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Prevalence and associated factors of post-stroke depression in Africa: a systematic review and meta-analysis

Bekalu Getachew[1*] and Abay Mulu[2]

Abstract

Background Depressive disorder is considered the most frequent and burdensome mental health complication after stroke. Post-stroke depression is under-recognized in Africa and data remain scarce. These systematic reviews and meta-analyses were, therefore conducted to fill the gap.

Methods An inclusive review of both published and unpublished articles was conducted. An initial search was conducted in PubMed, African Journal Online, EMBASE, SCOPUS and Google Scholar. Data were extracted using an Excel data format and the analysis was done using STATA version 14 statistical software. The heterogeneity of studies was determined using the Cochrane Q test statistic and I2 test statistics with forest plots. A random effects model was used to examine the pooled prevalence of post-stroke depression and subgroup analysis was conducted for those having significant heterogeneity. Sensitivity analysis and publication bias were also assessed. Pooled odds ratios (ORs) with a 95% confidence interval (CI) were calculated. Results were presented in narratives, tables and forest plots.

Result A total of 25 Articles with 3098 stroke patients from African countries were included to pool the prevalence of post-stroke depression in the meta-analysis. The pooled prevalence of post-stroke depression in Africa at any time was 38.35% [95% CI, 34.07-42.63%]. The pooled estimate for post-stroke depression using clinical diagnostic tools was [38.53%, 95%CI: 34.07–42.63] and (36.81% [32.09–41.52%]) by rating scale. Subgroup analysis by region showed that Central Africa [50.92%, 95% CI: 45.94–55.90] had the highest pooled estimate of depression among stroke survivors with high heterogeneity (92.5%). Female gender, cognitive dysfunction and younger age were found associated in the primary studies but their pooled Odds ratio and overall effect were not significant in the meta-analysis. The pooled estimate of the Odds ratio of physical disability in Africa was 2.02[95% CI, 1.04–3.94] with no heterogeneity but the overall effect was significant ($p=0.038$).

Conclusion Post-stroke depression was relatively higher in Africa. Central Africa had the highest burden of post-stroke depression followed by West Africa. Physical disability was significantly associated with post-stroke depression in the current meta-analysis.

Keywords Prevalence, Post-stroke depression, Associated factors, Africa

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Introduction

Stroke is a significant contributor to death and disability worldwide, Globally, in 2013, it was estimated that there were 6.5 million deaths from stroke, 25.7 million stroke survivors, and about 113 million disability-adjusted life years (DALY) were lost due to stroke [1]. The developing countries are worst affected as the World Health Organization (WHO) estimates suggested a sevenfold increase in disability-adjusted life years attributable to stroke in low- and middle-income regions compared to high-income regions [2].

Stroke often leads to physical and cognitive impairments and deficits, which are usually accompanied by emotional disturbances and symptoms of depression [3]. Depressive disorder is considered the most frequent and burdensome mental health complication after stroke. According to the Diagnostic and Statistical Manual of Mental Disorders V (DSM-V), post-stroke depression (PSD) can be described as a mood disorder resulting from a medical condition and characterized by an episode of major depression or a mood disorder with depressive symptoms [4]. The National Institute of Mental Health estimated that 10–27% of stroke survivors will experience major depression, while an additional 15–40% will have symptoms of depression within 2 months following a stroke. Various studies have put on their literature; the pooled estimate in Australia indicates that depressive symptoms are present in 33% of cases of all stroke survivors. Post-stroke depression has a widely varying prevalence, ranging from 25 to 79% depending on the type of studies and diagnostic tools used [5], According to a study conducted in Europe the prevalence is between 19.8% and 28.3% [5] However, in most parts of the world, it is under-recognized and undertreated, especially in developing countries [6]. Data from primary studies in Burkina Faso have shown that the prevalence of post-stroke depression is 38.6% [7] and in Benin the prevalence is 87.7% in 2006 [8]. Post-stroke depression is associated with more physical disability, particularly in day-by- day activities, poor functional outcomes, and a high death rate [9]. Data available from 51 studies that were run between 1977 and 2002 confirmed that depressive symptoms were assessed in 33% (29–36%) among all stroke survivors at any time during follow- up [10].

Even though there were few research findings on the magnitude and factors associated with post-stroke depression in a few African countries, the overall pooled estimate and related factors are still unknown in Africa, so this systematic review and meta-analysis were conducted to quantify the burden as well as to identify factors contributing to post-stroke depression in Africa.

The objective of this systematic review and meta-analysis is to determine the pooled prevalence of post-stroke depression and also to identify pooled factors associated with post-stroke depression in Africa.

