Relationship between quality of life and the metabolic-nutritional profile of individuals with type 2 diabetes *mellitus*

Relação entre a qualidade de vida e o perfil metabólico e nutricional de indivíduos com diabetes *mellitus* tipo 2

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Abstract

Knowing the quality of life and life satisfaction among the diabetic population can help in the development of food and nutritional education strategies, public policies related to food and nutritional security, as well as result additional benefits to this population. Thus, the objective of the study was to assess the relationship between quality and satisfaction of life and the metabolic-nutritional profile of individuals with type 2 diabetes mellitus. A cross-sectional study was carried out with patients with type 2 diabetes mellitus from an outpatient endocrinology clinic of the University Hospital in Curitiba, Paraná. Quality of life was measured by the Problem Area in Diabetes (PAID) scale and the satisfaction of life by the Satisfaction with Life (SWL) instrument. Nutritional status was assessed by Body Mass Index and waist circumference. Glycemic control was assessed by a glycosylated hemoglobin test. To verify associations between the variables, we applied the chi-square and the t-test, when relevant. A total of 69 subjects with type 2 diabetes mellitus were assessed. Good quality and satisfaction of life were found in the study; however, nutritional status and glycemic control were found to be inadequate. There was no relationship of emotional distress associated with diabetes, or life satisfaction with the metabolic and nutritional profile. Early interventions are suggested concerning the improvement of the nutritional status and glycemic control of this population with the interest of avoiding micro and macro vascular complications, which may compromise their quality and satisfaction of life.

Keywords: Diabetes *Mellitus*. Quality of Life. Obesity. Stress psychological. Metabolic diseases.

Resumo

Conhecer a qualidade e a satisfação de vida da população diabética pode auxiliar no desenvolvimento de estratégias de educação alimentar e nutricional, de políticas públicas relacionadas com a segurança alimentar e nutricional e culminar em benefícios adicionar a essa população. Dessa forma, foi objetivo do estudo avaliar a relação entre a qualidade e a satisfação de vida e o perfil metabólico e nutricional de indivíduos com diabetes mellitus tipo 2. Estudo transversal com portadores de diabetes mellitus tipo 2 adultos, de um ambulatório de Endocrinologia de um hospital universitário em Curitiba, PR. A qualidade de vida foi mensurada pelo instrumento *Problem Area in Diabetes* e a satisfação de vida pelo *Satisfaction with life*. O estado nutricional foi avaliado pelo Índice de Massa Corporal e pela circunferência abdominal e o controle glicêmico avaliado pelo exame de hemoglobina glicosilada. Para verificar associações entre as variáveis, aplicou-se qui-quadrado e o teste t quando pertinente. Foram estudados 69 indivíduos com diabetes mellitus tipo 2. Boa qualidade e satisfação de vida foram encontradas na população estudada, entretanto, o estado nutricional e o controle glicêmico encontraram-se inadequados. Não se verificou relação do sofrimento emocional associado ao diabetes ou da satisfação de vida com o perfil metabólico e nutricional nesta população. Sugere-se intervenções precoces a fim de melhorar o estado nutricional e o controle glicêmico dessa população a fim de evitar complicações micro e macrovasculares, as quais podem comprometer a qualidade e a satisfação de vida dos mesmos.

Palavras-chave: Diabetes *Mellitus*. Qualidade de vida. Obesidade. Estresse psicológico. Doenças metabólicas.

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INTRODUCTION

Diabetes mellitus (DM) affects 415 million people worldwide with an estimated 65% increase in the number of people by the year 2040.[1] Brazil has 14.3 million individuals with DM and is ranked fourth among the countries with greater numbers of diabetics. The estimated costs related to diabetes and health in Brazil is approximately 22 billion dollars per year, which settles the country in fifth place of the ranking regarding expenses toward diabetes.[1]

