



# Quality of Life Assessment with EQ-5D-3L in a Moroccan Diabetic Population

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## Abstract

Diabetes is a chronic metabolic disease that impairs the lifestyle of patients in different physical, mental and social dimensions. This study aims to investigate the determinants of health-related quality of life (HRQoL) in diabetics. A cross-sectional study was conducted on 526 diabetic patients followed in 2019 at the Hygiene Department of the Sidi Othmane district (Casablanca). The data were collected using a questionnaire gathering the demographic, clinical and paraclinical information of patients, as well as a description of health status in the 5 dimensions by the EQ-5D questionnaire. The data was analyzed using SPSS version 23 software. The determinants of quality of life were assessed using the ANOVA test and the Pearson correlation test. The result is considered statistically significant at 0.05. The average quality of life score based on the EQ-5D-3L scale and the VAS analog visual scale was  $0.52 \pm 0.34$  and  $55.47 \pm 15.50$ , respectively. Severe problems were observed in anxiety/depression dimensions in 19.20% of patients, while the highest percentages for moderate problems were for the pain/physical discomfort and mobility dimensions (53.80% and 36.90% respectively). The average scores of the EQ-5D-3L and visual analogue scale (VAS) were significantly ( $P < 0.05$ ) associated with age, gender, education, marital status, professional activity and complications. It follows from this study that the HRQoL of the population of diabetics studied is influenced by many factors, which must be considered in order to achieve better management of diabetes and improve their quality of life.

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## Subject Areas

Endocrinology

## Keywords

Diabetes, Quality of Life, EQ-5D, EQ-VAS, Health Dimensions

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## 1. Introduction

The rise of diabetes worldwide is the result of changes in style, lifestyle and an aging population. Diabetes is a major public health problem because of its increasing prevalence and incidence rates. According to the International Diabetes Federation (IDF) its prevalence was 463 million in 2019 and it will be in the order of 700 million by the year 2045 [1].

Diabetes is a chronic progressive disease. It is recognized as a major risk factor for cardiovascular disease, kidney disease and others. It is also a major cause of blindness, kidney failure, cardiovascular events, stroke and lower limb amputation [2]. It can affect the quality of life of patients through its physical but also psychological impact.

Health-related quality of life (HRQoL), it is the health status with three aspects physical, psychological and social, declared by the individuals themselves [3]. It is a way to assess how a person's well-being can be affected by a disease [3] [4]. Currently, it has become a major health issue. Its consideration allows the medical community to know how the patient experiences his disease [5].

The measure of HRQoL has the advantage of refocusing the patient care, of weighing the increasing technicality of medical procedures and of increasing the relevance of many medical decisions that are thus negotiated within the framework of a doctor-sick relationship [5] [6]. It is usually measured using questionnaires. Over the past few decades, the hundreds of HRQoL questionnaires have been developed to assess the quality of life of patients with many diseases [7] [8] [9]. In these questionnaires, we can distinguish between specific and generic instruments. Disease-specific instruments are more sensitive to detected changes in health status related to the disease, but due to of this specificity; comparisons between populations with different diseases are rarely possible [10]. On the other hand, generic instruments were built to assess the lifestyle of a general population without particularities or even to compare the lifestyle of groups of subjects to many pathologies [5] [11]. A number of generic measures have been developed and are being used, including Short Form-36 (SF-36), [12] [13] Short Form-12 (SF-12), [14] EQ-5D, [15] Nottingham Health Profile (NHP) [16] and Sickness Profile (SIP) [17].

Our study aims to assess lifestyle of a diabetic population using the generic EQ5D measurement instrument and to determine the factors that affect it.

## 2. Materials and Methods

### 2.1. Population Study

This is a cross-sectional study of a population of 526 diabetic patients, followed by the Hygiene Department of the Sidi-Othman district, Casablanca-Morocco.

### 2.2. Ethical Considerations

This study was approved by the Biomedical Research Ethics Committees of Casablanca and Marrakech and was conducted in accordance with the principles of the Helsinki Declaration.

