Brazilian Journal of
HEALTH AND PHARMACY

CRFMG

Assessment of the quality of life of patients with type 2 diabetes mellitus and associated variables

Avaliação da qualidade de vida de pacientes com diabetes mellitus tipo 2 e variáveis associadas

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Data de Submissão: 17/04/2024; Data do Aceite: 01/10/2024.
Citar: FERREIRA, M.C.; BALDONI, A.O.; DOMINGUETI, C.P. Assessment of the quality of life of patients with type 2 diabetes mellitus and associated variables. Brazilian Journal of Health and Pharmacy, v. 7, n. 1, p. 21 - 32, 2025. DOI: https://doi.org/10.29327/226760.7.1-3

ABSTRACT

Introduction: The lifelong treatment, comorbidities and complications of type 2 diabetes mellitus (T2DM) may result in compromised patients' quality of life (QOL). This study aimed to evaluate the QOL of patients with T2DM and analyze the association between clinical, sociodemographic and laboratory variables with the QOL. **Methods:** A cross-sectional study was carried out in 265 patients with T2DM treated at the Basic Health Units. QOL, knowledge and attitude were evaluated by validated questionnaires. Clinical, sociodemographic and laboratory data were collected. **Results:** Among patients interviewed, 53.6% had good, 31.7% very good, 10.9% regular and 3.8% excellent QOL. The levels of glycated hemoglobin (HbA1c), isolated albuminuria and urinary albumin/creatinine ratio were higher in the group of patients with regular QOL than in the group with good, very good or excellent QOL. The group with regular QOL had a higher proportion of individuals with HbA1c levels ≥ 7.0%, high-density lipoprotein cholesterol ≤ 50 mg/dL and isolated albuminuria ≥ 174 mg/L compared to the group with good, very good or excellent QOL. Knowledge and attitude towards T2DM had no impact on QOL, whereas female sex was independently associated with regular QOL. **Conclusion:** Poor glycemic control, increased albuminuria, reduced high-density lipoprotein cholesterol levels were more frequent in T2DM patients with regular QOL and female sex were independently associated with regular QOL.

Keywords: Diabetes complications; Health knowledge, attitudes, practice; Indicators of quality of life.

RESUMO

Introdução: O tratamento por toda vida, comorbidades e complicações do diabetes *mellitus* tipo 2 (DM2) podem resultar em comprometimento da qualidade de vida (QV). Este estudo teve como objetivo avaliar a QV de pacientes com DM2 e analisar a associação entre parâmetros sociodemográficos, clínicos e laboratoriais com a QV. **Métodos:** Foi realizado um estudo transversal com 265 pacientes com DM2 atendidos nas Unidades Básicas de Saúde. QV, conhecimento e atitude foram avaliados por questionários validados. Foram coletados dados sociodemográficos, clínicos e laboratoriais. **Resultados:** Dentre os pacientes, 53,6% apresentaram QV boa, 31,7% muito boa, 10,9% regular e 3,8% excelente. Os níveis de hemoglobina glicada (HbA1c), albuminúria isolada e relação albumina/creatinina urinária foram maiores no grupo de pacientes com QV regular do que no grupo com QV boa, muito boa ou excelente. O grupo com QV regular apresentou maior proporção de indivíduos com níveis de HbA1c ≥ 7,0%, colesterol da lipoproteína de alta densidade ≤ 50 mg/dL e albuminúria isolada ≥ 174

mg/L em comparação com o grupo com QV boa, muito boa ou excelente. Conhecimento e atitude em relação ao DM2 não tiveram impacto na QV, enquanto que o sexo feminino foi independentemente associado com uma QV regular. **Conclusão:** Controle glicêmico insatisfatório, albuminúria aumentada e níveis reduzidos de colesterol da lipoproteína de alta densidade foram mais frequentes nos pacientes com DM2 com qualidade de vida regular e o sexo feminino foi independentemente associado à qualidade de vida regular.

Palavras-chaves: Conhecimentos, atitudes e práticas em saúde; Complicações do diabetes; Indicadores de qualidade de vida.

INTRODUCTION

As it is a chronic disease, type 2 diabetes mellitus (T2DM) individuals who maintain poor glycemic control may develop complications over time such as retinopathy, nephropathy, neuropathy and cardiovascular disease. These complications significantly increase the costs of patient care and harm their quality of life (QOL) (FARIA et al., 2013).

