

Prevalence of Depression and Associated Factors Among Post Stroke Patients at St Paul's Hospital Millennium Medical College, A.A, Ethiopia

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Abstract

Background

Depression is one of the most common neuropsychiatric complications after stroke.

Objective

To assess the prevalence and factors associated with depression among stroke patients among post stroke patients at St Paul's Hospital Millennium Medical College, A.A, Ethiopia

Method

A hospital based cross sectional study design was conducted among 159 post stroke patients who were on follow up at SPHMMC neurology OPD from March-July, 2018 by using Patient Health Questionnaire (PHQ-9). Bivariate as well as multivariate logistic regressions were used to identify associated factors. *p* value of < 0.05 was considered statistically significant.

Results

The prevalence of post stroke depression is 43.4 %. Factors associated with increased risk of depression after strokes are age between 45 and 64 and shorter duration after the diagnosis of strokes (less than 3 months and between 3 to 6 months).

Conclusion and recommendation

PSD occurs in nearly half of the stroke patients. Age and time from diagnosis of stroke affect development of depression after stroke. We recommend that every stroke patient should be screened for depression as part of a comprehensive post stroke care.

Introduction

According to WHO depression is common mental disorder which is characterized by sadness, loss of interest in activities and decreased energy ⁽¹⁾. One of the most common neuropsychiatric complications of stroke is depression, which has huge pervasiveness and affects around 33% of all stroke patients ⁽²⁾.

The occurrence of depression has been found to have a negative effect in the post-stroke stage. PSD, or even some symptoms of depression after stroke, have been related with, hindrance in physical working and dialect, longer hospitalization, lessened personal satisfaction and subjective weaknesses, reduced quality of life and overall increased mortality rate ^(3,4). Studies have upheld that PSD has fundamental biological and psychosocial etiologic factors, for example, subjective weakness, female sex, hyper cortisolism, cognitive impairment, living alone and past depression ^(4,5).

Stroke is defined as rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting for more than 24 hours, with no apparent non-vascular cause(s) ⁽⁵⁾. It is caused by the interruption of the blood supply to the brain, usually because a blood vessel ruptures or is blocked by a clot. This cuts off the supply of nutrients and oxygen causing damage to the brain tissue ⁽⁶⁾.

Around 15 million of world population experiences stroke out of which around 33% (5 million) bite the dust and 33% end up plainly crippled for all time ⁽⁷⁾. Comprehensively on each tenth second, a life is taken by stroke and on each ½ second an episode of stroke happens ⁽⁸⁾.

Hypertension is the single most important risk factor in stroke which results in over 80% of stroke cases (12.7 million) around the world. Other important risk factors of stroke are smoking, metabolic derangements, atrial fibrillation, heart attack and heart failure ⁽⁹⁾.

In developing nations weight of stroke is expanding quickly ⁽¹⁰⁾. Stroke is the main source of death in individuals of age gathering of 60 years or more and is the fifth driving reason for death among individuals of age between 15–59 years ⁽¹¹⁾. Stroke is observed to be the leading cause worldwide and in developing nations it is the second driving reason for handicap ⁽¹²⁾. Inpatient case fatality rate was 30.1% and a huge number (45.4%) of patients were discharged with neurologic deficit ⁽¹³⁾.

Considering high figure of PSD and its strong correlation with significant impairment, poor rehabilitation outcome, poor quality of life, and higher mortality than those without significant depressive symptoms makes it vital to think about their relationship. Despite having many studies done elsewhere, there is paucity of data concerning the prevalence of PSD and associated factors in context of developing countries like in Ethiopia. This study was aimed to assess the prevalence of depression and associated factors among stroke patients on follow up at out-patient neurology clinic-SPHMMC

Methods

Study design and setting

A hospital based analytical cross sectional study was conducted using a questionnaire based interview, among post stroke patients on follow up at SPHMMC neurology OPD.

St. Paul's Hospital Millennium Medical College, as it is known today, was established through a decree of the Council of Ministers in 2007. However, the hospital was established in 1968 by the late Emperor Haile Selassie. It is governed by a board under the Federal Ministry of Health and located at capital city of Ethiopia, Addis Ababa.

