RESEARCH



Prevalence and associated factors of poststroke depression among patients on followup at medical referral clinics of Bahir Dar city public specialized hospitals

Ermiyas Yemane Debebe¹, Mulugeta Biyadgie², Hanamariam Abebe Chekol³, Lakew Asmare⁴ and Zeamanuel Anteneh Yigzaw^{5*}

Abstract

Background Post-stroke depression is among the most common neuropsychiatric complications in stroke survivors. Post-stroke depression is commonly under-recognized and under-treated. This study aimed to assess the prevalence and associated factors of post-stroke depression among patients on follow-up at medical referral clinics of Bahir Dar City public specialized hospitals.

Method An institutional-based prospective cross-sectional study was conducted from September to December 2023 on 394 patients. Public Health Questionnaire-9 was used to diagnose depression. Data was checked for cleanness manually and then exported to SPSS version 25 software for analysis. A systematic randomized sampling method was used to identify study participants. Bivariate and multivariate logistic regression analysis was performed to identify independent predictors of post-stroke depression. A p-value less than 0.05 is considered as significant with a 95% confidence interval.

Result The overall prevalence of post-stroke depression was found to be 42.9%. Employment status (AOR=0.282, 95% CI: 0.112–0.709 C, *P*-value=0.007), depression before stroke (AOR=3.237, 95% CI: 1.098–9.544, *P*-value=0.033), ischemic heart disease (AOR=4.090, 95% CI: 1.745–9.583, *P*-value=0.001) and physical disability (AOR=4.051 95% CI: 2.239–7.332, *P*-value=0.000) were found to be statistically significant independent predictors of post-stroke depression (PSD).

Conclusion The prevalence of post-stroke depression was found to be high relative to other similar studies. Patients with known depression before stroke, ischemic heart disease, and significant physical disability were at a higher risk of developing PSD. Employed patients had less risk of developing PSD. Sufficient and comprehensive evaluation of stroke patients for depression is recommended.

Keywords Stroke, Post-stroke depression, Medical referral clinic, Bahir Dar

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Introduction

A stroke, or cerebrovascular accident, is defined as a sudden onset of a neurologic deficit that is attributable to a focal vascular cause [1]. Stroke typically results in permanent damage in the form of cerebral infarction, intracerebral hemorrhage (ICH), and/or subarachnoid hemorrhage (SAH) [2].

Stroke has become one of the top causes of mortality and disability-adjusted life-years (DALYs) lost globally [3]. "The incidence of stroke has doubled in low-andmiddle-income countries over 1990–2016 but declined by 42% in high-income countries over the same period." Globally, stroke is still the second-leading cause of death and the third-leading cause of death and disability combined in 2019. There is a substantial increment in the annual number of strokes and deaths due to stroke from 1990 to 2019 [4].

Stroke is associated with multiple neuropsychiatric complications such as depression, anxiety, and adjustment disorders. Among these, Post-Stroke Depression (PSD) is the most frequent and disabling complication [5].

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM), -5 poststroke mood disorders are defined as mood disorders due to stroke with depressive features, major depressive-like episodes, or mixed-mood features. "A patient with a diagnosis of mood disorder due to stroke with a major depression-like episode must have depressed mood or loss of interest or pleasure along with four other symptoms of depression lasting 2 or more weeks." [6].

PSD is common, affecting around one-third of stroke survivors at some point in time after stroke [7]. The most recent meta-analysis of 61 cohorts which included 25,488 patients has reported that 31% of patients developed depression at any time point up to 5 years following stroke [8]. A hospital based study done in one of the countries in north Africa concluded that PSD is a common complication seen in stroke survivors with a prevalence of 36.9% [9]. Two institutional based cross-sectional studies done in Ethiopia has shown prevalence of PSD to be 32.2% and 43.3% [10, 11].

Perhaps, increased mortality associated with PSD is the most dramatic clinical phenomenon following PSD. During a 10-year follow-up period, a diagnosis of depression during the acute phase of stroke recovery was linked to a more than threefold increased risk of mortality [12]. Other studies also shown that even mild severity of PSD was associated with higher mortality as early as 1 year after stroke [13].

The burden of functional impairment following a stroke may raise the risk of PSD, which can then result in further impairment, such as increased disability, fewer social interactions, a failure to recover promptly, failure to return to work, and longer institutional care, all of which have an impact on quality of life [9]. Another study has also revealed two years after suffering from a stroke, patients with in-hospital diagnoses of major or minor depression had worse physical and language impairments compared with non-depressed individuals. And, in patients with major depression, the degree of physical or language recovery was found to be protracted even after the depression had waned [14].