Type 2 diabetes mellitus (T2DM) is characterized by a decreased response of peripheral tissues to insulin action, in addition to pancreatic B-cell dysfunction, which is manifested by inadequate secretion of this hormone.[2] Insulin resistance predicts the development of hyperglycemia and is usually accompanied by compensatory hyperfunctioning of B-cells.[3] Chronic hyperglycemia and concomitant metabolic dysregulation may be associated with secondary damage to multiple organ systems, especially kidneys, eyes, nerves, and blood vessels, which are the main complications and causes of death of this disease. [1,2]

Hypertension, physical inactivity, stress, age, genetic factors, elevation of waist circumference (WC), body mass index (BMI), and obesity are the main risk factors for type 2 diabetes mellitus (T2DM), which may interfere in the quality of life of this population.[4]

The quality of life of the diabetic population is increasingly valued, mainly as a focus of care due to the disease, the absence of a cure, and the need to minimize health costs.[5] Health-related quality of life is an important result in research involving the T2DM and is defined as a multidimensional construct that incorporates health-related physical, mental, emotional, and social well-being.[5,6]

Recent studies have shown that individuals with T2DM have a poorer quality of life when compared to healthy individuals.[7,8] Different reasons are highlighted for the lower quality of life in diabetics, ranging from daily use of medications, economic and social factors, information on the disease, type of care, changes in routine and eating habits, as well as the acute and chronic complications that may result from inadequate diet, insufficient metabolic control and/or poor nutritional status.[8-11]

Knowing the quality and satisfaction of life of this population, as well as the reasons that interfere with them, can help in the development of food and nutritional education strategies, of public policies related to food and nutritional security, and of the various health professionals associated with diabetes to culminate in better glycemic control, as well as in the aid of the psychosocioeconomic confrontation; which directly affects the quality of life of the population. At the moment, no studies have been found that evaluated the relationship between quality of life and the metabolic and nutritional profile of individuals with T2DM. Thus, the objective of this study was to evaluate the relationship between quality of life and the metabolic and nutritional profile of individuals with T2DM.

MATERIAL AND METHODS

A cross-sectional observational study was performed with patients diagnosed with T2DM, treated at an outpatient endocrinology clinic of the University Hospital in Curitiba, Paraná. The present study was approved by the Research Ethics Committee of the Positivo University, under nº 1.213.177.

Patients were recruited in the waiting room of the endocrinology clinic. Individuals over 18 years of age, both men and women, with medical diagnosis of T2DM, without amputation of limbs, with the absence of neurological and/or psychiatric disease, were invited to participate in the study. They all agreed and signed the Free Consent and Informed Term. The patients were then taken to an office for participation in the study. All patients were assessed at a single moment.

Assessment of quality of life index and life satisfaction

The questionnaire Problem Area in Diabetes (PAID), developed by Welch and translated and validated for use in Brazil[12], was used to determine the quality of life index. PAID comprises 20 questions regarding the

emotional state of patients diagnosed with type 1 and 2 diabetes. The topics covered involved feelings of guilt, anger, depression, worry, and fear about illness and treatment. The questions were self-reported based on a 5-point Likert scale, classified as "0=No problem", "1=Small problem", "2=Moderate problem", "3=Almost a serious problem", "4=Serious problem". The maximum score for this questionnaire is 100 points and its result was obtained by summing all the answers from 0 to 4 and multiplied them by the factor 1.25. The lower the result, the lower the impact of diabetes on the individual's QOL, and the higher the result, the more difficulties the patient experiences due to his/ her state of health.[12]

Satisfaction with Life (SWL) questionnaire was used to evaluate individuals' life satisfaction.[13] The questionnaire comprised 5 questions to be answered using a 7-point Likert scale, ranging from "1=Fully Agree" to "7=Strongly Disagree." The results obtained by the responses were analyzed as the higher the result, the greater the individual's dissatisfaction is with his/ her life, and the lower the result, the greater his/ her satisfaction is with life.[12]

