

Research

Depression and associated factors among people with epilepsy at Wolaita Sodo University Hospital, South Ethiopia

Tamene Berhanu¹ · Niguse Yigzaw² · Seblewongel Tinsae² · Yohannes Mirkena² · Asegid Belete¹

Received: 3 October 2024 / Accepted: 4 March 2025

Published online: 10 March 2025

© The Author(s) 2025 [OPEN](#)

Abstract

Background Epilepsy is one of the most common neurological disorders in the world and contributes to various psychiatric illnesses. Depression is one of the most frequent comorbid psychiatric disorders that affect the quality of life in people with epilepsy. Despite this impact, depression continues to be under-recognized and undertreated. Therefore, this study aimed to assess the magnitude of depression and its associated factors among people with epilepsy at Wolaita Sodo University Hospital, South Ethiopia, 2021.

Methods A hospital-based cross-sectional study was conducted from April 2021 to May 2021. A systematic random sampling technique was used to select 423 samples of people with epilepsy, and interviewer-administered structured questionnaires were employed. The Patient Health Questionnaire with 9 items was used to assess depression. A logistic regression model was used to determine the association between the outcome and independent variables. A 95% CI and odds ratio with a corresponding p-value < 0.05 were used to determine the strength of association.

Result The overall magnitude of depression among people with epilepsy in this study was 49.2%. Educational status; unable to read and write (AOR = 3.43, 95% CI 1.09, 10.7), being female (AOR = 2.54, 95% CI 1.43, 4.52), perceived stigma (AOR = 5.96, 95% CI 2.88, 12.3), poor social support (AOR = 2.88, 95% CI 1.28, 6.48), poor medication adherence (AOR = 4.60, 95% CI 2.46, 8.63), and seizure frequency above 5 times per month (AOR = 5.59, 95% CI 1.72, 18.1) were independent predictors of depression among people with epilepsy at p-value < 0.05.

Conclusion and recommendation In this study nearly half of the people with epilepsy had depression. Educational status; inability to read and write, being female, perceived stigma, poor social support, poor medication adherence, and seizure frequency of above 5 times per month were independent predictors of depression among people with epilepsy. Therefore, screening depression in people with epilepsy and appropriate management critically needed attention to reduce the effects of the problems.

Keywords Depression · Epilepsy · Wolaita Sodo · South Ethiopia

Abbreviations

ASM	Anti-seizure medication
ASSIST	Alcohol, Smoking and Substance Involvement Screening Test
AOR	Adjusted Odd Ratio
CI	Confidence Interval
COR	Crude Odd Ratio
IRB	Institutional Review Board

✉ Tamene Berhanu, tamenebirhanu2013@gmail.com | ¹College of Medicine and Health Sciences, Wolaita Sodo University, Wolaita Sodo, Ethiopia. ²Departments of Psychiatry, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia.



KSSE	Kilifi Stigma Scale for Epilepsy
MMAS	Morisky Medication Adherence Scale
OSS	Oslo Social Support
PHQ	Patient Health Questionnaire
PWE	People with Epilepsy
STATA	Statistical Data
WSUTRH	Wolaita Sodo University Teaching and Referral Hospital
WHO	World Health Organization

1 Introduction

Epilepsy is one of the most common neurological disorders, characterized by recurrent seizures and abnormal electrical activity in the brain that causes an involuntary change in body movement or function, sensation, awareness, or behavior [1]. The presence of recurrent seizures may cause difficulties in physical, social, psychological, and important areas of the patient's life [2]. Approximately 50 million people worldwide are affected by epilepsy, the majority of whom (80–85%) live in developing countries [3, 4]. In Ethiopia the prevalence rate is between 45.2 and 49.3%. Which affects 5.2 per 1000 population with an estimation of 0.5% of patients with seizures in the past 1–2 years [5–7].

