RESEARCH ARTICLE

The impact of diabetes mellitus on quality of life – differences between genders

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Abstract
Objective To determine whether there are gender differences in the impact of the disease in the quality of life of individuals with Diabetes Mellitus type 2.
Methods The sample consisted of 192 individuals distributed in equal numbers by gender. Data were collected between the months of August 2013 to May 2014, by sociodemographic and clinical questionnaires and instruments for assessing quality of life (PAID) and adherence to treatment.
Results The age of the patients ranged from 30 to 80 years old with a mean of 61 years of age (± 11). B-PAID scores were higher in men except in issues related to social support, but the differences were not statistically significant; 51.7% of the patients with good adherence to treatment were women and 48.3% were men.
Conclusions The perception of the impact of diabetes in the quality of life of individuals in the present study, measured by the B-PAID instrument, showed that the highest scores predominate in men, that is, they have a higher degree of emotional distress than women. In the group with good adherence to treatment, there is a greater number of individuals with higher PAID scores, especially in men. In the group with poor adherence to treatment, the number of individuals with a high degree of emotional distress was similar in both sexes. This research was approved by the Research Ethics Committee of UNIFESP, through Plataforma Brasil (Protocol number 103,384).

Keywords Diabetes Mellitus · Quality of life · Genders

Introduction

The Diabetes Mellitus (DM) costs affect the individual, the family, and the society, however they aren't only economic. The intangible costs (pain, anxiety and quality of life loss - QL) also show great impact on diabetic people's lives and their families, and are difficult to quantify. The individuals with DM face important changes in lifestyle, such as changes to eating habit and adherence to restrictive therapeutic methods. Besides, they must deal with the fact of having to live their whole lives with a disease, which can cause complications that are harmful to their health [1].

It was consensus, for a long time, the notion that the diseases' impact, in terms of public health, was measured by the morbidity and mortality rates. In chronic diseases, however, other evaluation perspectives are being used, taking into account not only the dimension of morbidity and mortality reductions [2].

The Quality of Life (QOL) evaluation in the individual is recognized as an important area of scientific knowledge, because its concept interposes that of health's: satisfaction and well-being in physical, psychological, socioeconomic and cultural areas. The utilization of QOL evaluation instruments allows for a more objective and clearer evaluation of the global impact of chronic diseases, such as DM on patients' lives. Such evaluation has the advantage of including subjective aspects, generally not addressed by other evaluation criteria [3].

Gender is a social factor directly implicated in health inequalities, both in social determinants and subjective determinants, as well as gender identity [4].

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The objective of the present study was to verify if there are gender differences in the impact of the disease on the quality of life of individuals with Diabetes Mellitus type 2, since the evaluation of the individual's quality of life is recognized as an important area of scientific knowledge, Because the concept of Quality of Life is interposed to that of health: satisfaction and well-being in the physical, psychic, socioeconomic and cultural spheres. The use of QOL assessment instruments allows a more objective and clear assessment of the overall impact of chronic diseases, such as DM in patients' lives. Such evaluation has the advantage of including subjective aspects, which are not usually addressed by other evaluation criteria. To date, the quality of life determinants of the individual with diabetes remain undefined, as they have a lower QOL level than individuals without diabetes. In this possible negative impact of DM on QOL, the aspects that are involved are not yet clearly known and it is known, however, that many variables can influence QOL in individuals with diabetes.

Methods

This a transversal survey study, done in the Center of Diabetes of the University of São Paulo - UNIFESP, in the period of August 2013 and May 2014, involving 192 individuals, distributed equally between genders.

This research was approved by the Research Ethics Committee of UNIFESP, through Plataforma Brasil (Protocol number 103,384).

The individuals were invited to participate in the study, through scheduled appointments. When they filled inclusion criteria (individuals with Diabetes Mellitus type 2, with more than one diagnostic, of both genders, in the age range of 30 to 80 years, regularly attended by the Center of Diabetes in the São Paulo Federal University (UNIFESP), and knowing how to read and write), accepted participating in the study, and signed a consent term. The exclusion criteria were: cognitive deficit carriers, presence of invalidating disease; hospitalization in the last three months; big surgeries in the last six months, and treatment with immunosuppressants). The participants responded to questions the following instruments: clinic questionnaire 1 (gender, age, time with diagnosis, drugs taking, and glycemic control) and questionnaires about negative impact of the presence of the diabetes (B-PAID) and adherence to the treatment (Morisky and Green), applied by the interviewer, before or after a regularly scheduled doctor's appointment. Data for clinical questionnaire 2 were taken from the volunteer manual, such as type of diabetes, presence of chronic complications and comorbidity, lab exam results done in the last six months, anthropometric measures (weight, height, body mass index (BMI), abdominal circumference) and arterial pressure.

