



Cross-sectional Study

Burden of depression and predictors among Ethiopian stroke survivors: Cross-sectional study

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ABSTRACT

Background: stroke is a common cause of mortality and morbidity in low- and middle-income countries. It is a very sudden episode in the patients' lives and can lead to multiple psychosocial, social, and economic consequences, and psychiatric problems. poststroke depression is the most common and major neuropsychiatric consequence of stroke that affects one-third of stroke survivors. The aim of this study to assess the burden of depression and its predictors among stroke survivors with local version validated Patient Health Questionnaire. **Methods:** An institutional-based cross-sectional study was conducted among stroke patients at selected tertiary level hospitals. Data were collected by interview method using structured questionnaires, and patient medical record reviews and data were recruited by using consecutive sampling method. Bivariate and multivariable binary logistic regression model analysis was used with SPSS version 23 to identify factors associated with depression.

Results: A total of one hundred eighty stroke patients participated in the study with a response rate of 88.2%. The overall prevalence of depression is 49.6% (95% CI: 42.8, 56.7). Occupation, marital status, level of education of stroke patients was significantly associated with post stroke depression with $P < 0.05$.

Conclusion: The study findings presented that nearly half of the stroke patients suffered from post stroke depression. Post-stroke depression was strongly associated with patient occupation, marital status, and level of education There is urgent need for integration of screening for and management of post-stroke depression among stroke survivors.

1. Background

Stroke is a chronic and devastating disease with an estimated high socioeconomic burden than that of cardiovascular disease and cancer. Worldwide, stroke remains the second leading cause of death and disability [1,2]. The burden of stroke worldwide increasing rapidly and the aging population makes it still prevalent [3]. Annually, around 15 million people grieve from stroke worldwide, of whom about 5 million die and 5 million suffer from permanent disabilities [4]. The global burden of disease study indicates 16.9 million stroke cases in 2010 and 70% occurred in low- and middle-income countries (LMICs) [5].

Ethiopia has also shared the global problem, and it is becoming more prevalent. In Ethiopia, stroke is a common cause of mortality and morbidity [5]. It is the most common neurological disorder seen in patients admitted in hospitals and burden of Disease study reported that, in 2016, there were 52,548 incidences of stroke and 38,353 deaths in Ethiopia [1,6]. According to WHO data published in 2017, stroke deaths

in Ethiopia reached 6.23% of total deaths. In addition, the age-adjusted death rate of stroke in the country is 89.82 per 100,000 of the population [7,8].

Stroke is a very sudden episode in the patients' lives and can lead to multiple psychosocial, social, and economic consequences, and psychiatric problems [9]. Patients with stroke have been consistently noted to experience changes in their emotional status that range from simple emotional reactions such as low motivation, indifference, and frustration to more complicated depressive symptoms like loss of appetite, insomnia, and feelings of worthlessness [10–12].

Poststroke depression (PSD) is the most common and major neuropsychiatric consequence of stroke that affects one-third of survivors and it is the most common mood problem after stroke. PSD has been related to physical disability and the limitations in daily activities [12]. Patients with PSD experience more functional disabilities, longer hospital stay, poorer rehabilitation results, lower quality of life, and high mortality in the first year after the stroke [13–15]. Previous studies reported that the level of physical disability, severity of stroke, history depression,

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Abbreviations

AOR	Adjusted Odds Ratio
COD	Crude Odds Ratio
DM	Diabetes Mellitus
ETB	Ethiopian Birr
LMICs	Lower and Middle Income Countries
HTN	Hyper Tension
PHQ	Patient Health Questionnaire
PSD	Post stroke Depression
UIN	Unique Identification Number
USA	United State of America

cognitive impairment, older age, female gender, and living environment have been increased the risk of PSD [13,16,17].

Evidence showed that the prevalence rate of PSD different due to the use of different diagnostic criteria and assessment time. A literature review showed that about 25%–79% of stroke survivors suffers from PSD [13]. A meta-analysis evaluating the prevalence of PSD reported by observational studies found a prevalence of 33%, on the other hand another meta-analysis examining the prevalence of mood disorders after stroke reported a prevalence of 17.7% for major depressive disorder and a prevalence of 13.1% for minor depressive disorder [18,19]. The studies done in Iran have reported conflicting prevalence rates for PSD, ranging from 18% to 72.5% [20,21]. Similarly, a study done in Ethiopia with small sample size and only on ischemic stroke patients has reported 32.2% of ischemic stroke patients have depressive symptoms [22]. Considering that to prevent and treat depression in stroke patients requires accurate statistical data, the small sample size of the previous studies, and given the lack of inclusiveness the type of stroke on the previous study, the present study aimed to assess the burden of depression and its predictors among stroke survivors with local version validated Patient Health Questionnaire (PHQ-9).

