



Factors influencing health-related quality of life among people with uncontrolled type II diabetes mellitus in Wenzhou, China: A cross-sectional study

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Abstract

Background: China has a high prevalence of Type 2 Diabetes Mellitus (T2DM), and more than half of the population has uncontrolled blood sugar levels. As a result, this leads to a reduction in health-related quality of life (HRQOL). Therefore, identifying the factors that influence HRQOL in individuals with uncontrolled T2DM is a clinical priority.

Objectives: This study aimed to describe the level of HRQOL among people with uncontrolled T2DM in Wenzhou, China, and to examine the predictive factors, including social support, diabetes distress, self-efficacy, and health literacy, in relation to HRQOL among these individuals.

Methods: This predictive correlational study used a simple random sampling technique to recruit 107 adults with uncontrolled T2DM from the Endocrinology outpatient department at the First Affiliated Hospital of Wenzhou Medical University in Wenzhou, China, between August and September 2024. Data were collected through questionnaires and standardized tools to assess the correlation between HRQOL, social support, health literacy, self-efficacy, and diabetes distress. Data were analyzed using descriptive statistics and multiple regression analysis.

Results: The HRQOL in this study was moderate (Mean = 3.34, SD = 0.31). Significant factors associated with HRQOL were health literacy ($r = 0.819$, $p < 0.01$), self-efficacy ($r = 0.825$, $p < 0.01$), and social support ($r = 0.477$, $p < 0.01$). All predictor variables in the regression model collectively explained 79.8% of the variance in HRQOL among individuals with uncontrolled T2DM. Furthermore, health literacy ($\beta = 0.426$, $p < 0.001$), self-efficacy ($\beta = 0.463$, $p < 0.001$), and social support ($\beta = 0.130$, $p = 0.009$) were significant predictors of HRQOL.

Conclusion: Enhancing health literacy, self-efficacy, and social support is crucial for improving HRQOL. Healthcare professionals and nurses should develop and implement intervention programs that help individuals and families enhance their critical thinking abilities and adopt lifestyles that support disease management and improve HRQOL.

Keywords

China; type 2 diabetes mellitus; health-related quality of life; social support; health literacy; self-efficacy; diabetes distress

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Background

Type 2 Diabetes Mellitus (T2DM) is a worldwide public health concern, with uncontrolled blood sugar levels contributing to severe complications and decreased health-related quality of life (HRQOL) (Alsayed Hassan et al., 2022; Kang et al., 2021; Papatheodorou et al., 2018; Teli et al., 2023). In 2021, the global prevalence of diabetes among individuals aged 20 to 79 was estimated at 10.5% (536.6 million people), projected to rise to 12.2% (783.2 million) by 2045 (Sun et al., 2022). In China, where the diabetes prevalence is 13% (International Diabetes Federation, 2024), 90% of patients have T2DM, and more than 50% have uncontrolled blood sugar levels (Chinese Diabetes Society, 2021). Uncontrolled T2DM presents both a

significant risk factor for the progression of diabetic complications and a major public health challenge (Haghighatpanah et al., 2018). Understanding the factors influencing HRQOL is essential for improving patient outcomes and healthcare strategies.

Health-related quality of life reflects an individual's well-being across physical, mental, social, and self-perceived health dimensions, as influenced by therapeutic interventions (Karimi & Brazier, 2016). It can be used as a tool to evaluate health outcomes and the effectiveness of interventions related to chronic health conditions (Oluchi et al., 2021), serving as an essential health outcome indicator (Teli et al., 2023).

Our study is guided by the HRQOL model of Ferrans et al. (2005) and relevant literature. The model begins with

biological function and links sequentially through symptoms, functional status, general health perception, and ultimately, overall quality of life. All of these aspects are influenced by the characteristics of the individual and the environment, highlighting that individual and environmental factors have multiple impacts on health outcomes (Ferrans et al., 2005).

A comprehensive literature review reveals that, while existing research has established that demographic and clinical factors significantly affect the HRQOL of T2DM patients (Teli et al., 2023; Zare et al., 2020; Zeng et al., 2023), the influence of social support, self-efficacy, diabetes distress, and health literacy on HRQOL among patients with uncontrolled T2DM remains limited in China. Therefore, this study identifies these four factors as independent variables. Based on the HRQOL model of Ferrans et al. (2005), social support falls under environmental characteristics, while self-efficacy, health literacy, and diabetes distress are classified as individual characteristics, all of which can directly affect HRQOL.