PSD is also associated with poorer functional outcomes after stroke. Even though not explored in a systematic review or meta-analysis, different individual studies has shown association between PSD and reduced poststroke Quality of Life(QOL) [7].

Several studies which are done in the past have shown that frequency of PSD can be influcenced by various factors including sex (female), history of depression, stroke severity, functional impairments or level of handicap, level of independence, and family and social support [15]. In contrast to this, other studies have not shown consistent association with factors like old age, female sex, diabetes mellitus, stroke subtype, education level, living alone and previous stroke on subsequent development of depression [16]. A lot of inconsistencies has been seen in the literature regarding predictors of PSD.

Although PSD complicates a significant proportion of stroke survivors and is associated with various complications it is commonly under-recognized and untreated in clinical practice and emphasis has to be given to the importance of the psychiatric examination of poststroke patients [17].

Various studies have been done in the past regarding post-stroke depression in many European and American countries showing a significant proportion of stroke survivors develop PSD. But little is known about the prevalence of PSD and associated factors in the context of developing countries like Ethiopia and in particular, in the study area. This study aims to assess the prevalence and associated factors of post-stroke depression among patients on follow-up at medical referral clinics of Tibebe Ghion Comprehensive Specialized Hospital (TGCSH) and Felege Hiwot Comprehensive Specialized Hospital (FHCSH).

Method

Study design

An institutional-based cross-sectional study was conducted from September 1 to December 31, 2023.

Study area and period

The study was conducted at two large public specialized hospitals in Bahir Dar city, the capital of Amhara region of Ethiopia; Tibebe Ghion Comprehensive Specialized Hospital (TGCSH) of Bahir Dar University and Felege Hiwot Comprehensive Specialized Hospital (FHCSH).

The study was conducted from September 1 to December 31, 2023. On average there are 80 to 100 and 70 to 90 stroke survivors' visits per month at the Neurology Clinic (Medical Referral Clinic) at TGSH and FHCSH respectively which was estimated by the health management information system (HMIS) records of TGCSH and data registry of medical referral clinic of FHCSH.

Source population

All patients with a history of stroke and who are on follow-up at the outpatient neurology clinic of TGCSH and FHCSH were the source population.

Study population

All adult patients with a history of stroke patients on follow-up at the neurology clinic at TGCSH and FHCSH during the study period were the study population.

Inclusion criteria

All adult patients with a history of stroke who are 18 years or older and who have brain imaging documented on their respective charts during the study period were included in the study.

Exclusion criteria

Patients with severe language impairment such as severe expressive or receptive aphasia or severe global aphasia, patients with cognitive impairment with difficulty in communication, incomplete medical chart, and a history of major psychiatric illness other than depression were excluded.

Study variables

Dependent variables

Prevalence of post-stroke depression.

Independent variables

Several factors were included as independent variables categorized as sociodemographic, stroke-related, psychosocial, and behavioral factors and comorbidities. Among sociodemographic factors age, sex, marital status, religion, place of residence, educational status, employment status, and monthly income was included. Stroke-related factors include stroke subtype, location

Table 1 Sample size calculation using significant factors

of the stroke, duration since stroke, and physical disability. Known depression before stroke and substance use such as smoking history, alcohol drinking history, and khat chewing history were included in psychosocial and behavioral factors. Comorbidities include hypertension, diabetes mellitus, previous stroke, ischemic heart disease, and atrial fibrillation.

Sample size determination and procedure Sample size determination

The sample size was determined by using the following assumptions; single population proportion formula taking p-value from another similar study conducted p=27.5% [18], level of significance 5% (a=0.05), margin of error 5% (d=0.05).

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

Where: -

n=sample size.

Z=95% confidence limit (1.96).

p=proportion of the post-stroke depression, 0.275.

d=margin of error or degree of accuracy desired (0.05). n= $(1.96)^2 \times (0.275) (0.725)/(0.05)^2 = 306.$

Adding a 10% non-response rate the sample size is 337. (Table 1)

Therefore, the sample size calculated by using the second objective is larger than the sample size calculated for a single population proportion so, the final sample size of the study was found to be 394.

Sampling technique and procedures

A systematic random sampling method was utilized. The estimated total population size was divided by the sample size to get the interval (k) which was found to be 2. Therefore, the first patient was selected randomly and after that, every second patient who visited medical referral clinics who met the inclusion criteria was interviewed.