Living with DM is characterized by states of imbalance related to metabolic changes, psychological readjustments, changes in eating habits, among others, which becomes a challenge for the patient and their family members and is associated with strong social impact on patients' lives (MOREIRA et al., 2009). These social and emotional factors can impact the metabolic control of the disease, which is related to the action of counter-regulatory hormones, such as adrenalin (FLÔR et al., 2018).

Health prevention, promotion and recovery are objectives for a better QOL of the individual with T2DM, strategies adopted by primary health care, as a national public policy. QOL is increasingly being used to evaluate the impact of a disease on a population, because this factor is recognized as an important public health indicator (MIRANZI et al., 2008; OLIVEIRA-CAMPOS et al., 2013).

The evaluation of patient's knowledge about T2DM and their attitudes towards the disease is extremely important for the adoption of health care strategies actions that aim to promote a healthy lifestyle and diet, encourage the practice of physical activity and the adherence to pharmacological treatment. DM education and a positive attitude towards the disease are related to the success of the treatment, good glycemic control, prevention of complications and QOL patients' improvement (RODRIGUES, 2011).

In this context and considering the lack of Brazilian studies about the influence of clinical, sociodemographic and laboratory variables on the QOL of T2DM patients, it is essential to identify the factors that contribute to a poor QOL. It is believed that these findings may be useful to guide public policies aimed at improving QOL of patients affected by the disease, developing autonomy and increasing the well-being of these individuals. Therefore, the aim of this study was to evaluate the QOL of patients with T2DM and analyze the association between clinical, sociodemographic and laboratory variables with the QOL.

METHODS

This is a cross-sectional observational study. Data were obtained from patients with T2DM between May 2018 and December 2019 in Divinópolis - MG. This city has 43 primary health care units, which offers treatment to approximately 10,800 patients with T2DM.

The study population consisted of patients aged between 18 and 80 years with clinical and laboratory diagnosis of T2DM, cared for at primary health care

units and who had registered data in the Integrated Health System. The exclusion criteria were people who were unable to respond legally and those with mental disabilities.

The study performed by Miranzi et al. (2008) was used for sample calculation. It was estimated that 20% of patients with T2DM have reasonable QOL, with a sampling error of 5% and a 95% confidence level, resulting in 241 patients with T2DM. To this value 10% was added for possible losses resulting in a total of 265 patients.

The city is divided into eleven health regions. In each region, one primary health care unit that had a minimum structure for the application of data collection instruments, as recommended by CNS/MS Resolution No. 466/12, was chosen by lottery. The eleven selected primary health care units had 1,523 patients with T2DM who had registered data in Integrated Health System. Among these, 265 patients were interviewed on the days they were at the primary health care units for medical appointment or to collect blood sample for tests, with the number of patients interviewed in each health care unit proportional to the number of patients attended and registered in that unit. Convenience sampling was carried out to recruit patients from each primary health care unit selected.

The main clinical, sociodemographic and laboratory data that could be associated with a worse quality of life of T2DM patients were collected. Socioeconomic and demographic data, data related to lifestyle, medication use and general health status, including the main comorbidities and complications of DM, were collected through a questionnaire. Clinical data, including medication use and main comorbidities and complications of DM, was also collected from the Integrated Health System and medical records. Laboratory data were collected from the Integrated Health System and medical records, considering the most recent exam available in the last 6 months.

During the interview, others validated questionnaires were also applied, including the Summary Brazilian Version of the Diabetes Instrument Quality of Life Measure (DQOL-Brazil-8) (CORRER et al., 2008); Brazilian version of the Diabetes Knowledge Questionnaire Instrument (DKN-A) (RODRIGUES, 2011) and Brazilian version of the Attitude Questionnaire Instrument (ATT-19) (TORRES et al., 2005).

Data from the DQOL Brasil-8 questionnaire were assessed using a 5-point Likert scale. Scores range from 1 "a lot" to 5 "nothing" for the satisfaction domain and range from 1"never" to 5 "forever" for the domains of impact and concerns. On these scales, the closer the result is to 1, the better the QOL. The QOL of patients was determined based on the average score obtained for the domains and was classified as: excellent (average score 1), very good (average score 2), good (average score 3), regular (average score 2) and poor (average score 1) (CORRER et al., 2008).

