.9 ± 3.1
Psychological health	13.2 ± 3.0
Social relationships	13.0 ± 3.3
Environment	12.0 ± 2.6
Overall perception of quality of life	2.9 ± 0.9
Overall perception of health	3.2 ± 0.9

*Data is presented as mean ± SD for continuous variables (age and quality of life) and percentage (%) for categorical variables (age, sex, marital status, education, employment, household income, health insurance, and confidence in filling out health forms)

(SD 1.8), while the majority of participants had most household amenities. However, only 38% owned a computer, and 51% commuted by car, 34% by public transportation, and 13% walked as means of transportation.

Partially adjusted models for relationship between demographic variables and quality of life domains

Table 3 provides the partially adjusted regression models for the relationship between demographic characteristics and domains of QoL. There were weak but significant associations between age and social relationships (β = − 0.04; CI: −0.075; −0.0003; p = 0.048) and environment (β = 0.03; CI: 0.002; 0.056; p = 0.037) domains. Having ≥ high-school education was positively associated with physical health (β = 0.89; CI: 0.08; 1.70; 0.03), psychological health (β = 0.91; CI: 0.14; 1.67; p = 0.02), and environment (β = 1.07; CI: 0.41; 1.74; p = 0.002) domains, as well as the overall perception of quality of life (β = 0.39; CI: 0.17; 0.61; 0.001). Being employed was positively associated with physical (β = 1.16; CI: 0.30; 2.02; p = 0.009) and psychological (β = 0.93; CI: 0.10; 1.74; p = 0.027) health domains and with overall perception of health (β = 0.55; CI: 0.29–0.80; p < 0.001). Income was positively associated with all QoL domains except for psychological health.

Fully adjusted models for relationship between SDOH and quality of life domains

Table 4 provides results of fully adjusted regression models to examine the independent relationships between SDOH and domains of QoL adjusting for demographic characteristics. Independent correlates of the physical health domain were age (β = −0.04; CI:-0.07;-0.009; p = 0.01), being employed (β = 0.98; CI:0.17;1.80; p = 0.02), and PHQ9 total score (β = −0.29; CI:-0.36;-0.21; p < 0.001). Psychological health domain was independently associated with employment (β = 1.08; CI: 0.39;1.77; p = 0.002), family size (β = 0.23; CI:0.06;0.40; p = 0.006), financial independence (β = −0.16; CI:-0.32;-0.001; p = 0.048), PHQ9 total score (β = −0.30; CI:-0.36;-0.24; p < 0.001), as well as variables from the neighborhood/built environment. Independent correlates of the social relationships domain included age (β = −0.055; CI:-0.091;-0.018; p = 0.004), family size (β = 0.27; CI:0.04;0.50; p = 0.024), PHQ9 total score (β = −0.21; CI:-0.30;-0.13; p < 0.001), and some amenities in the neighborhood/built environment. The environment domain was significantly and independently related to having insurance (β = −0.57; CI:-1.11;-0.24; p = 0.04), poor financial status (β = −1.65; CI:-2.61;-0.67; p = 0.001), number of rooms in the household (β = 0.22; CI:0.02;0.42; p = 0.028), ACE (β = 0.27; CI:0.04;0.50; p = 0.022) and PHQ9 (β = −0.15; CI:-0.21;-0.10; p < 0.001) scores. It was also associated with different variables from the

Table 2. Social determinants of health characteristics for study participants (n = 300).

	M ± SD or %
Socioeconomic Status Variables	
Family size	4.5 ± 1.9
Financial independence	1.6 ± 1.9
Number of persons per bedroom	2.0 ± 0.9
Number of rooms	3.5 ± 1.5
Financial status	
Comfortable; have more than enough to make ends meet	10.5
Have enough to make ends meet	27.8
Do not have enough to make ends meet	61.7
Accommodation	
Owned	36
Rented	64
Psychosocial Variables	
Diabetes Fatalism (Dfs12)	35.7 ± 7.9
Adverse childhood experience (ACE) Total Score	0.6 ± 1.1
Patient Health Questionnaire (PHQ9) Total Score	7.2 ± 5.1
Neighborhood/Built Environment Variables	
Food Insecurity Total Score	1.0 ± 1.8
Electricity	
Yes	100
Drinking water	
Yes	84.0
Television	
Yes	99.3
Cable subscription	
Yes	72.0
Telephone	
Yes	97.3
Air Conditioner	
Yes	61.7
Heater	
Yes	82.0
Wireless-internet subscription	
Yes	60.0
Computer	
Yes	37.7
Refrigerator	
Yes	93.3
Means of transportation	
Public transportation	34.0
Car	51.0
Walking	12.7

