Journal of Pioneering Medical Sciences
Received: September 03, 2025 | Accepted: November 06, 2025 | Published: January 05, 2026
Volume 14, Issue 12, Pages 129-137

DOI https://doi.org/10.47310/jpms2025141220

Association Between Self-Management Practices and Quality of Life in Patients with Type 2 Diabetes Mellitus in Sulaimaniyah City, Iraq

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Abstract: Background: Diabetes is managed by prescribed medication and dietary measures to control hyperglycemia, but self-management is a vital aspect that drastically affects patients' quality of life (QoL). **Objective:** To find the association between self-management practices (SMP) and QoL in patients with type 2 diabetes mellitus (T2DM). **Methods:** This descriptive cross-sectional study included 391 patients with T2DM at the Diabetes and Endocrine Centre, Sulaimaniyah, Iraq, from September 2024 to May 2025, using a non-probability convenience sampling technique. Data were collected through face-to-face interviews using a structured questionnaire that consisted of six parts, including patients' sociodemographic data, medical data, self-care behaviors, knowledge on diabetes management, QoL, and the presence of common diabetes complications. **Results:** Regarding glucose management among patients, most patients (61.6%) fairly practised diabetes self-management with a mean score of 68.56±13.62. For QoL, most patients (38.62%) are satisfied with QoL, with a mean score of 60.02±18.71. Subsequently, diabetes-related SMP in glucose control, dietary habits, healthcare use, physical activity, or general self-care has a substantial impact on individuals' QoL ($p = 0.001$). Additionally, education, the number of comorbidities, and body mass index significantly influenced SMP ($p \leq 0.001$), while age, gender, and smoking habit did not ($p \geq 0.05$). Finally, both sociodemographic characteristics and clinical data significantly influenced the patient's QoL ($p \leq 0.001$). **Conclusions:** A direct correlation was observed between patients' SMP and QoL; however, there is a need for targeted educational programs and tailored approaches to improve diabetes SMP and QoL among the studied population to better control diabetes.

Key Words: Diabetes Mellitus, Self-Management Practices, Quality of Life, Educational Program

INTRODUCTION

Diabetes mellitus (DM) is a complex metabolic disorder characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. The classification of DM is essential for understanding its pathophysiology, management, and potential complications. The widely recognized classifications include Type 1 diabetes mellitus (T1DM), Type 2 diabetes mellitus (T2DM), and gestational diabetes mellitus (GDM) [2].

T2DM is characterized by insulin resistance and relative insulin deficiency, making it the most prevalent form of diabetes, particularly in adults. It is associated with various risk factors, including obesity, physical inactivity, unhealthy dietary patterns, smoking, and genetic predisposition, particularly among younger populations [3]. It often leads to significant long-term complications, such as cardiovascular disease, nephropathy, and retinopathy [4].

The prevalence of T2DM has been shown to vary by region, with higher rates observed in urbanized and developed areas compared to rural settings [5]. In Iraq, the prevalence of T2DM mirrors global trends, with a significant rise in cases in recent years, in which around 1.4 million Iraqis have diabetes, with prevalence ranging from 8.5 to 13.9% [6]. The rising prevalence of T2DM has been accompanied by an increase in associated comorbidities, such as hypertension and dyslipidemia, which pose additional challenges not only to healthcare systems but also to patient management [7].

The economic implications are also significant, as the treatment of diabetes and its complications places a

substantial strain on the healthcare system. also, estimates suggest that diabetes-related healthcare costs could consume a considerable portion of the national health budget if current trends continue [8]. Therefore, all efforts should focus oncrucial education, prevention, and effective management programs to address the escalating burden of T2DM worldwide, including lifestyle interventions, early screening, and improved access to healthcare resources, thereby mitigating the long-term impact of diabetes on the population [9].

Furthermore, it was reported that nearly 60% of T2DM patients had at least one additional chronic illness, underscoring the complex and multifaceted nature of diabetes care. Additionally, the coexistence of multiple health issues necessitates an integrated approach to disease management that extends beyond glycemic control [9]. Given these challenges, the implementation of comprehensive public health strategies is essential. So, this study aimed to determine the association between self-management practices (SMP) and QoL in patients with T2DM.

