

# Diabetes Mellitus and Epilepsy: A Comparative Quality of Life Study

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## Abstract

**Background:** Diabetes mellitus and epilepsy are two of the most frequent, chronic diseases affecting many millions of people around the world. Both diseases can cause long-term and acute complications that adversely affect the sufferers' lives. **Objective:** The purpose was to compare the quality of life (QoL) of patients suffering from diabetes or epilepsy in relation to the general population in Greece. **Methodology:** A matched-control prospective design was used with a sample consisting of three sub-groups (i.e., 30 patients with diabetes, 30 with epilepsy, and 30 healthy volunteers) matched for age, gender, and socioeconomic status. Data were collected through SF-36. Statistical analysis was performed using the SPSS v.21 and both descriptive and inferential statistics were employed. The  $\chi^2$ , the Mann-Whitney, and the Kruskal-Wallis test were employed for group comparisons at a significance level of  $<0.05$ . **Results:** The sample's mean age was 52 years, range 48–65, and the majority was women (i.e., 60). There were no statistically significant differences among the three subcategories for an educational level or income level for the three sub-groups ( $P < 0.05$ ). The mean SF-36 scores per domain for each group are as follows: Diabetes: Mean: 48.46, SD =15.83, Median: 50.2, Mode: 70.6. For Epilepsy Mean: 52.92, SD =17.37, Median: 52.7, Mode: 81.6 and Healthy volunteers Mean: 70.47, SD =14.97, Median: 69, Mode: 86.6. Thus, the general population has a higher mean, that is, 70.47 compared to diabetics 48.46 and epileptics 52.92. All comparisons were statistically significant ( $P < 0.05$ ) except for the Pain, Health Vitality, and Mental Health domains ( $P > 0.05$ ). **Discussion:** The findings highlight the impact of both diabetes and epilepsy on the QoL in Greece. Patients with DM may feel challenged by their disease and the tiring daily management of their medication and lifestyle changes. Similarly, patients with epilepsy are facing daily anxiety and practical difficulties related to their diagnosis. Both patient groups carry the constant stress of not knowing of when their condition will manifest itself with either a seizure or a hypo/hyperglycemic reaction. **Conclusions:** Results have shown that the general population has a better QoL than diabetic and epileptic patients. Of course, we should bear in mind that the difference in results between the three categories of the sample is minimal; thus, there is no difference in the QoL of diabetics and epileptics in the general population.

**Keywords:** Diabetes Mellitus, Epilepsy, Quality of Life, SF-36

## 1. Introduction

In recent years, there has been an increased interest among policymakers, administrators, clinicians, and social scientists in quality of life (QoL) issues and in developing methodologies aiming at assessing it. The impact of QoL has been studied by researchers

from different disciplines, thus making it difficult to formulate a globally accepted definition. For example, clinicians are mainly considering its physical dimensions, whereas psychologists are focusing on the psychological and emotional dimensions<sup>1</sup>. Thus, our QoL is a multi-dimensional, diverse and subjective concept, for which many definitions have been given

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from time to time, depending on the angle of thinking for each scholar<sup>2</sup>.

Furthermore, some authors emphasize the individual's subjective view of QoL and livelihood. Thus, consequently, they define QoL as the sum of an individual's internal processes, namely different manifestations of the individual's physical, mental, and social well-being<sup>3</sup>. Yet, others interpret QoL as the possibility of allocating resources to meet social needs in conjunction with social and environmental conditions. In other words, they talk about existence and accessibility to the conditions necessary to ensure happiness in a given local community or wider society. Finally, according to the International Council of the French Language, QoL is defined as the physical and psychological condition of the person who achieves a sense of internal satisfaction within a specific environment<sup>4</sup>.

Yet, to date, QoL is defined as the physical, mental, and social well-being of an individual, as well as his/her ability to respond to the day-to-day challenges of life. However, more recently, it has been suggested that the concept of QoL should be even broader and even include the general well-being of people living in proximity in any given community<sup>5</sup>.

Recent efforts to advance health outcome research and health technology assessment have driven the tremendous increase in the use of QoL evaluation as a useful tool for clinical research. There is now increasing global awareness of the importance of assessing QoL and of health service performance along with its cost effectiveness<sup>6,7</sup>.

