RESEARCH ARTICLE

Determinants of Depression among Adult Epileptic Patients, in Ayder Comprehensive Specialized Hospital and Mekelle General Hospital, Tigray, Ethiopia. Case Control Study

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Abstract

Background: Depression is one of the most prevalent psychiatric disorders occurring in patients with epilepsy. There are no studies that assessed the factors among epileptic people in Mekelle, Tigray, Ethiopia. Therefore, this study determined the factors of depression in people with epilepsy.

Methods: Unmatched case control study was conducted from May 1 to 30, 2019 in Ayder Comprehensive Specialized Hospital and Mekelle General Hospital on 66 cases and 132 controls calculated using double population proportion formula. Study subjects were selected two controls after each case. Data were collected using a standardized and pretested questioner. Data was collected by four trained BSc nursing professionals under Psychiatric Nurse supervisor. Depression was measured by patient health questionnaire-nine using face to face interview techniques. Data were analyzed using SPSS 23.

Result: This study revealed that being female (AOR=2.79, 95% CI: 1.08-7.18, P=0.03), living with relative (AOR=2.82,95% CI:1.12-7.18, P=0.03), seizure frequency four and above per month (AOR=6.00, 95% CI:1.39-25.86, P=0.02), age onset of epilepsy between 12-24 years of age (AOR=3.11, 95% CI: 1.06-9.18, P=0.04), poor social support (AOR=5.34, 95% CI: 2.13-13.41, P=0.00) were significantly associated with depression.

Conclusion: Factor associated like gender (female), living status (with relative), poor social support, age onset of epilepsy (between 12 to 24 years) and seizure frequency are the factors associated with depression. Depression prevention efforts should be targeted towards these risk factors.

Keywords: Determinant; Depression; Epilepsy; Outpatient; Mekelle

Background

Epilepsy is one of the most common chronic neurological disorders, has no age, race, social class or geographical boundaries which is characterized by recurrent and unpredictable seizures associated with significant psychological and social consequences. More than eighty percent of 50 million People Living With Epilepsy (PWE) worldwide reside in low-income regions where human and technological resources for health care are extremely limited. More than 80% of people with epilepsy live in developing countries, where the condition remains largely untreated. Frequent seizures may cause difficulties in important areas of life (at school or the workplace), as well as sometimes hindering the development of new friendships and relationships. Fortunately, epilepsy can be managed with antiepileptic medications and more than 70 percent of people become seizure-free with treatment [1-4].

Co-morbidity in people with epilepsy imposes significant burdens on patients and their families [1]. Nationwide the total people who suffer from epilepsy, 11-60% have depression [4]. Depression is characterized by loss of interest, depressed mood, disturbance of sleep, problem in appetite and psychomotor activity, difficulty to concentrate or make a decision, guilty or sinful feeling, easily tiredness and recurring thoughts of death or suicide [5,6].

Depression is very common in people with epilepsy. The altered brain activity that causes epileptic seizures can lead to depressive moods and the stress of living with a chronic condition can worsen feelings of depression. As a consequence, epilepsy may be more difficult to manage, as depression is sometimes known to make seizures more frequent and can decrease the motivation to manage epilepsy effectively [7].

People with epilepsy experience depression at two to three times the rate of the general population [8]. There is a strong link between epilepsy and depression, disorders can be aggravated or developed following being diagnosed for epilepsy; or as a consequence of living with epilepsy. Structural brain abnormalities, monoamine pathways, cerebral glucose metabolism and the hypothalamic-pituitary-adrenal axis are also associated with the pathogenesis of depression in people with epilepsy [9-11]. Depression is an episodic disorder, [12] of all people who experience one major depressive episode, 80-90% will experience another within the following 2 years; and 50% of those people will experience further recurrence, with recurrence; the depressive episode evolve into major depression, and each recurrence increase the risk of the disorder becoming chronic, which in turn increase the risk of disability and suicide [13,14].

World Health Organization has ranked depression will be the second in global disease burdens by the year 2020 and one of the priority conditions covered by WHO's mental health gap action program. The problem is more significant in the developing countries, particularly in sub-Saharan Africa with the prevalence more than fifty one percent [15,16]. In Ethiopia; mental illness is the leading non-communicable disease in terms of burden with schizophrenia and depression included in the top ten most burdensome conditions, out-ranking Human immune deficiency virus /Acquired Immune Deficiency Syndromes (HIV/AIDS) [17].