Study Population and Sampling Procedure

All post stroke patients on follow up at neurology OPD (SPHMMC) during the study period and age of 18 years and above, those who gave consent, patients who had brain imaging documented on the chart or

obtained from electronic data from radiology department. Whereas those with history of mood disorder prior to the diagnosis of stroke, language impairment (severe enough to prevent valid neuropsychiatric assessment, history of some other CNS disease (e.g., head trauma, multiple sclerosis, medically unstable including symptoms of delirium were excluded.

Sample size was calculated using single population proportion formula taking p value from another similar study conducted p= 33 %, level of significance 5% ($\alpha=0.05$), margin of error 5% ($d=0.05$) and, the total sample was 159.

Data collection

The data were collected using structured questionnaire which is prepared in English language, with both closed and open ended questions that was translated to Amharic language and Afaan Oromo for the respondents; the tool for screening depression in stroke patients is the PHQ-9, Amharic and Afaan Oromo versions which have already been validated.

A PHQ-9 threshold score of 10 was found to give optimal discriminatory power with respect to diagnosis of MDD via the clinical interview (sensitivity=86% and specificity=67%)⁽³⁴⁾. Hence, those who scored 10 or greater were considered to have PSD.

The questionnaire was filled by trained individuals for the data collection; the questionnaire was pretested at similar hospital with a similar setting, on patients who fulfill the inclusion criteria (but who do not participate in the study), before the actual data collection period to check clarity of the questions, their sensitivity and completeness.

Training was given to the data collectors before actual data collection period, the questionnaire was prepared and organized as simple as possible so that it can easily be understood both by data collectors and respondents and it was presented before the data collection period, completeness and consistency was checked by the researcher.

Data was collected by two trained data collectors (nurses) after being trained for three days ahead of data collection. Data collection was done from March to July 2018. The study's criteria and purpose was also explained in detail to all of them and to their relatives/caregivers. Written informed consent of patients to participate in study was sought.

Afterwards, the interviews of the patients (who fulfilled the inclusion criteria) was conducted using the questionnaire devised for this study, during follow up visits (OPD timing from 8:30 AM to 12:00 PM in week days except Wednesdays) of the post stroke patients to the neurology OPD.

Data management

The data was entered using Epi info and analyzed by using SPSS version 25.0 software. The data was cleaned and rechecked for its consistency. The descriptive analysis was done by simple frequencies and

proportions, the results are presented by tables, pie charts and graphs. Simple logistic regression analysis was performed to evaluate the strength of association between PSD, socioeconomic, demographic and stroke characteristics. Multiple logistic regression analysis of all statistically significant variables was also performed to control potential confounders. P-value less than 0.05 was considered statistically significant. Both simple and multiple regression analysis were expressed as odd ratios (OR) with 95% confidence interval (CI).

Operational Definitions

- **Stroke**- An imaging confirmed diagnosis of stroke with a comment of a radiologist.
- **Depression** - The patient must fulfill the defining criteria for depression according to PHQ-9 i.e. a score of 10 or greater.
- **Post stroke depression**-New onset of depression after the occurrence of the stroke.

Result

A total of 159 post stroke patients were enrolled in this study to assess the magnitude and associated factor of depression in stroke patient. Baseline demographic and stroke characteristics are appended:

5.1 Baseline Characteristics of Post Stroke Patients

5.1.1 Socio demographic characteristics of participants

Among the total of 159 patients 92(57.9%) were male and 67(42.1%) female (Male: Female 1.4:1). The mean age of patients was 58.4 (S.D \pm 13.7) years. All patients were divided into four different age groups ranging from 21–90 years. Highest proportion of the patients belonged to 45–64 years age group 77(48.3%) and out of them 44(57.9%) were male and 33(42.1%) were female. The second highest proportion of patients was in the age group of 65 years and above which was 60(37.7%). Out of all the study participants 51(32.1%) received no formal education, 30(18.7%) had attended secondary school, 29(18.2%) had college education. With regard to monthly income, 54(33.9%) belong to < 500ETB group, 50(31.4%) fall under the category of 501-1000ETB. The majority, 123(77.4%) of patients were urban residents. Among the total study subject 65(40.9%) patients were employed (Table-1).

