Epilepsy & Behavior 54 (2016) 58–64

Contents lists available at ScienceDirect

Epilepsy & Behavior

journal homepage: www.elsevier.com/locate/yebeh

Clinical Research

Prevalence and correlates of major depressive disorder (MDD) among adolescent patients with epilepsy attending a Nigerian neuropsychiatric hospital

Ayodele Fela-Thomas [a,*], Akinwande Akinhanmi [a,1], Oluyomi Esan [b,2]

[a] Neuropsychiatric Hospital, Aro, Abeokuta, Ogun State, Nigeria
[b] Department of Psychiatry, University of Ibadan, Ibadan, Oyo State, Nigeria

ARTICLE INFO

Article history:
Received 27 January 2015
Revised 19 September 2015
Accepted 8 November 2015
Available online 3 December 2015

Keywords:
Epilepsy
Major depressive disorder
Seizure control
Adolescents

ABSTRACT

Background: A high prevalence of mood disorders exists in patients with epilepsy. In most cases, this is not detected and, consequently, not treated. This study aimed to determine the prevalence and correlates of major depressive disorder (MDD) among adolescents with epilepsy attending a child and adolescent clinic in Nigeria.
Methods: We recruited 156 participants consecutively for the study. Adherence was assessed using the 8-item Morisky Medication Adherence Questionnaire, while the K-SADS was used to assess the presence of major depressive disorder. Seizure control was evaluated by the frequency of seizures within a year.
Results: Major depressive disorder (DSM-IV criteria) was diagnosed in 28.2% of the participants. The age of participants ($p = 0.013$), seizure control ($p = 0.03$), medication adherence ($p = 0.045$), frequency of seizures in the preceding 4 weeks ($p < 0.001$), and duration of illness ($p < 0.001$) were all significantly associated with the presence of MDD. Participants with seizures occurring more than once weekly in the preceding 4 weeks were 16 times more likely to have a MDD compared with those with no seizures in the preceding 4 weeks ($p < 0.001$, 95% C.I. [4.13, 65.43]), while participants with a duration of illness more than 10 years were more than four times likely to have MDD compared with those with an illness duration of 5–10 years ($p < 0.01$, 95% C.I. [0.07, 0.70]).
Conclusion: The prevalence of MDD among patients with epilepsy was high. Poor seizure control, poor medication adherence, and long duration of illness were associated with the presence of MDD among such patients. Intervention should focus on ensuring good seizure control and optimal adherence in order to mitigate the impact of MDD in patients with epilepsy.

1. Introduction

Epilepsy is the most common chronic neurological disorder, affecting almost 50 million people worldwide [1], with an estimated prevalence of 5–10 per 1000 people [2]. Two-thirds of people living with epilepsy come from developing countries, where people with epilepsy are stigmatized because of erroneous beliefs about its origin [3]. The incidence of epilepsy in developing countries has been estimated at 1–1.9 cases/1000 per year [2]. A study from Nigeria reported a point prevalence of 5.3–37/1000 [4]. Osuntokun reported that the highest age-specific prevalence in Nigeria was below 20 years [5].

The burden of epilepsy may arise from the physical hazards (falls and burns) associated with the health condition due to the unpredictability of seizures or the social consequences of the disease which arise due to stigmatization. Often, children with epilepsy present with poor academic performance or are withdrawn from school [6,7]. A study in Nigeria found that children with epilepsy had lower academic performance compared with their counterparts without epilepsy [8]. The burden also entails the psychological consequences of the disease as reflected by the high level of anxiety and depressive disorders observed in people with epilepsy [9]. This also includes the economic consequences arising from the cost of health care and enormous time spent in procuring treatment as well as an increase in the mortality rate compared with the general population [10–12]. For instance, one Dutch study reported that children with symptomatic epilepsy had a twentyfold increase in mortality risk [13]. The global burden of epilepsy

* Corresponding author at: Federal Neuropsychiatric Hospital, Uselu, Benin City, Edo State, Nigeria. Tel.: +234 8051629414.
E-mail addresses: ayoth2001f@yahoo.com (A. Fela-Thomas), aoakinhanmi@yahoo.com (A. Akinhanmi), oluyomie@yahoo.com (O. Esan).
[1] Tel.: +234 8060954451.
[2] Tel.: +234 8033880312.

http://dx.doi.org/10.1016/j.yebeh.2015.11.008
1525-5050/

for the year 2000 was estimated at 0.5% of the total disease burden according to the Global Burden of Disease Study [14].

Epilepsy is usually controlled but not cured. There exists no strict definition for seizure control as this has been a controversial subject; nevertheless, good seizure control has been defined as a complete cessation of seizures for at least 1 year [15]. It is said that a vast majority of those diagnosed with epilepsy are treated with antiepileptic drugs, with 70% of them said to achieve good seizure control once an effective regime is followed [16]. Poor adherence to medication may be the major cause of poorly controlled epilepsy [17,18].

