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Research Article

Anxiety, Depression, and Health-Related Quality of Life in Family Caregivers of Patients with Epilepsy

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Abstract

Epilepsy is a chronic neurological disorder that imposes substantial physical, psychological, and social burdens not only on patients but also on their family caregivers. Although psychiatric comorbidities and impaired quality of life have been extensively investigated in patients with epilepsy, the psychological well-being and health-related quality of life of their caregivers remain insufficiently studied. This study aimed to evaluate anxiety, depression, and health-related quality of life among family caregivers of patients with epilepsy and to identify patient-related factors associated with these outcomes. The study included three groups: patients with epilepsy, their caregivers, and healthy controls. Differences in scale scores between two groups were analyzed using the independent-samples *t*-test, whereas comparisons among three or more groups were performed using one-way analysis of variance (ANOVA). Associations between categorical variables were evaluated using Pearson's chi-square test or the likelihood ratio test, depending on the distribution of the data. Pearson's correlation coefficient was calculated for continuous variables. A *p*-value of <0.05 was considered statistically significant. Caregivers of patients with epilepsy had significantly higher anxiety and depression scores than healthy controls. These findings indicate an increased prevalence of anxiety and depressive symptoms among caregivers. Furthermore, evaluation of quality of life using the Short Form-36 (SF-36) questionnaire demonstrated significant impairment across all quality-of-life domains in the caregiver group. The findings suggest that being a caregiver of a patient with epilepsy is, by itself, an important factor adversely affecting emotional well-being and quality of life. Changes in caregivers' mood status and quality of life were not associated with the patients' sex, seizure type, or seizure frequency.

Keywords

Epilepsy, Caregiver, Anxiety, Depression, Health Related Quality of Life

1. Introduction

Epilepsy is one of the most common chronic neurological disorders encountered in neurological practice. It is a neurological syndrome characterized by recurrent seizures and generally requires long-term treatment [1]. The prevalence of epilepsy has been reported to be approximately 6 per 1,000 population in developed countries and 19 per 1,000 population in developing countries [1].

In addition to the various motor manifestations associated with epileptic seizures, patients may also experience a wide range of non-motor symptoms. Among these, psychiatric manifestations, including mood disturbances, represent a significant component of the disease burden [2]. Psychiatric

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symptoms are known to occur more frequently in patients with epilepsy than in the general population [3]. However, psychiatric disorders in individuals with epilepsy are frequently underrecognized and, consequently, remain untreated [4, 5].

Mood disorders, particularly anxiety and depression, are among the most commonly encountered psychiatric comorbidities in patients with epilepsy [6, 7]. As a chronic neurological disorder, epilepsy may lead to varying degrees of disability depending on seizure frequency, severity, and clinical manifestations, thereby increasing patients' need for physical and emotional support [8]. This support is primarily provided by family members or caregivers and may impose a substantial physical and psychological burden on them. It has been suggested that this caregiving burden may adversely affect the emotional well-being of first-degree relatives, particularly those who maintain close daily contact with the patient or are directly involved in providing care [9].

Based on these considerations, the present study aimed to determine whether first-degree caregivers who provide physical and psychological support to patients with epilepsy experience alterations in mood status. In addition, we sought to investigate whether these mood changes are associated with impaired quality of life among caregivers.

1.1. Definition of epilepsy

Epilepsy is defined as the occurrence of at least two unprovoked epileptic seizures separated by an interval of at least 24 hours, or a single unprovoked seizure when the probability of subsequent seizures is considered sufficiently high to justify the diagnosis of epilepsy [10].

Epileptic seizures may manifest as motor, sensory, autonomic, cognitive, or affective symptoms, either individually or in various combinations. Impairment of consciousness may also accompany these clinical manifestations. Accordingly, epilepsy is recognized as a chronic paroxysmal neurological disorder characterized by recurrent episodes of abnormal neuronal activity [11].

1.2. Historical Perspective

Throughout history, epilepsy has been referred to by various names in different languages, many of which were derived from the dramatic clinical manifestations of the disease. The term *epilepsy* originates from the Greek words *epi* and *lambanein* (historically rendered as *lipsis* in some sources), meaning "to seize" or "to take hold." Likewise, the Turkish term *sara* derives from a word meaning "to strike down" [12, 13].

Because epileptic seizures are often accompanied by transient loss of consciousness, epilepsy was historically regarded as a sacred or supernatural condition. Hippocrates was the first to propose that epilepsy was a natural disease rather than a divine phenomenon, emphasizing that it should be considered like any other medical disorder. In the nineteenth century, the English neurologist John Hughlings Jackson introduced the concept that most closely resembles the modern definition of epilepsy, describing seizures as the result of occasional, excessive, and disorderly discharges of nervous tissue [14]. Continuous advances in neuroscience and neurophysiology have progressively improved our understanding of the pathophysiology of epilepsy, leading to the contemporary concepts of the disorder.

