Assessment of health-related quality of life using the EQ-5D-3L in individuals with type 2 diabetes mellitus

Abstract
The daily experience with type 2 diabetes mellitus (T2DM) has significant adverse effects on health-related quality of life (HRQoL). HRQoL assessment is essential for measuring the impact of the disease on the patient and selecting individualized strategies. Generic measures for assessing HRQoL are very useful because, unlike specific measurement instruments, they allow for the comparison with other instruments. The EQ-5D-3L is a generic measure and it describes HRQoL in five dimensions; mobility, self-care, usual activities, pain/discomfort and anxiety/depression, with three levels each. In Portugal, studies using the EQ-5D-3L as a generic measure to assess HRQoL in diabetic patients are scarce.

Objective: To assess HRQoL in individuals with T2DM using the Portuguese version of the EQ-5D-3L.

Methodology: An accidental sample of patients with T2DM (n=437) was selected at Family Health Units and healthcare centers in Coimbra, Portugal, between January 2013 and January 2014. The EQ-5D-3L was applied in interviews. The EQ-5D-3L score was calculated based on the answers to the five dimensions and the value system for the Portuguese population.

Results: In this sample, 100% of the participants answered the EQ-5D-3L. The HRQoL score was 0.6772 in the EQ-5D-3L and 64.85 in the EQ-VAS. The most frequent answers to the five dimensions were no problems or some problems. The mean score of the EQ-5D-3L was significantly associated with age, male gender, high level of education, having an occupation, practicing physical activity, being single and having been diagnosed with T2DM for less time. The Cronbach alpha’s value was 0.674, confirming an acceptable internal consistency.

Conclusion: HRQoL levels in individuals with T2DM are lower than the national average and vary depending on sociodemographic and clinical characteristics. The EQ-5D-3L is a reliable instrument that can be used to assess the quality of life of diabetic patients and contribute to assess the patients’ overall health status, adding data from the subjective dimension of self-care management.

Keywords: type 2 diabetes mellitus, EQ-5D-3L, health-related quality of life, diabetes mellitus, anxiety, depression, chronic disease, macrovascular complications, asthma, chronic obstructive pulmonary disease, rheumatoid arthritis

Introduction
Diabetes mellitus (DM) is a silent chronic disease, with slow evolution to chronicity, and a high prevalence worldwide.1 It is estimated that 387 million people have diabetes worldwide.2 In 2013, the estimated prevalence of diabetes among Portuguese adults aged 20-79 years was 13.0%.3 Portugal ranks among the European countries with the highest prevalence of diabetes, and whose incidence has been exponentially increasing, particularly among younger people.4 Diabetes affects mainly individuals aged 40-59 years, and its prevalence is different between men (15.6%) and women (10.7%).3 As a chronic disease, diabetes can lead to long-term microvascular and macrovascular complications.4-6 It has a negative impact on individuals, affecting all spheres of life and reducing their quality of life.7-8 The psychosocial9 and psychological10,11 problems associated with diabetes, as well as the burden of disease and the lifestyle restrictions of diabetic patients are widely addressed in the literature.12 For these reasons, individuals with DM need ongoing professional support and specific training to minimize complications and improve their well-being.13-15

Type 2 Diabetes Mellitus (T2DM) has significant adverse effects on health-related quality of life (HRQoL). HRQoL is a multidimensional concept that assesses the individuals’ perception of their health, thus being a useful indicator for the burden of disease.16 Diabetic patients perceive themselves as having less HRQoL than non-diabetics, and the quality of life decreases with the progression of the disease and its complications.17,13,14 In short, the impact of its treatment, complications and comorbidities substantially affect HRQoL.17 Therefore, given the evolution of the disease to chronicity, its continuous monitoring in clinical practice is essential. HRQoL assessment helps to identify needs for new or revised health policies, the allocation of health resources, and strategic planning, while guiding and helping to improve the monitoring of the outcomes from community health interventions.19
Specific and generic instruments have been developed for measuring HRQoL, making it difficult to compare results and select research instruments.\textsuperscript{12} Thus, greater attention has been given to the development of generic instruments to measure HRQoL since, unlike specific measure, they have the advantage of enabling comparisons across different diseases.\textsuperscript{16} The EQ-5D-3L is a generic instrument for measuring HRQoL that allows creating a health status index\textsuperscript{19} and, for this reason, its use has an advantage over other instruments. It also allows combining two key components of any HRQoL measure to be used in cost-utility economic evaluations: a profile describing the health status in terms of domains or dimensions, and a numeric value associated with the health status previously described.\textsuperscript{25}

