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Linking quality of healthcare and health-related quality of life of patients with type 2 diabetes: an evaluative study in Mexican family practice

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Abstract

Objective. To assess the association between quality of care and health-related quality of life among type 2 diabetes patients.

Design. A cross-sectional study assessing the association between quality of care and quality of life using multiple linear regression analysis.

Setting. Family medicine clinics (FMC) ($n = 39$) of the Mexican Institute of Social Security (IMSS) in Mexico City.

Participants. Type 2 diabetes patients ($n = 312$), older than 19 years.

Main Outcome Measure(s). Health-related quality of life was measured using the MOS Short-Form-12 (SF-12); quality of healthcare was measured as the percentage of recommended care received under each of four domains: early detection of diabetes complications, non-pharmacological treatment, pharmacological treatment and health outcomes.

Results. The average quality of life score was 41.4 points on the physical component and 47.9 points on the mental component. Assessment of the quality of care revealed deficiencies. The average percentages of recommended care received were 21.9 for health outcomes and 56.6 for early detection of diabetes complications and pharmacological treatment; for every 10 percent additional points on the pharmacological treatment component, quality of life improved by 0.4 points on the physical component (coefficient 0.04, 95% confidence intervals 0.01–0.07).

Conclusions. There was a positive association between the quality of pharmacological care and the physical component of quality of life. The quality of healthcare for type 2 diabetes patients in FMC of the IMSS in Mexico City is not optimal.

Keywords: quality measurement, quality management, quality indicators, patient outcomes (health status, quality of life, mortality)

Background

Type 2 diabetes mellitus is a multidimensional health problem with important consequences owing to its increasing prevalence, chronicity and complications that cause disability, decreased health-related quality of life (HRQoL) and premature death [1]. The effectiveness of diabetes management has different interpretations from the perspectives of healthcare providers and patients. From the medical perspective, the aim is to attain values of biological parameters that are considered appropriate, such as blood glucose, body mass index (BMI) and blood pressure. These parameters are associated with the risk for acute or chronic complications and can be used to measure the success of treatment. From the patients' perspective, the aim is to feel better and able to perform their daily activities. Both, patients and providers share a common goal: avoiding future complications.

HRQoL measurement provides an estimate of the sense of well-being and functioning of the patients; it is a reliable approach to measuring survival experience and, for other

conditions, has been an independent predictor of the performance and effectiveness of health services [2, 3]. Several patient characteristics are associated with low HRQoL scores among patients with diabetes: female sex, older age, low literacy, limited schooling, low income, sedentary lifestyle, obesity, having been diabetic for >5 years and having complications and/or co-morbidities such as heart disease and depression [4–6].

Few studies have investigated the relationship between the quality of health care and HRQoL. Some studies have reported higher HRQoL scores when there is higher adherence to process of care standards [7] and continuity of healthcare [8]. Better glycemic control reduces the risk of cardiovascular disease [9] and amputations [10], thus improving HRQoL [11]. Providing high quality of care for diabetes patients is a challenge, particularly for primary care services; however, once it reaches high standards, the probability of improving health outcomes increases [12].

In developing countries, the prevalence of diabetes is on the rise; for example, in Mexico, between 1993 and 2006, the prevalence of diabetes increased from 6.7 to 14.4% [13]. The Mexican Institute of Social Security (IMSS) is a contributory national social security institution that provides social, economic and health benefits to its beneficiaries, which account for 47% of the Mexican population. It is contributory because employers and employees must pay in order to receive benefits. It is a pre-payment system. This institution reported that diabetes is among the top causes of ambulatory visits and hospital admissions.

IMSS has implemented strategies to improve the quality of healthcare for diabetes patients. The institution developed clinical guidelines, programs to update family doctors and healthcare models, and introduced an electronic health record (EHR). Despite these efforts, evaluations suggest that clinical quality for diabetes patients does not reach high standards [14–16]. Moreover, IMSS is still evaluating healthcare on biological parameters and lacks other perspectives such as the perception of patients regarding HRQoL.

This paper examines the association between quality of healthcare and HRQoL in patients with type 2 diabetes cared for at family medicine clinics (FMC). Additionally, it explores the potential association between HRQoL and the characteristics of the patients and healthcare services.

