Health related quality of life of children with epilepsy in Egypt

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Background/aim
Children with epilepsy are at an increased risk of poor health-related quality of life even in the absence of active seizures. The study was undertaken to assess the health-related quality of life and its predictors in children with epilepsy, comparing the relationship between different types of seizures and health-related quality of life in Egypt.

Patients/methods
This cross sectional case control study included 50 epileptic children aged 8–12 years, with a mean age of 9.35 ± 1.59 years and a male to female ratio of 1.8 : 1. They were divided into two subgroups according to the types of seizures: 26 patients with generalized seizures in subgroup I and 24 patients with partial seizures in subgroup II, and 50 apparently healthy children of matched age, sex, and social class were included as the control group. The Arabic version of the 23-item Pediatric quality of life Generic Core Scale (Parents' scale) was applied to evaluate the health-related quality of life of both patients and healthy controls.

Results
Diminished health-related quality of life is a common feature of epilepsy. Highly significant lower overall quality of life scores of all functioning domains of health-related quality of life were present between patients' subgroups ($P < 0.001$), and between total patients versus control groups ($P < 0.001$). Univariate analysis was performed to identify significant predictors of poorer quality of life in children with epilepsy. On analyzing the risk factors using odds ratio, epilepsy-related risk factors such as age at onset of seizures, types of seizures, duration of the illness, number and duration of antiepileptic drugs as well as children's clinical variables such as learning problems, developmental delay in milestones, limitation in child hobbies, urine incontinence, and prolonged sleep, and some family-related variables such as marital disharmony and parental anxiety were found to be significantly strong predictors of poorer health-related quality of life in children with epilepsy, with prediction of 95%.

Conclusion
Epileptic patients were found to be at a higher risk of developing impaired quality of life with lower mean scores of all domains of quality of life, especially patients with generalized, frequent fits, those on polytherapy, and patients with a younger age of seizure onset and a longer duration of illness. The scope of management of epilepsy should include optimal seizure control and improvement of the health-related quality of life of the affected children.

Keywords:
Epilepsy, Children, Egypt, Health Related Quality of life

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Introduction

Epilepsy is a common chronic neurological condition in developing years that can negatively impact one's physical, social and emotional function [1]. Freilinger *et al.* [2] in Austria reported behavioral and emotional problems in 22% of epileptic children, and studies have described feelings of shame, rejection, fear, worry, low self esteem, and perception of stigma to be common in children with epilepsy [3]. Epilepsy also has a significant emotional impact on parents of affected children, and parental emotional stability has been found to be a major predictor of the quality of life (QOL) of the epileptic child [4]. It has been associated with significant psychosocial maladjustment in both the affected children and their families [5].

Increasing attention is being focused on problems experienced by children with epilepsy as a result of stigma, which is associated with poor psychosocial health outcomes and impaired QOL. Epilepsy may interfere with social functioning by limiting educational opportunities, employability, and interpersonal relationships and also increase the risk of death [6]. Aldenkamp *et al.* [7] in the Netherlands, reported a high QOL in a group of individuals with epilepsy, with only 6% of the cases reporting a low QOL. However, all the cases in the study had well-controlled epilepsy and it is suggested that a low QOL may be a major problem only in individuals with refractory epilepsy.

The traditional medical goal in the management of epilepsy has focused almost exclusively on seizure control with minimal or no adverse medication effect,

whereas the importance of assessing QOL has been ignored [8]. This is particularly true for Egyptian children, where the QOL is probably affected by the social stigma associated with the disease. Therefore, this study was undertaken to assess the health-related quality of life (HRQOL) and its predictors in children with epilepsy in Egypt, comparing the relationship between different types of seizures and the HRQOL and increasing the awareness of the importance of assessing physical, psychosocial, and behavioral well-being of children with epilepsy in Egypt.

Patients and methods

Patients

This cross sectional case control study was conducted on 50 patients with epilepsy aged between 8 and 12 years, and 50 apparently healthy children with no chronic illness, of matched age, sex, and social class were included as the control group. The study was carried out in the outpatient Neuropsychological and Behavior Modification Clinic in the National Research Center, Egypt, during a 1-year period. Epilepsy was defined as separate occurrence of two or more unprovoked seizures, not diagnosed as neonatal or febrile seizures. The diagnosis of epilepsy in the children was based on history and the electroencephalographic findings, as all of them underwent electroencephalography. Seizure types and epilepsy disorders in these patients was based on the International classification of epileptic seizures, epilepsies, and epileptic syndromes of the League against Epilepsy (ILAE) (1993) [9].

In our study, epileptic patients were subdivided into two subgroups according to their type of seizures: 26 patients with generalized seizures in subgroup I and 24 patients with partial seizures in subgroup II. The inclusion criteria for selection were as follows: (a) epileptic children with at least one seizure in the previous 24 months and [b] current age between 8 and 12 years. There were no restrictions with respect to the etiology or the localization of the seizures. Exclusion criteria included children with associated mental retardation (IQ<70), cerebral palsy, epileptic syndrome, or any other neurological deficit. After informed consent was obtained from the parents, information obtained for each patient included age, sex, child's hobbies and leisure time activities, sleep disorders, urine incontinence, previous academic failure or success, and last year's achievements and absenteeism rate. The child's medical history included the age at onset of seizures, the frequency of seizures, the number of anti-epileptic drugs, the duration of therapy, and history of hospital admission. Demographic data of the family included the residence place, parental consanguinity, parents' level of education, and family medical history of epilepsy.

Materials and methods

Assessment of quality of life in children with epilepsy

The WHO defines HRQOL in children as children's perception of their position in life in the context of the culture in which they live and in relation to their goals, expectations, and concerns. It is a broad-ranging concept affected in a complex way by the children's physical health, psychological state, level of independence, social relationships, and their relationship to features of their environment [10]. QOL was assessed using Pediatrics' quality of life inventory version 4.0. It is a modular approach to measuring HRQOL in children and adolescents. The Pediatric QOL inventory consists of brief, practical, generic score scales (domains); it contains 23 items suitable for use with healthy school and community populations, and with pediatric populations with acute and chronic health conditions. Standard questionnaires, adapted from the Pediatric QOL Questionnaire, were administered to the children and their mothers. The format was translated into Arabic. The 23-item Pediatric QOL Generic Core Scales were designed to measure these core dimensions of health as delineated by WHO and school functioning [11].