The value of the glycated hemoglobin - HbA1c was used to evaluate the glycemic control and considered the value of the exam done in the last three months. Glycemic control above the HbA1c value below 7% were considered as good.

The B-PAID was chosen for this research, since it is the only specific instrument to evaluate quality of life focused on DM, translated to Portuguese, and validated for use in Brazil, since it evaluates, from the perspective of the patients, the DM and treatment impact on their lives [5]. It is an instrument that measures the suffering that the patients normally feel in living with diabetes and it is elaborated in the form of a questionnaire, containing 20 items focused on the negative emotional aspects of the patient in living with type 1 and 2 DM, from which it is evaluated the perception of the individual about the problems faced daily with the disease. It shows four subdimensions: Problems with eating, problem with social support, problems with the treatment, and emotional problems. It produces a total score that varies from 0 to 100, in which a high score indicates a high level of emotional suffering. It utilizes a Likert scale of 5 points, varying between "No problem = 0", "Small Problem = 1", "Moderate Problem = 2", "Almost Serious Problem = 3", "Serious Problem = 4". The total score of 0–100 is obtained by the sum of the answers of 0–4 given in the 20 items of the PAID and multiplying this sum by 1.25 [6]. It shows also a positive association with the glycated hemoglobin levels, serving as a predictor of low treatment adherence. Its internal consistency (Cronbach alfa) is of 0.95, showing its efficiency for this type of specific population, independent of the DM type presented [7]. For the analysis of the results, the score of 40 or higher indicates a high degree of emotional suffering.

The Morisky test [8] is a scale composed of four questions, that try to evaluate the patient behavior in relation to the habitual use of the medicine. The patient is classified in the high adherence degree group when the answers to all the questions are negative [9]. However, when at least one of the answers is affirmative, the patient is classified in the low adherence degree group. This evaluation permits, also, to separate whether the low adherence degree behavior is intentional or unintentional, being also possible to characterize patients as demonstrating both types of low adherence behavior.

The analyses of the data was done through the statistical program SPSS, where comparisons between gender scores, quality of life, adherence to the treatment, and the impact of the diabetes presence, were done with the use of appropriate test (Teste t-Student).

For the descriptive analysis of the variables, position measures (medium) and variability (deviation-pattern) were used.

Data availability The sets of data used and / or analyzed during manuscript entitled "The impact of diabetes mellitus on quality of life – differences between genders" the are available from the corresponding author on prior request.

Results

Data were collected between the months of August 2013 and May 2014, through questionnaires and quality of life evaluating instruments (B-PAID), and treatment adherence (MORISKY).

Individuals' age varied between 30 and 80 years, with an average of 61 years (±11), being 60 years (±10) for females and 62 years (±11) for males. The average time of disease diagnosis was 15 years (±8).

Table 1 shows the age averages and deviations of pattern, time of diagnosis, weight, height, BMI, abdominal circumference, and fasting glycemia results. HbA1c, total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides, by gender.

It was verified that weight and height were significantly greater in males and that BMI was higher in females. The cholesterol (HDL and LDL) fractions values were more elevated in females and the glycemic control, evaluated by HbA1c, showed that women demonstrate a worse control than that of men (0.003).

The comorbidity more frequent were systemic arterial hypertension (83.9%) and dyslipidemia (56.8%). The chronic diabetes complication more frequent was the retinopathy, which was present in 50.5% of the studied population.

Table 2 shows the B-PAID averages and the B-PAID standard deviations, by domain and gender. It can be observed that, although the differences don't have statistical significance, the scores were higher in males, with exception to the ones relative to social support related problems.

For the B-PAID scored analysis, the value of 40 was used as a threshold, where the values equal to or greater than 40 indicated a higher degree of emotional suffering [10].

Comparing the proportion of males and females, according to this threshold, it is observed that, aside from the difference

not being statistically significant, males predominate the higher scores, as it is presented on Table 3.

Table 4 presents the averages and standard deviations of B-PAID scores, according to the glycemic control, diagnosis time, insulin use, metformin use, and BMI category, by gender.

Although statistical significance in gender differences haven't been found, some tendencies are observed, such as: in individuals with poor glycemic control, women had higher B-PAID scores than men; in less than 15 year-old individuals, men had higher scores than women; in insulin users, women had higher scores than men; in metformin users, men had higher scores than women; and overweight men had a tendency for higher scores than overweight women, especially in obese individuals.