MATERIALS AND METHODS

Study Design, Setting, And Sample Size Calculation

This descriptive cross-sectional study included 391 patients with T2DM at the Diabetes and Endocrine Center, Sulaimaniyah, Iraq, from September 2024 to May 2025, using a non-probability convenience sampling technique. The sample size was determined using the sample size calculator, available online [10]. The minimum recommended sample size was calculated to be 381 participants among an estimated total of 40.000 patients in the Diabetes and Endocrine Center in Sulaimaniyah, Iraq with a response distribution of 50%, a confidence level of 95%, and a margin of error of 5%. However, we increased the numbers to 391 to avoid bias.

Inclusion Criteria

Patients who are diagnosed with T2DM and registered at the Diabetes and Endocrine Center.

Exclusion Criteria

Patients with cognitive impairments, communication barriers, or severe comorbidities.

Study Protocol

A validated questionnaire was used to collect data related to the association between SMP and QoL among patients with T2DM that consisted of six parts, including patients' sociodemographics (age, gender, marital status, educational level, occupation, family income, residency, body mass index, smoking and alcohol use), medical data (diabetes management/duration, family history, comorbidities, treatment type, medication count, HbA1c, and fasting blood sugar), self-care behaviors (glucose monitoring, dietary habits, physical activity, and healthcare use) that scored on a 4-point Likert scale from 0 (disagree very much) to 3 (agree very much), knowledge on diabetes management (complication prevention, importance of medication adherence, diet, and early detection of complications), QoL (physical, psychological, and social) using WHOQOL-BREF, environmental domains (general health, pain, emotional well-being, social support, and environmental factors) using a 5-point Likert scale from very dissatisfied (1) to very satisfied (5), and the presence of common diabetes complications (neuropathy, retinopathy, edema, poor wound healing, dizziness, hypertension, and infections). Each part was translated and adapted into both Kurdish and Arabic. Trained interviewers administered the questionnaire face-to-face to ensure clarity and completeness of the responses. Then, the scoring and interpretation adhered to the Original Bloom's cut-off points, in which the diabetes SMP, patient's diabetes knowledge, and WHOQOL-BREF scores were classified into poor (<50%), fair (50-74%), and good (75-100%).

Statistical Analysis

Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS, IBM, Chicago, USA, version 26). Descriptive statistics including frequency, percentage, mean, and standard deviation (SD). Inferential statistics involved a chi-square test to assess associations between categorical variables. Statistical significance is considered when $p \leq 0.05$, highly significant when $p \leq 0.001$, and very highly significant when $p \leq 0.000$.

RESULTS

In the domain of glucose management (GM), 52.2% of participants reported a fair SMP, 34.5% had a good one, and 13.3% had a poor one, with a mean score of 71.66±15.89. In the dietary control (DC) domain, 54% of participants rated their nutritional habits as fair, 34.5% as good, and 11.5% as poor, with a mean score of 66.77±15.07. Healthcare use (HU) domain showed that 61.9% of participants rated fair, 28.6% reported good use of health care resources, while only 9.5% were poor with a mean score of 67.45±17.43. In physical activity (PA), 47.8% of patients had good habits, 39.4% had fair habits, and 12.8% had poor habits, with a mean score of 68.49±20.62. Overall, the total score reveals that 61.6% of participants fall into the fair category, with 26.9% in the good category and 11.5% in the poor category, with a mean score of 68.56±13.62 (Table 1).

Regarding the levels of the WHOQOL-BREF in Table 2, the general QoL domain reveals that 35.55% of participants rated their QoL as poor, 34.02% as fair, and 30.43% as good, with a mean score of 55.24±29.76. The general health (GH) domain displayed a slightly more favourable distribution, with 38.62% rating their health as good, 32.23% as fair, and 29.15% as poor, with a mean score of 59.78±30.73. In the physical health (PH) domain, 53.45% rated their PH as fair, 19.44% as poor, and 27.11% as good, with a mean score of 61.43±15.14. The

Table 1: Levels of Diabetes Self-Management Among Patients.