Socioeconomic evaluation

The socioeconomic situation was evaluated by the Brazilian Economic Classification Criterion, a self-fulfilling questionnaire that estimates the purchasing power of families through items they own and the education level of the head of household. From the achieved score, we obtained the family economic class and, therefore, the average gross family income, classified as A1 (R$ 12,926), A2 (R$ 8,418), B1 (R$ 4,418), B2 (R$ 2,565), C1 (R$ 1,541), C2 (R$ 1,024), D (R$ 714) and E (R$ 477).[14]

Anthropometric evaluation

The anthropometric data of body weight, height and WC were evaluated and then the BMI was determined by dividing the individual's measured weight by their squared height value. Anthropometric assessments were performed in a doctor's office. The values of WC and BMI obtained were classified according to the World Health Organization.[15,16] For individuals aged 60 years or over, BMI was classified according to the Brazilian Ministry of Health.[17]

Glycemic control

Glycemic control was assessed by the glycated hemoglobin (HbA1c) test collected from the patient's medical records, referring to the last three months of the study collection date, and it was classified as adequate when values were below 7% .[4]

Statistical treatment

The results were described by mean and standard deviation distribution and compiled in the Microsoft Excel™ software. For the statistical analyzes, the t-test for quantitative variables and the chi-square test for the qualitative variables were used, with the aid of the Statistical Package for the Social Sciences, version 10.0. The level of significance was set at $p < 0.05$.

RESULTS

Sixty nine patients diagnosed with T2DM participated in the study. They were attending an outpatient endocrinology clinic of the University Hospital in Curitiba, Paraná from July to September of 2015. The characterization of the sample studied can be visualized in Table 1. By separating individuals by gender, it was noted that the groups were homogeneous regarding to age, income, glycemic control, BMI and WC (p>0.05), while weight and height differed significantly (p<0.05) (Table 1).

The predominant economic class in the study was class B2 (R$ 2,565) followed by C2 (R$ 1,024). Less than 5% of the studied population presented family income equal to or greater than R$ 4,418 (Table 1). Based on the HbA1c exams, 62% of the patients presented utmost HbA1c values for diabetic patients (between 7% and 8.5%), the others presented values above 8.5%. No patient in the study had optimal control (less than 7%) (Table 1). Prevalence of overweight was observed in both genders, with 85.7% of women and 66.7% of men presenting a risk of metabolic complications associated with obesity according to WC (Table 1).

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The evaluation of the quality of life measured by PAID presented a mean score of 36 ± 12.3 points, with a higher score of 74 points, indicating a high impact of diabetes on quality of life, and the lowest result, 2 points, indicating a low impact of T2DM on daily life. PAID did not differ between the gender variables (p=0.26) (Table 1) and glycemic control (p=0.57) (Table 2). However, it was observed that 61.9% (n=39) of the sample that obtained better quality of life results had glycemic control closer to recommended levels (Table 2). There was also no association between quality of life measured by PAID and nutritional status, glycemic control, economic class and age group (Table 2).

The presence of overweight and obesity found in the studied population was prevalent and independent of the PAID classification (Table 2). In this study, there was no significant influence of income on the glycemic control of the studied population (p=0.08) (Table 3).

Although not significant, it was observed that the increased or substantially increased risk of metabolic complications associated with obesity was more prevalent (66.7%) in the individuals with lower economic classification, as well as, overweight and obesity (Table 4). This study also found no association between nutritional status and glycemic control in diabetic individuals (p = 0.70, data not shown).

In addition to the application of PAID, the SWL questionnaire was used in this population, which showed positive life satisfaction in the sample studied (Table 1). Life satisfaction was not affected by the variables: glycemic control, nutritional status, economic class and age group (Table 5).

However, although not significant, the results showed a better quality of life and greater life satisfaction in lower income obese individuals, with an increased or substantially increased risk of metabolic complications associated with obesity, but with better yet not adequate glycemic control (Tables 2 and 5).

Table 1 – Characterization of the sample of adult individuals with type 2 diabetes mellitus Curitiba, Paraná, 2015.