Suicide risk increase during depression between 10 and 15% of individual who have been hospitalized at some time due to depression eventually commit suicide, and 60% of all suicide occurs among people suffering from depression [12]. It is likely that the mechanics behind the intersection of depression and other illnesses differ for every person and situation. Regardless, these other comorbid illnesses need to be diagnosed and treated [16].

Alcohol and other substance abuse or dependence may also co-occur with depression [18]. People who have depression in addition to another serious medical illness tend to have more severe symptoms of both depression and the medical illness [19].

Researches show that treating depression can improve the outcome of treating the co-occurring illness [20]. Incidence of depression is significantly higher among blood relatives than the general population [21]. First-degree biological relatives of people with Major Depression Disorder (MDD) are 1.5 to 3 times more likely to develop MDD than the general population [22]. More recently literatures have indicated that what is inherited is not a single gene, but a genetic vulnerability that may be activated by environmental factors [23].

Depression is the most common co-morbid psychiatric condition associated with epilepsy, yet its actual incidence and prevalence remained to be established [24]. Depression and epilepsy share common pathogenic mechanisms, which explain the bidirectional relationship between them. These pathogenic mechanisms include abnormal function of common neurotransmitters in the central nervous system, particularly serotonin, nor-adrenaline, and dopamine [25].

The most common factors are side effects of Anti-Epileptic Drugs (AEDs) and psychosocial factors experienced as a direct result of having epilepsy such as perceived stigma, fear of seizures, discrimination, joblessness, lack of social support, and lifestyle changes imposed by increased seizure severity/frequency (giving up driving privileges, changing jobs, etc.), have all been contribute to depression [26].

Evidences show that depression is common and prevalent in epileptic patients, in Ethiopia, the author found that, no published studies concerning factors of depression among epileptic patients in the study area. Therefore, this study will fill the gap with regard to the Northern part of Ethiopia (Tigray, Mekelle), where the socio-cultural diversity of the community is different from the other part of the country and may contribute for the variation of the factors for the illness. Thus, the main purpose of this study was to identify the factors affecting depression among adult epileptic patients.

General objective

To assess factors affecting depression among adult people with epilepsy in outpatient departments of Neurology, Ayder Comprehensive Specialized Hospital and Mekelle General Hospital, Mekelle, Tigray, Ethiopia, 2019.

Specific objectives

- To describe socio-demographic characteristics of adult people with epilepsy in depression.
- To identify clinical related factors of depression among adult patients with epilepsy.
- To assess social related factors of depression among adult epileptic patients.

Materials and Methods

Study area and period

This study was conducted in May 1 to 30, 2019 at ACSH and Mekelle General Hospital, Mekelle City. This is located in Tigray regional state 783km away from Addis Ababa, the capital city of Ethiopia to the North. Mekelle has one comprehensive specialized hospital (Ayder) and four other general government hospitals which are Mekelle General Hospital, Quiha General Hospital, Adi-Haki General Hospital and North command General Hospitals and 10 health centers. ACSH serving more than 9 million people from Afar, Tigray, and Amhara; and has about 500 inpatient beds. It runs all the specialized/non-specialized hospital services including in emergency, an outpatient and inpatient of all age groups and special facility services and substance rehabilitation center. These all services also run by Mekelle General Hospital, a teaching hospital, except the rehabilitation. These hospitals also used as a research center for the College of Health Sciences, Mekelle University. Neurology services are given by Neurologists, Residents, General practitioners and BSc Nurses. Current flow of epileptic patients on average was 200 and 350 patients per month in ACSH and Mekelle General Hospital respectively.

Study design

An institutional-based unmatched case-control study was conducted.

Source population

All epileptic patients who have follow up at Ayder comprehensive specialized Hospital and Mekelle General Hospital, Mekelle, Tigray, Ethiopia.

Study population

All epileptic sampled outpatient neurology department visitors of Ayder comprehensive specialized Hospital and Mekelle General Hospital, Mekelle, Tigray, Ethiopia

Eligibility criteria

Inclusion criteria: Cases: epileptic patient attending outpatient

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2

neurology department, who are on treatment follow up at least six months and above, and aged 18 years and above, clients who had PHQ-9 score, ≥5.

Control: epileptic patient attending outpatient neurology department, who are on treatment follow up for at least six months and above, aged 18 years and above having PHQ-9 score <5.

Exclusion criteria: Epileptic patients who are known depressive patient and on treatment follow up, unable to communicate, unable to sign verbal informed consent and those who had decision incapacity, seriously ill and patients below six months on epilepsy follow up.

