Review Article

Predicting Factors of Health-Related Quality of Life Among Adults With Type 2 Diabetes: A Systematic Review

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Abstract

Introduction: One of the most important outcomes of diabetes care and treatment is an improvement in patients' health-related quality of life (HRQoL).

Objective: This study aimed to review the empirical evidence regarding the predictors of HRQoL among adults with type 2 diabetes mellitus (T2DM).

Methods: To find all English-language articles published between 2012 and 2022, a comprehensive literature search was conducted using ProQuest, Scopus, PubMed, Science Direct, and CORE. Cross-sectional studies were the focus of this analysis. Search terms included "type 2 diabetes" OR "T2DM" AND "health-related quality of life" OR "HRQoL" AND ("predicting factors" OR "influencing factors" OR "associated factors"). The original search yielded a total of 1,089 studies, from which 35 met the review's inclusion criteria. The systematic review protocol was registered with PROSPERO CRD42023431229.

Results: The final analysis comprised 24,346 people with type 2 diabetes and used data from 35 cross-sectional studies conducted during the preceding decade. Socio-demographic factors (age, marital status, gender, monthly income, education, area of residence, and religiosity), patient-centered factors (diabetes knowledge and self-efficacy), disease characteristics (comorbidities, duration of diabetes, and insulin treatment), self-management behaviors (physical activity, medication adherence, and frequent glucose checks), and family support were found to be predictors of HRQoL.

Conclusion: A diabetes program to enhance the HRQoL among people with T2DM is highly encouraged to address these factors, which can be focused on promoting self-management behaviors, diabetes distress management, and encourage family support.

Keywords

type 2 diabetes, health-related quality of life, self-management , family support , systematic review

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Introduction

Diabetes is a chronic disorder that is frequently associated with many complications including blindness from diabetic retinopathy, kidney failure from diabetic nephropathy, nerve damage from diabetic neuropathy, heart disease, and amputation from diabetic foot ulcers (Pham et al., 2020; Wan et al., 2016). These difficulties affect one's mental and physical health, which in turn affects their personal and familial life (Al-Khaledi et al., 2018; Amelia et al., 2018; Hurtado & Vella, 2019), can affect mood, generating frustration and symptoms like depression (Zurita-cruz et al., 2018), leading to conflicts, and negatively affecting patients' health-related quality of life (HRQoL) (Natasya et al., 2018). Furthermore, the potential impact of treatment complexity on daily life and the potential for side effects of diabetes treatment work together to impair HRQoL (Oluchi

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et al., 2021). Type 2 diabetes (T2DM) negatively impacts HRQoL by impairing physical and mental well-being.

HRQoL is a subjective evaluation based on an individual's unique perspective, experiences, and goals (Wilson & Clearly, 1995). The term "health-related quality of life" is gaining popularity as an alternative to "quality of life." The phrase "quality of life" (QoL) is broad, encompassing an evaluation of how every facet of living contributes to one's well-being. This word is too general to be used for a healthcare claim, as it suggests the evaluation of life's non-health-related features. HRQoL's primary concern is with one's QoL as it pertains to one's health (Shamshirgaran et al., 2016). The disease-specific HRQoL assessments concentrate on features specific to diabetes (AL-Aboudi et al., 2015). A systematic review that assessed HRQoL measurements for diabetes revealed 17 specific measurements that are used worldwide (Oluchi et al., 2021). The study highlighted that the Audit of Diabetes-Dependent quality of life measure (ADDQOL), Appraisal of Diabetes Scale, Diabetes Impact Measurement Scales, Diabetes-Quality of Life Clinical Trial Questionnaire, Diabetes Quality of Life, Iranian Diabetes Quality of Life, Brief Clinical Inventory, and Problem Areas in Diabetes are applicable measures of HRQoL for type 1 and type diabetes and have good psychometric properties (Oluchi et al., 2021).

The HRQoL has been suggested as another important health outcome indicator. Several recent cross-sectional studies have identified factors influencing HRQoL in people with type 2 diabetes. A Chinese study indicated that older age, lower monthly family income, less physical activity, and the presence of multiple comorbidities were all related to lower HRQoL (Kang et al., 2021). Medication non-adherence was linked to worse HRQoL in both the physical and mental dimensions in another Pakistani investigation (Iqbal et al., 2017). Poorer health-related quality of life was also found to be significantly linked to longer diabetes duration (Barua et al., 2021; Tran Kien et al., 2021). Moreover, people with T2DM who are distressed frequently have poorer HRQoL (Onu et al., 2022). Uncontrolled blood sugar levels were observed to have a poor impact on HRQoL ($\beta = -4.29$) (Gebremariam et al., 2022).

Despite the existence of numerous primary reports that evaluated the predicting factors of HRQoL in adults with T2DM, little is known about studies that combine these influencing factors of HRQoL in adults with T2DM, especially metabolic factors, social supports, and extensive demographic factors. Multiple systematic reviews had been conducted; however, most studies focused on factors that affect the QoL (Fakhri et al., 2021; Jing et al., 2018). Hence, identifying predictors associated with HRQoL among people with T2DM can assist nurses in setting up appropriate interventions and may assist decision-makers in setting funding priorities and carrying out actions for improving HRQoL. Therefore, this systematic review is the first study that aims to explore the predicting factors of HRQoL of adults with T2DM.

Methods

Design

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were used to conduct this comprehensive literature evaluation (Figure 1). This study gained approval from an international prospectively registered protocol (PROSPERO CRD42023431229). This review was conducted on cross-sectional studies regarding the factors that predict HRQoL in those with T2DM. The research question is framed in terms of the PICO components. The research question is: "What are the predicting factors of health-related quality of life among adults with type 2 diabetes mellitus?."

Search Strategy

We conducted a comprehensive search of electronic databases for all English-language articles published between 2012 and 2022. Article searches were performed using the following databases: ProQuest, Scopus, PubMed, Science Direct, and CORE. Several trial searches were conducted to refine the search terms and to decide which term to use in the various databases. The searching terms were combined as the medical subject heading (MeSH) terms, text word, and BOELAN operator. Keywords searching is used as follows; ("type 2 diabetes OR "T2DM" AND "health-related quality of life" OR "HRQoL" AND "predicting factors" OR "predictors") (Supplemental File 1).