Several studies have identified social support, health literacy, self-efficacy, and diabetes distress as predictors of HRQOL in T2DM patients (Gaffari-Fam et al., 2020; Nacanabo et al., 2021; Sari et al., 2021; Teli et al., 2023). However, these studies predominantly focus on populations in Western or urbanized settings, with limited research conducted in the Chinese context. In China, due to differing policies and unbalanced regional economic development, T2DM patients receive varying levels of medical care (Li et al., 2018; Luo et al., 2019). This unequal healthcare access and management result in low diabetes awareness, suboptimal treatment adherence, and poor disease control (Chinese Diabetes Society, 2021; Luo et al., 2019).

Additionally, differing from Western dietary habits, traditional Chinese cuisine is rich and often high in fat (Li et al., 2022). Moreover, inappropriate behaviors among T2DM patients in China, such as smoking and insufficient physical activity, are quite common (Li et al., 2022; Wang et al., 2021). These differences may uniquely influence HRQOL, making it more urgent to understand HRQOL and its predictors in China. This understanding will help nurses provide tailored interventions and education programs to improve HRQOL among the Chinese population and offer valuable data to support China's T2DM management and care.

Furthermore, studies specifically targeting patients with uncontrolled T2DM remain scarce. While many Chinese studies focus on QOL and its related factors among general T2DM patients (Jing et al., 2018; Li & Tong, 2023; Wang et al., 2024; Zhang et al., 2020), there is a lack of research specifically addressing HRQOL among patients with uncontrolled T2DM. As such, the HRQOL level and its influencing factors among uncontrolled T2DM patients in Wenzhou, China, remain unclear due to limited data and research.

To address this gap, our study aims to describe the HRQOL level among people with uncontrolled T2DM in Wenzhou, China. Additionally, the study seeks to examine the predictive relationships among social support, diabetes distress, self-efficacy, health literacy, and HRQOL in this population. The results of this study may provide empirical evidence on HRQOL among people with uncontrolled T2DM,

enhancing nurses' professional proficiency and evidence-based nursing capabilities.

Methods

Study Design

This study employed a predictive correlational design to explore the factors influencing HRQOL among individuals with uncontrolled T2DM.

Sample/Participants

Participants were individuals diagnosed with T2DM, with glycosylated hemoglobin (HbA1c) levels greater than 7%, receiving treatment at the Endocrinology Outpatient Department of the First Affiliated Hospital of Wenzhou Medical University from August to September 2024. Inclusion criteria required participants to be over 18 years of age, have a stable condition, a clear mental state, no history of mental illness, and the ability to read and write Mandarin.

Additionally, participants must not have any acute diabetes-related complications. The exclusion criteria included individuals with a Mini-Cog score less than 3, indicating cognitive impairment (Borson, 2024), and those with comorbidities such as cancer, mental illness, hypertension, heart disease, kidney disease, or thyroid disorders.

The sample size was calculated using the G*Power program, based on a medium effect size of 0.13 (Ellis, 2010), a power of 0.80, and a significance level of 0.05. The minimum required sample size was determined to be 97 participants. To account for the possibility of incomplete data, 10% was added to the sample size (Little & Rubin, 2019), resulting in a total of 107 participants. This calculation ensured that the study was adequately powered to detect significant effects, minimizing the risk of Type II errors. Choosing a medium effect size also balanced the feasibility of participant recruitment with clinical relevance, which is particularly important in settings where resources may be limited.

Instruments

One instrument was used to screen participants' cognitive ability, and six instruments were used to collect data. With the exception of the demographic questionnaire, all instruments used the Chinese versions and were employed with the authors' permission. These scales had been previously validated in Chinese populations and demonstrated strong reliability.

The demographic questionnaire, developed by the researcher, consisted of two sections. The general information section collected data on gender, age, education level, marital status, living conditions, individual monthly income, and working status. The health information section included duration of T2DM diagnosis, number of complications, diabetic medication, current HbA1c level, and body mass index (BMI). General information was self-reported by participants, while health data were obtained from medical records.

The Chinese version of the Perceived Social Support Scale, translated by Jiang (2012) from the original developed by Zimet et al. (1988), was used to assess social support. This 12-item scale measures support from significant others, family, and friends. The total score ranges from 12 to 84, with higher scores indicating greater perceived support. Scores are

classified into low (12–36), moderate (37–60), and high (61–84) support. Cronbach's alpha for this study was 0.720.