Sample size and sampling procedure

Sample size: The sample size was calculated using a double population proportion formula, took from a study conducted at Amanuel Mental Specialized and Tikur Anbesa Hospital in Addis Ababa showed that one of the risk factors for depression in people living with epilepsy was having perceived stigma (AOR=2.47) [27]. Other assumptions made during the sample size calculation was 5% level of significance (α) and Confidence Interval (CI) of 95% ($z_{(\alpha/2)}=1.96$). Based on these assumptions, the sample size calculated as follow: Two sided confidence level=95%, power 80%, ratio of case to control=1:2, and odds ratio=2.47.Then, the desired sample size using Epi info Stata calculation, case=66 and control=132, the final sample size was 198.

Sampling technique and procedure: The study participants were proportionally allocated to both ACSH and MGH. Since the ratio of case to control was 1:2, every one case two controls were selected after assessing the patient first using PHQ-9 in both hospitals (Figure 1).

Data collection procedure

Face-to-face interview method using a structured questionnaire was used in this study to identify determinants of depression among epileptic patients such as 1. Socio-demographic information, 2. Clinical related 3. Perceived stigma … etc. also, the chart was reviewed to check the epilepsy and other medical illness diagnoses.

The questionnaire was translated from English to Tigrigna language by expert and retranslated to English by another proficient in English. This primary version was made to compare with the original English version to resolve inconsistencies and then the data collectors, who are Tigrigna native speakers, collected data in the Tigrigna version questionnaire.

Data were collected by four BSc degrees in nursing professionals and one psychiatric nurse as supervisor. The principal investigator checked the filled questionnaires for consistency and completeness daily.

Data collectors and supervisor were trained for three days on the questions included in the questionnaire, on interviewing techniques, purpose of the study, and importance of privacy, discipline and approach to the interviewees and confidentiality of the respondents. The questionnaire was pre-tested on 5 % of the sample size at Quiha General Hospital in which psychiatric and epilepsy services delivered OPD two weeks prior to data collection. Based on the feed-back and results obtained from the pretest, data collectors and supervisor were re-oriented and the questionnaire was modified as necessary.

The data was collected by using different instruments that measure depression, perceived stigma, social support, medication adherence and other clinical related factors.

The Patient Health Questioner (PHQ-9) is the nine item depression
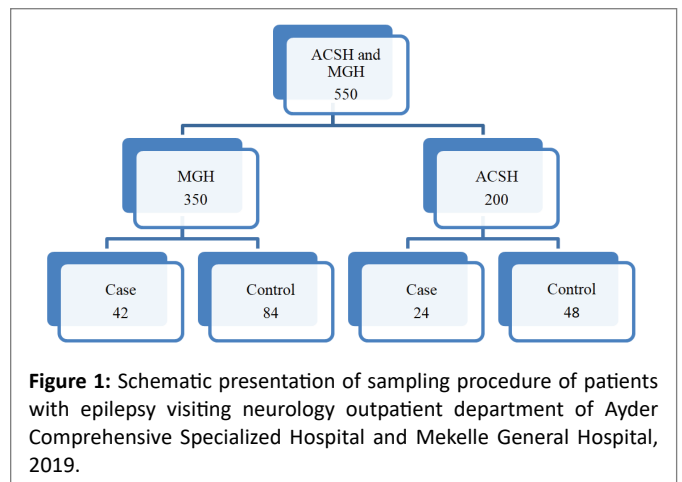

Figure 1: Schematic presentation of sampling procedure of patients with epilepsy visiting neurology outpatient department of Ayder Comprehensive Specialized Hospital and Mekelle General Hospital, 2019.

scale which is a strong tool to screen depression.PHQ-9 is validated and mostly used in Ethiopia. So, patients who score ≥5 were considered as having depression [28,29].

Social support was measured by using three Oslo scale of social support measurement scores three up to eight (poor social support), nine up to eleven (moderate social support) and twelve up to fourteen (strong social support) [30].

Perceived stigma was measure by three item stigma scales ranging from zero (no felt stigma) to three (maximally felt stigma) [31].

Four Morisky Scale self-reported measurement of medication adherence was used to assess adherence of medications [32].

Study variables

Dependent variable: Depression

Independent variables: Socio-demographic (gender, age, residential area, marital status, religion, ethnicity, living status, level of education, occupation and monthly income), perceived stigma, medication adherence, family history of depression, substance use, duration of the illness, co-morbid illness (other medical illness), poly and mono therapy, age onset of epilepsy and frequency of seizure.

Data quality assurance

The pre-test was conducted on a sample of 5% (8 controls and 4 cases) of the total study population in Quiha General Hospital before 2 weeks of data collection and a common understanding was reached between the data collectors and supervisor to avoid inter rater variability. Pre-test questionnaire would not be included in the analysis as part of the main study. Data collection was collected within one month.

