Published in final edited form as:

J Neurol Sci. 2017 August 15; 379: 261–265. doi:10.1016/j.jns.2017.06.032.

POST-STROKE DEPRESSION IN GHANA: CHARACTERISTICS AND CORRELATES

Fred Stephen Sarfo^{1,2}, Carolyn Jenkins³, Arti Singh¹, Mayowa Owolabi⁴, Akin Ojagbemi⁴, Nathaniel Adusei², Raelle Saulson³, and Bruce Ovbiagele³

¹Kwame Nkrumah University of Science & Technology, Kumasi, Ghana

²Komfo Anokye Teaching Hospital, Kumasi, Ghana

³Medical University of South Carolina, USA

⁴University College Hospital Ibadan, Nigeria

Abstract

Background—Poststroke depression (PSD) is prevalent and is an important determinant of functional recovery, quality of life and mortality after stroke. Scanty data on the nature of PSD among stroke survivors in sub-Saharan Africa prompted this study.

Objective—To assess the prevalence and predictors of depression in a convenience sample of Ghanaian stroke survivors.

Methods—We evaluated consecutive stroke survivors encountered at a comprehensive neurology clinic in a tertiary medical center in Ghana. The Center for Epidemiologic Studies Depression Scale (CES-D) and Geriatric Depression Scale (GDS) were both used to screen for depressive symptoms and subjects were considered as depressed if they scored ≥ 16 on the CES-D scale and ≥ 5 on the GDS. Demographic and clinical data on stroke type and severity as well as health-related quality of life indicators were collected. Predictors of stroke-related depression were assessed using a logistic regression model.

Results—Of 200 stroke survivors, mean $\pm$ SD age was 62.0 ± 14.4 years, and 105 (52.5%) patients were men. Among the cohort 78.5% were classified as being depressed by CES-D, 42.5% by GDS, and 36.5% on both CES-D and GDS. In multivariable analyses, for each unit increase on the Modified Rankin scale (i.e. worsening disability), there were higher odds of depression (adjusted OR 1.85; 1.28–2.69, $p=0.001$), and being divorced (vs. being married) was linked to depression (adjusted 2.82; 1.18–6.71, $p=0.02$). Stroke survivors with depression demonstrated profound diminutions in the physical, psycho-social, cognitive and eco-social domains of quality of life compared with those without depression ($p<0.05$).

Corresponding Author: Fred Stephen SARFO, Kwame Nkrumah University of Science & Technology, Kumasi, Ghana. Tel: 233-243-448464, stephensarfo78@gmail.com.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Competing Interests: The authors have declared that no competing interests exist.

Conclusion—Almost 4 out of 10 stroke survivors in this Ghanaian cohort displayed clinically significant depression. Prospective interventional studies are urgently needed to provide solid evidence-based and culturally tailored interventions to address post-stroke depression particularly in LMICs.

Keywords

Post-stroke depression; Quality of Life; Disability; Ghana

INTRODUCTION

Post-stroke depression (PSD) is highly prevalent among stroke survivors and is associated with significant morbidity and mortality.^{1–3} Data available from high-Income countries (HICs) indicate that approximately a third of stroke survivors experience depression with incidence rates highest within the first year after stroke and declines subsequently.^{1,2,4–6} Clinically, PSD is a neglected entity being under-recognized by clinicians and often undertreated or untreated. Consequently, patients with PSD have a low quality of life,^{7–10} poorer functional outcomes,¹¹ higher healthcare use,^{12–14} and higher mortality,^{3,6,15,16} with paucity of high quality studies that has evaluated the efficacy of pharmacotherapy and psychotherapy interventions to guide practice.¹⁷ The most consistent predictors of depression after stroke include physical disability, stroke severity, history of depression and cognitive impairment.^{6,18,19}

Unfortunately, data on the frequency, severity and predictors of stroke-related depression is scanty in Low-and-Middle Income Countries (LMICs). The fragmentary and uncoordinated post-stroke care in LMICs coupled with perennial paucity of neurologists and mental health practitioners²⁰ may engender a greater burden of undiagnosed and untreated depression among stroke survivors but this is currently unknown due to lack of studies particularly in Sub-Saharan where stroke prevalence is escalating.^{21, 22} The objective of this study was to narrow the knowledge gap identified in our literature search by assessing the rates and predictors of depression among Ghanaian stroke survivors presenting at a tertiary medical center in West Africa.