The data attributed to the DKN-A questionnaire used score one for correct answer and zero for the incorrect answer. Items 1 to 12 require a single correct answer, while items 13 to 15 require two correct answers to obtain score one. The total score can vary from 0 to 15, with a total score above 8 indicating that the patient has knowledge about T2DM (RODRIGUES, 2011; TORRES et al., 2005).

The ATT-19 questionnaire assessed the information using a 5-point Likert scale (score 1 for "strongly disagree" to score 5 for "strongly agree"). The total score can vary from 19 to 95 points and a total score above 70 points indicates a positive attitude towards the disease (TORRES et al., 2005). After the analysis, it was observed that no patient had a score above 70 points, therefore, a score of 55 points (60% of the score) was used as indicative of a positive attitude. This adaptation was made to enable comparison between higher and lower scores in this study.

For the statistical analysis of the data, patients were distributed into two groups according to QOL: group 1 patients with regular QOL; and group 2 patients with good, very good or excellent QOL. The results obtained were analyzed using the statistical program SPSS 20.0. The Shapiro-Wilk normality test was performed for continuous variables. For the variables that presented a normal distribution, the mean and standard deviation values were calculated, and the T test was used to compare the groups. For variables that did not have a normal distribution, the median and the 25 and 75% percentiles were calculated, and the Mann Whitney U test was used to compare the groups. Categorical variables were presented as absolute and relative frequencies, and the chi-square test was used to compare these variables. Multivariate logistic regression analysis was performed to assess which variables are independently associated with regular quality of life. The variables included in this analysis were previously associated with regular quality of life in the bivariate logistic regression analysis ($p < 0.20$). The value $p < 0.05$ was considered significant.

Regarding to the ethical aspects, this study was approved by the Human Research Ethics Committee of the Federal University of São João Del Rei - Campus Centro Oeste (CEP CCO) in December 2017 (nº 2,433,578). Patients who agreed to participate in the study signed the Informed Consent Form.

RESULTS

Among the 265 interviewed patients with T2DM, the QOL of the patients assessed using the DQOL-Brazil-8 questionnaire was good for 53.6% (n = 142), very good for 31.7% (n = 84), regular for 10.9% (n = 29) and great for 3.8% (n = 10).

Clinical and sociodemographic characteristics, knowledge about diabetes and attitude to disease of patients with T2DM classified according to QOL are presented in Table 1. Female sex was more frequent and male sex was less frequent in patients with regular QOL compared with those with good, very good or excellent QOL ($p = 0.009$). Patients with regular QOL had younger age of T2DM diagnoses ($p < 0.001$) and longer duration of T2DM ($p = 0.011$) than those with good, very good or excellent QOL.

Table 1: Clinical and sociodemographic characteristics, knowledge about diabetes and attitude to disease of patients with type 2 diabetes mellitus classified according to quality of life evaluated using the Summary Brazilian Version of the Diabetes Instrument Quality of Life Measure (DQOL-Brazil-8).

	NUMBER OF PATIENTS	PATIENTS WITH REGULAR QUALITY OF LIFE	PATIENTS WITH GOOD OR VERY GOOD OR GREAT QUALITY OF LIFE	P VALUE
Individuals number (n)		29	236	
Male (n, %)	79	3 (10.3)	76 (32.2)	0.009*
Female (n, %)	186	26 (89.7)	160 (67.8)	0.009*
Age (years)	265	70 ± 9	56 ± 7	NS
Height (m)	265	1.60 ± 0,11	1.59 ± 0,07	NS
Weight (kg)	265	82 ± 4	86 ± 4	0.047*
BMI (kg/m^2)	265	32 ± 3	34 ± 2	NS
BMI < 25 kg/m^2 (n, %)	47	4 (15.4)	43 (20.2)	NS
BMI 25 a < 30 kg/m^2 (n, %)	79	6 (23.1)	73 (34.3)	NS
BMI ≥ 30 kg/m^2 (n, %)	113	16 (61.5)	97 (45.5)	NS
T2DM diagnoses age (years)	265	45 ± 3	50 ± 12	< 0.001*
T2DM duration (years)	265	25 ± 6	6 ± 5	0.011*
Duration of T2DM (<10 years)	113	8 (27.6)	105 (44.9)	NS
Duration of T2DM (≥ 10 years)	150	21 (72.4)	129 (55.1)	0.056
Current smoking (n,%)	24	3 (10.3)	21 (9.0)	NS
Previous smoking (n,%)	53	4 (13.8)	49 (20.9)	NS
Drinking alcohol 3 or more times a week (n,%)	7	0 (0.0)	7 (3.0)	NS
Practice of physical activity 3 or more times a week (n,%)	86	11 (37.9)	75 (31.8)	NS
Have knowledge about diabetes according to Brazilian version of DKN-A instrument (n,%)	63	56 (23.7)	7 (24.1)	NS
Positive attitude towards diabetes according to Brazilian versions of ATT-19 instrument** (n,%)	62	56 (23.7)	6 (20.7)	NS