At the end of each day, the questionnaires were reviewed and checked for completeness, accuracy and consistency by the supervisor and investigators and corrective discussion was undertaken with all the research team members. Remarks were given during morning times on how to eliminate or minimize errors and take corrective actions timely.

Data analysis

After all the necessary data collected, the data were coded on pre-arranged coding sheet by the investigators. Data entry and cleaning was done using Epi-info version 6 statistical package. The data were analyzed using SPSS version 23. Text, tables and figures were used

to present the data. The association and significance between the explanatory and response variables were also measure using p-value, odds ratios, and 95% CI.

Bivariate logistic regression model analysis was done to see the association between the explanatory and outcome variables. Henceforth, multivariable logistic regression analysis was employed by selecting only variables with a P value <0.25 in the bivariate analysis. Odds ratio with 95% CI was used to measure the strength between dependent and independent variables at P-Value <0.05 to determine the level of statistical significance. To determine an association between dependent and independent variables adjusted odds ratio was entered into multivariate logistic regression one by one in order to control potential confounder and to detect the determinants of independent variables with the outcome variable. Variables with the p-value less than 0.05 (i.e. 95% confidence interval) in multivariate regression was declared to be potential predictors for depression.

Results

Socio-demographic characteristics

In this study, a total of 198 study subjects were involved and fully participated with a response rate of 100%. The mean age for respondents was 32.28 ± 9.18. About half of the cases and controls were among the ages of 25 up to 34 years old. In terms of gender 78(59.1%) of these were male among the control and 34(51.5%) of these were females among the cases. About sixty three (47.7%) of control and 32(48.5%) of cases were married. With regard to education 62(47.0%) of controls and 33(50.0) of cases complete primary and secondary school, income was also, 39(29.5%) of the control and 28(42.4%) of cases receive below 600 ETB (Table 1).

Clinical related factors

The study shows that only 33(25.0%) controls and 21(31.8%) cases of the participants had family history of depression. Among the participants 52(39.4%) controls and 33(50.0%) cases had one to three frequency of seizure per month. The age onset of epilepsy between 12 to 24 years of age was 53(40.0%) controls and 36(54.5%) cases. Duration of illness above ten years was 75(56.8%) controls and 36(54.5%) cases. While non-adherence was 132(100%) controls and 66(100%) cases (Table 2).

Social related factors

This study revealed that 24(18.2%) controls and 32(48.5%) cases had poor social support figure 2; of the participants 132(100%) controls and 66(100%) cases had perceived stigma.

Bivariate analysis

Bivariate analysis was used and the associations between the dependent variable (depression) and independent variables were assessed; the results show that there was a significant association with depression and the following variables (Table 3).

Multivariable analysis

Multivariate logistic regression analysis was used to calculate odds ratios and corresponding 95% confidence intervals for the determinants of depression. On multivariate logistic regression analysis, it was found that respondents who have the odds developing depression was 5.34 among those with less social support compared to people having good social support. Age onset of epilepsy between 12 and 24 has had 3.11 times affected by depression greater than 25 years. Patients who had have four and above seizure frequency per month had 6 times

Table 1: Socio-demographic characteristics of patients with epilepsy visiting neurology outpatient in ACSH and Mekelle General Hospital, 2019(n=198, control=132 and case=66).

Variables		Case N (%)	Control N (%)
Gender	Male	32(48.5%)	**78(59.1%)**
	Female	34(51.5%)	54(40.9%)
Age	18-24	11(16.7%)	34(25.8%)
	25-34	33(50.0%)	53(40.2%)
	35-44	17(25.8%)	26(19.7%)
	>44	5(7.6%)	19(14.4%)
Residency	Rural	20(30.3%)	49(37.1%)
	Urban	46(69.7%)	83(62.9%)
Marital Status	Married	32(48.5%)	63(47.7%)
	Single	24(36.4%)	48(36.4%)
	Divorced	9(13.6%)	16(12.1%)
	Widowed	1(1.5%)	5(3.8%)
	Orthodox	60(90.9%)	119(90.2%)
	Muslim	6(9.1%)	12(9.1%)
	Other*	-	1(0.8%)
Ethnicity	Tegaru	60(90.9%)	129(97.7%)
	Amharic	2(3.0%)	1(0.8%)
	Afar	1(1.5%)	2(1.5%)
	Oromo	3(4.5%)	-
Living status	With family	16(24.2%)	55(41.7%)
	Alone	9(13.6%)	16(12.1%)
	With relative	39(59.1%)	61(46.2%)
	Other**	2(3.0%)	-
Level of education	Can't read and write	13(19.7%)	44(33.3%)
	1^0 and 2^0 school	33(50.0%)	62(47.0%)
	College and university	20(30.3%)	26(19.7%)
Occupation	Farmer	10(15.2%)	17(12.9%)
	Employee	11(16.7%)	19(14.4%)
	Student	6(9.1%)	18(13.6%)
	Daily laborer	1(1.5%)	15(11.4%)
	House wife	23(34.8%)	27(30.3%)
	Merchant	15(22.7%)	23(17.4%)
Monthly Income (in ETB)	<600	28(42.4%)	39(29.5%)
	601-1400	13(19.7%)	22(16.7%)
	1401-2500	8(12.1%)	27(20.5%)
	2501-3500	8(12.1%)	21(15.9%)
	3501-5000	9(13.6%)	23(17.4%)

