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RESEARCH

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Prevalence and associated factors of depression among people with epilepsy in Ethiopia: a cross-sectional study

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Abstract

Background: Depression is the most common comorbid psychiatric disorders that affect people with epilepsy. We aim to determine the prevalence of depression and associated factors among people with epilepsy.

Results: The prevalence of depression was found to be 34.8%. Unable to read and write (AOR = 0.400, 95% CI: 0.162, 0.986), long duration of the medication intake at least for 11 years (AOR = 3.715, 95% CI: 1.498, 9.212), absence of improvement with antiepileptic drugs (AOR = 0.216, 95% CI: 0.101, 0.460), feeling of perceived stigma (AOR = 0.244, 95% CI: 0.129, 0.462), stress symptoms (AOR = 0.452, 95% CI: 0.220, 0.928), were significantly associated with depression.

Conclusions: Prevalence of depression among people with epilepsy was high. Therefore, early screening and management is mandatory. This is the first research study, to our knowledge, that evaluates the association between substance use, sexual and physical abuse among people with epilepsy with depression. Therefore, future research needs to investigate the association.

Keywords: Comorbidity, Depression, Epilepsy, People with epilepsy, Mekelle

Background

Globally from the total people who suffer from epilepsy, ≈ 15–60% also experienced depression and/or anxiety disorder, 80% of them existed in low-income regions and these comorbidities are often underrecognized and undertreated [1–3]. Depression is characterized by loss of interest, depressed mood, disturbance of sleep, the problem in appetite and psychomotor activity, difficulty concentrating or making decisions, guilty or sinful feeling, easily tiredness and recurring thoughts of death or suicide [4]. There are several possible causes of depression in patients with epilepsy, including antiepileptic drugs [5], and it is often difficult to determine whether psychopathological manifestations, especially depressive symptoms, are due to drug therapy or to multiple other factors. The burden of comorbidity in people with epilepsy imposes significant burdens on patients and their families [6]. Several diseases, including depression, anxiety...& others are up to eight times more common in people with epilepsy than in the general population and negatively affect the quality of life [6, 7]. People with epilepsy (PWE) have been experienced more psychological disorders than the general population [8].

Psychiatric comorbidities, especially depression [9–12] and anxiety disorders, seem to be the most frequent complications of epilepsy and reduce the quality of life beyond seizures itself and affect the clinical course of epilepsy [6, 13–16]. A population-based study in the United Kingdom indicated that 30.6% of PWE have depression [1]. A Canadian study using data from the national population health survey demonstrated an association between epilepsy and lifetime major depression not only seriously affects PWE's health-related quality of life but

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also contributes to the high suicide rates among PWE compared with the general population, making it potentially life-threatening [2].

A systematic desk review and an electronic web-based search conducted in the United States show that the prevalence of depression among patients with epilepsy was 32.71% and receiving polytherapy is the factor associated with epilepsy [17]. A systematic review study conducted in different countries of Asia revealed that 25% of PWE suffer from depression [18]. A hospital-based cross-sectional study conducted in the northeastern part of India prevailed that 18% of PWE experiences depression and the Presence of partial seizures, frequent seizures, long duration of epilepsy and poor compliance to the antiepileptic drug were significantly associated with depression [19]. Another institutional-based cross-sectional study conducted on patients attending psychiatric outpatient epilepsy clinic in the psychiatry department of Amritsar city in India shows that 40% of the participant suffers from depression (with 22.5% severe depression and 17.5% moderate depression) and also being female and on antiepileptic medication also factors associated with depression [20].

A community-based cross-sectional study among people with epilepsy in Brazil shows that the prevalence of depression was 24.7% and low educational status, lifetime suicidal thought and suicidal attempt were factors significantly associated with depression [21]. A study conducted in Turkey using the beck depression inventory scale on 41 PWE show that 34.7% were suffering from depression, seizure frequency was the independent predictor of depression [22].

A cross-sectional study conducted in Rwanda shows that 26.8% of the participants were experienced depression [23]. Institution-based quantitative cross-sectional study shows that the prevalence of depression was 45.2% and Lower educational status, early onset of illness, seizure frequency, poly-pharmacy and difficulties of adherence to antiepileptic drugs (AEDs) were factors statistically associated with depression [24]. A study conducted in Ethiopia shows that the prevalence of depression among PWE was 43% and Occupational status and perceived stigma were significantly associated with it [25].