### 2.3. Collect Data

Diabetic patients were recruited from October 2019 to February 2020 at the Hygiene Department of the Sidi-Othman borough and diagnosed for at least a year. People under the age of 18 and pregnant women were excluded from this study.

A questionnaire was designed to collect information, including:

- Socio-demographic data (gender, age, marital status, education, professional activity).
- Clinical and medical data (type and age of diabetes, presence of complications, blood pressure...).
- Biological data (HbA1c, GAI, GPP, blood pressure, cholesterol: CT, TG, HDL, LDL).

The blood glucose was measured by a One Call extra glucometer.

Blood pressure and pulse were measured using an Electronic Omron M6 Comfort blood pressure monitor.

Total cholesterol, LDL, HDL, triglycerides and HbA1c were dosed in laboratories of the private or public sectors of Casablanca.

For this study, we used the EQ-5D scale. It is a generic instrument that assesses the overall condition of patients (physical, psychological and social) regardless of their pathology [18]. The EQ-5D questionnaire consists in two parts:

- A descriptive part composed of five dimensions of health: mobility, self-care, usual activities, pain/discomfort and anxiety/depression.
- A vertical Visual Analogue Scale (EQ-VAS). The latter measuring 20 cm and graduated from 0 (the worst health condition) to 100 (the best health). It is a general assessment of the respondent's perceived health. It has four levels of answers: excellent, good, medium and bad. It is easy to use, just choose the level that well describes the patient's current state of health [19].

We preferred the EQ-5D 3L because we noticed that the answers for the EQ-5D 5L are very close. For each dimension of the EQ-5D 3L, the respondent has three options for answers: "no problems" rated 1, "moderate problems" rated 2, or "severe problems" rated 3. The answers given can be combined in a number of 5 digits, describing the respondent's state of health. The "11111" profile is a perfect health match designed for all 5 dimensions. The results of the

EQ-5D dimensions can be transformed into a weighted index, ranging from  $-0.594$  (poor health) to 1 (good health) [20].

The cross-cultural adaptation process of EQ-5D for Morocco was carried out according to the procedure indicated by the EuroQol International Group [15].

We have produced two translations of this scale from the French language to the Moroccan Arabic dialect by two teams of translators. Each is made up of two translators. The translations carried out by the two teams were compared, in the presence of investigators who had not been involved in the translation. The discrepancies between the two translated versions were discussed between the two teams, on the basis of which a final version adapted to Moroccan culture was developed.

The new translated version was again translated by two other different teams, mastering the French language and not having the original version of the EQ-5D scale. Two retro-translated versions of the questionnaire were developed, the synthesis of which was compared to the original French version.

The pre-final version of the questionnaire was pre-tested on a well-selected group of diabetic patients of different levels of knowledge, using both the descriptive EQ-5D (5-dimensional response) and EQ-VAS system. Each patient was asked about each question, to ensure that all the questions were properly understood by the respondents. Changes were made to the pre-final version and a final version of the questionnaire was developed.

The validated version of the EQ-5D scale was administered by the investigators to diabetics, after their information of the objectives of the study and the signature of informed consent.

## 2.4. Statistical Analysis

The SPSS version 23 software was used to analyze the collected data. The results were expressed in mean  $\pm$  standard deviation for all variables studied.

The calculation of the different health scores was made using a data sheet that we modeled on MS-Access, which allowed the automatic calculation of scores by dimension (scores between 0 and 100).

To identify the different factors affecting lifestyle, we studied the association between EQ-5D index and VAS scores and socio-demographic, socio-economic and clinical characteristics by the ANOVA (Analysis of variance) test for discontinuous variables and the Pearson test for continuous variables. The statistical significance has been set at  $P < 0.05$ .

The quota of the squares of factor and total deviations (partial eta-square (part eta squared)) has been calculated. It makes it easy to define the correlation ratio, also known as the non-linear correlation coefficient. It represents the proportion of variance of the dependent variable (the variable tested) explained by the independent variable (the group variable). This correlation ratio is always between 0 and 1. The interpretation of this index was carried out according to Cohen (1988) [21].

Effet of Eta-square ( $\eta^2$ ):

- Around 0.01 = Small effect.
- Around 0.06 = Medium effect.
- Around 0.14 and above = Large effect.