Epilepsy has a high prevalence of psychiatric comorbidity, with major depressive disorder (MDD) being the most frequently seen psychiatric comorbidity [19–22]. A population-based study in Norway reported a prevalence for psychiatric comorbidity of 37.8% in children with epilepsy compared with 17% in a matched control, a finding that was significant [22]. Similarly in a South West Nigerian study, it was reported that about 37% of participants with epilepsy had a comorbid psychiatric illness [21]. The prevalence of depression in epilepsy has been estimated at 20–50% [23], although one study reported a lower estimate of 11% [24]. In another prospective case–control study in South West Nigeria, it was reported that depression was more prevalent among those with epilepsy compared with matched controls [25]. The consequences of depression in epilepsy are far reaching, affecting all domains of a patient's quality of life [26–28]. It was reported in a study conducted at a tertiary mental health institution in South West Nigeria among adolescents with epilepsy that depression predicted a poor quality of life in the participants [29].

Poor quality of life could result from the emotional stress caused by depression, leading to poor medication adherence, which consequently increases seizure frequency [30]. Often, when patients with epilepsy are seen at referral clinics, emphasis and treatment are focused on the epileptic disorder, neglecting psychiatric comorbidities [31]. Despite the high prevalence of psychiatric morbidities in epilepsy, they usually go undiagnosed or are underdiagnosed [21,32].

Epilepsy and its association with several factors have been the subject of many studies in Africa and Nigeria [17,33,34]. However, most have focused either on the psychiatric comorbidities singly or on the perceived quality of life of such patients with very few studies examining depression among adolescents with epilepsy [35,36]. For instance, a study in Uganda examined factors related to adherence among children with epilepsy; however, their findings were not related to mood disorders, and ages of participants ranged from 2 months to 18 years [37].

Similarly, in a Nigerian study among patients with epilepsy, the researchers investigated the relationship between epilepsy, quality of life, activities of daily living, and depressive mood disorder. Again, their study participants were adults, and the sample size was relatively small (n = 51) [28].

The aim of this study was to assess depression and its correlates in adolescents with epilepsy attending the child and adolescent clinic of a specialist hospital in Nigeria.

2. Methods

2.1. Design and setting of the study

This was a cross-sectional study carried out in the child and adolescent clinic of the Neuropsychiatric Hospital, Aro, Abeokuta, Ogun State in South West Nigeria from September to December 2013. The hospital is a tertiary specialist center that provides psychiatric services to patients with mental illness nationwide and to some other African countries. The clinic provides health-care services to children below 18 years and offers treatment for schizophrenia, affective disorder, epilepsy, and other childhood psychiatric disorders. The clinic runs twice a week. On average, 30 patients are seen per clinic day.

2.2. Population

All patients with a diagnosis of seizure disorder who met the eligibility criteria were recruited consecutively. This method was employed to allow an adequate number of patients to be recruited within the study duration based on the assumption that the eligibility criteria would limit the number of patients that could be seen in a clinic day.

Eligibility criteria were as follows:

i. Patients should have a clinical diagnosis of epilepsy and be between 11 and 17 years of age.
ii. Patients must have been diagnosed for at least a year prior to the study.
iii. Patients were currently using antiepileptic medication for at least 6 months prior to the interview.

Those with chronic medical conditions (e.g., learning disability) or those that could communicate in neither the native Yoruba language nor the English language were excluded.

2.3. Sample size calculation

The sample size for the study was calculated using the sample size formula for a descriptive study:

$N = Z^2pq/d^2$ [38];

where

Z	the normal standard deviate 1.96 at 95% confidence interval
p	estimated prevalence of depression in patients with epilepsy [39]
q	1 − p
d	sampling error tolerated set at 0.05.

Thus,

$$N = \left(1.96^2 * 0.11 * 0.89\right)/0.05^2 = 138$$

To make allowance for a possible nonresponse, this was increased to 174.

2.4. Data collection

Eligible participants were approached while waiting for consultation at the clinic waiting room. After consenting to participate, all questionnaires were administered to patients by an interviewer either in English or Yoruba depending on which language the patient was most comfortable with. Questionnaires were administered by a single interviewer (A.F.T.) who had been trained extensively in the administration of the K-SADS.

Responses were filled in for participants that were too young to fill the medication adherence questionnaires by the interviewer. Parents/guardians who are responsible for administering medication to young patients were also interviewed. However, a child's report was considered more valid in situations where there is conflicting information. This is because parents/guardians may deliberately conceal suboptimal adherence because of fear and/or embarrassment.

2.5. Pilot study

A pilot study was conducted on 40 patients from the same clinic prior to the execution of the main study. These results were excluded from the main study. The pilot study was done to determine the feasibility of the study, the ease of administration of the questionnaire, and the

average time taken to complete an interview. The pilot study revealed that about half the patients seen at the clinic had comorbid psychiatric illness; most parents/guardians supervise the medication of their participants; the questionnaires were acceptable to the majority of the participants; and an average time of 30 min was required to conduct an interview.