An institution-based cross-sectional study conducted at Emanuel Mental Specialized and Tikur Anbesa Hospitals shows that 43.7% of the participant were experienced depression and being female, single, having a feeling of perceived stigma and antiepileptic drugs nonadherence were factors significantly associated with it [26]. Another cross-sectional study conducted in selected public health facilities shows that 51.2% experience depression and low educational status, Seizure frequencies ≥ 3 per month, Age onset of epilepsy ≤ 11 years, low antiepileptic drug adherence and poor knowledge about epilepsy were the independent predictors of depression [27]. A study conducted in Ethiopia shows that 17.4% of PWE take alcohol [28] but there is a limited study revealing association substance use with depression among PWE.

People with epilepsy (PWE) will experience depression at a higher rate, mainly two–threefold when compared to a general population [16]. About 55% lifetime prevalence for depression was unrecognized and untreated in many patients with epilepsy [29]. In Ethiopia, other factors like sexual and physical abuse also were not addressed. As a result, little is known about the magnitude and associated factors of depression among epileptic people. Therefore, This study was conducted to study the prevalence of depression and its associated factor among patients with epilepsy in Ethiopia, 2019.

Methods

Participants

People with epilepsy aged 12 years and over were recruited as participants via systematic sampling between April 15/2019–May 30/2019 at the neurologic outpatient department of Ayder Comprehensive Specialized Hospital and Mekelle General Hospital**.**

Study design

An institutional-based cross-sectional study was conducted.

Eligibility criteria

Newly diagnosed epileptic patients and those who were in regular follow-up treatment at the age of 12 years and above were included in the study. However, outpatients unable to speak & hear, and those PWE aged from 12 to 17 years come alone was excluded from the study.

Sample size and sampling procedure

Sample size

The sample size of 296 was determined based on the formula for a single population proportion by assuming the prevalence of depression among epileptic patients was 43.8% [26], confidence level 95%, margin of error 5 and 5% for non-response rate.

Sampling technique and procedure

A systematic random sampling technique was used to select participants from both hospitals. The *k* value was calculated by dividing the total population to the total sample size ($1103/296 \approx 3$). The data was collected in a 6-week duration; the total patient follows in one month was obtained by calculating the average of the previous year of 12 months. The required sample size was

proportionally allocated for each hospital. Finally, every 3rd person the data collector was selected the patient from the respected hospital.

Data collection

Data were collected by trained 2 BSc degree health professionals using an interviewer-administered pre-tested questionnaire. The questionnaire consisted of the sociodemographic characteristics (age, sex, marital status, educational level and others) and questions that address the factors associated with depression. Depression was assessed using patient health questionnaires (PHQs).

Data collection procedure

PHQ-9 is one of the most widely used self-report measures of depression. It is a reliable and valid measure of depression in a range of cultural groups and has been validated with psychiatric and non-psychiatric populations with Cronbach's α range from 0.84 to 0.915 in most of the countries including Africa [30, 31]. In Ethiopia, it was also validated in Afaan Oromo Cronbach's alpha, 0.84 [32]. It consists of 9 items, and each item four-point Likert scores (not at all '0'up to nearly every day '3') to describe a specific behavioral manifestation of depression. A score ≥ 10 is considered as having depression.

Perceived stigma was measured using the KSSE which was developed and validated in Kilifi, Kenya with high internal consistency, Cronbach's α of 0.91 [22] and adopted to Ethiopia [33, 34]. It is a simple three-point Likert scoring system scored as "not at all" (score of 0), "sometimes" (score of 1), and "always" (score of 2). It has fifteen items and a total score was calculated by the addition of all item scores. The lowest score was 0 and the highest was 30. The 66th percentile was used to categorize the scores [22, 33–35].

Social support was assessed by Oslo 3-item social support scale, Oslo 3-item social support scale is a 3-item questionnaire commonly used to asses' social support. The scale asks about the ease of getting help from neighbors, the number of people the subjects can count on when there are serious problems, and the level of concern people show in what the subject is doing. A sum-index is obtained by adding the raw scores of the three items. The range is 3–14. The scores are interpreted as; 3–8 (poor social support), 9–11 (moderate social support), and 12–14 (strong social support) [36, 37].

For screening of substance use a modified form of ASSIST, developed by the World Health Organization (WHO) an international group of substance abuse researchers to detect and manage substance use and related problems in primary and general medical care settings was used.

To assess anxiety and stress GAD-7 and modified form of DASS, respectively, were used. GAD-7 is mostly used tool for screening of anxiety by remembering the past 2 weeks. It also contains 7 items with a four Likert item. The tool is cross-culturally validated with the internal consistency of Cronbach's $\alpha = 0.915$ [38]. A score greater than or equal to 10 is considered as having moderate to severe anxiety [39].