Table-1 Socio demographic characteristics of the post stroke patients on follow up at SPHMMC, AA, Ethiopia, 2018

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	92	57.9
	Female	67	42.1
Marital status	Single	8	5.0
	Married	113	71.1
	Divorced	2	1.3
	Widowed	36	22.6
Residency status	Urban	123	77.4
	Rural	36	22.6
Educational status	Illiterate	51	32.1
	Read and write	25	15.7
	Primary school	24	15.1
	Secondary school	30	18.9
	College	29	18.2
Employment status	Employed	65	40.9
	Un-employed	94	59.1
Average monthly income (Ethiopian Birr)	≤ 500	54	33.9
	501–1000	50	31.4
	1001–2000	23	14.5
	2001–3000	7	4.4
	> 3000	25	15.7

5.1.2 Stroke Characteristics

Out of the total of 159 patients 89(56%) had hemorrhagic stroke. The right hemisphere stroke account for 87(54.7%), and 61(38.4%) patients had left side stroke and 11(6.9%) had both left and right side stroke. Among the total patients 52(32.7%) were 3month-6month, 41(25.8%) were > 1 year and 37(23.3%) were > 6 month-1 year after diagnosis of stroke. Stroke characteristics are provided in Table-2.

Table-2 Stroke characteristics of the post stroke patients on follow up at SPHMMC, AA, Ethiopia, 2018 (n = 159)

Variable		Male	Female	Total
Stroke type	Hemorrhagic stroke	51(57.7%)	38(42.3%)	89(56%)
	Ischemic stroke	41(58.6%)	29(41.4%)	70(44%)
Side of stroke	Right side	55(59.78%)	32(47.76%)	87(54.7%)
	Left side	32(34.78%)	29(43.28%)	61(38.4%)
	Both left and right	5(5.43%)	6(8.96%)	11(6.9%)
Time from Diagnosis of stroke	< 3 Month	17(18.5%)	12(17.9%)	29(18.2%)
	3 month-6 month	29(31.5%)	23(34.3%)	52(32.7%)
	> 6 month-1 year	20(21.7%)	17(25.4%)	37(23.3%)
	> 1 year	26(28.3%)	15(22.4%)	41(25.8%)

5.2 Prevalence of post stroke depression and level of difficulty on daily activity

The overall prevalence of PSD among 159 study subjects was 43.4% (69 out of 159 patients). The prevalence in males was found 42.3% (39 out of 92) whereas in female it was 44.8% (30 out of 67). Among the total of 69 depressed patients, 43(62.3%) found to have extreme difficulty, 18(26.1%) had very difficult and 7(10.1%) had somewhat difficulty. From the total depressed patients only 1(1.5%) had no difficulty on performing daily activities.

5.3 Factors associated with PSD among post stroke patients on follow up at SPHMMC, AA, Ethiopia, 2018

In binary logistic regression age of patients, educational level of the patients, monthly income, stroke type, time from diagnosis of stroke were associated with depression. However in multi variant analysis after controlling confounding factors significant association was observed only in age of patient and time from diagnosis of stroke.

Table-3 Univariate and Multi-variable analysis of factors associated with PSD among post stroke patients on follow up at SPHMMC, AA, Ethiopia, 2018