Overall, QoL is considered to be the result of the interaction of many factors such as health, access to amenities, physical environment, and economic circumstances, which can profoundly affect the development and attitudes of individuals and societies<sup>8</sup>. For many, health status is an essential prerequisite concerning QoL as health and QoL are considered as two interrelated concepts. This results in the Health-related QoL concept, a term which recognizes the effect of a disease on the physical, psychological, and social dimension of a person's life and its effect on the extent to which a person can feel satisfaction with life<sup>9,10</sup>. Many studies have shown that there is no direct relationship between the symptoms or dysfunctions a disease can cause and a direct reduction in a person's QoL. These findings have led to further studies of the mechanisms behind the impact of a disease on QoL. Various models have been

proposed, some of which focus on psychological factors and some on societal and cultural factors. Along these lines, the Social Production Function Theory, which treats humans as a biopsychosocial being, studies the effects on all dimensions of life in a holistic manner<sup>11</sup>.

## 1.1. Diabetes mellitus (DM)

DM is a complex set of disorders, which have a common characteristic in disturbances of metabolism and the malfunction of glucose use, caused primarily by a dysfunction of pancreatic beta cells, that is, in the islets of Langerhans, which secrete insulin. DM is characterized by a disruption of mainly carbohydrate and subsequently fat and albumin, which are the main nutrients from which the body draws energy and is characterized by increased blood sugar levels<sup>12</sup>.

DM is now recognized as a pandemic and is one of the most concerning chronic diseases globally. At present, it is estimated that some 366 million adults aged 20 and over are suffering from type II diabetes, that is, 8.3% of the world's population, and this figure is projected to reach 552 million in 2030<sup>13,14</sup>. Regions with the greatest relative prevalence are North America, where 10% of the population is diabetic; the Middle East and North Africa follow with 9.3%; India with 73 million is a DM "dense" country, followed by China with 116 million. The increased prevalence is mainly due to rising obesity, reduced physical activity, and consumption of highly processed foods<sup>15</sup>. The prevalence of people with type I DM is 490,000 worldwide, with the largest density in Europe. At present, type I DM is estimated to affect 480,000 children worldwide up to the age of 15, of whom 24% come from Southeast Asia and 23% from Europe<sup>16</sup>.

The incidence of DM in Greece is 7–8% of the total population, with approximately 95% having type II. There has been a continuous increase in the incidence of DM in Greece over time (2.4% in 1974, 3.1% in 1990, and 7–8% today).

DM is the world's fourth major cause of death. Although life expectancy has increased, chronic complications remain the main cause of diabetic morbidity and mortality. Many studies have demonstrated that DM affects the physical, social, and psychological dimensions of QoL<sup>17</sup>. The emergence of complications reduces life expectancy by 10–30%, as well as the overall QoL<sup>18</sup>.

Type I diabetes affects young people and they have to deal with it for life. It is therefore expected to have an

impact on social activities, work, psychology, and social relations<sup>19</sup>. The most important factors that affect the QoL of type I diabetes are depression and anxiety due to the timeliness and complications of the disease, as well as the self-regulation of DM<sup>20</sup>. Type II diabetics have a worse QoL than type I diabetics, as well as worse physical function, less energy, more emotional problems, and more anxiety<sup>21</sup>.

## 1.2. Epilepsy

The term epilepsy is used to define a group of brain diseases with heterogeneous etiology in patients who have experienced at least two seizures without having found any apparent cause. However, a single seizure does not mean that the patient suffers from epilepsy<sup>22</sup>. Epilepsy is said to be a “hidden weakness” because between seizures, patients appear normal and often avoid talking about it. Seizures affect both men and women and can start at any age, although they more rapidly present during childhood and adolescence. Nevertheless, up to 5% of the world's population may experience a single seizure in a lifetime<sup>23</sup>.

A seizure is a short-term brain disorder caused by increased landings of cortical and subcortical neurons with subsequent various disorders depending on the location, intensity, and extent of pathological landings. In addition to consciousness disorder and muscle contractions, other changes may also occur, such as in thinking, behavior, memory, emotion, and feeling<sup>24</sup>.