Inclusion and Exclusion Criteria

In order to qualify for inclusion in this review, studies had to meet the following criteria: (a) participants were adults (aged 18 years) with T2DM; (b) studies had to be conducted in English; (c) studies had to be cross-sectional; and (d) studies were primarily designed to examine predicting factors, associated factors, or influencing factors of HRQoL from different concepts/theories. Studies involving (a) pregnant women with gestational diabetes, type 1 diabetes, multiple chronic conditions, and pre-diabetes; and (b) abstracts, conference proceedings, reviews, letters, research monographs, editorials, and pooled analyses were not included.

Quality Appraisal

These articles' quality was evaluated using a 14-item checklist based on criteria proposed by the Critical Appraisal Skills Program Tools (CASP). The item received a score of "0" if it responded "NO" or "UNCLEAR"; a score of "1" was awarded if the item was "YES." The quality score for the

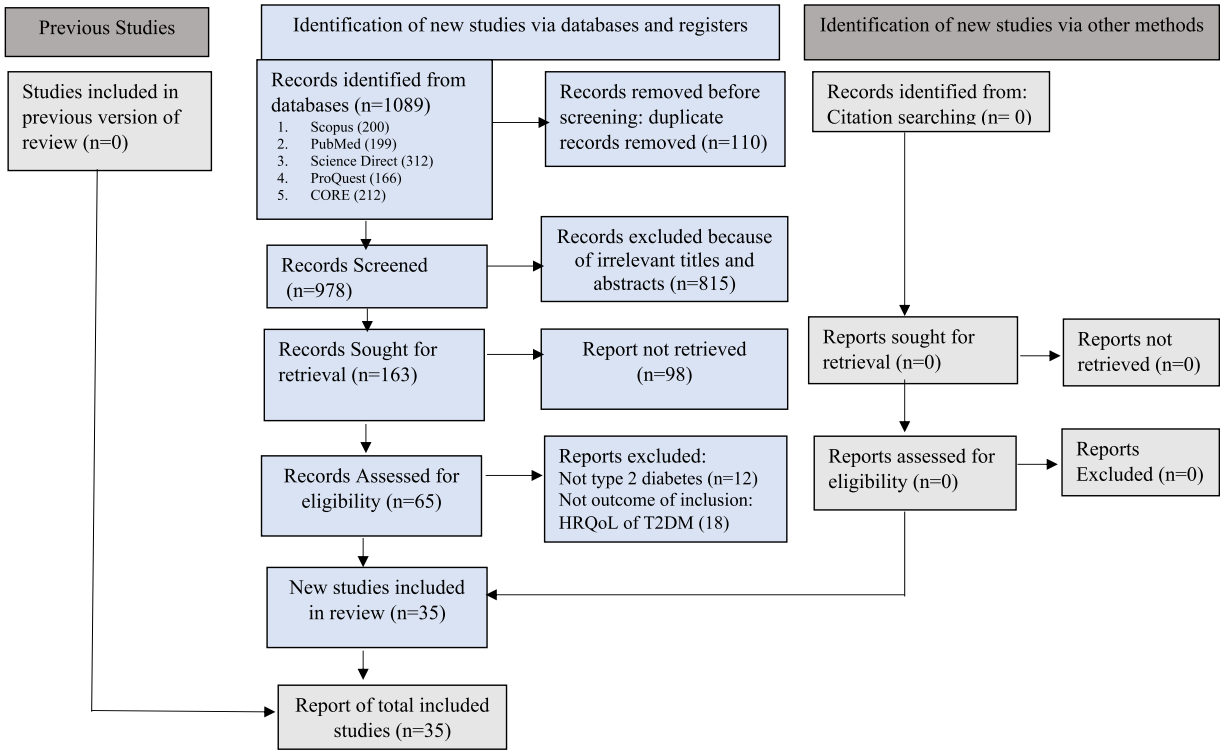

Figure 1. The PRISMA flowchat according to the new PRISMA Guidelines, 2021.

article was calculated as follows based on the results of the 14 evaluation criteria: 1–5 indicate low, 6–10 indicate moderate, and 11–14 indicate high quality (Supplemental File 2). The analysis would include high-quality publications. Following the search, 35 articles were added for analysis.

Data Extraction and Analysis

The four authors each performed their screening procedure. The results of the search were added to the Mendeley database. Both the titles and the abstracts and then the complete articles were screened separately using inclusion and exclusion criteria to narrow down the pool of potentially relevant studies. We omitted the articles that were not relevant. Studies that passed the first screening and were deemed relevant enough to warrant reading in full were subjected to a second screening. The full-text papers were checked by the authors to figure out if they fulfilled the requirements for inclusion. At last, the writers compared their findings and resolved their differences by reaching a consensus. The included articles were then extracted into a structured table including title, year of publication, authors, country, study design, sample size, HRQoL measurements, and the main findings (Table 1). Regarding the data analysis to determine the associated factors of HRQoL, the results were organized by socio-demographic factors, patient-centered factors, characteristics of diseases, self-management behaviors, psychological factors, social support, and metabolic factors.

Result

Search Outcomes

The databases CORE, ProQuest, Scopus, Science Direct, and PubMed were searched, yielding a total of 1,089 published papers. The articles were published between 2012 and 2022. Of these, 110 articles were excluded due to duplication across databases. After deleting duplications, 978 articles were screened. Of these, 815 articles were excluded because of irrelevant titles and abstracts. Then leaving 163 articles sought for retrieval, and then 98 articles were not retrieved. Finally, the systematic review included 35 papers that fulfilled the inclusion criteria after excluding for various reasons such as having an inappropriate population, and not having the outcome of inclusion.

Study Characteristics

Thirty-five cross-sectional studies examined the predicting factors of HRQoL in type 2 diabetic patients. There were 24.346 total participants in these studies; the sample size varied from around 105 to 2,832. These primary investigations were conducted in 21 countries including Iran

(4), Ethiopia (4), China (3), Saudi Arabia (3), Vietnam (2), Malaysia (2), Indonesia (2), Bangladesh (2), Franch (1), Palestine (1), India (1), Thailand (1), Nigeria (1), Germany (1), Nepal (1), Greece (1), Hongkong (1), Burkina Faso (1), South Korea (1), Qatar (1), and Pakistan (1).

Regarding the measurement used for measuring the HRQoL, the most frequently used was The Euro Quality of life-5 dimension 5 levels (EQ-5D-5L) (15), followed by WHOQOL-BREF (5), SF-36 (5), SF-12 (4), the diabetes 39 QOL (3), and ADDQoL (1), Diabetes quality of life Brief Clinical Inventory (1), and Diabetes-Quality of Life (1). This study found that both generic and diseases specific HRQoL are still used interchangeably across the studies.