Stroke survivor patients arriving at the neurology clinics of each hospital for their follow-up were questioned for their willingness and consent to be involved in the study after they completed their usual care at the clinic. Those patients who gave informed consent were interviewed by healthcare workers or volunteers at the clinics using the Patient Health Questionnaire (PHQ-9) and additional information was taken from patients' charts.

Variables	CI	AOR	Ratio (unexposed/expose d	Power	% of outcome in un-exposed	% of outcomes in exposed	Sample size	Add 10% of NPR
Post-stroke duration [24]	95%	2.1	1.34	80%	14.1	25.9	358	394
Gender [24]	95%	2.45	2.45	80%	20.28	38.46	198	218

Operational definitions

Stroke is defined as a sudden onset of a neurologic deficit that is attributable to a focal vascular cause and the diagnosis must be supported by imaging findings such as CT or MRI [1].

Depression The patient must fulfill the defining criteria for depression according to PHQ-9 [19]i.e., a score of 10 or greater.

Post-stroke depression new onset of depression after the occurrence of the stroke.

Data collection tools

Data was collected by interviewing the study participants using a structured pretested questionnaire and patient chart review. The Patient Health Questionnaire (PHQ) is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as 0-3 (0=not at all, 1=several days, 2=more than half the days, and 3=nearly every day). A sum of all these scores forms the basis for the scale score that ranged between zero and twenty-seven (score of 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). A score of 10 or more was used to classify patients as having depression or not. A PHQ-9 score≥10 has been found to have a sensitivity of 88% and a specificity of 88% for major depression [19]. The screening tool which is prepared in English was translated to Amharic for the respondents.

Alcohol misuse is assessed using the CAGE questionnaire which is a tool that uses four questions to screen for excessive drinking or abuse. A score of 2 or more will be used to identify patients with alcohol misuse. Physical disability is assessed using a modified Rankin Scale which is a scoring system that measures the degree of disability or dependence in the daily activities of people who suffered a stroke or other cause of neurological disability. Patients with a score of 0–2 were categorized as 'No symptom to slight disability', a score of 3–4 as 'Moderate to moderately severe disability', and a score of 5 as 'Severe disability/Bedridden'. Other factors like patient demographics, stroke type, location of the stroke, duration since the stroke, prior known depression, and comorbidities will be collected from the patient chart review.

Data quality assurance

Among the total sample size, 5% was taken for the pretest, and the pretest was done at Addisalem Primary Hospital, Bahir Dar, Ethiopia before data collection in the study areas. The data was collected by trained health

	Rural	200	50.8
Religion	Christian	350	88.8
	Muslim	42	10.7
	Others	2	0.5
Marital status	Single	14	3.6
	Married	272	69.0
	Divorced	22	5.6
	Widowed	86	21.8
Educational status	Illiterate	236	59.9
	Can read and write	65	16.5
	Elementary school	32	8.1
	High school	22	5.6
	College & above	39	9.9
Employment status	Employed	86	21.8
	Unemployed	210	53.3
	Retired	98	24.9
professionals (t	rained nurses v	who work	in outpatient

professionals (trained nurses who work in outpatient clinics & medical residents). Training was given on how to proceed with filling the questionnaire, patient interviewing, and collection of data from patient charts. Data collection was supervised by internal medicine residents.

Data processing and analysis

Data was checked for completeness and quality before data entry. The data was checked for cleanness manually and then exported to and analyzed by Statistical Package for Social Science (SPSS) version 25 software. The descriptive analysis was done by simple frequencies and proportions, and tables, and pie charts presented the results. Simple logistic regression analysis was performed to evaluate the strength of the association between PSD, sociodemographic, stroke-related factors, comorbidities, and psychosocial factors. Multiple logistic regression analysis of all statistically significant variables was performed to control potential confounders. A P-value less than 0.05 was considered statistically significant. Both simple and multiple regression analyses were expressed as odd ratios (OR) with a 95% confidence interval (CI).

Result

Socio-demographic characteristics

The study included 394 respondents in total, with a response rate of 100%. The mean age of respondents

Frequency Percentage (%)

52.8

47.2

124

33.3

40.6

14.0

49.2

I	able 2 Sociodemographic characteristics of post-stroke
p	patients on follow-up at neurology clinics of Bahir Dar public
S	pecialized hospitals ($n = 394$)

208

186

130

160

55

194

49

Male

< 45

45-60

61-74

>75

Urban

Female

Variables

Place of Residence

Gender

Aae

was $60.8(\text{SD}\pm13.5)$ years. The respondents were divided into four different age groups ranging from 23 to 91 years. The highest proportion belonged to the age group 61 to 74 years which included 160(40.6%) of the total respondents. Just over half of the respondents were male accounting for 52.8% of the total respondents. Regarding employment status, 210(53.3%) of the respondents were unemployed and 98(24.8%) were retired. 200(50.8%) of the respondents were rural residents (Table 2).