On the other hand, this instrument can be applied to a wide range of health conditions and treatments, because it allows creating not only a health profile, but also an index value for the individuals’ health status.\textsuperscript{20,21} The EQ-5D-3L has been widely used at an international level, however, there are only a few studies in Portugal using the EQ-5D-3L to assess HRQoL in individuals with T2DM. We selected the EQ-5D-3L because it has the advantage of being able to calculate an index that can be compared among diseases and used for economic evaluation.

This instrument has been used by some researchers in Portugal,\textsuperscript{21} but the validation process was conducted by Ferreira, Ferreira & Pereira (2013) using three samples, including one composed of individuals with chronic diseases (cataracts, asthma, chronic obstructive pulmonary disease, and rheumatoid arthritis).\textsuperscript{21} More recently, the value system and the normative data of the EQ-5D-3L were established for the Portuguese population.\textsuperscript{22,23}

This study has the following objectives:

- To assess HRQoL using the EQ-5D-3L in patients with T2DM;
- To analyze the impact of T2DM on HRQoL using the EQ-5D-3L Portuguese population norms;
- To assess the psychometric properties of the EQ-5D-3L by calculating its reliability and validity in patients with T2DM.

**Methods**

This cross-sectional study included a sample of 437 patients with T2DM attending six Health Care Centers/Family Health Units (FHU) of the central region of Portugal. For data collection, the principal investigators conducted interviews using an instrument developed for this study. The data collection instrument consisted of two parts. The first part was composed of sociodemographic variables (age, gender, education, marital status, and professional situation) and clinical variables (time elapsed since diabetes diagnosis, glycated hemoglobin, and physical activity). The participants were divided into three groups according to their level of education: “Low” (below 9th grade), “Medium” (completed 9th grade) and “High” (completed 12th grade). As regards the professional situation, two groups were created: active (with professional activity) and non-active (pensioners, unemployed and students).

The second part consisted of the HRQoL questionnaire: the EQ-5D-3L. The EQ-5D-3L is a descriptive system of the HRQoL that includes five dimensions: Mobility (MO), Self-Care (SC), Usual activities (UA), Pain/discomfort (PD) and Anxiety/depression (AD). The answers predict three levels of severity: no problems, some problems, and extreme problems. It also comprises a visual analogue scale (VAS) in which respondents classify their general health status from 0 (worst health state imaginable) to 100 (best health state imaginable). The global index is generated by an algorithm, based on the preferences of the answers obtained for the five dimensions. The EQ-5D uses a scale from 1 (perfect health) to 0 (death), admitting, however, negative values corresponding to health states considered worse than death.\textsuperscript{1,20,22} Data were collected between January 2013 and January 2014. The participants were selected based on pre-established inclusion criteria: having been diagnosed with T2DM for no less than six months, being 18 years old or above, having preserved cognitive skills, and accepting to voluntarily participate in the study. The following exclusion criteria were used: existence of previous history of degenerative, neurological or psychiatric disorders that could prevent a correct self-administration.

This study was approved by the Ethics Committee of the Faculty of Medicine of the University of Coimbra and of the Central Regional Health Administration (ARSC). Participants were asked to participate on a voluntary basis. They were informed about the study objectives, procedures, risks, benefits, alternatives, their rights, and data anonymity and confidentiality.\textsuperscript{21} This information was included in the informed consent form signed by the participants. Permission to use the instrument was also requested from and granted by the Center of Study and Research in Health of the University of Coimbra (CEISUC).

**Psychometric properties of the EQ-5D-3L**

To assess the respondents’ level of acceptability of the questionnaire, we used the nonresponse pattern (missing values). The analysis of the distribution of the participants’ answers revealed floor and ceiling effects, i.e. the percentage of individuals in the upper or lower end of the scale.\textsuperscript{25} As a measure of reliability, internal consistency was analyzed through the calculation of Cronbach’s alpha values. Cronbach’s alpha values greater than 0.70 were considered acceptable.\textsuperscript{21} The construct validity of the EQ-5D-3L was measured based on the correlations between the EQ-5D-3L dimensions and the sociodemographic and clinical characteristics. The correlations were classified according to the criteria proposed by Cohen and Holliday: very high correlation for values above 0.90, high correlation for values between 0.70 and 0.89, moderate correlation for values between 0.40 and 0.69, low correlation for values between 0.20 and 0.39, and very low correlation for values below 0.19.