Data obtained from interviews with patients and consultation of medical records. Variables with a normal distribution were expressed as mean ± standard deviation and were compared using the Student's T test. Variables that did not have a normal distribution were expressed as median (25% - 75% percentile) and were compared using the Mann-Whitney U test. Categorical variables were expressed as absolute and relative frequency n (%) and were compared using the Chi test. -Square. * p <0.05 for patients with good or very good or excellent quality of life compared to patients with regular quality of life. ASA = acetylsalicylic acid, NS = not significant. ** nephroprotective drugs consisted of angiotensin-converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB).

Through the DKN-A questionnaire it was observed that most patients with T2DM included in this study have no knowledge about T2DM (n = 202; 76.2%). Through the ATT-19 questionnaire, regarding attitude towards T2DM, there was no statistically significant difference between the group of patients with regular QOL and the group with good, very good or excellent QOL. It is important to highlight that a score of 55 points and not 70 points was used as indicative of a positive attitude in this study.

Medications used, comorbidities and DM complications of patients with T2DM classified according to QOL are presented in Table 2. Oral antidiabetic agents (p = 0.036) were used less frequently and insulin was used more frequently (p = 0.023) by patients who have a regular QOL compared to those who have a good, very good or excellent QOL. Angina (p = 0.026), congestive heart failure (p = 0.002), stroke (p = 0.005) and depression (p = 0.021) were more frequent in patients with regular QOL.

Table 2: Medications used, comorbidities and DM complications of patients with type 2 diabetes mellitus classified according to quality of life.

	NUMBER OF PATIENTS	PATIENTS WITH REGULAR QUALITY OF LIFE	PATIENTS WITH GOOD OR VERY GOOD OR GREAT QUALITY OF LIFE	P VALUE
Individuals number (n)		29	236	
Use of oral antidiabetics (n,%)	173	14 (48.3)	159 (67.4)	0.036*
Insulin use (n,%)	105	17 (58.6)	88 (37.3)	0.023*
Statin use (n,%)	146	14 (48.3)	132 (55.9)	NS
AAS use (n,%)	110	13 (44.8)	97 (41.1)	NS
Use of antihypertensive drugs (n,%)	215	25 (86.2)	190 (80.5)	NS
Use of nephroprotective drugs** (n, %)	143	17 (58.6)	126 (53.4)	NS
Hypertension (n,%)	223	26 (89.7)	197 (83.5)	NS
Dyslipidemia (n,%)	150	19 (65.5)	131 (56.0)	NS
Acute myocardial infarction (n,%)	27	5 (17.2)	22 (9.3)	NS
Angina (n,%)	50	10 (34.5)	40 (16.9)	0.026*
Congestive heart failure (n,%)	31	9 (31.0)	22 (9.3)	0.002*
Stroke (n,%)	12	5 (17.2)	7 (3.0)	0.005*
Thrombosis (n,%)	21	3 (10.3)	19 (8.1)	NS
Diabetes kidney disease (n,%)	29	5 (17.2)	24 (10.2)	NS
Cataract (n,%)	84	7 (24.1)	77 (32.6)	NS
Diabetic retinopathy (n,%)	70	7 (24.1)	63 (26.7)	NS
Diabetic neuropathy (n,%)	42	3 (10.3)	39 (16.5)	NS
Cirrhosis (n,%)	6	0 (0.0)	6 (2.5)	NS
Cancer (n, %)	18	2 (6.9)	16 (6.8)	NS
Depression (n, %)	71	13 (44.8)	58 (24.6)	0.021*

Data obtained from interviews with patients and consultation of medical records. Variables with a normal distribution were expressed as mean ± standard deviation and were compared using the Student's T test. Variables that did not have a normal distribution were

expressed as median (25% - 75% percentile) and were compared using the Mann-Whitney U test. Categorical variables were expressed as absolute and relative frequency n (%) and were compared using the Chi test. -Square. * p <0.05 for patients with good or very good or excellent quality of life compared to patients with regular quality of life. ASA = acetylsalicylic acid, NS = not significant. ** nephroprotective drugs consisted of angiotensin-converting enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB).