In our study, parents' scale was used to assess the children's QOL by asking the mother about any problems the child faced in the last month from the following domains: physical (eight items), emotional (five items), social (five items), and school (five items) functioning domains. The child's physical functioning was measured in terms of problems in walking more than a block, running, participating in sports activities, lifting heavy objects, taking a bath or shower by themselves, doing chores around the house, having aches, and low energy levels. The child's emotional functioning was measured in terms of feeling afraid or scared, sad, angry, have trouble sleeping, and worry about what will happen to them. The child's social functioning was measured in terms of problems in getting along with other children, getting teased by other children, keeping up when playing with other children, worrying about not being able to do things that other children their age can do, and other children not wanting befriend them. The child's school functioning was assessed in terms of problems in paying attention in class, forgetting things, keeping up with the school work, missing school because of not being well, and missing school to go to the doctor or hospital. The scoring system was based on the items of children's

QOL. Each question was scored as grades 0, 1, 2, 3, and 4. The question is scored 0 when the child or mother answered no problem, scored 1 when the response was almost never a problem, scored 2 if the response was sometimes a problem, scored 3 if the response was often a problem, and finally scored 4 if the response was almost always a problem. Items are transformed to a 0–100 scale as follows: 0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0, such that higher scores indicate a better HRQOL. The mean Total Scale Score is computed as the sum of all the items over the number of items answered on all the scales. The average score for each domain was obtained by summing up all the scores and dividing the sum by the total number of questions answered. The mean score taken to the nearest whole number was taken as the measure of the impact of epilepsy on the overall HRQOL. Severity was rated by the clinicians as a score of 0–1 implying no impact, whereas a score of 4 implying the worst impact on the criterion being assessed. Patients with a score of 2 were considered to be mildly affected, whereas patients with a score of 3 were moderately affected, and those with a score of 4 were severely affected. The Physical Health Summary Score is the same as the Physical Functioning Scale Score. The mean Psychosocial Health Summary Score is computed as the sum of the items over the number of items answered in the Emotional, Social, and School Functioning Scales.

Statistical analysis

Data were analyzed using the statistical package for the social sciences version 20 computer program. SPSS Inc. was a software house headquartered in Chicago and incorporated in Delaware USA. The results were presented as tables. Data were presented as means ± SDs, number and percentage (frequency distributions). The χ^2-test was used for the comparison between the categorical data. The unpaired student *t*-test (two sided) and nonparametric tests were used for comparing the numerical data. Univariate analysis of each covariate (item by item) was performed to identify significant predictors of poor QOL in children with epilepsy. Odds ratios were calculated as a measure of the association between the different risk factors and epilepsy at 95% confidence limit. A *P* value of less than 0.05 was considered statistically significant throughout all statistical tests within this study.

Results

Sociodemographic and clinical characteristics of the studied patients

Sociodemographic and clinical characteristics of the studied patients are shown in Table 1. Of 50 patients aged 8–12 years, there were 32 male patients (64%) and 18 female patients (36%), with a male to female ratio of 1.8 : 1. About 56% (28/50) of the patients were living in rural areas. Positive consanguineous marriage among their parents was present in 35 of 50 patients (70%). Approximately two-third of the parents of the studied patients were illiterate: 78% of the fathers and 74% of the mothers; 22% of the fathers and 26% of the mothers were educated. Marital disharmony with consequent divorce was reported in nine (18%) of the families. There were highly significant differences ($P < 0.001$) between patients' subgroups with regard to marital status and parental anxiety. There was no significant difference ($P > 0.05$) between patients' subgroups with regard to patients' sex, residence place, parental consanguinity, and their education level.

Regarding limitations in school activity, 20 patients (40%) did not experience any form of limitation in school work, 10 patients (20%) having to drop out of school on account of severe epilepsy and missing school as a result of seizures, whereas deterioration in academic performance was present in 20 patients (40%). Fourteen percent of the children had hobbies such as computer-related activities in 4%, and watching TV and playing football in 10%. Learning problems, developmental delay in milestones, limitation in child hobbies, urine incontinence, and prolonged sleep were more common in patients with generalized seizures in subgroup I compared with patients with partial seizures in subgroup II with significant differences between patients' subgroups ($P < 0.05$).

Epilepsy-related variables

Twenty seven patients (48%) were on monotherapy and 26 patients (52%) were receiving polytherapy (three to five antiepileptic drugs). Twenty seven patients (54%) were controlled, and 23 (46%) suffered two to 10 fits per month (i.e. uncontrolled); of them, six patients (12%) had a positive history of previous injuries during epileptic attacks. Most of the children had diurnal seizures (14, 28%), whereas only 10 (20%) had nocturnal seizures and another 26 patients (52%) had both diurnal and nocturnal seizures. Twenty-four patients (48%) had no precipitating factors for seizures, while emotions, fever, and fatigue were the most frequent precipitating factors. Twenty-six patients (52%) reported postictal manifestations: sleep was the most common, followed by drowsiness, headache, and amnesia. Table 2 shows a comparison of the types of seizures and epilepsy-related variables in the studied patient groups. Highly significant differences ($P < 0.001$) were found between patient subgroups regarding the age at onset of seizures, the duration of therapy, the number of antiepileptic