1.3. Epidemiology

Although epilepsy occurs most commonly during the first year of life, its incidence demonstrates a bimodal age distribution, with peaks in individuals younger than 20 years and those older than 55 years. The annual incidence is estimated to be approximately 50 per 100,000 population in developed countries and nearly twice as high in developing countries [15].

The prevalence of epilepsy has been reported to be approximately 6 per 1,000 population in developed countries and 19 per 1,000 population in developing countries [16]. This disparity has largely been attributed to poorer healthcare conditions, a higher frequency of birth-related complications, and the increased prevalence of central nervous system infections in developing regions.

Epilepsy is slightly more prevalent in men than in women. Individuals with a positive family history of epilepsy have a higher risk of developing the disorder than the general population. The magnitude of this risk is also influenced by the specific epilepsy syndrome involved. The hereditary risk is greater in idiopathic epilepsies than in symptomatic epilepsies. Unsurprisingly, the likelihood of epilepsy is substantially increased in children when both parents are affected by the disorder [17, 18].

With regard to seizure types, focal (partial) seizures are the most frequently encountered, followed by generalized tonic-clonic seizures, absence seizures, and myoclonic seizures in decreasing order of frequency [17].

1.4. Etiology and Classification

From an etiological perspective, epilepsy has traditionally been classified into primary (idiopathic) and secondary (symptomatic) epileptic syndromes [19]. However, advances in molecular genetics have considerably improved our understanding of the disease, and the term *idiopathic epilepsy* has gradually been replaced by *genetic epilepsy*. In this context, an increasing number of ion channel abnormalities and pathogenic gene mutations associated with epilepsy continue to be identified [59].

The etiology of symptomatic epilepsy is diverse and includes perinatal brain injury, intellectual disability, cerebral palsy, traumatic brain injury, central nervous system infections, cerebrovascular diseases, brain tumors, Alzheimer's disease, substance abuse, and drug intoxication [60].

The internationally accepted classification of epilepsy is

based on the system developed and periodically revised by the International League Against Epilepsy (ILAE). Epileptic syndromes may be categorized according to seizure type or the age at which they most commonly occur.

1.5. Epileptogenesis

During an epileptic seizure, neurons are known to generate repetitive abnormal electrical discharges in either a synchronous or asynchronous manner. The electrophysiological mechanisms underlying these abnormal discharges remain an active area of research, and several hypotheses have been proposed to explain the process of epileptogenesis [61].

Structural or functional abnormalities in the γ-aminobutyric acid (GABA) neurotransmitter system, the principal inhibitory neurotransmitter pathway of the central nervous system, may contribute to neuronal hyperexcitability. Likewise, enhanced glutamatergic neurotransmission may promote epileptogenesis through intracellular calcium accumulation and excitotoxic neuronal injury. Genetic defects affecting ion channels or neurotransmitter-related proteins may also result in neuronal hyperexcitability and prolonged depolarizing responses. Furthermore, morphological alterations involving neuronal axons and dendrites have highlighted the potential roles of growth factors and modulatory hormones in the development of epilepsy [61].

From a physiological perspective, an epileptic seizure can be defined as the sudden disruption of neurological function resulting from paroxysmal high-frequency or synchronized low-frequency, high-amplitude electrical discharges within the central nervous system. These abnormal electrical discharges originate from hyperexcitable cortical regions and may subsequently propagate to subcortical structures [20].

Three fundamental conditions are considered necessary for seizure generation. First, a population of pathologically hyperexcitable neurons must be present. Second, increased excitatory neurotransmission together with recurrent neuronal pathways facilitates the propagation of abnormal electrical discharges. Finally, reduced inhibitory GABAergic activity further promotes seizure initiation and propagation [20]. Electrophysiological studies of epileptic foci have consistently demonstrated that neurons within these regions exhibit increased excitability.

Although several hypotheses have been proposed to explain the mechanisms underlying epilepsy, two major concepts have received the greatest attention: chronic partial depolarization of neurons and increased permeability of neuronal membranes to ions. This increased membrane permeability may contribute to enhanced seizure susceptibility under various metabolic conditions, including hyperthermia, hypoxia, hypoglycemia, hypocalcemia, and hyponatremia. Similarly, repetitive stimuli such as photic stimulation and periods of sleep characterized by neuronal hypersynchronization are known to facilitate seizure activity [61].