The Chinese version of the Diabetes Distress Scale, translated by [Zhang et al. \(2022\)](#) and originally developed by [Fisher et al. \(2008\)](#), was used to measure diabetes-related distress. It consists of 17 items across four dimensions: emotional distress, physician-related distress, regimen-related distress, and diabetes-related personal distress. Mean scores range from 1 to 6 and are interpreted as follows: scores below 2.00 indicate little or no distress, 2.00 to 2.90 indicate moderate distress, and 3.00 or above indicate high distress. Cronbach's alpha for this study was 0.708.

The Chinese version of the Diabetes Management Self-Efficacy Scale (DMSES), translated by [Wu et al. \(2008\)](#) from the original developed by [Bijl et al. \(1999\)](#), was used to measure participants' self-efficacy. The scale contains 20 items across four domains: nutrition, blood sugar and foot checks, physical exercise and weight, and medical treatment. The total score ranges from 0 to 200, with higher scores reflecting greater self-efficacy. The Cronbach's alpha for this study was 0.727.

Health literacy was assessed using the Chinese version of the Health Literacy Scale, translated by [Zhao et al. \(2021\)](#) from the original developed by [Ishikawa et al. \(2008\)](#). This 14-item scale includes three dimensions: functional, communicative, and critical health literacy. The total score ranges from 14 to 56, with higher scores indicating better health literacy. Cronbach's alpha for this study was 0.893.

HRQOL was measured using the Chinese version of the Brief Diabetes Quality of Life Questionnaire, translated by [Tang et al. \(2020\)](#) from the original developed by [Burroughs et al. \(2004\)](#). The scale includes 15 items scored on a 5-point Likert scale, with responses ranging from "Very Dissatisfied" to "Very Satisfied" or "All the Time" to "Never." The average score ranges from 1 to 5, with scores between 1 and 1.5 indicating low HRQOL, 1.5 to 4.5 indicating moderate HRQOL, and 4.5 to 5 indicating high HRQOL. Cronbach's alpha in this study was 0.705.

The Mini-Cog test, developed by [Borson \(2024\)](#), was used to screen cognitive function in participants aged over 60. The total score ranges from 0 to 5, with scores of 0 to 2 indicating cognitive impairment and scores of 3 to 5 suggesting a low likelihood of impairment.

Data Collection

Data were collected by the researcher at the Endocrinology Outpatient Department of the First Affiliated Hospital of Wenzhou Medical University in Wenzhou, China. Participants were selected through simple random sampling by preparing two identical pieces of paper labeled "odd" and "even." These were placed in a container and mixed thoroughly each day. The researcher then drew one paper and selected participants with corresponding queue numbers (odd or even), recruiting 8 to 10 individuals per day. Before data collection, participants were informed about the purpose, procedures, and content of the study. Written informed consent was obtained, and participants completed the self-administered questionnaires in a private room with ample time. The researcher checked each questionnaire for completeness upon submission.

Data Analysis

SPSS version 26.0 was used for data analysis. The statistical significance level was set at 0.05. Descriptive statistics were used to summarize demographic characteristics, independent variables, and the dependent variable. Pearson correlation analysis was conducted to examine relationships among study variables. Multiple regression analysis using the Enter method was applied to identify factors influencing HRQOL in patients with uncontrolled T2DM.

Assumptions for multiple regression were tested and met. The Kolmogorov-Smirnov test confirmed normal distribution with a significance value greater than 0.05. The Durbin-Watson value was 1.744, indicating no autocorrelation. Collinearity statistics showed tolerance values of 0.807 for social support, 0.463 for health literacy, 0.475 for self-efficacy, and 0.922 for diabetes distress. Corresponding VIF values were 1.239, 2.161, 2.107, and 1.085, respectively, indicating no multicollinearity. Cook's distance was less than 1, and standardized residuals were within ± 3 , indicating no outliers in the dataset.

Ethical Consideration

Ethical approval was obtained from the ethics committees of Burapha University, Thailand (No. G-HS039/2567), and the First Affiliated Hospital of Wenzhou Medical University, China (No. KY2024-150). Participants were informed of the study's purpose, benefits, and lack of associated risks. They were assured of their right to withdraw from the study at any point without explanation or impact on their medical care. Informed consent was obtained from all participants prior to data collection.