Depression is the most common psychiatric comorbidity in people with epilepsy, and it affects 9.5–63% of people with epilepsy worldwide [8, 9]. Depression is defined by depressed mood, loss of interest or pleasure, feelings of worthlessness or inappropriate guilt, disturbed sleep and appetite, feelings of tiredness, and poor concentration for a minimum of 2 weeks [10, 11]. Globally, from the total number of people who suffer from epilepsy, \approx 15–60% also experienced depression; 80% of them exist in low-income regions, including Ethiopia, and are often under recognized and undertreated [12–16]. People with epilepsy experienced significant burdens to them and their families and more psychological disorders than the general population [17, 18]. Despite the high prevalence of epilepsy in Ethiopia and the linkage between depression and epilepsy, the extent of depression among people with epilepsy in the region is still less understood. In Ethiopia, depression continues to be under-recognized and undertreated due to limited study on the impact of depression among people with epilepsy [19–25]. According to previous studies, factors linked with depression in people with epilepsy were female gender and low educational status [26–29], uncontrolled seizure [25], presence of frequent seizures, long duration of epilepsy and poor compliance to anti-seizure medication [22], cannot read and write [20, 30, 31], poor medication adherence, frequency of seizure, having developed perceived stigma, contagious belief, heritability belief & treatability belief of the patients was associated with co-morbid depression [32–35]. Moreover, depression among people with epilepsy was rarely studied in Ethiopia, despite the fact that there are factors in these countries that affect it. Therefore, this study aimed to assess the magnitude of depression and its associated factors among people with epilepsy at Wolaita Sodo University Hospital, South Ethiopia.

2 Methods and materials

2.1 Study design, setting and period

A study was conducted from April 15 to May 10, 2021, at the Wolaita Sodo University Hospital Psychiatry Clinic, Wolaita Sodo, South Ethiopia. Wolaita Sodo University Teaching and Referral Hospital is located in Wolaita Sodo town, which is located 380 km south from Addis Ababa. Wolaita Sodo University Teaching Referral Hospital (WSUTRH) is the only public teaching and referral hospital in the Wolaita Zone, which provides a broad range of medical services in its catchment area for about more than three million people. The hospital delivers different medical services for outpatients, emergencies, and inpatients for approximately 450–500 patients per day. In the hospital, the psychiatry unit is giving neurological services with mental health services.

2.2 Participants

All sampled people with epilepsy who attended the Wolaita Sodo University Hospital psychiatry clinic during the data collection period were included in the study, and participants who were critically ill to the extent of being unable to communicate during the data collection period were excluded from the study.

2.3 Sample size and sampling procedure

The single population proportion formula was used to calculate the number of required samples for this study, and the sample size was calculated by using 51.2% prevalence of depression among people with epilepsy attending the selected public health facilities of the Bench Maji Zone, South Ethiopia, 0.512 P, 1.96 Z (standard normal distribution), 95% CI, $\alpha = 0.05$, (31). By adding a 10% non-response rate, the final sampling size was 423. The systematic random sampling technique was used for the selection of study participants. The k value was calculated by dividing the total population by the total sample size, so the sampling fraction is $(868/423 \approx 2)$. Hence, the sample interval was 2, and study participants were chosen at regular K intervals up to the required sample size.

2.4 Data collection tools

Patient health question (PHQ-9) was used to assess depression. It 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 ranging from 0.84 to 0.915 in most of the countries, including Africa. In Ethiopia, it was validated in Amharic and Afan Oromo versions with Cronbach's α of 0.85, specificity (67%), and sensitivity (86%). PHQ-9 consists of 9 items, and each item has 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 was considered as having depression [36, 37].

Perceived stigma was measured by using the KSSE, which was developed and validated in Kilifi, Kenya, with high internal consistency, Cronbach's α of 0.91, and adopted in Ethiopia. It has a three-point Likert scale that is 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 scores were categorized using the 66th percentile [38, 39].

Using the Oslo 3-item social support scale, social support was evaluated. The three-item social support scale is a widely used questionnaire for evaluating social support. It asks about how easy it is to seek aid from neighbors, how many people the subjects can rely on in case of significant issues, and how concerned people are about what the subject is doing. The sum index was created by summing the three elements' raw scores, which ranged from 3 to 14. Poor social support was rated at 3–8, moderate social support at 9–11, and strong social support at 12–14 [40, 41].

The validated Morisky Medication Adherence Scale (MMAS) was used to measure medication non-adherence. It has eight items with a binary response (yes/no), with questions asking the patient to answer "yes" or "no" to items 1–7 and a 5-point Likert scale for the final item. A good answer suggests that there is an issue with adherence. As a result, higher ratings suggest that a patient is not taking their drugs as prescribed. The sum of the scores for each item determines the overall score for each patient. MMAS classifies poor medication adherence ($\text{MMAS} \geq 3$) and good medication adherence ($\text{MMAS} < 3$) [42].

For screening of substance use, a modified form of ASSIST was used, which was 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.