METHODS

Study design and setting

This cross-sectional study was approved by the Committee on Human Research Publication and Ethics (CHRPE) of the School of Medical Sciences, Kwame Nkrumah University of Science and Technology, and the Komfo Anokye Teaching Hospital, (KATH) Kumasi, Ghana. The study was conducted at the Neurology Clinic of the Komfo Anokye Teaching Hospital, a tertiary medical center in Kumasi, Ghana. Kumasi is the second largest city in Ghana with an estimated population of 4 million inhabitants. The Neurology clinic was instituted in 2011 and currently runs once a week providing care for adults >16 years with neurologic disorders from 6 out of the 10 administrative regions of Ghana and serves an estimated population of 10 million.²³

Study Participants

Consecutive stroke survivors attending the Neurology service at KATH were approached for enrollment into the study after obtaining informed consent. Stroke survivors on sedatives, those with profound aphasia without a proxy, and those who could not stand for measurement of weight and height due to disability were excluded. Subjects on sedatives were excluded because they could not complete the survey questionnaires satisfactorily. Also, body mass index could not be accurately assessed among subjects who could not stand for weight and height measurements. Recruitment of study participants was performed from 01/11/2015 to 28/02/2016.

Data Collection

We first collected demographic information including age, gender, marital, educational and occupational status as well as location of residence. Vascular risk factor profile, stroke type, stroke severity was assessed using National Institute of Health Stroke Scale (NIHSS), and functional status assessed using the Modified Rankin scale were collected by two trained Research Assistants through review of medical charts and interview of stroke survivors and/or their proxy. Stroke type was defined radiologically into ischemic and hemorrhagic based on cranial CT scan done at onset of stroke symptoms.

The 20-item Center for Epidemiologic Studies Depression Scale²⁴ and the 15-item Geriatric Depression Scale (GDS)²⁵ were both used to screen for depressive symptoms among stroke survivors. On the CES-D scale, a score of ≥ 16 is considered generally as depressed with ≥ 16 –28 as mild-to-moderate depression and >28 as clinically severe depression. The GDS short form has 15 questions with ‘Yes’ or ‘No’ responses with a score >5 suggestive of depression and ≥ 10 almost always indicative of depression. In the present study, subjects were considered as depressed if they scored ≥ 16 on the CES - D scale as well as >5 on the GDS to enhance the rigor of the procedure for diagnosis of depression.

The Health-Related Quality of Life in Stroke Patients questionnaire²⁶ is a multidimensional instrument which assesses the physical, psychoemotional, cognitive and socio-economic domains of well being was used to assess the quality of life of each subject. The physical, psycho-emotional, and socio-economic domains of the HRQOLISP has 7 items each with a minimum and maximum scores of 7 and 35 respectively, while the cognitive domain has 5 items with minimum and maximum scores of 5 and 25 respectively. Higher scores on the HRQOLISP indicate a better quality of life and vice versa.

Measurements and Definitions

- The weight of study subjects was measured in kilograms using a scale with patient standing at the anatomical position on a scale and the height in centimeters was measured using a stadiometer with patient standing at the anatomical position in front of the stadiometer. The weight and height measurements were used to calculate the body mass index (BMI). Subjects with BMI $\geq 30\text{kg/m}^2$ were classified as obese.
- Blood pressure was measured thrice on the upper left arm using a validated automatic sphygmomanometer, after at least 5 minutes of rest and the second and

third readings were averaged for analysis. Hypertension was diagnosed if the patient was on antihypertensive medications over the last 15 consecutive days or if the patient had a systolic and/or diastolic blood pressure of 140 / 90 mmHg.