Quality Appraisal of the Included Study

Three researchers purposefully examined the quality of studies based on the Critical Appraisal Skills Program Tools for a cross-sectional study. Thirty-five (35) studies are included since their final scores were all in the "high quality" range of 11–14 (Supplemental File 2).

Predicting Factors of Health-related Quality of Life

The present study discovered a number of variables associated with HRQoL, which then were categorized into socio-demographic factors, patient-centered factors, characteristics of diseases, self-management behaviors, psychological factors, social support, and metabolic factors.

Socio-demographic Factors

Gender. In 18 primary studies, gender was determined as a significant predictor of HRQoL. Females were shown to have significantly poorer HRQoL and the most statistically significant in the physical and psychological domain (Al Hayek et al., 2014; Alsayed Hassan et al., 2022; Alshayban & Joseph, 2020; Barua et al., 2021; Bourdel-Marchasson et al., 2013; Chantzaras & Yfantopoulos, 2022; Chew et al., 2015; Gebremedhin et al., 2019; Hamady et al., 2022; Natarajan & Mokoboto-Zwane, 2022; Nguyen et al., 2018; Saleh et al., 2015; Shamshirgaran et al., 2016; Tran Kien et al., 2021; Wan et al., 2016; Wonde et al., 2022; Zare et al., 2020) in particular, on the dimensions of physical functioning, emotional role, energy, emotion, social functioning, and pain (Al Hayek et al., 2014).

Age. One of the factors that affected HRQoL was age. The majority of studies revealed that patients with older age have lower HRQoL (Alsayed Hassan et al., 2022; Bourdel-Marchasson et al., 2013; Chantzaras & Yfantopoulos, 2022; Gebremariam et al., 2022; Kalayou Haftu et al., 2022; Kang et al., 2021; Saleh et al., 2015; Tran Kien et al., 2021; Wan et al., 2016; Zare et al., 2020).

Marital status. Four studies revealed that marital status was identified as one of the strongest factors predicting HRQoL among adults with T2DM. Married people have higher HRQoL (Barua et al., 2021; Chew et al., 2015; Shamshirgaran et al., 2016; Wan et al., 2016).

Monthly income. Monthly household income or economic status as a strong predictor of HRQoL was analyzed in nine studies with 2,466 enrolling participants (Al Hayek et al., 2014; Alshayban & Joseph, 2020; Barua et al., 2021; Bourdel-Marchasson et al., 2013; Chantzaras & Yfantopoulos, 2022; Gebremariam et al., 2022; Kalayou Haftu et al., 2022; Natarajan & Mokoboto-Zwane, 2022; Shamshirgaran et al., 2016). Poor economic status was significantly associated with poor HRQoL. Being unemployed ($B = -2.68$, $p = .0008$) is significantly associated with lower HRQoL (Zyoud et al., 2015).

Education. Nine initial studies (Alsayed Hassan et al., 2022; Arifin et al., 2019; Barua et al., 2021; Chantzaras & Yfantopoulos, 2022; Hamady et al., 2022; Natarajan & Mokoboto-Zwane, 2022; Saleh et al., 2015; Sari et al., 2021; Tran Kien et al., 2021) examined how education level affected the HRQoL of T2DM patients. Poor HRQoL was more prevalent among those with lower levels of education ($B = -0.617$) (Natarajan & Mokoboto-Zwane, 2022), while those who have a higher education have higher HRQoL (OR = 3.013) (Barua et al., 2021).

Area of residents. Two studies found that the area of residents was one of the strong predictors of HRQoL. A study in Bangladesh and Nepal found that diabetic patients living in rural areas had better HRQoL (OR: 2.149) (Barua et al., 2021; Mishra et al., 2015); however, a study in Vietnam highlighted the opposite findings—those higher HRQoL scores were seen in those who could afford treatment and lived in cities (Nguyen et al., 2018).

Religiosity. Religiosity was found to have a favorable impact on HRQoL in a Malaysian study ($B = 3.07$ to 4.76) (Chew et al., 2015).

Patient-centered factors

Diabetes knowledge. Four studies found that diabetes literacy was a strong determinant of HRQoL among people with T2DM (Arifin et al., 2019; Barua et al., 2021; Nacanabo et al., 2021; Wonde et al., 2022). According to an investigation carried out in Indonesia, a lower EQ-5D score was substantially correlated with a lack of understanding of therapy (Arifin et al., 2019). In addition, a study in Ethiopia reported that diabetic patients who joined diabetes counseling had better HRQoL (Wonde et al., 2022).

Self-efficacy. Research has shown that self-efficacy is a predictor of HRQoL in those living with T2DM. Higher levels of self-efficacy were linked to higher HRQoL ($\beta = .133$, $p = .003$) (Sari et al., 2021). Twenty percent of

Table 1. Characteristics of the Studies Included in the Analysis.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
1	Shamshirgaran et al. (2016)	Iran	Cross-sectional study/$n = 300$	Examining the factors that contribute to people with T2DM having a lower HRQoL	WHOQOL-BREF questionnaires.	1. Gender: Women's HRQoL was lower, especially in the psychological dimension (b: − 5.787, 95% CI: − 10.742 to − 0.833) 2. Married people have better HRQoL (b: 8.058, 95% CI: 0.683 to 15.433), 3. Monthly household income: Higher-income families had better HRQoL (b: 4.553, 95% CI: 0.597 to 8.508), 1. 4. Comorbidity: The patients with renal disease had the lowest overall HRQOL scores. (b:−9.829, 95% CI: − 16.573 to − 3.084)
2	Tran Kien et al. (2021)	Vietnam	Cross-sectional study/$n = 519$	To investigate HRQoL and figure out the contributing factors.	The Short Form 36-item survey (SF-36)	1. Gender: females scored worse in physical and mental domains 2. Age: those that are elderly have lower HRQoL 3. Comorbidity: Patients with more than one comorbidity have lower HQoL 4. HRQoL was found to be lower in insulin-treated patients. 5. Education: Patients who have a higher education have higher HRQoL 2. 6. Exercise: Frequent exercises were positively associated with HRQoL.
3	Al Hayek et al. (2014)	Saudi Arabia	A cross-sectional study/ $n = 283$	The purpose of this study is to evaluate the variables related to T2DM patients' HRQOL.	The Short Form 36-item survey (SF-36)	1. Economic status: Poor economic condition was significantly associated with poor HRQOL. Patients with middle and high economic status had significantly higher HRQOL. 2. Diabetic complications (with ≥ 2 complications) were strongly linked with poor HRQOL. 3. Diabetes duration: A longer diabetes history was strongly linked to poorer HRQoL 4. Patients receiving oral medicine together with insulin therapy demonstrated better HRQOL than those receiving only insulin therapy. 3. 5. Gender: Females' HRQOL scores on the subscales of physical functioning, role emotional, energy, emotional, social, and pain were found to be considerably lower.