Methodology

Information source and search strategy

A comprehensive search of published and unpublished research was carried out. An initial search was conducted in PubMed, African Journal online, EMBASE, SCOPUS and Google Scholar using the following keywords ((((stroke OR Post-stroke) OR (cerebrovascular accident OR Stroke survivors)) OR (Cerebrovascular Accident OR Stroke survivors)) AND (Depression OR Minor Depression OR Major Depression OR Major Depressive disorders OR Depressive symptoms OR Post-stroke emotional disorders OR Emotional Response)) AND (Epidemiology OR Frequency OR Prevalence OR Incidence OR factors OR Risk Factors OR Associated factors OR Predisposing Factors OR Precipitating Factors OR Outcome OR Mortality). Grey literature was retrieved exhaustively using search engines. The reference lists of the retrieved studies were probed by contacting relevant experts and the organization's website to collect inaccessible articles through databases and search engines (Fig. 1).

Population, Exposure, Comparison, Outcome (PECO) search Guide

- P-population: stroke patients (survivors)
- E-exposure: associated factors (sex, age, physical disability, cognitive impairment, lesion location)
- C-comparison: stroke survivors with and without depression
- Outcome: post-stroke depression (PSD)

Eligibility criteria

Inclusion criteria

- All adult (age > 18) stroke survivors
- All observational studies (cross-sectional, case-control, and cohort) were included
- The full-text article is written in English and reports the outcome of interest.

Exclusion criteria

- Studies that report depression with other psychiatric disorders (Anxiety, bipolar disorders) were excluded.
- Experimental studies conducted in non-human species.

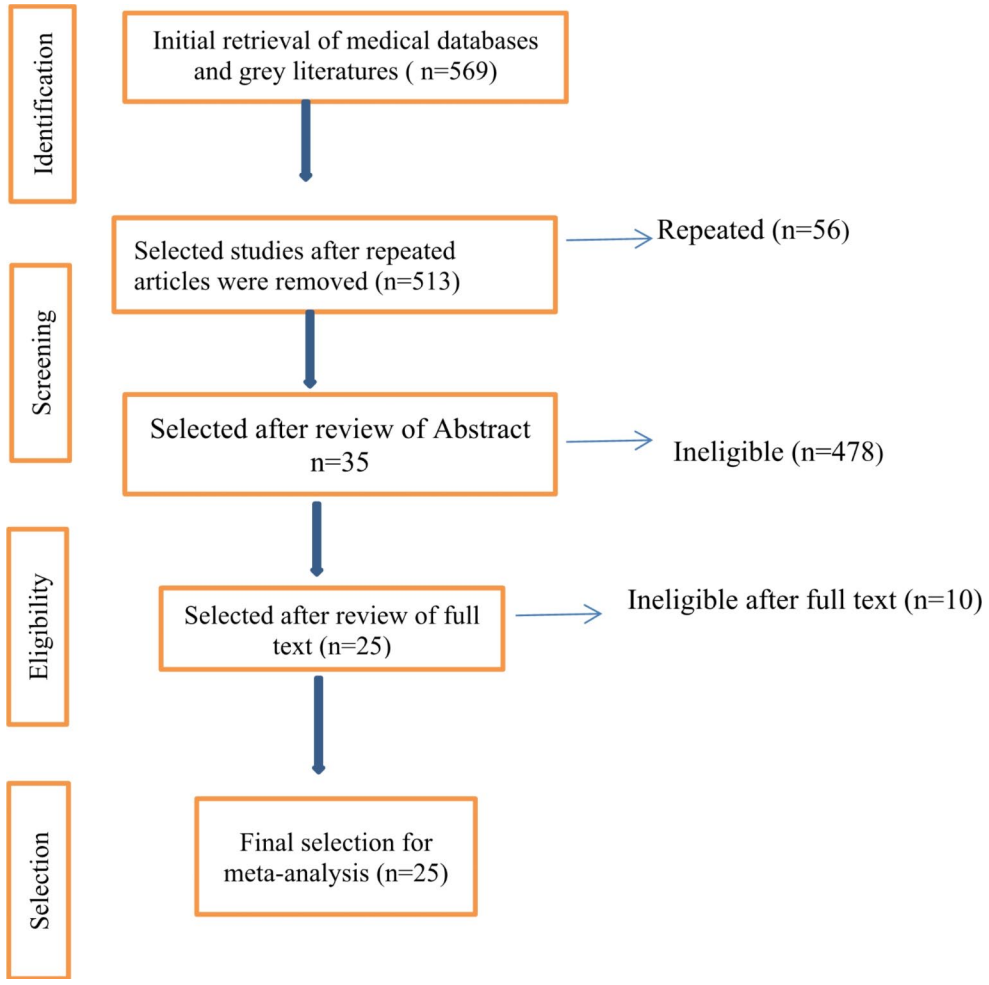

Fig. 1 PRISMA flow diagram depicting the selection process of studies for the systematic review and meta-analysis on the prevalence and associated factors of post-stroke depression in Africa, 2023