	Poor		Fair		Good		Total score %	
Variable	No.	Percentage	No.	Percentage	No.	Percentage	Mean	SD
Glucose managemen	52	13.3	204	52.2	135	34.5	71.66	15.89
Dietary control	45	11.5	211	54.0	135	34.5	66.77	15.07
Healthcare use	37	9.5	242	61.9	112	28.6	67.45	17.43
Physical activity	50	12.8	154	39.4	187	47.8	68.49	20.62
Total	45	11.5	241	61.6	105	26.9	68.56	13.62

Table 2: Levels of the WHOQOL-BREF Among Diabetic Patients

	Poor		Fair		Good		Total score	
Variable	No.	Percentage	No.	Percentage	No.	Percentage	Mean	SD
General QOL	139	35.55	133	34.02	119	30.43	55.24	29.76
General health	114	29.15	126	32.23	151	38.62	59.78	30.73
Physical health	76	19.44	209	53.45	106	27.11	61.43	15.14
Psychological	98	25.06	172	43.99	121	30.95	61.92	16.42
Environment	100	25.57	144	36.83	147	37.60	62.69	21.84
Social relationships	105	26.86	127	32.48	159	40.66	59.03	23.94
Total	117	29.92	151	38.62	123	31.46	60.02	18.71

QoL: Quality of life

Table 3: Mean Score of the WHOQOL-BREF in Diabetes Self-Management

Diabetes Self-Management		No.	Mean	SD	p-value
Glucose management	Poor	52	49.02	14.88	0.000***
	Fair	204	63.20	19.79	
	Good	135	59.44	16.71	
Dietary control	Poor	45	53.13	17.38	0.000***
	Fair	211	64.06	18.98	
	Good	135	55.99	17.26	
Healthcare use	Poor	37	45.51	12.53	0.000***
	Fair	242	63.22	19.08	
	Good	112	57.87	17.08	
Physical activity	Poor	50	54.41	16.88	0.000***
	Fair	154	68.11	18.80	
	Good	187	54.84	16.70	
Overall self-care	Poor	45	51.28	18.36	0.001**
	Fair	241	62.41	19.23	
	Good	105	58.26	16.35	

: Highly significant difference, *: Very highly significant difference

psychological domain, with a mean score of 61.92±16.42, shows that 43.99% of participants rated their psychological well-being as fair, 25.06% as poor, and 30.95% as good.

Similarly, the environment domain, with a mean of 62.69±21.84, indicates that 37.6% of participants rated their environment as good, 36.83% as fair, and 25.57% as poor.

Lastly, the social relationships domain, with a mean score of 59.03±23.94, shows that 40.66% of patients rated their social relationships as good, 32.48% as fair, and 26.86% as poor. The total score indicates that 29.92% of participants rated their overall quality of life (QoL) as poor, 38.62% as fair, and 31.46% as good, with a mean score of 60.02±18.71.

Table 3 compares the mean scores of the WHOQOL-BREF about different levels (poor, fair, and good) of diabetes SMP. For GM, participants in the poor SMP category (mean = 49.02) had lower scores compared to those in the fair (mean = 63.20) and good (mean = 59.44) categories ($p = 0.000$). Similarly, in DC, the poor group (mean = 53.13) scored lower than both the fair (mean = 64.06) and good (mean = 55.99) groups ($p = 0.000$). The HU domain followed a similar pattern, with the poor group (mean = 45.51) reporting the lowest QoL compared to the fair (mean = 63.22) and good (mean = 57.87) categories ($p = 0.000$). In the PA domain, the poor group (mean = 54.41) had a lower score than the fair group (mean = 68.11), but the good group (mean = 54.84) scored similarly to the poor group, indicating that PA is crucial for health. Despite this ($p = 0.000$), it suggests that individuals engaging in regular PA tend to have a better QoL. Finally, when examining overall self-care, the poor group (mean = 51.28) had the lowest mean score, followed by the good group (mean = 58.26), with the fair group (mean = 62.41) showing higher scores ($p = 0.001$).

Additionally, Table 4 shows that the mean scores for participants aged <40 years were 69.90, for those aged 40–50 years were 68.77, and for those aged >50 years were 67.99 ($p = 0.628$). Similarly, male participants (mean = 67.38) and female participants (mean = 69.05) reported comparable mean scores ($p = 0.272$). However, educational level significantly influences SMP, as seen with participants holding a Bachelor's degree (mean = 79.58), who demonstrated the highest SMP scores. In

Table 4: Mean Score of the Diabetes Self-Management in Patients' Characteristics.