Table 1 Some important sociodemographic and clinical characteristics in the studied patients

	n (%)			
Variables	Generalized seizures (subgroup I) (*N* = 26)	Partial seizures (subgroup II) (*N* = 24)	Total patients group (*N* = 50)	Subgroup I vs. subgroup II
Sex				
Male	9 (73.1)	13 (54.2)	22 (44)	0.78
Female	7 (26.9)	11 (45.8)	18 (36)	
Parental consanguinity				
Negative	15 (57.7)	13 (54.2)	28 (56)	0.54
Positive	11 (42.3)	11 (45.8)	22 (44)	
Residence place				
Rural	17 (65.4)	18 (75)	35 (70)	0.86
Urban	9 (34.6)	6 (25)	15 (30)	
Fathers' education				
Illiterate	21 (80.8)	18 (75)	39 (78)	0.62
Educated	5 (19.2)	6 (25)	11 (22)	
Mothers' education				
Illiterate	20 (76.9)	17 (70.8)	37 (74)	0.56
Educated	6 (23.1)	7 (29.2)	13 (26)	
Parental marital status				
Married	17 (65.4)	24 (100)	41 (82)	0.00**
Divorced	9 (73.1)	0 (0)	9 (18)	
Types of child hobbies				
Negative	25 (96.2)	18 (75)	43 (86)	0.03*
Positive	1 (3.8)	6 (25)	7 (14)	
Learning problems				
Negative	4 (15.4)	16 (66.7)	20 (40)	0.001**
Drop out	7 (26.9)	3 (12.5)	10 (20)	
Poor academic performance	15 (57.7)	5 (20.8)	20 (40)	
Developmental delay				
Negative	21 (80.8)	24 (100)	45 (90)	0.02*
Positive	5 (10)	0 (0)	5 (10)	
Sleep disorders				
Negative	17 (65.4)	22 (91.7)	39 (78)	0.02*
Positive	9 (34.6)	2 (8.3)	11 (22)	
Urine incontinence				
Negative	5 (19.2)	20 (83.3)	25 (50)	0.00**
Positive	21 (80.8)	4 (16.7)	25 (50)	
Parental anxiety				
Negative	2 (7.7)	16 (66.7)	18 (36)	0.00**
Positive	24 (92.3)	8 (33.3)	32 (64)	

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

drugs, the time of seizures, postictal manifestations, previous injuries during attacks, precipitating factors during seizures, and seizure frequency per month.

Quality of life of studied patients

Regarding the physical functioning domain, 20 patients (40%) had normal physical activity, whereas the majority of them (60%) had a variable degree of limitation of physical functioning; 30% of them were mildly affected, 22% moderately affected, and only a few (8%) were severely affected. Regarding the school functioning domain, 20 patients (40%) had normal school work, whereas 30 (60%) had educational problems: three patients (6%) were mildly affected, 21 (42%) were moderately affected, and six (12%) were severely affected. The child's emotional functioning domain was normal in 20 patients (40%), whereas feelings of sadness, worries and feelings and expressions of fear were detected in 60% with varying degrees of severity: 13 patients (26%) were mildly affected, 14 (28%) were moderately affected, and only three were severely affected. The child's social functioning domain was normal in twenty-five patients (50%), and varying degrees of abnormal social functioning was present in 25 patients (50%) in the form of poor peer relationship, feelings of envy of nonepileptic children, and dislike for their peers including physical fights with other children. The psychosocial functioning domain was normal

Table 2 Comparison of the types of seizures and epilepsy-related variables in the studied patient groups

	n (%)			
Variables	Generalized seizures (subgroup I) (*N* = 15)	Partial seizures (subgroup II) (*N* = 15)	Total patients group (*N* = 30)	Subgroup I vs. subgroup II
Age at onset of seizures (years)				
≤5	21 (80.8)	7 (29.2)	28 (56)	0.00**
>5	5 (19.2)	17 (70.8)	22 (44)	
Duration of therapy (years)				
≤3	3 (11.5)	16 (66.7)	19 (38)	0.00**
>3	23 (88.5)	8 (33.3)	31 (62)	
Number of antiepileptic drugs				
Monotherapy	5 (19.2)	19 (79.)	24 (48)	0.00**
Polytherapy	21 (80.8)	5 (20.8)	26 (52)	
Seizure frequency				
Nil in last month	26 (100)	1 (4.2)	27 (54)	0.00**
2–10/month	0 (0)	23 (95.8)	23 (46)	
Previous injuries during attacks				
Negative	21 (80.8)	23 (95.8)	44 (88)	0.00**
Positive	5 (19.2)	1 (4.2)	6 (12)	
Time of seizures				
Diurnal	3 (11.5)	11 (45.8)	14 (28)	0.00*
Nocturnal	8 (26.9)	2 (8.3)	10 (20)	
Both	23 (88.5)	3 (12.5)	26 (52)	
Precipitating factors for seizures				
Negative	5 (19.2)	19 (79.)	24 (48)	0.00**
Positive	21 (80.8)	5 (20.8)	26 (52)	
Postictal manifestations				
Negative	5 (19.2)	19 (79.)	24 (48)	0.00**
Positive	21 (80.8)	5 (20.8)	26 (52)	

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

in 15 patients (30%), 18 (36%) were mildly affected, 11 (22%) were moderately affected, and six (12%) were severely affected. Table 3 shows a comparison of the types of seizures with the HRQOL, and its subdomains in the studied patients and control groups. Epileptic patients with generalized seizures in subgroup I had highly significantly lower mean scores of all functioning domains of HRQOL including total QOL and physical, emotional, social, school, and psychosocial domains compared with those patients with partial seizures in subgroup II ($P < 0.001$) highly significant lower scores were also present in total patients versus control groups ($P < 0.001$).

The univariate analysis for predictors of impaired total QOL score in children with epilepsy is listed in Tables 4–9. These tables show the effect of some variable on the scores of the total QOL, and physical, emotional, social, school, and psychosocial functioning domains. Epilepsy-related risk factors such as the age at onset of seizures, types of seizures, the duration of illness, number and duration of antiepileptic drugs, as well as children's learning problems, types of child hobbies, urine incontinence, and sleep disorders, and some family-related variables such as marital disharmony and parental anxiety were found to be significantly strong predictors of an impaired total QOL and all of the quality-of-life functioning subdomain scores, with a prediction of 95%. Simultaneously, fathers' and mothers' education was statistically significantly associated with only impaired physical and school functioning domain scores, whereas sex was statistically significantly associated with only impaired total QOL, physical and school functioning domains, with a prediction of 95%. Parental consanguinity and residence place were non significant predictors of impaired quality of life.