When the pathological electrical discharge originating from a cortical focus overcomes the surrounding inhibitory mechanisms, it propagates through corticocortical, corticobasal, and interhemispheric pathways, ultimately resulting in generalized seizure activity. Involvement of subcortical structures and the brainstem leads to impaired consciousness, increased muscle tone, and transient respiratory arrest. Autonomic manifestations, including hypertension, tachycardia, hypersalivation, and mydriasis, reflect activation of the autonomic nervous system, whereas generalized tonic muscle contractions indicate widespread cortical involvement.

Shortly after the propagation of excitatory activity, diencephalic inhibitory mechanisms become activated. These inhibitory processes intermittently interrupt the epileptic discharge, thereby terminating the tonic phase and facilitating the onset of the clonic phase. On electroencephalography (EEG), this transition is characterized by the evolution of multiple spike discharges into spike-and-wave complexes. The frequency and intensity of clonic contractions gradually diminish as neurons within the epileptic focus become functionally exhausted.

Transient regional cerebral edema detected on magnetic resonance imaging (MRI) is considered to reflect a temporary increase in blood-brain barrier permeability. When these pathophysiological processes are particularly severe, postictal neurological deficits, including Todd's paralysis, aphasia, stupor, and hemianopia, may occur [61].

1.6. Psychiatric Manifestations of Epilepsy

A huge number of patients with epilepsy have been evaluated for psychiatric symptoms in many neurology clinics [48-50]. In many research articles. Numerous studies have demonstrated that psychiatric comorbidities are considerably more common among patients with epilepsy than in the general population, with reported prevalence rates ranging from 29% to 70% [51-54]. A study conducted in Turkey in 2009 reported that anxiety disorders were the most prevalent psychiatric comorbidity among patients with temporal lobe epilepsy, whereas mood disorders were most frequently observed in patients with juvenile myoclonic epilepsy. The prevalence of psychiatric disorders in both patient groups was significantly higher than that observed in healthy controls [55].

In a longitudinal study, patients with epilepsy were followed over an extended period and were found to have a fourfold higher risk of developing psychiatric disorders compared with the general population [56].

Manchanda et al. reported that approximately 45% of patients with drug-resistant epilepsy had at least one psychiatric disorder [57].

Psychiatric disorders are particularly common among patients with epilepsy, especially those with focal epilepsy, compared with the general population [3, 21, 22]. In addition to mood disorders such as depression and anxiety, personality changes have also been reported among the psychiatric manifestations associated with epilepsy [21-24]. In severe cases, psychiatric disturbances may progress to suicidal behavior [25].

According to the timing of symptom onset, psychiatric manifestations in epilepsy can be broadly classified into two categories: peri-ictal and interictal psychiatric symptoms [26].

Peri-ictal psychiatric manifestations include irritability, confusion, and paranoid symptoms, all of which are closely related to the location of the epileptic focus and the brain regions involved in seizure propagation [26].

Similar to patients with other chronic medical conditions, individuals with epilepsy frequently experience interictal psychiatric disorders, including anxiety and phobic disorders, minor and major depression, obsessive-compulsive disorder, and bipolar disorder [27].

In an attempt to explain the underlying psychopathology, a study investigating the psychosocial impact of epilepsy suggested that the unpredictable nature of seizures, patients' inability to control their occurrence, feelings of embarrassment, and perceived social stigma are major contributing factors to psychological distress [28].

Several factors have been identified as contributing to these psychological consequences, including clinical characteristics such as disease duration, disease severity, and seizure type; psychosocial factors including educational level, socioeconomic status, and fear of seizures; as well as biological factors, particularly the localization of the epileptogenic focus [21].

Personality disorders are also more prevalent among patients with epilepsy than in the general population [24]. The most frequently reported personality disorders include antisocial personality disorder, avoidant personality disorder, obsessive-compulsive personality disorder, schizoid personality disorder, and dissocial personality disorder [21, 29].

Patients with epilepsy may also exhibit a characteristic behavioral profile historically referred to as the epileptic personality syndrome [23]. This syndrome has traditionally been described as being characterized by quarrelsome behavior, a viscous interpersonal style marked by excessive interpersonal attachment and circumstantiality, and an egocentric personality structure [30].

In a study, patients with epilepsy were reported to exhibit hypoactivity, hyposexuality, and increased emotionality [31].

Antiseizure medications (ASMs) may also have a substantial impact on patients' neuropsychiatric status. Behavioral disturbances and affective disorders are among the most commonly reported psychiatric adverse effects, whereas psychotic symptoms occur less frequently [32]. The risk of these adverse effects increases with greater disease severity, high drug doses, rapid dose titration, and polytherapy. The reported effects of commonly prescribed antiseizure medications on mood are summarized in Table 1 [33].