2. Methods and materials

2.1. Study design and setting

An institutional-based multicenter cross-sectional study design was conducted at tertiary level hospitals from April 1–May 31, 2019. Each hospital has a chronic illness outpatient department for the follow-up service for chronic disease including stroke and physiotherapy center for rehabilitation service. On average, each hospital has 60 stroke survivors per month.

2.2. Study participants

The study population consisted of patients with stroke who were seeking post-stroke rehabilitation at the chronic illness OPD during the study period and Patients who had three months and above the duration of the event were included in this study. Patients who were involved in the study were selected based on established criteria. Accordingly, after checking the patients' medical record card, all adult patients (≥ 18 years) with any type of stroke who had the disease for three or more months were included, whereas patients with a brain tumor, any musculoskeletal problem, mental disorder, traumatic brain injury, or spinal cord injury and stroke patients with severe aphasia were excluded from this study.

2.3. Sample size and sampling procedure

The sample size required for this study was determined using the single population proportion formula and calculated using Epi Info

software version 7.1 (Centres for Disease Control and Prevention, USA). The samples were obtained from a relatively small population ($N = 180$). The following assumptions were used to determine the required sample: prevalence of post stroke depression is 32.2% taken from the previous study [22], a confidence level of 95%, 5% margin of error., the required sample size was obtained by the following calculation

$$n = (za/2)^2 p (1-p)/d^2,$$

where n = sample size.

$Z = 95\%$ confidence limit (1.96)

p = proportion of the post stroke depression which take prevalence of 32.2%

d = margin of error or degree of accuracy desired (0.05)

$n = (1.96)^2 \times (0.322) (0.678) / (0.05)^2 = 336$. Since the samples were obtained from a relatively small population ($N = 180$); correction formula was used.

$$n = n/1 + n/N$$

$$n = 336/1 + 336/180 = 336/1.65 = 204$$

The derived power calculated sample size was $n = 204$.

The study participants were recruited by using consecutive sampling method until the required sample size was reached.

2.4. Study variables

The dependent variable of depression (Yes/No) was measured using the widely used Patient Health Questionnaire (PHQ-9). The Amharic version of the scale has been validated in (sensitivity = 86% and specificity = 67%) [23].

PHQ-9 is a multipurpose instrument for screening, diagnosis, monitoring, and measuring the severity of depression. It assesses 9 parameters each scored 0–3 (0 = not at all, 1 = several days, 2 = more than half the days, and 4 = nearly every day). A sum of all these scores forms the basis for the scale score that ranged between zero and twenty-seven (score 0–4 = no depression, score of 5–9 = minimal symptoms, score of 10–14 = minor depression, score of 15–19 = moderately severe depression, and score of 20–27 = severe depression). We have used a cutoff point of 10 to classify patients as having depression or not. PHQ-9 scale and extremity power were dichotomized for certain analyses (PHQ-9 >10 as indication of depression).

Independent variables like Age, sex, marital status, average monthly income, educational level, smoking habit, alcoholic habit, physical activity was collected by interviewer-administered questionnaire whereas variables like Type of stroke, side of involvement, co-morbidities like were collected from patient charts. The smoking and Alcohol use habits were assessed by asking the stroke patients if they ever smoke cigarette or drink alcohol, and social support was evaluated using the Oslo 3 item social support scale with scores ranging from 3 to 14 (poor = 3–8, moderate = 9–11, and strong = 12–14) [24].

2.5. Data collection procedure and quality assurance

The data was composed by interviewing the participants using a structured pretested questionnaire and chart review. The data was collected by six physiotherapists working in each Neurology physiotherapy unit. Data collectors were trained for one day about the objective of the study and ethical considerations. Data collectors were supervised by the principal investigator. Data was reviewed and checked for completeness, accuracy, and consistency after each day of data collection.

2.6. Data processing and analysis

Data were checked for completeness and entered into Epi-Info

version 7.1 and then exported to IBM SPSS version 23 statistical software for coding, recoding, storing and further analysis. Descriptive statistics like frequencies, percentages, means, and standard deviations were used for all participant characteristics and factors associated with depression. Binary logistic regression was used to select variables and to determine Crude Odds Ratio (COR). Variables with P value < 0.2 were entered into multivariable logistic regression. Adjusted Odds Ratio (AOR) with 95% confidence intervals for variables with P-value < 0.05 was estimated to show factors affecting depression among stroke patients. The fitness of the model was checked by using the Hosmer-Lemeshow goodness-of-fit test. Finally, this study was reported in accordance with the STROCSS statement checklist (Additional file 1) and registered at www.researchregistry.com with Research Registry UIN7117.