Discussion

Epilepsy can significantly affect the HRQOL, not only because of its chronicity, need for regular medications, and their side effects, but also due to prejudices and social conventions that still surround it [12].

QOL was studied before in Egypt among epileptic children and adolescents using the health-related quality-of-life inventory of epilepsy (HRQOL-AD-48) version 1 developed in 1999 that contains 48 items [13]. The quality of life-AD-48 is a survey of health-related QOL for epileptic children and adolescents aged between 11 and 18 years [14].

Table 3 Comparison of the types of seizures with the total quality of life and its subdomains in the studied patients and the control groups

		n (%)				*P* value	
Variables	Severity	Generalized seizures (subgroup I)	Partial seizures (subgroup II)	Total patients	Control groups	Subgroup I vs. subgroup II	Total patients vs. control groups
Physical health functioning domain	Normal	4 (15.4)	16 (15.4)	20 (40)	50 (100)	0.00**	0.00**
	Mild affected	8 (30.8)	7 (29.2)	15 (30)	0 (0)		
	Moderate affected	10 (38.5)	1 (4.2)	11 (22)	0 (0)		
	Severe affected	4 (15.4)	0 (0)	4 (8)	0 (0)		
Emotional functioning domain	Normal	3 (11.5)	17 (70.8)	20 (40)	50 (100)	0.00**	0.00**
	Mild affected	9 (34.6)	4 (16.7)	13 (26)	0 (0)		
	Moderate affected	11 (42.3)	3 (12.5)	14 (28)	0 (0)		
	Severe affected	3 (11.5)	0 (0)	3 (6)	0 (0)		
Social functioning domain	Normal	5 (19.2)	20 (83.3)	25 (50)	50 (100)	0.00**	0.00**
	Mild affected	8 (30.8)	3 (12.5)	11 (22)	0 (0)		
	Moderate affected	7 (26.9)	1 (4.2)	8 (16)	0 (0)		
	Severe affected	6 (23.1)	0 (0)	6 (12)	0 (0)		
School functioning domain	Normal	3 (11.5)	17 (70)	20 (40)	50 (100)	0.00**	0.00**
	Mild affected	1 (3.8)	2 (8.3)	3 (6)	0 (0)		
	Moderate affected	20 (76.9)	1 (3.8)	21 (42)	0 (0)		
	Severe affected	2 (7.7)	4 (16.7)	6 (12)	0 (0)		
Psychosocial functioning domain	Normal	2 (7.7)	13 (54.2)	15 (30)	50 (100)	0.002**	0.00**
	Mild affected	10 (38.5)	8 (33.3)	18 (36)	0 (0)		
	Moderate affected	9 (34.6)	2 (8.3)	11 (22)	0 (0)		
	Severe affected	5 (19.2)	1 (4.2)	6 (12)	0 (0)		
Total quality of life	Normal	2 (7.7)	14 (58.3)	16 (32)	50 (100)	0.00**	0.00**
	Mild affected	4 (15.4)	9 (37.5)	13 (26)	0 (0)		
	Moderate affected	18 (69.2)	1 (8.3)	19 (38)	0 (0)		
	Severe affected	2 (7.2)	0 (0)	2 (4)	0 (0)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

Our work aimed at studying the relationship between different types of seizures and HRQOL, and identifying the predictors that may be associated with these problems in Egyptian epileptic children in the age range from 8 to 12 years using Pediatrics' quality of life inventory version 4.0 Generic Core Scales (parent scale) [11]. Hence, it is considered to be the first study in Egyptian children in this age group.

Our present study demonstrated, as in others [2,15,17], that epilepsy has a major impact on the HRQOL of children, with significant impairments in at least two-third of the cases in all of the physical, school, psychosocial, social, and emotional functioning domains tested. The total QOL scores were rated as optimal in 40% and impaired in 60% of the children with epilepsy. These were consistent with the findings reported by Rutter *et al.* [18], who found that 58% of the children with epilepsy with seizure and CNS dysfunction had impaired total QOL scores.

Our present study revealed a highly significantly lower total QOL and overall QOL scores of all QOL domains including physical, emotional, social, school, and psychosocial functioning domains, especially in epileptic patients with generalized seizures compared with those patients with partial seizures ($P < 0.001$). This was consistent to the findings reported by Stevanovic [19], who found that the overall QOL was significantly lower in patients with generalized epilepsy compared with those with partial epilepsy.

In the present study, highly significant lower QOL scores of all QOL domains were also present in the total patient versus the control groups ($P < 0.001$). This was consistent to the findings reported by Miller *et al.* [20], who demonstrated that the HRQOL in children with epilepsy compared with healthy controls is diminished in all functioning domains.

In our study, the physical health functioning domains defined by play, exercise, and domestic chores was rated as optimal in 40% of the patients and impaired in the majority of them (60%), with a variable degree

Table 4 Univariate analysis of the total quality of life score with demographic, clinical, and epilepsy-related variables in epileptic patients

