

Original Article

Predictors of Quality of Life in Adults with Type 2 Diabetes in Northern Philippines

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Abstract. Type 2 diabetes mellitus (T2DM) is a chronic metabolic condition that can substantially affect quality of life (QoL) across physical, psychological, social, and environmental domains. Although self-care management and self-efficacy are recognized as important factors in diabetes outcomes, their contributions to QoL remain insufficiently examined in community-based populations. This study examined the predictive contributions of self-care management ability and self-efficacy to QoL among adults with T2DM in Laoag City, Ilocos Norte, Philippines. A cross-sectional predictive correlational design was employed among 150 adults with T2DM selected through total enumeration. Data were collected using the Diabetes Self-Management Questionnaire (DSMQ), Diabetes Empowerment Scale (DES), and WHOQOL-BREF. Descriptive statistics and MM-estimator robust multiple regression with 1,000-resample bootstrapped confidence intervals were used following assessment of regression assumptions. Results showed significant regression models for physical health (Robust $R^2 = 0.255$, $p < 0.001$), psychological health (Robust $R^2 = 0.114$, $p = 0.009$), and social relationships (Robust $R^2 = 0.194$, $p < 0.001$). Dietary control ($\beta = 0.232$, $p = 0.026$) and glucose management ($\beta = 0.257$, $p = 0.021$) significantly predicted physical health. For psychological health, glucose management was a significant predictor ($\beta = 0.254$, $p = 0.040$), whereas dietary control was not significant ($\beta = 0.219$, $p = 0.058$). For social relationships, dietary control ($\beta = 0.225$, $p = 0.030$) and glucose management ($\beta = 0.292$, $p = 0.009$) were significant positive predictors. The environmental model was not significant (Robust $R^2 = 0.105$, $p = 0.063$). Findings indicate that specific self-care behaviors, particularly glucose management and dietary control, contribute to selected QoL domains, with physical health showing the greatest explained variance. Structural, socioeconomic, and contextual factors beyond individual self-care behaviors may more strongly influence environmental QoL.

Keywords: Predictive analysis; Quality of life; Self-care management ability; Self-efficacy; Type 2 diabetes mellitus.

Diabetes is a complex, chronic metabolic disorder that requires consistent medical care with comprehensive risk-reduction strategies beyond glycemic management (American Diabetes Association Professional Practice Committee, 2025). Type 2 diabetes is primarily characterized by the inability of the body's cells to respond to insulin. Over time, increased blood sugar levels can cause serious damage and debilitating consequences that may impair quality of life. Globally, over 800 million people live with diabetes, which is four times more than in 1990 (NCD Risk Factor Collaboration [NCD-RisC], 2024). Type 2 diabetes is the most prevalent,

accounting for 90-95% of all cases (International Diabetes Federation [IDF], 2024). In the Philippines, it accounts for 19,214 deaths, or 6.3% of all recorded deaths in 2024, highlighting the growing burden of diabetes as a major public health concern in the country (Philippine Statistics Authority, 2025).

Effective diabetes management primarily aims to prevent complications, decrease mortality, and healthcare expenses by slowing disease progression and enhancing overall quality of life (Davies et al., 2022). Quality of life is a multidimensional construct that encompasses physical health, psychological state, social relationships, and environmental factors that provides a holistic perspective on an individual's lived experience of health and illness (WHOQOL Group, 1995). In general, individuals with illness experience lower quality of life compared to those without disease, and enhancing physical health is particularly challenging without addressing quality of life, especially with chronic non-communicable conditions (Tamornpark et al., 2022).

Self-care activities are pivotal in glycemic control. Self-care management involves dietary control, glucose management, physical activity, and physician contact, which translates to effective self-care management ability (Schmitt et al., 2022). This set of essential health behaviors is required to maintain optimal glucose regulation, wherein it serves as one of the critical determinants of successful management in chronic conditions in achieving and maintaining quality of life (Eshtaya et al., 2025). Diabetes self-efficacy refers to individual's confidence in managing the condition that helps them cope with emotional challenges, recognize the need for behavioral changes, and enhance ability in achieving better health outcomes and improved quality of life (Anderson et al., 2003). Despite growing literature linking quality of life, self-care management ability, and self-efficacy, evidence remains limited and context-specific, particularly in local settings. Moreover, few studies have examined these variables and their interrelationships simultaneously. Existing local studies primarily describe associations between variables but rarely explore their predictive contributions to quality of life outcomes.