Other*=Pagans; Other**=Street and helping aids

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affected by depression than no seizure. With regard to living status with relative had 2.82 times affected by depression than living with family and females have had 2.79 times affected by depression than male (Table 4).

Discussion

A finding from this study, being female was significant predictor for depression which is similar with study done in Canada [33], Gaza

Table 2: Clinical related factors of patients with epilepsy visiting neurology outpatient in ACSH and Mekelle General Hospital, 2019(n=198, control=132 and case=66).

| Variables		Case N (%)	Control N (%)
Family history of depression	Yes	21(31.8%)	33(25.0%)
	No	45(68.2%)	99(75.0%)
Seizure frequency per month	No	23(34.8%)	73(55.3%)
	1-3	33(50.0%)	52(39.4%)
	4 and above	10(15.2%)	7(5.3%)
Age onset of epilepsy (years)	<12	15(22.7%)	38(28.8%)
	12-24	36(54.5%)	53(40.2%)
	≥25	15(22.7%)	41(31.1%)
Duration of illness in year	< 1 yr	2(3.0%)	3(2.3%)
	1-5 yrs	19(28.8%)	28(21.2%)
	6-10 yrs	9(13.6%0	26(19.7%)
	≥ 10 yrs	36(54.5%)	75(56.8%)
Co-morbidity	Yes	14(21.2%)	14(10.6%)
	No	52(78.8%)	118(89.4%)
Therapy	Mono therapy	45(68.2%)	100(75.8%)
	Poly therapy	21(31.8%)	32(24.2%)
Substance use	None	49(74.2%)	116(87.9%)
	Alcohol	12(18.2%)	15(11.4%)
	Chat	3(4.5%)	-
	Cigarette smoking	1(1.5%)	-
	Alcohol, chat & cigarate	1(1.5%)	1(0.8%)
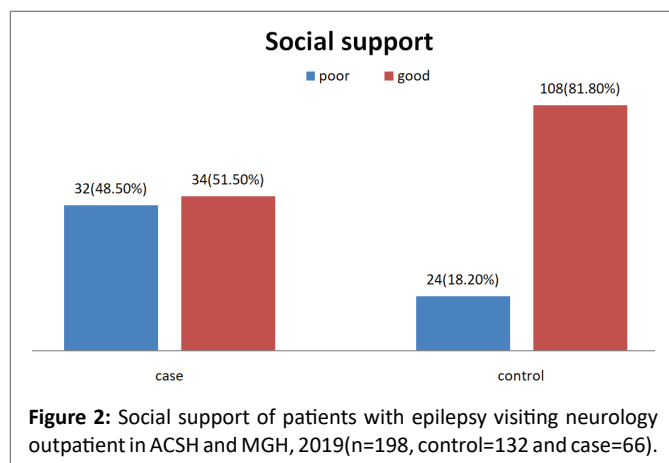
Figure 2: Social support of patients with epilepsy visiting neurology outpatient in ACSH and MGH, 2019(n=198, control=132 and case=66).

strip [34], Burkina Faso [35], and Ethiopia [27,36]. And was not consistent with study done in Pakistan [37] in which being male was associated with depression. The reason could be females face a lot of hardships like, during marriage, pregnancy, delivery, managing all the household activities and difficulties in decision making on different major life events. This all life activities and rolls may predispose them to depression.

Study done in Ethiopia, Ambo age greater than or equal to 45 years of age [38] was associated with depression while in this study finding age was not associated with depression. The inconsistence could be due to differences in sample size, screening tools and study design.

In this study marital status was not significantly associated with depression but studies done in Pakistan [37], being married, Ethiopia, Addis Ababa [27], being single was significantly associated with depression. This discrepancy may be due to the difference in socio-cultural, sample size and study design.