2.6. Measures

A specially designed semistructured questionnaire developed by the lead researcher was used to obtain information on (i) the sociodemographic characteristics of patients and their parents/guardians and (ii) patients' clinical information including seizure characteristics and degree of seizure control. The clinical information was obtained from case notes of participants. These included a patient's age, sex, hospital number, ethnicity, and educational level. Questions to elicit information on the parent or guardian's occupation, highest educational level, whether the parents or guardians are dead or alive, and their current marital status were also included. The clinical data obtained were seizure type, age at onset of seizures, duration of illness, frequency of seizures before starting medication, seizure activity in the preceding four weeks, and when the last seizure occurred. Seizure types were classified based on the diagnosis made in the case notes which were further corroborated with EEG results. The duration of illness was measured as time from the first seizure occurrence until the date of the interview. Good seizure control was defined arbitrarily as the absence of seizures for 1 year or more [40]. Medication adherence was assessed using the 8-item Morisky medication adherence scale, a structured self-report scale. Responses to items one through seven are categorized in a dichotomous format (yes/no), while responses to item eight are on a five-point Likert scale. A total score of 3–8 is graded as poor adherence, 1–2 is graded medium adherence, while a total score of 0 is graded as high adherence. It has been shown to have good psychometric properties [41]. Depression was assessed using the Schedule for Affective Disorder and Schizophrenia for school age children: present and lifetime version (K-SADS), version 1 [42]. The schedule diagnoses major depressive episodes using the DSM-IV criteria. The K-SADS was administered by a single interviewer, the lead author (AFT) who has been trained extensively in its administration. Children and their parents were interviewed, and in cases where there was conflicting information, the child's responses were considered as more valid based on the interviewer's clinical judgment.

2.7. Data analysis

Analysis of data was done using the Statistical Package for the Social Sciences version 20. For descriptive statistics, the frequency table was employed while relationships between variables were determined using cross-tabulations. Continuous variables were described using means and standard deviations, while categorical variables were described using numbers and percentages. For comparisons of means, the appropriate t-test was employed, while the chi square test was used to determine the association between categorical variables. Fisher's exact test was performed where applicable. All significant variables in the univariate analysis were further investigated using simultaneous binary logistic regression. Using depression as the dependent variable and the significant clinical variables (seizure control, medication adherence, frequency of seizures in the preceding 4 weeks, and duration of illness) as independent variables, binary logistic regression (simultaneous method) to determine predictors of depression was performed. A statistical level of $p < 0.05$ was considered to be as significant.

2.8. Ethical issues

Ethical approval was obtained from the Health Research Ethics Committee of the Neuropsychiatric Hospital, Aro, Abeokuta. The consent of patients from 16 years of age and above was sought. For those not old enough to give their consent, an assent was obtained, while permission was obtained from their parents or guardian.

3. Results

A total of 174 participants were interviewed; 18 were excluded from the analysis because of missing vital information. Finally, data from 156 (89.7%) participants were analyzed for the study. Males comprised 64.7% of the study sample. Ages of participants ranged from 11 to 17 years, with a mean age of 13.3 (S.D. ± 2.14) years. About 45% were in primary school, while 8.3% had no formal education. Those of the Yoruba ethnic tribe (92.3%) comprised the majority of the group. See Table 1.

3.1. Clinical characteristics of participants

Table 3 shows the clinical characteristics of the participants. Those with a duration of illness between 5 and 10 years comprised the majority of the study participants (49.4%). The mean duration of illness was 7.6 (S.D. ± 4.03) years. Participants largely had an onset of seizures before age 5 years, 78 (50%). The mean age at onset of seizures was 5.6 (S.D) years. Generalized tonic-clonic seizure was the most common type of seizure seen among the participants (n = 118; 75.6%). Good seizure control was observed in 33 (21.2%) participants, while 123 (78.8%) had poor seizure control. High adherence to medication was reported by 24 (15.4%) participants interviewed, while 61 (39.1%) reported medium adherence to medication, and 71 (45.5%) reported poor adherence to medication. Major depressive disorder (DSM-IV criteria) was observed in 44 (28.2%) of the participants.

3.2. Sociodemographics of parents

Most of the fathers (97 [62.2%]) and mothers (84 [53.8%]) of the participants had secondary or tertiary level of education. Most parents were still married (123 [78.8%]). Majority of the fathers and mothers were unskilled workers (94 [60.3%] and 127 [81.4%], respectively). See Table 2.

3.3. Gender differences

No significant differences were observed between the two gender groups in terms of age, age at onset of seizures, duration of illness, frequency of seizure pretreatment, frequency of seizures in the preceding 4 weeks, seizure control, adherence to medication, and prevalence of MDD ($p > 0.05$).

Table 1
Sociodemographic characteristics of participants.

Characteristics	N = 156
Gender	N (%)
Male	101 (64.7)
Female	55 (35.3)
Age (years)	
11–12	68 (43.6)
13–14	46 (29.5)
15–17	42 (26.9)
Mean age	13.3
Level of education	N (%)
Nonformal	13 (8.3)
Primary	71 (45.5)
Secondary/tertiary	72 (46.2%)
Ethnicity	
Yoruba	144 (92.3)
Others[a]	12 (7.7)

[a] Others: Delta, Edo, Kogi, Benue, Igbo, and Calabar.