**Statistical analysis**

Descriptive statistics were used to calculate the mean, median, standard deviation, minimum and maximum values, and floor and ceiling effects in each dimension. Both floor and ceiling effects were considered significant if >15%.\textsuperscript{26} The mean scores were compared through the two-tailed Student’s t-test for continuous variables. Categorical variables were compared using the chi-square test ($\chi^2$). Reliability was assessed through the Cronbach’s alpha, whereas the normality of the distribution of the EQ-5D-3L and the EQ-VAS was assessed using the Kolmogorov-Smirnov-Lilliefors test for normality. The significance level was set at 0.05. Data were analyzed using SPSS, version 21.0 for Windows.

**Results**

In this study, the sample was composed of 437 individuals with T2DM. The EQ-5D-3L was well accepted by the diabetic patients, simple and easy to apply. Table 1 shows the sociodemographic and clinical characteristics of the sample. Most participants were women (52.4%). The mean age was 66.28±9.67 years, ranging from a
minimum of 35 years to a maximum of 94 years. Most respondents were aged 50-69 years (57.7%). With regard to marital status, 73.5% of the participants were married or cohabiting, 4.6% were single, 5.9% were separated, and 16% were widowed. Most of the participants had a low level of education (62%), i.e. they had not completed compulsory education (9th grade) and 29.5% had a medium level of education. In relation to the professional situation, the great majority of participants (66.4%) were non-active (pensioners, unemployed and students). Concerning the practice of physical activity, our sample was divided: 50.1% practiced physical activity on a regular basis and 49.9% did not practice any physical activity. On average, the mean time elapsed since T2DM diagnosis was 8.8±7.26 years, ranging from 1 to 42 years.

Table 1 Sociodemographic and clinical characteristics of the sample

| Variable                      | N  | %   |
|-------------------------------|----|-----|
| Gender                        |    |     |
| Female                        | 229| 52.4|
| Male                          | 208| 47.6|
| Total                         | 437| 100 |
| Age                           |    |     |
| Min: 35 – Max: 94             |    | 100 |
| Mean: 66.2 ± 9.678            | 437|     |
| 30-49                         | 27 | 6.2 |
| 50-69                         | 252| 57.7|
| ≥70                           | 158| 36.2|
| Total                         | 437| 100 |
| Marital status                |    |     |
| Single                        | 20 | 4.6 |
| Married/Cohabiting            | 321| 73.5|
| Divorced/separated            | 26 | 5.9 |
| Widowed                       | 70 | 16  |
| Total                         | 437| 100 |
| Level of education            |    |     |
| Low                           | 271| 62  |
| Medium                        | 129| 29.5|
| High                          | 37 | 8.5 |
| Total                         | 437| 100 |
| Professional Situation        |    |     |
| Active                        | 67 | 15.3|
| Non-active                    | 290| 66.4|
| Total                         | 357| 81.7|
| Physical Activity             |    |     |
| Yes                           | 219| 50.1|
| No                            | 218| 49.9|
| Total                         | 437| 100 |
| Time elapsed since T2DM diagnosis (years) |    |     |
| Min: 0 – Max: 42             |    | 99.5|
| Mean: 8.88±7.260             | 435|     |

Acceptability and distribution

The acceptability rate, which was measured through the participants’ non-response rate, was 100%. In the dimensions of mobility, self-care and usual activities, more than 70% of the sample scored at level 1 (no problems). In the dimensions of pain/discomfort and anxiety/depression, more than 50% of the participants scored at level 2 (some problems) (Table 2). A ceiling effect was found in all dimensions, i.e. few individuals were positioned in level 3 of the five dimensions, but particularly in the dimensions of mobility and self-care. A higher response rate and a less pronounced ceiling effect were found in the dimensions of pain/discomfort and anxiety/depression. The results showed total mean scores for the population of T2DM patients of 0.677 in the EQ-5D-3L and 64.85 in the EQ-VAS. Men scored higher (0.744) than women (0.617) in the EQ-5D-3L and in the EQ-VAS (68.44 and 61.58, respectively) (Table 3). As expected, the EQ-5D-3L and the EQ-VAS scores decreased with age. Widowed individuals had the lowest score in the EQ-5D-3L. Divorced/separated individuals had substantially lower EQ-VAS scores than the others. In this sample, the individuals with a higher level of education had higher EQ-5D-3L and EQ-VAS scores than individuals with a lower level of education.