Methodology

From September to October 2010, a cross-sectional study was conducted in 39 IMSS FMC in Mexico City.

Sample

The sample size required to assess the association between HRQoL and quality of care was estimated as follows: first, the sample size was calculated without considering the clinics (clusters) in the design of the study by using the formula to test the differences between means assuming normal distributions [17]. The assumptions considered a mean increase of at least four points on the physical and mental composite scores of MOS Short-Form-12 (SF-12) per 10% increase in the quality of recommended care received. Other assumptions were as follows: the previously-reported average HRQoL score for diabetes patients ($\mu_0 = 45.5$ and standard deviation 12.3), alpha = 0.05, 80% power and 10% non-response rate. This calculation resulted in a sample of 198 patients. The study included 39 FMC; therefore, the sample size was re-calculated, considering the design effect and the expected number of diabetes patients per clinic per day ($n = 8$) with a correlation coefficient estimated at $\rho = 0.05$ and with the use of the formula proposed by Eldridge *et al.* [18], yielding a sample size of 316 patients.

Study variables

HRQoL was measured using the Spanish version of MOS SF-12, which comprises 12 items and assesses 8 subdomains: general health, physical functioning, role functioning (physical), bodily pain, vitality, role functioning (emotional), mental health and social functioning. The subdomains are summarized in the physical (PCS) and mental (MCS) composite scores. We used an algorithm to convert each item response into both physical and mental standardized values according to a specific predetermined weight. The summary scores for each component are located in a range from 0 to 100 and are interpreted as low HRQoL when the score is close to 0 and as high HRQoL when the score approaches 100 [19].

The quality of healthcare was assessed in four domains: early detection of diabetes complications, non-pharmacological treatment, pharmacological treatment and health outcomes. We used the quality of care indicators developed and validated previously by our research group [16]. We ascertained the percentage of recommended care received in each quality of care domain by calculating a simple proportion [20]. The numerator was the sum of indicators that the diabetes patient received in each component; the denominator was the total number of recommended indicators; the result was multiplied by 100.

Based on previous studies suggesting an association between HRQoL and the socio-demographic and health characteristics of patients, we included as covariates the patient's sex, age, schooling, employment status, medical history (duration of diabetes, co-morbidities and complications) and nutritional status, which was measured by calculating the BMI and classified into groups: normal weight (BMI 18.5–24.9 kg/m^2), overweight (BMI 25.0–29.9 kg/m^2) and obese (BMI $\geq$30.0 kg/m^2).

To depict additional aspects of healthcare delivered by the family doctor and helpful to understand the process of care, we collected information regarding the number of follow-up visits, inquiries of the family doctor about the patient's lifestyle (regular leisure-time physical activity and diet) and adherence to hypoglycemic medicines; delivery of information about diabetes and its complications, support groups, hypoglycemic medicines (instructions to take it and identify adverse events). The characteristics of pharmacological treatment included medicines prescribed at the last visit and treatment adjustments for uncontrolled blood glucose. The visits to IMSS emergency room, private doctor and private laboratory were registered as well. Other variables known to be related to the HRQoL were as follows: patients' adherence to family doctor

recommendations such as diet, physical activity and hypoglycemic medicines.

Fieldwork description and inclusion criteria

Two sources of data were used: the patient interview and the EHR. The EHR provided data about patients' diagnosis, nutritional status, foot evaluation, referrals to the ophthalmologist, treatment and registries of blood pressure, HbA1c, fasting plasma blood glucose and total cholesterol levels.

Four registered nurses received a one-week training to run the fieldwork. The training included identification and recruitment of participants, application of the questionnaire and extraction of the information from the EHR. The nurses interviewed patients of >19 years of age with an established diagnosis of type 2 diabetes, who had six or more diabetes follow-up visits to the family doctor during the past year; this is the average number of visits that IMSS clinical guidelines recommend. In each clinic, the nurses interviewed the first four patients in the morning and evening shifts after obtaining their verbal informed consent. The interview took place immediately after the follow-up visit. The nurses reviewed the EHR to verify and register the information about the healthcare that the participant had received during the previous year, including the last visit. This revision was performed to fill out the data collection instrument.

Statistical analysis

Descriptive statistics was used to analyze the general characteristics, medical history, nutritional status and HRQoL of participants, and also the characteristics of healthcare in the last 12 months and adherence to the family doctor recommendations.