Variables		Depression N (%)		COR(95%CI)	AOR(95%CI)
		Yes	No		
Demographic Variables					
Age	18–25 years	1(16.6)	5(83.4)	0.5(0.05–4.3)	0.5(0.4–5.8)
	25–44 Years	6(37.5)	10(62.5)	1.4(0.4–4.4)	2.1(0.4–11.8)
	45–64 Years	44(57.1)	33(42.9)	3.1(1.5–6.3)	3.5(1.4–8.9)
	≥ 65 Years	18(31.3)	42(68.7)	1	1
Gender	Male	39(42.4)	53(57.6)	1.1(0.6-2)	
	Female	30(44.8)	37(55.2)	1	
Residency status	Urban	54(43.9)	69(56.1)	1	
	Rural	15(41.8)	21(58.2)	1.1(0.5–2.3)	
Marital status	Married	45(39.8)	68(60.2)	1	
	Currently unmarried	24(52.1)	22(47.8)	1.6(0.8–3.3)	
Educational level	Illiterate	33(64.7)	18(35.3)	8.8(2.8–27)	2.9(0.5–17.2)
	Read and write	12(48)	13(52)	4.4(1.3–15.4)	4.4(0.6–31.6)
	Primary	7(29.2)	17(70.8)	1.9(0.5–7.3)	0.7(0.9–4.6)
	Secondary	12(40)	18(60)	3.2(0.9–10.7)	2(0.4–10.9)
	College and above	5(17.2)	24(82.8)	1	1
Employment status	Employed	28(43.1)	37(56.9)	1.02(0.5–1.9)	
	Un-employed	41(43.6)	53(56.4)	Ref	
Monthly Income (ETB)	≤ 500	33(63.5)	19(36.5)	8.6(2.6–28.9)	6.8(0.99–46.1)
	501–1000	24(46.1)	28(53.9)	4.6(1.4–15.5)	2.4(0.36–16.2)

Variables		Depression N (%)		COR(95%CI)	AOR(95%CI)
	1001–2000	8(34.8)	15(65.2)	2.8(0.7–11.03)	2.05(0.3–14.4)
	2001–3000	0	7(100)	0.0	0.0
	> 3000	4(16)	21(84)	1	1
Stroke type	Ischemic stroke	23(32.8)	47(67.2)	1	1
	Hemorrhagic stroke	46(51.7)	43(51.7)	2.1(1.1–4.2)	1.9(0.8–4.7)
Side of stroke	Left side	32(52.5)	29(47.5)	1.4(0.4–5.1)	
	Right side	32(36.8)	55(63.2)	1.9(0.9–3.7)	
	Both side	5(45.5)	6(54.5)	1	
Time from diagnosis of stroke	< 3 month	21(72.4)	8(27.6)	18.9(5.4–65.3)	22.3(4.5–106) ***
	3 month-6 month	33(63.5)	19(36.5)	12.5(4.2–37.3)	19(4.8–75.5) ***
	> 6 month-1 year	10(27.1)	27(72.9)	2.6(0.82–8.7)	2.16(0.52-9)
	> 1 year	5(12.2)	36(87.8)	1	1
* P < 0.05, **P < 0.01, and *** P < 0.001					

Discussion

The prevalence of post stroke depression is 43.4 %. Factors contributing to increased risk of depression after stroke include age between 45 and 64 and shorter duration after the diagnosis of strokes (less than 3 months and between 3 to 6 months).

The prevalence of depression in this study is very high when compared to studies done in Ethiopia, among the general population, 2.2%⁽¹⁷⁾ and 9.1%⁽¹⁵⁾. The range is very wide when it comes to prevalence of PSD in studies done worldwide (20–65%)⁽¹⁶⁾. This can be attributed to the difference in study setting, screening tools, sample size, severity of stroke and other list of factors. The result in this study is comparable with studies conducted in other developing countries, Uganda (31.5%)⁽¹⁷⁾, Nigeria (40.1%)⁽¹⁸⁾ and Pakistan (35%)⁽¹⁹⁾.

Out of the depressed 43.3% of patients, 62.3% of them reported to have extreme difficulty, while 26.1% found it very difficult to perform their daily activities. Only one patient (1.5%) had reported no difficulty on performing daily activities. This highlights some of the devastating effects of PSD clearly.

Most of the study participants lie above the age of 45. This result is comparable with the studies done at SPHMMC Ethiopia⁽¹³⁾ and Ayder referral hospital in Ethiopia⁽²⁰⁾, but different from a study done at Tikur Anbessa hospital in Addis Ababa where a quarter of patients were under 34years⁽²¹⁾.