Table 2
Sociodemographics of parents.

Characteristics	Father (n = 156)	Mother (n = 156)
Level of education	N (%)	N (%)
Nonformal	20 (12.8%)	21 (13.5%)
Primary	39 (25.0%)	51 (32.7%)
Secondary/tertiary	97 (62.2%)	84 (53.8%)
Occupation		
Professional occupation	16 (10.3)	12 (7.7)
Managerial and technical occupation	6 (3.8)	3 (1.9)
Skilled manual and nonmanual occupations	17 (10.9)	14 (9.0)
Unskilled occupation	94 (60.3)	127 (81.4)
Partly skilled occupation	23 (14.7)	–
Dead/alive		
Alive	140 (89.7)	154 (98.7)
Dead	16 (10.3)	2 (1.3)
Marital status	Parents	
Married	123 (78.8)	
Divorced/separated	16 (10.3)	
Widowed	17 (10.9)	

3.4. Age category and MDD

Participants' ages were significantly associated with a diagnosis of MDD. The prevalence of MDD increased with increasing age. The older adolescents were more likely to have a diagnosis of MDD ($p = 0.013$).

3.5. Medication adherence, seizure control, and MDD

The occurrence of MDD was significantly associated with medication adherence ($p = 0.045$). More of those with poor (low) medication adherence were observed to have a higher occurrence of MDD (38.0%) compared with those with medium adherence (19.7%) and high adherence (20.8%). See Table 4.

Seizure control ($p = 0.03$) was observed to be significantly associated with the occurrence of MDD among the participants as illustrated in Table 4.

Table 3
Clinical characteristics of participants.

Characteristics	Frequency (N = 156)
Type of seizures	N (%)
Generalized tonic–clonic	118 (75.6)
Others[a]	38 (24.4)
Duration of illness (years)	N (%)
Less than 5 years	44 (28.2)
5–10 years	77 (49.4)
More than 10 years	35 (22.4)
Age at onset of seizure (years)	N (%)
Below 5 years old	78 (50%)
5–10 years old	54 (34.6)
Above 10 years old	24 (15.4)
Frequency of seizures (before treatment)	N (%)
At least once daily	84 (53.8)
At least once weekly but less than once daily	33 (21.2)
At least once monthly but less than once weekly	39 (25.0)
Frequency of seizures (last 4 weeks)	N (%)
More than once weekly	22 (14.1)
At least once monthly but less than once weekly	45 (28.8)
None	89 (57.1)
Adherence	N (%)
High adherence	24 (15.4)
Medium adherence	61 (39.1)
Poor/low adherence	71 (45.5)
Seizure control	
Good seizure control	33 (21.2%)
Poor seizure control	123 (78.8%)

[a] Others: complex partial, simple partial, absence, atonic, and secondarily generalized.

Table 4
Seizure variables and major depressive disorder.

Variable	Depression n (%)		χ^2	p
	No N = 112	Yes N = 44		
Gender				
Male	77 (76.2)	24 (23.8)	2.79	0.095
Female	35 (63.6)	20 (36.4)		
Age group				
11–12	57 (83.8)	11 (16.2)	8.63	0.013*
13–14	29 (63.0)	17 (37.0)		
15–17	26 (61.9)	16 (38.1)		
Level of education				
Nonformal	8 (61.5)	5 (38.5)	4.71	0.095
Primary	57 (80.3)	14 (19.7)		
Secondary/tertiary	47 (65.3)	25 (34.7)		
Ethnicity				
Yoruba	105 (72.9)	39 (27.1)	1.16	0.32
Others*	7 (58.3)	5 (41.7)		
Living status: father				
Dead	8 (50.0)	8 (50.0)	–	0.07[a]
Alive	104 (74.3)	36 (25.7)		
Living status: mother				
Dead	1 (50.0)	1 (50.0)	–	0.49[a]
Alive	111 (72.1)	43 (27.9)		
Level of education: father				
Nonformal/Arabic	10 (50.0)	10 (50.0)	5.48	0.065
Primary	30 (76.9)	9 (23.1)		
Secondary/tertiary	72 (74.2)	25 (25.8)		
Level of education: mother				
Nonformal	14 (66.7)	7 (33.3)	0.92	0.63
Primary	39 (76.5)	12 (23.5)		
Secondary/tertiary	59 (70.2)	25 (29.8)		
Occupation of father				
Professional	10 (8.9)	6 (13.6)	3.72	0.45
Managerial and technical	5 (4.5)	1 (2.3)		
Skilled manual and nonmanual	15 (13.4)	2 (4.5)		
Unskilled	65 (58.0)	29 (65.9)		
Partly skilled	17 (15.2)	6 (13.6)		
Occupation of mother				
Professional	8 (7.1)	4 (9.1)	4.40	0.22
Managerial and technical	1 (0.9)	2 (4.5)		
Skilled manual and nonmanual	8 (7.1)	6 (13.6)		
Unskilled	95 (84.8)	32 (72.7)		
Partly skilled	–	–		
Parents' marital status				
Married	89 (72.4)	34 (27.6)	4.95	0.084
Separated	14 (87.5)	2 (12.5)		
Widowed	9 (52.9)	8 (47.1)		
Medication adherence				
Low	44 (62.0)	27 (38.0)	6.22	0.045*
Moderate	49 (80.3)	12 (19.7)		
High	19 (79.2)	5 (20.8)		
Seizure control				
Poor	83 (67.5)	40 (32.5)	5.35	0.03 *
Good	29 (87.9)	4 (12.1)		
Seizure type				
Generalized tonic–clonic	89 (75.4)	29 (24.6)	3.15	0.076
Others	23 (60.5)	15 (39.5)		
Age at onset of seizures				
Below 5 years old	54 (69.2)	24 (30.8)		
5–10 years old	38 (70.4)	16 (29.6)	1.89	0.39
Above 10 years old	20 (83.3)	4 (16.7)		
Duration of illness				
Less than 5 years	30 (68.2)	14 (31.8)		
5–10 years	65 (84.4)	12 (15.6)	15.66	<0.001*
More than 10 years	17 (48.6)	18 (51.4)		
Frequency of seizures in the last 4 weeks				
More than once weekly	8 (36.4)	14 (63.6)	21.68	<0.001*
At least once monthly but less than once weekly	29 (64.4)	16 (35.6)		
None	75 (84.3)	14 (15.7)		