The DASS 21 is a 21-item self-report questionnaire designed to measure the severity of a range of symptoms common to both Depression and Anxiety stress. However, for this study, I used the modified form of DASS-21 contains 7 items only, which scored from 0 (did not apply to me at all over the last week) to 3 (applied to me very much or most of the time over the past week) with the main focus on to assess the severity of the core symptoms Stress only. This tool is cross-culturally valid measures in China with a Cronbach alpha of = 0.86 and adopted in Ethiopia [40]. A score > 9 is considered as having moderate to severe stress. For that PHQ-9, GAD-7 and the modified form of DASS-21 scores > 9 and the patients become voluntary, they were linked to the psychiatry outpatient department for further screening and management.

Operational definitions

Anxiety: According to Generalized Anxiety Disorder-7 scale people with epilepsy, those who scored > 9 were concluded to have anxiety [39].

Comorbidity: is defined as greater than the coincidental presence of two disorders in the same person without inferring a causal relation [41].

Depression: According to Patient Health Questionnaire-9 scale people with epilepsy, those who score > 9 was concluded to have depression [30, 32, 39].

Nonstigmatized patient: People with epilepsy who score less than or equal to the 66th percentile of the Kilifi stigma scale of epilepsy [22, 33–35].

People with epilepsy: People who experienced At least two unprovoked (or reflex) seizures occurring greater than 24 h apart [42].

Perceived stigmatized patient: People with epilepsy who score above the 66th percentile of the Kilifi stigma scale of epilepsy [22, 33–35].

Physical abuse: Those acts commission by other persons that cause actual physical harm or have the potential for harm on people with epilepsy [43].

Sexual abuse: Those acts where another person uses an epileptic patient for sexual gratification forcefully [43].

Stress: According to the modified form of depression, anxiety & stress scale people with epilepsy, those who scored > 9 was concluded to have stress [40].

Suicidal ideation: After starting the illness any thoughts about self-harm with deliberate consideration or planning of possible techniques of causing one's own death [4].

Suicidal attempt: After starting epilepsy any attempt to end one's own life [44].

Data quality assurance

To keep the quality of the study's data, the questionnaires were translated into Tigrigna (local language) by professional Tigrigna speaker individuals who had experience and knowledge in mental illness and back-translation to English was performed by a senior specialist who had clinical experiences in institutions for its simplicity and clarity for use.

Two weeks before the actual data collection pre-test was carried out on 5% of the total sample of people with epilepsy in Qiuha General Hospital to ascertain clarity, feasibility, and applicability of the study tools, to estimate the proper time required for answering the questionnaire, and to identify obstacles that may be faced during data collection. The sample in the pre-test was excluded from the entire sample of research work.

In addition, the principal investigator gave a 1-day training for data collectors on the techniques of data collection. Throughout the whole process of data collection confidentiality of the participants was maintained. The collected data were checked daily for completeness.

Data analysis procedure

Data were entered and cleaned using Epi-info version 4.4.3.1 and transferred to Statistical Package for Social Sciences version 25 (SPSS-25) for further analysis. Descriptive statistical analysis was used to estimate the frequencies and percentages of the variables. Binary logistic regression and adjusted odds ratio with a 95% confidence interval was used to identify the associated factors of the outcome variable. All factors with a p value < 0.30 in the bivariate logistic regression were directly entered into the multivariate model. Finally, all p value less than 0.05 will be considered statistically significant.

Ethical consideration

Ethical approval was obtained from the ethical review board of Mekelle University, College of Health Science. A verbal and then written consent form was taken from each participant. For those aged from 12 to 17, written assent was taken from their relatives that s/he comes with them. An information sheet was attached to each questionnaire to provide study details & to tell the rights of the participants. All the collected data were used for this study only. Hard copy completed questionnaires and computer data was kept confidentially.

Results

A total of 296 patients with epilepsy were recruited in the study. The overall response rate was 100%.

Sociodemographic characteristics

All of the respondents were in the age group of 13–65 years with the mean, age of 31.6 ± 13.04.SD. The median and mode age of the respondent was 29 and 24, respectively. Among all participants, 163(55.1%) were male, 186(62.8%) were living in the urban area & geographically 268(90.5) were Tigran in ethnicity. Majority of the participant 239(80.7%) were orthodox in religion, 96(32.4%) were unable to read and write, 95(32.1%) were married, 135 (45.6%) had no any specified monthly income and 162(54.7%) were had moderate social support (Table 1).