Results

Description of Participant Characteristics

In the current study, 107 participants with uncontrolled type 2 diabetes mellitus (T2DM) were involved, consisting of 58 males (54.2%) and 49 females (45.8%). The participants' ages ranged from 33 to 73 years, with a mean of 57.2 years ($SD = 8.55$). Regarding educational background, 35.5% of participants completed primary school, 35.5% completed secondary school, and 23.4% had attained a college degree or higher. Only 5.6% had not completed primary education. Most participants were married (96.3%), and 90.7% reported living with family members. In terms of monthly income, 51.4% earned between 3,000 and 4,999 RMB, while 33.7% earned less than 3,000 RMB. More than half of the participants (53.3%) were unemployed or retired ([Table 1](#)).

Health and Clinical Characteristics

The mean duration of T2DM among participants was 6.67 years ($SD = 4.10$). A total of 85.1% reported no diabetes-related complications, while 14% had one complication and 0.9% had two complications. The majority used oral medications (66.4%), followed by insulin (19.6%), and a combination of oral medication and insulin (14.0%). Most participants (61.7%) had a normal weight, and the mean HbA1c level was 9.48%. Notably, 31.8% had an HbA1c level of 10.0% or higher ([Table 2](#)).

Table 1 Demographic characteristics of the participants (*N* = 107)

Characteristic	<i>n</i>	%
Age (<i>M</i> = 57.2, <i>SD</i> = 8.55, <i>Min</i> =33, <i>Max</i> =73)		
31–40	5	4.7
41–50	18	16.8
51–60	41	38.3
61–70	41	38.3
71–80	2	1.9
Gender		
Male	58	54.2
Female	49	45.8
Level of Education		
Less than primary	6	5.6
Primary school	38	35.5
Secondary school	38	35.5
Graduate and up	25	23.4
Marital Status		
Single	1	0.9
Married	103	96.3
Divorced/Widowed	3	2.8
Living Condition		
Living alone	6	5.6
Living with family	97	90.7
Living with friends/colleagues	4	3.7
Living with others	0	0
Individual Monthly Income		
< ¥3,000	36	33.7
¥3,000–4,999	55	51.4
¥5,000–10,000	15	14.0
> ¥10,000	1	0.9
Working Status		
Employed	50	46.7
Unemployed/Retired	57	53.3

Table 2 Health and clinical characteristics of the participants (*N* = 107)

Characteristics	<i>n</i>	%
Duration of T2DM (years) (<i>M</i> = 6.67, <i>SD</i> = 4.10, <i>Min</i> =1, <i>Max</i> = 20)		
1–5	47	43.9
6–10	45	42.1
>10	15	14.0
Number of Complications		
0	91	85.1
1	15	14.0
2	1	0.9
3 or more	0	0
Medication		
Oral medication	71	66.4
Insulin	21	19.6
Both oral medication and insulin	15	14.0
Latest HbA1c (%)		
7.0–7.9	27	25.2
8.0–8.9	22	20.6
9.0–9.9	24	22.4
≥ 10.0	34	31.8
BMI (kg/m²)		
Underweight (<18.5)	4	3.7
Normal weight (18.5–24.9)	66	61.7
Overweight (25–29.9)	34	31.8
Obesity Class 1 (30–34)	3	2.8

Description of HRQOL in Uncontrolled T2DM Patients

The average HRQOL score among participants was moderate, with a mean of 3.34 (*SD* = 0.31), ranging from 2.73 to 4.07. The mean scores of the independent variables were

as follows: social support at 58.07 (*SD* = 2.89), health literacy at 26.63 (*SD* = 6.68), self-efficacy at 119 (*SD* = 16.68), and diabetes distress at 1.80 (*SD* = 0.16) ([Table 3](#)).

Table 3 Descriptive characteristics of the study variables ($N = 107$)

Study Variables	Possible Score	Actual Score	Mean	SD
HRQOL	1–5	2.73–4.07	3.34	0.31
Social support	12–84	52–64	58.07	2.89
Health literacy	14–56	14–42	26.63	6.68
Self-efficacy	0–200	91–159	119.00	16.68
Diabetes distress	1–6	1.41–2.12	1.80	0.16

Correlations of Selected Factors with HRQOL

As shown in [Table 4](#), HRQOL was significantly and positively correlated with health literacy ($r = 0.819$, $p < 0.01$), self-efficacy

($r = 0.825$, $p < 0.01$), and social support ($r = 0.477$, $p < 0.01$). Conversely, diabetes distress was negatively correlated with HRQOL ($r = -0.249$, $p < 0.01$).