3. Results

3.1. Socio-demographic characteristics of the participants

A total of one hundred eighty (180) stroke patients participated in the study with a response rate of 88.2%. The reasons for non-responses were no time, not interested, and refusal to take consent. The age of the study participants ranged from 22 to 92 years with a mean age of (59.22 ± 12.71 years). From the total respondents, almost half 91 (50.56) of them were female, nearly two-third 120 (66.67%) of them were urban dwellers, majority of them 100 (55.56%) were married. Table 1 shows the socio-demographic characteristics of the study participants.

3.2. Clinical and behavioral characteristics of study participants

Two of three 120 (66.7%) of the study participants have diagnosed with ischemic stroke. Nearly three fourth 134 (74.44%) of the participant had one or more associated comorbidity. More than half 96 (53.3%) of the study participants had right hemiplegic. Nearly one fifth 40 (22.2%) of the patients had poor social support and only 10 (5.56%)

Table 1
Socio-demographic characteristics of stroke patients who attained in tertiary Hospitals (n = 180).

Variables	Categories	Frequency (n)	Percentage (%)
Age in years (Mean age (59.22 ± 12.71))	18–44	24	13.3
	45–64	92	51.1
	≥65	64	35.6
Residence	Urban	120	66.67
	Rural	60	33.33
Gender	Male	89	49.44
	Female	91	50.56
Marital status	Married	100	55.56
	Single	11	6.11
	Windowed	27	15.00
	Divorced	42	23.33
Religion	Orthodox Christian	98	54.44
	Muslims	66	36.67
	Protestant	16	8.89
Occupation	Government employed	38	21.11
	Private	58	32.22
	House wife	50	27.78
	Farmer	27	15.00
	Retired	7	3.89
	Illiterate	63	35.00
Level of education	Primary school	47	26.11
	Secondary school	29	16.11
	College and above	41	22.78
	<1000	33	18.33
Income (ETB/month)	1000–2000	21	11.76
	2001–3000	22	12.22
	3001–4000	41	22.87
	>4000	63	35.00

of them were smoker. Table 2 shows the clinical and behavioral characteristics of the study participants.

3.3. Prevalence of depression among stroke patients

In this study 89 patients had depression making the prevalence of 49.6% (95% CI: 42.8, 56.7). The prevalence of depression among male stroke patients was 51.69% (95% CI: 41.76, 59.21) whereas it was 48.31% (95% CI: 41.91, 55.58) among female patients. The burden of depression was higher among urban dwellers 64 (70.3%) and ischemic stroke patients 55 (60.4). The prevalence of depression was significantly higher (46.2%, n = 42) among women stroke patients with 45–65 years age group. The prevalence and distribution of post stroke depression among stroke patients are shown in Table 3.

3.4. Regression analysis

In the univariate regression analyses, PSD was significantly (p < 0.20) associated with occupation, marital status, level of education of stroke patients, monthly income, affected side, and type of stroke. Multivariate regression revealed that occupation, marital status, level of education of stroke patients was significantly associated with depression when adjusting for the other included variables. Table 3 shows the association between dependent and independent variables among the study participants.

A divorced stroke patients had significantly increased the odds of PSD in married individual by almost 8 times (AOR 7.92; 95% CI, 1.15–54.72) and windowed individual 9.86 times higher risk to develop PSD compared to married stroke patients (AOR 9.86; 95% CI, 1.32–53.52). The model also showed that illiterate stroke patients were 12.02 times more likely (AOR 12.02; 95% CI, 2.93–49.36), those who completed primary school 7.87 times high risk likely (AOR 7.87; 95% CI, 2.08–29.71) and those individual completed high school 4 times more likely (AOR 4.02; 95% CI, 1.14–14.19) to have PSD as compared to completed college and above education. The adjusted odds of PSD were 81% and 96% less likely among stroke patients who had private job and house wife respectively as compared to stroke patients who had government employed patients (AOR 0.19; 95% CI, 0.53–0.69) and (AOR 0.04; 95% CI, 0.01–0.17) respectively.

4. Discussion

In this study, we have assessed the magnitude of depression among stroke patients and the factors associated with post stroke depression

Table 2
Clinical and behavioral characteristics of stroke patients who attained in tertiary Hospitals (n = 180).