	Females		Males		p*
	N	**%**	**N**	**%**	
Gender	42	60,8%	27	39,2%	
Average age (years)	48,4 ± 13,5		48,3 ± 10,2		0,95
Age group					
≤ 40 years	15	35,7%	3	11,1%	
40-60 years	19	45,2%	23	85,2%	
≥ 60 years	8	19,1%	1	3,7%	
Average family income (R$) – Socioeconomic class	1729,7 ± 937,1		1504,7 ± 592,6		0,27
A	0	0%	0	0%	
B1	2	4,7%	0	0%	
B2	14	33,3%	5	18,5%	
C1	8	19,1%	12	44,4%	
C2	12	28,6%	7	25,9%	
D-E	6	14,3%	3	11,1%	

Glycemic control					
Mean glycated hemoglobin (%)	8,8 ± 2,0		8,3 ± 1,2		0,24
Ideal control (<7%)	0	0%	0	0%	
Utmost control (7-8,5%)	26	61,9%	16	59,2%	
Poor control (>8,5%)	16	38,1%	11	40,8%	
Average weight (kg)	75,7 ± 14,1		85,3 ± 13,3		0,007*
Average height (m)	1,63 ± 0,09		1,71 ± 0,08		0,0008*
Average Body Mass Index (kg/m2)	28,4 ± 5,2		29,0 ± 3,6		0,57
Underweight	2	4,7%	0	0%	
Eutrophy	11	26,2%	5	18,5%	
Overweight	16	38,1%	15	55,5%	
Obesity	13	31%	7	26%	
Mean abdominal circumference (cm)	104,2 ± 22,5		108,1 ± 21,1		0,46
No risk of metabolic complications	6	14,29%	9	33,33%	
Increased risk of metabolic complications	3	7,14%	3	11,11%	
Substantially increased risk of metabolic complications	33	78,57%	15	55,56%	
Problem Area in Diabetes – PAID	37,3 ± 12,5		33,9 ± 11,8		0,26
Satisfaction with Life – SWL	16,0 ± 5,3		16,6 ± 4,9		0,46

*(p<0,05 t test)

Table 2 – - Characterization of the sample of adult individuals with type 2 diabetes mellitus Curitiba, Paraná, 2015.

	More impact PAID (> 50 points)	Less impact PAID (≤ 50 points)	p*
	% (n)	% (n)	
Average age (years)			
Individuals with glycated hemoglobin >8,5%	50% (3)	38,1% (24)	0,57
Individuals with glycated hemoglobin ≤8,5%	50% (3)	61,9% (39)	
Metabolic complications			
No risk of metabolic complications	16,7% (1)	22,2% (14)	0,75
Increased risk of metabolic complications / substantially increased	83,3% (5)	77,8% (49)	

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Nutritional status			
Underweight and Eutrophy	24% (6)	25% (11)	0,92
Overweight and Obesity	76% (19)	75% (33)	
Economic class			
B	32% (8)	29,5% (13)	0,83
C, D and E	68% (17)	70,4% (31)	
Age group			
> 60 years	33,3% (2)	11,1% (7)	0,12
≤ 60 years	66,7% (4)	88,9% (56)	

*(p<0,05 Chi-Square). Label: PAID: Problem Areas in Diabetes. Class B: R$ 2,565; C: R$ 1,024; D: R$714; E: R$477.

Table 3 – Influence of socioeconomic status on glycemic control of individuals with type 2 diabetes mellitus. Curitiba, Paraná, 2015.

	Individuals with glycated hemoglobin >8,5%	Individuals with glycated hemoglobin ≤ 8,5%	p*
	% (n)	% (n)	
B	18,5% (5)	38,1% (16)	0,08
C, D and E	81,5% (22)	61,9% (26)	

*(p<0.05 Chi-Square). Label: Class B: R$ 2,565; C: R$1,024; D: R$714; E: R$ 477.

Table 4 – Influence of socioeconomic status on the risk of metabolic complications associated with obesity and body mass index in individuals with type 2 diabetes mellitus. Curitiba, Paraná, 2015.