Laboratory characteristics of patients with T2DM classified according to QOL are presented in Table 3. Patients with regular QOL presented higher values of HbA1c (p = 0.043), isolated albuminuria (p <0.001) and albumin/creatinine ratio (RAC) (p = 0.035) than those with good, very good or excellent QOL. Furthermore, higher frequency of HbA1c ≥ 7.0% (p = 0.044); high density lipoprotein cholesterol ≤ 50 mg/dL (p = 0.045) and isolated albuminuria ≥ 174 mg/L (p = 0.020) was observed in patients with regular QOL.

Table 3: Laboratory characteristics of patients with type 2 diabetes mellitus classified according to quality of life.

	Number of patients	Patients with regular quality of life	Patients with good or very good or excellent quality of life	p value
Number of individuals (n)	265	29	236	
Fasting blood glucose (mg/dL)	253	98 ± 68	154 ± 57	NS
HbA1c (%)	238	7.7 ± 1.9	7.4 ± 2.0	0.043*
Triglycerides (mg/dL)	248	130 ± 90	159 ± 16	NS
Total cholesterol (mg/dL)	249	201 ± 11	184 ± 19	NS
LDL cholesterol (mg/dL)	204	122 (105 – 139)	82 (81 – 100)	NS
HDL cholesterol mg/dL)	241	53 ± 6	58 ± 13	NS
Non-HDL cholesterol (mg/dL)	204	148 ± 6	126 ± 22	NS
Isolated albuminuria (mg/L)	59	234 ± 329	3 ± 3	< 0.001*
RAC (mg/g)	32	625 ± 875	7 ± 5	0.035*
Creatinine (mg/dL)	237	1.0 ± 0.4	0.9 ± 0.2	NS
GFR (mL/min/1.73 m2)	237	67 ± 13	83 ± 16	NS
Fasting blood glucose ≥ 130 mg/dL (n,%)	127	15 (55.6)	112 (49.6)	NS
HbA1c ≥ 7.0% (n,%)	146	21 (77.8)	125 (59.0)	0.044*
Triglycerides ≥ 150 mg/dL (n,%)	117	15 (55.6)	102 (46.6)	NS
Total cholesterol ≥ 190 mg/dL (n,%)	113	15 (55.6)	98 (44.3)	NS
LDL cholesterol ≥ 100 mg/dL (n,%)	106	15 (62.5)	91 (44.6)	NS
HDL cholesterol ≤ 50 mg/dL (n,%)	128	19 (70.4)	109 (5.2)	0.045*
Non-HDL cholesterol ≥ 130 mg/dL (n,%)	126	16 (59.3)	110 (50.0)	NS
Isolated albuminuria ≥ 14 and <174 mg/L (n,%)	22	2 (40.0)	20 (37.7)	NS
Isolated albuminuria ≥ 174 mg/L (n,%)	5	2 (40.0)	3 (5.7)	0.020*
ACR ≥ 30 and <300 mg/g (n,%)	6	1 (20.0)	5 (18.5)	NS
ACR ≥ 300 mg / g (n,%)	8	2 (40.0)	6 (22.2)	NS
Creatinine ≥ 1.4 mg/dL (n,%)	18	1 (4.0)	17 (8.1)	NS
GFR <60 mL/min/1.73 m2 (n,%)	78	11 (44.0)	67 (31.8)	NS

Data obtained from medical records. Variables with a normal distribution were expressed as mean ± standard deviation and were compared using the Student's T test. Variables that did not have a normal distribution were expressed as median (25% - 75% percentile) and were compared using the Mann-Whitney U test. Categorical variables were expressed as absolute and relative frequency n (%) and were compared using the Chi test. -Square. * p <0.05 for patients with good, very good or excellent quality of life compared to patients with regular quality of life. HbA1c = glycated hemoglobin, HDL = high density lipoprotein, LDL = low density lipoprotein, NS = not significant, RAC = albumin / creatinine ratio, GFR = glomerular filtration rate.

Table 4 presents the association between clinical, sociodemografic and laboratory variables with good or very good or excellent quality of life. According to multivariate analysis, female sex was independently associated with a regular QOL (OR = 0.166 (0.031 – 0.877), p = 0.043).