- Participants were considered to have diabetes mellitus if they were on hypoglycemic medications or if their fasting blood glucose levels were > 126mg/dl and/or HbA1C >6.5%.
- Dyslipidemia was defined as a high total cholesterol > 200mg/dl or LDL-cholesterol > 130mg/dl, triglyceride > 150mg/dl or HDL-cholesterol <40mg/dl for women and <50mg/dl for men or previous use of statin for dyslipidemia.
- Cardiac disease including myocardial infarction, rheumatic valvular heart disease, and prosthetic heart valve, atrial fibrillation or flutter was based on self-reported history, clinical examination, review of baseline ECG and/or echocardiography result at enrollment into care at the neurology clinic.
- Current smoking status and alcohol intake status was ascertained from either the patient or a reliable relative. A high alcohol intake was defined as 14 U per week for women, 21 U per week for men.
- Physical activity status of participants was assessed using the International Physical Activity Questionnaire. Responders who reported spending more than half the day on their feet or reported daily exercises were classified as physically active. Those who spent less than half of the day on their feet or led a sedentary life were classed as physically inactive.

Statistical Analysis

Stroke subjects were dichotomized into those with depression and those for comparative analysis. Means and medians were compared using the Student's t-test or Mann-Whitney's U-test for paired comparisons. Proportions were compared using the Chi-squared test with Yates correction for proportions with subgroupings <5. A multivariate logistic regression analysis was performed to identify independent predictors of depression. In all analysis, two-tailed p-values <0.05 were considered statistically significant with no adjustments for multiple comparisons. Statistical analysis was performed using SPSS version 19.

RESULTS

Demographic & clinical characteristics

There were 200 stroke survivors with a mean $\pm$ SD age of 62.0 ± 14.4 years of which 105 (52.5%) subjects were males. Nearly 50% had no or primary level education and 70% were urban residents. The dominant vascular risk factors identified included hypertension (93%), overweight & obesity (65.5%), dyslipidemia (42.5%), and diabetes mellitus (31.0%). The median (IQR) duration of stroke diagnosis was 2 (1–4) years and stroke was ischemic type in 70%, hemorrhagic in 18% and the type undetermined in 12% of subjects. The median (IQR) NIHSS score and modified Rankin score were 8 (2–12) and 2 (1–4) respectively shown in Table 1.

Frequency of Depression

One hundred and fifty-seven (78.5%) subjects scored ≥ 16 on the CES-D scale while 85 (42.5%) subjects were classified as likely depressed based on a score of ≥ 5 on the GDS-15 scale. Severe depression (with a score of ≥ 8 on the CES-D) was found in 9.0% of subjects and 8.0% using the GDS cut-off score of ≥ 10 . There was a significant correlation between the CES-D and GDS-15 scores with Pearson's $r = 0.44$ (95% CI: 0.32 to 0.54), $p < 0.0001$. For the present analysis, we considered subjects as depressed if both scales suggested subjects were depressed giving us 73 (36.5%) subjects with depression. There is a bimodal frequency distribution of post-stroke depression and duration of stroke as depicted in Figure 1. Briefly, frequencies of depression among stroke survivors declined from 38.1%, 33.3% and 27.3% between years 1 to 3 and then started to increase again among those with stroke lasting four years and beyond with a frequency of 42.3% among subjects with 6 years or more of stroke.

Correlates of Depression status

There were no significant differences between subjects with depression compared with those without depression with respect to key demographic characteristics except for marital status where more subjects with depression were more likely to be divorced. Additionally the vascular risk factor profile and stroke type, as well as duration of stroke, were not significantly different between the two groups as shown in Table 1. However, compared with those without depression, stroke survivors with depression had severer neurologic deficits with significantly higher median (IQR) NIHSS scores of 10 (5–14) vs 5 (0–11), $p = 0.0002$ and higher functional deficits median MRS (IQR) score of 3 (2–4) vs 2 (1–3), $p < 0.0001$. Furthermore, subjects with depression had significantly lower quality of life compared with those without depression as reflected in significantly lower scores in all four domains of the health related quality of life of stroke patients questionnaire namely the physical, psychosocial, cognitive and eco-social domains.