Therefore, this study aimed to determine the predictive contributions of diabetes self-care management ability and self-efficacy to the quality of life of adults with Type 2 Diabetes Mellitus in Laoag City, Ilocos Norte, Philippines. Specifically, the study examined the predictive contributions of the Diabetes Self-Management Questionnaire (DSMQ) subscales and Diabetes Empowerment Scale (DES) subscales to quality of life outcomes. The findings may support patient education, strengthen community-based diabetes programs, and provide evidence that may help inform health policies and diabetes management interventions.

Methodology

Research Design

This study employed a cross-sectional predictive correlational design based on its objectives. This design is appropriate for examining relationships among variables measured at a single point in time and for identifying significant predictors using regression analysis (Baumeister et al., 2026). Multiple linear regression was used to determine the predictive contributions of the Diabetes Self-Management Questionnaire (DSMQ) subscales and Diabetes Empowerment Scale (DES) subscales to the WHOQOL-BREF domain scores. Robust regression analysis was performed as a sensitivity test to assess the stability of regression estimates in cases where violations of regression assumptions were detected.

Participants and Sampling Technique

The study was conducted in community health centers of Laoag City, Province of Ilocos Norte, Philippines. The study population was composed of adults aged 30 years and above who have been clinically diagnosed with type 2 diabetes mellitus, bona fide residents of the City of Laoag, Ilocos Norte for at least six months, actively enrolled in the diabetes registry or consistently undergoing follow-up care in Rural Health Units (RHUs), Barangay Health Stations (BHSs), or private health institutions that provide diabetes management. Those who are diagnosed with type 1 diabetes mellitus, gestational diabetes, or other uncommon types of diabetes, with severe complications such as end-stage renal disease or advanced cardiovascular disease, with cognitive or psychiatric impairments that hinder their ability to independently participate or provide accurate responses, and unwilling to participate in the study were excluded. A total enumeration sampling technique was used, in which all eligible individuals based on the inclusion criteria were invited to participate in the study. The target population consisted of 181 eligible respondents; however, 31 declined to participate. Thus, the final sample size included 150 respondents who completed the study.

Research Instrument

The Diabetes Self-Management Questionnaire (DSMQ) assessed diabetes-related self-care behaviors. It evaluates behaviors associated with glycemic control rather than knowledge-based aspects of diabetes management. The instrument consists of four subscales: dietary control, glucose management, physical activity, and physician contact. The DSMQ has been widely validated in diabetes populations and demonstrates good psychometric properties (Schmitt et al., 2016). The Diabetes Empowerment Scale (DES) was utilized to measure the psychosocial self-efficacy of individuals with diabetes, particularly their confidence in managing the condition. It consists of three subscales: managing psychosocial aspects of diabetes, assessing dissatisfaction and readiness to change, and setting and achieving diabetes-related goals (Anderson et al., 2003). The World Health Organization Quality of Life- BREF (WHOQOL-BREF) was used to measure individuals' perceived quality of life across four domains: physical health, psychological health, social relationships, and environment. The WHOQOL-BREF is a widely used and internationally validated instrument developed by the World Health Organization (WHOQOL Group, 1998). All tools are self-report in nature and scored according to their respective scoring guidelines. Higher scores indicated stronger self-care management ability, greater self-efficacy, and better quality of life, respectively.

A pilot testing procedure was undertaken among 20 patients in a different local with the same inclusion criteria who were deliberately excluded from the actual respondents. Cronbach's alpha (α) was used to determine primary index of internal consistency for the scales measuring self-care management ability, self-efficacy, and quality of life. The overall quality of life ($\alpha = 0.905$) and self-efficacy ($\alpha = 0.947$) scales achieved $\alpha \geq 0.70$ and are therefore considered reliable for use in the present study. Additionally, the overall self-care management ability scale demonstrated acceptable internal consistency result ($\alpha = 0.688$). The tools are self-report in nature and scored according to their respective scoring guidelines. Higher scores indicated better quality of life, stronger self-care management ability, and greater self-efficacy, respectively. The data were analyzed using R through RStudio. OLS regression assumptions, including normality, equal variance, independence, and outliers, were examined. Since some assumptions may not have been met, MM robust regression was utilized to provide more reliable estimates. Bootstrapped 95% confidence intervals based on 1,000 resamples were also applied. A p-value below 0.05 was considered statistically significant.