Table 1. *Reported Psychotropic Effects of Commonly Used Antiseizure Medications.*

Antiseizure Medication	Depression	Mania	Bipolar Disorder	Anxiety
Carbamazepine	0	+	+	0
Oxcarbazepine	0	+	0	0
Valproate	0	+	+	0
Lamotrigine	0	0	+	0
Gabapentin	0	–	–	±
Topiramate	0	–	0	0
Tiagabine	0	–	0	0
Levetiracetam	0	0	0	–
Pregabalin	–	–	–	+
Zonisamide	–	–	–	–

Abbreviations: ASM, antiseizure medication.
Note: + = favorable psychotropic effect; – = unfavorable psychotropic effect; 0 = no significant psychotropic effect reported; ± = variable or inconsistent effect.

The substantial neuropsychiatric burden associated with epilepsy may extend beyond patients themselves and indirectly affect the psychological well-being of their caregivers. Providing long-term care for individuals with epilepsy may impose considerable physical and emotional burden on family members. In this regard, a study published in 2013 demonstrated significantly higher levels of perceived stress among caregivers of patients with epilepsy [35]. Furthermore, caregiver burden was reported to be positively associated with a greater number of antiseizure medications, lower quality-of-life scores in patients, and lower educational attainment among caregivers [34].

1.7. Quality of Life in Epilepsy

When caregivers of patients with epilepsy were asked which aspects of their lives were most affected by the disease, continuous stress and the financial burden associated with epilepsy were identified as the primary factors negatively influencing their emotional well-being and overall psychological status [36].

Despite the growing body of evidence regarding the psychosocial consequences of epilepsy, the available literature suggests that relatively few studies have specifically investigated how these patient-related burdens are reflected in the psychological well-being and quality of life of caregivers.

According to the World Health Organization (WHO), quality of life is defined as an individual's perception of their position in life within the context of their culture, value systems, personal goals, expectations, standards, and concerns [37]. Perceived quality of life is influenced by numerous factors, including psychological well-being, degree of independence, personal beliefs, environmental conditions, and overall health status. In patients with epilepsy, additional disease-specific factors such as seizure type, seizure frequency, the unpredictability of seizures, adverse effects of antiseizure medications, treatment adherence, and difficulties related to employment and occupational functioning have a substantial impact on quality of life [38].

Therefore, the assessment of quality of life has become an essential component of epilepsy management, providing valuable information regarding both disease burden and the functional limitations experienced by patients [39].

Although the determinants of quality of life vary across studies, the factors most consistently associated with poorer quality of life in patients with epilepsy include age, disease duration, seizure frequency, and depression [40-43].

2. Materials and Methods

The study population consisted of 34 patients with epilepsy, 34 first-degree caregivers, and 27 healthy volunteers serving as the control group.

Sociodemographic characteristics were recorded for all participants, including patients, caregivers, and healthy controls. In addition, detailed clinical information was collected from the patient group, including seizure frequency, disease duration, seizure type, current antiseizure medication use, family history of epilepsy, comorbid medical conditions, electroencephalography (EEG) findings, and, when available, magnetic resonance imaging (MRI) findings.

All three groups—patients with epilepsy, caregivers, and healthy controls—were evaluated through face-to-face interviews. The assessment protocol included the Hamilton Anxiety Rating Scale (HAM-A), the Hospital Anxiety and Depression Scale (HADS), and the Short Form-36 Health Survey (SF-36).

2.1. Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale (HADS) is a self-administered questionnaire developed to assess symptoms of anxiety and depression in non-psychiatric clinical settings. The scale consists of 14 items, with the odd-numbered items assessing anxiety (HADS-A) and the even-numbered items assessing depression (HADS-D). Participants were instructed to select the response that best reflected their current emotional state according to the instructions provided with the questionnaire.

Following completion of the scale, separate total scores were calculated for the anxiety and depression subscales. In the Turkish validation study, cut-off scores of ≥11 for HADS-A and ≥8 for HADS-D were found to indicate an increased risk of clinically significant anxiety and depression, respectively.

The validity and reliability of the Turkish version of the HADS were established by Aydemir et al. [44].

2.2. Hamilton Anxiety Rating Scale (HAM-A)

The Hamilton Anxiety Rating Scale (HAM-A) is a clinician-administered instrument designed to assess the severity of anxiety symptoms. The scale consists of 14 items, each rated on a 5-point Likert scale ranging from 0 (not present) to 4 (very severe). The total score is calculated by summing the scores of all items.

No validated cut-off value has been established for the Turkish version of the HAM-A. Therefore, the scale is primarily used as a comparative measure of anxiety severity rather than as a diagnostic instrument.

The validity and reliability of the Turkish version of the HAM-A were established by Yazıcı et al. in 1998 [45].

2.3. Short Form-36 Health Survey (SF-36)

The Short Form-36 Health Survey (SF-36) is a self-administered questionnaire designed to assess health-related quality of life. The instrument evaluates eight health domains: physical functioning, role limitations due to physical health, bodily pain, general health perception, vitality, social functioning, role limitations due to emotional problems, and mental health.