Description of respondents by clinical factors

From the total 296 respondents, 120 (40.5%) were with onset of epilepsy at the age of 18 and above, 135 (45.6%) were suffering from epilepsy for at least 11 years and 134 (45.3%) were experienced seizure-related physical trauma. 163 (55.1%) of the participant were reported that they experience at most 2 seizures in a month and 82 (27.7%) experienced seizure frequency 3–5 times per month. Majority of the respondents 216 (73.0%) were on monotherapy, 88 (28.7%) were taken the medication for more than 11 years and 243 (82.1%) were had good improvement with medication (Table 2).

Description of respondents patient's contagion belief, and causal belief of epilepsy

Regarding the cause of epilepsy, 94 (31.8%) believed that it is caused by walks around garbage, dumps, ashes, walking along a river and 69 (23.3%) were not know. Out of the total participant, 181 (61.1%) were believe that epilepsy is a mental illness, 263 (88.9) were believe that epilepsy is treatable (Table 3).

Depression scores of participants

Regarding the proportion of depression toward each item, most of the participants 213 (71.9%) reported that they trouble falling or staying asleep or sleeping too much, 210 (70.9%) were reported feeling down, depressed or hopeless and 197 (66.6%) also reported that having little interest or pleasure in doing things.

The lowest score of the data was 0 and the highest score was 19. The mean, median and mode the respondent was 7.2, 6, and 5, respectively (Fig. 1).

Table 1 Distribution of study subjects by socio-demographic factors peoples with epilepsy ($n=296$) on follow-up at Ayder comprehensive specialized hospital and Mekelle hospital, Mekelle, Ethiopia, 2019

Variables	Frequency	Percentage
Age		
12–17 years	34	11.5
18–24 years	77	26.0
24–34 years	70	23.6
35–44 years	63	21.3
> 44 years	52	17.6
Sex		
Male	163	55.1
Female	133	44.9
Residency		
Urban	186	62.8
Rural	110	37.2
Ethnicity		
Tigray	268	90.5
Amhara	11	3.7
Afar	16	5.4
Other	1	0.3
Religion		
Orthodox	239	80.7
Catholic	4	1.4
Protestant	4	1.4
Muslim	49	16.5
Educational status		
Unable to read and write	96	32.4
Primary 1–8	84	28.4
Secondary 9–12	48	16.2
Techniques	8	2.7
Diploma	9	3.1
first degree and above	51	17.2
Marital status		
Married	95	32.1
Single	150	50.7
Divorced	22	7.4
Widowed	26	8.8
Other	3	1.0
Employment		
No	41	13.9
Student	69	23.3
Farmer	32	10.8
Housewife	56	18.9
Government	16	5.4
Private	33	11.1
Merchant	24	8.2
Others	25	8.4
Monthly income		
No	135	45.6
301–600	23	7.8
< 300	21	7.1
601–1000	24	8.1
> 1000	93	31.4
Social support		
Low	72	24.3
Moderate	162	54.8
High	62	20.9

PHQs scores above 9 were considered to show the PWE who had depression. Accordingly, the prevalence of depression was found to be 34.8% (Fig. 2).

Factors associated with depression

Bivariate analyses were done between depression and response variables of socio-demographic variables (age, residency, educational status, marital status, employment and social support), Clinical factors (total duration of the illness, seizure frequency, number of AEDs, the side effect of medication, seizure-related trauma, feeling perceived stigma, anxiety symptoms, stress symptoms and history of suicidal attempt) and patients belief factors (contagious belief, heritability belief, perceived as a mental illness and treatability belief) were found to be significantly associated with depression at p value less than 0.3. All individual factors < 0.30 at bivariate analyses were entered to multivariate logistic regression for further analysis.

Accordingly, unable to read and write (AOR = 0.400, 95% CI: 0.162, 0.986), long duration of the medication intake at least for 11 years (AOR = 3.715, 95% CI: 1.498, 9.212), poor improvement with medication (AOR = 0.216, 95% CI: 0.101, 0.460), feeling of perceived stigma (AOR = 0.244, 95% CI: 0.129, 0.462), stress symptoms (AOR = 0.452, 95% CI: 0.220, 0.928), were significantly associated with depression (Table 4).

Discussion

This study aimed to assess the prevalence of depression and associated factors among people with epilepsy on regular follow-up at Ayder comprehensive specialized hospitals and Mekelle hospital. Overall, the prevalence of depression was found to be 34.8%. (95% CI: 29.3, 40.2).