In this study on multivariate analysis, educational status was not significantly associated with depression but studies done; in Iran, less education [39], in Ethiopia, illiterate [40,41], low education [42,43] was associated with depression. The discrepancy could be due to the screening tools, study design (most of the studies were used cross-sectional study design) and socio-cultural differences. The reason why the illiterate becomes depressed than the educated one could be those high educated one can understand and cope up the illness and can adjust different activities how to serve and handle themselves.

The finding of this study, occupational status was not significantly associated with depression. But it was associated with study conducted in UK, unemployment [44], in Ethiopia; Ambo, farmer and house wife [38] and Hawassa, unemployment [36] were associated with depression. This discrepancy could be due the screening tools, sample size, culture, seasonal, environmental and study design differences.

A previous finding in Ethiopia, Bench Maji Zone [42] and in Addis Ababa [27] shows that; living status was not associated with depression. While in this study living with relative was significantly associated with depression. The reason might be misunderstanding as well as miss communications. They might not discuss openly each other as a family members do. So, that they will have low self-esteem, feels helplessness and depressed.

Studies done in Iran, low income [39], in Pakistan low socio-economic stratum (<5000 Pak Rs (60 USD)) [37], in Gaza Strip; least income (<500 NIS) [34], in Ethiopia; Addis Ababa, low income (<200 ETB) [41] was significantly associated with depression while in this study was not associated. The difference could be sample size, screening tools and study design. The reasons might be unable to pay or might be in affordability to buy the medicines, distances from health facilities (accessibility and affordability of medicines) predispose to depression.

A finding in this study shows that, poor social support was significantly associated with depression. The finding was in align with previous studies done in Korea [45], in Ethiopia; Hawassa [36].The reason could be cultural believes of the society, low self-esteem of the epileptic patient and this predisposes them to have disrupted social relations as a consequence of the presence of epilepsy then finally they will end up with depression.

Perceived stigma was not associated significantly with depression in this study, but it was associated with studies done in Burkina Faso [35], in Ethiopia; Addis Ababa [41,27], Jimma [43] and Ambo [38]. The reason could be people with epilepsy mostly over protected and restricted from doing, and participating in different activities. Because

Table 3: Crude odds ratio showing effects of selected factors on depression among patients with epilepsy visiting neurology outpatient in ACSH and Mekelle General Hospital, 2019(n=198, control=132 and case=66).

Variables		Case N (%)	Control N (%)	COR (95% CI)	p -Value
Gender	Male	32(48.5%)	78(59.1%)	1	
	Female	34(51.5%)	54(40.9%)	1.54(0.85_2.78)	0.16*
Age	18-24	11(16.7%)	34(25.8%)	1	
	25-34	33(50.0%)	53(40.2%)	1.93(0.86_4.31)	0.11*
	35-44	17(25.8%)	26(19.7%)	2.02(0.81_5.04)	0.13*
	>44	5(7.6%)	19(14.4%)	0.81(0.25_2..69)	0.74
Residency area	Rural	20(30.3%)	49(37.1%)	0.74(0.39_1.39)	0.34
	Urban	46(69.7%)	83(62.9%)	1	
Living status	With family	16(24.2%)	55(41.7%)	1	
	Alone	9(13.6%)	16(12.1%)	1.93(0.07_5.20)	0.19*
	With relative	39(59.1%)	61(46.2%)	2.20(1.11_4.37)	0.03*
Level of education	Can't read and write	13(19.7%)	44(33.3%)	0.38(0.16_0.90)	0.03*
	1⁰ and 2⁰ school	33(50.0%)	62(47.0%)	0.69(0.34_1.42)	0.32
	College & above	20(30.3%)	26(19.7%)	1	
Occupation	Farmer	10(15.2%)	17(12.9%)	1	
	Employee	11(16.7%)	19(14.4%)	0.98(0.34_2.89)	0.98
	Student	6(9.1%)	18(13.6%)	0.57(0.17_1.90)	0.36
	Daily laborer	1(1.5%)	15(11.4%)	0.11(0.01_0.99)	0.05*
	House wife	9(13.6%)	27(20.5%)	0.57(0.19_1.68)	0.31
	Jobless	14(21.2%)	13(9.8%)	1.83(0.63_5.43)	0.28
	Merchant	15(22.7%)	23(17.4%)	1.11(0.40_3.06)	0.84
Monthly Income	<600	28(42.4%)	39(29.5%)	1.84(0.74_4.56)	0.19*
	601-1400	13(19.7%)	22(16.7%)	1.51(0.54_4.24)	0.43
	1401-2500	8(12.1%)	27(20.5%)	0.76(0.25_2.28)	0.62
	2501-3500	8(12.1%)	21(15.9%)	0.97(0.32_2.98)	0.96
	3501-5000	9(13.6%)	23(17.4%)	1	
Seizure frequency per month	No	23(34.8%)	73(55.3%)	1	
	1-3	33(50.0%)	52(39.4%)	2.01(1.06_3.82)	0.03*
	4 and above	10(15.2%)	7(5.3%)	4.53(1.55_13.27)	0.01*
Age onset of epilepsy	<12	15(22.7%)	38(28.8%)	1.08(0.47_2.50)	0.86
	12-24	36(54.5%)	53(40.2%)	1.86(0.90_3.84)	0.10*
	> 25	15(22.7%)	41(31.1%)	1	
Co-morbidity	Yes	14(21.2%)	14(10.6%)	2.27(1.01_5.10)	0.05*
	No	52(78.8%)	118(89.4%)	1	
category of social support	Poor	32(48.5%)	24(18.2%)	4.22(2.20_8.15)	0.00*
	Good	34(51.5%)	108(81.8%)	1	