The Morisky & Green test [8] was used to analyse the habitual use of antidiabetic medication. Scores higher than or equal to 4 were considered good adherence whereas scores lower than 4 were considered poor adherence. In the 192 individuals analysed, 116 showed good adherence (56 males and 60 females) to the drug treatment and 76 (40 males and 36 females) showed poor adherence.

Table 5 illustrates the participants' distribution according to the B-PAID scores (≥ 40 and < 40), in reference to the drug treatment adherence and gender.

In the good adherence group, there is a higher number of individuals with higher B-PAID scores, especially in men. In the poor adherence group, the number of individuals with high degree of emotional suffering was the same in both genders.

Table 6 presents the averages and standard deviations of B-PAID scores, according to the presence of comorbidities and chronic diabetes complications, according to gender.

According to the results presented on Table 6, it is observed that the presence of comorbidities didn't have an influence in the B-PAID scores and the differences don't

Table 1 Averages and standard deviation in anthropometric and clinical characteristics of the subjects of the study

	Total $n = 192$	Male $n = 96$	Female $n = 96$	Value p
Age (years)	61 ± 11	62 ± 11	60 ± 10	0,088
Diagnostic time (years)	15 ± 8	15 ± 8	15 ± 8	0,947
Weight (kg)	74,9 ± 14,8	78,5 ± 16,1	71,4 ± 12,6	**0,001**[*]
Height (m)	1,61 ± 0,08	1,66 ± 0,07	1,55 ± 0,05	**0,000**[*]
BMI (kg/cm^2)	29,15 ± 7,3	27,96 ± 4,9	30,39 ± 8,9	**0,027***
Waist circumference (cm)	100 ± 13,0	101 ± 13,0	99 ± 13,0	0,368
Glycemia in fasting (mg/dL)	148 ± 64,0	144 ± 71,0	153 ± 56,0	0,335
HbA1c (%)	8 ± 1,0	7,9 ± 1,7	8,7 ± 1,8	**0,003**[*]
Cholesterol- total (mg/dL)	177 ± 144,0	179 ± 20,0	174 ± 41,0	0,821
HDL (mg/dL)	48 ± 15,0	45 ± 13,0	50 ± 16,0	**0,009***
LDL (mg/dL)	91 ± 36,0	83 ± 32,0	98 ± 37,0	**0,007***
Triglycerides (mg/dL)	140 ± 79,0	149 ± 93,0	132 ± 62,0	0,152

*$p < 0.05$

Table 2 Averages and standard deviations in B-PAID scores, by domain and gender

B-PAID	Total $n = 192$	Male $n = 96$	Female $n = 96$	Value p
Total	50,0 ± 23,7	51,4 ± 22,4	48,7 ± 25,1	0,436
Emotional problems	31,8 ± 15,7	32,2 ± 15,1	31,5 ± 16,3	0,770
Problems related to treatment	6,9 ± 4,8	7,4 ± 4,5	6,4 ± 5,1	0,186
Problems related to eating	7,4 ± 4,4	7,9 ± 4,2	6,9 ± 4,4	0,104
Problems related to social support	3,9 ± 3,5	3,9 ± 3,5	3,9 ± 3,6	0,960

show statistical significance. It must be noted that, although insignificant, the scores were higher in individuals with neuropathy, especially in men.

Discussion

The study population is mostly elderly, reflecting the characteristics of patients with T2DM seen at the Diabetes Center of UNIFESP, which is a referral service, attending patients with a longer time of disease evolution and frequent complications. The mean age of 61 years (± 11), the frequency of women (62.3%) was higher in the age group of 60–69 years and in men (70.8%), in the age groups of 60–69 years and 70 years and more.

The rate of the elderly is increasing in developed and developing countries, and women's life expectancy is getting longer, on average, from 6 to 8 years [11].

We observed that the frequency of obesity as measured by BMI was higher in women than in men. Excessive adiposity [9, 12] is a well established risk factor for premature death in the general population, including those due to cardiovascular disease or diabetes [12], and is also a strong predictor of decreased quality of life, because obese individuals experience a range of psychological problems that affect their mental health and self-esteem, especially in women, and that psychosocial stress can affect women's ability to control disease by preventing them from achieving metabolic control [13]. The results of this study also show that women have worse glycemic control and a higher BMI than men, according to the literature recommending that from a health perspective, older women are more likely to have experiences of disability

functional in morbidity and personal self-care than men of similar age [11, 14].

It was observed that men have higher B-PAID scores than women for some comorbidities, such as systemic arterial hypertension (SAH) and dyslipidemia, and also for complications of nephropathy, retinopathy and neuropathy, which probably translates to a greater degree of emotional distress in men than in women, in the presence of these complications.