Data Gathering Procedure

Ethical clearance was obtained, along with formal approval from the local government unit of Laoag City. Standardized questionnaires were personally distributed to 181 eligible adults with Type 2 diabetes mellitus. Prior to participation, the purpose and procedures were explained, and written informed consent was obtained. Participants were given approximately 10–15 minutes, or longer when necessary, to complete the questionnaires. Completed questionnaires were retrieved either immediately after completion or within 3–5 days. All questionnaires were reviewed for completeness prior to data analysis. Responses were anonymized and analyzed with the assistance of a statistician. The study strictly observed ethical principles, including voluntary participation, confidentiality, anonymity, and the right to withdraw at any time without coercion.

Ethical Considerations

Ethical clearance was secured from the University Research Ethics Review Board of Mariano Marcos State University, ensuring that all research procedures complied with established ethical standards. Formal approval was likewise obtained from the local government unit of Laoag City prior to data collection. Participation was voluntary, and the researchers obtained informed consent before administering the questionnaire. Participants were also informed of the study's purpose, their right to refuse or withdraw at any time without consequence, and the minimal risks associated with participation. The study strictly maintained confidentiality, anonymity, privacy, and respect for participants' dignity throughout. The data collection process excluded identifiable information by using assigned data codes. All printed and electronic data were securely stored and made accessible only to the researcher. Collected data were used solely for academic purposes and will be properly disposed of after the prescribed retention period. No financial or material incentives were provided to participants, and no conflict of interest existed between the researcher and respondents.

Results and Discussion

Self-Care Management Ability of Respondents with Type 2 Diabetes.

Respondents with type 2 diabetes had moderate self-care ability, with an overall DSMQ score of $\bar{x} = 4.87$, interpreted as moderate self-care ability (MSCA). This indicates partial or inconsistent adherence to recommended

diabetes self-management behaviors such as blood glucose monitoring, medication adherence, dietary control, physical activity, and healthcare utilization.

Table 1. *Self-Care Management Ability of Respondents with Type 2 Diabetes Mellitus*

Scale	M	SD	Interpretation
Dietary Control	5.79	1.26	Moderate Self-Care Ability
Glucose Management	6.32	1.80	Moderate Self-Care Ability
Physical Activity	5.83	2.10	Moderate Self-Care Ability
Physician Contact	5.43	1.60	Moderate Self-Care Ability
Overall DSMQ Score	4.87	1.18	Moderate Self-Care Ability

Although they are able to perform some self-care practices, the findings suggest that these behaviors are not consistently maintained. According to the study by Adarmouch et al. (2020), inadequate self-management behaviors may contribute to poorer glycemic control, reduced quality of life, and increased risk of diabetes-related complications among patients with type 2 diabetes mellitus. This implies that nurses should promote empowerment by encouraging active participation in treatment planning and decision-making to prevent complications associated with poor diabetes self-management.

Among the domain of self-care management ability, glucose management had the highest mean of 6.32, interpreted as moderate self-care ability (MSCA). This moderate result may suggest that glucose management is prioritized because of its direct association with daily awareness of health status; however, adherence remains inconsistent, indicating the need to further strengthen and maintain regular self-care practices. This result corroborates the qualitative study of Peng et al. (2022), which found that noncompliance and arbitrary changes in medication therapy, blood glucose monitoring, lifestyle modifications, and complication management indicate clear challenges to self-management behavior and highlight potential key influencing factors. This emphasizes the need for nursing support in enhancing respondent's capacity to consistently monitor blood glucose levels, understand their results, and comply with recommended management practices.

In contrast, physician contact had the lowest mean (5.43), interpreted as moderate self-care ability (MSCA). This moderate result suggests that respondents may have limited or irregular contact with healthcare providers, possibly due to accessibility issues, time constraints, or greater reliance on self-management, leading to less frequent follow-up consultations. This result aligns with Orozco-Beltrán et al. (2016), who found that lack or inconsistent adherence significantly hinders the attainment of optimal therapeutic control. This finding suggests that nurses and other healthcare providers should strengthen patient engagement through ongoing education, regular follow-up, and improved therapeutic communication to address inconsistent self-management behaviors.