The validity and reliability of the Turkish version of the SF-36 were established by Kocyigit et al. in 1999 [46].

Item scores were transformed to a standardized scale ranging from 0 to 100, with higher scores indicating better perceived health status and quality of life. Individual items were scored according to the standardized scoring algorithm of the SF-36, and domain scores were subsequently calculated using the recommended scoring procedures.

Reference mean values and standard deviations for each SF-36 domain in the Turkish population have been validated and summarized in Table 2 [47].

Table 2. Normative Mean Scores of the SF-36 Domains in the Turkish Population.

SF-36 Domain	Women (Mean ± SD)	Men (Mean ± SD)
Physical Functioning (PF)	80.6 ± 21.7	87.2 ± 17.1
Role Limitations Due to Physical Health (RP)	82.9 ± 28.6	89.8 ± 19.3
Bodily Pain (BP)	81.0 ± 20.2	85.1 ± 16.4
General Health Perception (GH)	69.1 ± 16.9	73.6 ± 14.9
Vitality (VT)	63.4 ± 13.7	65.7 ± 11.9
Social Functioning (SF)	90.1 ± 12.9	91.7 ± 12.8
Role Limitations Due to Emotional Problems (RE)	89.0 ± 22.5	92.8 ± 15.1
Mental Health (MH)	70.1 ± 11.4	71.0 ± 10.6

Abbreviations: PF, Physical Functioning; RP, Role Limitations Due to Physical Health; BP, Bodily Pain; GH, General Health Perception; VT, Vitality; SF, Social Functioning; RE, Role Limitations Due to Emotional Problems; MH, Mental Health.

3. Results

The mean age of the patients included in the study was 30.47 ± 13.39 years (range, 18–72 years). The mean duration of epilepsy was 11.15 ± 7.72 years (range, 1–27 years).

Occupational status revealed that the majority of patients were unemployed or not actively engaged in the workforce. With respect to educational attainment, most participants had completed high school education or less.

The sociodemographic characteristics of the study groups, together with the duration of epilepsy in the patient group, are summarized in Table 3.

Table 3. Sociodemographic Characteristics of the Study Population.

Variable	Patients (n = 34)	Caregivers (n = 34)	Healthy Controls (n = 27)
Age (years), mean ± SD	30.47 ± 13.39	40.00 ± 11.94	35.44 ± 11.30
Sex, n (%)			
Male	17 (50.0)	20 (58.8)	22 (81.5)
Female	17 (50.0)	14 (41.2)	5 (18.5)
Occupation, n (%)			
Worker	3 (8.8)	7 (20.6)	14 (51.9)
Civil servant	3 (8.8)	0 (0.0)	4 (14.8)
Self-employed	4 (11.8)	4 (11.8)	1 (3.7)
Retired	2 (5.9)	2 (5.9)	3 (11.1)
Unemployed / Not working	22 (64.7)	21 (61.8)	5 (18.5)
Educational level, n (%)			
Literate only	3 (8.8)	5 (14.7)	0 (0.0)
Primary school	8 (23.5)	15 (44.1)	2 (7.4)
High school	17 (50.0)	12 (35.3)	2 (7.4)
University	6 (17.6)	2 (5.9)	23 (85.2)
Duration of epilepsy (years), mean ± SD (range)	11.15 ± 7.72 (1–27)	—	—

Data are presented as mean ± standard deviation (SD) or number (percentage), unless otherwise indicated.
The distribution of seizure types among patients with epilepsy is summarized in Table 4.

Table 4. Distribution of Seizure Types Among Patients with Epilepsy.

Seizure Type	n	%
Generalized tonic-clonic seizure	20	58.8
Absence seizure	5	14.7
Focal aware seizure*	1	2.9
Focal impaired awareness seizure*	6	17.6
Tonic seizure	1	2.9
Reflex epilepsy	1	2.9
Total	34	100.0

Data are presented as number (n) and percentage (%).
* Formerly referred to as simple partial and complex partial seizures, respectively, according to the revised ILAE seizure classification.

Magnetic resonance imaging (MRI) findings were available for a subset of the patients. Among those who underwent MRI, 65.0% (n = 13) had no detectable pathological abnormalities. In contrast, abnormalities on electroencephalography (EEG) were identified in 55.9% (n = 19) of the patients.

The results of the Hospital Anxiety and Depression Scale (HADS), Hamilton Anxiety Rating Scale (HAM-A), and Short Form-36 Health Survey (SF-36) are presented in the following tables.

Table 5. Descriptive Statistics of Anxiety, Depression, Hamilton Anxiety, and SF-36 Scores in Patients with Epilepsy.