This result was in line with the other study conducted in the USA (32.7%), in the United Kingdom (30.6%), in India (40%), [1, 17, 20]. The prevalence of depression (34.8%) was in line with a study conducted in Turkey among people with epilepsy (34.7%) [45]. The prevalence of depression among PWE in this study is greater

Table 2 Distribution of study subjects by clinically related factors of peoples with epilepsy ($n=296$) on follow-up at Ayder comprehensive specialized hospital and Mekelle hospital, Mekelle, Tigray, Ethiopia, 2019

Variables	Frequency	Percentage
Age of onset		
< 6 years	32	10.8
6–11 years	76	25.7
12–17 years	68	23.0
18 and above years	120	40.5
Total duration of the illness		
≤ 1 year	11	3.7
2–5 years	64	21.6
6–10 years	86	29.1
11 years or above	135	45.6
Number of seizures		
≤ 2 per month	163	55.1
3–5 per month	82	27.6
6–10 per 6 months	41	13.9
≥ 11 per year	10	3.4
Seizures-related physical trauma		
No	162	54.7
Yes	134	45.3
Number of AEDs		
Monotherapy	216	73.0
Polytherapy	80	27.0
Length of time with medication		
0–11 months	31	10.5
Less than 2 years	40	13.5
2–5 years	85	28.7
6–10 years	52	17.6
11 or more years	88	29.7
Improvement with medication		
No	53	17.9
Yes	243	82.1
Medication-related side effects		
No	207	69.9
Yes	89	30.1
Lifetime substance use history		
No	220	74.3
Yes	76	25.7
Substance use history in the past 3 months		
No	267	90.2
Yes	29	9.8
Presence of chronic medical illness		
No	250	84.5
Yes	46	15.5
Perceived stigma		
No	193	65.2
Yes	103	34.8
Anxiety		
No	200	67.6
Yes	96	32.4
Stress		
No	227	76.7
Yes	69	23.3
History of physical abused		
No	284	95.9
Yes	12	4.1
History of sexual abused		
No	293	99.0
Yes	3	1.0
Suicidal attempt history		
No	285	96.3
Yes	11	3.7
Presence of suicidal wish		
No	238	80.4
Yes	58	19.6

Table 3 Distribution of study subjects by (causal, contagion, heritability, treatability and mental illness belief) of people with epilepsy ($n=296$) up at Ayder on- follow comprehensive specialized hospital and Mekelle hospital, Mekelle, Tigray, Ethiopia, 2019

Variables	Frequency	Percentage
Cause of epilepsy		
I don't know	69	23.3
Spiritual possession	39	13.2
Evil eye	19	6.4
Family history	32	10.8
Pathogens	6	2.0
Sinful act	37	12.5
Walks around garbage, dumps, ashes, walking along a river ……	94	31.8
Contagious		
No	255	86.1
Yes	41	13.9
Heritable		
No	235	79.4
Yes	61	20.6
Mental illness		
No	115	38.9
Yes	181	61.1
Treatable		
No	33	11.1
Yes	263	88.9
By what means?		
Hole water	1	0.3
Traditional treatment	2	0.6
Modern medicine	222	75.0
Hole water and modern medicine	41	14.0

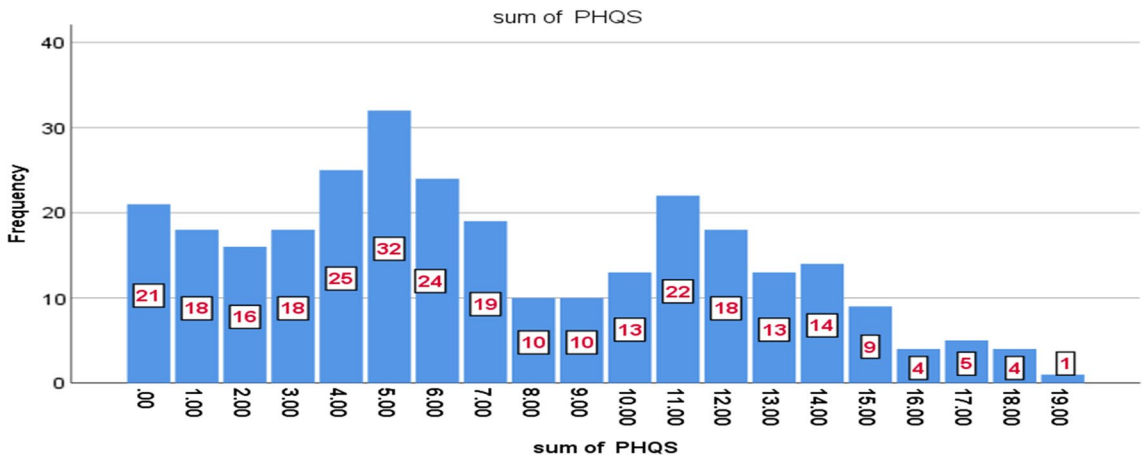

Fig. 1 The frequency of the sum of patient health questionnaire responses to the study depression and associated factors among PWE (n = 296) on follow-up at Ayder comprehensive specialized hospital and Mekelle hospital, Mekelle, Tigray, Ethiopia, 2019