To determine the factors associated with HRQoL, first, the crude association of the socio-demographic and clinical variables and quality of care with each component of HRQoL was assessed through bivariate analysis; then, a multiple linear regression analysis for each HRQoL component (physical and mental) was performed. The rationale to build the model was to include all the conceptually relevant independent variables. The study included patients from 39 FMC (eight patients per clinic); thus, one of the assumptions was that the measurements within FMC may not be independent because patients affiliated to the same FMC were more likely to receive similar quality of care than patients from other FMC. Therefore, the cluster effect was considered in the analysis. For this purpose, we adjusted the standard errors by computing clustered robust standard errors for the coefficients. The statistical package Stata 10.0 (Stata 10.0, Stata Corp, College Station, TX, USA) served to perform the analysis.

The IMSS National Research and Ethics Committee approved the project.

Results

The study included 312 participants. Table 1 shows their general characteristics. Most participants were female (69%), >59 years of age (67%), had a life partner (65%), low education level (63%) and unemployed (78.8%). More than 50% had been diabetics for >10 years; 72% had additional chronic conditions such as hypertension and 14% had diabetes complications. Over 80% were overweight. Regarding the HRQoL components, the average PCS was 41.5 and the average MCS was 47.9.

Table 1 General characteristics, medical history, nutritional status and HRQoL

Variables	Total, $N = 312$ *n* (%)
General characteristics	
Female sex	217 (69.6)
Age group	
<50 years	26 (8.3)
50–59 years	76 (24.4)
60–69 years	120 (38.5)
≥70 years	90 (28.8)
Having a life partner	204 (65.4)
Schooling	
Primary school or less	198 (63.5)
Secondary school	74 (23.7)
High school or higher	40 (12.8)
Employment status	
Employed	66 (21.2)
Retired or unemployed	246 (78.8)
Medical history	
Duration of diabetes	
<5 years	60 (19.2)
5–10 years	88 (28.2)
11–15 years	66 (21.2)
>15 years	98 (31.4)
Number of chronic diseases, median[a] (minimum–maximum)	3.0 (1–7)
Type of chronic diseases	
Hypertension	225 (72.1)
Cardiovascular diseases[b]	26 (8.3)
Osteomuscular diseases	74 (23.7)
Gastrointestinal diseases	41 (13.1)
Depression	9 (2.9)
Diabetes complications	45 (14.4)
Nutritional status	
Normal weight	47 (15.1)
Overweight	126 (40.4)
Obesity	139 (44.6)
HRQoL[c]	
Physical component, mean (standard deviation)	41.5 (9.2)
Mental component, mean (standard deviation)	47.9 (11.4)

[a]Number of chronic diseases including diabetes and its complications.
[b]Cardiovascular diseases excluding hypertension.
[c]Health-related quality of life.

Table 2 Characteristics of healthcare during the last 12 month and patient's adherence to family doctor's recommendations

Variables	*n* (%) *N* = 312
Number of diabetes follow-up visits, median (minimum–maximum)	12 (6–12)
Family doctor explored patient's lifestyle by interrogating about	
Diet	175 (66.1)
Regular leisure-time physical activity	215 (68.9)
Adherence to hypoglycemic medications	251 (80.4)
Family doctor delivered information about	
Diabetes	256 (82.1)
Diabetes complications	239 (76.6)
Support groups	93 (29.8)
Importance of hypoglycemic medication(s)	279 (89.4)
How to take hypoglycemic medication(s)	288 (92.3)
Adverse effects of hypoglycemic medication(s)	187 (59.9)
Pharmacological treatment prescribed in the last visit[a]	*n* = 312
Number of medicines prescribed, median (minimum–maximum)	6.0 (1–14)
Type of hypoglycemic treatment	
None	2 (0.6)
Oral hypoglycemic medicines	234 (75.0)
Insulin with or without oral hypoglycemic medicines	76 (24.4)
Treatment adjustments for uncontrolled blood glucose	*n* = 120
	31 (25.8)
Use of additional health services for the management of diabetes	*n* = 312
Emergency services at IMSS	123 (39.4)
Visits to private doctor	88 (28.2)
Visits to private laboratory	36 (11.5)
Patient's adherence to family doctor recommendations	
Adherence to dietary recommendations	183 (58.7)
Adherence to physical activity recommendations	203 (65.1)
Adherence to hypoglycemic treatment	266 (85.2)

[a]The information regarding the pharmacological treatment was obtained from the EHR.