Variable		No.	Mean	SD	p-value
Age (Years)	<40	59	69.90	9.12	0.628
	40-50	142	68.77	12.49	
	>50	190	67.99	15.48	
Gender	Male	114	67.38	13.50	0.272
	Female	277	69.05	13.66	
Educational level	Illiterate	117	67.08	12.95	0.000***
	Read and write	78	60.30	15.29	
	Primary school	53	71.84	10.08	
	Secondary school	42	65.17	11.17	
	Diploma	66	74.64	10.06	
	Bachelor	35	79.58	11.59	
Financial status	Sufficient	93	69.41	11.39	0.961
	Barely sufficient	220	68.54	13.27	
	Insufficient	78	67.62	16.77	
Duration of diabetes (Years)	<5	129	69.97	12.23	0.232
	5-10	135	68.63	14.19	
	> 10	127	67.06	14.27	
Number of comorbidities	0	121	73.88	11.16	0.000***
	1	79	67.28	14.19	
	2	91	66.02	11.94	
	≥3	100	65.46	15.48	
BMI	Normal	220	71.95	12.62	0.000***
	Overweight	148	65.89	13.37	
	Obese	23	53.30	10.00	
Smoking	Smoker	104	68.47	10.56	0.933
	Non-smoker	287	68.60	14.58	
Recent HbA1c (%)	<7	186	69.54	10.14	0.299
	7.1 – 8.0	122	67.08	16.32	
	>8.0	83	68.54	15.85	
Recent FBS (mg/dL)	< 100	7	71.69	6.99	0.579
	100–125	175	69.15	10.43	
	≥ 126	209	67.96	15.94	

BMI: Body mass index, FBS: Fasting blood sugar, HBA1c: Glycated hemoglobin, ***: Very highly significant difference

contrast, those who were illiterate (mean = 67.08) scored the lowest (p = 0.000). Financial status shows no significant difference (p = 0.961), as the mean scores for the sufficient (mean = 69.41), barely sufficient (mean = 68.54), and insufficient (mean = 67.62) groups are nearly identical. There is no significant variation (p = 0.232) in SMP across different durations of diabetes. The number of comorbidities has a very high and significant effect (p = 0.000) on SMP, with participants having no comorbidities (mean = 73.88) reporting the highest values, while those with ≥3 comorbidities (mean = 65.46) showed the lowest. Additionally, those with a normal weight (mean = 71.95) reported better SMP than those who were overweight (mean = 65.89) or obese (mean = 53.30) (p = 0.000). Smoking status does not show significant differences (p = 0.933), with smokers (mean = 68.47) and non-smokers (mean = 68.60) having nearly identical values. Neither recent HbA1c nor FBS tests revealed significant associations with SMP (p = 0.299 and p = 0.579, respectively).

The data in Table 5 highlights the significant differences in QoL, as measured by the WHOQOL-BREF. Age significantly influences the QoL, with younger individuals aged <40 years (mean = 82.48) reporting the highest QoL, while those aged >50 years (mean = 48.24) reporting the lowest scores (p = 0.000). Gender also plays a role, with females (mean = 62.02) reporting better QoL than males (mean = 55.15) (p = 0.001). Regarding educational level, participants with illiterate status (mean = 47.68) report the lowest scores, while Diploma and Bachelor's degrees (mean = 73.85 and 69.89, respectively) reported much higher scores (p = 0.000). Whereas individuals with sufficient financial resources (mean = 78.70) reported the highest QoL, while those with insufficient financial status (mean = 40.68) reported the lowest (p = 0.000). Individuals diagnosed for <5 years (mean = 72.60) showed higher QoL than those living with diabetes for >10 years (mean = 43.84) (p = 0.000). Additionally, participants with no comorbidities (mean = 72.07) reported the highest scores, while those with three or more comorbidities (mean = 46.35) reported the lowest (p = 0.000). In terms of BMI, individuals with a normal BMI (mean = 65.59) reported better QoL than overweight (mean = 54.44) or obese (mean = 42.49) (p = 0.000). Non-smokers (mean = 61.19) reported a higher QoL than smokers (mean = 56.78) (p = 0.033). Finally, the recent HbA1c and FBS show that those with HbA1c of <7% (mean = 69.54) and FBS of <100 mg/dL (mean = 85.19) had the highest QoL, while those with higher HbA1c or FBS levels reported significantly lower scores (p = 0.000).