Covariates	Impaired [*n* (%)]	Normal [*n* (%)]	Odd ratio (95% confidence Interval)	*P* value
1-Sex				
Male	27 (81.8)	5 (29.4)	10.8 (2.75–42.41)	0.000**
Female	6 (18.2)	12 (70.6)		
2-Residence				
Urban	9 (27.3)	11 (64.7)	1.45 (0.41–5.11)	0.55
Rural	24 (72.7)	6 (35.3)		
3-Consanguinity				
Positive	14 (42.4)	9 (52.9)	0.83 (0.26–2.69)	0.75
Negative	19 (57.6)	8 (47.1)		
4-Father education				
Illiterate	28 (84.8)	11 (64.7)	3.05 (0.77–12.1)	0.11
Educated	5 (15.2)	6 (35.3)		
5-mother education				
Illiterate	26 (78.8)	11 (64.7)	20.3 (0.55–7.42)	0.28
Educated	7 (21.2)	6 (35.3)		
6-Sleep disorders				
Positive	10 (30.3)	1 (5.9)	36.8 (4.28–316.69)	0.001**
Negative	23 (69.7)	16 (94.1)		
7-Abnormal sphincteric control				
Positive	24 (72.7)	1 (5.9)	42.7 (4.9–370.2)	0.001**
Negative	9 (27.3)	16 (94.1)		
8-Parental marital status				
Married	24 (72.7)	17 (100)	–	0.01*
divorced	9 (27.3)	0 (0)		
9-Parental anxiety				
Positive	29 (87.9)	3 (17.6)	33.8 (6.6–172.1)	0.000**
Negative	4 (12.1)	14 (82.4)		
10-Learning problems				
Positive	28 (84.8)	2 (11.8)	42 (7.2–243)	0.000**
Negative	5 (15.2)	15 (88.2)		
11-Types of child hobbies				
Positive	1 (3)	6 (35.3)	17.4 (1.8–161.5)	0.002**
Negative	32 (97)	11 (64.7)		
12-Age at onset of seizures (years)				
≤5	12 (54.5)	5 (17.9)	5.52 (1.53–19.1)	0.007**
>5	10 (45.5)	23 (82.1)		
13-Duration of therapy (years)				
≤3	5 (16.1)	12 (63.2)	8.9 (2.3–33.9)	0.001**
>3	26 (83.9)	7 (36.8)		
14-Types of seizures				
Generalized	23 (69.7)	3 (17.6)	10.7 (2.5–45.5)	0.000**
Partial	10 (30.3)	14 (82.4)		
15-Antiepileptic drugs				
Monotherapy	8 (24.2)	16 (94.1)	50 (57–438)	0.000**
Polytherapy	25 (75.8)	1 (5.9)		
16-Seizure frequency				
Nil in last month	24 (72.7)	3 (17.6)	12.4 (2.8–53.7)	0.000**
2–10/month	9 (27.3)	14 (82.4)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

of limitation of physical functioning: 30% of them were mildly affected, 22% were moderately affected, and only a few (8%) were severely affected. These functioning scores are important elements in daily living of children, and impairment in these areas have been shown to be associated with frustration and abnormal behavioral tendencies [19].

The mean psychosocial health summary score is computed as the sum of the items over the number of items answered in the emotional, social, and school functioning scales. In the present study, the psychosocial functioning domain was rated as impaired in 70% of the patients with epilepsy, and has been found to be highly affected. The child's social

Table 5 Univariate analysis of physical function scores with demographic, clinical, and epilepsy-related variables in epileptic patients

Covariates	Impaired [*n* (%)]	Normal [*n* (%)]	Odd ratio (95% confidence Interval)	*P* value
1-Sex				
Male	24 (80)	8 (40)	0.16 (0.04–0.91)	0.004**
Female	6 (20)	12 (60)		
2-Residence				
Urban	8 (26.7)	7 (35)	1.48 (0.44–5.04)	0.529
Rural	22 (73.3)	13 (65)		
3-Consanguinity				
Positive	12 (40)	10 (50)	0.67 (0.21–2.09)	0.48
Negative	18 (60)	10 (50)		
4-Father education				
Illiterate	31 (10)	12 (40)	0.82 (0.28–2.40)	0.01*
Educated	17 (90)	8 (60)		
5-Mother education				
Illiterate	25 (83.3)	12 (40)	0.30 (0.08–1.11)	0.049*
Educated	5 (16.7)	8 (60)		
6-Sleep disorders				
Positive	20 (66.7)	1 (5)	38 (4.43–326.5)	0.04*
Negative	10 (33.3)	19 (95)		
7-Abnormal sphincteric control				
Positive	24 (76.7)	2 (10)	30.86 (5.72–166.59)	0.000**
Negative	7 (23.3)	18 (90)		
8-Parental marital status				
Married	21 (70)	20 (100)	–	0.01*
Divorced	9 (30)	0 (0)		
9-Parental anxiety				
Positive	28 (93.3	4 (20)	56 (9.2–340)	0.000**
Negative	2 (7.6)	16 (80)		
10-Learning problems				
Positive	25 (83.3)	5 (25)	15.00 (3.72–60.53)	0.000**
Negative	5 (16.7)	15 (75)		
11-Types of child hobbies				
Positive	1 (3.3)	6 (30)	0.08 (0.009–0.73)	0.008**
Negative	29 (96.7)	14 (70)		
12-Age at onset of seizures (years)				
≤5	22 (78.6)	6 (21.4)	0.15 (0.4–0.54)	0.002**
>5	8 (36.4)	14 (63.6)		
13-Duration of therapy (years)				
≤3	5 (29.4)	11 (84.6)	13.2 (2.11–82.50)	0.009**
>3	12 (70.6)	2 (15.4)		
14-Types of seizures				
Generalized	23 (76.7)	3 (15)	0.15 (0.04–0.54)	0.000**
Partial	7 (23.3)	17 (85)		
15-Antiepileptic drugs				
Monotherapy	7 (23.3)	17 (85)	18.6 (4.1–82.6)	0.000**
Polytherapy	23 (76.7)	3 (15)		
16-Seizure frequency				
Nil in last month	24 (80)	3 (15)	0.04 (0.02–0.25)	0.000**
2–10/month	6 (20)	17 (85)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

functioning domain defined by poor peer relationship, feelings of envy of nonepileptic children, and dislike for their peers including physical fights with other children was impaired in 50% of the patients with epilepsy. About 60% of the children experienced varying degrees of stress in their emotional functioning, and the percentage was higher compared with the findings of Freilinger *et al.* [2], who reported emotional problems in about 22.2% of a cohort of epileptic Austrian children. Wagner and Smith [15] also described behavioral problems as the overall most common reason for referral to psychological services in a cohort of 84 epileptic children referred to an on-site pediatric psychologist. The higher percentage in

Table 6 Univariate analysis of social function scores with demographic, clinical, and epilepsy-related variables in epileptic patients