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
4	Iqbal et al. (2017)	Pakistan	Cross-sectional analysis/$n =$ 300	To evaluate the variables influencing HRQoL in T2DM patients	Euroqol Quality of Life- 5 Dimensions	It was found that medication adherence is a robust predictor of HRQoL, with a one-point improvement in adherence correlated with a 1.75-factor improvement in HRQoL.
5	Wan et al. (2016)	China	Cross-sectional study/ $n =$ 1,826	To identify risk factors for deteriorating health-related quality of life in persons with Type 2 diabetes.	The Short Form-12 Health Survey version 2 (SF-12v2)	1) Gender: male had better HRQoL 2) Marriage was a predictor associated with higher PCS 3) Regular exercise is associated with better HRQOL. 4) Obesity is associated with poorer PCS or SF-6D scores. 5) Comorbid hypertension, chronic kidney disease (CKD), and cardiovascular disease (CVD) were predictors of poorer HRQOL. 6) Using insulin increased the likelihood of having a poor HRQOL outcome. 7) Older age affected PCS scores negatively but positively, and MCS scores positively.
6	Carter et al. (2022)	China	Cross-sectional study/$n = 406$	To assess the HRQoL and its corresponding determinants	EQ-VAS and EQ-5D index	Diabetes duration: Having T2DM for more than 10 years (OR = 6.77) and having it for 5–10 years (OR = 5.66) both remained substantially linked with HRQoL issues
7	Barua et al. (2021)	Bangladesh	Cross-sectional study/$n = 1,806$	To identify the HRQoL and its predictors	The EuroQol-5 Questionnaire (EQ- 5D-5L)	1. Area of residence: Living in rural areas had good HRQoL (OR = 2.149) 2. Gender: men had better HRQoL (OR = 3.765), 3. Education status: higher education had good HrQoL(OR = 3.013), 4. Marital status: married people associated with higher HRQoL (OR = 1.281) 5. Higher monthly income had higher (OR = 1.785) 6. Patients without comorbidity had good HRQoL (OR = 2.405) 7. Duration of diabetes: $\leq$ 5 years had better HQQoL(OR = 1.184).
8	Dehesh et al. (2019)	Iran	Cross-sectional study/ $n = 163$	To identify the metabolic variables and other variables which influenced HRQoL.	The SF-36 health survey	1. Hihger blood pressure, low density lipoprotein, cholesterol, BhA1c, fasting blood sugar, and BMI had a significant negative impact on the physical component summary score. 2. A lower education level has a more pronounced negative

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
						effect on PCS score. The MCS score rises alongside one's educational attainment. 3. Males performed better than females did on the MCS.
9	Bourdel-Marchasson et al. (2013)	French	Cross-sectional study/ $n=$ 2,832	To investigate a variety of potential factors that affect HRQol	The SF-12 health survey	1. Higher MCS was associated with older age and male gender, while lower MCS was linked to lower income, poorer satisfaction with social support, and a HbA1c in the 8.1-10.0% range. 2. The PCS was lower for people who used insulin, had macrovascular disease, or had experienced severe hypoglycemia episodes; it was greater for those who had a large and supportive social network.
10	Kang et al. (2021)	China	Cross-sectional study design/n = 2,231	To identify the HRQoL and explore the influencing factors.	The EuroQol-5 Questionnaire (EQ- 5D-5L)	1. Older age is significantly associated with poor HRQoL 2. Economic status: poverty was negatively related to HRQoL 3. low physical activity: was negatively related to HRQoL 4. Comorbidities impacted HRQoL negatively. 5. A higher education level was linked to better HRQoL.
11	Gebremariam et al. (2022)	Ethiopia	Cross-sectional study/ $n=352$	To evaluate HRQoL and the factors that affect it	EuroQoL-5 dimensions questionnaire.	1. Older age was a highly substantial negative effect on HRQoL. 2. A significant unfavorable predictor of HRQoL was having poor glycemic control. 3. A long history of diabetes demonstrated a significant negative effect on HRQoL. 4. Insulin use showed a highly substantial negative effect on HRQoL prediction. 5. significant poor predictor of HRQoL was obesity. 6. A significant negative predictor of HRQoL was having diabetes-related comorbidities.
12	Nguyen et al. (2018)	Vietnam	Cross-sectional study/$n=171$	To determine relevant factors that affect HRQoL.	The Euro -Five (EQ-5D-3L) and	1. Gender: male had better HRQoL than female 2. Living in an urban area where they can easily access good treatment is associated with good HRQoL.

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Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
					the Visual Analog Scale (VAS).	3. Polypharmacy: taking fewer medications associated with better HRQoL. 4. A higher EQ-5D index was strongly correlated with the number of times per week that someone tested their blood sugar (1–4). 5. The EQ-5D index was negatively linked with increasing diabetes duration. 6. Older age T2DM patients have poor HRQoL 7. Comorbidities resulted in worse VAS ratings
13	Zyoud et al. (2015)	Palestine	Cross-sectional study/$n = 385$	To determine how clinical and socio-demographic factors influence HRQoL.	The European Quality of Life scale (EQ-5D-5L)	1. Being unemployed was significantly associated with HRQoL ($B = -2.68$, $p = ??.0008$), 2. The Number of comorbid diseases was significantly associated with HRQoL ($B = -2.68$, $p = .0008$)
14	Jannoo et al. (2017)	Malaysia	Cross-sectional study/$n = 497$	To formulate a model linking HRQoL, DD, DSCA, medication adherence, and HRQoL in patients with T2DM	Audit of Diabetes-Dependent QOL	1. There was a statistically significant correlation between diabetes self-care behaviors and HRQoL (SF-36) (Beta = 0.11). 2. HRQoL was significantly influenced by diabetes-related distress (Beta = −0.11).
15	Natarajan and Mokoboto-Zwane (2022)	India	Cross-sectional study/$n = 352$	To investigate factors associated with diabetes-related HRQOL	The Diabetes-39 Quality of Life Questionnaire.	1. Gender: female gender predicted poor HRQOL of type2 diabetic patients ($B = -1.042$, $p = 0.029$) 2. Lower educational status predicted poor HRQOL of type2 diabetic patients($B = -0.617$,$p = .001$) 3. T2DM patients' poor HRQOL was predicted by having uncontrolled FBS ($B = 0.841$, $p = .000$). 4. Being in the older age group predicted poor HRQOL of T2DM ($B = 0.046$, $p = .013$) 5. Having lower family income predicted poor HRQOL of type2 diabetic patients ($B = 0.540$, $p = .0035$)
16	Khunkaew et al. (2019)	Thailand	Cross-sectional design/$n = 502$	Identifying the Socio-demographic and	The Diabetes-39 Quality of Life Questionnaire	1. There was a correlation between age and HRQoL; older people had greater HRQoL when it came to managing their diabetes.