The mean age of patients with stroke in this study was 58.4 (S.D \pm 13.7) years, which is also comparable with the study done at SPHMMC on which the reported mean age was 57.53 \pm 15.8 years⁽¹³⁾. Age between 45 and 64 showed significant association in the multiple logistic regression analysis.

In this study we found that amongst the 159 patients selected for the study, 57.9% were male and 42.1% were females. It is in accordance with the results presented by previous study conducted at SPHMMC⁽¹³⁾. Significant association was not observed on gender. A systematic review of 24 studies of stroke patients reported that gender was not a significant risk factor for PSD in 13 out of 21 studies that examined this association. However, one-third of these studies identified female sex as a risk factor for PSD⁽³⁵⁾. Other socioeconomic and demographic factors like residency status, marital educational status, employment status and average monthly income did not show association.

The other variable which showed a strong significant association with PSD is a shorter duration from the diagnosis of stroke, specifically less than 3 months and 3 months up to 6 months. Which has also been reported by most other researches^(29,30). Overall the prevalence of post stroke depression reduces over time with improvements in activities of daily living if treatment is initiated early.

In this study out of the selected 159 participants, 56 % of them were having hemorrhagic stroke which goes in line with most other studies done in Ethiopia^(13, 22, 23, 24). Type of stroke had no statistically significant association with PSD. Most literatures reported that ischemic stroke is more associated with PSD^(25, 26, 27). On the other hand, recent systematic reviews argue against an association between PSD and the type (i.e., ischemic or hemorrhagic)⁽²⁸⁾.

No association was found between stroke lateralization and prevalence of PSD. Lesion location has been extensively investigated as a risk factor for PSD. With this regard, literatures show contradictory results. Some show strong association between left side stroke and PSD^(25, 31, 32), while others report in contrary^(33, 34). This can be explained by difference in severity of the stroke, size of the lesion, level of disability and other factors.

This study has potential limitations. Being a cross sectional study, it is difficult to test the temporal relation and to establish causal relationship between exposure and outcome. We used a screening tool (PHQ-9) which could further inflate the prevalence of PSD. This study was institutional based, limited to a single hospital and had small number of sample size, which might be biased in stroke type, stroke

severity and demographic characteristics of the patients. The study does not control common comorbidities like hypertension, cardiovascular disorders, diabetes mellitus, neurocognitive impairment, and concomitant medications taken, which can pose a higher burden of depression independently. Therefore, it affects the generalizability of the results to all stroke patients. Despite its limitations the study has significant importance in showing the prevalence of PSD, its impact on daily life and contributes to early detection and management.

Conclusion And Recommendation

The prevalence of post stroke depression is high and frequent (nearly half) among stroke patients on follow up at SPHMMC. Age and time from stroke diagnosis are important determinants of PSD. PSD has significant negative impact on the functionality and day to day life of those patients. Despite all this, PSD remained under recognized.

We recommend that adequate attention should be given to the evaluation and early detection of neuropsychiatric (particularly depression) sequels posed on stroke survivors, with respect to a comprehensive post stroke care. Providing training sessions and easily applicable screening tools of depression are suggested for health care professionals. Further, large scale hospital and community based studies are also recommended.

Abbreviations

AA: Addis Abeba

AOR: Adjusted Odds Ratio

CNS: Central Nervous System

COR: Cruds Odds Ratio

MDD: Major Depressive Disorder

OPD: Out Patient Department

PHQ-9: Patient Health Questionnaire-9

PSD: Post Stroke Depression

SPHMMC: St Paul's Hospital Millennium Medical College

SPSS: Statistical Package for Social Sciences

WHO: World Health Organization

Declarations

Ethics approval and consent to participate

Ethical clearance and a letter of support were obtained from SPHMMC, research ethical review committee before the data collection. After final clearance and approval, the letter was submitted to SPHMMC Psychiatry department Office. Objective and use of the interview was explained to the respondents and written consent was obtained.

It was explained to the participants that they have the full right not to participate in the study or if they are not willing to continue their participation at any stage of the study. To ensure confidentiality of information, participants name was not used during data collection and this was clearly explained to participants of the study. The questionnaires and others tools were coded to exclude showing names; no references were made in oral or written reports that could link participants to the research. No conflict of interest was taken in to consideration while doing the research. Appropriate treatment and follow up will be initiated for the study subjects that are found depressed or suicidal.