	B	C, D and E	p*
	% (n)	% (n)	
No risk of metabolic complications	26,7% (4)	73,3% (11)	0,71
Increased risk of metabolic complications / substantially increased	33,3% (17)	66,7% (37)	
Nutritional status			
Underweight and eutrophy	47,05% (8)	52,95% (8)	0,08
Overweight and obesity	25% (13)	75% (39)	

*(p<0.05 Chi-Square). Label: Class B: R$ 2,565; C: R$1,024; D: R$714; E: R$ 477.

Table 5 – Influence of glycemic control, metabolic risk, nutritional status, socioeconomic status and age on life satisfaction detected by Satisfaction with Life (SWL) of individuals with type 2 diabetes mellitus. Curitiba, Paraná, 2015.

	Lower life satisfaction (> 18 points)	Increased life satisfaction (≤ 18 points)	p*
	% (n)	% (n)	
Glycemic control			
Individuals with glycated hemoglobin > 8.5%	40% (8)	38,7% (19)	
Individuals with glycated hemoglobin ≤ 8.5%	60% (12)	61,3% (30)	0,92
Metabolic complications			
No risk of metabolic complications	25% (5)	23,6% (10)	0,73
Risk of metabolic complications increased / substantially increased	75% (15)	76,4% (37)	
Nutritional status			
Underweight and eutrophy	26,7% (4)	22,8% (13)	0,75
Overweight and obesity	73,3% (11)	77,2% (44)	
Economic class			
B	35,7% (5)	26,3% (15)	0,48
C, D and E	64,3% (9)	73,7% (42)	
Age group			
> 60 years	20% (4)	10,2% (5)	0,27
≤ 60 years	80% (16)	89,8% (44)	

*(p<0.05 Chi-Square). Label: Class B: R$ 2,565; C: R$ 1,024; D: R$ 714; E: R$ 477.

DISCUSSION

As already defined, T2DM is one of the main chronic diseases that cannot be transmitted nowadays, contributing negatively to morbidity and mortality rates.[1-3] Evaluating the health-related quality of life of individuals with T2DM is essential when seeking treatment, follow-up and intervention in chronic diseases.[6,9] Thus, quality of life is a measure of clinical outcome, which prioritizes the aspects observed by the individual, as well as their satisfaction and well-being.

When desiring to evaluate the quality of life related to the health of an individual or group, it is necessary to select an appropriate evaluation instrument for the variables to be analyzed that is valid for this population.[2,5,6,9,10,18] There is currently different specific instruments such as *Diabetes* Care Profile (DCP), Diabetes Quality of Life Measure (DQOL), Diabetes Impact Measurement Scales (DIMS), Appraisal of Diabetes Scale (ADS), Audit of Diabetes-Dependent Quality of Life (ADDQoL), Diabetes Health Profile (DHP-1 e DHP-18), Questionnaire on Stress in Patients with Diabetes-Revised (QSD-R), Well-Being Enquiry for Diabetics (WED), Diabetes-Specific Quality-of-life Scale (DSQOLS), Diabetes 39 (D-39) and Problems Areas in Diabetes (PAID)[1,2,18,19]

The PAID tool selected for use in this study evaluates the level of emotional distress associated with the routine of living with diabetes.[18] This study evidenced that the quality of life of diabetic individuals was slightly affected, but there was no association between quality of life with nutritional status, assessed by WC and BMI. In addition, the SWL questionnaire was used to evaluate the life satisfaction of the T2DM population. Again, positive results were found in this population without association with the variables studied. It was expected that greater risks of metabolic complications would bring about a lower perception of the quality of life and of life satisfaction, as well as, it was expected that a greater income would contribute significantly to the better quality and satisfaction of life. However, it is important to note that these patients receive frequent follow-up care from a multiprofessional health team at the University's outpatient clinic. Also, none of the patients presented amputated limbs, a frequent situation in T2DM, which may justify the favorable results obtained in the study on quality of life and life satisfaction in this population. Other studies corroborate the results found here.[11,20,21]