Summary of studies selected for systematic review and meta-analysis

The studies included in this systematic review and meta-analysis were nineteen descriptive/analytical cross-sectional studies, four comparative cross-sectional studies and two case-control studies. A total of 25 studies were included in the systematic review and meta-analysis. The studies were done on the African continent. The studies were listed below by making a category list of authors, country, sample size, prevalence, year of publication, mean age, study design and Tool used (Table 1).

Data extraction

After identifying eligible studies, two independent reviewers (BG and AM) extracted the relevant data using a standardized data extraction format on a Microsoft Excel spreadsheet. Finally, the two reviewers independently extracted the full texts of the name of the first author, year of publication, country, study design, mean age, sample size, number of cases with post-stroke depression and associated factors of post-stroke depression on a separate Excel sheet on a two by two table using the structured data extraction format.

Data items

Outcome variables

- Post-stroke depression

Participants

- Studies reported on prevalence of post-stroke depression and associated factors in Africa.

Quality appraisal and risk of bias assessment for individual studies

Two independent reviewers (BG and AM) performed the quality assessment. The quality of each article was

Table 1 A summary of included studies for the prevalence of post-stroke depression in Africa, 2023

Author	Year	Country	Sample size	Prevalence	Design	Age (Mean + SD)	Tool Used	Quality
Mpembi et.al [11]	2013	Democratic Congo	58	54	CS	54.7 ± 12.5	Patient Health Questionnaire (PHQ9) and Aphasia (SADS)	High
Ibeneme et.al [12]	2017	Nigeria	50	40	CS	NR	Becks Depression Inventory(BDI)	High
Mohammed et.al [13]	2019	Egypt	102	60.7	CCS	56.67 ± 10.43	Clinical Assessment (DSM-IV)	High
Khedr et al. [14]	2020	Egypt	103	36.9	CCS	61.2 ± 14.7	Clinical Interview for DSM-IV	High
Camara et.al [15]	2018	Gabon	153	48.8	CS	56.7 ± 12.1	Clinical interview ((DSM-IV and MADRS)	Medium
Sarfo et.al [16]	2015	Ghana	200	36.5	CS	62.0 ± 14.4	(CES-D) and Geriatric Depression Scale (GDS)	High
Eze et.al [17]	2022	Nigeria	110	32.7	CS	NR	Beck Depression Inventory(BDI)	Medium
Oladiji et.al [18]	2008	Nigeria	51	25.5	CS	52.5 ± 5.9	Depression Anxiety stress scale(DASS-21)	Medium
Abou Sy et.al [19]	2019	Senegal	98	33.6	CS	58.5 ± 13.7	Clinical (DSM-IV)	Medium
Agbola et.al [20]	2019	Nigeria	130	41.5	CCS	59.54 ± 11.08	Clinical Assessment(SCAN)	High
Gyagenda et.al [21]	2015	Uganda	73	31.5	CS	NR	PHQ-9	Medium
Ezema CI et.al [22]	2019	Nigeria	66	48.5	CS	57.52 ± 11.35	Hamilton Depression Rating Scale(HDRS)	Medium
Zemed et.al [23]	2021	Ethiopia	180	49.6	CS	59.22 ± 12.71	PHQ-9	High
Tsehayneh and Tafesse [24]	2020	Ethiopia	84	32.2	CS	57.1 ± 14.8	PHQ-9	High
Wubshet et.al [25]	2022	Ethiopia	249	27.5	CS	NR	PHQ-9	High
Worku et.al [26]	2021	Ethiopia	159	43.4	CS	58.4 ± 13.7	PHQ-9	High
Abubakar et.al [27]	2019	Nigeria	112	42.9	CS	56.71 ± 6.49	Clinical Assessment (MINI)	Medium
Abubakar et.al [28]	2014	Nigeria	68	16.2	CS	54.99 ± 11.8 years	Hamilton Depression Rating Scale(HDRS)	Medium
Ibeneme et.al [29]	2016	Nigeria	50	42	CS	54.76 ± 8.79	Beck Depression Inventory	High
Osunwale et al. [30]	2018	Nigeria	140	22.9	CS	57.43 ± 9.67	Clinical assessment by (SCAN)	High
Femi O. Fatoye [31]	2009	Nigeria	118	39.8	CCS	NR	Beck Depression Inventory (BDI)	High
Mitchaï et al. [32]	2022	Benin	44	34.1	CS	54.1 ± 11.5	Hospital Anxiety and Depression Scale (HADS)	High
Ali et al. [33]	2016	Nigeria	191	52.9	CS	50.14 ± 16.05	Clinical Assessment(DSM-IV and HDRS)	High
Akin et al. [34]	2014	Nigeria	260	-	CC	NR	Clinical (DSM IV)	High
Fantu et al. [35]	2022	Ethiopia	240	-	CC	60.8 ± 14.3	Patient Health Questionnaire (PHQ-9)	High