*Data is presented as mean ± SD for continuous variables (family size, financial independence, number of persons per bedroom, number of rooms, diabetes fatalism, ACE, and PHQ9) and percentage (%) for categorical variables (financial status, accommodation, and neighborhood/ built environment variables)

neighborhood/built environment like access to water, air conditioning and car. As for the overall perception of quality of life, it was significantly associated with household income ≥$1500 (β = 0.55; CI:0.12–0.97; p = 0.012), poor financial status (β = −0.50; CI:-0.86;-0.14; p = 0.007), financial independence (β = −0.08 CI:-0.14;-0.02; p = 0.004), and PHQ9 score (β = −0.04; CI:-0.06;-0.02; p < 0.001). Finally, the overall perception of health was independently associated with being employed (β = 0.50; CI:0.23–0.77; p < 0.001) and PHQ9 score (β = −0.057; CI:-0.081;-0.034; p < 0.001).

Discussion

This is the first study that assessed the independent relationship between social determinants of health and QoL domains in a sample of low-income Lebanese adults with type 2 diabetes (T2DM). Results from the fully adjusted regression models showed that variables from psychosocial domain (i.e. adverse childhood experiences and depression), socioeconomic domain (i.e. employment, income, family size, insurance, financial status, and financial independence), and neighborhood/built environment domain (i.e. transportation, number of rooms in the household, and certain household items) were independent correlates of different QoL domains.

Age was inversely associated with the physical health and social relationships domains of QoL, in line with previous studies [33,34]. Advanced age is linked to a decline in health status and increased risk of chronic diseases especially in people with diabetes [35,36]. Increasing age in T2DM could also indicate longer diabetes duration that was also found to be negatively related to QoL [33,34], and this may be partly due to higher odds of diabetes complications [37]. In addition, older age is also associated with social isolation [38,39], which could explain the negative correlation with the social relationships domain of QoL found in the present study.

Table 3. Partially adjusted models for correlates of quality of life domains.

Variables	Physical health	Psychological health	Social relationships	Environment	Overall perception of quality of life	Overall perception of health
Age	−.010(−.044; 0.023)	0.01(−0.02; 0.05)	−0.04 (−0.07-0.0003)*	0.03 (0.002;0.056)*	−0.0004(−0.01; 0.01)	0.01(−0.02; 0.02)
Sex						
Male	0.58(−0.24; 1.39)	0.44(−0.34; 1.22)	−0.25(−1.18; 0.67)	−0.28(−0.95; 0.39)	0.0001(−0.22; 0.22)	−0.19(−0.43; 0.05)
Marital status						
Married	−0.37(−0.84; 0.77)	0.19(−0.57; 0.96)	0.66(−0.31; 1.62)	−0.15(−0.81; 0.51)	0.04(−0.18; 0.26)	0.05(−0.19; 0.29)
Education						
≥ high school grad	0.89(0.08;1.70)*	0.91(0.14;1.67)*	0.36(−0.54; 1.27)	1.07(0.41;1.74)*	0.39(0.17;0.61)*	0.14(−0.01; 0.37)
Employment status						
Employed	1.16(0.30;2.02)*	0.93(0.10;1.74)*	0.62(0-.35; 1.60)	0.44(−.27; 1.15)	0.06(−0.18; 0.30)	0.55(0.29-0.80)**
Income						
500 USD – 1499 USD	1.39(0.44;2.35)*	0.84(−0.08; 1.75)	1.50(0.44;2.57)*	1.33(0.55;2.12)*	0.61(0.35;0.87)**	0.37(0.09-0.65)*
≥1500 USD	1.20(−0.22; 2.61)	1.24(−0.11; 2.59)	1.63(0.07;3.19)*	2.23(1.07;3.40)**	1.00(0.61;1.39)**	0.43(0.01-0.84)*
Not reported	1.09(0.13;2.05)*	0.53(−0.38; 1.43)	−0.28(−1.4; 0.84)	0.99(0.21;1.78)*	0.36(0.10;0.62)*	0.19(−0.09; 0.47)
Health Insurance						
Yes	−0.25(−0.99; 0.49)	0.21(−0.49; 0.91)	−0.29(−1.13; 0.55)	−0.10(−0.70; 0.51)	0.19(−0.01; 0.39)	−0.004(−0.22; 0.21)
Confident in filling out health forms						
No	0.67(−0.20; 1.55)	0.27(−0.56; 1.11)	0.47(−0.54; 1.48)	0.67(−0.05; 1.39)	0.15(−0.08; 0.39)	0.80(−0.18; 0.34)