2.5 Data collection procedure

A structured face-to-face interviewer-administered questionnaire was used to gather data. Data was collected by three Bachelors of Science degree holders in psychiatry and one mental health specialist under the supervision of the principal investigator.

2.6 Data quality control

The questionnaire was developed in English and translated into Amharic and then back-translated into English by experts and psychiatry professionals to check consistency. To assure the quality of data, training was given for data collectors prior to the data collection time. Before the actual data collection, the questionnaire was tested on 5% of the total sample size ($n = 21$) people with epilepsy at Hawassa University Referral Hospital. The principal investigator was supervising and distributing all necessary items for data collection on each data collection day, checking filled questionnaires for completeness, and solving forwarded problems in a timely manner during data collection.

2.7 Data processing and analysis

Data was entered into Epi Data Software version 4.6.0.2, and then it was exported and analyzed by using STATA version 14. Then, the data was analyzed to generate descriptive statistics: means, frequencies, percentages, and standard deviations, using STATA version 14. Logistic regression analysis was used to calculate adjusted odds ratios to control for confounding variables with a 95% confidence interval. Bivariate analysis was done to get variables that have an association with the dependent variable, and then variables with a p -value less than 0.25 were entered into multivariable analysis. An odds ratio with 95% CI was computed, and variables having a p -value less than 0.05 in multivariable models were considered as significantly associated with the dependent variable.

3 Results

3.1 Socio-demographic characteristics of the respondents

Out of 423 participants, 402 completed interviews with a response rate of 95%. In this study, male respondents were 212 (52.7%); greater than half of the respondents, 243 (60.45%) were Protestant by their religion. About 134 (33.3%) of the study subjects have attended secondary education, followed by Diploma and above, 102 (25.4%). Out of 402 participants, 172 (42.79%) were married, and more than half of them, 215 (53.48%), were urban residents (Table 1).

3.2 Clinical, psychosocial and substance use characteristics of the respondents

Regarding clinical characteristics, among respondents, 283 (70.4%) had a seizure frequency of 2–5 times/month, and 339 (84.32%) of respondents had an age at onset of illness greater than 18 years. Of the participants, 101 (25.12%) had a family history of mental illness, and about 169 (42.04%) of respondents had moderate social support. From the respondents, 69 (17.2%) and 55 (13.7%) had lifetime and current substance use history, respectively (Table 2).

3.3 Magnitude of depression among people with epilepsy

In this study the magnitude of depression among people with epilepsy was found to be 49.2%. The finding of this research revealed that the prevalence of depression is higher in females than in males' people with epilepsy at Wolaita Sodo University Hospital, South Ethiopia.

3.4 Factors associated with depression among people with epilepsy

In bi-variable analysis, sex, educational status, marital status, social support, seizure frequency, duration of illness, duration of treatment, contagiousness, heritability, treatability belief, anti-seizure medication adherence, and perceived stigma were associated with depression among people with epilepsy at p -value < 0.25 . During multivariable analysis, being female, being unable to read and write, having poor social support, seizure frequency, poor

Table 1 Distribution of participants by their socio demographic characteristics at Wolaita sodo University Hospital, south Ethiopia, 2021

Variables	Category	Frequency (n)	Percentage (%)
Sex	Male	212	52.7
	Female	190	47.3
Age (years)	18–24	115	28.6
	24–34	179	44.53
	35–44	91	22.64
	≥ 45	17	4.23
Religion	Orthodox	91	22.64
	Muslim	29	7.21
	Catholic	39	9.70
	Protestant	243	60.45
Educational level	Can't read and write	43	10.7
	Read and write only	49	12.2
	Primary school	74	18.4
	Secondary school	134	33.3
	Diploma and above	102	25.4
Marital status	Single	159	39.55
	Married/in union	172	42.79
	Divorced/separated	32	7.96
	Widowed/widower	39	9.70
Occupation	Student	96	23.9
	Self-employee	130	32.33
	Government employee	120	29.85
	Unemployed	26	6.46
	House wife	30	7.46
Residence	Urban	215	53.48
	Rural	187	46.52

anti-seizure medication adherence, and having perceived stigma were significantly associated with depression at p -value < 0.05 (Table 3).