Self- Efficacy of Respondents with Type 2 Diabetes Mellitus

Respondents with type 2 diabetes mellitus exhibited high self-efficacy, reflected in an overall DES score of $\bar{x} = 4.03$, interpreted as high self-efficacy (HSE). This indicates strong confidence in managing diabetes-related challenges, making appropriate health-related decisions, and attaining self-management goals. The results further suggest that respondents generally feel capable of performing key diabetes care tasks, such as adhering to medication regimens, following dietary recommendations, engaging in physical activity, monitoring blood glucose levels, and managing the psychosocial demands associated with the condition. This aligns with Hurst et al. (2020), who found that higher self-efficacy among patients with type 2 diabetes is associated with better glycemic control. This implies that strengthening family and community support systems may help sustain motivation and self-efficacy over time through continuous guidance, education, and empowerment strategies, nurses can contribute to improved diabetes outcomes, prevention of complications, and better quality of life.

Table 2. *Self- Efficacy of Respondents with Type 2 Diabetes Mellitus*

Scale	M	SD	Interpretation
Managing Psychosocial	4.03	0.65	High Self- Efficacy
Assessing Dissatisfaction & Readiness	3.99	0.58	High Self- Efficacy
Setting and Achieving Goals	4.08	0.63	High Self- Efficacy
Overall DSMQ Score	4.03	0.57	High Self- Efficacy

Within the self-efficacy domain, setting and achieving goals had the highest mean (4.08), interpreted as high self-efficacy and indicating strong confidence in setting and achieving goals. This substantiates the study by Khalooei, A., & Hasheminejad, Z. (2023), who reported that self-efficacy is considered suboptimal among type 2 diabetes

mellitus patients. Their findings also indicate that higher self-efficacy is associated with improved medication adherence, better glycemic control, reduced risk of complications, and fewer healthcare visits. This implies that respondents with type 2 diabetes mellitus should continue to build a strong sense of self-efficacy by consistently adhering to positive self-management behaviors in their daily lives. Their confidence in managing psychosocial challenges, assessing readiness for change, and setting and achieving goals should support medication adherence, proper blood glucose monitoring, healthy lifestyle practices, and regular healthcare consultation.

Conversely, assessing dissatisfaction and readiness had the lowest mean of 3.99, interpreted as high self-efficacy. This result suggests that, despite being the lowest among the domains, respondents can still reflect on their condition and make informed decisions about improving their self-care behaviors. This finding is consistent with Oluma et al. (2020), who reported that higher self-efficacy is associated with positive self-care behaviors, including regular blood glucose monitoring, physical activity, and adherence to diabetes management practices. This finding implies that despite high self-efficacy, nurses should implement continuous reinforcement strategies to maintain patients' confidence and prevent potential decline in motivation, particularly in sustaining long-term self-care behaviors.

Quality of Life of Respondents with Type 2 Diabetes Mellitus

Respondents with type 2 diabetes have a moderate quality of life across all domains. Among the domains of quality of life, social relationship had the highest mean ($\bar{x} = 65.89$), interpreted as moderate quality of life.

Table 3. *Quality of Life of Respondents with Type 2 Diabetes Mellitus*

Domain	M	SD	Interpretation
Physical Health	63.48	14.29	Moderate Quality of Life
Psychological	64.53	18.20	Moderate Quality of Life
Social Relationship	65.89	16.95	Moderate Quality of Life
Environment	61.77	18.26	Moderate Quality of Life

This indicates that respondents may experience moderate satisfaction with their surrounding conditions, including access to healthcare services, living conditions, social support, and other environmental factors that influence daily functioning and diabetes management. The results corroborate the cross-sectional study of Mendoza-Núñez et al. (2016), which revealed that social capital, particularly peer networks and community-based self-help groups, plays a significant contribution of social support structures for diabetes management outcomes among older populations. This implies that even if the result is moderate, patients with type 2 diabetes mellitus should still take necessary precautions in managing their condition.

Meanwhile, the environment had the lowest mean ($\bar{x} = 61.77$), interpreted as moderate quality of life. This implies that environmental conditions influencing well-being are perceived as neither highly favorable nor highly unfavorable. This finding is consistent with Yousaf et al. (2023), which reported that individuals often face challenges in various aspects of daily living, including environmental conditions that may not sufficiently support well-being. Accordingly, this finding underscores the need to strengthen environmental support systems that facilitate effective diabetes management and enhance overall quality of life.