* Statistically significant at $p < 0.05$.
[a] Fisher's exact test.

3.6. Duration of illness, frequency of seizures in the preceding 4 weeks, and MDD

The prevalence of MDD was observed to increase as the duration of illness increased among participants, and this was significant ($p < 0.001$) (Table 4). The prevalence of a major depressive disorder was also significantly associated with seizure frequency in the preceding 4 weeks ($p < 0.001$); those with seizures occurring more than once weekly were more likely to have an episode of a major depressive disorder compared with others.

3.7. Multivariate analysis

Those with a frequency of seizures occurring more than once weekly in the preceding 4 weeks prior to assessment were 16 times more likely to have MDD compared with those with no seizures. This was statistically significant (95% C.I. [4.13, 65.43], $p < 0.001$). Those with seizures occurring at least once monthly in the preceding 4 weeks were more than three times more likely to have MDD compared with those with none in the last 4 weeks (95% C.I. [1.27, 9.17], $p = 0.02$) (Table 5). Participants with a duration of illness more than 10 years were more than 4 times more likely to have MDD compared with those with an illness duration of 5–10 years ($p = 0.01$, 95% C.I. [0.07, 0.70]).

4. Discussion

Our results show a point prevalence of 28.2% for MDD among adolescents with epilepsy being treated at the child and adolescent clinic of this Nigerian Neuropsychiatric Hospital.

The age of participants, poor seizure control, poor medication adherence, longer duration of illness, and increased frequency of seizures in the preceding 4 weeks were associated with a diagnosis of MDD among the participants. Similarly, the duration of illness and frequency of seizures in the preceding 4 weeks were seen to be independent predictors of MDD among participants.

Table 5
Logistic regression analysis for predictors of major depressive disorder in adolescent patients with epilepsy.

Variable	B	S.E.	Wald	Odds ratio	95% C.I.	p-Value
Seizure control						
Poor seizure control	0.33	0.68	0.24	1.4	0.37, 5.27	0.63
Good seizure control (ref)	1.0					
Adherence						
Low adherence	0.41	0.66	0.38	1.5	0.41, 5.45	0.54
Medium adherence	−0.34	0.69	0.24	0.71	0.18, 2.77	0.63
High adherence (ref)	1.0					
Duration of illness						
Duration less than 5 years	−0.5	0.55	0.82	0.61	0.21, 1.79	0.37
Duration between 5 and 10 years	−1.52	0.60	6.5	0.22	0.07, 0.70	0.01*
Duration longer than 10 years (ref)	1.0					
Frequency of seizures in the preceding 4 weeks						
More than once weekly	2.8	0.71	15.78	16.4	4.13, 65.43	<0.001*
At least once monthly	1.2	0.5	5.95	3.42	1.27, 9.17	0.02*
None (ref)	1.0					
Age group						
11–12 years	−1.20	0.65	3.44	0.3	0.08, 1.07	0.06
13–14 years	−0.15	0.55	0.08	0.86	0.29, 2.51	0.78
15–17 years (ref)	1.0					

* $p < 0.05$.