Table 4 Correlation matrix of predictors and HRQOL ($N = 107$)

	HRQOL	DDS	HL	SE	SS
HRQOL	1				
Diabetes distress (DDS)	-0.249**	1			
Health literacy (HL)	0.819**	-0.217*	1		
Self-efficacy (SE)	0.825**	-0.155	0.717**	1	
Social Support (SS)	0.477**	-0.244*	0.383**	0.370**	1

Note: ** $p < 0.01$; * $p < 0.05$

Predictive Power of Selected Factors for HRQOL

Multiple regression analysis revealed that HRQOL in individuals with uncontrolled T2DM was significantly predicted by health literacy ($\beta = 0.426$, $p < 0.001$), self-efficacy ($\beta = 0.463$, $p < 0.001$), and social support ($\beta = 0.130$, $p = 0.009$). Diabetes distress, however, was not a significant predictor ($\beta = -0.053$, $p = 0.244$). Together, these variables explained 79.8% of the variance in HRQOL ($Adjusted R^2 = 0.798$, $F_{(4, 102)}$

$= 105.867$, $p < 0.001$). Among the predictors, self-efficacy was the strongest, indicating that for each 1-point increase in self-efficacy, HRQOL increased by 0.463 points. Health literacy also had a strong influence, with a 1-point increase predicting a 0.426-point rise in HRQOL. Social support contributed more modestly, with each 1-point increase associated with a 0.130-point gain in HRQOL ([Table 5](#)).

Table 5 Summary of regression analysis predicting HRQOL In people with uncontrolled T2DM ($N = 107$)

Predictor	B	SE	β	t	p-value	95% CI (Lower–Upper)
Social support	0.014	0.005	0.130	2.670	0.009	0.004–0.024
Health literacy	0.020	0.003	0.426	6.642	<0.001	0.014–0.025
Self-efficacy	0.009	0.001	0.463	7.312	<0.001	0.006–0.011
Diabetes distress	-0.105	0.090	-0.053	-1.173	0.244	-0.283–0.073
Constant = 0.898; $R^2 = 0.806$; $Adjusted R^2 = 0.798$; $F_{(4, 102)} = 105.867$; $p < 0.001$						

Discussion

The study revealed moderate HRQOL among participants with uncontrolled T2DM ($M = 3.34$, $SD = 0.31$). This contrasts with [Lu et al. \(2017\)](#), whose findings in China, which reported a different HRQOL level. The discrepancy may be attributed to the distinct instruments used for measuring HRQOL across studies. Other tools include varied items and scoring standards, which affect the outcome. Additionally, differing inclusion criteria in both studies, despite focusing on T2DM populations, likely contributed to divergent results. The regression analysis indicated that social support, self-efficacy, and health literacy jointly explained 79.8% of the variance in HRQOL among people with uncontrolled T2DM in Wenzhou, China. These findings are supported by both empirical data and theoretical frameworks.

The results indicated that social support was at a moderate level among participants and served as a significant predictor of HRQOL. Social support, defined as perceived and actual support from one's environment ([Shao et al., 2017](#)), plays a pivotal role in enhancing diabetes self-management and self-care behaviors ([Gu et al., 2017](#); [Mohebi et al., 2018](#)). It facilitates the effective utilization of external resources,

improves therapeutic outcomes, mitigates disease burden, and enhances HRQOL ([Mohebi et al., 2018](#)). Family emerged as a vital component of social support. Our study showed that 90.7% of participants lived with family members, and 96.3% were married, conditions reflective of China's cultural emphasis on familial cohesion ([Liu et al., 2022](#)). In Chinese culture, family is a central support system in managing chronic illnesses like T2DM ([Li & Tong, 2023](#); [Yue et al., 2019](#)). Family involvement promotes adherence to healthy lifestyles, such as balanced diets and regular physical activity, and supports routine self-monitoring ([Zhao et al., 2022](#)). Even behaviors like nagging or complaining may effectively motivate T2DM management ([Zhao et al., 2022](#)). Better family support leads to improved compliance, emotional expression, and psychological well-being, ultimately enhancing HRQOL ([Mohebi et al., 2018](#); [Pazokian et al., 2020](#); [Shao et al., 2017](#); [Teli et al., 2023](#)).