Ordinary Least Squares (OLS) Assumption Violations and Method Applied per QoL Domain

For the physical health domain, several issues were found with the assumptions underlying the regression model. The residuals did not show a normal distribution, and the spread of errors varied across observations. The Durbin-Watson statistic also pointed to possible correlation among errors. In addition, several cases were identified as unusually influential. Overall, these results suggest that the standard regression model does not provide a good fit for this domain. The psychological domain followed a similar pattern. The residuals were not normally distributed, and the variability of errors was uneven across cases. There was also evidence that the assumption of independent errors may have been violated. Influential observations were again present, indicating that a small number of cases may be strongly affecting the results. This raises concerns about the stability of the regression estimates for this domain. For the social relationships domain, the findings were somewhat inconsistent. One test indicated a departure from normality, while another suggested that the distribution was acceptable. The assumptions regarding error variance and independence were generally met. However, a few influential cases were still detected, meaning that some observations may be affecting the results more than others. Overall, this model appears to perform better, though minor concerns remain.

Table 4. OLS Assumption Violations and Method Applied per QoL Domain

Outcome	Normality (SW / KS)	Homoscedasticity (BP)	Independence (DW)	Influential Cases (Cook's D / Leverage)
Physical Health	Violated (SW $p = .017$, KS $p = .022$)	Violated ($p < .001$)	Violated (DW = 1.197)	Violated (Cook's D $n = 11$, Leverage $n = 7$)
Psychological	Violated (SW $p = .002$, KS $p = .009$)	Violated ($p = .002$)	Violated (DW = 1.122)	Violated (Cook's D $n = 6$, Leverage $n = 7$)
Social Relationships	Violated (KS $p = .020$); Met (SW $p = .135$)	Met ($p = .123$)	Met (DW = 1.559)	Violated (Cook's D $n = 7$, Leverage $n = 7$)
Environment	Met (SW $p = .094$, KS $p = .107$)	Violated ($p = .024$)	Violated (DW = 1.190)	Violated (Cook's D $n = 4$, Leverage $n = 7$)

Note: OLS = ordinary least squares. SW = Shapiro-Wilk normality test (threshold: $p > .05$). KS = Kolmogorov Smirnov/Lilliefors test (threshold: $p > .05$). BP = Breusch-Pagan heteroscedasticity test (threshold: $p > .05$). DW = Durbin-Watson statistic for independence of errors (acceptable range: 1.5–2.5; Durbin & Watson, 1951). Cook's D = Cook's distance for influential cases (threshold: $4/n$). Leverage = hat-value threshold ($2(k+1)/n$).

In the environment domain, the residuals largely met expectations for normality. However, there was still evidence of uneven error variance and possible dependence among errors. A small number of influential cases were also identified. Although this model showed fewer issues than the others, these remaining concerns suggest caution when interpreting standard regression results. This supports Amado et al. (2023), who showed that robust regression methods remain reliable even when standard assumptions such as equal error variance are violated or when outliers and influential cases are present.

MM-Estimator Robust Regression Model Summary

Robust regression was applied to address the assumption violations identified earlier, producing more stable estimates that are less affected by outliers and other data irregularities.

Table 5. MM-Estimator Robust Regression Model Summary

Outcome	Robust R^2	Adj. R^2	F	P	Sig	Scale
Physical Health	0.255	0.218	7.892	< 0.001	**	12.859
Psychological	0.114	0.070	2.802	0.009	**	18.400
Social Relationships	0.194	0.155	3.831	< 0.001	**	15.620
Environment	0.105	0.061	1.970	0.063	ns	18.356

Note: Robust R^2 = variance explained under robust estimation; Adj. R^2 = adjusted for number of predictors; F = Wald F-test with HC3 standard errors; Scale = robust residual scale (lower = better fit); ** $p < .01$; ns = not significant.

Among the four domains, physical health showed the strongest model performance. It accounted for 25.5% of the variation in scores (Robust $R^2 = 0.255$) and was statistically significant ($F = 7.892$, $p < .001$), indicating that self-care and self-efficacy are important predictors of physical well-being. The psychological domain was also statistically significant ($F = 2.802$, $p = .009$), although it explained a smaller proportion of variance (Robust $R^2 = 0.114$). This suggests that the predictors have a more limited but still meaningful effect on psychological well-being. For the social relationships domain, the model remained statistically significant ($F = 3.831$, $p < .001$) and explained about 19.4% of the variance (Robust $R^2 = 0.194$). This reflects a moderate association between self-care, self-efficacy, and social functioning.