### 3. Results

#### 3.1. Socio-Demographic and Socio-Economic Data

This study involved 526 patients, of whom 75.9% are women and 24.1% are men. The average age was  $54.56 \pm 12.86$  years. 61.2% of the population are married, 24% widowed, 10% single while only 4.8% are divorced. According to the level of education, 59.5% are illiterate, 20.5% have primary education and 16.9% have a secondary level (College: 10.6%; High school: 6.3%), while only 1.9% have completed a university course. In terms of professional activity, 86.7% of patients are unemployed (without occupation, housewives, retirees and students), compared to 13.3% who are employed. In terms of lifestyle, 96% of diabetics live in families, while 4% live alone. For medical coverage, 50.6% benefited from the Medical Assistance Plan (RAMED), 24.5% had the National Social Security Fund (CNSS); 6.8% have the National Fund of Provident Organizations (CNOPS) and 18.1% of patients have no medical coverage (**Table 1**).

#### 3.2. Clinical, Biological and Lifestyle

For the clinical characteristics of the population, 63.3% have type 2 diabetes (DNID) and 36.7% type 1 diabetes (DID), with an average of diabetes duration  $11.39 \pm 7.78$  years.

High blood pressure is present in 55% of diabetics. The most common chronic complication is retinopathy, followed by heart disease, neuropathy, arterial disease and kidney disease respectively (25.6%; 21.4%; 16.10%; 10.4%; 6.4%). We also noticed that hyperglycemia is the most common acute complication in our diabetics (35.8%) followed by hypoglycemia (25.9%) coma (9.4%), while the majority (98.90%) have no complications (**Table 2**).

#### 3.3. EQ5D-3L Assesses the Quality of Life of Diabetics

The average score for the EQ-5D index was  $0.52 \pm 0.34$ , ranging from  $-0.59$  to 1. While the health status scores of diabetics on the visual analog scale (VAS) was 55.47 vs. 15.50 and ranged from 25 to 100.

Higher percentages of patients reported that they had no problems in different dimensions such as self-care (85.6%), mobility (59.7%) and usual activities (55.1%). However, the highest percentages for moderate problems were reported in anxiety/depression (63.50%) and in pain/discomfort (53.80%). The highest percentages for extreme problems have been reported in some dimensions such as anxiety/depression (19.20%), pain/discomfort and self-care with (11%) (**Table 3**).

The EQ5D Score is strongly associated with physical activity ( $P = 0.0001$ ;  $\eta^2 =$

**Table 1.** Socio-demographic and socio-economic characteristics of the diabetics surveyed.

<b>Variables</b>	
<b>Age</b>	
Average age	54.56 ± 12.86 years
<b>Gender</b>	
Men	24.1%
Women	75.9%
<b>Professional activity</b>	
Yes	13.30%
Not	86.70%
<b>Marital status</b>	
Single	10%
Married	61.20%
Divorced	4.80%
Widower	24%
<b>Educational level</b>	
Illiterate	59.50%
Primary	20.50%
College	10.60%
Secondary	6.30%
University	1.9%
<b>Lifestyle</b>	
Only	4%
Family	96%
<b>Social coverage</b>	
RAMED	50.60%
Cnss	24.50%
Cnops	6.80%
No	18.10%

0.145) and chronic complications ( $P = 0.0001$ ;  $\eta^2 = 0.092$ ), which is moderately associated with the level of education ( $P = 0.0001$ ;  $\eta^2 = 0.087$ ) and marital status ( $P = 0.0001$ ;  $\eta^2 = 0.055$ ); while it is weakly associated with gender ( $P = 0.003$ ;  $\eta^2 = 0.017$ ); professional activity ( $P = 0.011$ ;  $\eta^2 = 0.012$ ) and acute complications ( $P = 0.003$ ;  $\eta^2 = 0.017$ ).