*Bivariate logistic regression significant level in, (p<0.25) Reference: 1.00

of this they may prefer to avoid themselves and feel haplessness, due to those issues they become depressed.

Age onset of epilepsy was associated with depression and this result is similar with study done in Ethiopia, Gondar [40] and Bench Maji Zone [42]. This might be due to chronicity of the illness and they restricted from most of the social activities like driving, operating machineries and this leads them to be isolated then this precipitates to depression.

This study showed that seizure frequency was significant a predictor of depression, which is similar with studies done in Pakistan [37], India [46], in Africa; Burkina Faso [35], Nigeria [47], Morocco [48] and in Ethiopia; Gondar [40], Bench Maji Zone [42], Addis Ababa [41] and Jimma [46]. The reason for this association could be having

frequent seizure, refrain patients from involving in different social activities. And having seizure in front of any one can have low self-esteem, poor self-confidence; compromising quality of life can lead them to depression.

In previous studies done in Ethiopia; Addis Ababa, poly pharmacy [41] and Gondar [40] was significantly associated with depression. While in this study there is no significant association with depression. The reason could be due to pill burden, drug side effects, and expenses for medicine.

Studies done in Ethiopia; Addis Ababa, low adherence [27], Gondar, difficulty in adherence [40] and Bench Maji Zone, low adherence [42] was associated with depression. But in this study does not show significant association with depression. The difference could

Table 4: Factors associated with depression among patients with epilepsy visiting neurology outpatient in ACSH and Mekelle General Hospital, 2019(n=198, control=132 and case=66).

Variables		Case N (%)	Control N (%)	COR (95% CI)	AOR (95% CI)	*p*-Value
Gender	Male	32(48.5%)	78(59.1%)	1	1	
	Female	34(51.5%)	54(40.9%)	1.54(0.85_2.78)	2.79(1.08_7.18)	0. 03*
Living status	With family	16(24.2%)	55(41.7%)	1	1	
	Alone	9(13.6%)	16(12.1%)	1.93(0.07_5.20)	2.15(0.57_8.11)	0.26
	With relative	39(59.1%)	61(46.2%)	2.20(1.11_4.37)	2.82(1.12_7.18)	0.03*
Level education	Can't read & write	13(19.7%)	44(33.3%)	0.38(0.16_0.90)	0.08(0.02_0.41)	0.002*
	1^0 and 2^0 school	33(50.0%)	62(47.0%)	0.69(0.34_1.42)	0.47(0.14_1.63)	0.23
	College & above	20(30.3%)	26(19.7%)	1	1	
Occupation	Farmer	10(15.2%)	17(12.9%)	1	1	
	Employee	11(16.7%)	19(14.4%)	0.98(0.34_2.89)	0.19(0.03_1.4)	0.10
	Student	6(9.1%)	18(13.6%)	0.57(0.17_1.90)	0.10(0.01_0.85)	0.04*
	Daily laborer	1(1.5%)	15(11.4%)	0.11(0.01_0.99)	0.04(0.003_0.50)	0.01*
	House wife	9(13.6%)	27(20.5%)	0.57(0.19_1.68)	0.14(0.02_0.84)	0.03*
	Merchant	14(21.2%)	13(9.8%)	1.11(0.40_3.06)	0.37(0.07_2.05)	0.25
Seizure frequency per month	No	23(34.8%)	73(55.3%)	1	1	
	1-3	33(50.0%)	52(39.4%)	2.01(1.06_3.82)	1.31(0.57_2.99)	0.53
	4 & above	10(15.2%)	7(5.3%)	4.53(1.55_13.27)	6.00(1.39_25.86)	0.02*
Age onset of epilepsy	<12	15(22.7%)	38(28.8%)	1.08(0.47_2.50)	1.27(0.35_4.67)	0.720
	12-24	36(54.5%)	53(40.2%)	1.86(0.90_3.84)	3.11(1.06_9.18)	0.04*
	≥ 25	15(22.7%)	41(31.1%)	1	1	
Social support	Poor	32(48.5%)	24(18.2%)	4.22(2.20_8.15)	5.34(2.13_13.41)	0.00*
	Good	34(51.5%)	108(81.8%)	1	1	