Covariates	Impaired [*n* (%)])	Normal [*n* (%)]	Odd ratio (95% confidence Interval)	*P* value
1-Sex				
Male	18 (72)	14 (56)	0.49 (0.15–1.61)	0.23
Female	7 (28)	11 (44)		
2-Residence				
Urban	8 (32)	7 (35)	1.21 (0.36–4.07)	0.75
Rural	17 (68)	18 (65)		
3-Consanguinity				
Positive	11 (44)	11 (50)	1.00 (0.33–3.06)	1
Negative	14 (56)	14 (50)		
4-Father education				
Illiterate	21 (84)	18 (72)	0.81 (0.23–2.88)	0.3
Educated	4 (16)	7 (28)		
5-Mother education				
Illiterate	19 (76)	18 (72)	0.49 (0.12–1.95)	0.74
Educated	6 (24)	7 (28)		
6-Sleep disorders				
Positive	16 (64)	2 (8)	20.44 (3.89–107.50)	0.01*
Negative	9 (36)	23 (92)		
7-Abnormal sphincteric control				
Positive	23 (92)	2 (8)	132.2 (17–1020)	0.000**
Negative	2 (8)	23 (92)		
8-Parental marital status				
Married	21 (70)	20 (100)	–	0.01*
Divorced	9 (30)	0 (0)		
9-Parental anxiety				
Positive	24 (96)	8 (32)	51 (5.82–446.56)	0.000**
Negative	1 (4)	17 (68)		
10-Learning problems				
Positive	23 (92)	7 (28)	29.57 (5.47–159.97)	0.000**
Negative	2 (8)	18 (72)		
11-Types of child hobbies				
Positive	0 (0)	7 (28)	–	0.004**
Negative	25 (100)	18 (72)		
12-Age at onset of seizures (years)				
≤5	15 (68.2)	10 (35.7)	3.86 (1.18–12.61)	0.02*
>5	7 (31.8)	18 (64.3)		
13-Duration of therapy (years)				
≤3	10 (32.3)	15 (78.9)	0.13 (0.03–0.48)	0.001
>3	21 (76.7)	4 (21.1)		
14-Types of seizures				
Generalized	21 (84)	5 (20)	21 (4.92–89.56)	0.000**
Partial	4 (16)	20 (80)		
15-Antiepileptic drugs				
Monotherapy	7 (28.0)	17 (68)	0.18 (0.05–0.61)	0.000**
Polytherapy	18 (72.0)	8 (32)		
16-Seizure frequency				
Nil in last month	21 (84)	6 (24)	16.63 (4.06–68.04)	0.000**
2–10/month	4 (16)	19 (76)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

our study may be explained by the higher percentage of uncontrolled children and may be due to the need for better healthcare.

Children with epilepsy are known to be vulnerable to educational problems and resultant academic underachievement. In the present study, 30 patients (60%) had educational problems and impairment in school activity: 6% of the patients were mildly affected, 21 patients (42%) were moderately affected, and six patients (12%) were severely affected. Academic underachievement in our study as in other reports [20,21] may be attributed to a combination of factors acting individually or synergistically, which

Table 7 Univariate analysis of school function scores with demographic, clinical, and epilepsy-related variables in epileptic patients

Covariates	Impaired [*n* (%)]	Normal [*n* (%)]	Odd ratio (95% confidence Interval)	*P* value
1-Sex				
Male	25 (80.6)	7 (36.8)	0.33 (0.17–0.67)	0.002**
Female	6 (19.4)	12 (63.2)		
2-Residence				
Urban	9 (29)	6 (31.6	1.13 (0.33–3.90)	0.84
Rural	22 (71)	13 (68.4)		
3-Consanguinity				
Positive	12 (38.7)	10 (52.6)	0.57 (0.18–1.80)	0.33
Negative	19 (61.3)	9 (47.4)		
4-Father education				
Illiterate	28 (90.3)	11 (57.9)	6.2 (1.52–30.1)	0.007**
Educated	3 (9.7)	8 (42.1)		
5-Mother education				
Illiterate	26 (83.9)	11 (57.9)	0.26 (0.07–0.99)	0.04*
Educated	5 (16.1)	8 (42.1)		
6-Sleep disorders				
Positive	9 (29)	0 (0)	–	0.009**
Negative	22 (71)	19 (100)		
7-Abnormal sphincteric control				
Positive	29 (93.5)	3 (15.8)	77.3 (11.6–512)	0.000**
Negative	2 (6.5)	16 (84.2)		
8-Parental marital status				
Married	10 (32.3)	18 (94.7)	37.8 (4.40–324.48)	0.02*
Divorced	21 (67.7)	1 (5.3)		
9-Parental anxiety				
Positive	16 (84.2)	1 (5.3)	96 (9.05–1018.04)	0.000**
Negative	3 (15.8)	18 (94.7)		
10-Learning problems				
Positive	28 (90.3)	2 (10.5)	79.33 (12.01–524.08)	0.000**
Negative	3 (9.7)	17 (89.5)		
11-Types of child hobbies				
Positive	1 (3.2)	6 (31.6)	0.07 (0.008–0.66)	0.005**
Negative	30 (96.8	13 (68.4)		
12-Age at onset of seizures (years)				
≤5	14 (63.2)	5 (17.9)	8.05 (2.19–29.54)	0.001**
>5	8 (36.4)	23 (82.1)		
13-Duration of therapy (years)				
≤3	7 (22.6)	12 (63.2)	0.17 (0.05–0.60)	0.004**
>3	24 (77.4)	7 (36.8)		
14-Types of seizures				
Generalized	28 (90.3)	3 (15.8)	49.78 (8.97–276.37)	0.000**
Partial	3 (9.7)	16 (84.2)		
15-Antiepileptic drugs				
Monotherapy	8 (25.8)	16 (84.2)	0.07 (0.01–0.28)	0.005**
Polytherapy	23 (74.2)	3 (15.8)		
16-Seizure frequency				
Nil in last month	16 (84.2)	3 (15.8)	28.44 (4.97–162.69)	0.000**
2–10/month	3 (15.8)	16 (84.2)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

include the deleterious effects of repeated seizures on the developing brain, behavioral problems, psychosocial issues, and the effect of antiepileptic drugs.