Pedagogical, psychological, and social care of the patient with a seizure is a key element of the therapeutic relationship. The unpredictable nature of the crisis, the need for prolonged treatment, and the absence of a direct and objective experience of the disease give rise to a strong sense of fragility and destabilization. Some patients consider themselves to be intolerably disabled by minimally active epilepsy. Other patients may suffer from uncontrolled epilepsy and be in denial of the disease, often being placed in situations that are potentially dangerous for themselves and others.

The patient, assisted by the doctor and the nurse, must constantly adapt his/her approach to the disorder and to others in a society which is generally less lenient toward it. In addition to the frequency of seizures and possible adverse reactions of treatment, objective and subjective attitudes of the patient toward daily life are the most robust criteria for assessing the QoL of patients. There are

various scales of self-assessment for assessing the level of QoL of patients with epilepsy<sup>25</sup>.

One of the most popular tools in QoL studies is the Social Functioning-36 (SF-36). The SF-36 contains 36 questions to measure functional health and well-being from the patient's point of view. It is a practical, reliable, and valid measure of physical and mental health that can be completed in 5–10 min. Moreover, the SF-36 is a generic research tool as it be used across age (>18), disease, and treatment group, as opposed to a disease-specific health survey, which focuses on a particular condition or disease. It is meaningful to patients, clinicians, researchers, and administrators across the health care spectrum, including measuring health improvement or decline; predicting medical expenses; assessing treatment effectiveness; and comparing disease burden across populations<sup>26</sup>.

## 1.3. Aim

The purpose of this study is to compare the QoL of patients suffering from type 2 DM or epilepsy in relation to the general population in Greece.

## 2. Materials and Methods

A matched-control prospective study design was chosen as the most appropriate methodology. The target population was adults suffering from DM or epilepsy but not suffering from any other chronic disease. The sample consisted only of Greeks whose condition had been diagnosed for 2 years or more. The sample consisted of three sub-groups (i.e., 30 patients with DM, 30 patients with epilepsy, and 30 healthy volunteers) matched for age, gender, and socioeconomic status. Thus, out of the total sample of 90 participants, 60 were patients, randomly selected from the records of two outpatient clinics of a major city hospital until all three groups were matched.

The DM group included patients with type II diabetes (but not women with gestational diabetes because the sub-sample of epileptics could not be matched accordingly). All sub-types of epilepsy were included in the epilepsy group.

Data collection was performed using the SF-36 through face-to-face personal interviews. The average time taken to complete the questionnaire was approximately 10 min and data were collected between April to September 2019. The SF-36 was chosen because it provides a general

overview of a patient's QoL, that is, biological, mental, and social. The SF-36 has been widely used internationally, and this study used a validated version for use in Greece whereby a multitrait scaling analysis confirmed the hypothesized scale structure of the (Greek version) of the SF-36 and Cronbach's alpha coefficient met the criterion ( $>0.70$ ) for group analysis in all eight sub-scales<sup>27</sup>.

The aim of the study, methods, and procedures was explained to participants and written informed consent was secured. Patient anonymity and data confidentiality were secured throughout the whole process.

Statistical analysis of the data was performed using the SPSS v.21 and both descriptive (mean, standard deviation, and range) and inferential statistics were employed. The  $\chi^2$  was used for comparing the three groups in terms of their demographic characteristics. Furthermore, the Kruskal–Wallis test was used to compare mean scores for the SF-36's domains for the three matched groups as data did not follow a typical Gaussian Population distribution and the Mann–Whitney test was used for comparisons between the three groups overall mean scores. The significance  $\alpha$  level was set on 0.05 or below for all tests employed.

### 3. Results

Of the 90 participants in the survey, their mean age was 52 years, range 48–65. The descriptive statistics for each group's demographic characteristics are presented in Table 1. The majority were women (i.e., 60), while 30 were men. In terms of gender distribution among the subgroups, there were 20 women in each subgroup (i.e., DM, epilepsy, and healthy volunteers). The educational level of participants showed 11 secondary education graduates, 16 tertiary education graduates, and 3 with a postgraduate qualification for the DM, and 9, 17, 4 for epilepsy, and 13, 13, 4 for the healthy volunteers, respectively. There were no statistically significant differences among the three subcategories for educational level for the three subgroups ( $P < 0.05$ ).