Coefficients of associations (95% CI) are presented. Statistically significant *p < 0.05; **p < 0.001
Models adjusted for age, sex, marital status, education, employment status, monthly income, insurance, and confidence in filling out health forms.

Table 4. Fully adjusted models for correlates of quality of life domains.

Variables	Physical health	Psychological health	Social relationships	Environment	Overall perception of quality of life	Overall perception of health
Age	−0.04(−0.07;−0.009)*	−0.002(−0.29; 0.024)	−0.055 (−0.091;−0.018)*	0.0003(−0.02; 0.02)	−0.007(−0.016; 0.002)	0.004(−0.006; 0.14)
Employment status Employed	0.98(0.17;1.80)*	1.08(0.39;1.77)*	0.84(−0.14; 1.82)	0.33(−0.30; 0.97)	0.06(−0.18; 0.29)	0.50(0.23−0.77)**
Income						
500 USD – 1499 USD	0.09(−0.84; 1.03)	−0.15(−0.94; 0.65)	0.50(−0.63; 1.64)	−0.08(−0.81; 0.64)	0.25(−0.02; 0.52)	0.24(−0.08; 0.55)
≥1500 USD	−0.31(−1.78; 1.15)	0.66(−0.59; 1.90)	1.10(−0.63; 2.83)	0.10(−1.04; 1.24)	0.55(0.12−0.97)*	0.25(−0.24; 0.74)
Not reported	0.51(−0.45; 1.48)	0.11(−0.70; 0.93)	−0.73(−1.94; 0.48)	0.33(−0.43; 1.09)	0.17(−0.11; 0.45)	0.12(−0.20; 0.44)
Family size	0.13(−0.18; 0.21)	0.23(0.06;0.40)*	0.27(0.04;0.50)*	−0.05	0.04(−0.02; 0.09)	0.006(−0.06; 0.07)
Insurance	−0.38(−1.08; 0.32)	−0.15(−0.75; 0.44)	−0.15(−0.99; 0.69)	−0.57(−1.11;−0.24)*	0.07(−0.13; 0.27)	−0.05(−0.28; 0.18)
Financial status	−0.82(−2.07; 0.42)	−0.28(−1.34; 0.78)	0.23(−1.27; 1.72)	−1.65(−2.61;−0.67)*	−0.50 (−0.86;−0.14)*	−0.18(−0.60; 0.23)
Do not have enough to make ends meet						
Financial independence	0.006(−0.18; 0.20)	−0.16(−0.32;−0.001)*	−0.008(−0.23; 0.22)	−0.12(−0.27; 0.02)	−0.08 (−0.14;−0.02)*	−0.04(−0.11; 0.02)
Number of rooms	0.07(−0.18; 0.33)	0.43(−0.17; 0.26)	0.02(−0.28; 0.32)	0.22(0.02;0.42)*	0.038(−0.04; 0.11)	−0.01(−0.10; 0.07)
Adverse Childhood Experience (ACE)	0.25(−0.04; 0.55)	0.14(−0.11; 0.39)	0.039(−0.34; 0.42)	0.27(0.04;0.50)*	0.06(−0.02; 0.15)	0.07(−0.03; 0.17)
Patient Health Questionnaire (PHQ9)	−0.29(−0.36;−0.21)**	−0.30(−0.36;−0.24)**	−0.21(−0.30;−0.13)**	−0.15(−0.21;−0.10)**	−0.04 (−0.06;−0.02)**	−0.057 (−0.081;−0.034)**
Drinking water	0.43(−0.50; 1.37)	0.43(−0.36; 1.23)	1.43(0.30;2.56)*	1.00(0.26;1.73)*	−0.10(−0.37; 0.17)	−0.14(−0.46; 0.17)
Telephone	0.16(−1.98; 2.30)	−2.39(−4.21;−0.57)*	0.08(−2.53; 2.70)	−1.41(−3.26; 0.44)	−0.19(−0.81; 0.43)	−0.39(−1.10; 0.33)
Air Conditioner	0.11(−0.65; 0.88)	0.015(−0.63; 0.66)	0.28(−0.63;1.20)	0.61(0.02;1.21)*	0.15(−0.07; 0.37)	−0.06(−0.31; 0.20)
Heater	0.82(−0.90; 1.73)	0.99(0.22;1.76)*	0.50(−0.62; 1.62)	0.66(−0.05; 1.38)	−0.11(−0.38; 0.15)	0.19(−0.11; 0.49)
Refrigerator	−0.38(−1.89; 1.12)	−1.14(−2.42; 1.39)	−2.05(−3.84;−0.26)*	0.56(−0.61; 1.73)	0.15(−0.28; 0.59)	−0.22(−0.73; 0.28)
Means of transportation						
Public transportation	0.19(−0.75; 1.14)	0.66(−0.14; 1.46)	1.50(0.36;2.65)*	−0.089(−0.82; 0.65)	−0.004(−0.28; 0.27)	0.03(−0.29; 0.34)
Car	0.94(−0.03; 1.90)	0.89(0.07;1.71)*	1.10(−0.07; 2.28)	1.12(0.37;1.87)*	0.12(−0.16; 0.40)	−0.002(−0.32; 0.32)