4.1. Prevalence of major depressive disorder

We reported a point prevalence of 28.2% for MDD among the participants in the current study. This is very high considering that the prevalence of MDD among adolescents in the general population in Nigeria is about 6.9% [43]. The prevalence obtained in our study is, however, comparable with the prevalence estimate of 28.43% found in a study by Adewuya and Ola where a diagnostic instrument (diagnostic interview schedule for children (version iv)) was used to assess the prevalence of depressive disorder among adolescents with epilepsy in a South West Nigerian neuropsychiatric hospital [44]. Participants were between 12 and 18 years of age, and they further reported a predominance of males, a result similar to our results. Our findings differ from the 33% prevalence reported by Caplan et al. among children with epilepsy. In their study, patients were much younger (5–16 years), recruited from both community and tertiary centers, and while it included a control group, the study measured depression comorbid with anxiety disorder.

4.2. Correlates of depression

Similar to the results of other studies among children and adolescents with epilepsy, we observed an age-related increase in the prevalence of depression among participants [19,45]. This differs from the results of a study in Turkey among children and adolescents with epilepsy [46]. Differences in methodology and ages of participants may be responsible for this. For instance, participants in our study and the study by Oguz et al. were much older than the participants in the study by Baki et al.

A larger proportion of those with poor medication adherence were observed to have MDD, a result similar to the findings in another study [47,48]. This suggests that with poor adherence, seizures may be more frequent and poorly controlled, a factor that has been associated with depression in epilepsy in other studies [17,49].

Consistent with results from other studies, seizure control was associated with the presence of MDD in this study [45,49,50]. This may be a reaction to the experience of having little or no control over their illness [51]. Furthermore, the social constraints and stigma associated with uncontrolled seizures may explain the presence of MDD in those with poorly controlled seizures [51,52].

A longer duration of illness was significantly associated with a major depressive disorder in line with findings from other studies [45,47,53]. Fatoye et al. [53] in a study of 52 adult patients with epilepsy and matched controls in a Nigerian hospital reported a significant association between the duration of illness greater than 10 years and the presence of a depressive symptom, a result very similar to the findings in this study. However, this result is dissimilar to what was reported in a study among adolescents with epilepsy in Turkey where the researchers reported no association between the duration of illness and the presence of a depressive disorder. The authors suggested that the small sample size may be responsible for the discrepancy in their findings [46]. Patients with a longer duration of illness may have more intractable seizures resulting in a sense of hopelessness, a factor linked with depression.

In keeping with the literature, seizure frequency in the preceding 4 weeks was significantly associated with MDD [44,45]. In contrast to this, Attarian et al. in a study among patients with epilepsy seen in an outpatient clinic in the US reported no association between monthly seizure frequency and depression among participants [54]. Differences in methods of assessment and criterion definitions may be a plausible explanation for this discrepancy. Our finding is not surprising, though it is assumed that those with a higher frequency of seizures in the preceding 4 weeks have poor seizure control; these patients are more likely to experience physical and mental distress and are, thus, more likely to present with depressive symptoms [55].

We found no significant gender difference in the occurrence of MDD among the participants, a result similar to what was reported in other

studies among patients with epilepsy [39,56] However, in a Canadian community health survey, it was reported that females with epilepsy were more likely to have depression [57].

The strength of this study lies in the fact that medication adherence was investigated in relation to depression and other seizure variables in adolescents. This is the first study in this environment to investigate this relationship to the best of the researchers' knowledge. Another strength is the relatively robust sample size.

Limitations of this study include the use of a self-report measure in determining medication adherence, a process known to overestimate a patient's compliance [58]; this could have biased the findings in the study.

In conclusion, our results show that there is a high prevalence of MDD among adolescents with epilepsy. We also found that seizure control, medication adherence, frequency of seizures in the preceding 4 weeks, and duration of illness are significant factors for the occurrence of MDD in adolescents with epilepsy.

We recommend that interventions be tailored towards ensuring good seizure control and that strategies for encouraging optimal medication adherence in such adolescents be developed and validated. This should also include assessing for and instituting prompt treatment of depression in these adolescents when seen at the clinic.

Acknowledgments

The authors acknowledge Somoye Edward for providing editorial assistance.

Conflict of interest

None.