Table 2 shows the characteristics of healthcare over the previous 12 months. All participants had between six and twelve follow-up visits. Most reported that the family doctor had asked about their lifestyle and provided information concerning the diabetes and its treatment. The information provided frequently was the instructions to take the medication (92%), whereas information about support groups (29.8%) was scant. All patients were prescribed six medicines on average. Most were treated with oral hypoglycemic agents (75%). The treatment plan was changed in 25% of patients with uncontrolled blood glucose. In addition to the family doctor visits, 39% had attended IMSS emergency services because of diabetes-related complications and 28% had seen a private medical doctor. More than half of participants reported adherence to family doctors recommendations.

Table 3 describes the quality of care indicators. Adherence to processes of care was 32% for at least one measurement of HbA1c, 25% for an ophthalmological examination and 100% for fasting blood glucose measurements. With respect to the non-pharmacological treatment, only 30% had received nutritional counseling. The pharmacological treatment evaluation showed that 89% of overweight patients were prescribed metformin but only 41% of those with hypercholesterolemia received a statin. The health outcomes component revealed that 18% had adequate blood glucose control in the last three measurements; 54.5% had adequate serum cholesterol levels and only 5.8% had blood pressure control. The lowest mean score of recommended care was 21.9% for health outcomes and for non-pharmacological treatment was 44.6%.

Table 4 shows the bivariate analysis of the HRQoL components according to the participants' socio-demographic and health conditions. The highest PCS was observed in: males, with life partner, secondary or higher education, normal weight, without comorbidity, reporting adherence to physical activity recommendations, not attending emergency services and not being prescribed insulin. The highest MCS was among male participants, non-hypertensives, reporting adherence to dietary and physical activity recommendations and not attending emergency services or being prescribed insulin.

Table 3 Indicators of quality of healthcare[a]

Indicators	Total *n* (%) *N* = 312
I. Process of care	
A. Timely detection of diabetes complications and comorbidity	
At least one measurement of HbA1c in the last year	101 (32.4)
Comprehensive foot evaluation in the last year	306 (98.1)
Referral to the ophthalmologist in the last year	79 (25.3)
Screening for dyslipidemia by measuring total cholesterol in patients without previous diagnosis of dyslipidemia in the last year	*n* = 231 178 (77.1)
B. Non-pharmacological treatment	
Nutritional counseling provided by the nutrition service in the last year	96 (30.8)
Advise to practice aerobic physical exercise of moderate intensity, at least 150 min per week, unless contraindicated in the last year	*n* = 300 171 (57.0)
Smoking cessation counseling for current smokers in the last year	*n* = 49 36 (73.5)
C. Pharmacological treatment	
Overweight/obese (BMI ≥25 kg/m^2) patients who received metformin, in the last three visits, unless contraindicated	*n* = 237 211 (89.6)
Patients with hypertension receiving inhibitors of angiotensin-converting enzyme or angiotensin-receptor blocker, in the last three visits, otherwise contraindicated	*n* = 225 147 (65.3)
Patients >40 years of age with one or more of the following risk factors: smoking, hypertension, dyslipidemia, receiving 75–150 mg/day of acetylsalicylic acid, in the last three visits, unless contraindicated	*n* = 306 98 (32.0)
Patient with total cholesterol >200 mg/dl and were prescribed statins, in the last three visits, unless contraindicated	*n* = 93 38 (40.9)
II. Health outcomes	
HbA1c <7% or fasting plasma glucose ≤130 mg/dl in the last 3 measurements	*n* = 312 57 (18.3)
Total cholesterol levels <200 mg/dl in the last measurement	*n* = 255 139 (54.5)
Blood pressure <130/80 mmHg in the last 3 measurements	*n* = 312 18 (5.8)
Overweight/obese (BMI ≥25 kg/m^2) patients who lost ≥5% body weight in the last year	*n* = 262 39 (14.9)
IV. Recommended healthcare received	Mean % (SD)
Timely detection of diabetes complications and comorbidity	56.6 (21.9)
Non-pharmacological treatment	44.6 (32.3)
Pharmacological treatment	56.7 (29.4)
Health outcomes	21.9 (20.6)

[a]The indicators of quality of healthcare were developed by Pérez-Cuevas R *et al.* [16].