Table 5: Mean Score of the WHOQOL-BREF in Patients' Characteristics

Variable		No.	Mean	SD	p-value
Age (Years)	< 40	59	82.48	9.32	0.000***
	40 – 50	142	66.44	14.06	
	> 50	190	48.24	14.85	
Gender	Male	114	55.15	21.29	0.001**
	Female	277	62.02	17.19	
Educational level	Illiterate	117	47.68	16.41	0.000***
	Read and write	78	52.58	17.40	
	Primary school	53	65.88	14.43	
	Secondary school	42	70.83	11.02	
	Diploma	66	73.85	14.05	
	Bachelor	35	69.89	15.78	
Financial status	Sufficient	93	78.70	8.77	0.000***
	Barely sufficient	220	58.97	16.49	
	Insufficient	78	40.68	10.23	
Duration of diabetes (Years)	<5	129	72.60	14.97	0.000***
	5 – 10	135	63.21	16.39	
	> 10	127	43.84	11.56	
Number of comorbidity	0	121	72.07	13.38	0.000***
	1	79	67.00	13.18	
	2	91	52.95	17.08	
	≥3	100	46.35	17.58	
BMI	Normal	220	65.59	17.87	0.000***
	Overweight	148	54.44	17.14	
	Obese	23	42.49	14.94	
Smoking	Smoker	104	56.78	21.92	0.033*
	Non-Smoker	287	61.19	17.30	
Recent HbA1c (%)	<7	186	69.54	10.14	0.000***
	7.1 – 8.0	122	67.08	16.32	
	>8.0	83	68.54	15.85	
Recent FBS (mg/dL)	< 100	7	85.19	9.37	0.000***
	100 – 125	175	72.62	13.25	
	≥ 126	209	48.62	14.89	

BMI: Body mass index, FBS: Fasting blood sugar, HBA1c: Glycated hemoglobin, **: Highly significant difference, ***: Very highly significant difference

DISCUSSION

Improvement of high QoL requires a critical evaluation of how DM affects patients' lives in numerous dimensions, how they respond to prescribed self-management, and to what extent they cope with the challenges [11]. Thus, this study aimed to provide valuable insights into the association between SMP and QoL among patients with T2DM in Sulaimaniyah, Iraq.

In the current study, the domain of GM suggests a moderately effective level of glucose control, but with substantial variability across samples. This suggests that while most individuals manage their glucose levels at a moderate level, some still struggle significantly, while others are more adept at controlling their levels. The domain of DC reflects a generally moderate level of adherence to dietary guidelines. However, the variability in scores suggests that DC is a significant area of concern for some individuals, and interventions may be necessary to promote better dietary habits across the group. The HU domain suggests that while many individuals use healthcare services moderately well, there is a broad range of behaviours, indicating the need for more consistent and accessible healthcare utilization strategies. Additionally, PA reflects a positive engagement, although a significant variation in activity levels persists among individuals. Overall, the total score indicates a moderate level of diabetes severity in the SMP across the entire sample. While many participants demonstrate reasonable SMP, there is clear room for improvement, particularly in DC and HU. The variability in SMP, particularly in GM and PA, highlights the importance of individualized interventions to enhance the overall diabetes care strategy. This data highlights the need for targeted educational programs and tailored approaches to improve self-management of diabetes (SMP) among the studied population. In this regard, the GM findings align with those of Zhang *et al.* who indicate that a significant proportion of diabetic individuals struggle with glycemic control [12]. Whereas ALotaibi reported similar trends, revealing that while medication adherence was high, other components of SMP, particularly DC, are often neglected [13]. Alshahrani *et al.* associates poor SMP with inadequate health outcomes and emphasizes the necessity for healthcare providers to assess diabetes SMP [14]. However, socioeconomic factors and access to healthcare services could influence SMP among diabetic populations [12]. Concerning the HU domain, our outcome resonates with that of Kim *et al.* who noted a decline in healthcare utilization during the COVID-19 pandemic, leading to suboptimal SMP outcomes and emphasizing the importance of equal access to healthcare resources [15]. Additionally, substantial individuals with fair or poor healthcare use in his study highlights the necessity for systems that ensure consistent and accessible healthcare utilization strategies, which is corroborated with that of Bour *et al.* [16].