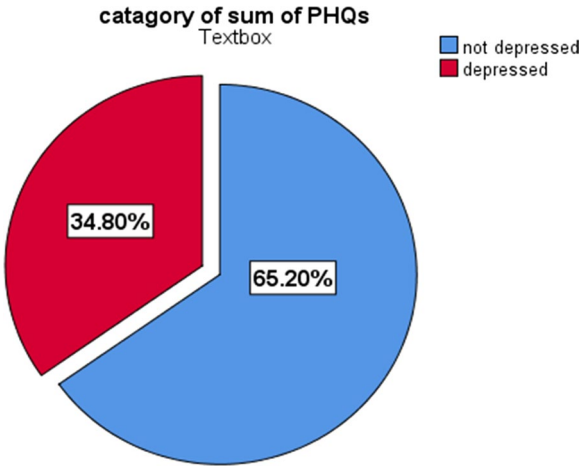

Fig. 2 Prevalence of depression among people with epilepsy (n = 296) on follow-up at Ayder comprehensive specialized hospital and Mekelle hospital, Mekelle, Tigray, Ethiopia, 2019

as compared to other study conducted in India (18%), in Brazil (24.7%), in Asia (25%), in Rwanda (26.8%) and in Nigeria among people with epilepsy [18, 19, 21, 23, 46]. In contrast, the prevalence of depression and anxiety the result of these study (34.8%) is lower than when compared to the study conducted in west Africa Togo (84%) and Benin (85.3%), [46] in Northwest Ethiopia (45.2%), in central Ethiopia (43.7%), in west Shewa (43%), in Bench Maji zone (51.2%) [24–27]. The possible explanations for the variation may be due to the use of different tools; geographical areas sample size and cultures of the study subject (Table 5).

Regarding the associated factors, those who are unable to read and write were more likely to have depression (AOR = 0.400, 95% CI: 0.162, 0.986) than those who have a first degree or above. This study is supported by other studies conducted in Brazil [21], in Northwest Ethiopia [24] in the Bench Maji zone [27]. The possible explanations might be those individuals with lower educational status might face difficulties socioeconomic stressors like unemployment, poverty and economic dependency and may have poor coping strategies to their illness, which in turn to social isolation, poor adherence to their AEDs, school dropout that impaired their cognition and contributes to a poorer psychological adjustment that they face in life.

People with epilepsy who were taking AEDs for at least 11 years were four times more likely to had depression (AOR = 3.715, 95% CI: 1.498, 9.212) than those who were taking less than 11 years. The possible explanation is patients taking antiepileptic medication may become depressed as a result of their treatment. Because patients starting tiagabine may develop symptoms of agitation, withdrawal, and mood disturbance suggestive of depression. The negative effects of antiepileptic drugs on mood should always consider all potential factors. The incidence of depression as a result of antiepileptic drugs. The barbiturates, vigabatrin and topiramate show greater associations with the occurrence of depressive symptoms than other antiepileptic drugs. Patents taking high dosage of zonisamide were experienced 7% mood disorders symptoms. Tiagabine, levetiracetam and felbamate present an intermediate risk, with prevalence of depression of about 4% or lower. Phenytoin, ethosuximide, carbamazepine, oxcarbazepine, gabapentin, sodium valproate, pregabalin and lamotrigine are all associated with low risks for depression [3, 5, 47] (Table 5).

Those people with epilepsy who haven't good improvement with antiepileptic medication were more like to

Table 4 Factors associated with depression in people with epilepsy (bivariate and multivariate analysis) for the study of the prevalence of depression and associated factors among epileptic patients in ACSH & MGH, 2019