Income-wise, the total sample was divided in four categories for matching purposes, that is,  $<5000$  Euros annually, 5001–15,000, 15,001–30,000, and  $>30,001$ . Thus, there were 5, 9, 13, and 3 subjects in the DM group, 7, 7, 12, and 4 for epilepsy, and 4, 7, 15, and 4 for the healthy volunteers, respectively, while there were no statistically significant differences among the four subcategories ( $P < 0.001$ ).

The mean SF-36 scores per domain for each group are as follows (Table 2): DM: Mean: 48.46, SD =15.83, Median: 50.2, Mode: 70.6. For Epilepsy Mean: 52.92, SD =17.37, Median: 52.7, Mode: 81.6 and Healthy volunteers Mean: 70.47, SD =14.97, Median: 69, Mode: 86.6. Thus, the general population has a higher mean, that is, 70.47 compared to diabetics 48.46 and epileptics 52.92. All comparisons were statistically significant ( $P < 0.05$ ) except for the Pain, Health Vitality, and Mental Health domains ( $P > 0.05$ ).

Moreover, comparisons were between the overall mean scores between the three groups, that is, G1= DM, G2=Epileptics, and G3=Healthy Volunteers. Mann–Whitney test was performed for the three pairs (Table 3) and analysis showed that results were statistically significant for DM versus Epileptics and Healthy Volunteers versus DM only ( $P < 0.05$ ).

### 4. Discussion

The findings show that in this sample the performance of the SF-36 scales was satisfactory and proved to be a useful tool for recording and monitoring QoL in patients and public alike.

In our study, the majority of participants in all three categories were women. There was no statistical difference in the sample characteristics (gender, age, education, and socioeconomic status) because the survey was conducted with a matched-control design, as mentioned previously. In this sample, the average income was 15,001–30,000 Euros. This is in line with national statistics in Greece, whereby the average household net adjusted disposable income per capita is USD 17,700 a year. In terms of education, 36.6% of the sample has completed upper secondary education, while our sample had 63.4% of participants with tertiary (or post) education. Thus, our sample is close to the national average in terms of its general characteristics.

The results of this study highlight the impact of both DM and epilepsy on the QoL of patients in Greece. When the QoL of DM or epileptic patients was compared with healthy persons, as perhaps expected, both patient groups reported a significantly lower QoL in total and across all subscales. These results are consistent with many previous international studies<sup>28,29</sup>. As the findings of this study showed, the total mean score of SF-36 in epileptic patients was 52.92 and that of DM patients 48.46 as

**Table 1. Sample demographic characteristics**

Gender	DM n=30				Epilepsy n=30				Healthy volunteers n=30				
	Men		Women		Men		Women		Men		Women		
	10	20	10	20	10	20	10	20	10	20			
Mean age	55				50				51				* <sup>3</sup> P<0.05
Educational level* <sup>1</sup>	a	b	c	a	b	c	a	b	c	a	b	c	* <sup>4</sup> P<0.05
	11	16	3	9	17	4	13	13	4				
Income* <sup>2</sup>	i	ii	iii	iv	i	ii	iii	iv	i	ii	iii	iv	* <sup>4</sup> P<0.05
	5	9	13	3	7	7	12	4	4	7	15	4	

\*<sup>1</sup>a= secondary education, b= tertiary education, c= postgraduate qualification. \*<sup>2</sup>i=<5000, ii=5001–15,000, iii=15,001–30,001, iv=>30,000. \*<sup>3</sup>=Kruskal–Wallis test. \*<sup>4</sup>=Chi-square test