Predictors of Post-stroke Depression

Using bivariate analysis we identified marital status, duration of stroke, functional status and stroke severity to be associated with depression. Upon adjustment in a multivariable model for confounders, the independent predictors that emerged were functional status on the Modified Rankin scale with adjusted OR (95% CI) of 1.85 (1.28–2.69), $p = 0.001$ and being divorced with AOR (95% CI) 2.82 (1.18–6.71), $p = 0.02$ compared with being married. As shown in Figure 2, the frequency of depression rises sharply according to functional status of stroke subjects from 0.0%, 16.7%, 35.9% for MRS scores of 0, 1, and 2 respectively and plateaus at peak frequencies of 51.4%, 50.9%, and 50.0% after MRS scores of 3, 4 and 5 respectively.

DISCUSSION

We found that approximately 4 out of 10 stroke survivors in this Ghanaian study had clinically significant depression based on consensus classification using two validated depression scales namely the CES-D and GDS. Mild-to-moderate depression was preponderant with about 10% of study subjects experiencing severe depression. Although the CES-D identified a pervasive frequency of 78.5% of our study subjects with depression

and the GDS questionnaire found 42.5%, the conservative figure of 36.5% achieved by consensus classification using both questionnaires is in accord with previous studies in HICs.¹⁻⁵ A recent guideline recommendation from the American Heart Association and American Stroke Association¹⁷ has recommended the CES-D and GDS as valid tools for screening for depression among stroke subjects although CES-D had better diagnostic qualities.

To put our data in context, the rate of depression among this Ghanaian cohort of stroke survivors is higher than 6.7% reported among the general Ghanaian adult population aged above 50 years.²⁷ Among Nigerians aged 18 years and beyond, lifetime estimates of major depressive episodes are reported at a rate of 3.1%²⁸. Previous studies conducted among indigenous African stroke subjects reported depression rates ranging between 20% and 40% which concurs with estimated obtained in our study.²⁸⁻³⁵ We took advantage of the opportunity afforded by the cross-sectional design of the study to assess the frequency of depression according to duration of stroke. PSD in our population was found to follow a bi-modal distribution whereby depression rates are high among stroke subjects within the first year post-stroke and then declines afterwards as previously reported.¹⁻⁵ However, we observed a later rise in frequency of depression among those living with stroke for 4 or more years. We however caution over-interpretation of these observations due to the small sample size of our study and the cross - sectional nature. Again, in the general Ghanaian adult population²⁷, there is a reported association between depression and increasing age but of lower frequency compared with the frequency reported among the stroke survivors in the present study.

Physical disability and being divorced were potently associated with risk of stroke-associated depression. Although odds for depression was found to increase by 85% for each unit increase on the Modified Rankin Scale, a closer scrutiny revealed that the frequency of depression increased abruptly from a score of 0 to 2 corresponding to mild disability, peaks and plateaus at MRS score of 3 to 5. This concurs with previous studies and is consistent with the assertion that post-stroke depression may be a psychological reaction to acquired functional deficits after stroke.^{36,37} While stroke severity has been associated with depression in previous studies^{6,18,19} and indeed demonstrated an association on bivariate analysis in the present study, it was moderated into non-significance upon adjusted analysis. We noted that stroke severity and functional status did not exhibit significant interactions as covariates in our logistic regression model indicating that these two factors are not independent predictors on risk for depression in our population. The fact that being divorced carried a higher risk of depression after stroke strongly supports a view that social factors³⁸ may promulgate the occurrence of depression. It is important to underscore the fact that none of the traditional vascular risk factors, stroke type, or symptom duration were significantly different between subjects with and without depression in our study.