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
				Clinical Factors Affecting HRQoL		2. Females are more likely to have better HRQoL 3. Diabetic foot ulcer was a predictor of worse HRQoL 4. Insulin therapy and the use of oral medications in conjunction with insulin therapy were linked to lower HRQOL.
17	Onu et al. (2022)	Nigeria	Cross-sectional design/$n = 396$	To examine whether SS moderates the relationship between DD and HRQoL in type 2 diabetes.	Diabetes-Quality of Life Brief Clinical Inventory	1. Patients with type 2 diabetes who experienced both emotional and regimen distress had significantly lower HRQoL ($r = .26$, $p = .001$; $r = .35$, $p = .001$, respectively). 2. Distressed people with T2DM have a lower HRQoL ($r = .29$, $p = .01$).
18	Karami et al. (2021)	Iran	Cross-sectional study/$n = 685$	To examine type 2 diabetic patients' HRQoL and how it relates to diabetes complications	The Euro -Five (EQ-5D-3L) and the Visual Analog Scale (VAS).	Diabetes complications are strongly associated with poor HRQOL after controlling confounding factors
19	Chew et al. (2015)	Malaysia	Cross-sectional study/ $n = 700$	To examine the determinants of HRQoL	The WHOQOL-BRIEF	1. Diabetes distress was associated negatively with HRQoL. 2. Spirituality has a favorable impact on HRQoL ($B = 3.07$ to 4.76) 3. Young adults experienced better HRQoL compare with older adults 4. A short period of being diagnosed had good HRQoL. 5. The HRQoL of patients who were not married was poorer. 6. Patients with dyslipidemia showed worse HRQoL and higher total cholesterol levels. 7. Problems had the biggest detrimental impact on HRQoL as a whole.
20	Eckert (2012)	Germany	Cross-sectional study/$n = 370$	To assess the association betwen exercise on health-related quality of life	The SF-36	1. High BMI had a negative effect on HRQoL 2. Despite controlling for age, sex, and BMI, physical activity was still a significant predictor of HRQoL across the board ($B = 0.09$). This included the composite summary ($B = 0.10$), physical function ($B = 0.10$), mental composite summary ($B = 0.13$), vitality ($B = 0.15$), and psychological well-being ($B = 0.11$), among others.

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Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
21	Mishra et al. (2015)	Nepal	Cross-sectional study/$n = 157$	To examine the relationship between depressive symptoms and health-related quality of life in persons with type 2 diabetes	The WHOQOL-BREF	1. Living in an urban area reduced physical health scores by 4.74 points (95% CI: −8.66, −0.82). 2. Having had a diabetes diagnosis for more than ten years increased 5.18 physical health scores 3. The social relation domain scores dropped by 6.053 points for people with severe depression.
22	Gebremedhin et al. (2019)	Ethiopia	Cross-sectional study/$n = 267$	To evaluate type II diabetes patients' HRQOL and its contributing variables.	The WHOQOL-BREF questionnaire	1. Duration of disease associated with lower physical health domain $\beta = -1.50$) 2. Having high fasting blood sugar has been linked to worse physical health ($\beta = -.08$) 3. Being comorbid associated with lower physical health domain($\beta = -5.86$) 4. Having two or more complications associated with lower physical health domain ($\beta = -11.45$)
23	Alshayban and Joseph (2020)	Saudi Arabia	Cross-sectional research/$n =$ 378	To examine the factors that predict health-related quality of life in persons with type 2 diabetes	The EQ-5D-5L	1. The EQ-5D index was greater among men than women 2. Higher monthly income is correlated with higher EQ-5D indices. 3. The EQ-5D index was shown to be lower among people with diabetes who had complications. 1. 4. A higher EQ-5D index is linked to better glycemic management.
24	Arifin et al. (2019)	Indonesia	Cross-sectional study/$n = 907$	To evaluate the association between EQ-5D and sociodemographic factors and clinical condition.	The EQ-5D-5L	1. Lower educational level was identified as a significant predictor for lower EQ-5D index scores 2. A lack of understanding of diabetes therapy is associated with significantly poorer EQ-5D index scores. 3. Being a housewife was identified as a significant predictor for lower EQ-5D index scores
25	Chantzaras and Yfantopoulos (2022)	Greece	Cross-sectional study/$n = 518$	To explore the relationship between medication adherence	EQ-5D-5L questionnaire	1. Medication adherence was a significant predictor of a higher EQ-5D index and VAS. 2. the EQ-5D index was often lower among women.

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
				and HRQoL of adults with T2DM		3. Older age was one of the predictors of lower EQ-5D index 4. Lower economic status or unemployment had a strong correlation with a lower EQ-5D index, 5. Lower health-related quality of life (HRQoL) was linked to obesity. 6. Comorbid conditions had significant relationship with a lower EQ-5D index. 7. The EQ-5D index rises with education levels. 8. Being active is associated with increased HRQoL
26	Sari et al. (2021)	Indonesia	Cross-sectional study/ $n = 641$	To investigate factors affecting the HRQoL among Type 2 DM	The SF-36	1. Level of education: High level of education improved HRQoL ($\beta = .119$, $p = .006$) 2. DSM improved HRQo ($\beta = .122$, $p = .006$) 3. Diabetes distress was a significant predictor of HRQOL ($\beta = -.288$) 4. Diabetes complications were found to strongly predict HRQOL ($p = .019, = .106$). 5. Self-efficacy was a highly significant ($\beta = .133$, $p = .003$) predictor of HRQOL.
27	Nacanabo et al. (2021)	Ouagadougou, Burkina Faso.	Cross-sectional study/$n = 175$	To define health literacy and examine how the HRQoL of those with T2DM relates to it	The EQ-5D and the EQ-VAS	HRQoL was moderately linked with health literacy ($r = .31–.49$).
28	Lee et al. (2016)	South Korea	Cross-sectional design/$n = 459$	To create a model that examines the correlation among self-efficacy, self-care, health literacy, and HRQOL	The diabetes-specific QoL (D-QoL)	1. The model of HRQoL among T2DM was explained by 20% of self-efficacy 2. Self-efficacy indirectly influenced HRQOL via self-care practices ($b = 0.265$, $p = .004$). 3. Self-care practices are responsible for 61.0% of the variance in HRQoL.
29	Wonde et al. (2022)	Ethiopia	Cross-sectional study/$n = 368$	Assessing the Health-Related Quality of Life (HRQOL) of Adults with Type 2	The WHOQOL-BREF questionnaire	1. Gender: Being male is associated with good HRQOL (AOR = 4.28, 95%CI:2.36, 7.78) 2. Being active is associated with good HRQOL (AOR = 2.33,95%CI:1.34, 4.05)