According to the authors, this suffering happens because health statistics show higher mortality rates for men, since men have more life-threatening chronic diseases such as coronary, cancer and cardiovascular disease diseases, while women have a higher rate higher chronic diseases [15, 16], and chronic complications of diabetes mellitus (DM) are the main factors responsible for the morbidity and mortality of individuals with diabetes. Cardiovascular diseases are the main cause of death (52%) and several risk factors for intervention are associated with increased cardiovascular impairment in patients with T2DM [17].

Table 3 Distribution of participants according to B-PAID scores (≥ 40 e < 40), by gender

B-PAID	≥ 40 n (%)	< 40 n (%)
Total ($n = 192$)	127 (100,0)	65 (100,0)
Male ($n = 96$)	65 (51,2)	31 (47,7)
Female ($n = 96$)	62 (48,8)	34 (52,3)

Table 4 Averages and standard deviations of B-PAID scores according to some variables, by gender

	Male ($n = 96$)	Female ($n = 96$)	p value
Hba1c (%)			
< 7,0	51,8 (±21,7)	39,3 (±28,1)	0,101
≥ 7,0	48,9 (±22,3)	52,1 (±23,7)	0,449
DM duration (years)			
< 15	56,1 (±22,9)	46,5 (±25,9)	0,059
≥ 15	46,9 (±21,4)	50,9 (±24,2)	0,385
Insulin use			
Yes	48,5 (±23,3)	53,8 (±22,5)	0,686
No	58,0 (±18,8)	36,8 (±26,9)	0,179
Metformin use			
Yes	54,4 (±19,7)	47,0 (±24,8)	0,054
No	45,5 (±26,1)	57,2 (±25,4)	0,145
BMI (kg/cm^2)			
18,5–24,9	42,9 (±23,3)	42,9 (±26,4)	0,998
25–29,9	53,6 (±19,2)	52,7 (±23,0)	0,874
≥ 30	56,4 (±23,4)	47,6 (±24,4)	0,134

Table 5 Distribution of participants in the study according to treatment adherence B-PAID

	Morisky = 4		Morisky <4	
B-PAID	≥ 40	< 40	≥ 40	<40
Total (n = 192)	79	37	48	28
Male (n = 96)	41	15	24	16
Female (n = 96)	38	22	24	12
p value	0,865	0,133	0,673	0,488

The unfavorable impact of SAH and dyslipidemias on cardiovascular morbidity and mortality is widely recognized, as well as the frequent association of these conditions with DM [17]. Also, intervention on dyslipidemia has been shown to be beneficial in the control of macrovascular disease in diabetic individuals [18], and the presence of clinical complications due to DM has a potentially significant impact on QOL, since the higher the number of complications, the worse the QV of the patient [19], because in addition to the complications related to the disease, the episodes and the fear of hypoglycemia, the change in the lifestyle and the fear of the long term consequences can reduce the QV related to the health of the person with the disease [20].

Health-related quality of life (HRQoL) as a measure of well-being is a matter of interest in the assessment of health in the elderly compared to traditional measures of mortality based on literature results [14], as the aging process corresponds to the increased incidence of chronic conditions such

Table 6 Averages and standard deviations of B-PAID scores according to the presence of some comorbidities

	Male n = 96		Female n = 96	
Nephropathy	N	Paid score	N	Paid score
Yes	43	50,52 (±23,09)	26	47,93 (±25,11)
No	52	51,92 (±22,20)	70	49,00 (±25,23)
Retinopathy				
Yes	53	49,71 (±22,27)	44	50,48 (±25,35)
No	42	53,27 (±22,90)	52	47,22 (±24,97)
Neuropathy				
Yes	38	55,32 (±25,05)	27	49,53(±26,33)
No	57	48,59 (±20,42)	69	48,39 (±24,74)
Hypertension				
Yes	79	50,79 (±22,60)	82	48,05 (±25,67)
No	16	53,75 (±22,56)	14	52,58 (±21,60)
Dyslipidemia				
Yes	51	49,77 (±22,49)	58	47,42 (±25,87)
No	44	53,03 (±22,64)	38	50,69 (23,98)

as obesity, diabetes, hypertension, cardiovascular diseases and cancer that influence the deterioration of HRQoL [11, 21, 22]. Regardless of these chronic conditions, some studies in Iranian populations reported poor QoL in women than men [14, 23, 24], when evaluated by the Health-related quality of life (HRQoL) instrument or other instruments, while our study used the B-PAID for quality of life assessment in DM2.