4 Discussion

In this study the magnitude of depression among people with epilepsy was 49.2%, which is in line with the study done in Northwest Ethiopia (45.2%) [4] and Nigeria (45%) [29]. But in this study, the prevalence of depression among people with epilepsy was higher than in the study conducted in Mekelle, Ethiopia (34.8%) [34], in Central Ethiopia (43.8%) [16], Thai-land (38.5%) [43] and Egypt (25.5%) [44]. The observed discrepancy might be the result of variations in the study areas, cutoff points, data collection methods, and participant cultures. In the Egyptian study, for example, 100 healthy participants were selected for comparison out of the entire study population, potentially reducing the prevalence of depression. In contrast to our study, the Hospital Anxiety and Depression scale was employed in Thailand to measure depression, and its cutoff point differed. This could explain why people with epilepsy have varying levels of depression.

In this study, PWE who had seizure frequency of above 5 were nearly six times more likely to develop depression as compared to those patients who had seizure frequency less than 6, which is consistent with a study conducted at Northwest Ethiopia [4]. The possible explanation for this linkage might be that the symptomatic appearance of epilepsy is overt, sudden, and not easy to realize, so this difficulty of realizing where and when the seizure comes may be associated with socially unacceptable signs such as loss of bladder control, foaming from the mouth, and tongue biting, and furthermore, recurrent seizures impair quality of life. These signs may lead the people with epilepsy to stigma, depression, anxiety, and other social and psychological problems.

The finding of this study found that being female was more than two times linked with depression compared to male respondents, which is in line with the study carried out in Gaza [33, 45, 46]. This association might be that females face

Table 2 Distribution of participants by their clinical, psychosocial and substance use characteristics at Wolaita sodo university hospital, south Ethiopia, 2021

Variables	Category	Frequency (n)	Percentage (%)
Family history of mental illness	Yes	101	25.12
	No	301	74.88
Seizure frequency per month	< 2 times	78	19.4
	2–5 times	283	70.4
	> 5 times	41	10.2
Age at onset of disease in years	< 11 years	10	2.48
	11–17 years	53	13.2
	≥ 18 years	339	84.32
Duration of illness in years	< 5 year	258	64.18
	5–10 years	114	28.36
	≥ 11 years	30	7.46
Treatment duration in years	< 5 years	287	71.39
	5–11 years	92	22.89
	> 11 years	23	5.72
Social support	Poor	144	35.82
	Moderate	169	42.04
	Strong	89	22.14
Life time substance use history	Yes	69	17.2
	No	333	82.8
Substance use in the past 3 months	Yes	55	13.7
	No	347	86.3
Perceived stigma	Yes	116	28.9
	No	286	71.1
Cause of epilepsy	I don't know	240	59.70
	Spiritual possession	60	14.93
	Evil eye	14	3.48
	Family history	81	20.15
	Others	7	1.74
Contagious	Yes	105	26.1
	No	297	73.9
Heritable	Yes	146	36.3
	No	256	63.7
Treatable	Yes	376	93.53
	No	26	6.47
By what means	Prayer	9	2.24
	Traditional treatment	5	1.24
	Modern medicine	388	96.52
ASM (anti-seizure medication) adherence	Good	251	62.4
	Poor	151	37.6

Others indicates-pathogens, sinful act and walks around garbage and walking along a river

difficulty in performing normal activities of daily living, and they might face several risks or challenges regarding reproductive activity, and hormonal change during menstruation or pregnancy can enhance depression. Furthermore, due to the effects of recurrent seizures, women with epilepsy can have a hard time making decisions with regard to major life events such as marriage or bearing children. Thus, these consequences might increase depression among females.

Those PWE who had perceived stigma were nearly six times more likely to develop depression than those people with epilepsy who had no perceived stigma. This finding is supported by other studies conducted in South India [47] and Addis Ababa, Ethiopia [32]. This association could be explained by a lack of coping mechanisms for various seizure effects, such as a perceived negative social attitude brought on by an unaccepted seizure sign, or by the subjects' failure to acquire stigma resistance skills throughout their lives, which would have enabled them to deal with social stigma,

Table 3 Bivariable and multivariable analysis of factors associated with depression among people with epilepsy at Wolaita sodo university hospital, south Ethiopia, 2021