Variables	Depression		Bivariate		Multivariate analysis
	No	Yes	*p* value	COR (95%, CI)	AOR (95%, CI)
Age					
12–17 years	23	11	1		
18–24 years	52	25	0.588	1.298 (0.505, 3.338)	1.392 (0.279, 6.953)
24–34 years	37	33	0.502	1.305 (0.600, 2.837)	1.136 (0.301, 4.285)
35–44 years	43	20	**0.025***	2.421 (1.119, 5.238)	2.261 (0.700, 7.305)
> 45 years	38	14	0.573	1.262 (0.561, 2.839)	1.517 (0.523, 4.400)
Sex					
Male	102	61	1		
Female	91	42	**0.294***	1.296 (0.799, 2.103)	1.022 (0.581, 1.795)
Educational status					
Unable to read and write	58	38	0.300	0.723 (0.391, 1.336)	**0.400 (0.162, 0.986)****
Primary 1–8	57	27	0.809	0.916(0.449, 1.869)	0.692 (0.255, 1.877)
Secondary 9–12	30	18	0.566	1.526 (0.360, 6.474)	3.189 (0.615, 16.543)
Techniques	4	4	0.714	0.763 (0.180, 3.237)	0.335 (0.053, 2.106)
Diploma	6	3	**0.090***	0.522 (0.246, 1.106)	0.348 (0.115, 1.055)
First degree and above	38	13	1		1
Employment					
No	25	16	0.655	0.833 (0.375, 1.854)	1.273 (0.472, 3.432)
Student	45	24	0.492	0.710 (0.268, 1.885)	1.695 (0.503, 5.715)
Farmer	22	10	0.705	1.172 (0.516, 2.663)	1.628 (0.584, 4.540)
House wife	32	24	0.744	1.215 (0.377, 3.916)	1.470 (0.361, 5.986)
Governmental	9	7	**0.104***	0.421 (0.148, 1.195)	2.405 (0.107, 1.532)
Private	26	7	0.903	0.937 (0.332, 2.646)	1.971 (0.527, 7.372)
Others/day labor	15	9	**0.213***	0.493 (0.162, 1.500)	0.592 (0.154, 2.279)
Merchant	19	6	1		
Monthly income					
No	95	44	0.836	1.103 (0.435, 2.797)	0.708 (0.206, 2.432)
< 300	15	8	**0.183***	1.880 (0.743, 4.760)	2.655 (0.802, 8.787)
301–600	11	10	**0.213***	1.750 (0.726, 4.219)	1.395 (0.436, 4.461)
601–1000	13	11	0.958	0.985 (0.560, 1.732)	1.265 (0.561, 2.853)
> 1001	63	30	1		
Social support					
Low	44	28	0.587	0.853 (0.481, 1.513)	1.143 (0.540, 2.420)
Moderate	105	57	**0.232***	0.643 (0.311, 1.327)	0.819 (0.316, 2.123)
High	44	18	1		
Age of onset					
< 6 years	20	12	1		1
6–11 years	44	32	0.657	1.212 (0.519, 2.831)	1.128 (0.326, 3.899)
12–17 years	50	18	**0.264***	0.600 (0.245, 1.470)	1.602 (0.596, 4.306)
18 & above years	79	41	0.725	0.865 (0.385, 1.942)	0.854 (0.324, 2.248)
Treatment duration					
0–11 months	18	13	**0.132***	1	1
less than 2 years	29	11		1.926 (0.820, 4.523)	2.850 (0.927, 8.761)
2–5 years	54	31	0.979	1.011 (0.438, 2.338)	1.975 (0.653, 5.972)
6–10 years	28	24	**0.195***	1.531 (0.804, 2.916)	1.820 (0.764, 4.337)
11 or more years	64	24	**0.024***	2.286 (1.113, 4.692)	**3.715 (1.498, 9.212)****
Adherence with medication					

Table 4 (continued)

Variables	Depression		Bivariate		Multivariate analysis
	No	Yes	*p* value	COR (95%, CI)	AOR (95%, CI)
No	20	33	**0.000***	0.245 (0.132, 0.456)	**0.216 (0.101, 0.460)****
Yes	173	70	1		1
Feeling perceived stigma					
No	146	47	1		
Yes	47	56	**0.000***	0.270 (0.163, 0.449)	**0.244 (0.129, 0.462)****
Stress					
No	157	70	1		
Yes	36	33	**0.010***	0.486 (0.281, 0.843)	**0.452 (0.220, 0.928)****
Sexual abuse					
No	192	101	1		
Yes	1	2	**0.278***	0.263 (0.024, 2.936)	
Heritability belief					
No	161	74	1		
Yes	32	29	**0.020***	0.507 (0.286, 0.899)	
The belief of mental illness					
No	81	34	1		
Yes	112	69	**0.133***	0.681 (0.413, 1.124)	

p value of Hosmer and Lemeshow goodness of fit test was = 0.593

*Significantly associated at $p < 0.30$ and **statistically significant at $p < 0.05$

develop depression (AOR = 0.216, 95% CI: 0.101, 0.460) than those people with epilepsy who had good improvement medication. These results were consistent with the previous studies in Europe [47] in India [19], in Northwest Ethiopia [24], in Bench Maji zone [27]. The possible explanation is those patients who had difficulties of adherence to their AEDs may result in breakthrough seizures that may lead an individual to develop depression.