Reliability

We found that the mean rank of the total EQ-5D-3L was 0.737 (p=0.000). Thus, we continued analyzing the data through a non-parametric statistical analysis. We found that the mean rank of the total EQ-5D-3L was higher in men than in women (265.26 and 176.98, respectively), and that this difference was statistically significant (p<0.01). The same applied to the EQ-VAS, with men scoring higher (mean=244.25) than women (mean=196.06). This difference was statistically significant (p<0.01) (Table 4).

We observed that individuals who practiced physical activity had higher mean scores in the EQ-5D-3L and in the EQ-VAS than those who practiced no physical activity, and this difference was statistically significant (p<0.01). Individuals with an active professional situation also scored higher in the EQ-5D-3L and in the EQ-VAS (p<0.01) (Table 4).

Table Continued....

| Variable                        | N  | %   |
|---------------------------------|----|-----|
| Glycated Hemoglobin             |    |     |
| Normal                          | 237| 69.5|
| High                            | 104| 30.5|
| Total                           | 341|     |
In both the EQ-5D-3L and the EQ-VAS, we observed higher mean scores in the age group of 30–49 years than in the other age groups, with these differences being statistically significant (p<0.01). Divorced/separated individuals had the highest mean score in the EQ-5D-3L and this difference was statistically significant (p<0.01). However, in the EQ-VAS, single individuals had the highest scores, but without statistical significance (p>0.01). As regards education, individuals with a high level of education had higher mean scores in the EQ-5D-3L and in the EQ-VAS than individuals with a medium and low level of education, with this difference being statistically significant (p<0.01) (Table 5). Spearman’s correlation was used to investigate the association between the EQ-5D-3L and the EQ-VAS (Table 6).

Table 2: Distribution of the answers to the EQ-5D-3L dimensions and the EQ-VAS

| EQ-5D-3L                   | N  | %  |
|---------------------------|----|----|
| Mobility (MO)             |    |    |
| I have no problems         | 315| 72.1|
| I have some problems       | 122| 27.9|
| I am confined to bed       | 0  | 0  |
| I have no problems with self-care | 384| 87.9|
| Self-Care (SC)            |    |    |
| I have some problems       | 53 | 12.1|
| I am unable to wash or dress myself | 0  | 0  |
| I have no problems with my usual activities | 374| 85.6|
| Usual activities (UA)      |    |    |
| I have some problems       | 62 | 14.2|
| I am unable to perform     | 1  | 0.2 |
| I have no pain or discomfort | 146| 33.4|
| Pain/discomfort (PD)       |    |    |
| I have moderate pain       | 288| 65.9|
| I have extreme pain        | 3  | 0.7 |
| I am not anxious or depressed | 206| 47.1|
| Anxiety/depression (AD)    |    |    |
| I am moderately anxious or depressed | 225| 51.5|
| I am extremely anxious or depressed | 6  | 1.4 |
| Total                      | 437| 100|

Table 2: Distribution of the answers to the EQ-5D-3L dimensions and the EQ-VAS

| EQ_VAS                 |    |    |
|------------------------|----|----|
| 5th Percentile         | 40 |    |
| 10th Percentile        | 50 |    |
| 25th Percentile        | 50 |    |
| 50th Percentile        | 60 |    |
| 75th Percentile        | 80 |    |
| 90th Percentile        | 90 |    |
| 95th Percentile        | 95 |    |
| 100th Percentile       | 100|    |
| Minimum                | 0  |    |
| Maximum                | 100|    |
| Mean                   | 64.85|    |
| Standard deviation     | 18.18|    |
| Total                  | 437| 100|