Variables	Category	Depression		COR (95% CI)	AOR (95% CI)
		Yes	No		
Sex	Male	82	130	1.00	1.00
	Female	116	74	2.48 (1.66, 3.71)	2.54 (1.43, 4.52)**
Marital status	Married/in union	72	100	1.00	1.00
	Single	77	82	1.30 (0.84, 2.01)	1.21 (0.65, 2.26)
	Divorced/ Separated	24	8	4.16 (1.77, 9.80)	2.09 (0.56, 7.77)
	Widowed/ widower	25	14	2.48 (1.20, 5.10)	2.60 (0.98, 6.92)
Educational status	Can't read and write	33	10	5.33 (2.36, 12.0)	3.43 (1.09, 10.7)*
	Read and write only	29	20	2.34 (1.16, 4.69)	0.75 (0.26, 2.10)
	Primary school (1–8)	36	38	1.53 (0.83, 2.80)	0.87 (0.37, 2.04)
	Secondary school (9–12)	61	73	1.34 (0.79, 2.28)	1.26 (0.62, 2.57)
Seizure frequency	Diploma and above	39	63	1.00	1.00
	< 2 per month	18	60	1.00	1.00
	2–5 per month	147	136	3.60 (2.02, 6.40)	2.28 (1.10, 4.70)
Contagious belief	> 5 per month	33	8	13.7 (5.39, 35.0)	5.59 (1.72, 18.1)**
	Yes	75	30	3.53 (2.18, 5.72)	1.49 (0.67, 3.34)
Heritability Belief	No	123	174	1.00	1.00
	Yes	94	52	2.64 (1.73, 4.02)	1.19 (0.59, 2.39)
Treatable belief	No	104	152	1.00	1.00
	Yes	179	197	1.00	1.00
Duration of illness	No	19	7	2.98 (1.22, 7.27)	0.60 (0.13, 2.64)
	< 5 years	107	151	1.00	1.00
	5–10 years	75	39	2.71 (1.71, 4.29)	1.74 (0.54, 5.59)
Treatment duration	≥ 11 years	16	14	1.61 (0.75, 3.44)	3.58 (0.23, 24.2)
	< 5 years	127	160	1.00	1.00
	5–11 years	61	31	2.47 (1.51, 4.05)	0.83 (0.23, 2.93)
Social Support	> 11 years	10	13	0.96 (0.41, 2.28)	0.27 (0.01, 5.08)
	Poor	116	28	11.8 (6.33, 22.2)	2.88 (1.28, 6.48)*
	Moderate	59	110	1.53 (0.87, 2.72)	1.11 (0.54, 2.28)
Stigma	Strong	23	66	1.00	1.00
	Yes	99	187	11 (6.22, 19.4)	5.96 (2.88, 12.3)**
ASM (anti-seizure medication) adherence	No	99	17	1.00	1.00
	Good	82	169	1.00	1.00
	Poor	116	35	6.83 (4.30, 10.3)	4.60 (2.46, 8.63)**

NB. *:- $p < 0.05$, **:- $p < 0.01$ indicate associated factors at p-value and 1.00 indicate reference category

cultural beliefs, and the effects of the illness that contributed to felt stigma. Also, PWE are less credited by their society and experience negative social judgment due to epileptic seizure and social stigma, which might contribute to the occurrence of depression.

The odds of developing depression among people with epilepsy who had poor social support were nearly 3 times more likely when compared with people with epilepsy who had strong social support, which is evidenced by the studies from South West Ethiopia [31]. This association might be due to the fact that social isolation reduces social support, which can have a negative influence on physical, mental, and psychological well-being, including depression. In addition to this, negative effects from poor social support lead to feelings of loneliness, hopelessness, helplessness, financial problems, and negative self-image, which could be linked with a higher risk of depression among PWE who had poor social support.

This research revealed that people with epilepsy who cannot read and write were more than three times as associated with depression as compared to people with epilepsy who had educational status of diploma and above. These findings were consistent with the previous studies from India [48] and Iran [49]. This linkage could be due to the fact that those patients with lower educational status may have poor insight and stress coping mechanisms about their

illness, which might be a contribution to developing depression in different ways. Moreover, a low level of education enhances poor insight and perceived social stigma, which impairs the quality of life and self-confidence among PWE; this can increase the odds of depression among PWE who had lower academic levels. Finally, this study found that the odds of having depression among people with epilepsy who have poor ASM (anti-seizure medication) adherence were nearly five times more than the odds of having depression among people with epilepsy who had good ASM adherence, which is supported by a previous study from the United States of America [50]. This association may be bilateral since low mood and disinterest in depression may lead to less motivation to take drugs as prescribed and may be linked to greater apathy to the possible repercussions of non-adherence. Moreover, poor adherence to ASM because of financial difficulties, ignorance, fear of stigma, and side effects; exhaustion and disturbed sleep may lower quality of life, which raises the risk of depression among people with epilepsy [51].