A notable observation was the profound influence of depression on quality of life of stroke survivors. Subjects with depression had significantly lower scores on 4 key domains of HRQOLISP questionnaire namely the physical, psycho-social, cognitive and eco-social domains. The HRQOLISP is a valid stroke-specific instrument developed based on a comprehensive and multidimensional model of health-related quality of life indicators.²⁶

Previous studies that have assessed the associations between post-stroke depression and quality of life have used the Short-Form General Health Survey,^{7,8} EuroQoL questionnaire⁹ or the Assessment of Quality of Life¹⁰ which are not specific for assessing quality of life for stroke subjects. It is likely that the lower QOL among depressed stroke subjects are invoked by the cognitive and physical deficits as well as the social isolation produced by stroke. It however remains to be determined whether depression exerts an independent effect on QOL and whether therapies directed at alleviating depression would result in improvements in QOL as shown for antidepressant therapy and motor recovery after stroke.^{39–41}

This study has limitations. Firstly, stroke subjects 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, due to the cross-sectional design causality of associated factors cannot be drawn. The implication is that further studies are needed to illuminate our understanding on the complexities of the pathophysiology, natural course, screening instruments and interventions for post-stroke depression particularly in the context of LMICs in sub-Saharan Africa where there is a disproportionately great burden of stroke. Again, the high frequency of depression identified in this study population indicates that clinicians may be neglecting a major post-stroke complication often to the detriment of stroke survivors and the necessary attention is needed to curb this shortfall in clinical practice.

In conclusion, depression after stroke has a high frequency among Ghanaian stroke survivors and is associated with functional limitations and accompanied by profound alterations in the quality of life. Prospective interventional studies are urgently needed to provide solid evidence-based, culturally tailored interventions to address post-stroke depression particularly in LMICs.

Acknowledgments

Funding: Grant R21 NS094033 from the National Institute of Neurological Disorder and Stroke.

References

1. Hackett ML, Pickles K. Part I: frequency of depression after stroke: an updated systematic review and meta-analysis of observational studies. *Int J Stroke*. 2014; 9:1017–1025. [PubMed: 25117911]
2. Kutlubayev 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. [PubMed: 25156411]
3. Bartoli F, Lillia N, Lax A, Crocamo C, Mantero V, Carra G, et al. Depression after stroke and risk of mortality: a systematic review and meta-analysis. *Stroke Res Treat*. 2013; 2013:862978. [PubMed: 23533964]
4. Ayerbe L, Ayis S, Crichton S, Wolfe CD, Rudd AG. The natural history of depression up to 15 years after stroke: the South London Stroke Register. *Stroke*. 2013; 44:1105–1110. [PubMed: 23404719]
5. Hackett ML, Yapa C, Parag V, Anderson CS. Frequency of depression after stroke: a systematic review of observational studies. *Stroke*. 2005; 36:1330–1340. [PubMed: 15879342]
6. Ayerbe L, Ayis S, Wolfe CD, Rudd AG. Natural history, predictors and outcomes of depression after stroke: systematic review and meta-analysis. *Br J Psychiatry*. 2013; 202:14–21. [PubMed: 23284148]