Dietary control and glucose regulation emerged as key behavioral predictors of quality of life, underscoring the importance of prioritizing these behaviors in community-based diabetes interventions. Local health centers may strengthen diabetes programs by focusing on dietary adherence and effective glucose regulation as essential components of daily disease management. In contrast, the environment domain was not statistically significant ($F = 1.970$, $p = .063$), although it explained 10.5% of the variance. This indicates that the predictors in the model were not sufficient to reliably explain variations in environmental quality of life. This result is consistent with Harb et al. (2025), who found that environmental quality of life is more strongly shaped by broader socioeconomic and contextual factors such as income, employment, marital status, comorbid conditions, and glycemic control rather than by self-management alone. This suggests that environmental well-being may depend more on external life circumstances than on personal behavioral factors.

Robust Regression Coefficients for Predicting Physical Health QoL

The model was statistically significant, $F = 7.892$, $p < .001$, explaining 25.5% of the variance in physical health-related QoL ($R^2 = 0.255$), which interpreted as physical health quality of life to a fair extent. Two predictors were significant. Dietary control was positively associated with physical health QoL ($b = 2.639$, $\beta = 0.232$, $p = .026$), suggesting that better adherence to dietary guidelines is linked to improved physical well-being. This may be because proper diet management supports stable energy levels, better metabolic outcomes, and fewer diabetes-

related complications, which enhance overall physical functioning.

Table 6. Robust Regression Coefficients for Predicting Physical Health QoL

Predictor	B	β	SE	t	p	Sig	95% Boot CI
(Intercept)	13.967		8.711	1.603	0.111	ns	
Dietary Control	2.639	0.232	1.176	2.244	0.026	*	[0.451, 5.234]
Glucose Management	2.046	0.257	0.873	2.343	0.021	*	[0.313, 3.869]
Physical Activity	-1.250	-0.184	0.843	-1.483	0.140	ns	[-3.087, 0.503]
Physician Contact	1.130	0.127	0.938	1.204	0.231	ns	[-0.460, 2.949]
Managing Psychosocial	-0.790	-0.036	3.281	-0.241	0.810	ns	[-8.408, 6.489]
Assessing Dissatisfaction	8.453	0.342	4.556	1.855	0.066	ns	[-0.888, 17.615]
Setting & Achieving Goals	-2.067	-0.091	3.029	-0.682	0.496	ns	[-9.239, 7.372]

Note: b = unstandardized coefficient: the expected change in the QoL score for a one-unit increase in the predictor, holding all others constant; β = standardized coefficient: allows comparison of predictor strength across different scales; SE = robust standard error; t = robust t-statistic; 95% Boot CI = bootstrap percentile confidence interval (B = 1,000).

Glucose management also significantly predicted physical health QoL ($b = 2.046$, $\beta = 0.257$, $p = .021$), indicating that respondents who regulate their blood sugar more effectively tend to report better physical health. Effective glycemic control reduces symptoms and long-term complications, improving daily functioning and health perception. The other predictors, including physical activity, physician contact, and psychosocial management-related subscales, were not significant. Although assessing dissatisfaction showed a relatively large coefficient, its effect was not statistically significant, likely due to high variability in responses as reflected in the wide confidence interval. The results suggest that diet and glucose-related self-care behaviors are the most influential contributors to physical health QoL in this model. This is consistent with a previous study by Wan et al. (2016), which showed that poor dietary control and inadequate glycemic regulation are associated with reduced physical functioning and daily activity limitations.

Robust Regression Coefficients for Predicting Psychological QoL

Among the predictors, only glucose management significantly predicted psychological QoL ($b = 2.576$, $\beta = 0.254$, $p = .040$, 95% Boot CI [0.140, 5.555]). This suggests that better blood glucose control is linked to improved psychological well-being. This may be because maintaining stable glucose levels helps reduce physical symptoms such as fatigue and irritability, which can negatively affect mood. It may also enhance a person's sense of control over their condition, lowering stress and emotional burden. Dietary control showed a near-significant effect ($p = .058$), indicating a possible positive relationship with psychological QoL. This could be explained by healthy eating supporting more stable glucose levels, which may contribute to better emotional balance, although sample size or variability may have influenced the result. This result corroborates the study of Lucena et al. (2026), which found that respondents with type 2 diabetes mellitus experience reduced psychological quality of life, as poor glucose management is associated with increased emotional distress, heightened worry, and diminished perceived well-being.