Additionally, the results for PA in this study indicated a more favourable engagement, which contradicts the findings of a meta-analysis by Habebo *et al.* which indicate low levels of engagement in PA among diabetes patients [17]. Also, Heydarian *et al.* emphasized that while some individuals maintain active lifestyles, many still lack adequate exercise routines [2].

The overall diabetes SMP total score (moderate level) of this study echoed by Yang *et al.* who identified multiple barriers that affect diabetes SMP, such as emotional and psychological challenges [18]. In this light, the results call for the development of individualized interventions and tailored educational programs alongside integrated support systems, which are crucial for addressing the diverse needs of individuals with DM, as highlighted in broader health promotion strategies [19].

Regarding the general QoL domain in this study, a significant portion of participants reported a less-than-ideal QoL, with a notable group having a more positive outlook. The GH domain suggests that most individuals feel reasonably good about their health, although the variability indicates some inconsistencies in health perceptions. Whereas the PH domain was perceived as moderately positive by most participants, the lower variability here suggests that PH perceptions are somewhat more consistent across the sample. In the psychological domain, the relatively high fair category suggests moderate satisfaction with psychological health. However, there is still room for improvement, especially considering the number of participants reporting lower levels of psychological well-being. Similarly, the environment domain reflects a positive perception, but also highlights significant dissatisfaction among a portion of the sample. The social relationships domain indicates while most participants reported positive experiences with social relationships, the variability suggests that some individuals may experience challenges in this area. The total score further confirms that, on average, participants perceived their QoL as moderate, with a diverse range of experiences, which means score across the domains suggests a satisfactory QoL. Still, the variability in individual scores emphasizes the need for targeted interventions to improve QoL, especially in areas like social relationships and general QoL where participants showed more varied perceptions.

In this regard, the outcomes of general QoL align with those of Miao *et al.*, who indicated disparities in QoL perceptions across regions [20]. Whereas the outcomes of our social domain aligns with findings of Keating *et al.* that emphasizes the influence of social determinants on health outcomes [21]. Our results on the GH domain reflect the observations of Garcia-Bernabeu *et al.*, who emphasized the importance of comprehensive metrics that capture community health status [22]. Meanwhile, Keating *et al.*, indicate that a significant number of participants feel good about their health. Local health policies and socioeconomic factors [21] could influence their perceptions. Concerning the PH domain, identical results were noted by Tarigan *et al.*, who emphasize the link between PH perceptions and overall QoL among diabetes patients [23]. Thus, a moderate perception of PH indicates a potential need to improve interventions to enhance PA and health engagement. Regarding the psychological domain, Thornblade *et al.* discussed mental health service availability; however, they did not directly address variations in psychological well-being related to regional QoL [24]. The outcome of the environmental domain indicates positive perceptions among participants, with some dissatisfaction, which aligns with Oláh *et al.*, who described how environmental quality and accessibility shape residents' QoL perceptions in different contexts. This suggests that improving environmental factors could significantly enhance overall perceptions of QoL [25]. Finally, the social relationships domain findings align with those of Börnhorst *et al.*, who examined the contributions of social networks to QoL among older adults [26].