Variable	n	Minimum	Maximum	Mean ± SD
HADS-A (Anxiety)	34	3	20	8.62 ± 3.48
HADS-D (Depression)	34	1	15	6.50 ± 3.89
HADS Total Score	34	5	31	15.12 ± 6.08
HAM-A Psychic Anxiety	34	1	17	7.12 ± 3.85
HAM-A Somatic Anxiety	34	2	23	9.15 ± 5.54
HAM-A Total Score	34	3	34	16.26 ± 8.37
SF-36 Physical Functioning	34	35	100	82.06 ± 15.48
SF-36 Role Limitations Due to Physical Health	34	0	100	46.32 ± 35.96
SF-36 Bodily Pain	34	32	100	69.21 ± 23.01
SF-36 General Health Perception	34	22	82	50.65 ± 12.74
SF-36 Vitality	34	0	80	53.09 ± 20.63
SF-36 Social Functioning	34	25	100	65.81 ± 22.89
SF-36 Role Limitations Due to Emotional Problems	34	0	100	50.00 ± 36.01
SF-36 Mental Health	34	0	84	52.00 ± 19.40

Data are presented as mean ± standard deviation (SD).

Abbreviations: HADS-A, Hospital Anxiety and Depression Scale–Anxiety; HADS-D, Hospital Anxiety and Depression Scale–Depression; HAM-A, Hamilton Anxiety Rating Scale; SF-36, Short Form-36 Health Survey.

The mean HADS-A score in the patient group was below the established cut-off value of 11, indicating that the overall anxiety score of the study population did not reach the threshold suggestive of clinically significant anxiety.

Similarly, the mean HADS-D score was below the recommended cut-off value of 8, indicating that the overall depression score did not meet the threshold suggestive of clinically significant depressive symptoms.

Evaluation of the SF-36 demonstrated that the mean Physical Functioning score in the patient group was 82.06, which was lower than the normative mean reported for the Turkish population (86.6).

Likewise, the mean score for Role Limitations Due to Physical Health was 46.32, which was substantially lower than the corresponding normative value for the Turkish population (89.5).

The mean SF-36 Bodily Pain score in the patient group was 69.21, which was lower than the normative mean reported for the Turkish population (86.1).

The mean General Health Perception score was 50.65, compared with a normative population mean of 73.9.

The mean Vitality score was 53.09, whereas the corresponding normative mean for the Turkish population was 67.0.

The mean Social Functioning score was 65.81, which was markedly lower than the normative value of 94.8.

Similarly, the mean score for Role Limitations Due to Emotional Problems was 50.00, considerably lower than the corresponding normative mean of 94.7.

The mean Mental Health score was 52.00, compared with a normative mean of 73.5 for the Turkish population.

Overall, patients with epilepsy demonstrated lower SF-36 scores across all domains of health-related quality of life when compared with the established normative values for the Turkish population.

The mean age of caregivers was 40.0 ± 11.9 years, whereas the mean age of the healthy control group was 35.4 ± 11.3 years. This difference was not statistically significant (p = 0.135).

The majority of healthy controls were employed (81.5%, n = 22), whereas 61.8% (n = 21) of caregivers were unemployed or not actively engaged in the workforce. Educational attainment was also higher in the healthy control group than among caregivers.

Correlation analyses demonstrated no significant associations between caregivers' psychometric scale scores and either the patients' age or disease duration.

The comparative results of the psychometric assessments between caregivers and healthy controls are presented in Table 6.

Table 6. *Comparison of Psychometric Scale Scores Between Caregivers and Healthy Controls.*

Outcome Measure	Caregivers (n = 34) Mean ± SD	Healthy Controls (n = 27) Mean ± SD	p-value
HADS-A (Anxiety)	8.65 ± 4.03	5.89 ± 4.44	0.014
HADS-D (Depression)	6.97 ± 4.01	4.00 ± 3.56	0.004
HADS Total Score	15.62 ± 6.92	9.89 ± 7.40	0.003
HAM-A Psychic Anxiety	6.71 ± 3.75	4.00 ± 4.76	0.016
HAM-A Somatic Anxiety	8.56 ± 5.93	3.78 ± 5.11	0.002
HAM-A Total Score	15.26 ± 9.04	7.78 ± 9.61	0.003
SF-36 Physical Functioning	72.35 ± 23.91	89.44 ± 13.11	0.001
SF-36 Role Limitations Due to Physical Health	54.71 ± 35.29	85.19 ± 25.25	<0.001
SF-36 Bodily Pain	60.21 ± 19.89	81.37 ± 19.99	<0.001
SF-36 General Health Perception	47.74 ± 10.54	66.81 ± 16.21	<0.001
SF-36 Vitality	49.26 ± 21.82	67.78 ± 20.02	0.001
SF-36 Social Functioning	66.18 ± 20.99	75.00 ± 23.26	0.125
SF-36 Role Limitations Due to Emotional Problems	50.98 ± 38.70	75.31 ± 37.66	0.017
SF-36 Mental Health	56.12 ± 14.52	72.30 ± 21.16	0.001

Data are presented as mean ± standard deviation (SD).