7. Naess H, Waje-Andreassen U, Thomassen L, Nyland H, Myhr KM. Health-related quality of life among young adults with ischemic stroke on long-term follow-up. *Stroke*. 2006; 37:1232–1236. [PubMed: 16601213]
8. Paolucci S, Gandolfo C, Provinciali L, Torta R, Toso V. DESTROK Study Group. The Italian multicenter observational study on post-stroke depression (DESTRO). *J Neurol*. 2006; 253:556–562. [PubMed: 16767539]
9. Christensen MC, Mayer SA, Ferran JM, Kissela B. Depressed mood after intracerebral hemorrhage: the FAST trial. *Cerebrovasc Dis*. 2009; 27:353–360. [PubMed: 19218801]
10. Pan JH, Song XY, Lee SY, Kwok T. Longitudinal analysis of quality of life for stroke survivors using latent curve models. *Stroke*. 2008; 39:2795–2802. [PubMed: 18617653]
11. Parikh RM, Robinson RG, Lipsey JR, Starkstein SE, Fedoroff JP, Price TR. The impact of poststroke depression on recovery in activities of daily living over a 2-year follow-up. *Arch Neurol*. 1990; 47:785–789. [PubMed: 2357159]
12. Jia H, Damush TM, Qin H, Ried LD, Wang X, Young LJ, et al. The impact of poststroke depression on healthcare use by veterans with acute stroke. *Stroke*. 2006; 37:2796–2801. [PubMed: 17008625]
13. Ghose SS, Williams LS, Swindle RW. Depression and other mental health diagnoses after stroke increase inpatient and outpatient medical utilization three years poststroke. *Med Care*. 2005; 43:1259–1264. [PubMed: 16299438]
14. Dossa A, Glickman ME, Berlowitz D. Association between mental health conditions and rehospitalization, mortality, and functional outcomes in patients with stroke following inpatient rehabilitation. *BMC Health Serv Res*. 2011; 11:311. [PubMed: 22085779]
15. Ayerbe L, Ayis S, Rudd AG, Heuschmann PU, Wolfe CD. Natural history, predictors, and associations of depression 5 years after stroke: the South London Stroke Register. *Stroke*. 2011; 42:1907–1911. [PubMed: 21566241]
16. Ayerbe L, Ayis S, Crichton SL, Rudd AG, Wolfe CD. Explanatory factors for the increased mortality of stroke patients with depression. *Neurology*. 2014; 83:2007–2012. [PubMed: 25355829]
17. Towfighi A, Ovbiagele B, Hussein NE, Hackett ML, Jorge RE, Kissela BM, et al. Poststroke Depression. A scientific statement for healthcare professionals from the American Heart Association/ American Stroke Association. *Stroke*. 2016; 47:00–00.
18. Hackett ML, Anderson CS. Predictors of depression after stroke: a systematic review of observational studies. *Stroke*. 2005; 36:2296–2301. [PubMed: 16179565]
19. De Ryck A, Brouns R, Geudens M, Elseviers M, De Deyn PP, Engelborghs S. Risk factors for poststroke depression: identification of inconsistencies based on a systematic review. *J Geriatr Psychiatry Neurol*. 2014; 27:147–158. [PubMed: 24713406]
20. Owolabi MO, Bower JH, Ogunniyi A. Mapping Africa's way into prominence in the field of neurology. *Archives of neurology*. 2007; 64:1696–700. [PubMed: 18071032]
21. Feigin VL, Lawes CM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. *Lancet Neurol*. 2009 Apr; 8(4):355–69. [PubMed: 19233729]
22. Feigin VL. Stroke epidemiology in the developing world. *Lancet*. 2005; 365:2160–1.
23. Sarfo FS, Akassi J, Badu E, et al. Profile of neurological disorders in an adult neurology clinic in Kumasi, Ghana. *eNeurologicalSci*. 2016; 3:69–74. [PubMed: 27110596]
24. Radloff LS. The Center for Epidemiologic Studies Depression Scale (CES-D) scale: A self-reported depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
25. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, et al. Development and validation of a geriatric depression screening scale: a preliminary report. *J Psychiatr Res*. 1982–1983; 17:37–49.
26. Ojo Owolabi M. HRQoLISP-26: A concise, multiculturally valid, multidimensional, flexible, and reliable stroke-specific measure. *ISRN Neurol*. 2011; 2011:295096. [PubMed: 22389812]
27. Thapa SB, Martinez P, Clausen T. Depression and its correlates in South Africa and Ghana among people aged 50 and above: findings from the WHO Study on global ageing and adult health. *J Psychiatry*. 2014; 17(6):1000167. [PubMed: 25914902]