Clinical and behavioral characteristics

The majority of patients had an ischemic stroke (307) which accounts for 77.9% of the total patients. Regarding location of stroke, right hemispheric and left hemispheric stroke account for 48.5% and 45.4% of the total patients respectively, while only 24 (6.1%) patients had stroke involving bilateral hemispheres. Regarding physical disability, 234(59.4%), 58(14.7%), and 102(25.9%) patients had no symptoms of a slight disability, Moderate to moderately severe disability, and Sever disability respectively (Table 3).

Prevalence of post-stroke depression

The overall prevalence of PSD was found to be 42.9% (169 of 394 patients) (Fig. 1).

Factors associated with post-stroke depression

To assess the relationship between various sociodemographic, clinical, and behaviorally relevant variables with PSD binary logistic regression was utilized. Candidates for multivariate regression analysis were variables in the bivariate analysis with a p-value of <0.25. The bivariate logistic regression analysis identified age, marital status, educational status, employment status, location of stroke, duration since stroke, known depression before stroke, known ischemic heart disease, and physical disability associated with PSD. Among the variables analyzed with multivariate logistic regression analysis only employment status, known depression before the stroke, known ischemic heart disease, and physical disability assessed by a modified Rankin Scale were strongly associated with PSD (Table 4).

Discussion

The study was conducted to assess the prevalence and factors associated with PSD among stroke patients on follow-up at a neurology clinic in TGSH and FHCSH, Bahir Dar, Ethiopia. Our study showed the prevalence of PSD to be 42.9% (95% CI; 37.9%, 47.9%). Among the depressed patients, 14% had minor depression whereas 28.9% had moderately severe to severe depression. Employment status, known depression before stroke, IHD, and physical disability were all found to be factors contributing to increased risk of PSD.

Table 3 Clinical and behavioral characteristics of post-stroke	
patients on follow-up at neurology clinics of Bahir Dar public	
specialized hospitals ($n = 394$)	

Variables		Frequency	Per-
			cent-
			age (%)
Stroke subtype	Ischemic	307	77.9
	Hemorrhagic	87	22.1
Location of	Left hemispheric	179	45.4
stroke	Right hemispheric	191	48.5
	Bilateral	24	6.1
Duration since	<6 months	82	20.8
stroke	6 to 12 months	179	45.4
	> 12 months	133	33.8
History of	Yes	277	70.3
hypertension	No	117	29.7
Known depres-	Yes	32	8.1
sion before stroke	No	362	91.9
History of DM	Yes	28	7.1
	No	366	92.9
Known previous	Yes	41	10.4
stroke	No	353	89.6
Known ischemic heart disease	Yes	50	12.7
	No	344	87.3
Atrial fibrillation	Yes	24	6.1
	No	370	93.9
Smoking history	Previous smoker	21	5.3
	No smoking history	373	94.7
Alcohol drinking history	Previously drinking	71	18
	No history of drinking	323	82
Khat Chewing history	Current user	8	2
	Previous user	32	8.1
	No history	354	89.8
Physical disability assessment by Modified Rankin Scale	No symptom of Slight disability	245	62.2
	Moderate to Moderately severe disability	58	14.7
	Severe disability/Bedridden	91	23.1

Based on numerous individual studies and meta-analyses, the prevalence of PSD has been estimated to be between 20 and 65% [15]. The prevalence of PSD based on our study was comparable to some studies done in Ethiopia and Nigeria which have shown the prevalence of PSD to be 43.3% and 42.9% respectively [11, 20]. Compared to other Ethiopian and large worldwide studies and meta-analyses, the prevalence of PSD was found to be higher in our study. The difference in prevalence estimates can be attributed to various factors including sociocultural differences, differences in methods used for



Fig. 1 Prevalence of post-stroke depression

ascertaining PSD, and methodological factors of different studies. One study that evaluated four of the various screening tests for depression in post-stroke patients has shown different prevalence outcomes with different sensitivities and specificity for the diagnosis of depression based on the type of tool used [21]. Another important factor for a high prevalence of PSD in the current study may be a higher proportion of patients with duration since stroke less than 1 year compared with more than 1 year (66.2% vs. 33.7%). Various individual studies and large meta-analyses have shown that PSD most commonly develops within the first few months after stroke and the proportion of PSD after the first year post stroke is significantly lower [22–24].