On the other hand, the VAS score shows a strong direct association with genre ( $P = 0.003$ ;  $\eta^2 = 0.17$ ), physical activity ( $P = 0.0001$ ;  $\eta^2 = 0.104$ ) and with the level of education ( $P = 0.0001$ ;  $\eta^2 = 0.093$ ). This score is moderately associated with marital status ( $P = 0.0001$ ;  $\eta^2 = 0.048$ ) and chronic complications ( $P = 0.0001$ ;  $\eta^2 = 0.056$ ) and weakly associated with marital status ( $P = 0.012$ ;  $\eta^2 = 0.012$ ) (**Table 4**).

**Table 2.** Clinical characteristics and lifestyle of diabetics surveyed.

Clinical variables	
<b>Diabetes duration</b>	
Average age	11.39 - 7.78 years
<b>Type of diabetes</b>	
T1D	36.70%
T2D	63.30%
<b>Smoking</b>	
Yes	3.60%
No	96.40%
<b>Alcoholism</b>	
Yes	0.80%
No	99.20%
<b>Physical activity</b>	
Yes	37.50%
No	62.50%
<b>HBP</b>	
Yes	55%
No	45%
<b>Chronic complications</b>	
Arteriopathy	10.40%
Heart	21.40%
Nephropathy	6.40%
Neuropathy	16.10%
Retinopathy	25.60%
Other complications	7.90%
No Complications	12.80%
<b>Acute complications</b>	
Hyperglycemia	35.80%
Hypoglycemia	25.90%
Coma	9.40%
No complications	28.90%

The study of correlations generally shows an inverse correlation between the scores of EQ-5D and VAS respectively, age ( $P = 0.0001$ ;  $r^2 = -0.273$ ); ( $P = 0.0001$ ;  $r^2 = -0.242$ ), the duration of diabetes ( $P = 0.0001$ ;  $r^2 = -0.164$ ); ( $P = 0.011$ ;  $r^2 = -0.111$ ) and blood pressure ( $p = 0.0001$ ;  $r^2 = -0.186$ ); ( $P = 0.007$ ;  $r^2 = -0.144$ ) (Table 5). This shows that most of these parameters increase, the patient's quality of life deteriorates.

#### 4. Discussion

In this study, which aimed to assess the lifestyle of a population of diabetics

**Table 3.** Patient health description for each quality of life level.

Dimensions EQ5D	Percentage (%)
<b>Mobility</b>	
No problem	59.30%
Moderate problem	36.90%
Extreme problem	3.80%
<b>Self-care</b>	
No problem	85.60%
Moderate problem	9.50%
Extreme problem	4.90%
<b>Usual activities</b>	
No problem	55.10%
Moderate problem	33.30%
Extreme problem	11.60%
<b>Pain/discomfort</b>	
No problem	35.20%
Moderate problem	53.80%
Extreme problem	11%
<b>Anxiety/Depression</b>	
No problem	17.30%
Moderate problem	63.50%
Extreme problem	19.20%

followed by the Hygiene Department of the Sidi Othmane district (Casablanca, MAROC) using the EQ-5D-3L questionnaire, the average score for the lifestyle and VAS scale was 0.52 and 55.47, respectively. This is consistent with the results of Lyhyaoui who observed in type 2 diabetics that VAS was 56.66 [22]. Diabetes appears to be a health-degrading and health-altering condition of patients with diabetes. This alteration in quality of life varies according to studies. Thus, Cardoso observed in Portugal, that the average score of the EQ-5D was 0.67 and the VAS score was 64.85, [23] while Abedini who conducted a study in Iran, the score of the EQ-5D was 0.89 and VAS was 65.22 [24]. This difference in the lifestyle of diabetics could be explained by the actions of some factors (socio-economic, clinical and paraclinical...) that could affect it. Thus, these indicators must be taken into account when evaluating the results of the studies.