5 Limitation of the study

This research used a small sample size, which could affect the generalizability of the results in other study settings, and the data was collected through an interviewer-administered questionnaire; there might have been social desirability, interviewer bias, and recall bias. Lastly, the shortage of financial support didn't allow reaching all chronic follow-up clinics like HIV, DM, and HTN.

6 Conclusions and recommendation

In this study, the magnitude of depression among PWE was found to be slightly higher than in a similar study. Having lower educational status, poor social support, seizure frequency, having poor anti-seizure medication adherence, and having perceived stigma were factors associated with depression in PWE. Routine screening for depression among people with epilepsy, education on medication adherence, and strengthening social support and educational status of PWE are strongly needed to reverse the effect of the problems and enhance quality of life.

Acknowledgements The authors would like to thank the University of Gondar and study participants for their commitment in giving study information.

Author contributions TB revised and edited the final manuscript; AB conceptualized the study, wrote the proposal, participated in data collection, analyzed the data and prepared the manuscript. NY, ST and YM revised the proposal, and reviewed subsequent drafts, approved the proposal. All authors read and approved the final manuscript.

Funding This research was funded by the University of Gondar. However, the University of Gondar has no role in the designing of the study and data collection, analysis, or interpretation of data and in writing the manuscript.

Data availability Data is provided within the manuscript or supplementary information files.

Declarations

Ethics approval and consent to participate Ethical clearance was obtained from the Institutional Review Board (IRB) of the University of Gondar; reference number (Ref.No-426/2021). Detailed information about the study was explained to all study participants in the information sheet in accordance with relevant guidelines and regulations of the ethical standards of Ethiopian medical research, which is comparable to the 1964 Declaration of Helsinki ethical standards. Each participant provided written informed consent; for those who couldn't read and write the interviewer read the consent; and after they agreed to participate, informed consent was obtained by the use of their fingerprints. Participants had the right not to participate in the study and even to withdraw in between, as explained in advance. The privacy and confidentiality of study participants' information were kept at every stage of data processing by excluding any personal identifiers in the questionnaire well explained. Finally, participants who had depression after screening received appropriate treatment.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party