Adherence to treatment is another variable that has been explored in the context of the person with DM [25], defined as the use of prescribed medications or other guidelines in at least 80% of their total, considering time, dose and treatment time [20].

Drug treatment of DM is complex and may involve different drugs with multiple doses as well as daily applications of exogenous insulin [24, 25]. Adherence to the patient with a regimen provides for successful treatment and reduces the severity of the negative complications.

Of the individuals that composed the sample of this study, 116 (60.5%) had good adherence to the drug treatment, according to the Morisky & Green test. Of the 96 women, 60 (51.7%) had good adherence and of the 96 men, 56 (48.3%) showed good adherence, demonstrating that women tend to have a better adherence to treatment, which is in agreement with literature [15, 26] where it is reported that there is an idea among women with diabetes who can not get sick because they often play a key role in families, dealing with an overload of household chores that aim at they take more and better care of themselves [27].

A study conducted in Sargogha, Pakistan [28], surveyed 392 patients. The majority of the participants were males (n = 222, 56.6%) with 5.58 ± 4.09 years of DM2 history and were categorized in the age range of 51 to 60 years with a mean age of 50.77 ± 9671 years. The study found that individuals with type 2 diabetes mellitus presented a decrease in HRQoL (0.4715 ± 0.3360) and low adherence to the medication (4.44 ± 1.8), observing significant but weak positive correlations between adherence to medication and HRQoL, although the association between adherence to HRQoL and HRQoL in the present study cohort was significant, it was assessed as weak, therefore, it was unable to produce a general impression about quality of life. The study underscored the need to identify other individual factors that affect HRQOL among patients with T2DM in Pakistan.

Of the 116 individuals with good adherence to drug treatment, 56 (48.3%) were male and 60 (51.7%) were female. In the group with good adherence, a greater degree of emotional distress predominated, which was 73.2% for men and 63.3% for women. In the poor adherence group, the frequency of high emotional distress was 60% in men and 66.6% in women.

In a study [20] in women using the B-PAID instrument and adherence to treatment, it was observed that the great majority of the participants adhered to the treatment and that the

increase of the depressive symptoms is correlated with greater problems related to food and social support, increasing thus emotional suffering.

Adherence to treatment is a factor that significantly influences the emotional impact of DM2 on people's lives, which is demonstrated by the lower emotional distress with good adherence to treatment [26, 29]. Emotional distress usually affects people with diabetes in different cultures, but it does not refer to gender, and is often associated with several difficulties related to the daily routine of treatment and fear of possible future complications [30–32] and when associated with quality of life, show that the lower quality of life related to health is associated with higher level of emotional distress and this association showed a statistically significant correlation moderate [33], and the authors [34] believe that educating patients about disease and management of medication may result in better control of DM2 and thus improve quality of life.

The results of the study conducted in Selangor, Malaysia [35], are consistent with our findings, since they confirm that patients with higher levels of medication adherence presented lower levels of emotional distress, suggesting that adherence to medication plays an important role in prevention of specific diabetes problems. Thus, strategy-focused medication among patients with type 2 diabetes can be encouraged in clinical practice to help these individuals cope better and reduce the complications of diabetes [36].

The averages of the B-PAID scores, by domain, were greater in men with emotional problems, problems related to eating, and problems related to the treatment; and they were equal in both sexes for problems related to social support. Men, according to the B-PAID scores, tended to show worse quality of life, with is in agreement with the literature [37].

The measurement of emotional suffering related to diabetes, evaluated by B-PAID, showed a medium value in the total scale close to the values found in national and international studies [38, 39].

Conclusion

The differences in the perception of quality of life in individuals studied, in relation to age, time of diagnosis, and treatment were not statistically significant when evaluated by the B-PAID instrument, but higher scores were observed in women that used insulin; and higher scores in men that used metformin.

No differences between genders were found, with statistical significance, in quality of life for the B-PAID domains. The scores were higher (worse quality of life) in males, with exception to problems related to social support and higher emotional suffering.

Although statistical significance was not found between genders, it was observed that in individuals with good glycemic control, the B-PAID scores were higher in women than in men, higher in men with a smaller diagnostic time, and a tendency for higher scores in overweight men, especially in the obese.

It was observed also that the presence of comorbidities didn't have an influence in the B-PAID scores and the differences didn't show statistical significance, but it needs to be emphasized that although not significant, the scores were higher in individuals with neuropathy, particularly in men.

The negative aspects of diabetes presence seem to be more accentuated in individuals with good treatment adherence, especially in men; whereas in glycemic control, the negative aspects of the diabetes presence were higher in women with poor glycemic control and in men with good glycemic control.

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