Consent for Publication

This manuscript is not containing data from any other person's.

Availability of data and material

We send All data which is available us, there is not remaining data and materials.

Competing interests

The authors declare no conflicts of interest

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Authors' contributions

SW: designed research, conducted research, wrote paper, analyzed data and edited paper and MT & ED advised the research. MA edited paper and prepare the manuscript for submission. All authors read and approved the final manuscript.

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References

1. Aben I, Verhey F. Depression after a cerebrovascular accident. The importance of the integration of neurobiological and psychosocial pathogenic models. *Panminerva Med* 2006;48:49-57
2. Appelros and M. Viitanen, Prevalence and predictors of depression at one year in a Swedish population-based cohort with first-ever stroke; 2005; *Journal of Stroke and Cerebrovascular Diseases*, 13, 52-57.
3. King RB. Quality of life after stroke. *Stroke* 1996;27:1467-1472.
4. Parikh RM, Robinson RG, Lipsey JR, et al. The impact of poststroke depression on recovery in activities of daily living over a 2-year followup. *Arch Neurol* 1990;47:785-789.
5. WHO MONICA Project Investigators. The World Health Organization MONICA Project (Monitoring trends and determinants in cardiovascular disease). *J Clin Epidemiol* 41, 105-114. 1988.
6. World Health Report 2007. Geneva: World Health Organization. Available at: (http://www.who.int/whr/2007/whr07_en.pdf).
7. Luisa Terroni1 ,MatildesF.M,et al. Association among depression, cognitive impairment and executive dysfunction after stroke. *Dement Neuropsychol*2012 ;6(3):152-157
8. Ermias Shenkutie Greffie, TadesseMitiku, SeidGetahun. Risk Factors, Clinical Pattern and Outcome of Stroke in a Referral Hospital, Northwest Ethiopia. *Clinical Medicine Research*. Vol. 4, No. 6, 2015, pp. 182-188. doi: 10.11648/j.cmr.20150406.13
9. Wayne Rosamond; Katherine Flegal, Gary Friday ;Karen Furie; Alan Go; Kurt Greenlund; et al. Heart Disease and Stroke Statistics, A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee; 2007 update.
10. Lamassa, M., et al., Characteristics, Outcome, and Care of Stroke Associated With Atrial Fibrillation in Europe Data From a Multicenter Multinational Hospital–Based Registry (The European Community Stroke Project). *Stroke*, 2001. 32(2): p. 392-398.
11. Ermias Shenkutie Greffie, TadesseMitiku, SeidGetahun. Risk Factors, Clinical Pattern and Outcome of Stroke in a Referral Hospital, Northwest Ethiopia. *Clinical Medicine Research*.2015 ; 4:182-188.
12. Truelsen, P U Heuschmann, R Bonita, G Arjundas, P Dalal, A Damasceno, et al. Standard method for developing stroke registers in low-income and middle income countries: experiences from a