References

[1] World Health Organization. Epilepsy: epidemiology, aetiology and prognosis. Fact sheet, 165; 2001.
[2] Sander J. The epidemiology of epilepsy revisited. Curr Opin Neurol 2003;16:165–70.
[3] Jilek-Aall L. Morbus sacer in Africa: some religious aspects of epilepsy in traditional cultures. Epilepsia 1999;40(3):382–6.
[4] Akinsulore A, Adewuya A. Psychosocial aspects of epilepsy in Nigeria: a review. Afr J Psychiatry 2010;13(5):351–6.
[5] Osuntokun BO, Adeuja AOG, Nottidge VA, Bademosi O, Olumide A, Ige O, et al. Prevalence of the epilepsies in Nigerian Africans: a community-based study. Epilepsia 1987;28(3):272–9.
[6] de Boer HM, Mula M, Sander JW. The global burden and stigma of epilepsy. Epilepsy Behav 2008;12(4):540–6.
[7] Nuhu F, Yusuf A, Sheikh T, Eseigbe E. Poor academic performance among adolescents with epilepsy in Kaduna, Northern Nigeria: a case–control study. S Afr J Child Health 2012;6(4):132–4.
[8] Ibekwe RC, Ojinnaka NC, Iloeje SO. Factors influencing the academic performance of school children with epilepsy. J Trop Pediatr 2007;53(5):338–43.
[9] Baker GA. The psychosocial burden of epilepsy. Epilepsia 2002;43(s6):26–30.
[10] Sperling MR, Feldman H, Kinman J, Liporace JD, O'Connor MJ. Seizure control and mortality in epilepsy. Ann Neurol 1999;46(1):45–50.
[11] Forsgren L, Hauser WA, Olafsson E, Sander JWAS, Sillanpaa M, Tomson T. Mortality of epilepsy in developed countries: a review. Epilepsia 2005;46:18–27.
[12] Pugliatti M, Beghi E, Forsgren L, Ekman M, Sobocki P. Estimating the cost of epilepsy in Europe: a review with economic modeling. Epilepsia 2007;48(12):2224–33.
[13] Callenbach P, Westerndorp R, Geerts A, Arts W, Peeters E, Van Donselaar C, et al. Mortality risk in children with epilepsy: the Dutch study of epilepsy in childhood. Pediatrics 2001;107:1259–63.
[14] Leonardi M, Ustun TB. The global burden of epilepsy. Epilepsia 2002;43:21–5.
[15] Berg AT, Shinnar S, Levy SR, Testa FM, Smith- Rapaport S, Beckerman B, et al. Defining early seizure outcomes in pediatric epilepsy: the good, the bad and the in-between. Epilepsy Res 2001;43(1):75–84.
[16] Eatock J, Baker G. Managing patient adherence and quality of life in epilepsy. Neuropsychiatr Dis Treat 2007;3(1):117–31.
[17] Ojuawo A, Joiner KT. Childhood epilepsy in Ilorin, Nigeria. East Afr Med J 1997;74(2):72–5.
[18] Hovinga CA, Asato MR, Manjunath R, Wheless JW, Phelps SJ, Sheth RD, et al. Association of non-adherence to antiepileptic drugs and seizures, quality of life, and productivity: survey of patients with epilepsy and physicians. Epilepsy Behav 2008;13(2):316–22.
[19] Caplan R, Siddarth P, Gurbani S, Hanson R, Sankar R, Shields WD. Depression and anxiety disorders in pediatric epilepsy. Epilepsia 2005;46(5):720–30.
[20] Tellez-Zenteno J, Patten S, Jette N, Williams J, Wiebe S. Psychiatric comorbidity in epilepsy: a population-based analysis. Epilepsia 2007;48(12):2336–44.
[21] Gureje O. Interictal psychopathology in epilepsy. Prevalence and pattern in a Nigerian clinic. Br J Psychiatry 1991;158(5):700–5.
[22] Alfstad KA, Clench-Aas J, Van Roy B, Mowinckel P, Gjerstad L, Lossius MI. Psychiatric symptoms in Norwegian children with epilepsy aged 8–13 years: effects of age and gender? Epilepsia 2011;52(7):1231–8.
[23] Kanner AM, Palac S. Depression in epilepsy: a common but often unrecognized comorbid malady. Epilepsy Behav 2000;1(1):37–51.
[24] Currie S, Heathfield KW, Henson RA, Scott DF. Clinical course and prognosis of temporal lobe epilepsy. A survey of 666 patients. Brain 1971;94(1):173–90.
[25] Okubadejo N, Danesi M, Aina O, Ojini F, Adeyemi J, Olorunshola D. Prospective case–control study of interictal depression and suicidal ideation in Nigerians with epilepsy. Niger Postgrad Med J 2007;14(3):204–8.
[26] Boylan L, Flint L, Labovitz D, Jackson S, Starner K, Devinsky O. Depression but not seizure frequency predicts quality of life in treatment-resistant epilepsy. Neurology 2004;62(2):258–61.
[27] Johnson EK, Jones JE, Seidenberg M, Hermann BP. The relative impact of anxiety, depression, and clinical seizure features on health-related quality of life in epilepsy. Epilepsia 2004;45(5):544–50.
[28] Mosaku K, Fatoye F, Komolafe M, Lawal M, Ola B. Quality of life and associated factors among adults with epilepsy in Nigeria. Int J Psychiatry Med 2006;36(4):469–81.
[29] Gbiri CA, Akingbohungbe AD. Determinants of quality of life in Nigerian children and adolescents with epilepsy: a hospital-based study. Disabil CBR Incl Dev 2012;22(3):89–96.
[30] DiMatteo M, Lepper H, Croghan T. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160(14):2101–7.