Furthermore, in this study, the data of the WHOQOL-BREF about different levels of diabetic SMP indicate that individuals who reported better SMP in diabetes across all domains had significantly higher QoL scores. For GM, data confirms that better GM correlates with higher perceived QoL. Similarly, DC supports the notion that improved dietary management enhances QoL, while the HU domain highlights that proper health care utilization plays a critical role in maintaining and improving one's QoL. Overall, the data demonstrates that diabetic SMP, whether in glucose control, dietary habits, HU, PA, or general self-care, has a substantial impact on individuals' QoL. These findings highlight the importance of enhancing SMP in diabetes care to improve the well-being and QoL of individuals with diabetes. In this regard, our GM data are corroborated with those of Mwadulo *et al.*, who emphasized that poor glycemic control is consistently associated with lower QoL scores, reinforcing the argument that effective GM is a critical determinant of QoL in diabetic populations [27]. While the domain of DC similarly reflected that reported by Platis *et al.*, where compliance with dietary guidelines was directly linked to improvements in QoL among diabetic patients [28]. This theme underscores the significant role that dietary adherence plays, supporting the assertion that dietary management is integral to enhancing health-related QoL. The results of HU align with Khan *et al.*, who found that HU effectively plays in managing diabetes and improving patient outcomes and echoes the emphasis that data places on the importance of healthcare access and utilization in shaping QoL perceptions [29]. Interestingly, the domain of PA calls for a nuanced analysis, as PA is widely recognized as beneficial for QoL. In contrast, Abualhommos *et al.* indicated positive correlations between active engagement in physical activities and enhanced QoL measures [30]. The discrepancies in findings may suggest that additional factors, such as the intensity of physical activity or psychological constructs, may influence perceived QoL beyond mere activity levels. Finally, the overall self-care scores further reiterate the impact of self-care practices on QoL, which resonates with Feyzi *and* Madmoli, 2019 who highlighted how health-related QoL serves as an essential indicator of

healthcare quality and indicated that improvements in SMP can lead to significant enhancements in overall patient well-being [31].

Moreover, this study reveals that age, gender, financial status, duration of diabetes, and smoking status did not significantly impact diabetes SMP; however, educational level had a significant influence on SMP, with a strong correlation between higher education and improved diabetes management. Also, having comorbidities suggested that managing multiple health conditions negatively impacts diabetes SMP. Additionally, BMI was strongly associated with SMP and emphasizing the importance of maintaining a healthy weight. Finally, both recent HbA1c and FBS indicated that recent blood sugar measurements may not directly impact how individuals manage their diabetes. Overall, these findings highlight the importance of targeting education and weight management to improve diabetes care, especially for individuals with multiple comorbidities. In this manner, the educational findings were consistent with those of Asante *et al.*, who highlighted that educational interventions tailored to the needs of patients could significantly enhance SMP [32]. Similarly, Huang *et al.* pointed out that individuals who received structured DM education reported improved SMP, emphasizes the vital role education plays in diabetes care, underscores a robust link between educational status and SMP outcomes, further reinforcing the need for targeted educational programs to empower patients [33]. Whereas the data of age and gender align with findings from Fatharani *et al.* who observed no relationship between age/gender and patient's diabetic SMP [34]. This observation suggests that demographic factors, such as age and gender, may be less impactful in certain contexts, indicating a trend that could pave the way for a more inclusive approach centred on individual capabilities rather than demographic characteristics. However, the stark contrast in the number of comorbidities is noteworthy, which parallels that of Cheng *et al.*, who discussed how the complexity of managing multiple chronic conditions adversely affects patients' SMP abilities. [35]. Additionally, the relationship between BMI and SMP is supported by Kamarli *et al.*, who found that obesity significantly complicates SMP efforts and glycemic control among people with diabetes. Maintaining a healthy weight is crucial, reflecting broader recommendations in diabetes management that emphasize lifestyle modifications, including weight control, to improve overall health outcomes. Regarding smoking status, results highlight a possible area for further investigation, particularly regarding how smoking cessation could play a role in health improvements. Lastly, no significant relationships between recent HbA1c and FBS tests were tests were also addressed by Wu *et al.*, who posited that while clinical indicators are essential for managing diabetes, the psychological and behavioural aspects of diabetes SMP require more systemic support [36].

Regarding the correlation between different variables and QoL, age significantly influences the QoL, suggests that older individuals may experience more challenges in managing diabetes, leading to a lower perceived QoL, while data on gender suggests that women may have a slightly better overall health status or coping mechanisms. Regarding educational level, the obtained data underscore the importance of education in improving health outcomes and socioeconomic mobility in diabetes. Whereas financial resources highlight the strong correlation between financial stability and better diabetes management. In the same manner, duration of diabetes suggests that longer duration may lead to complications or more complex management, which negatively impacts QoL. Additionally, data on comorbidities highlights that additional health conditions significantly affect diabetes management and well-being. Then, BMI demonstrates the strong impact of weight management on QoL outcomes. Further, data suggests that smoking negatively affects QoL in individuals with DM. Finally, the HbA1c and FBS results confirm that better blood glucose control directly correlates with improved QoL. Overall, these findings emphasize the multifaceted nature of diabetes management. Importantly, maintaining optimal blood sugar levels, managing weight, and addressing socioeconomic factors are key to improving the well-being of individuals with diabetes.