Citation: Cardoso AF, Cruz R, Queirós P, et al. Assessment of health-related quality of life using the EQ-5D-3L in individuals with type 2 diabetes mellitus. *J Diabetes Metab Disord Control*. 2016;3(2):33–40. DOI: 10.15406/jdmdc.2016.03.00064
**Table 3** Distribution of the EQ-5D-3L and the EQ-VAS according to the sociodemographic and clinical characteristics of T2DM patients

| Characteristics          | N   | EQ-5D-3L | EQ-VAS |
|--------------------------|-----|----------|--------|
|                          |     | Mean     | sd     | Mean   | sd     |
| Total                    | 437 | 0.677    | 0.193  | 64.85  | 18.188 |
| **Gender**               |     |          |        |        |        |
| Male                     | 208 | 0.744    | 0.18   | 68.44  | 16.029 |
| Female                   | 229 | 0.617    | 0.184  | 61.58  | 19.411 |
| 30-49                    | 27  | 0.802    | 0.163  | 78.22  | 10.649 |
| **Age**                  |     |          |        |        |        |
| 50-69                    | 252 | 0.695    | 0.181  | 65.54  | 18.162 |
| ≥70                      | 158 | 0.628    | 0.202  | 61.46  | 18.149 |
| Single                   | 20  | 0.69     | 0.213  | 72     | 18.595 |
| Married/Cohabiting       | 321 | 0.695    | 0.186  | 65.41  | 17.369 |
| Divorced/separated       | 26  | 0.691    | 0.187  | 56.92  | 23.583 |
| Widowed                  | 70  | 0.587    | 0.202  | 63.14  | 18.75  |
| Low                      | 271 | 0.639    | 0.191  | 61.96  | 18.732 |
| **Marital status**       |     |          |        |        |        |
| Single                   | 20  | 0.69     | 0.213  | 69.29  | 16.732 |
| Married/Cohabiting       | 321 | 0.695    | 0.186  | 65.41  | 17.369 |
| Divorced/separated       | 26  | 0.691    | 0.187  | 56.92  | 23.583 |
| Widowed                  | 70  | 0.587    | 0.202  | 63.14  | 18.75  |
| Low                      | 271 | 0.639    | 0.191  | 61.96  | 18.732 |
| **Level of education**   |     |          |        |        |        |
| Medium                   | 129 | 0.73     | 0.179  | 69.29  | 16.732 |
| High                     | 37  | 0.774    | 0.181  | 70.46  | 14.521 |
| **Professional situation** |     |          |        |        |        |
| Active                   | 67  | 0.737    | 0.16   | 68.58  | 16.039 |
| Non-active               | 290 | 0.662    | 0.198  | 63.89  | 18.599 |
| **Physical activity**    |     |          |        |        |        |
| Yes                      | 219 | 0.728    | 0.176  | 68.69  | 17.912 |
| No                       | 218 | 0.627    | 0.197  | 60.98  | 17.674 |
| 0-10                     | 315 | 0.682    | 0.187  | 64.9   | 19.042 |
| 20-Nov                   | 95  | 0.674    | 0.216  | 65.63  | 15.475 |
| **Time elapsed since T2DM diagnosis (years)** |     |          |        |        |        |
| 21-30                    | 21  | 0.625    | 0.194  | 59.29  | 17.556 |
| 31-40                    | 2   | 0.604    | 0.076  | 67.5   | 17.678 |
| >40                      | 2   | 0.731    | 0.052  | 62.5   | 17.678 |

**Table 4** Association between the EQ-5D-3L and the EQ-VAS and the variables gender, physical activity and professional situation

| Characteristics          | N   | EQ-5D-3L | EQ-VAS |
|--------------------------|-----|----------|--------|
|                          |     | Mean rank| Z      | p    | Mean rank| Z      | p    |
| **Gender**               |     |          |        |      |          |        |      |
| Male                     | 208 | 265.26   | -7.384 | 0    | 244.25   | -4.05  | 0    |
| Female                   | 229 | 176.98   | 196.06 |      |          |        |      |
| **Physical Activity**    |     |          |        |      |          |        |      |
| Yes                      | 219 | 255.91   | -4.154 | 0    | 243.63   | -6.195 | 0    |
| No                       | 218 | 181.92   | 194.26 |      |          |        |      |
| **Professional Situation** |     |          |        |      |          |        |      |
| Active                   | 89  | 266.74   | 244.44 |      |          |        |      |
| Non-active               | 348 | 206.79   | 212.49 |      |          |        |      |
| Total                    | 437 |          |        |      |          |        |      |