Coefficients of associations (95% CI) are presented. Statistically significant *p < 0.05; **p < 0.001
Models adjusted for age, sex, marital status, education, employment status, monthly income, insurance, confidence in filling out health forms, financial status, family size, financial independence, number of persons per bedroom, number of rooms, diabetes fatalism, adverse childhood experience, depression (PHQ9), food insecurity, home availability of drinking water, television, cable subscription, telephone, air conditioner, heater, wireless-internet subscription, computer and refrigerator, and means of transportation. Primary outcomes are domains of QoL (physical health, psychological wellbeing, social relationships, environment, overall perception of quality of life, and overall perception of health); primary independent variables included SDOH variables (socioeconomic, psychosocial, and neighborhood/built environment); and covariates included age, sex, marital status, education, employment status, monthly income, insurance, and confidence in filling out health forms.

Socioeconomic SDOH factors (i.e. employment, income) and neighborhood/built environment SDOH factors (i.e. number of rooms in household, availability of drinking water, telephone, air conditioning, heating, and owning a refrigerator) were positive correlates of different domains of QoL. This finding has been consistently reported in the western population, whereby higher socioeconomic status has been linked to better diabetes outcomes, including QoL [40]. This relationship is thought to be mediated through improved functional capacity [7], access to care [41], higher self-efficacy, lower diabetes distress, and lower perceived stress [42]. The latter variables were not assessed in the present study and thus future research to explore their contribution in a Middle Eastern population with diabetes is warranted. Another neighborhood/built environment SDOH factor, family size was positively associated with the psychological health and social relationships domains of QoL. This might suggest higher social support, which is known to improve diabetes outcomes [43]. This is especially relevant in the context of a population from the MENA region, characterized by strong family ties and social support [44]. Similarly, using public transport that also improves social interaction had a favorable impact on the social relationships domain of QoL.

On the other hand, socioeconomic SDOH factors such as having insurance and financial independence were negatively and independently related to the environment domain of QoL and to the overall perception of quality of life, respectively. This could be linked to the availability of financial resources, which is an item in the environment domain of QoL. It is worthy to note that many individuals in Lebanon opt for paid private insurance, since it offers better healthcare access and services compared to public insurance, which is not readily available to all [45]. This increases the financial burden of people with T2DM and thus may negatively affect their QoL. Along the same lines, being financially independent could also signify that the individual is financially supporting other members in his/her social circle, especially given that it is a region with solid family and social bonds and ensuing financial responsibilities [44]. Consistent with prior studies [45], patients in the present study who reported not having 'enough to make ends meet,' which suggests financial challenges, had lower QoL related to the environment domain and the overall perception of quality of life [45].