[31] Jackson M, Turkington D. Depression and anxiety in epilepsy. J Neurol Neurosurg Psychiatry 2005;76(Suppl. 1):i45–7.
[32] Kanner AM. Depression in epilepsy: prevalence, clinical semiology, pathogenic mechanisms, and treatment. Biol Psychiatry 2003;54:388–98.
[33] Sanya E, Kolo P, Adekeye A, Mustapha K, Ademiluyi B, Ajayi K. Cost of epilepsy care in a Nigerian tertiary hospital. Niger Postgrad Med J 2013;20(4):266–71.
[34] Simms V, Atijosan O, Kuper. H, Nuhu A, Rischewski D, Lavy C. Prevalence of epilepsy in Rwanda: a national cross-sectional survey. Trop Med Int Health 2008;13(8):1047–53.
[35] Nubukpo P, Preux PM, Houinato D, Radji A, Grunitzky EK, Avode G, et al. Psychosocial issues in people with epilepsy in Togo and Benin (West Africa) I. anxiety and depression measured using Goldberg's scale. Epilepsy Behav 2004;5(5):722–7.
[36] Imam I, Talabi O, Sanya E, Ogunniyi A. The quality of life of chronic epileptic patients in Ibadan, Nigeria. Afr J Med Sci 2003;32:367–9.
[37] Nazziwa R, Mwesige AK, Obua C, Ssenkusu JM, Mworozi E. Adherence to antiepileptic drugs among children attending a tertiary health unit in a low resource setting. Pan Afr Med J 2014;1744.
[38] Kish L. Survey sampling. New York: Wiley; 1965.
[39] Mensah SA, Beavis JM, Thapar AK, Kerr M. The presence and clinical implications of depression in a community population of adults with epilepsy. Epilepsy Behav 2006;8:213–9.
[40] Elwes RDC, Johnson AL, Shorvon SD, Reynolds EH. The prognosis for seizure control in newly diagnosed epilepsy. N Engl J Med 1984;311(15):944–7.
[41] Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens 2008;10(5):348–54.
[42] Kaufman J, Birmaher B, Brent D, Ryan N, Rao U. Schedule for affective disorders and schizophrenia for school-age children — present and lifetime version (K-SADS-PL): initial reliability and validity data. J Am Acad Child Adolesc Psychiatry 1997;36(7):980–8.
[43] Adewuya A, Ola B, Aloba O. Prevalence of major depressive disorders and a validation of the Beck Depression Inventory among Nigerian adolescents. Eur Child Adolesc Psychiatry 2007;16(5):287–92.
[44] Adewuya AO, Ola BA. Prevalence of and risk factors for anxiety and depressive disorders in Nigerian adolescents with epilepsy. Epilepsy Behav 2005;6(3):342–7.
[45] Oguz A, Kurul S, Dirik E, Eylul D. Relationship of epilepsy-related factors to anxiety and depression scores in epileptic children. J Child Neurol 2002;17(1):37–40.
[46] Baki O, Erdogan A, Kantarci O, Akisik G, Kayaalp L, Yalcinkaya C. Anxiety and depression in children with epilepsy and their mothers. Epilepsy Behav 2004;5(6):958–64.
[47] Ogunrin OA, Obiabo YO. Depressive symptoms in patients with epilepsy: analysis of self-rating and physician's assessment. Neurol India 2010;58(4):565–70.
[48] Ettinger AB, Good MB, Manjunath R, Edward Faught R, Bancroft T. The relationship of depression to antiepileptic drug adherence and quality of life in epilepsy. Epilepsy Behav 2014;36:138–43.
[49] Dias R. Depression in epilepsy is associated with lack of seizure control. Epilepsy Behav 2010;19:445–7.
[50] Seminario NA, Farias ST, Jorgensen J, Bourgeois JA, Seyal M. Determination of prevalence of depression in an epilepsy clinic using a brief DSM-IV-based self-report questionnaire. Epilepsy Behav 2009;15(3):362–6.
[51] de Souza EAP, Salgado PCB. A psychosocial view of anxiety and depression in epilepsy. Epilepsy Behav 2006;8(1):232–8.
[52] Ekinci O, Titus JB, Rodopman AA, Berkem M, Trevathan E. Depression and anxiety in children and adolescents with epilepsy: prevalence, risk factors, and treatment. Epilepsy Behav 2009;14(1):8–18.
[53] Fatoye F, Mosaku KS, Komolafe M, Adewuya AO. Interictal anxiety and depression symptoms in Nigerians with epilepsy: a controlled study. Epilepsy Behav 2006;9(2):312–6.
[54] Attarian H, Vahle V, Carter J, Hykes E, Gilliam F. Relationship between depression and intractability of seizures. Epilepsy Behav 2003;4(3):298–301.

[55] Alwash R, Hussein M, Matloub F. Symptoms of anxiety and depression among adolescents with seizures in Irbid, northern Jordan. Seizure 2000;9:412–6.
[56] Onwuekwe I, Ekenze O, Bzeala-Adikaibe O, Ejekwu J. Depression in patients with epilepsy: a study from Enugu, South East Nigeria. Ann Med Health Sci Res 2013;2(1):10–3.
[57] Fuller-Thomson E, Brennenstuhl S. The association between depression and epilepsy in a nationally representative sample. Epilepsia 2009;50:1051–8.
[58] Gaebel W. Towards the improvement of compliance: the significance of psychoeducation and new antipsychotic drugs. Int Clin Psychopharmacol 1997;12(Suppl. 1):S37–42.