material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Engel J, Pedley TA, Aicardi J. *Epilepsy: a comprehensive textbook*. Lippincott Williams & Wilkins; 2008.
2. Organization WH. *Epilepsy in the WHO Eastern Mediterranean region: bridging the gap*. World Health Organization; 2010.
3. Engel J Jr. *Epilepsy in the world today: medical point of view*. *Epilepsia*. 2002;43:12–3.
4. Biftu BB, Dachew BA, Tiruneh BT, Tebeje NB. Depression among people with epilepsy in Northwest Ethiopia: a cross-sectional institution based study. *BMC Res Notes*. 2015;8(1):1–8.
5. Ngugi AK, Bottomley C, Kleinschmidt I, Sander JW, Newton CR. Estimation of the burden of active and life-time epilepsy: a meta-analytic approach. *Epilepsia*. 2010;51(5):883–90.
6. Tekle-Haimanot R, Abebe M, Forsgren L, Gebre-Mariam A, Heijbel J, Holmgren G, et al. Attitudes of rural people in central Ethiopia toward epilepsy. *Soc Sci Med*. 1991;32(2):203–9.
7. Tekle-Haimanot R, Abebe M, Gebre-Mariam A, Forsgren L, Heijbel J, Holmgren G, et al. Community-based study of neurological disorders in rural central Ethiopia. *Neuroepidemiology*. 1990;9(5):263–77.
8. Berhanu S, Alemu S, Asmera J, Prevett M. Primary care treatment of epilepsy in rural Ethiopia. *Ethiop J Health Dev*. 2002;16(3):235–40.
9. Wubie MB, Alebachew MN, Yigzaw AB. Common mental disorders and its determinants among epileptic patients at an outpatient epileptic clinic in Felegehiwot Referral Hospital, Bahirdar, Ethiopia: cross-sectional study. *Int J Ment Heal Syst*. 2019;13(1):1–10.
10. Rakesh P, Ramesh R, Rachel P, Chanda R, Satish N, Mohan V. Quality of life among people with epilepsy: a cross-sectional study from rural southern India. *Natl Med J India*. 2012;25(25):261–4.
11. American Psychiatric Association A, Association AP. *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, DC: American Psychiatric Association; 2013.
12. Burton K, Rogathe J, Whittaker RG, Mankad K, Hunter E, Burton MJ, et al. Co-morbidity of epilepsy in Tanzanian children: a community-based case-control study. *Seizure*. 2012;21(3):169–74.
13. Mula M. Treatment issues for psychiatric comorbidities of epilepsy. *Clin Pract*. 2013;10(3):293.
14. Edeh J, Toone B. Antiepileptic therapy, folate deficiency, and psychiatric morbidity: a general practice survey. *Epilepsia*. 1985;26(5):434–40.
15. Mendez MF, Doss RC. Ictal and psychiatric aspects of suicide in epileptic patients. *Int J Psychiatry Med*. 1992;22(3):231–7.
16. Chaka A, Awoke T, Yohannis Z, Ayano G, Tareke M, Abate A, et al. Determinants of depression among people with epilepsy in Central Ethiopia. *Ann Gen Psychiatry*. 2018;17(1):1–7.
17. Al-Asmi A, Dorvlo AS, Burke DT, Al-Adawi S, Al-Zaabi A, Al-Zadjali HA, et al. The detection of mood and anxiety in people with epilepsy using two-phase designs: experiences from a tertiary care centre in Oman. *Epilepsy Res*. 2012;98(2–3):174–81.
18. Patel RS, Elmaadawi A, Mansuri Z, Kaur M, Shah K, Nasr S. Psychiatric comorbidities and outcomes in epilepsy patients: an insight from a nationwide inpatient analysis in the United States. *Cureus*. 2017;9(9): e1686.
19. Hesdorffer DC, Hauser WA, Annegers JF, Cascino G. Major depression is a risk factor for seizures in older adults. *Ann Neurol*. 2000;47(2):246–9.
20. Dessie G, Mulugeta H, Leshargie CT, Wagnew F, Burrowes S. Depression among epileptic patients and its association with drug therapy in sub-Saharan Africa: a systematic review and meta-analysis. *PLoS ONE*. 2019;14(3): e0202613.
21. Fg G. Diagnosis and treatment of mood disorders in persons with epileps. *Curr Opin Neurol*. 2005;18:129–33.
22. Rehman S, Kalita KK, Baruah A. A hospital based cross sectional study on comorbid psychiatric problems in persons with epilepsy from north eastern part of India. *Int J Epilepsy*. 2017;4(1):31–5.
23. Rani R, Arora R, Dass Garg P, Bala N, Neki N. Prevalence of psychiatric comorbidities among the patients of epilepsy attending general hospital psychiatric unit. *Int J Curr Res Med Sci*. 2018;4(5):90–6.
24. Mbewe EK, Uys LR, Nkwanyana NM, Birbeck GL. A primary healthcare screening tool to identify depression and anxiety disorders among people with epilepsy in Zambia. *Epilepsy Behav*. 2013;27(2):296–300.
25. Aziz-ur-Rehman Yousafzai AW, Yousafzai RT. Frequency of depression in epilepsy: a hospital based study. *J Ayub Med Coll Abbottabad*. 2009;21(2):21–2.
26. Nidhinandana S, Chinvarun Y, Sithinamsuwan P, Udommongkol C, Suwantamee J, Wongmek W, et al. Prevalence of depression among epileptic patients at Phramongkutklo Hospital. *J-Med Assoc Thailand*. 2007;90(1):32.
27. Stefanello S, Marín-Léon L, Fernandes PT, Li LM, Botega NJ. Depression and anxiety in a community sample with epilepsy in Brazil. *Arq Neuropsiquiatr*. 2011;69(2B):342–8.
28. Sezibera V, Nyirasafari D. Incidence of depression in Epilepsy patients. *Rwanda J*. 2013;1(1):67–77.
29. Ogunrin OA, Obiabo YO. Depressive symptoms in patients with epilepsy: analysis of self-rating and physician's assessment. *Neurol India*. 2010;58(4):565.
30. Angelo A. Prevalence of depression and its associated factors among adult epileptic patients following treatment at selected public health facilities of bench Maji zone, South West Ethiopia, 2017. *Epilepsy J*. 2018;4(1000121):2472–0895.
31. Engidaw NA, Bacha L, Kenea A. Prevalence of depression and associated factors among epileptic patients at Ilu Ababore zone hospitals, South West Ethiopia, 2017: a cross-sectional study. *Annals of general psychiatry*. 2020;19:1–8.
32. Tegegne MT, Mossie TB, Awoke AA, Assaye AM, Gebrie BT, Eshetu DA. Depression and anxiety disorder among epileptic people at Amanuel Specialized Mental Hospital, Addis Ababa, Ethiopia. *BMC Psychiatry*. 2015;15(1):1–7.
33. Tsegabrhan H, Negash A, Tesfay K, Abera M. Co-morbidity of depression and epilepsy in Jimma University specialized hospital, Southwest Ethiopia. *Neurol India*. 2014;62(6):649.