Table 4: Association between clinical and laboratory variables with good or very good or excellent quality of life.

Variable	Good or Very Good or Excellent Quality of Life x Regular Quality of Life - Bivariate Logistic Regression Analysis - Odds Ratio (95% CI)	Good or Very Good or Excellent Quality of Life x Regular Quality of Life - Multivariate Logistic Regression Analysis - Odds Ratio (95% CI)
Women	0.243 (0.071 – 0.828), p = 0.024*	0.166 (0.031 – 0.877), p = 0.035*
Unemployment or unpaid work	0.356 (0.138 – 0.920), p = 0.033*	NS
BMI ≥ 30 kg/m^2	0.523 (0.227 – 1.204), p = 0.128	NS
Use of oral antidiabetics	2.212 (1.017 – 4.814), p = 0.045*	NS
Insulin use	0.420 (0.192 – 0.920), p = 0.030*	NS
T2DM duration ≥ 10 years	0.468 (0.199 – 1.100), p = 0.081	NS
Acute myocardial infarction	0.493 (0.171 – 1.422), p = 0.191	NS
Angina	0.388 (0.168 – 0.896), p = 0.027*	NS
Congestive heart failure	0.228 (0.093 – 0.562), p = 0.001*	NS
Brain stroke	0.147 (0.043 – 0.498), p = 0.002*	NS
Depression	0.401 (0.182 – 0.883), p = 0.023*	NS
HbA1c ≥ 7.0%	0.411 (0.159 – 1.059), p = 0.066	NS
LDL cholesterol ≥ 100 mg/dL	0.483 (0.202 – 1.155), p = 0.102	NS
HDL cholesterol ≤ 50 mg/dL	0.441 (0.185 – 1.052), p = 0.065	NS

The bivariate and multivariate logistic regression analyzes were performed using the group of patients with good or very good or excellent quality of life as a reference. * p <0.050 for patients with good or very good or excellent quality of life compared to patients with regular quality of life. T2DM = type 2 diabetes mellitus, HbA1c = glycated hemoglobin, HDL = high density lipoprotein, 95% CI = 95% confidence interval, BMI = body mass index, LDL = low density lipoprotein, NS = not significant.

DISCUSSION

Since 1948, the World Health Organization (WHO) defines health as "the state of the most complete physical, mental and social well-being, and not just the absence of disease". This new definition had important implications, since in addition to the treatment and prevention of diseases, health systems had to adopt strategies to promote the health and QOL of individuals (SCLIAR, 2007). The treatment of T2DM requires the chronic use of medications and changes in diet and lifestyle habits, which results in the emergence of emotional problems and impairment patients' QOL. This situation can still be intensified by the comorbidities and chronic complications of DM (GROSS, 2004). Among patients interviewed in this study, 53.6% had good, 31.7% very good, 10.9% regular and 3.8% excellent QOL, reflecting the impact of the disease in the patients' QOL.

The epidemiological profile of individuals with T2DM was characterized by the predominance of females, which was independently associated with a worse QOL. Women seek frequently for better health care, favoring the disease diagnosis, and the demand for family health care is a role for women in our society (Miranzi et al., 2008; Valença et al., 2018). For Gomes et al. (2007), the characteristics of men as strong and invulnerable could be questioned by searching for health services. On the other hand, a study conducted by Moreschi et al. (2018) found no significant difference between QOL and the sex of patients with T2DM. However, these authors used the WHOQOL-Bref questionnaire to evaluate the QOL of patients, which is not specific to asses the QOL of DM patients and has not been adapted to the Brazilian population.

A longer duration of the T2DM, assessed by a longer time since diagnosis, was associated with a worse QOL. Patients with long-term illness in general have poor glycemic control favoring complications, which makes it difficult to manage the disease, contributing to a worse QOL (LIMA et al., 2018). It was also observed that younger age of T2DM at diagnoses was associated with a worse QOL. Possibly, most patients with a younger age at diagnosis had a longer duration of diabetes in this study, which would explain this finding.

Patients who had poor glycemic control with HbA1c ≥ 7% had worse QOL, since it is associated with the appearance of complications and comorbidities, contributing to a worse QOL (TONETTO et al., 2019). According to the Brazilian Diabetes Society (SBD, 2024), the HbA1c target is < 7.0% for adults, < 7.5% for healthy elderly people and < 8.0% for debilitated elderly people. Despite that, it was used a single target of < 7.0% for the analyses since this study included adults and elderly people, and even so an association between HbA1c ≥ 7% and a regular QOL was found.