The psychosocial SDOH variable depression was an independent correlate of all domains of QoL in the present study, in line with various previous reports [42]. Prior research has demonstrated higher prevalence of depression among Lebanese adults with chronic diseases in general [46,47] and specifically among those with diabetes [48], and it has been shown to contribute to worsening diabetes outcomes, including QoL [49,50]. This may be linked to the distress generated by the burden of the disease, be it the financial burden and the need for life-long self-management practices, in addition to the concerns about short-term and long-term complications [9]. However, contrary to what was previously and consistently reported about the inverse relationship between adverse childhood experiences (ACE) and diabetes risk and outcomes [51,52], ACE was found to be positively and independently associated with the environment domain of QoL in the present study. ACE are defined as stressful events that occur throughout the child's developmental stage and are usually associated with increased risk of chronic diseases later in life. The exact mechanism or explanation for this finding is not clear and requires further investigation. However, this data should also be interpreted with caution due a potential response bias, given that this scale included sensitive questions related to childhood abuse and violence, which are considered taboo topics in Arab countries [53].

Limitations of the study includes the convenience sampling that may limit broader generalization of the findings, as well as the cross-sectional design that limits any causal inference. Recall bias is another possible limitation related to the self-reporting nature of the questionnaires. Finally, residual confounding might exist, even though results were adjusted for multiple relevant confounders.

Conclusions

This is the first study that assessed the independent relationship between social determinants of health and QoL domains in a sample of low-income Lebanese adults with type 2 diabetes (T2DM). Results from the fully adjusted regression models showed that psychosocial (i.e. adverse childhood experiences and depression), socioeconomic (i.e. employment, income, family size, insurance, financial status, and financial independence), and neighborhood/built environment (i.e. transportation, number of rooms in the household, and certain household items) variables were independent correlates of different QoL domains. Thus, this study shows that SDOH are strongly associated with quality of life in low-income adults with T2DM in Lebanon. In addition, the findings of the study are pertinent to large proportion of Arabs who are immigrants or refugees in many Western countries, including the United States of America. There is, indeed, lack of data on the social factors that modulate their disease risks, both prior to and after their displacement. Thus, findings from the current study can also serve to inform prevention and intervention programs for immigrant populations with diabetes from the MENA region.

ORCID

Leonard E. Egede 🔟 http://orcid.org/0000-0003-1546-1515
Maya Bassil 🔟 http://orcid.org/0000-0001-9996-1300