- feasibility study of a stepwise approach to stroke surveillance (STEPS Stroke); 2007 ; The Lancet Neurology, 6, P 134-139.
13. Gedefa B, Menna T, Berhe T, Abera H (2017) Assessment of Risk Factors and Treatment Outcome of Stroke Admissions at St. Paul's Teaching Hospital, Addis Ababa, Ethiopia. *J Neurol Neurophysiol* 8: 431.
 14. Alem A, Kebede D, et al: The prevalence and socio-demographic correlates of mental distress in Butajira, Ethiopia. *Acta Psychiatr Scand Suppl* 1999, 397:48–55.
 15. Solomon.H, Henok .T, the prevalence of depression and associated factors in Ethiopia, *International Journal of Mental Health Systems* 2012.
 16. Primeau F. Post-stroke depression: a critical review of the literature. *Can J Psychiatry*. 1988;33:757–65
 17. Gyagenda JO, Ddumba E, Odokonyero R, Kaddumukasa M, Sajatovic M, Smyth K, et al. Post-stroke depression among stroke survivors attending two hospitals in Kampala Uganda. *Afri Health Sci*. 2015;15(4):1220-31.
 18. Berg A, Palomaki H, Lehtihalmes M, Lonnqvist J, Kaste M: Poststroke depression: an 18-month follow-up. *Stroke* 2003, 34(1):138-143.
 19. Adnan Aslam, Muhammad; Numan, Ahsan; Arif, Muhammad; and Siddueiq, Abubaker (2015) "Frequency of depression in patients with stroke," *Pakistan Journal of Neurological Sciences (PJNS)*: Vol. 10 : Iss. 3 , Article 4.
 20. Connor MD, Walker R, Modi G, Warlow CP (2007) Burden of stroke in black populations in sub-Saharan Africa. *Lancet Neurol* 6: 269-278.
 21. Alemayehu CM, Birhanesilasie SK (2013) Assessment of stroke patients: occurrence of unusually high number of haemorrhagic stroke cases in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. *Clin Med Res* 2: 94-100.
 22. Guta Zenebe, Mengistu Alemayehu, Jilalu Asmera. (2005) Characteristics and outcomes of stroke at Tikur Anbessa Teaching Hospital, Ethiopia. *Ethiop Med J* 43: 251-259.
 23. Alemayehu CM, Birhanesilasie SK (2013) Assessment of stroke patients: occurrence of unusually high number of haemorrhagic stroke cases in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. *Clin Med Res* 2: 94-100.
 24. Asefa G, Meseret S (2010) CT and clinical correlation of stroke diagnosis, pattern and clinical outcome among stroke patients visiting Tikur Anbessa Hospital. *Ethiop Med J*. 48: 117 122.
 25. Zafarula.Q, depression among stroke patients and relation with demographic and stroke characteristics,Liaquat university hospital, Pakistan, 2011
 26. T Pohjasvaara, A Leppävuori, I Siira, R Vataja, M Kaste, and T Erkinjuntti,. Frequency and clinical determinants of post stroke depression. 1998; *Stroke-Journal of American Heart Association*, 29, 2311-2317.

27. Risto Vataja, Tarja Pohjasvaara, Antero Leppävuori, Riitta Mantyla, Hannu Juhani Aronen, Olli Salonen, et al; Magnetic Resonance Imaging Correlates of Depression After Ischemic Stroke; 2001; Arch Gen Psychiatry; 58, 925-931
28. Kutlubaev MA, Hackett ML: Part II: predictors of depression after stroke and impact of depression on stroke outcome: an updated systematic review of observational studies. Int J Stroke 2014; 9:1026–1036
29. Terese S, Ida K. Wium-Andersen, Marie K, Incidence of Depression After Stroke, and Associated Risk Factors and Mortality Outcome, *JAMA Psychiatry*. 2016;73(10):1032-1040.
30. Jørgensen TS, Mårtensson S, Ibfelt EH, et al. Time trend in depression diagnoses among acute coronary syndrome patients and a reference population from 2001 to 2009 in Denmark. *Nord J Psychiatry*. 2016;70(5):335-341.
31. RG Robinson, PL Bolduc and TR Price, A two-year longitudinal study of post stroke mood disorders: diagnosis and outcome at one and two years. (1987). *Stroke -Journal of American Heart Association*, 18, 837-843.
32. R.G Robinson, and T.R Price. Post-stroke depressive disorders: A follow-up study of 103 patients. 1982; *Stroke-Journal of American Heart Association*, 13, 635-641.
33. M Kotila, H Numminen, O. Waltimo, and M. Kaste. Depression after stroke. Results of the Finn stroke study; 1998. *Stroke-Journal of American Heart Association*, 29, 368-372.
34. H Dam, H.E Pedersen, and P. Ahlgren. Depression among patients with stroke. 1989; *Acta Psychiatrica Scandinavica*, 80, 118-124.
35. De Ryck A, Brouns R, Geurden M, et al: Risk factors for poststroke depression: identification of inconsistencies based on a systematic review. *J Geriatr Psychiatry Neurol* 2014; 27:147–158