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
				Diabetes and Related Factors		3. Receiving counseling was directly related to having good HRQOL (AOR = 3.33; 95% CI:1.82, 5.94). 4. HRQOL was lower among those who also had diabetes complications (AOR = 0.46, 95%CI:0.26, 0.80).
30	Zare et al. (2020)	Iran	Cross-sectional design/ $n =$ 3,472	To evaluate the health-related quality of life of adults with t2DM and the related factors	The EQ-5D-3L	1. Gender; Male patients had a greater mean HRQoL than female patients 2. Age: older adults have severe problems in HRQoL 3. Marital status: married people have higher HRQoL 4. Diabetes-related complications are significant independent determinants of HRQoL.
31	Wong et al. (2013)	Hongkong	Cross-sectional study/$n = 488$	To examine the relationship of multiple clinical factors with HRQOL	SF-12 Health Survey	1. The BMI and MCS-12 demonstrated a positive connection but a negative correlation with PCS-12. 2. the presence of diabetes-related comorbidities was substantially correlated with a lower HRQoL. 3. Being on insulin medication was connected to lower MCS-12.
32	Kalayou Haftu et al. (2022)	Ethiopia	Cross-sectional study/ $n = 415$	To evaluate the people with T2DM's HRQoL and related factors	The EQ-5D-3L instrument	1. HRQoL was 85% lower in people aged 40–50 2. Diabetic patients in private sector employees had 69% lower HRQoL 3. Lower monthly income patients had less HRQoL 4. Patients with diabetic complications had a 25% lower HRQoL.
33	Saleh et al. (2015)	Bangladesh	An analytical cross-sectional study/$n = 500$	To evaluate HRQoL and determine contributing factors.	The EQ-5D	1. Older age was associated with lower HRQoL ($p = .0001$) 2. The female had a negative correlation with HRQoL ($p = .0001$). 3. Higher education levels are associated with higher HRQoL ($p = .025$). 4. Medication use and the EQ-5D index were positively linked ($p = .048$).
34		Qatar		To investigate the		

(continued)

Table 1. Continued.

No	Authors	Country	Study design and sample size	Purpose of the study	HRQoL measurements tools	Main findings Factors predicting/affecting and associated HRQoL
	Alsayed Hassan et al. (2022)		Cross-sectional study/$n = 105$	association between DSM behaviors and the HRQOL of type 2 diabetic individuals	The HRQOL Short Form (SF-12)	1. Older persons were more likely to have poor PC (OR 11.04, 95% CI, 1.47–82.76. 2. Participants with a secondary education exhibited substantially reduced odds pf reporting bad mental health components (OR = 0.13, 95% CI = 0.03–0.62; $p = -.10$) 3. The odds ratio for poor PC was considerably higher in women than in men (OR = 7.08;95% CI = 2.21–22.67).
35	Hamady et al. (2022)	Saudi Arabia	Cross-sectional study/$n = 420$	To assess type 2 diabetics' HRQOL and its determinants.	The WHOQOL-BREF	1. Those suffering from emotional discomfort, anxiety, or depression had lower HRQoL. 2. HRQOL was significantly lower in the group of adults aged more than 50 3. Patients with secondary and bachelor's degrees had significantly higher HRQOL scores across all domains ($p = .001$). 4. Diabetics who receive combination therapy demonstrated significantly improved HRQOL in terms of physical functioning ($p = .001$). 5. A healthy diet significantly improved physical functioning and HRQOL ($p = .001$). 6. Regular exercise significantly improved HRQOL ($p = .001$). 7. Low HRQoL is associated with having hypertension and having more than one complications ($p = .001$).

Note. D-QoL = Diabetes-Quality of Life; HRQoL = health-related quality of life; T2DM = type 2 diabetes; PCS = Pain Catastrophizing Scale.

the variation in self-efficacy for HRQoL was explained by the final model, according to a study conducted in South Korea (Lee et al., 2016).

Characteristics related to T2DM

Diabetes-related complications. Our research showed that patients with complications had a greater chance of experiencing diminished HRQoL (Alshayban & Joseph, 2020; Barua et al., 2021; Chantzaras & Yfantopoulos, 2022; Gebremariam et al., 2022; Gebremedhin et al., 2019; Hamady et al., 2022; Kalayou Haftu et al., 2022; Kang et al., 2021; Khunkaew et al., 2019; Nguyen et al., 2018; Sari et al., 2021; Tran Kien et al., 2021; Wonde et al., 2022; Wong et al., 2013; Zare et al., 2020; Zyoud et al., 2015). Patients suffering from renal disorders (Shamshirgaran et al., 2016), hypertension, chronic kidney diseases (Wan et al., 2016), and macrovascular complications (Bourdel-Marchasson et al., 2013) had the lowest HRQoL scores overall.

Diabetic duration. Seven studies (Al Hayek et al., 2014; Barua et al., 2021; Carter et al., 2022; Gebremariam et al., 2022; Gebremedhin et al., 2019; Mishra et al., 2015; Tran Kien et al., 2021) revealed that poorer HRQoL was substantially correlated with longer diabetes duration. According to Carter et al. (2022), T2DM duration of more than 10 years (OR = 6.77) and 5–10 years (OR = 5.56) both remained highly related to lower HRQoL.