**Citation:** Cardoso AF, Cruz R, Queirós P, et al. Assessment of health-related quality of life using the EQ-5D-3L in individuals with type 2 diabetes mellitus. *J Diabetes Metab Disord Control.* 2016;3(2):33–40. DOI: 10.15406/jdmdc.2016.03.00064
Discussion

Most participants were women (52.4%), which contradict the higher prevalence of diabetes in men observed in Portugal. This situation was also described and analyzed by Morais and colleagues (2015), who concluded that this may be, to some extent, associated with gender-related cultural issues, since women are more likely to adhere to vigilance than men. The mean age of participants was 66.28 years. This data contradicts the results found in the literature which indicate that the prevalence of diabetes in the Portuguese population increases with age and that more than one-fourth of the individuals aged 60-79 years have diabetes. The participants had a low level of education, as most of them did not complete compulsory education (9th grade) (62%). This result contributes to asserting the need for increased support to individuals with lower levels of education, which is an obstacle to fight against diabetes.

In this study, we measured the HRQoL of T2DM patients using the EQ-5D-3L. The EQ-5D-3L score was calculated based on the value set for Portugal. We found that the acceptability of the EQ-5D-3L was 100%, both in the descriptive system and in the EQ-VAS, and that participants had no difficulties understanding or completing it, which is similar to results found in other studies. The assessment of the health status of the participants in our study allowed us to conclude that the ceiling effect overlaps as been observed in all dimensions, i.e. few individuals were placed on level 3 of the five dimensions. The ceiling effect was more marked in the dimensions of mobility and self-care than in the others, which is consistent with other studies. In this study, individuals with T2DM perceive themselves more often to be at the "no problems" level in the five dimensions, but particularly in the dimensions related to mobility, self-care and usual activities. However, the percentage of individuals who answered "some problems" is higher in the dimensions of pain/discomfort and anxiety/depression (65.9% and 51.5%, respectively). “Extreme problems” were also found in these dimensions. This group of individuals with T2DM clearly valued the psychological dimensions over the dimensions related to mobility, self-care and usual activities.

We found that the EQ-5D-3L and the EQ-VAS measures HRQoL indirectly based on the five dimensions, whereas the EQ-VAS measures it directly through the patients’ subjective feelings. For this reason, the EQ-VAS shows the severity of the disease which the patient himself/herself experiences. The same trend was observed in the EQ-VAS score, which is higher than the one found in patients with other chronic conditions (rheumatoid arthritis, asthma, cataracts and chronic obstructive pulmonary disease), similar to the score found in a Portuguese study with patients with multiple sclerosis, and lower than the score found for Portuguese asthma patients.

We found that the score is lower than the one found in samples of diabetic patients in other cultural contexts. The EQ-5D-3L measures HRQoL indirectly based on the five dimensions, whereas the EQ-VAS measures it directly through the patients’ subjective feelings. For this reason, the EQ-VAS shows the severity of the disease which the patient himself/herself experiences. The same trend was observed in the EQ-VAS score, which is higher than the one found in patients with other chronic conditions (rheumatoid arthritis, asthma, cataracts and chronic obstructive pulmonary disease) in the study of Ferreira, Ferreira & Pereira (2013), but lower than the one found in samples of diabetic patients in different cultural contexts. Although the association between HRQoL and diabetes complications was not analyzed in our study, we noticed that the EQ-5D-3L score obtained in our sample is still much lower than the one found in studies with diabetic patients without complications and similar to the one found with diabetic patients with more than two diabetes complications.

Table 5 Association between the EQ-5D-3L and the EQ-VAS and the variables age, marital status and level of education

| Characteristics | N  | EQ-5D-3L | EQ-VAS |
|-----------------|----|---------|--------|
|                 |    | Mean order | KW | p   | Mean order | KW | p   |
| Age             |    |           |     |     |           |     |     |
| 30-49           | 27 | 297.89    | 0  | 318.65 |
| 50-69           | 252| 230.52    | 23.221 | 223.38 | 23.586 | 0  |
| ≥70             | 158| 187.15    | 194.99 |
| Single          | 20 | 235.15    | 264.43 |
| Married/Cohabiting | 321| 229.36    | 18.221 | 221.9  |
| Divorced/separated | 26 | 235.42    | 182.04 | 5.865 | 0.118 |
| Widowed         | 70 | 160.79    | 206.45 |
| Low             | 271| 191.78    | 198.02 |
| Medium          | 129| 258.79    | 34.718 | 252.02 | 20.407 | 0  |
| High            | 37 | 279.62    | 257.54 |
| Total           | 437|          |       |