The multivariate analysis revealed that having a high percentage of recommended care in the pharmacological treatment component (coefficient 0.04, 95% CI 0.01–0.07) was associated with a high PCS after adjusting for other covariates. This means that for every 10 percentage point increase in receiving the recommended care, the PSC improved by 0.4 points. The analysis of the association of other clinical quality components with PCS and MCS showed no statistically significant differences. Regarding the characteristics of participants, the covariates being male and having secondary school or higher education were associated with high PCS, whereas the covariates associated with low PCS were having higher BMI, hypertension, osteomuscular disease, being prescribed a large number of medicines or insulin and attendance to emergency services. Regarding the analysis of MCS, the covariates adherence to dietary recommendations were associated with high MCS, whereas the covariates insulin and large number of prescribed medicines were associated with low MCS scores (Table 5).

Discussion

The main results of this study showed the positive association between the pharmacological treatment and the physical

Table 4 Bivariate analysis of health-related quality of life according to socio-demographic, medical history, nutritional status and healthcare characteristics of respondents[a]

	Physical component Mean (standard deviation)		Mental component Mean (standard deviation)	
	With characteristic	Without characteristic	With characteristic	Without characteristic
Socio-demographic characteristics				
Male sex	44.2 (8.4)	39.8 (9.6)*	50.2 (10.3)	46.9 (11.8)*
Having a life partner	41.9 (9.3)	39.7 (9.6)*	47.4 (11.4)	48.8 (11.5)
Secondary school or higher	42.7 (9.6)	40.3 (9.3)*	48.5 (11.4)	47.6 (11.5)
Medical history				
Hypertension	40.2 (9.6)	43.6 (8.7)*	46.7 (11.8)	51.0 (9.9)*
Osteomuscular diseases	38.2 (10.1)	42.1 (9.1)*	47.1 (11.9)	48.1 (11.4)
Obesity	39.6 (9.5)	42.4 (9.2)*	47.1 (12.1)	48.5 (10.9)
Patients' adherence to family doctor recommendations				
Adherence to dietary recommendations	41.9 (9.2)	40.0 (9.8)	50.2 (11.0)	44.6 (11.3)*
Adherence to physical activity recommendations	42.4 (8.9)	38.8(10.1)*	49.7 (11.2)	44.4(11.3)*
Characteristics of healthcare				
Use of emergency services	38.9 (10.2)	42.6 (8.7)*	46.0 (12.1)	49.1 (10.9)*
Use of insulin	38.8 (10.0)	41.9 (9.2)*	44.4 (11.2)	49.1 (11.3)*

*$P < 0.05$.
[a]The table presents only variables that resulted significant in the bivariate analysis.

component score of HRQoL. The results also indicate that the clinical quality was substandard, although the overall HRQoL scores were comparable with what has been reported in similar studies.

Diabetes has important implications for the HRQoL because the symptoms and progression of the disease impact on the sense of well-being and functionality of the patients. Similar to other studies, the physical component score was lower than the mental component [21, 22]. This is because the disease has more physical than mental manifestations.

While clinical quality was not optimal, our study suggests that more effective pharmacological treatment was associated a higher PCS. This may be partially explained by the effect of drug treatment in mitigating symptoms, which in turn would result in improved HRQoL. If so, improving clinical quality process would have a positive impact in the score of HRQoL. Because our study is cross-sectional, it is also plausible that patients who report a better HRQoL receive better quality care because HRQoL is related to patient characteristics observable to family doctors. The statistical models controlled for many of these characteristics making such a reverse causation less likely, but it may be possible that other unmeasured characteristics influence the relationship between treatment and HRQoL.

The results suggest that it is advisable to include the evaluation of HRQoL as part of the daily practice and routine clinical quality assessment. Introducing the notion of the importance of measuring HRQoL to health personnel has had a positive impact on physician–patient communication, particularly in chronic patients [23, 24]. Adding the evaluation of HRQoL further the perspective of the disease-centered medical assessment and would provide a comprehensive picture for both patients and providers.