**Table 2. Mean SF-36 scores per domain**

Domain	DM* <sup>1</sup>	Epilepsy* <sup>1</sup>	Healthy volunteers* <sup>1</sup>	Norm* <sup>2</sup>	SD	P
Physical functioning	70.6 (23.1)	81.6 (19.2)	86.6 (26.1)	80.76	25.62	<0.05
Role physical	36.4 (39.1)	42.3 (28.8)	55.9 (31.8)	79.74	37.72	<0.05
Pain	51.3 (25.8)	62.2 (32.7)	69.4 (29.9)	72.98	31.66	0.09
General health	49.6 (28.4)	55.3 (22.6)	65.3 (19.9)	67.46	23.54	<0.05
Health vitality	48.3 (29.5)	50.1 (18.8)	62.3 (31.2)	66.53	22.39	0.21
Social functioning	62.4 (18.3)	61.3 (26.7)	78.2 (27.2)	82.05	28.12	<0.05
Role emotional	18.3 (31.6)	21.4 (33.8)	77.5 (29.9)	81.53	36.31	<0.05
Mental health	50.8 (19.8)	49.2 (26.4)	68.6 (17.8)	68.23	21.26	>0.15
Overall mean score	48.46 (24.2)	52.92 (24.7)	70.47 (23.4)	74.91	25.12	<0.05

\*<sup>1</sup>M\*<sup>1</sup>mean score and standard deviation. \*<sup>2</sup>Mean score and standard deviation. \*<sup>2</sup>Kruskal–Wallis test

**Table 3. Group comparisons for overall mean scores**

Group comparisons	P* <sup>1</sup>
DM versus Epileptics	<0.05
Epileptics versus Healthy Volunteers	0.09
Healthy Volunteers versus DM	<0.05

\*<sup>1</sup>=Mann–Whitney test

compared to 70.47 for healthy individuals. This indicates a relatively moderate to low QoL in both patient groups. Yet, as the total mean score of SF-36 in healthy persons was a moderate to high QoL (70.47) which is fairly representative of the general health status of a population and the Greek norm (74.91). These findings are in line with other similar studies<sup>30–32</sup>.

Patients with DM may feel challenged by their disease and the tiring daily management of their medication and

lifestyle changes. Similarly, patients with epilepsy are facing daily anxiety and practical difficulties related to their diagnosis. Both patient groups carry the constant stress of not knowing of when their condition will manifest itself with either a seizure or a hypo/hyperglycemic reaction. QoL for these patients will be substantially affected by taking antiepileptic medications or insulin. Furthermore, the psychosocial toll of living with DM or epilepsy can be a heavy one, and in turn, affect self-care behavior and, ultimately, long-term disease control, the risk of developing long-term complications, and ultimately QoL.

However, the epilepsy group reported better health perceptions compared to the DM patients and this finding is in line with earlier studies which also reported that epileptics with continued seizures with altered consciousness are worse off in terms of emotional well-being and overall QoL than all other chronic patients, such as depressive patients but not those with DM<sup>33,34</sup>. However, it should be noted that both epileptics and diabetics may experience phases of depressive symptomatology and therefore are in need of extra protection from falling into clinical depression.

There is now good evidence that psychosocial issues are critical to good diabetes or epilepsy care<sup>35,36</sup>. Moreover, psychosocial factors often determine self-care behavior, and patient's psychiatric status and social adaptive functioning are often stronger predictors of medical outcomes such as repeated hospitalization and increased risk of mortality than are physiologic and metabolic measures per se<sup>37</sup>.

## 5. Conclusions

DM and epilepsy are two physiologically different chronic conditions affecting the QoL of patients. In recent years, more research has been carried out into these conditions, as well as into the QoL. Yet, comparisons with healthy subjects are scarce and clinicians should remember that their patients have families and friends who are otherwise healthy; thus, comparisons may be part of a patient's routine, especially as both patient groups are facing daily lifestyle restrictions not found in their social surroundings.

The goals of monitoring psychosocial well-being and QoL in those with a chronic condition such as DM or epilepsy include identification of patients who are depressed or anxious; evaluating new treatments

by identifying psychological costs and benefits; and identifying dissatisfaction with treatment and other aspects of care. An additional aspect is to consider how a patient views the control of their condition, the care they receive and how they compare themselves to those around them. Ridding a sense of frustration, despair, or even anger is a vital step to improving QoL.

In conclusion, therefore, based on the data in this study, the general population has a better QoL than diabetic and epileptic patients. Of course, we should bear in mind that the difference in results between the three categories of the sample is minimal. In other words, there is no difference in the QoL of diabetics and epileptics in the general population.

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