Statistically significant p-values are shown in bold.

The distribution of seizure types among the patients showed that 79.4% had generalized seizures, whereas 20.6% had focal seizures.

Comparison of caregivers' psychometric scale scores according to the patients' epilepsy classification (focal/generalized) did not show any statistically significant difference (Table 7).

Table 7. Scale scores of caregivers against the epilepsy classification of patients.

Outcome Measure	Focal Epilepsy (n = 7) Mean ± SD	Generalized Epilepsy (n = 27) Mean ± SD	p-value
HADS-A (Anxiety)	8.71 ± 3.45	8.63 ± 4.23	0.961
HADS-D (Depression)	6.71 ± 4.89	7.04 ± 3.86	0.853
HADS Total Score	15.43 ± 7.16	15.67 ± 6.99	0.937
HAM-A Psychic Anxiety	7.43 ± 4.39	6.52 ± 3.63	0.575
HAM-A Somatic Anxiety	10.86 ± 7.78	7.96 ± 5.37	0.256
HAM-A Total Score	18.29 ± 11.53	14.48 ± 8.36	0.328
SF-36 Physical Functioning	80.71 ± 9.76	70.19 ± 26.07	0.306
SF-36 Role Limitations Due to Physical Health	50.00 ± 35.36	55.93 ± 35.84	0.699
SF-36 Bodily Pain	54.29 ± 20.06	61.74 ± 19.94	0.385
SF-36 General Health Perception	45.57 ± 6.13	48.30 ± 11.43	0.550
SF-36 Vitality	37.14 ± 25.96	52.41 ± 19.97	0.100
SF-36 Social Functioning	69.64 ± 32.16	65.28 ± 17.79	0.740
SF-36 Role Limitations Due to Emotional Problems	42.86 ± 37.10	53.09 ± 39.51	0.541
SF-36 Mental Health	53.14 ± 7.90	56.89 ± 15.82	0.551

Data are presented as mean ± standard deviation (SD).

4. Discussion

The present study demonstrated that caregivers of patients with epilepsy had significantly higher HADS anxiety (p = 0.014) and HADS depression (p = 0.004) scores than healthy controls. These findings indicate that caring for an individual with epilepsy is associated with increased symptoms of anxiety and depression among caregivers.

Consistent with our findings, a previous study involving children with epilepsy and their mothers reported that approximately one in five mothers experienced clinically significant anxiety and depression [58]. The similarity between these findings supports the notion that the psychological burden of epilepsy extends beyond patients and substantially affects their primary caregivers.

Assessment with the Hamilton Anxiety Rating Scale (HAM-A) also demonstrated significantly higher anxiety scores among caregivers than healthy controls (p = 0.003), further supporting the presence of increased anxiety symptoms in caregivers of patients with epilepsy. This observation is in agreement with previous reports describing elevated maternal anxiety among mothers of children with epilepsy [58].

Regarding health-related quality of life, the mean SF-36 Physical Functioning score was significantly lower in caregivers than in healthy controls (72.35 vs. 89.44, p = 0.001). This finding suggests that caregiving responsibilities may adversely affect the physical functioning of caregivers.

The SF-36 Role Limitations Due to Physical Health score was also significantly lower among caregivers than healthy controls (54.71 vs. 85.19, $p < 0.001$). This finding indicates that caregivers experienced greater limitations in performing daily physical activities because of physical health problems. Compared with both the healthy control group and the normative values reported for the Turkish population, caregivers demonstrated substantially poorer physical role functioning.

Similarly, the SF-36 Bodily Pain score was significantly lower in caregivers than in healthy controls (60.21 vs. 81.37, $p < 0.001$). These findings suggest that caregivers experienced a greater burden of pain-related symptoms, which may have adversely affected their overall quality of life.

The mean General Health Perception score was 47.74 in

caregivers compared with 66.81 in healthy controls ($p < 0.001$), indicating a significantly poorer perception of general health among caregivers. This reduction was also evident when compared with the normative values established for the Turkish population.

Likewise, the mean Vitality score was significantly lower among caregivers than healthy controls (49.26 vs. 67.78, $p = 0.001$). Reduced vitality scores suggest lower energy levels and increased fatigue, indicating that the caregiving burden may negatively influence caregivers' physical and emotional well-being.