References

1. (WHO), W.H.O. *Diabetes*. 2021; Available from: https://www.who.int/en/news-room/fact-sheets/detail/diabetes.
2. (IDF), I.D.F. *Diabetes in MENA* 2021; Available from: https://www.idf.org/our-network/regions-members/middle-east-and-north-africa/diabetes-in-mena.html.
3. Federation ID. *IDF MENA members*. 2020; Available from: https://idf.org/our-network/regions-members/middle-east-and-north-africa/members/39-lebanon.html.
4. Imayama I, Plotnikoff RC, Courneya KS, et al. Determinants of quality of life in adults with type 1 and type 2 diabetes. Health Qual Life Outcomes. 2011;9(1):1–9.
5. Group W. Development of the World Health Organization WHOQOL-BREF quality of life assessment. Psychol Med. 1998;28 (3):551–558.
6. Jing X, Chen J, Dong Y, et al. Related factors of quality of life of type 2 diabetes patients: a systematic review and meta-analysis. Health Qual Life Outcomes. 2018;16(1):1–14.
7. Rodríguez-Almagro J, García-Manzanares Á, Lucendo AJ, et al. Health-related quality of life in diabetes mellitus and its social, demographic and clinical determinants: a nationwide cross-sectional survey. J Clin Nurs. 2018;27(21–22):4212–4223.
8. Zurita-Cruz JN, Manuel-Apolinar L, Arellano-Flores ML, et al. Health and quality of life outcomes impairment of quality of life in type 2 diabetes mellitus: a cross-sectional study. Health Qual Life Outcomes. 2018;16(1):1–7.
9. Co MA, Tan LSM, Tai ES, et al. Factors associated with psychological distress, behavioral impact and health-related quality of life among patients with type 2 diabetes mellitus. J Diabetes Complications. 2015;29(3):378–383.
10. Saulsberry L, Peek M. Financing diabetes care in the US health system: payment innovations for addressing the medical and social determinants of health. Curr Diab Rep. 2019;19(11):1–8.
11. People H. *Secretary's Advisory Committee on Health Promotion and Disease Prevention Objectives for 2020. Healthy People 2020: an opportunity to address the societal determinants of health in the United States.* 2010.
12. Zhang K, Reininger B, Lee M, et al. Individual and community social determinants of health associated with diabetes Management in a Mexican American Population. Front Public Health. 2021;8:1084.
13. Menati W, Baghbanian A, Asadi-Lari M, et al. Health-related quality of life and socioeconomic status: inequalities among adults in West of Iran. Iran Red Crescent Med J. 2017;19(7):e55571.
14. Dimassi H, Nasser SC, Issa A, et al. Health-related quality of life in patients with health conditions in lebanese community setting. Int J Environ Res Public Health. 2021;18(16):8817.
15. Awad N, Saade R, Bassil M, et al. Relationship between social determinants of health and clinical outcomes in adults with type 2 diabetes in Lebanon. J Natl Med Assoc 2022;114(4): 392–405.
16. Sukkarieh O, Egede LE, Bassil M. Relationship between material needs security and clinical outcomes in adults with type 2 diabetes in Lebanon. Diabetes Res Clin Pract. 2022;186:109818.
17. Sukkarieh-Haraty O, Egede LE, Abi Kharma J, et al. Diabetes fatalism and its emotional distress subscale are independent predictors of glycemic control among Lebanese patients with type 2 diabetes. Ethn Health. 2019;24(7):767–778.
18. Atallah P, El-Zaheri M, Abu-Hijleh O, et al. Diabetes management, quality of life and treatment satisfaction in adult population in Jordan and Lebanon, Observations from the SIMPLIFY Study. J Diabetes. 2020;10(2):73–87.
19. Green M, Resnicow K, Tariq M, et al. Risk and protective factors for cost-related nonadherence Among Middle East and North African (MENA) Adults. Ethn Dis. 2022;32(1):11–20.
20. Ohaeri JU, Awadalla AW. The reliability and validity of the short version of the WHO Quality of Life Instrument in an Arab general population. Ann Saudi Med. 2009;29(2):98–104.
21. Egede LE, Ellis C. Diabetes and depression: global perspectives. Diabetes Res Clin Pract. 2010;87(3):302–312.
22. Sukkarieh-Haraty O, Egede LE, Abi Kharma J, et al. Predictors of diabetes fatalism among arabs: a cross-sectional study of lebanese adults with type 2 diabetes. J Relig Health. 2018;57(3):858–868.
23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the Adverse Childhood Experiences (ACE) Study. Am J Prev Med. 1998;14(4):245–258.
24. Murphy A, Steele M, Dube SR, et al. Adverse childhood experiences (ACEs) questionnaire and adult attachment interview (AAI): implications for parent child relationships. Child Abuse Negl. 2014;38 (2):224–233.
25. Sperber AD. Translation and validation of study instruments for cross-cultural research. Gastroenterology. 2004;126(Suppl 1):S124–8.
26. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606–613.
27. Sawaya H, Atoui M, Hamadeh A, et al. Adaptation and initial validation of the patient health questionnaire–9 (PHQ-9) and the generalized anxiety disorder–7 questionnaire (GAD-7) in an Arabic speaking Lebanese psychiatric outpatient sample. Psychiatry Res. 2016;239:245–252.
28. Bickel G, Nord M, Price C, et al. Guide to measuring household food security. Alexandria, VA: The U.S. Department of Agriculture. 2000.
29. Seligman HK, Davis TC, Schillinger D, et al. Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. J Health Care Poor Underserved. 2010;21(4):1227.
30. US household food security survey module: six-item short form. Washington: Economic Research Service, USDA; 2012.
31. Sahyoun NR, Nord M, Sassine AJ, et al. Development and validation of an Arab family food security scale. J Nutr. 2014;144(5):751–757.
32. *StataCorp*. Stata statistical software: release 16. College Station TX:: StataCorp LLC; 2019.
33. Al-Maskari MY, Al-Shookri AO, Al-Adawi SH, et al. Assessment of quality of life in patients with type 2 diabetes mellitus in Oman. Saudi Med J. 2011;32(12):1285–1290.
34. Sparring V, Nyström L, Wahlström R, et al. Diabetes duration and health-related quality of life in individuals with onset of diabetes in the age group 15—34 years–a Swedish population-based study using EQ-5D. BMC Public Health. 2013;13(1):1–11.
35. Corriere M, Rooparinesingh N, Kalyani RR. Epidemiology of diabetes and diabetes complications in the elderly: an emerging public health burden. Curr Diab Rep. 2013;13(6):805–813.
36. Mordarska K, Godziejewska-Zawada M. Diabetes in the elderly. Menopausal Review. 2017;16(2):38.
37. Zoungas S, Woodward M, Li Q, et al. Impact of age, age at diagnosis and duration of diabetes on the risk of macrovascular and microvascular complications and death in type 2 diabetes. Diabetologia. 2014;57(12):2465–2474.
38. Cotterell N, Buffel T, Phillipson C. Preventing social isolation in older people. Maturitas. 2018;113:80–84.
39. Landeiro F, Barrows P, Nuttall Musson E, et al. Reducing social isolation and loneliness in older people: a systematic review protocol. BMJ open. 2017;7(5):e013778.
40. Walker RJ, Smalls BL, Campbell JA, et al. Impact of social determinants of health on outcomes for type 2 diabetes: a systematic review. Endocrine. 2014;47(1):29–48.
41. Walker RJ, Gebregziabher M, Martin-Harris B, et al. Relationship between social determinants of health and processes and outcomes in adults with type 2 diabetes: validation of a conceptual framework. BMC Endocr Disord. 2014;14(1):1–10.