Table 7. Robust Regression Coefficients for Predicting Psychological QoL

Predictor	B	β	SE	t	p	Sig	95% Boot CI
(Intercept)	33.151		12.385	2.677	0.008	**	
Dietary Control	3.164	0.219	1.654	1.913	0.058	ns	[0.052, 5.887]
Glucose Management	2.576	0.254	1.241	2.076	0.040	*	[0.140, 5.555]
Physical Activity	-0.982	-0.113	1.192	-0.824	0.411	ns	[-3.458, 1.553]
Physician Contact	-1.057	-0.093	1.326	-0.797	0.427	ns	[-3.505, 1.177]
Managing Psychosocial	8.802	0.313	4.639	1.897	0.060	ns	[-1.581, 18.084]
Assessing Dissatisfaction	-9.426	-0.299	6.425	-1.467	0.145	ns	[-20.572, 2.069]
Setting & Achieving Goals	2.474	0.085	4.221	0.586	0.559	ns	[-5.457, 11.291]

Note: b = unstandardized coefficient: the expected change in the QoL score for a one-unit increase in the predictor, holding all others constant; β = standardized coefficient: allows comparison of predictor strength across different scales; SE = robust standard error; t = robust t-statistic; 95% Boot CI = bootstrap percentile confidence interval (B = 1,000).

Moreover, the remaining subscales were not significant, suggesting that psychological well-being may be more closely influenced by direct metabolic control, particularly glucose regulation, rather than other self-care behaviors that may have more indirect or long-term effects. Overall, the findings emphasize glucose management as an important factor in psychological quality of life among respondents with type 2 diabetes, consistent with research showing that poor glycemic control is associated with increased emotional distress and reduced well-being.

Robust Regression Coefficients for Predicting Social Relationship QoL

The robust regression model for the social relationship domain was statistically significant, $F(7, 142) = 3.831$, $p < .001$, with a moderate effect size ($R^2 = 0.194$). This shows that the combined self-care behaviors account for a meaningful proportion of variation in social relationship QoL. Dietary control was a significant positive predictor ($b = 3.037$, $\beta = 0.225$, $p = .030$, 95% Boot CI [0.388, 5.865]). This suggests that better adherence to dietary recommendations is linked to improved social functioning. Proper dietary habits help prevent complications and physical discomfort, allowing respondents to participate more actively in social activities and interact more comfortably with others.

Table 8. Robust Regression Coefficients for Predicting Social Relationship QoL

Predictor	B	β	SE	t	P	Sig	95% Boot CI
(Intercept)	13.469		10.380	1.298	0.197	ns	
Dietary Control	3.037	0.225	1.388	2.189	0.030	*	[0.388, 5.865]
Glucose Management	2.757	0.292	1.040	2.651	0.009	**	[0.883, 4.631]
Physical Activity	-1.561	-0.193	1.003	-1.556	0.122	ns	[-3.653, 0.501]
Physician Contact	-0.413	-0.039	1.128	-0.366	0.715	ns	[-2.499, 2.157]
Managing Psychosocial	5.994	0.228	3.889	1.541	0.126	ns	[-1.688, 14.336]
Assessing Dissatisfaction	-2.394	-0.082	5.406	-0.443	0.659	ns	[-13.757, 7.421]
Setting & Achieving Goals	3.443	0.127	3.524	0.977	0.330	ns	[-3.228, 11.087]

Note: b = unstandardized coefficient: the expected change in the QoL score for a one-unit increase in the predictor, holding all others constant; β = standardized coefficient: allows comparison of predictor strength across different scales; SE = robust standard error; t = robust t-statistic; 95% Boot CI = bootstrap percentile confidence interval ($B = 1,000$).

Glucose management was also a significant predictor ($b = 2.757$, $\beta = 0.292$, $p = .009$, 95% Boot CI [0.883, 4.631]). This indicates that respondents with better blood sugar control tend to have stronger social relationships. This may be because more stable energy levels and fewer diabetes-related symptoms support consistent social engagement and reduce disruptions such as fatigue or illness episodes. These results are supported by Khunkaew et al. (2019), who reported that poor blood glucose control and unhealthy dietary practices are linked to increased diabetes-related complications and greater treatment burden. These conditions can reduce energy levels, limit mobility, and disrupt daily functioning, which may hinder social participation and place strain on social relationships. The other predictors were not significant, suggesting they may have less direct influence on social relationship QoL. The findings highlight dietary control and glucose management as key factors in maintaining better social quality of life, as improved disease management reduces physical limitations.