To begin with data on age, similar findings were reported by Mwadulo *et al.*, who noted that younger patients with diabetes generally have a better health-related QoL, likely due to fewer complications and a more proactive approach to health management [37]. Conversely, Tietjen *et al.* mentioned that older adults often face multiple chronic conditions that complicate diabetes management and negatively impact their QoL [38]. Gender observation in the present study contrasts with another study that emphasized that while women may cope differently with diabetes, their QoL can be adversely affected by socio-cultural factors [38]. Results of education levels support Stojanović *et al.*, who highlighted education as pivotal in enhancing self-care knowledge and SMP [39]. Improved education often leads to better health outcomes, reaffirming the need to prioritize educational interventions in diabetes care programs.

Additionally, financial status correlated strongly with QoL, which was in line with the findings of Krzemińska *et al.*, where economic barriers were identified as critical factors hindering effective diabetes management and health-related QoL [40]. The duration of diabetes also significantly affected QoL; which also has been documented by Mwadulo *et al.*, who suggested that a greater duration of diabetes leads to increased complications, thereby decreasing QoL metrics [37]. Moreover, the results of comorbidities and a marked impact on reported QoL align with Di Mattei *et al.*, who emphasized the detrimental impact of additional health conditions on diabetes management and overall well-being [41]. Regarding BMI results, consistency was found with Meher *et al.*, who noted a direct correlation between maintaining a healthy weight and enhanced QoL in diabetics [42]. The Outcome of smoking is echoed by

Tamminga *et al.*, who indicate that smoking exacerbates diabetes complications and affects overall health perceptions [43]. Lastly, findings regarding glycemic control are significant, which aligns with Gómez-Pimienta *et al.*, who reinforced the importance of effective blood GM in improving the QoL for individuals with diabetes [44].

The limitations of this study include the use of a non-probability convenience sampling method, which limits the generalizability of the results as the sample may not represent all T2DM patients in Sulaimaniyah, Iraq. The cross-sectional design and data collection at a single point in time limit the ability to draw causal conclusions between SMP and QoL. Single-center studies may limit the diversity of patient experiences and treatment regimens captured.

CONCLUSIONS

Results concluded that participants perceived their QoL as moderate substantially affected by their glucose control, dietary habits, HU, PA, and general self-care. Subsequently, SMP was also perceived by patients at a moderate level, which was drastically affected by education, number of comorbidities, and BMI, but not age, gender, and smoking. However, a direct correlation was observed between patients' SMP and QoL. Consequently, there is a need for targeted educational programs and tailored approaches to improve diabetes SMP and QoL among the studied population to better control diabetes.

Ethical Considerations

The research proposal was reviewed and approved by the ethical committee at the College of Nursing, University of Sulaimani, Sulaimaniyah, Iraq (No. 1511 on November 05, 2023). Prior to the commencement of data collection, formal permissions were obtained from the administration of the Diabetes and Endocrine Center, Sulaimaniyah, Iraq. All individuals were provided with a clear explanation of the study's purpose and procedures. Formal informed consent was obtained from participants, and they were informed of their right to withdraw from the study at any time, without facing any consequences or penalties.

Consent for Publication

The study doesn't include conflicts related to the patient's data.

Competing Interest

The authors declare that they have no competing interests that might be perceived to influence the results and/or discussion reported in this paper.

Authors' Contribution

AAQ: Methodology, data collection, data analysis, and writing of the original manuscript; MRA: Conceptualization, methodology, supervision, study registration, and editing of the original manuscript. Both authors agreed to this submission.

Data Availability

The raw data used in this study are available from the corresponding author and can be provided upon request.

Acknowledgements

Authors thank the healthcare staff at Diabetes and Endocrine Center, Sulaimaniyah, Iraq for their help and support to this study.

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