Health literacy, defined as the ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions health ([Gaffari-Fam et al., 2020](#)), was found to significantly predict HRQOL. Individuals with high health literacy demonstrate better self-management, adherence to diabetic diets, improved

medication compliance, and healthier coping mechanisms (Chahardah-Cherik et al., 2018; Nacanabo et al., 2021; Vandenbosch et al., 2018). These outcomes affirm that health literacy plays a crucial role in improving HRQOL (Marciano et al., 2019).

The study revealed low levels of health literacy, consistent with Yu et al. (2021), who reported limited health literacy among Chinese T2DM patients. This may relate to participants' generally low educational attainment. Lower education levels affect individuals' ability to understand treatment, medication, and self-management requirements (Alsayed Hassan et al., 2022; Cravo et al., 2023; Ngoatle et al., 2023). Conversely, higher education correlates with better health comprehension, decision-making, and adherence to treatment (Abdullah et al., 2019; Tefera et al., 2020).

Cultural influences also impact health literacy in China. The hierarchical nature of Chinese society may prevent patients from actively communicating with healthcare providers due to concerns about disrespect (Levin-Zamir et al., 2017). Traditional beliefs about food, such as viewing rice and meat as healthy, may conflict with recommended diets, leading to resistance to dietary changes (Ormiston, 2023). These cultural barriers reduce health literacy and, in turn, negatively affect HRQOL.

Enhancing health literacy requires accessible communication. Health providers should use plain language and visual tools during consultations (Alsharbit & Alhalal, 2022; Xu et al., 2018). Nurses can tailor educational programs to patient needs, involve families, and use culturally sensitive materials (Butayeva et al., 2023). Community health workers can bridge linguistic and cultural gaps. For older or less-educated patients, interventions using local language, videos, and interactive sessions improve understanding (Butayeva et al., 2023; Seangpraw et al., 2023). Additionally, telephone follow-ups can reinforce learning and provide support (Butayeva et al., 2023).

Self-efficacy—the belief in one's ability to perform actions to achieve goals (Bandura, 1994)—was also a significant positive predictor of HRQOL. For individuals with T2DM, higher self-efficacy contributes to better medication adherence, self-care practices, and glycemic control, thereby improving HRQOL (Megasari Winahyu et al., 2019; Oluma et al., 2020; Tharek et al., 2018). These results support previous findings that link self-efficacy with better diabetes outcomes (Megasari Winahyu et al., 2019; Teli et al., 2023).

In the Chinese cultural context, where familial and community networks are central, self-efficacy is often reinforced by external support systems (Li & Tong, 2023; Yang et al., 2021; Yue et al., 2019). Future research could explore how cultural constructs directly influence self-efficacy in patients with uncontrolled T2DM in China.

Although diabetes distress was negatively correlated with HRQOL ($r = -0.249$, $p < 0.01$), it was not a significant predictor in the regression model. This finding contrasts with studies identifying diabetes distress as a significant predictor of HRQOL (Sari et al., 2021; Teli et al., 2023). One explanation is that distress may impact HRQOL through indirect pathways (Aliche & Idemudia, 2024). Moderate social support among participants likely buffered the effects of distress (Onu et al., 2022). Moreover, 85.1% of participants had no complications, and most were in a stable health condition (mean duration =

6.67 years, $SD = 4.10$), which may have minimized distress levels. The prevalence of distress was relatively low, with 85% of participants experiencing little or no distress, further explaining the lack of significant predictive power.

Advancements in diabetes treatment and management in China may also contribute to lower distress (Chinese Diabetes Society, 2021). While the national prevalence of diabetes distress is 34.64% (Zhang et al., 2024), aligning with global rates (Perrin et al., 2017), limited research exists on how Chinese culture specifically shapes distress. Future studies should explore this relationship more deeply.

The study demonstrated that social support, health literacy, and self-efficacy not only significantly predicted HRQOL but were also positively interrelated. This supports previous findings suggesting that social support can foster health literacy and self-efficacy (Chan et al., 2020; Rashid et al., 2018; Xu et al., 2018). Higher health literacy, in turn, enhances self-efficacy by equipping patients with the knowledge and confidence to engage in health-promoting behaviors (Panagiotidis et al., 2024; Xu et al., 2018), which positively impacts HRQOL.