Variables	Categories	Frequency(n)	Percentage (%)
Stroke type	Ischemic	120	66.7
	hemorrhagic	60	33.3
Affected side	Right	96	53.3
	Left	84	46.7
Social support	Poor	40	22.2
	Intermediate	75	41.7
	Strong	65	36.1
Co-morbidity	No	46	25.56
	Yes	134	74.44
Type of co-morbidity	HTN	117	65.00
	DM	4	2.22
	DM & HTN	8	4.44
	Cardiac & HTN	5	2.78
Smoking status	No	170	94.44
	Yes	10	5.56
Alcoholic habit	No	164	91.11
	Yes	16	8.89
Physical activity	No	122	67.88
	Yes	58	32.22

Table 3
Burden of post stroke depression among stroke patients attending at in tertiary Hospitals (n = 180).

Variables	PSD		Univariate COR (95%CI)	Multivariate AOR (95%CI)
	No	Yes		
Age in years				P > 0.2
18–44	15 (16.5%)	9 (10.1%)	1ref	
45–64	42 (46.2%)	50 (56.2)	1.98 (0.79,4.99)	
≥65	34 (37.4%)	30 (33.7%)	1.47 (0.56,3.85)	
Residence				P > 0.2
Urban	64 (70.3)	56 (62.9)	0.72 (0.38,1.33)	
Rural	27 (29.7%)	33 (37.1)	1ref	
Gender				P > 0.2
Male	43 (47.3%)	46 (51.7%)	1ref	
Female	48 (52.7%)	43 (48.3%)	0.84 (0.45,1.50)	
Marital status				
Married	46 (50.5%)	54 (60.7)	1ref	1ref
Single	9 (9.9)	2 (2.2)	3.60 (0.65,19.90)	6.21 (0.77, 49.98)
Windowed	15 (16.5)	12 (13.5)	4.50 (0.87,23.37)	9.86 (1.32,53.52) [#]
Divorced	21 (23.1%)	21 (23.6%)	5.28 (1.09,25.69)	7.92 (1.15–54.72) [#]
Religion				P > 0.2
Orthodox Christian	50 (54.9%)	48 (53.9)	0.75 (0.26,2.16)	
Muslims	34 (37.4%)	32 (36.0%)	0.73 (0.24,2.19)	
Protestant	7 (7.7%)	9 (10.1%)	1ref	
Occupation				
Government employed	17 (18.7%)	21 (23.6%)	1ref	1ref
Private	27 (29.7%)	31 (34.8%)	0.93 (0.41,2.11)	0.19 (0.53,0.69) [#]
House wife	34 (37.4%)	16 (18.0%)	0.38 (0.16,0.91)	0.04 (0.01,0.17) [#]
Farmer	10 (11.0%)	17 (19.1%)	1.38 (0.50,3.78)	0.22 (0.05,1.02)
Retired	3 (3.3%)	4 (4.5%)	1.08 (0.21, 5.49)	0.47 (0.08,2.85)
Level of education				
Illiterate	30 (33.0%)	33 (37.1%)	1.91 (0.85,4.27)	12.02 (2.93,49.36) [#]
Primary school	21 (23.1%)	26 (29.2)	2.15 (0.91,5.06)	7.87 (2.08, 29.71) [#]
Secondary school	14 (15.4%)	15 (16.9%)	1.86 (0.71,4.88)	4.02 (1.14, 14.19) [#]
College and above	26 (28.6%)	15 (16.9%)	1ref	1ref
Income (ETB/month)				
<1000	15 (16.5%)	18 (20.2%)	1.71 (0.73,3.99)	1.62 (0.61,4.29)
1000–2000	7 (7.7%)	14 (15.7%)	2.85 (1.01,8.03)	2.50 (0.76,8.23)
2001–3000	9 (9.9%)	13 (14.6%)	2.06 (0.77,5.52)	2.29 (0.73,7.19)
3001–4000	23 (25.3%)	18 (20.2%)	1.11 (0.50,2.46)	0.96 (0.37,2.49)
>4000	37 (40.7%)	26 (29.2%)	1ref	1ref
Type of stroke				
Ischemic	55 (60.4%)	65 (73.0%)	1.77 (0.95,3.33)	2.00 (0.92,3.27)
Hemorrhagic	36 (39.6%)	24 (27.0%)	1ref	1ref
Affected side				
Right	43 (40.3%)	53 (59.6%)	1.64 (0.91,2.97)	1.64 (0.82,3.27)

Table 3 (continued)

Variables	PSD		Univariate COR (95%CI)	Multivariate AOR (95%CI)
	No	Yes		
Left	48 (52.7%)	36 (40.4%)	1ref	1ref

Variables significant with p-value <0.05, 1 = reference category; COR crude odds ratio, AOR adjusted odds ratio, CI confidence interval, Post Stroke Depression.

and provide baseline data for the integration of rehabilitation and psychiatric care with neurology clinic. The findings of this study showed that the overall prevalence of PSD among stroke patients was 49.6% with 95% CI (42.8, 56.7) and occupation, marital status, and level of education were found to be independent predictors of depression.