In our patients, drop out of school was rather due to excessive care of the parents, who believed that the child may be hurt at school. The educated group of our patients had a significantly better total score of QOL and social support. This was in agreement to the study by Phabphal *et al.* [22], who found that educated individuals had a higher score in QOL aspects, and that a poor QOL may cause epileptic patients to leave education, especially when there is not enough social support.

Table 8 Univariate analysis of emotional function score with demographic, clinical, and epilepsy-related variables in epileptic patients

	Emotional function			
Covariates	Impaired [*n* (%)]	Normal [*n* (%)]	Odd ratio (95% confidence interval)	*P* value
1-Sex				
Male	21 (70)	11 (55)	0.52 (0.16–1.70)	0.27
Female	9 (30)	9 (45)		
2-Residence				
Urban	9 (30)	6 (30)	1.00 (0.29–3.44)	1
Rural	21 (70)	14 (70)		
3-Consanguinity				
Positive	13 (43.3)	9 (45)	1.07 (0.34–3.34)	0.9
Negative	17 (56.7)	11 (55)		
4-Father education				
Illiterate	24 (80)	15 (75)	0.75 (0.19–2.90)	0.67
Educated	6 (20)	5 (25)		
5-Mother education				
Illiterate	22 (73.3)	15 (75)	1.09 (0.30–3.99)	0.89
Educated	8 (26.7)	5 (25)		
6-Sleep disorders				
Positive	8 (26.7)	1 (5)	6.9 (0.76–60.3)	0.02*
Negative	22 (77.3)	19 (95)		
7-Abnormal sphincteric control				
Positive	28 (80)	4 (26.7)	11.1 (2.6–45.18)	0.000**
Negative	7 (20)	11 (73.3)		
8-Parental marital status				
Married	9 (30)	18 (90)	21 (4.01–110.06)	0.33
Divorced	21 (70)	2 (10)		
9-Parental anxiety				
Positive	24 (80)	1 (5)	76 (8.4–686)	0.000**
Negative	6 (20)	19 (95)		
10-Learning problems				
Positive	26 (74.3)	4 (26.7)	7.94 (2.01–31.35)	0.002**
Negative	9 (25.7)	11 (73.3)		
11-Types of child hobbies				
Positive	2 (5.7)	5 (33.3)	0.12 (0.02–0.72)	0.01*
Negative	33 (94.3	10 (66.7)		
12-Age at onset of seizures (years)				
≤5	11 (50)	9 (32.1)	0.47 (0.15–1.50)	0.012*
>5	11 (50)	19 (67.9)		
13-Duration of therapy (years)				
≤3	11 (29.4)	11 (32.1)	5.50 (0.98–30.81)	0.000**
>3	11 (70.6)	2 (15.4)		
14-Types of seizures				
Generalized	24 (90.3)	2 (13.3)	0.07 (0.01–0.37)	0.000**
Partial	11 (31.4)	13 (86.7)		
15-Antiepileptic drugs				
Monotherapy	12 (34.3)	12 (80)	7.67 (1.81–32.52)	0.003**
Polytherapy	23 (65.7)	3 (20)		
16-Seizure frequency				
Nil in last month	25 (71.4)	2 (13.3)	0.06 (0.01–0.3)	0.000**
2–10/month	10 (28.6)	13 (86.7)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

In the present study, univariate analysis of each covariate was performed to identify significant predictors of poorer QOL in children with epilepsy. On analyzing risk factors using odds ratios in univariate analysis, epilepsy-related variables such as the age at onset of seizures, types of seizures, duration of illness, and the number and duration of antiepileptic drugs were found to be significantly strong predictors of a poorer total QOL score, with a prediction of 95%. This is in accordance with that reported by Benavente *et al.* [23], who also examined illness-related variables that are related to a diminished QOL in children with

Table 9 Univariate analysis of psychosocial function with demographic, clinical, and epilepsy-related variables in epileptic patients

	Psychosocial function			
Covariates	Impaired no [*n* (%)]	Normal [*n* (%)]	Odd ratio (95% confidence interval)	*P* value
1-Sex				
Male	24 (68.6)	8 (53.3)	0.52 (0.15–1.81)	0.34
Female	11 (31.4)	7 (46.7)		
2-Residence				
Urban	10 (28.6)	5 (31.6)	1.25 (0.34–4.59)	0.73
Rural	25 (71.4)	10 (68.4)		
3-Consanguinity				
Positive	20 (57.1	8 (47.4)	0.86 (0.25–2.89)	0.80
Negative	15 (42.9)	7 (52.6)		
4-Father education				
Illiterate	27 (77.1)	12 (80)	1.19 (0.27–5.26)	0.82
Educated	8 (22.9)	3 (20)		
5-Mother education				
Illiterate	25 (71.4)	12 (80)	1.60 (0.37–6.91)	0.52
Educated	10 (28.6)	3 (20)		
6-Sleep disorders				
Positive	26 (74.3)	2 (13.3)	18.78 (3.53–99.81)	0.033*
Negative	9 (25.7)	13 (86.7)		
7-Abnormal sphincteric control				
Positive	24 (68.6)	1 (6.7)	30.5 (3.5–262)	0.000**
Negative	11 (31.4)	14 (93.3)		
8-Parental marital status				
Married	27 (77.1)	14 (93.3)	4.15 (0.47–36.58)	0.017*
Divorced	8 (22.9)	1 (6.7)		
9-Parental anxiety				
Positive	28 (80)	4 (26.7)	11 (2.6–45.1)	0.000**
Negative	7 (20)	11 (73.3)		
10-Learning problems				
Positive	26 (74.3)	4 (26.7)	7.94 (2.01–31.35)	0.002**
Negative	9 (25.7)	11 (73.3)		
11-Types of child hobbies				
Positive	2 (5.7)	5 (33.3)	0.12 (0.02–0.75)	0.01**
Negative	33 (94.3)	10 (66.7)		
12-Age at onset of seizures (years)				
≤5	10 (45.5)	5 (17.9)	3.83 (1.07–13.79)	0.03*
>5	12 (54.5)	23 (82.1)		
13-Duration of therapy (years)				
≤3	5 (16.1)	10 (52.6)	0.17 (0.05–0.64)	0.006**
>3	26 (83.9)	9 (47.4)		
14-Types of seizures				
Generalized	24 (90.3)	2 (13.3)	14.18 (2.72–73.91)	0.000**
Partial	11 (31.4)	13 (86.7)		
15-Antiepileptic drugs				
Monotherapy	12 (34.3)	12 (80)	0.13 (0.03–0.55)	0.003**
Polytherapy	23 (65.7)	3 (20)		
16-Seizure frequency				
Nil in last month	25 (71.4)	2 (13.3)	16.25 (3.09–85.43)	0.000**
2–10/month	10 (28.6)	13 (86.7)		