We observed that the majority of patients had no problems or reported mild problems in all dimensions especially, mobility and self-care, while moderate and severe problems were more common in the dimensions of anxiety/depression, usual activities and pain/discomfort. These results are consistent with many studies that have reported that the pain and depression were the main complaints of patients [25] [26]. On the other hand, Lyhyaoui, in Fez in 2011, also reported that the most extreme diabetic complaints were predominant, especially in the dimensions of pain and depression [22]. Along with

**Table 4.** Association between average quality of life score VAS scale and qualitative variables.

Variables		Score EQ-5D-3L			Score VAS		
		Mean $\pm$ Sd	ANOVA p-Value	$\eta^2$	Average ET	Mean $\pm$ Sd	$\eta^2$
<b>Gender</b>	Men	0.60 $\pm$ 0.35	0.003	0.017	59.06 $\pm$ 16.86	0.003	0.17
	Women	0.50 $\pm$ 0.34			54.32 $\pm$ 14.88		
<b>Type of diabetes</b>	DT1	0.49 $\pm$ 0.36	0.084	0.006	54.40 $\pm$ 16.73	0.232	0.003
	DT2	0.54 $\pm$ 0.33			56.08 $\pm$ 14.73		
<b>Professional activity</b>	With profession	0.63 $\pm$ 0.32	0.011	0.012	58.61 $\pm$ 18.75	0.092	0.005
	No profession	0.51 $\pm$ 0.34			55.05 $\pm$ 14.99		
<b>Alcoholism</b>	Yes	0.76 $\pm$ 0.20	0.174	0.004	55.41 $\pm$ 15.51	0.363	0.002
	Not	0.52 $\pm$ 0.34			62.50 $\pm$ 14.43		
<b>Smoking</b>	Yes	0.63 $\pm$ 0.40	0.176	0.03	59.21 $\pm$ 14.93	0.284	0.002
	Not	0.52 $\pm$ 0.34			55.33 $\pm$ 15.51		
<b>Physical activity</b>	Yes	0.69 $\pm$ 0.23	0.0001	0.145	61.93 $\pm$ 15.27	0.0001	0.104
	Not	0.42 $\pm$ 0.36			51.60 $\pm$ 14.32		
<b>Marital status</b>	Single	0.64 $\pm$ 0.30	0.0001	0.055	63.21 $\pm$ 15.96	0.0001	0.048
	Married	0.56 $\pm$ 0.31			56.13 $\pm$ 14.74		
	Divorced	0.46 $\pm$ 0.31			53 $\pm$ 19.52		
	Widower	0.39 $\pm$ 0.40			50.99 $\pm$ 14.96		
<b>Educational level</b>	Illiterate	0.45 $\pm$ 0.36	0.0001	0.087	52.27 $\pm$ 14.59	0.0001	0.093
	Primary	0.57 $\pm$ 0.27			56.94 $\pm$ 14.43		
	College	0.72 $\pm$ 0.29			63.84 $\pm$ 15.75		
	Secondary	0.68 $\pm$ 0.28			62.12 $\pm$ 16.67		
<b>Chronic complications</b>	University	0.76 $\pm$ 0.13	0.0001	0.092	72.50 $\pm$ 14.19	0.0001	0.056
	Yes	0.46 $\pm$ 0.35			53.46 $\pm$ 62.19		
<b>Acute complications</b>	Not	0.71 $\pm$ 0.24	0.003	0.017	62.19 $\pm$ 16.49	0.012	0.012
	Yes	0.49 $\pm$ 0.34			54.30 $\pm$ 14.82		
	Not	0.59 $\pm$ 0.35			57.89 $\pm$ 16.59		

**Table 5.** Correlation between average quality of life score, VAS scale and quantitative variables.

Variables	Score EQ-5D		Score VAS	
	p-Value	Correlation coefficient ( $r^2$ )	p-Value	Correlation coefficient ( $r^2$ )
Age	0.0001	-0.273	0.0001	-0.242
Diabetes elderly	0.0001	-0.164	0.011	-0.111
HbA1	0.496	0.034	0.516	0.032
Blood pressure	0.0001	-0.186	0.007	-0.144

different work in this field, our study also confirmed that most patients complained of moderate to severe problems with depression, pain and every day activities [24].