Elevated levels of low density lipoprotein cholesterol and reduced levels of high density lipoprotein cholesterol are associated with an increased risk of cardiovascular complications (FALUDI et al., 2017). However, there was no association between the presence of dyslipidemia (data reported by patients or collected in medical records) or elevated levels of low density lipoprotein cholesterol with worse QOL in this study. On the other hand, high density lipoprotein cholesterol levels < 50 mg/dL were associated with a worse QOL.

Cardiovascular complications caused by T2DM, such as stroke, angina and congestive heart failure were associated with a worse quality of life in the present study. Patients with T2DM who suffered stroke have a great tendency to develop sadness and depression. Patients becomes more dependent on their relatives and this dependence generates feelings of worthlessness and low self-esteem, a fact that can compromise treatment adherence and may affect the patients' QOL (Venditti Junior et al., 2019).Depression is indeed a factor that worsens the QOL of patients with T2DM (CAMPOS; RODRIGUES NETO, 2009). Moreira et

al. (2009) concluded that the presence of depression in these individuals is associated with less adherence to treatment and greater risk of discontinuing the use of medications. These facts contribute to a possible worsening of glycemic control leading to increased morbidity and mortality. In accordance, depression was more frequent in patients with regular QOL in this study.Although the changes in patients who live with chronic kidney disease may impose limitations and interfere with the patient's QOL, the present study observed no association with diabetes kidney disease (data reported by patients or collected in medical records), high levels of serum creatinine and reduced glomerular filtration rate with a worse patients' QOL. On the other hand, patients with increased levels of isolated albuminuria or albumin/creatinine ratio and isolated albuminuria dosage ≥ 174 mg/L, which indicates the presence of glomerular lesion, was associated with a worse QOL (DALLACOSTA et al., 2017).

Treatment with oral antidiabetic agents is the first choice for patients with T2DM. However, if these drugs are not enough to control blood glucose, the use of insulin is necessary. Due to the chronic nature of T2DM, over the years, most patients are unable to maintain good glycemic control only with the use of oral antidiabetic agents, requiring insulin therapy. This type of therapy can present several inconveniences, such as painful injections, strict treatment regimens, the need for multiple applications per day, limited daily activities and even the presence of lipodystrophies and hypoglycemia. As a result, the use of insulin by patients with T2DM is among the variables that may contribute to a worse QOL (Campos; Rodrigues Neto, 2009). This information corroborates with the data obtained in the present study, also indicating that individuals using oral antidiabetic agents had better QOL than patients who are already using insulin.

Factors such as attitude towards the disease and knowledge about T2DM were assessed using the ATT-19 and DKNA instruments respectively, and despite not having an influence on QOL in the present study, they showed to be important for patient treatment compliance. It is important to emphasize that no patient had a score above 70 points in ATT-19 instrument, so no patient had a positive attitude to diabetes in this study. Therefore, a score of 55 points was used as indicative of a positive attitude to enable statistical analysis. Lima et al. (2018) reported that the attitude is related to patients' psychological and emotional issues in the face of the behavioral changes necessary for self-management of T2DM.

This study has some limitations, since the sociodemographic and clinical data, including the presence of comorbidities and complications of DM, was obtained through interviews with patients and supplementing this information by consulting medical records. Patients are often unaware of their own comorbidities and complications of DM and many data was not available in the medical records. Obtaining laboratory data by consulting the medical records is also a limitation of this study, since many data were missing from the medical records.

CONCLUSION

In this study, 10.9% of the T2DM had regular QOL, and presented higher levels of HbA1c, isolated albuminuria and urinary albumin/creatinine than patients with good, very good or excellent QOL. The frequency of HbA1c levels ≥ 7.0%, HDL cholesterol ≤ 50 mg/dL and isolated albuminuria ≥ 174 mg/L was also higher in patients with regular QOL than in those with good, very good or excellent QOL. Knowledge and attitude towards T2DM had no impact on QOL, whereas female sex was independently associated with regular QOL. These factors that can compromise the QOL of patients with T2DM must be taken into account by health teams for the adoption of strategies to promote the QOL of these patients.

ACKNOWLEDGEMENTS

The authors would like to thank Coordination for the Improvement of Higher-Level Education (CAPES) which supported this study, Finance code 001.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in relation to the publication of this manuscript.

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