Regarding other factors associated with HRQoL, the results of our study were consistent with prior studies, which have reported that being female, being overweight/obese or hypertensive, with lower schooling, having osteomuscular disease, being prescribed more medicines or insulin and attending emergency services were associated with lower HRQoL scores. Adherence to dietary and exercise recommendations were associated with better HRQoL [4, 25].

The shortage of resources affects clinical quality. The fact that only 32% of patients had HBA1c measurements and 25% ophthalmological examinations is mostly due to scarcity of resources rather than poor clinical decision-making. These findings are similar to what has been reported in México [14–16] and other developing countries [26, 27], with shortcomings in the supply of specialists and laboratory resources. Further investment in infrastructure can bring medium- and long-term returns. Appropriate monitoring of blood glucose allows identifying whether the patient fails to reach expected levels and make treatment adjustments, which in turn delays appearance of complications. Timely screening for diabetic retinopathy also prompts treatment changes and reduces the progression to blindness by 50% [28].

Diabetes non-pharmacological treatment is critical and poorly addressed in primary care clinics despite its potential benefits. Adequate diet [29, 30] and regular moderate intensity physical activity (≥150 min/week) [31] reduce HbA1c between 1 and 2% and lower LDL cholesterol levels, body weight and blood pressure. In our study, ∼57% had received physical activity recommendations, and 30% had received nutritional

Table 5 Factors associated with HRQoL in diabetes patients

Variables	Crude coefficient	Confidence intervals at 95%	*P* value	Adjusted coefficient	Confidence intervals at 95%	*P* value
Physical component						
Recommended healthcare						
Timely detection of diabetes complications and comorbidity	0.002	−0.04 to 0.04	0.93	0.01	−0.04 to 0.06	0.73
Non-pharmacological treatment	0.02	−0.01 to 0.06	0.19	0.01	−0.02 to 0.05	0.44
Pharmacological treatment	0.03	−0.01 to 0.06	0.14	**0.04**	**0.01 to 0.07**	**0.04**
Health outcomes	0.02	−0.03 to 0.07	0.38	0.01	−0.04 to 0.06	0.68
Other patients and healthcare characteristics						
Male sex	4.4	1.8 to 6.9	0.00	**2.4**	**0.1 to 4.6**	**0.04**
Having a life partner	2.2	0.2 to 4.6	0.08	0.6	−1.2 to 2.5	0.48
Secondary school or higher	2.5	0.3 to 4.6	0.03	**2.6**	**0.4 to 4.5**	**0.02**
Employed	2.4	−0.1 to 4.9	0.06	0.9	−1.4 to 3.3	0.43
BMI	− 0.3	−0.5 to −0.1	0.04	**−0.3**	**−0.5 to −0.6**	**0.01**
Hypertension	−3.8	−6.1 to −1.5	0.01	**−1.9**	**−3.9 to −0.1**	**0.05**
Osteomuscular diseases	−3.5	−5.9 to −1.2	0.00	**−2.9**	**−5.5 to −0.3**	**0.03**
Duration of diabetes ≥5 years	0.9	−1.8 to 3.6	0.50	−0.2	−2.6 to 2.3	0.89
Diabetes complications	−0.7	−3.2 to 1.8	0.58	0.1	−2.8 to 3.0	0.94
Adherence to dietary recommendations	1.9	0.1 to 3.8	0.04	0.2	−1.6 to 1.9	0.82
Adherence to physical activity recommendations	3.5	1.2 to 5.9	0.00	1.3	−1.3 to 3.9	0.32
Number of prescribed medicines	−0.8	−1.3 to −0.3	0.00	**−0.7**	**−1.2 to −0.2**	**0.01**
Use of insulin	−3.1	−5.5 to −0.7	0.01	−2.8	−5.7 to −0.2	0.07
Use of emergency services	−3.7	−5.9 to −1.6	0.00	**−2.2**	**−4.1 to −0.3**	**0.02**
Mental component						
Recommended healthcare						
Timely detection of diabetes complications and comorbidity	0.04	−0.11 to 0.02	0.20	−0.02	−0.08 to 0.03	0.42
Non-pharmacological treatment	0.03	−0.02 to 0.07	0.21	0.01	−0.04 to 0.05	0.75
Pharmacological treatment	0.01	−0.04 to 0.06	0.76	0.01	−0.04 to 0.07	0.63
Health outcomes	−0.02	−0.06 to 0.3	0.45	−0.02	−0.07 to 0.02	0.37
Other patients and healthcare characteristics						
Male sex	3.3	0.2 to 6.3	0.04	2.8	−0.3 to 5.9	0.78
Having a life partner	−1.4	−4.2 to 1.4	0.33	−2.2	−5.0 to 0.5	0.11
Secondary school or higher	0.9	1.5 to 3.4	0.45	0.9	1.7 to 3.6	0.48
Employed	1.7	−1.5 to 5.0	0.29	0.3	−2.9 to 3.5	0.86
BMI	−0.1	−0.4 to 0.2	0.45	−0.3	−0.4 to 0.3	0.88
Depression	−6.7	−18.6 to 5.1	0.26	−5.7	−15.7 to 4.3	0.25
Osteomuscular diseases	−1.1	−4.0 to 1.9	0.48	0.03	−3.1 to 3.2	0.98
Duration of diabetes ≥5 years	0.5	2.5 to 3.6	0.73	−0.3	−3.6 to 2.9	0.83
Diabetes complications	−1.1	−4.7 to 2.6	0.56	0.4	−3.9 to 4.0	0.98
Adherence to dietary recommendations	5.6	3.0 to 8.1	0.00	**4.1**	**1.6 to 6.6**	**0.00**
Adherence to physical activity recommendations	5.3	2.7 to 7.9	0.00	2.8	−0.6 to 6.3	0.09
Number of prescribed medicines	−0.9	−1.6 to −0.4	0.00	**−0.7**	**−1.4 to −0.1**	**0.02**
Use of insulin	−4.7	−7.6 to −1.8	0.00	**−3.9**	**−6.5 to −1.4**	**0.00**
Use of emergency services	−3.1	−5.5 to −0.8	0.01	−1.6	−3.9 to 0.6	0.15