Table 6 Association between the EQ-5D-3L and the EQ-VAS

| EQ-5D-3L | EQ-VAS |
|----------|--------|
| N 437    | 437    |
| ρ 0.370**| 1      |
| N 437    | 437    |
| rho 0.370**| 1      |
| ρ 0.370**| 1      |

Citation: Cardoso AF, Cruz R, Queirós P, et al. Assessment of health-related quality of life using the EQ-5D-3L in individuals with type 2 diabetes mellitus. J Diabetes Metab Disord Control. 2016;3(2):33–40. DOI: 10.15406/jdmdc.2016.03.00064
The psychometric characteristics tested in this study indicate a reasonable internal consistency (0.674), although lower than the one found in the previous Portuguese study. The dimensions of mobility, self-care and usual activities of the physical component of HRQoL are more clearly interrelated than the dimensions of pain/discomfort and anxiety/depression of the psychological component, which seems to indicate that the EQ-5D-3L is more sensitive in the physical dimension of HRQoL. However, this is not a diabetes-specific instrument and, for this reason, it may reflect problems related to other conditions. Although our sample did not include individuals aged 18-29 years, we observed that HRQoL decreases with age, reflecting the same trend observed in other studies. Our results indicate that men, younger people, people who practice physical activity and people with less time elapsed since T2DM diagnosis scored higher in the EQ-5D-3L and in the EQ-VAS.

Conclusion

In this sample of diabetic patients, the mean score of the EQ-5D-3L and the EQ-VAS was 0.677 and 64.85, respectively. These scores are lower than those observed in the general Portuguese population, and also than those found in other groups of diabetic patients in other cultural contexts. Men, younger people, people with a higher level of education, single people, people who practice physical activity and people with less time elapsed since T2DM diagnosis scored higher both EQ-5D-3L and EQ-VAS. Women reported more problems than men. HRQoL is affected by age, regardless of sex.

These results emphasize the impact of diabetes on the patients’ quality of life and highlight the subjective experience of diabetic patients. Given its metric characteristics (Cronbach’s α: 0.674), acceptability, ease and short time of administration (mean completion time of 10minutes), this instrument is extremely useful and valuable in clinical practice and research for valuing the subjective dimension of T2DM patients.