Robust Regression Coefficients for Predicting Environmental QoL

The robust regression model for the environmental domain was not statistically significant, $F(7, 142) = 1.970$, $p = .063$, with a small effect size ($R^2 = 0.105$), indicating that the predictors explained only a limited portion of the variance in environmental QoL.

Table 9. Robust Regression Coefficients for Predicting Environmental QoL

Predictor	B	β	SE	t	P	Sig	95% Boot CI
(Intercept)	28.170		12.441	2.264	0.025	*	
Dietary Control	2.595	0.179	1.655	1.569	0.119	ns	[-0.653, 5.388]
Glucose Management	1.938	0.191	1.245	1.557	0.122	ns	[-0.704, 4.685]
Physical Activity	-0.545	-0.063	1.191	-0.458	0.648	ns	[-2.801, 2.009]
Physician Contact	-1.806	-0.158	1.323	-1.365	0.174	ns	[-4.058, 0.149]
Managing Psychosocial	8.409	0.298	4.629	1.817	0.071	ns	[-1.512, 17.345]
Assessing Dissatisfaction	-4.606	-0.146	6.414	-0.718	0.474	ns	[-17.159, 7.363]
Setting & Achieving Goals	0.850	0.029	4.205	0.202	0.840	ns	[-6.623, 10.394]

b = unstandardized coefficient: the expected change in the QoL score for a one-unit increase in the predictor, holding all others constant; β = standardized coefficient: allows comparison of predictor strength across different scales; SE = robust standard error; t = robust t-statistic; 95% Boot CI = bootstrap percentile confidence interval ($B = 1,000$).

None of the respondents' subscales were significant predictors, suggesting that self-care behaviors such as dietary control, glucose management, physical activity, and related psychosocial factors do not meaningfully influence environmental quality of life. This implies that environmental QoL is less affected by personal self-management and is more likely shaped by external conditions. This result corroborates Habibi et al. (2022), who emphasized that environmental quality of life is less responsive to self-care behaviors and is more strongly determined by socioeconomic and structural factors beyond the patient's control. This implies that improvements in quality of life are most strongly driven by prioritizing high-impact behaviors, particularly dietary adherence and glucose regulation as core components of daily disease management.

Conclusion

This study strengthens the existing evidence on diabetes care by demonstrating the role of self-management behaviors in shaping the quality of life of adults with Type 2 Diabetes Mellitus (T2DM). Among the behaviors examined, dietary control and glucose management were key predictors of quality of life, reinforcing that effective diabetes management involves more than pharmacological and clinical treatment. It also requires individuals to consistently practice appropriate self-care behaviors. These findings support the development of patient-centered interventions that emphasize healthy dietary practices and effective glucose regulation as essential elements of everyday diabetes management.

The findings also provide relevant implications for healthcare practice, policy, and professional education. Nurses, physicians, diabetes educators, and other healthcare professionals can incorporate these findings into community-based interventions that promote dietary adherence, glucose monitoring, patient education, counseling, and ongoing self-management support. Local health centers may prioritize these behaviors when designing diabetes programs to improve health outcomes and quality of life. At the policy level, diabetes programs should integrate behavioral and clinical approaches by improving access to diabetes education, nutritional counseling, self-monitoring resources, and community-based support. Policies should also recognize social, economic, and environmental conditions that may affect an individual's capacity to maintain effective diabetes self-care. Similarly, academic and professional training programs may strengthen their emphasis on patient empowerment to prepare healthcare providers for holistic and patient-centered diabetes care.

The methodological approach also contributes by demonstrating the usefulness of MM-estimator robust multiple regression with bootstrapped confidence intervals in identifying predictors while accounting for potential non-normality and influential observations. This analytical approach may provide a useful framework for future community-based and regional public health research involving similar data characteristics.

Future research may examine the relationships among self-care behaviors, self-efficacy, and quality of life through longitudinal and intervention-based designs. Further studies may also consider the effects of social support, health literacy, healthcare accessibility, and socioeconomic conditions on diabetes self-management and quality of life. Research involving different populations and geographic areas may provide additional evidence for developing culturally appropriate, sustainable, and context-specific diabetes interventions.

Contributions of Authors

The main author led the study, including conceptualization, methodology, data collection, formal analysis, and manuscript drafting, and both authors contributed equally to critical revision and refinement.

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Conflict of Interests

The authors declare no known competing financial interests or personal relationships that could have influenced the work reported in this study.

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