42. Walker RJ, Gebregziabher M, Martin-Harris B, et al. Independent effects of socioeconomic and psychological social determinants of health on self-care and outcomes in Type 2 diabetes. Gen Hosp Psychiatry. 2014;36(6):662–668.

43. Strom JL, Egede LE. The impact of social support on outcomes in adult patients with type 2 diabetes: a systematic review. Curr Diab Rep. 2012;12(6):769–781.

44. Tajvar M, Fletcher A, Grundy E, et al. Social support and health of older people in M iddle E astern countries: a systematic review. Australas J Ageing. 2013;32(2):71–78.

45. Salti N, Chaaban J, Raad F. Health equity in Lebanon: a microeconomic analysis. Int J Equity Health. 2010;9(1):1–21.

46. Akel R, El Darsa H, Anouti B, et al. Anxiety, depression and quality of life in breast cancer patients in the levant. Asian Pac J Cancer Prev. 2017;18(10):2809.

47. Semaan V, Noureddine S, Farhood L. Prevalence of depression and anxiety in end-stage renal disease: a survey of patients undergoing hemodialysis. Appl Nurs Res. 2018;43:80–85.

48. Ahmadieh H, Itani H, Itani S, et al. Diabetes and depression in Lebanon and association with glycemic control: a cross-sectional study. Diabetes Metab Syndr Obes. 2018;11:717.

49. Naous E, Boulos M, Sleilaty G, et al. Quality of life and other patient-reported outcomes in adult Lebanese patients with type 2 diabetes during COVID-19 pandemic. J Endocrinol Invest. 2021; 45 (4):763–772.

50. Rapaport MH, Clary C, Fayyad R, et al. Quality-of-life impairment in depressive and anxiety disorders. Am J Psychiatry. 2005;162 (6):1171–1178.

51. Huang H, Yan P, Shan Z, et al. Adverse childhood experiences and risk of type 2 diabetes: a systematic review and meta-analysis. Metabolism. 2015;64(11):1408–1418.

52. Huffhines L, Noser A, Patton SR. The link between adverse childhood experiences and diabetes. Curr Diab Rep. 2016;16(6):1–9.

53. Haboush KL, Alyan H. "Who can you tell?" Features of Arab culture that influence conceptualization and treatment of childhood sexual abuse. J Child Sex Abus. 2013;22(5):499–518.