Limitations

This study involved a relatively small sample size of 107 participants, all recruited from a single tertiary hospital in Wenzhou, China. As such, the findings may not be generalizable to patients with uncontrolled T2DM in other regions of China, especially areas with differing socioeconomic, cultural, or healthcare access conditions. Furthermore, the cross-sectional design limits the ability to draw causal inferences between the studied variables and HRQOL. Longitudinal studies are recommended to assess how social support, self-efficacy, and health literacy influence HRQOL over time. In addition, this study did not examine other potentially influential variables such as demographic factors (e.g., age, duration of diabetes, BMI), dietary habits, physical activity levels, or access to healthcare resources, all of which may significantly affect HRQOL. Future research could explore these variables to provide a more comprehensive understanding of the determinants of HRQOL in individuals with uncontrolled T2DM.

Implications and Recommendations

This study offers valuable insights into HRQOL among individuals with uncontrolled T2DM and suggests actionable steps for healthcare providers. Nurses and other healthcare professionals should develop and implement targeted intervention programs that emphasize the enhancement of health literacy and self-efficacy. By strengthening patients' understanding of diabetes and boosting their confidence in self-care, such programs can support the adoption of healthier lifestyles, improve medication adherence, raise awareness of HbA1c levels, and help patients achieve their treatment goals. Although diabetes distress was not a significant predictor of HRQOL in this study, it remains an important psychological factor that can impact disease management. Nurses should continue to assess patients for signs of diabetes distress and provide emotional support and health education to foster a positive outlook toward disease management. Future research should explore diabetes distress more deeply within the

Chinese cultural context to better understand its potential indirect effects on HRQOL.

Enhancing social support is also critical. Nurses can assess patients' social networks and help them connect with community resources and support groups. Strengthening family involvement and encouraging community participation can create a more supportive care environment that benefits disease management and overall quality of life. Moreover, interdisciplinary collaboration is essential for delivering comprehensive care. Nurses can work with psychologists, dietitians, community health workers, and other professionals to offer coordinated and holistic support. Regular follow-up and individualized care planning based on patient needs can lead to more effective interventions.

This multifaceted approach, centered on education, emotional support, social connection, and collaborative care, can help improve the HRQOL of people with uncontrolled T2DM and provide a robust framework for culturally sensitive diabetes management in China.

Conclusion

This study identified a moderate level of HRQOL among individuals with uncontrolled T2DM in Wenzhou, China, with social support, self-efficacy, and health literacy emerging as key predictors. These findings provide valuable insights for healthcare professionals, highlighting the importance of enhancing patients' health literacy, supporting their ability to identify health needs, and increasing their confidence in managing diabetes-related behaviors. By strengthening self-efficacy, these efforts can improve both disease management and HRQOL outcomes. The central role of family in Chinese culture underscores the importance of family support for patients with uncontrolled T2DM. In the context of Wenzhou, family members are pivotal in assisting with dietary management and promoting exercise routines. The findings emphasize the need to integrate family support into diabetes care strategies, aligning with traditional values and fostering improved disease outcomes. This study is the first to explore the predictors of HRQOL (social support, diabetes distress, self-efficacy, and health literacy) among individuals with uncontrolled T2DM in Wenzhou, China, and contributes to validating the HRQOL model of Ferrans et al. (2005) within the Chinese cultural context. The results demonstrate that social support, self-efficacy, and health literacy play significant roles in enhancing HRQOL, reinforcing their importance in the management of uncontrolled T2DM. The findings serve as a crucial reference for the development of targeted interventions aimed at improving HRQOL among people with uncontrolled T2DM, offering practical implications for healthcare management within the Chinese cultural context. By focusing on these predictors, healthcare providers can better tailor interventions to promote improved health outcomes for patients with uncontrolled T2DM.

Declaration of Conflicting Interest

No conflict of interest in this study to declare.

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Authors' Contributions

Huiwei Li, Saifone Mounikum, and Pornchai Jullamate contributed equally to the study's conception and design, data acquisition, and data analysis, wrote the first draft of the manuscript, revised the final draft, and gave final approval of the version to be published.

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Data Availability

The dataset generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Scientific Writing

Nothing to declare.

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