Our results revealed a significantly higher quality of life in men compared to

women ( $P = 0.003$ ), similar results were obtained with the VAS scale ( $P = 0.003$ ). This finding is consistent with that of Abedini who also found that average scores for men's quality of life ( $0.92 \pm 0.12$ ) were significantly higher ( $P = 0.004$ ) than those of women ( $0.86 \pm 0.13$ ), for the VAS scale, the scores were  $68.85 \pm 8.20$  and  $62.73 \pm 9.25$  respectively ( $P = 0.008$ ) [24]. This could be explained by the fact that women have shown a higher tendency to express health-related problems compared to men, thus lowering the quality of life score. This result agrees with that of Quah who showed that women had a significantly lower score of EQ-5D than men ( $0.82 \pm 0.21$ ;  $0.89 \pm 0.17$ ;  $P < 0.0001$ ). On the other hand, they observed that the score of the VAS scale in women was lower than that of men, without any statistically significant difference ( $68.4 \pm 16.8$ ;  $70.2 \pm 16.4$ ;  $P < 0.151$ ) [27].

Our results showed an inverse association between EQ5D, age ( $p = 0.0001$ ) and duration of diabetes ( $p = 0.0001$ ), suggesting that HRQoL decrease with age. Similar results were observed by Abedini in Iran, which have shown that the HRQoL of diabetic patients decreases with age and with the duration of diabetes ( $P < 0.05$ ) [24]. The influence of age on quality of life may be due to a direct effect of aging and indirectly by the effect of aging on the dimensions that influence HRQoL [28]. On the other hand, O'Reilly have shown that quality of life scores increase with age, [29] which could be due to different economic and social conditions in many societies, [24] while other studies have found that more the duration of diabetes greater, more the HRQoL decreases [30].

In the present study, we observed that a lower HRQoL was related to widowed or divorced patients compared to married or single people with a higher HRQoL. We also found a significant correlation [24] between marital status and quality of life ( $P = 0.0001$ ). Indeed, intimate attachment to other human beings is the pivot around which a person's life revolves, from birth to old age. Thus, the fact of being married helps draw strength and joy of life of the other, while the divorce reports a sharp drop in life satisfaction and well-being. [31] Our results are consistent with other authors reported that those separated/divorced/widowed were more likely to have lower HRQoL than others [32] [33]. This suggests that marital status could be a good predictor of health.

In this study, diabetics with a professional activity had a better HRQoL ( $0.63 \pm 0.32$ ) compared to diabetics who did not ( $0.51 \pm 0.34$ ) ( $P = 0.011$ ). Our result is consistent with that [31] of some authors [34] [35] [36]. This could be explained by having a job and a medium to high income can give a life satisfaction, because the subjects are more likely to access health services [37]. This was already demonstrated by Saleh who observed that income plays an important role in HRQoL [38].

In addition, higher-educated diabetics were more likely to have a good HRQoL compared to those with lower levels of education. Patients with a good level of education have positive self-esteem, better knowledge and a better understanding of the disease, its treatment and its complications [39]. Similar re-

sults were observed by several authors [40].

Our results also suggest that the average quality of life score for diabetics engaged in physical activity is significantly higher ( $P = 0.0001$ ) than that of non-practicing people. A similar result was observed by Cardoso and his collaborators who noted that people engaged in physical activity have a higher score in EQ-5D and EQ-VAS and therefore, a better HRQoL [23].

In our study, we not only observed a relationship of complications of diabetes with a deterioration in quality of life, but also that high levels of HbA1c are associated with a decrease in the QOL score. This result perfectly matches those of Abdeni who showed that patients with an HbA1c level below 7 had a higher HRQoL score than those with a level above 7 [24]. Furthermore, the results of Solli show that people suffering from complications related to diabetes had a negative impact on their HRQoL [41]. Given the direct correlation between the complications of diabetes and good glycemic control [41] and the fact that the HbA1c level is indicative of glycemic status in the past 3 months, patients with low HbA1c levels should have a better HRQoL and fewer complications [42].

## 5. Conclusion

The results of this study emphasize the impact of diabetes on quality of life. It also appears that advanced age, female sex, low level of education, marital status (widowed or divorced), the presence of complications, were significantly associated with a decrease in the level of HRQoL and VAS scale. Therefore, improving the HRQoL of diabetics requires appropriate care, as well as an improvement in the socio-economic level and the level of education of the patients.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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