This study has shown that the odds of developing PSD among employed individuals decreased by 71.8% (AOR: 0.282, 95% CI: 0.112–0.709) as compared to retired individuals. Being unemployed was found to be a predictor for PSD in several Ethiopian and African studies [18, 25]. Employed patients were shown to have lower depressive symptoms compared to an unemployed group of patients in a study done in Norway [26] while several other studies suggest no relation could be demonstrated between employment status and PSD [27]. This could be explained by patients without a job are more likely to face financial challenges which could be a contributing factor to depressive symptoms as was shown in a study done in Nigeria [28].

Our study revealed that patients with known depression before stroke are three times more likely to develop PSD than their counterparts. A personal history of depression has been shown in various European studies, systematic reviews, and metanalyses to be a significant predictor of PSD [15, 17, 29]. A prior history of mental disorders including depression was found to be strongly associated with PSD in another meta-analysis which included a total of 36 studies [30]. In a recent systematic review and meta-analysis that assessed the possible contribution of pre-stroke depression to PSD, it was revealed that patients with pre-stroke depression had three times higher odds of developing PSD which goes in line with our study finding [31]. An important possible explanation for the higher odds of PSD in patients with a history of depression may be a higher chance of recurrence of psychiatric disorders including depression. To our knowledge, no other Ethiopian studies have identified depression as a predictor for PSD. It is of note that stroke patients should be evaluated for past psychiatric history and depression assessment should be done at baseline to identify any known prior depressive episodes.

In this study, the odds of developing PSD are four times more likely in patients who have concomitant ischemic heart disease (IHD). A recent Ethiopian study has revealed IHD as an independent predictor of PSD [32] and it has been shown that depression is a common comorbidity in the Ischemic heart disease population which has been associated with worse outcomes [33]. A high prevalence of underrecognized and undertreated depression in these patients could be explanatory for the higher prevalence of PSD but requires further investigation to determine whether it is an independent predictor or not.

The other important variable that has shown significant association with PSD in our study was physical disability assessed by a modified Rankin Scale. Compared to patients with "No symptom to slight disability", patients with "Moderate to Moderately severe disability" and "Severe disability" are two times and four times more likely to develop PSD respectively. Similar findings have been found in several studies from various African countries including Ethiopia, Egypt, and Ghana [9, 32, 34] A significant degree of disability would have a negative influence on the patient's life and career, causing significant physical and psychological trauma that would ultimately lead to PSD [26]. An important point to note is PSD is also an unfavorable factor for recovery and physical rehabilitation in the post-stroke period [35, 36].

Even though it is a long-standing debate, some studies hypothesize stroke-related biological factors and lesion location as independent predictors for post-stroke depression [37], other studies have revealed a contradicting finding and rather non-stroke-specific related factors such as the history of personal or family history of depression and level of handicap could be a better predictor for the development of PSD [38] which is consistent with the finding of our study.

Variables	Categories		ression	COR (95% CI)	AOR (95% CI)	
		Yes	No			
Age	<45	15	34	1	1	
	45–60	47	83	1.284(0.634–2.598)	1.211(0.489–2.998)	
	61–74	77	83	2.103(1.063–4.159)	1.210(0.491–2.985)	
	>75	30	25	2.720(1.214–6.094)	1.404(0.467-4.225)	
Marital status	Single	8	6	1.007(0.322-3.152)	0.738(0.178-3.066)	
	Married	99	173	0.432(0.264-0.708)	0.718(0.379–1.360)	
	Divorced	13	9	1.091(0.421-2.823)	2.209(0.658-7.416)	
	Widowed	49	37	1	1	
Educational status	Illiterate	109	127	1.373(0.686–2.749)	0.411(0.151-1.118)	
	Can read and write	31	34	1.459(0.650-3.273)	0.514(0.177-1.495)	
	Elementary school	8	24	0.533(0.191–1.491)	0.336(0.091-1.237)	
	Highschool	6	16	0.600(0.192-1.874)	0.292(0.068-1.250)	
	College and above	15	24	1	1	
Employment status	Employed	15	71	0.294(0.148–0.584)	0.282(0.112–0.709) *	
	Unemployed	113	97	1.620(0.998–2.629)	1.434(0.778–2.640)	
	Retired	41	57	1	1	
Location of stroke	Left hemispheric	69	110	1	1	
	Right hemispheric	88	103	1.362(0.900-2.061)	1.157(0.705-1.900)	
	Bilateral	12	12	1.594(0.678–3.748)	2.272(0.796-6.480)	
Duration since stroke	< 6 months	26	56	0.532(0.299–0.946)	0.740(0.367-1.493)	
	6 to 12 months	98	98	0.947(0.603-1.485)	1.270(0.726-2.221)	
	>12 months	71	71	1	1	
Known depression before stroke	Yes	23	9	3.781(1.701-8.404)	3.237(1.098–9.544) *	
	No	146	216	1	1	
Known IHD	Yes	39	11	5.836(2.887-11.797)	4.090(1.745–9.583) *	
	No	130	214	1	1	
Physical disability	No symptom to slight disability (mRS 0–2)	72	173	1	1	
	Moderate to Moderately severe disability (mRS 3–4)	36	22	3.932(2.163–7.146)	2.330(1.172–4.629) *	
	Severe disability (mRS 5)	61	30	4.886(2.915-8.188)	4.051(2.239–7.332) *	