28. Gureje O, Uwakwe R, Oladeji B, Makanjuola VO, Esan O. Depression in adult Nigerians: results from the Nigerian survey of mental health and well-being. *J Affect Disord*. 2010; 120(1–3):158–64. [PubMed: 19450883]
29. Hamza AM, Al-Sadat N, Loh SY, Jahan NK. Predictors of poststroke health-related quality of life in Nigerian stroke survivors: a 1-year follow-up study. *Biomed Res Int*. 2014; 2014:350281. [PubMed: 24982864]
30. Oladiji JO, Akinbo SR, Aina OF, Aiyeijusunle CB. Risk factors of post - stroke depression among stroke survivors in Lagos, Nigeria. *Afr J Psychiatry (Johannesbg)*. 2009; 12(1):47–51. [PubMed: 19517047]
31. Mpembi NM, Mampunza MMS, Massamba KV, Matonda MNT, Dubois V, De Partz MP, et al. Clinical course of post-stroke depression in Kinshasa. *Rev Neurol (Paris)*. 2014; 170(10):614–20. [PubMed: 24854963]
32. Fatoye FO, Mosaku SK, Komolafe MA, Egunranti BA, Adebayo RA, Komolafe EO, et al. Depressive symptoms and associated factors following cerebrovascular accident among Nigerians. *Journal of Mental Health*. 2009; 18(3):224–232. (2009).
33. Ojagbemi A, Akinyemi R, Baiyewu O. Cognitive dysfunction and functional limitations are associated with major depression in stroke survivors attending rehabilitation in Nigeria. *NeuroRehabilitation*. 2014; 34(3):455–61. [PubMed: 24463232]
34. Ojagbemi A, Owolabi M. Predictors of functional dependency after stroke in Nigeria. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association*. 2013; 22(8):e381–7. [PubMed: 23680683]
35. Ojagbemi A, Owolabi M, Atalabi M, Baiyewu O. Stroke lesions and post-stroke depression among survivors in Ibadan, Nigeria. *African journal of medicine and medical sciences*. 2013; 42(3):245–51. [PubMed: 24579386]
36. Ng KC, Chan KL, Straughan PT. A study of post-stroke depression in a rehabilitative center. *Acta Psychiatr Scand*. 1995; 92:75–79. [PubMed: 7572253]
37. Nys GM, van Zandvoort MJ, van der Worp HB, de Haan EH, de Kort PL, Kappelle LJ. Early depressive symptoms after stroke: neuropsychological correlates and lesion characteristics. *J Neurol Sci*. 2005; 228:27–33. [PubMed: 15607207]
38. Murphy E. Social origins of depression in old age. *Br J Psychiatry*. 1982; 141:135–142. [PubMed: 7116052]
39. Chollet F, Tardy J, Albucher JF, Thalamas C, Berard E, Lamy C, et al. Fluoxetine for motor recovery after acute ischemic stroke (FLAME): a randomized placebo-controlled trial. *Lancet Neurol*. 2011; 10:123–130. [PubMed: 21216670]
40. Dam M, Tonin P, De Boni A, Pizzolato G, Casson S, Ermani M, et al. Effects of fluoxetine and maprotiline on functional recovery in poststroke hemiplegic patients undergoing rehabilitation therapy. *Stroke*. 1996; 27:1211–1214. [PubMed: 8685930]
41. Zittel S, Weiller C, Lipert J. Citalopram improves dexterity in chronic stroke patients. *Neurorehabil Neural Repair*. 2008; 22:311–314. [PubMed: 18219053]

Highlights

- Disability adjusted years from stroke is greatest in LMICs
- Post-stroke depression is associated with poor outcomes
- The burden of PSD in LMICs remains unknown
- Among Ghanaian stroke survivors, 36.5% had PSD
- PSD was associated with poor quality of life

Figure 1. Frequency of post-stroke depression according to duration of stroke in years
Please note that 26 subjects did not have data on stroke duration.