Insulin treatment. HRQoL was predicted by insulin treatment among those with T2DM. It was measured in seven studies; worse HRQoL was correlated with insulin therapy and the use of both insulin therapy and oral medications (Al Hayek et al., 2014; Gebremariam et al., 2022; Hamady et al., 2022; Khunkaew et al., 2019; Tran Kien et al., 2021; Wan et al., 2016; Wong et al., 2013). People who took fewer prescriptions had a greater HRQoL than those who took more than five different medications (Nguyen et al., 2018).

Self-management behaviors. Self-management behaviors include taking medications regularly, following a proper diabetic diet, being physically active, and self-monitoring of blood glucose (ADA, 2022).

Physical activity. In our selected studies (Chantzaras & Yfantopoulos, 2022; Eckert, 2012; Kang et al., 2021; Tran Kien et al., 2021; Wan et al., 2016; Wonde et al., 2022), we discovered that patients who exercised frequently had greater HRQoL than those who exercised less frequently. A Vietnamese study demonstrated that the HRQoL score was predicted to increase by 0.91 and 0.83 points for every extra point in the physical and psychological scores (Tran Kien et al., 2021), while a study in Ethiopia found that people who exercised regularly had a positive HRQOL 2–3 times more often than those who did not (Wonde et al., 2022).

Medication adherence. Measured by EuroQOL-5D (Chantzaras & Yfantopoulos, 2022; Iqbal et al., 2017) and ADDQoL-19 (Jannoo et al., 2017) adherence to prescribed medication was found to be a robust indicator of HRQoL. An increase of one adherence score was related to a 1.75-factor improvement in HRQoL (Iqbal et al., 2017).

Regular blood glucose monitoring. A higher EQ-5D score was seen in people with T2DM who checked their blood pressure more frequently (1–4 times per week) (Nguyen et al., 2018).

Physiological factors

Diabetes distress (DD). Diabetes distress was one of the factors that predicted HRQoL (Chew et al., 2015; Hamady et al., 2022; Jannoo et al., 2017; Mishra et al., 2015; Onu et al., 2022; Sari et al., 2021). Patients with higher levels of emotional distress related to diabetes were found to have worse HRQoL (Jannoo et al., 2017). Those with type 2 diabetes who struggled with both emotional discomfort and regimen distress had a considerably lower HRQoL ($r = .26$; $r = .35$, respectively (Onu et al., 2022)). Social relation domain scores dropped by 6.053 points when someone had severe depression (Mishra et al., 2015).

Social support

Family support. Family social support was found to be a significant predictor of HRQoL in two studies with a total of 3,228 participants (Bourdel-Marchasson et al., 2013; Onu et al., 2022). After controlling for age and gender, researchers discovered that those who were dissatisfied with their social support from the family had a lower Mental Component Summary (MCS) (Bourdel-Marchasson et al., 2013).

Metabolic factors

Glycated hemoglobin (HbA1c level). Glycated hemoglobin (HbA1c level) is known as a strong predictor of HRQol; (Bourdel-Marchasson et al., 2013; Dehesh et al., 2019; Gebremariam et al., 2022; Natarajan & Mokoboto-Zwane, 2022). A study in Iran highlighted that the Physical Component Summary (PCS) score was most negatively influenced by the HbA1c level ($B = 0.878$, $p = .004$) (Dehesh et al., 2019). Meanwhile, a study in French found that poor glycemic control (HbA1c = 8.1%–10%) was associated with lower Mental Component Summary (MSC) (Bourdel-Marchasson et al., 2013).

Hyperlipidemia. Patients who had dyslipidemia and higher levels of total cholesterol had lower HRQoL (Chew et al., 2015). Cholesterol and low-density lipoprotein had the most adverse effect on the physical component summary score ($\beta = -.648$, $\beta = -.721$, respectively) (Dehesh et al., 2019).

Body mass index. HRQoL is negatively affected by body mass index (BMI). HRQoL was poorer in patients with grade II obesity (BMI = 35) compared to those with overweight (BMI = 25–29.99) and grade I (BMI = 30–35) (Eckert, 2012; Wong et al., 2013). Obesity was associated with poorer SF-12 PCS (Wan et al., 2016).

Discussion

According to this current review, there are sufficient empirical shreds of evidence to support a significant correlation between multiple variables and HRQoL among type 2 diabetic patients. The factors consist of socio-demographic factors, patient-centered factors, characteristics of diseases, self-management behaviors, family support, psychological factors, and metabolic factors.

Based on our findings, socio-demographic factors have been confirmed to have a significant correlation with HRQoL among adults with T2DM. Those factors include gender, age, marital status, monthly income, education, area of residence, and religiosity. This study found that scores of all domains of HRQoL were lower in females. They are more likely to experience distressing emotional states, which could negatively affect their HRQoL (Tran Kien et al., 2021). Women tend to prefer identifying as family caregivers and are less likely to accept support from other family members, which makes it more difficult for them to manage illnesses and stick to diets and exercise routines (Moeineslam et al., 2019). When age was taken into account, it was shown that older age had a negative effect on PSC score but a favorable effect on MCS score (Wan et al., 2016). One of the many issues affecting the physical and mental health of the elderly is the prevalence of several chronic illnesses, which can have a negative impact on cognitive capacities and require the use of multiple medications (Nguyen et al., 2018).

HRQoL has also been associated with monthly income. The majority of the study found that higher-income families had better HRQoL and lower income was associated with lower HRQoL (Barua et al., 2021; Gebremariam et al., 2022; Shamshirgaran et al., 2016). The economic status contributes to the heavier burden on the individuals who need to pay a large amount for their treatment (Kyrou et al., 2020). According to the results of the current review, marital status is a positive predictor of HRQoL that is associated with having sufficient social and economic support (Shamshirgaran et al., 2016).

Additionally, higher levels of education were associated with improved HRQoL, particularly in the areas of mental and emotional well-being. Higher-educated patients may have stronger treatment adherence and an enhanced HRQoL because they are more likely to have a positive outlook on their health, comprehend their disease, treatment plan, and the potential outcomes of diabetes, and pay more attention to their treatment and nutrition (Abedini et al., 2020; Gebremariam et al., 2022). Moreover, being religious was found to be the most effective predictor of HRQoL. People who regularly engage in religious practices tend to enjoy better spiritual health, which in turn may improve their mental health, sense of belonging, and sense of direction in life. All of these are internal resources for managing their diseases (Dewi et al., 2022; Jannoo et al., 2017; Saffari et al., 2019). In terms of location, two studies indicated that those who lived in rural areas had better HRQoL than those who lived in cities because they had easier access to fresh fruits, vegetables, and fish. Aside from that, they can assess information about diabetes via mass media (Barua et al., 2021; Mishra et al., 2015). Those living in metropolitan areas, on the other hand, reported a high degree of HRQoL due to their susceptibility to high diabetic care (Nguyen et al., 2018).