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

References

1. Morais CS, Pimenta RE, Ferreira PL, et al. Assessing Diabetes Health Literacy, Knowledge and Empowerment in Northern Portugal. New Contributions in Information Systems and Technologies. Advances in Intelligent Systems and Computing. 2015;63:71.
2. IDF. International Diabetes Federation. The Diabetes Atlas. 6th ed. 2014.
3. Gardete Correia L, Boavida JM, Almeida JF de, et al. Diabetes: Factos e Números 2014-Relatório Anual do Observatório Nacional da Diabetes. 2014.
4. Jimmy B, Jose J, Al-Hinai ZA, et al. Adherence to Medications among Type 2 Diabetes Mellitus Patients in Three Districts of Al Dakhiliyah Governorate, Oman: A cross-sectional pilot study. Sultan Qaboos Univ Med J. 2014;14(2):e231–e235.
5. Redekop WK, Koopmanschap MA, Stolk RP, et al. Health-Related Quality of Life and Treatment Satisfaction in Dutch Patients With Type 2 Diabetes. Diabetes Care. 2002;25(3):458–463.
6. Yordanova S, Petkova V, Petrov G, et al. Comparison of health-related quality-of-life measurement instruments in diabetic patients. Biotechnol Biotechnol Equip. 2014;28(4):769–774.
7. Kaplan RM. The significance of quality of life in health care. Qual Life Res. 2003;12(Suppl 1):3–16.
8. Alcubierre N, Rubinat E, Travessa E, et al. A prospective cross-sectional study on quality of life and treatment satisfaction in type 2 diabetic patients with retinopathy without other major late diabetic complications. Health Qual Life Outcomes. 2014;12:131.
9. Chew BH, Shariff-Ghazali S, Fernandez A. Psychological aspects of diabetes care: Effecting behavioral change in patients. World J Diabetes. 2014;5(6):796–808.
10. Prisciandaro JJ, Gebregziabher M, Grubauh AL, et al. Impact of psychiatric comorbidity on mortality in veterans with type 2 diabetes. Diabetes Technol Ther. 2011;13(1):73–78.
11. Chew BH, Sherina MS, Hassan NH. Association of diabetes-related distress, depression, medication adherence, and health-related quality of life with glycated hemoglobin, blood pressure, and lipids in adult patients with type 2 diabetes: a cross-sectional study. Ther Clin Risk Manag. 2015;11:669–681.
12. Sakamaki H, Ikeda S, Ikegami N, et al. Measurement of HRQL Using EQ-5D in Patients with Type 2 Diabetes Mellitus in Japan. Value Health. 2006;9(1):47–53.
13. Frost J, Garside R, Cooper C, et al. A qualitative synthesis of diabetes self-management strategies for long term medical outcomes and quality of life in the UK. BMC Health Serv Res. 2014;14(1):348.
14. Vinagre I, Mata-Cases M, Hermosilla E, et al. Control of glycaemia and cardiovascular risk factors in patients with type 2 diabetes in primary care in Catalonia (Spain). Diabetes Care. 2012;35(4):774–779.
15. Cardoso AF, Queiros P, Ribeiro CF. Intervenções para a aquisição do autocuidado terapêutico da pessoa com diabetes mellitus: revisão sistemática da literatura. Revista Portuguesa de Saúde Pública; 2015;33(2):246–255.
16. Ahola AJ, Saraihme M, Forsblom C, et al. Health-related quality of life in patients with type 1 diabetes-association with diabetic complications (the FinnDiame Study). Nephrol Dial Transplant. 2010;25(6):1903–1908.
17. Solli O, Stavem K, Kristiansen IS. Health-related quality of life in diabetes: The associations of complications with EQ-5D scores. Health Qual Life Outcomes. 2010;8:18.
18. Wexler DJ, Grant RW, Wittenberg E, et al. Correlates of health-related quality of life in type 2 diabetes. Diabetologia. 2006;49(7):1489–1497.
19. Kalaratna S, Whitby JA, Johnson NW, et al. EQ-5D-3L Derived Population Norms for Health Related Quality of Life in Sri Lanka. PLoS One. 2014;9(11):e108434.
20. Ferreira PL, Ferreira LN, Pereira LN. Contributos para a Validação da Versão Portuguesa do EQ-5D. Acta Med Port. 2013;26(6):664–676.
21. Paiva CMRG de J. Consumo de recursos e qualidade de vida dos doentes com esclerose múltipla: evidência para portugal. Coimbra:FEUC; 2012.
22. Ferreira LN, Ferreira PL, Pereira LN, et al. The valuation of the EQ-5D in Portugal. Qual Life Res. 2014;23(2):413–423.
23. Ferreira LN, Ferreira PL, Pereira LN, et al. EQ-5D Portuguese population norms. Qual Life Res. 2014;23(2):425–430.
24. World Medical Association. World Medical Association Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects. JAMA. 2013;310(2):219–1.
25. Terwee CB, Bot SD, de Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007;60(1):34–42.
26. Cohen L, Holliday M. London: Statistics for Social Scientists. 1982.
27. Marôco J. Análise Estatística com o SPSS Statistics. 5a Edição. Report Number. In: Análise e Gestão de Informação L, editor. Portugal; 2011.
28. Pestana MH, Gageiro JN. Análise de Dados para Ciências Sociais – A complementaridade do SPSS. In: Edições Silabo L, editor. Edições Silabo, Lda. 3rd ed. Lisboa, Portugal; 2003. p. 501–553.

29. Dyer MTD, Goldsmith KA, Sharples LS, et al. A review of health utilities using the EQ-5D in studies of cardiovascular disease. Health Qual Life Outcomes. 2010;8(13):1–12.

30. Ferreira LN, Brito U, Ferreira PL. Qualidade de vida em doentes com asma. Rev Port Pneumol. 2010;16(1):23–55.

31. Grandy S, Fox KM. EQ-5D visual analog scale and utility index values in individuals with diabetes and at risk for diabetes: Findings from the Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD). Health Qual Life Outcomes. 2008;6:18.

32. UK Prospective Diabetes Study Group. Quality of life in type 2 diabetic patients is affected by complications but not by intensive policies to improve blood glucose or blood pressure control (UKPDS 37). UK Prospective Diabetes Study Group. Diabetes Care. 1999;22(7):1125–1136.