34. Seid J, Mebrahtu K. Prevalence and associated factors of depression among people with epilepsy in Mekelle, Tigray, Ethiopia, 2019.. Research Square; 2020. <https://doi.org/10.21203/rs.3.rs-17990/v1>
35. Mesafint G, Shumet S, Habtamu Y, Fanta T, Molla G. Quality of life and associated factors among patients with epilepsy attending outpatient department of Saint Amanuel Mental Specialized Hospital, Addis Ababa, Ethiopia, 2019. *J Multidiscip Healthc*. 2020;13:2021.
36. Woldetensay YK, Belachew T, Tesfaye M, Spielman K, Biesalski HK, Kantelhardt EJ, et al. Validation of the Patient Health Questionnaire (PHQ-9) as a screening tool for depression in pregnant women: Afaan Oromo version. *PLoS ONE*. 2018;13(2): e0191782.
37. Gelaye B, Williams MA, Lemma S, Deyessa N, Bahretibeb Y, Shibire T, et al. Validity of the patient health questionnaire-9 for depression screening and diagnosis in East Africa. *Psychiatry Res*. 2013;210(2):653–61.
38. Mbuba CK. Epilepsy treatment gap, associated risk factors and intervention strategies in Kilifi. Kenya: Verlag nicht ermittelbar; 2011.
39. Fanta T, Azale T, Assefa D, Getachew M. Prevalence and factors associated with perceived stigma among patients with epilepsy in Ethiopia. *Psychiatry J*. 2015;2015: 627345.
40. Jemal K. Prevalence and correlates of co-morbid anxiety and depression among patients with dental disease on follow up at Saint Paul's hospital millennium medical college, Addis Ababa, Ethiopia. *J Am Sci*. 2018;14(3):77–83.
41. Ibrahim AW, Mukhtar YM, Sadique PK, Tahir BM, Olabisi AM, Bukar RI, et al. A facility-based assessment of internalized stigma among patients with severe mental illnesses in Maiduguri, North-Eastern Nigeria. *Int Neuropsychiatr Dis J*. 2016;6:1–11.
42. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986;24:67–74.
43. Phabphal K, Sattawatcharawanich S, Sathirapunya P, Limapichart K. Anxiety and depression in Thai epileptic patients. *Med J Med Assoc Thailand*. 2007;90(10):2010.
44. Hamed SA, Metwaly NAH, Hassan MM, Mohamed KA, Ahmad MAR, Soliman AAM, et al. Depression in adults with epilepsy: relationship to psychobiological variables. *World J Neurol*. 2012;2:1–10.
45. Biftu BB, Dachew BA, Tiruneh BT, Birhan Tebeje N. Depression among people with epilepsy in Northwest Ethiopia: a cross-sectional institution based study. *BMC Res Notes*. 2015;8:585. <https://doi.org/10.1186/s13104-015-1515-z>. PMID: 26482788; PMCID: PMC4617742.
46. 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*. 2012;2(1):10–3.
47. Joseph N, Ray A, Bhat S, Herady M, Kumar A. Assessment of quality of life, stigma associated and self-management practices among patients suffering from epileptic seizures: a cross sectional study. *J Neurosci Behav Health*. 2011;3(7):91–8.
48. Mehmedika-Suljić E. Presence of depressive disorder among patients with epilepsy in relation to the duration of illness and type of antiepileptic therapy. *Med Arh*. 2008;62(3):156–8.
49. Zahiuddin AR, Shafiee-Kandjani AR, Ghoreishi FS. Depression rate among 18–40-year-old patients suffering from generalized tonic-clonic epilepsy referred to Neurology Clinics in an Iranian Hospital. *Neurosciences*. 2008;13(1):86–7.
50. Ettinger AB, et al. The relationship of depression to antiepileptic drug adherence and quality of life in epilepsy. *Epilepsy Behav*. 2014;36:138–43.
51. Boylan LS, Flint LA, Labovitz DL, Jackson SC, Starner K, Devinsky O. Depression but not seizure frequency predicts quality of life in treatment-resistant epilepsy. *Neurology*. 2004;62:258–61.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.