The results showed that nearly half of the patients with stroke suffered from depression. The prevalence of post stroke depression found in the current study is comparable with the results of the studies done in Iran 45% [25], 47.4% [26], another systematic review and meta-analysis study of Iran 46.9% [27] and Finland 48.1% [28]. However, the reported prevalence of PSD in our study was found to be higher than the studies done in USA 31% [29], German 31.1 [30], New Zealand 23% [31], Ghanaian studies 36.5% [32], Uganda 31.5% [33], Nigeria 25.5 [34], Addis Ababa, Ethiopia 32.2% [22]. This discrepancy could be attributable to the difference in the study populations in terms of types of strokes, the tool used for screening depression or other socio-demographic variations and severity of depression considered. Another reason for different prevalence rates is partly due to the use of different diagnostic criteria and different assessment times [13]. Whereas, the finding of this study was lower than the study conducted in Bangladesh 70% [35], Tehran, Asian study 72.5% [36] and Rafsanjan, Iran 59% [37]. This difference might be the variation of the assessment tool, in this study we use Patient Health Questionnaire (PHQ-9) while the Bangladesh study used Hamilton Depression Rating Scale (HDRS). The other studies also used Hospital Anxiety Depression Scale (HADS) and Beck Depression Inventory (BDI) assessment tool to screen depression for patients with stroke. The other possible reason could be the difference in the age distribution of the study participants and onset of stroke.

The odds of depression was significantly reduced in patients who are private job and housewife when compared to government employees [38]. This could be related to work-related stress which worsens feelings of inadequate control over one's work, frustrated hopes and expectations leading to depression [39].

The odds of illiterate stroke patients, completed primary school and high school were more likely to have PSD as compared to stroke patients completed college and above education. This finding is supported by a study from Italy [40], USA [41]. The possible reason could be these patients may have a better understanding of the disease and have early screening which increases their recovery. While this finding is not supported by Iranian study [26] and Ghana [32].

A divorced and windowed stroke patients had significantly increased the odds of PSD compared to married stroke patients. This finding is supported by the study done in Ghana [32], Japan [42]. This could be marriage can improve the personal well-being through by elevating financial resource, fostering better physical health, and providing greater emotional support. Research has argued that marriage is associated with low rates of depression since it shields the individual from exposure to stress [43].

5. The strength and limitation of the study

The strength of this study was data was collected in multicenter which could be representative and collected with Amharic version validated Patient Health Questionnaire. For the benefit of future researches, the findings of this study should be interpreted within the

context of a few limitations. The most significant limitation of this study is the relatively small number of study participants and stroke survivors were not screened for prior history of depression before onset of stroke. Secondly, history of use of antidepressant medications was not collected but almost all study subjects had never been screened for depression before as part of routine care and are thus less likely to be taking antidepressants. Thirdly The cross-sectional nature of this study presents limitations in terms of causal association interpretations.

6. Conclusion

The study findings presented that nearly half of the Ethiopian stroke patients suffered from PSD. There is a high prevalence of unrecognized post-stroke depression. Post-stroke depression was strongly associated with patient occupation, marital status, and level of education There is urgent need for integration of screening for and management of post-stroke depression among stroke survivors.

Ethical approval

Ethical clearance was secured from the ethical review committee of the College of Medicine and Health Sciences, University of Gondar, Ethiopia.

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This study was funded by the University of Gondar. University of Gondar did not involve in the design of the study, data collection, analysis, and interpretation.

Author contribution

AZ developed the proposal, organized data collection, analyzed the data, prepared and revised the manuscript. MG and KS revised the proposal, involved in data collection, data analysis, and revised the manuscript. All authors approved the final manuscript for publication.

Registration of research studies

Research registry UIN7117.

Guarantor

Moges Gashaw, Kedir Sany and Ashenafi Zemed.

Consent

Personal identifiers in the manuscript and during data collection processes were not included. So, consent for publication not applicable.

Declaration of competing interest

The authors report no conflicts of disclosure in this work.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102926>.

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