Figure 2. Frequency of post-stroke depression according to functional status assessed using the Modified Rankin Scale

Comparison of Socio-demographics and Clinical features among Stroke Survivors with Depression and those without depression

TABLE 1

Variable	Depression (n=73)	Not depressed (n=127)	Total n =200	p-value
Female	35 (47.9)	60 (47.2)	95	0.92
Age, median (IQR)	63 (53–72)	62 (52–73)	62 (52–72)	0.77
Educational level				0.06
	None	18 (14.2)	36 (18.0)	
	Primary	38 (29.9)	56 (28.0)	
	Secondary	22 (30.1)	77 (38.5)	
	Tertiary	15 (20.5)	31 (15.5)	
Marital Status				0.05
	Married	42 (69.3)	88 (57.5)	
	Divorced	16 (9.4)	12 (21.9)	
	Widow	15 (21.3)	27 (20.5)	
Occupational Status				0.55
	Employed	52 (71.2)	94 (74.0)	
	Unemployed	14 (19.2)	26 (20.5)	
	Retired	7 (9.6)	7 (5.5)	
Location of residence, n (%)				0.18
	Rural	1 (1.4)	6 (4.7)	
	Semi-urban	16 (21.9)	38 (29.9)	
	Urban	56 (76.7)	83 (65.4)	
Vascular Risk Factors				
	Hypertension	68 (93.2)	118 (92.9)	0.95
	Diabetes Mellitus	24 (32.9)	38 (29.9)	0.66
	Dyslipidemia	32 (43.8)	53 (41.7)	0.77
	Alcohol excess	16 (21.9)	32 (25.2)	0.60
	Cigarette smoking	3 (4.1)	10 (7.9)	0.30
	Cardiac diseases	2 (2.7)	1 (0.8)	0.27
	Physical inactivity	32 (43.8)	40 (31.5)	0.08
Body Mass Index (kg/m ²) mean ± SD	27.4 ± 4.4	27.1 ± 5.1	27.2 ± 4.9	0.68

Variable	Depression (n=73)	Not depressed (n=127)	Total n =200	p-value
Stroke type				0.22
Ischemic	53 (72.6)	87 (68.5)	140 (70.0)	
Hemorrhagic	9 (12.3)	27 (21.2)	36 (18.0)	
Undetermined	11 (15.1)	13 (8.7)	24 (12.0)	
Duration of stroke in years, Median (IQR)	1.5 (1.0–4.0)	2.0 (1.0–4.0)	2.0 (1–4)	0.67
NIHSS, Median (IQR)	10 (5–14)	5 (0–11)	8 (2 – 12)	0.0002
Modified Rankin Score, Median (IQR)	3 (2–4)	2 (1–3)	2 (1–4)	<0.0001
HRQOLISP				
Physical domain score, median (IQR)	18 (14–22)	24 (18–30)	21 (16–28)	<0.0001
Psycho-social domain score, median (IQR)	20 (18–23)	23 (21–27)	22 (19–26)	<0.0001
Cognitive domain score, median (IQR)	13 (10–20)	21 (16–23)	19 (13–22)	<0.0001
Eco-social domain score, median (IQR)	23 (20–26)	28 (24–31)	26 (23–30)	<0.0001

HRQOLISP= Health-Related Quality of Life in Stroke Patients questionnaire

Table 2
Multivariate logistic regression analysis showing Predictors of Post-Stroke Depression

Predictor	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Gender		0.92		
Female	1.03 (0.58–1.83)		-	-
Male	1.00			
Age, each 10 year increase	1.05 (0.86–1.28)	0.63	-	-
Marital status				
Divorced	2.37 (1.08–5.21)	0.03	2.82 (1.18–6.71)	0.02
Widow	1.22 (0.57–2.60)	0.60	0.97 (0.43–2.21)	0.96
Married	1.00		1.00	
Duration of stroke, each year	0.24 (0.06–1.00)	0.05	1.21 (0.79–1.86)	0.38
Stroke type				
Ischemic	1.83 (0.80–4.18)	0.15	-	-
Undetermined	2.54 (0.84–7.64)	0.10	-	-
Hemorrhagic	1.00			
Modified Rankin Score, each unit increase	1.69 (1.33–2.14)	<0.0001	1.85 (1.28–2.69)	0.001
NIHSS, each unit increase	1.06 (1.03–1.11)	0.0014	1.08 (0.96–1.22)	0.20
MRS * NIHSS Interaction term	1.02 (1.01–1.03)	0.002	0.98 (0.95–1.01)	0.20