Although the mean SF-36 Social Functioning score was lower in caregivers than in healthy controls (66.18 vs. 75.00), the difference did not reach statistical significance ($p = 0.125$). Nevertheless, both groups demonstrated lower social functioning scores than the normative values established for the Turkish population [47].

The mean SF-36 Role Limitations Due to Emotional Problems score was significantly lower in caregivers than in healthy controls (50.98 vs. 75.31, $p = 0.017$). This finding suggests that caregivers experienced greater limitations in daily activities and social roles due to emotional problems than both healthy controls and the normative Turkish population.

Similarly, the mean SF-36 Mental Health score was significantly lower among caregivers than among healthy controls (56.12 vs. 72.30, $p = 0.001$), indicating poorer psychological well-being and perceived mental health in caregivers of patients with epilepsy.

When all findings were considered together, the healthy control group demonstrated SF-36 scores that were comparable to the established normative values for the Turkish population, indicating that this group was representative of the general population and therefore served as an appropriate reference for comparison. In contrast, caregivers of patients with epilepsy exhibited lower quality-of-life scores across nearly all domains compared with both healthy controls and the normative Turkish population.

To our knowledge, there are very few studies specifically investigating health-related quality of life among caregivers of patients with epilepsy. Consequently, direct comparisons with previous studies were limited, highlighting the novelty of the present findings. We therefore proceeded to examine whether these impairments in caregivers were associated with specific clinical characteristics of the patients.

No statistically significant differences were observed in caregivers' HADS, HAM-A, or SF-36 scores according to the sex of the patient.

Likewise, caregivers of patients with generalized epilepsy and those caring for patients with focal epilepsy did not differ significantly in any psychometric or quality-of-life measure. Nevertheless, caregivers of patients with generalized epilepsy tended to have lower scores for SF-36 Physical Functioning, General Health Perception, and Social Functioning than caregivers of patients with focal epilepsy. Although these differences did not reach statistical significance, they may suggest a trend toward greater functional impairment among caregivers of patients with generalized epilepsy.

In the present study, neither the sex of the patient, epilepsy classification (generalized vs. focal), nor seizure frequency was associated with significant differences in caregivers' anxiety, depression, or health-related quality of life compared with the healthy control group. These findings suggest that the psychological burden experienced by caregivers is largely independent of these clinical characteristics and may instead reflect the overall impact of living with and caring for a family member with epilepsy.

To evaluate the potential influence of pre-existing psychiatric conditions, a sensitivity analysis was performed after excluding the three caregivers with a history of antidepressant use. The results remained unchanged, indicating that the observed findings were robust and were not materially influenced by these participants.

5. Conclusion

Studies investigating anxiety, depression, and health-related quality of life among caregivers of patients with epilepsy remain limited. Nevertheless, caregivers of individuals with chronic neurological disorders such as epilepsy may be at increased risk of psychological distress and impaired quality of life because of the long-term caregiving burden. The present study sought to identify the domains of quality of life most affected in caregivers of patients with epilepsy and to determine whether these impairments were associated with specific patient-related clinical characteristics. In addition, the study aimed to increase awareness among neurologists regarding the psychological well-being of caregivers by evaluating the presence of anxiety and depressive symptoms in this population.

In conclusion, caregivers of patients with epilepsy exhibited significantly higher levels of anxiety and depression and poorer health-related quality of life than healthy controls. Although no significant differences were observed according to patients' sex, epilepsy classification, seizure frequency, or disease duration, caregivers consistently demonstrated impairments across multiple domains of the SF-36 questionnaire. These findings indicate that the psychosocial burden of epilepsy extends beyond the patient and substantially affects family members who provide ongoing care and support.

Given the chronic and unpredictable nature of epilepsy, a multidisciplinary approach addressing not only patients but also their caregivers should be considered in routine clinical practice. Routine psychological assessment, appropriate counseling, and supportive interventions for caregivers may help reduce caregiver burden and improve overall family well-being. Furthermore, larger multicenter prospective studies are warranted to better characterize the psychosocial impact of epilepsy on caregivers and to identify effective interventions for improving their quality of life.

Abbreviations

CT	Computed Tomography
EEG	Electroencephalography
FAS	Focal Aware Seizure
FIAS	Focal Impaired Awareness Seizure
GTCS	Generalized Tonic–Clonic Seizure
HAM-A	Hamilton Anxiety Rating Scale
HADS	Hospital Anxiety and Depression Scale
HADS-A	Hospital Anxiety and Depression Scale–Anxiety
HADS-D	Hospital Anxiety and Depression Scale–Depression
ILAE	International League Against Epilepsy
MRI	Magnetic Resonance Imaging
SF-36	Short Form-36 Health Survey

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Author Contributions

Guven Arslan: Conceptualization, Data curation, Methodology, Resources, Writing – original draft, Writing – review & editing

Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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