Although there is no influence of the income on the quality of life of the individuals evaluated, studies indicate that low income is associated with T2DM and is also a contributory factor for the poor quality of life of the patients affected.[21,23] Data from the Ministry of Health emphasize that the prevalence of DM increases more rapidly in poor and developing countries and has a very negative impact due to early morbidity and mortality.[24]

In clinical practice, glycemic control evaluation is performed using the glycemia test and HbA1c. However, because the glycemic test reflects only the glycemic level at the time of blood collection, in this study, the HbA1c test was used because it allows for the evaluation of the average glycemic control over the previous four months.[4] In this study, there was an association of poor glycemic control in the long term with quality of life. Probably, because 100% of the sample presented values of HbA1c above 7%, as previously mentioned. Adequate glycemic control depends on adherence to a correct eating plan, physical activity and use of medications to obtain control and prevention of acute and chronic complications.[2,4]

Studies have shown that elevated levels of HbA1c are associated with poor adherence to treatment.[25,26] A study in southern Brazil found a positive association of diabetic patients with low adherence to treatment and high HbA1c values.[27] Our results demonstrated a HbA1c mean of 8.9 ± 2.0%, which is higher than recommended, which may suggest low adherence to recommended treatments.

BMI is the most widely used indicator for identifying body fat. This index is easy to apply, at no cost, but not totally related to body fat, since it does not distinguish fat mass from lean mass. However, it is associated with the presence of comorbidities.[28] The quality of life index of the individuals evaluated did not change significantly according to the presence of overweight and obesity (Table 2), strengthening the hypothesis that the quality of life is more subjective. Despite this, obesity is seen as one of the main triggers of T2DM.[1, 4]

Obesity is constantly present in T2DM. In 2011, the national sample of American youngsters called TODAY showed that approximately 90% of young Americans with T2DM are obese and 38% are morbidly obese.[29] In Brazil, the national multicenter study published in 2006 showed that 75% of the population with T2DM is overweight or obese.[30] Corroborating with the Brazilian data, in this study 69.1% of the evaluated ones were also overweight or obese, which may justify the absence of significant statistical differences in the associations made (Tables 2, 4 and 5).

Adipose tissue, especially the visceral tissue, plays an important role in the understanding of the pathogenesis of T2DM. By the increase of non-esterified fatty acids, the deposition of fat in the visceral organs, the production of inflammatory mediators, and/or by the infiltration of pro-inflammatory macrophages in adipose tissue, increased cellular stress contributes to insulin resistance, which, in turn, activates multiple signaling cascades that antagonize the action of insulin in peripheral tissues.[3,31]

Knowledge and attitude in self-management of diabetes contribute significantly to better glycemic control.[11] Thus, developing health and

nutrition programs can add to the quality of life and life satisfaction of this population, as well as to the nutritional status and metabolic control of the disease.[32,33]

Among the limiting factors of the study we point out that the sample size, the absence of the type of drug treatment used, as well as, the time of diagnosis of T2DM in this population were not evaluated; these data could interfere in the results found.

CONCLUSION

In summary, the present study verified good quality of life and life satisfaction in the population evaluated, but there was no relationship of the emotional suffering associated with diabetes with the metabolic and nutritional profile. In addition, no studies were found in the literature associating quality of life assessed by PAID and SWL with the nutritional and metabolic profile in the T2DM population. However, there was a high prevalence of overweight and obesity in the evaluated sample and unsatisfactory metabolic control. This contributes to the subclinical inflammation of the individuals, aiding in their insulin resistance, as well as in future chronic complications that contribute to a decline in the quality of life of these patients; mainly due to micro and macro vascular complications, strong characteristic of this disease.

Maintaining nutritional assessment, monitoring quality of life, and evaluating the evolution of the life satisfaction of the diabetic population is necessary so that early interventions can be performed in order to avoid compromising health, quality of life and life satisfaction. More studies in this area are necessary to understand the relationship between the quality of life and the metabolic and nutritional profile of individuals with T2DM, while also considering the time of diagnosis and the type of medication used.

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