Those patients who had to develop perceived stigma were more likely to experience depression symptoms (AOR = 0.244, 95% CI: 0.129, 0.462) than those who had not feeling perceived stigma. The result is supported by other studies conducted in Europe [47] in Jimma [16] central Ethiopia [25] and in northwest Ethiopia [24]. This may be due to lack of coping strategies to different seizure effect, such as perceived negative social attitude as a result of an unaccepted sign of a seizure, or the subjects may not develop stigma resistance ability through their life that helps them to cope up with different cultural belief, social stigma and the impact of the illness that contributed to the felt stigma.

Those patients with high perceived stress were experience more depression symptoms (AOR = 0.452, 95% CI: 0.220, 0.928) as compared to those patients who had low perceived stress. These results were consistent with the previous studies in Ethiopia [24, 25]. The possible explanation is that those individuals with high perceived stress may have a poorer psychological adjustment when they face different stress causing problems such as unemployment, lower educational status, perceived stigma, and seizure frequency and related trauma in their life that may be precipitate depression disorders.

Limitation of the study

Recall and response biases might have occurred when completing the questionnaire. In addition, some of the independent variables like medication adherence, physical and sexual abuse, presence suicidal wish… were assessed by single questions this may lead some patients to respond in an indecorous manner. As a result of using a cross-sectional study design, the researcher was not establishing any cause and effect relationship between the possible determinant of perceived stigma and the outcome of interest.

Conclusions

This study shows that depression among PWE is a common public health problem. The study also revealed that sociodemographic factors like educational status, clinically related factors like long term intake of medication, poor improvement with medication, stress symptom, perceived stigma were significantly associated with the development of depression. On the behave of substance use, sexual and physical abuse were not significant relation with depression. This is the first research study, to our knowledge, that evaluates the association between

Table 5 Proportion of depression risk of antiepileptic drugs

Antiepileptic drugs	Prevalence of depression (%)
Barbiturates, vigabatrin and topiramate	10
Zonisamide	7
Tiagabine, levetiracetam and felbamate	4
Phenytoin, ethosuximide, carbamazepine, oxcarbazepine, gabapentin, sodium valproate, pregabalin and lamotrigine	< 1

Source [3, 5, 47]

substance use, sexual and physical abuse with depression among people with epilepsy. Therefore, future research needs to investigate the association.

On the behave of this study Clinicians and healthcare professionals taking care of PWE should be aware of an increased risk of developing psychiatric comorbidities depression in particular and also, be ready to look for the conditions among this particular population. Systemic approaches are needed to improve the quality of mental healthcare for PWE. Screening instruments may be helpful for the early detection and management of depression symptoms.

Abbreviations

ACSH: Ayder Comprehensive Specialized Hospital; AEDs: Antiepileptic drugs; AOR: Adjusted odds ratio; ASSIST: Alcohol, smoking, and substance involvement screening test; CI: Confidence interval; COR: Crude odds ratio; DASS-21: Depression, anxiety and stress scale-21; GAD-7: Generalized anxiety disorder-7; KSSE: Kilifi Stigma Scale of Epilepsy; MGH: Mekelle General Hospital; OR: Odds ratio; PHQ: Patient Health Questionnaire-9; PWE: People with epilepsy; SPSS: Statistical Package for Social Science; USA: United State of America; WHO: World Health Organization.

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Author contributions

JS was the principal investigator of the study; made substantial contributions in conception selecting the design, supervising and managing data collection as well as analysis and interpretation of data. KM involved in drafting and revising critically the manuscript. All authors also agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Both authors read and approved the final manuscript.

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Availability of data and materials

Available.

Declarations

Ethics approval and consent to participate

This study was carried out after obtaining ethical approval from Mekelle University, College of Health Science office of Health Research Ethics Review Committee (HRERC) with the reference number of Notification of Expedited Approval ERC 1301/2019. Permission letter was obtained from Mekelle University to Psychiatric clinics, and finally, the letter was distributed to health professionals who work in the neurologic clinics and data collectors. A verbal and then written consent form were taken from each participant. For those aged from 12 to 17, written assent was taken from their relatives that s/he comes with them. An information sheet was attached to each questionnaire to provide study details & to tell the rights of the participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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