*logistic regression significant level in 95% C.I, (p<0.05) Reference: 1.00

be due to different measurement of drug adherence, sample size and study design. The reasons could also be due to irregular medicine intake, increases disease severity and frequency of seizure then this predisposes to depression.

Current substance use in this study shows that no significant association with depression. While in other studies done in Ethiopia; Addis Ababa [27] was associated with depression. The differences could be due to study area, study design and sample size differences.

Limitations

Despite providing valuable baseline data, there are also some limitations encountered:

α)   Recall bias regarding duration of illness, age onset of the seizure.

β)   Social desirability bias as the data was collected by a face to face interviewer administered approach. So the respondents might reply in favorable of others that are either over reporting or under reporting.

χ)   In this study only adult epileptic patients were included, so it is difficult to generalize all epileptic patients because those who were seriously ill patients and children, known depression patients and patients who are below six month on treatment fellow up were not included in the study.

Conclusion

Among epileptic patients, factors associated with depression occurrence includes Gender (female), living status (with relative), poor social support, age onset of epilepsy (12-24 years of age), and seizure frequency. Using a multivariable model were associated factors of depression, the above variables independently increased the risk of depression. Depression prevention efforts also should be targeted towards these risk factors among epileptic patients.

Recommendation

Based on the study findings the following recommendations are forwarded.

To family/relatives

-Support to the epileptic patient to get access of medicines and related health services.

-Support to the epileptic patient (especially for female) to have a motivation on daily activities.

-Avoid over protection of the epileptic patients in order to have self-confidence and self-esteem.

-Support in relieving the over burden of responsibilities especially in females.

To health care providers

Health care providers should screen all patients that have follow up at epileptic OPD for depression, assess their adherences on treatment.

Use the updated protocol for management of seizure frequency and deliver epilepsy related education for the family of patient about the illness and its consequences.

To Government/Minster of health, NGOs and volunteers

Support health related problems especially with regard to identify the predisposing factors for depression in epileptic patients. This can be done through preparing road map, sponsoring and participating in studies and social mobilization on creating awareness and in overcome of the illness.

To researchers

It is also recommended researchers to conduct further research studies to assess other additional factors with large sample size.

Abbreviations

ACSH-Ayder Comprehensive Specialized Hospital; AOR-Adjusted Odds Ratio; COR-Crud Odds Ratio; CI-Confidence interval; HRQOL-Health Related Quality of Life, HRSD-Hamilton Rating Scale for Depression; MGH-Mekelle General Hospital; OPD-Out Patient Department; PHQ-Patient Health Questionnaire; SPSS-Statistical Package for Social Sciences software; WHO-World Health Organization.

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Informed Consent

All participants have individual rights that are not to be infringed. Individual participants in studies have, for example, the right to decide what happens to the (identifiable) personal data gathered, to what they have said during a study or an interview, as well as to any photograph that was taken.

Authors' Contributions

KM was the principal investigator of the study; made substantial contributions in conception selecting design, data collection as well as analysis and interpretation of data. SA, HB and HT were the supervisors of the research; participated in designing and managing data collection and analysis. SA & HE 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. All authors read and approved the final manuscript.

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Availability of Data and Materials

The datasets used during the current study is available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

Ethical clearance and approval obtained from the institutional review board of Mekelle University. Moreover, before conducting the study, the purpose and objective of the study were described to the study participants and written informed consent was obtained. The study participants were informed as they have full right to discontinue. Subject confidentiality and any special data security requirements were maintained and assured by not exposing patients' names and information. Besides, the questionnaires and all other information were stored on a personal computer which is protected with a password.

Consent for Publication

Not applicable as there is no image or other confidentiality related issues.

Competing Interests

We authors declare that we have no conflict of interest.

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9