Table 4 Bivariate and multivariate logistic regression analysis for factors associated with PSD among patients on follow-up at neurology clinics of Bahir Dar public specialized hospitals(*n* = 394)

*Significant at P<0.05

Limitations of the study

It is challenging to assess the temporal link and demonstrate the causal association between exposure and result since this study is cross-sectional. Our study has excluded patients with severe aphasia because of the communication difficulty and because of the lack of a gold standard depression assessment tool in aphasic patients. This might undermine the prevalence of PSD as post-stroke patients with aphasia, especially expressive aphasia, are at a higher risk of developing depression.

Conclusion

This study has found that the prevalence of PSD was high and it was relatively higher compared to some other studies done in Ethiopia. Our study has revealed that patients with known depression before stroke, ischemic heart disease, and significant physical disability were at a higher risk of developing PSD. Employed patients had less risk of developing PSD.

Recommendation

To physicians and other health care professionals

We recommend sufficient and comprehensive evaluation of post-stroke patients for depression and other neuropsychiatric complications of stroke which are underrated and undertreated. In addition to the usual care that stroke patients receive in outpatient clinics, routine use of easy self-report or interview-based assessment tools for depression could aid physicians and other health professionals in identifying patients with PSD. Assessing other comorbidities in stroke patients at baseline is recommended.

To Tibebe Ghion and Felege Hiwot comprehensive specialized hospitals

We recommend the institutions provide training sessions for all healthcare professionals regarding the thorough assessment of post-stroke patients and the use of depression assessment tools to identify patients with this underrated diagnosis.

Abbreviations

CVT	Cerebral venous thrombosis
DALYs	Disability-adjusted life-years
DSM	Diagnostic and Statistical Manual of Mental Disorders
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
GBD	Global Burden of Diseases
HMIS	Health Management and information service
ICH	Intracerebral hemorrhage
IHD	Ischemic heart disease
PSD	Post-stroke depression
PHQ	Public health questionnaire
QOL	Quality of Life
SAH	Subarachnoid hemorrhage
TGCSH	Tibebe Ghion Comprehensive Specialized Hospital
WHO	World Health Organization

Acknowledgements

We want to express our deepest gratitude to the Department of Internal Medicine and the College of Medicine and Health Science for providing a supportive environment for the preparation of this work.

Author contributions

EYD selected the topic, conceived and prepared the proposal, and wrote the paper, MB and HAC performed the method part, LA performed data analysis, and the software part, while ZAY prepared the manuscript including figures and tables.

Funding

The authors received no specific funding for this work.

Data availability

The data sets used and/or analyzed during the current study are available from the corresponding author Zeamanuel Anteneh Yigzaw (BSc, B.Th., BA, MPH) on reasonable request. (Email:- zeamanuel19@gmail.com).

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Bahir Dar University College of medicine and health sciences Ethical Review Committee (Meeting No.: Expedia/2023, Protocol number: 838/2023). A support letter was sent to TGCSH and FHCSH. Names were not used in collecting the data from the medical files. Confidentiality was maintained by keeping the data collection forms locked in a secure cabinet and the electronic data file was kept securely in a password-protected computer. The study was conducted according to the declaration of Helenski.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 18 April 2024 / Accepted: 22 November 2024 Published online: 04 December 2024

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