Due to their ability to learn more about the signs and difficulties of their illness, those who have better diabetes-related knowledge are more attentive to their treatment and nutrition (Abedini et al., 2020). Moreover, self-efficacy was also reported in this study as one of the predicted factors of HRQoL. Consistent with the findings of a prior study, self-efficacy was the only variable that exhibited a significant covariate-adjusted connection with HRQoL ($B = -0.376$, $p < .0001$) (Bowen et al., 2015). Self-efficacy is the belief that one can effectively control their diabetes; hence, initiatives designed to boost self-confidence in treating diabetes may help enhance HRQoL.

Numerous comorbidity and diabetes complication regression models showed that patients with diabetes comorbidities had a poorer HRQoL (Afroz et al., 2019; Gu et al., 2020; Karami et al., 2021). Treatments, dietary restrictions, and physical discomfort associated with disease control negatively impact HRQOL in diabetic patients. These consequences have the potential to significantly increase financial and health burdens. According to our study, poor HRQoL was substantially correlated with prolonged diabetes duration. A previous study found that it could happen due to a reduction in patient attitude, adherence to the prescribed course of treatment, and beta cell function (Jing et al., 2018).

Furthermore, there was evidence that patients who used insulin injections had poorer HRQOL scores across practically all dimensions. Another meta-analysis of 24 studies found that patients on insulin therapy had a higher chance of becoming depressed (OR = 1.59, 95% CI 1.41 to 1.80, $p < .001$) (Bai et al., 2018). Daily insulin injections may result in physical discomfort, increase patients' anxiety about becoming insulin-dependent, lead them to struggle more with social interaction, and negatively impact their mental health (Bai et al., 2018; Tran Kien et al., 2021).

Regarding self-management behaviors, this study found that physical activity, medication adherence, and glucose check frequently are the predictors of HRQoL. Frequent exercise has been linked favorably to improved HRQoL.

Jing et al. (2018) observed an increase in quality of life (QoL) among patients who exercised more compared to those who did not, including "role limitations due to physical health problems" (POR = 0.683), "general Health perceptions" (POR = 0.660), "vitality" (POR = 0.635), "social functioning" (POR = 0.825), and "emotional state" (POR = 0.642) (Jing et al., 2018). Regular walking exercise programs have been shown to improve HRQoL in people with type 2 diabetes by increasing their daily activity, activity intensity, and energy expenditure and decreasing biochemical consequences like fasting blood glucose, glycated hemoglobin (HbA1c), and lipid levels (Sung & Bae, 2012). Moreover, this study also found that a key predictor of having greater HRQoL is having higher medication adherence (Sung & Bae, 2012). Patients with better medication compliance experienced less anxiety related to their diabetes (Iqbal et al., 2017). Patients' HRQoL improves as a result of increased treatment adherence because of less symptoms and slower illness progression (Sung & Bae, 2012).

According to our study, family social support was also found as one of the strong predictors of HRQoL. People who received optimum support from their families felt satisfied with their life that impact physical and psychological comfort. The family provides emotional, appreciative, practical, and educational support to persons with DM, which enhances their HRQoL (Bowen et al., 2015). Furthermore, summary scores for both the physical and mental components were negatively affected by low-density lipoprotein, high cholesterol, and BMI. Researchers found that obesity negatively impacted both the physiological and psychological dimensions of HRQoL (Stephenson et al., 2021). Treatments for dyslipidemia, which are typically aimed at reducing the low-density lipoprotein cholesterol concentration, also have a significant impact on patient's HRQoL (Dehesh et al., 2019).

The current analysis also demonstrated a substantial inverse relationship between HbA1c and FBS levels on the HRQoL Physical and MCS. Cannon et al. (2018) revealed that 41% of people with poor glycemic control experienced poor psychological well-being such as depression, anxiety, and social withdrawal that negatively affect HRQoL. Multiple long-term vascular problems have been linked to poor glycaemic management, severely reducing patients' HRQoL (Cheng et al., 2021; Kuo et al., 2020).

This systematic review is the first study that explores the predicting factors of HRQoL of people with T2DM. Twenty-four cross-sectional studies were included in this study. This review comprehensively analyzed the factors that affect the HRQoL including demographic factors and individual characteristics, characteristics of the diseases, diabetes self-management behaviors, social supports, and metabolic factors. Meanwhile, the study also has several limitations such as the following. We included only English Language studies, which might be difficult to assess the factors outside the study setting. We did not retrieve the gray literature. Our search was limited to a few databases, which might have missed relevant studies published in other databases.

Implication for Practice

Knowing the predicting factors of HRQoL is a crucial need for nurses as front-line healthcare providers in taking care of people with T2DM both in clinical and community settings. In routine practice, nurses should assess the patient's HRQoL and the factors that influence it before taking any action.

Conclusion

Sufficient research exists to determine what characteristics predict HRQoL in people with type 2 diabetes. The systematic review classified the factors into socio-demographic factors (age, marital status, gender, monthly income, education, area of residence, and religiosity), patient-centered factors (diabetes knowledge and self-efficacy), characteristics of diseases (diabetes-related complications, diabetic duration, and insulin treatment), self-management behaviors (physical activity, medication adherence, glucose check frequently), family support, diabetes distress, and metabolic factors (HbA1c, hyperlipidemia, and BMI). Therefore, diabetes program to enhance the HRQoL among adults with T2DM is highly encouraged to address these factors, which can be focused on promoting self-management behaviors, diabetes distress management, and optimum family support.

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Author Contributions

M.Teli contributed to the conception, designed, acquisition, analysis, drafted manuscript, critically revised manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy Y. A. Rias contributed to the conception, design interpretation, drafted the manuscript, critically revised manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy. R. Thato contributed to the acquisition, analysis, drafted manuscript, critically revised manuscript, gave final approval, and agrees to be accountable for all aspects of the work ensuring integrity and accuracy.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics Statement

As this study analyzed the "Predicting Factors of Health-Related Quality of Life among Adults with Type 2 Diabetes: A Systematic Review" that had been approved by the Research Ethics Committee and was registered in Clinical Trials, no ethical consent is needed.

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Supplemental Material

Supplemental material for this article is available online.

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