*Significant difference at $P < 0.05$; **Highly significant difference at $P < 0.001$.

epilepsy. Duration of the illness, severity of epilepsy, seizure frequency [24], the number of medications taken [25], and the presence of comorbid problems (e.g. behavioral, cognitive, and neurological) [8] have been found to be related to diminished QOL in children with epilepsy and their families.

In our study, patients with a younger age at onset of seizures, those receiving polytherapy, having generalized seizures, a longer duration of treatment, and those who had higher seizure frequency and increased duration of epilepsy had lower overall HRQOL scores with a highly significant association.

Patients who had been free of epileptic seizures for the last month had a better level of QOL as compared with those with more frequent seizures, with a highly significant association. This is in agreement with that reported by Victoria *et al.* [26], who found that the prescription of multiple drugs can result in multiple adverse side effects and have a bad effect on HRQOL, and epileptic patients who were taking one antiepileptic drug had a slightly higher HRQOL score than those on multiple drugs. The poorest ratings were found in patients with severe epilepsy. Patients with infrequent seizures, who would generally be regarded as having good control, had a relatively compromised HRQOL as compared with those who were seizure-free. Guekht *et al.* [27] reported that patients with frequent seizures had a lower QOL score, which is in agreement with our results.

In this study, patients who had learning problems, a prolonged sleep pattern, urine incontinence, or children who had no hobbies had significantly lower overall HRQOL scores in all HRQOL domains as compared with their counterparts ($P<0.05$). Parental beliefs and attitudes concerning epilepsy significantly impact the QOL for both the child and the family. Parents often worry that their child will die when a seizure occurs, and that seizures and anticonvulsants result in a loss of intelligence. Frequently, these beliefs result in overprotection and limitations imposed on the child's activities. Parental anxiety, which may result in restriction of activities, was believed to be associated with a decreased QOL for both the child and the family. This is in agreement with that reported by Williams *et al.* [25], who suggested that depending on the severity of the condition and illness variables, parental anxiety was found to be significantly associated with a decreased QOL. Highly anxious parents may be more likely to perceive higher risks for their children and misinterpret information about their child's condition.

In our study, other sociodemographic factors including parental consanguinity, parents' education, and residence place were found to be weak predictors of a poorer total QOL score. Consistent with Sherman *et al.* [28], our results support the assumption that sociodemographic variables in children with epilepsy were weak predictors of HRQOL in comparison with seizures, clinical, and behavioral variables.

In our study, it is noteworthy that a fractured family cohesion was present in nine of the 50 families, which was consistent with the findings of Das *et al.* [29], who reported that the presence of an epileptic child in the family precipitated divorce in five of the 66 families. The fractured family cohesion may be related to the lack of social support services and misconceptions about the disease including the fact that epilepsy is believed in our society to be infectious and therefore transmissible or inheritable. Other issues that may impact family cohesion are financial hardships related to managing the epileptic child and stigmatization of Nigerian patients and parents [30].

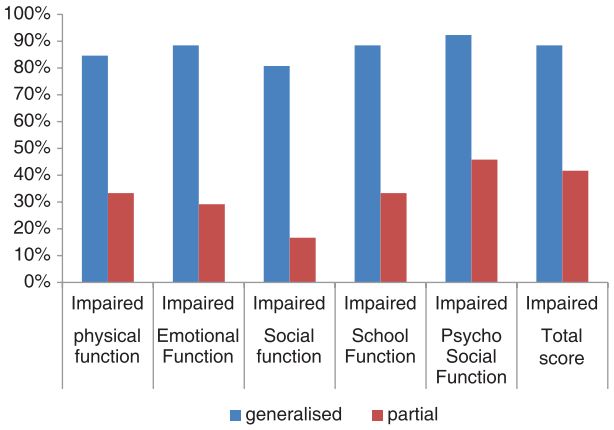
In this study, patients who had a low parental educational level showed a statistically significantly poorer total HRQOL, physical and school functioning domains, and also insignificantly lower scores in the emotional and psychosocial functioning domains (Fig. 1). Children with more educated mothers had an optimal HRQOL score compared with the children with illiterate mothers. This could be explained by the better care, understanding of the disease pattern, and importance of regular therapy by the educated mothers. In a previous Indian study, a better level of education showed a significant positive correlation with the awareness of the public towards epilepsy [31].

In this study, patients living in rural areas and those with a positive history of parental consanguinity had insignificantly lower scores in all domains of QOL in comparison with their counterparts. It was reported that epilepsy and its sequelae were more prevalent in patients with low social and economic levels [32].

Conclusion

Diminished QOL is a common feature of epilepsy. Epileptic patients had lower mean scores of all domains

Figure 1



Comparison of health-related quality of life and its subdomains with types of seizures in the studied patients.

of QOL, especially those with frequent fits, those on polytherapy, and in patients with generalized fits. The patients had significantly lower scores in all domains of QOL in comparison with controls. The scope of management of epilepsy should include optimal seizure control and improvement of the HRQOL of the affected children. Routine screening, counseling, and psychosocial support for cognitive, emotional, and physical health problems of children with epilepsy should be recommended. Counseling therapy and social support groups for the families of children living with epilepsy should be advised on an individual basis, and increased health education about seizure risks and psychosocial development and greater access to mental health services may also be beneficial.

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Conflicts of interest
None

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