The bold values highlighted the statistically significant adjusted coefficients.

counseling. These data must be given further attention because the study population had a high prevalence of overweight and obesity, dyslipidemia and poor glycemic control (85, 82 and 82%, respectively). These figures indicate that this population requires further individual counseling to improve their lifestyle. Additionally, nutritional counseling and subsequent follow-up by a dietitian is more effective for diabetes patients than family doctor recommendations [32].

Pharmacological treatment requires improvement for diabetes patients with comorbidity such as hypertension or with risk factors for cardiovascular events. For patients with diabetes and hypertension, treatment with ACE inhibitors delays the development or progression of kidney disease. For diabetes patients with high levels of cholesterol, treatment with statins can reduce the risk of cardiovascular events; the use of acetylsalicylic acid reduces the risk of death from CVD by decreasing myocardial infarctions up to 30% and acute cerebrovascular events by 20% [33].

In clinical practice, optimal glycemic and blood pressure control are difficult targets to achieve. Multiple factors such as duration of illness, presence of comorbidities, patient adherence to diet, exercise and drug treatment among others influence the expected health outcomes [34]. Achievement of glycemic and blood pressure control should be a responsibility shared between the doctor and the patient. In our study, less than a quarter of patients had achieved glycemic and blood pressure control. These figures were lower than reported by other studies in the same institution [14, 15].

The study has several limitations. There is a selection bias in the sample. Only patients with six or more visits were included in the study. This could overestimate the quality of care, because these patients were seen more often. Furthermore, the answers of the patients might be biased. There is some inconsistency between their answers about the information received concerning the disease and the actual health outcomes. As noted earlier, this was a cross-sectional study, so causal inferences may be limited, yet the results are consistent with other studies analyzing the factors associated with HRQoL.

To conclude, there is a pressing need to improve quality of care for diabetes patients and improve their awareness of the implications of receiving proper care. We found a positive association between the quality of pharmacological care and HRQoL on its physical component.

Authors' contributions

S.V.D. conceptualized and designed the study, conducted the statistical analysis, and interpreted the data and wrote the article. D.M.-L. reviewed the results and contributed to drafting the article. R.P.-C. participated in conceptualization of the study, coordinated the fieldwork, contributed to drafting the article and reviewed the paper for significant intellectual content. All the authors approved the final manuscript.

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Conflict of interest

None declared.

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