**CS– cross sectional CCS– comparative cross –sectional CC– case control PHQ: patient health questioner DSM– Diagnostic statistical manual

assessed using the standardized Joanna Briggs Institute (JBI) critical appraisal tool prepared for case–control, analytical cross-sectional and descriptive cross-sectional studies, each with 10, 8 and 9 question items assessed respectively (JBI). All tools have 'Yes' and 'No' types of questions, and scores were given 1 for 'Yes' and 0 for 'No' responses. Scores were summed up and transformed into percentages. Only studies that scored 50% were considered for systematic review and meta-analysis of prevalence [36]. For any scoring disagreements, the source of discrepancy was investigated through making a thorough revision, and disagreements were resolved through discussion.

Summary measures

The pooled estimates or effect measures were calculated for each study. The effect size (pooled estimate) was calculated for prevalence and odds ratio (OR). The log transformations were calculated for each value before being analyzed. The log-transformed values made the scale symmetric to perform the overall analyses, and then the results were converted back to ratio values for interpretation. The precision and confidence intervals were used to estimate the true effect.

Synthesis of results

The extracted data were exported to STATA Version 14 for further analysis. The data were synthesized based on the presence/absence of post-stroke depression. The existence of heterogeneity among studies was examined by Forest plot, Cochran's Q statistics (X^2 test) and the size of I^2. The Inverse variance (I)2 values of 25%, 50% and 75% were interpreted as low, medium and high heterogeneity, respectively [37]. A pooled estimate of the prevalence was generated for post-stroke depression. The potential cause of heterogeneity was explored by meta-regression analysis, sensitivity analysis and subgroup analyses. The funnel plot was used as a subjective way of assessing publication bias, whereas the Egger test statistics were used to examine the publication bias objectively. A cumulative

meta-analysis was also performed. All statistical interpretation was reported based on p-value and 95% CI. The presence of a statistical association was declared based on a p-value of <0.05. To determine the factors associated with post-stroke depression, the data was entered into STATA V.14, and pooled odds ratios (ORs) with a 95% confidence interval (CI) were calculated. Results were presented in narratives, tables and forest plots.

Risk of bias across studies

The risk of bias was tested by a Funnel plot subjectively and Egger's regression test objectively, and publication bias was checked. The Asymmetry of the funnel plot or statistical significance of Egger's regression test ($p<0.05$) was suggestive of a potential publication bias.

Subgroup analysis

Subgroup analysis was conducted based on sample size, region, tool used and study design.

Results

Description of study selection

Five hundred sixty-nine studies on the prevalence of post-stroke depression and associated factors in African countries were found in Medline (PubMed), Cochrane, Embase, AJOL, Google Scopus and Google Scholars. Fifty-six articles were removed due to duplication. After reviewing the titles and abstracts of the remaining 513 papers, it was determined that 478 were irrelevant to the study and were thus eliminated. For the final systematic review and meta-analysis, 25 papers that met the criteria were selected.

Characteristics of the included studies

In this systematic review and meta-analysis, 25 studies from nine African countries were considered eligible for assessing the prevalence of post-stroke depression. Four African countries were included in the analysis of associated factors, with a total sample size of 3098 participants. All research published between 2000 and 2022 that met the criteria were eligible. There were nineteen cross-sectional studies (76%) [11, 12, 15–19, 21–30, 32, 33], four comparative cross-sectional studies (16%) [13, 14, 20, 31] and two case-control studies (8%) [34, 35] were used in this analysis. About sixteen Articles have used a rating scale to diagnose depression after stroke, and nine articles have used clinical assessment.

Meta- analysis on pooled prevalence of post-stroke depression

A total of 25 articles were included in the systematic review and meta-analysis to pool the estimate. The pooled prevalence of post-stroke depression in Africa was 38.35% [95% CI, 34.07-42.63%]. The highest prevalence was reported from the study done in Egypt while the lowest prevalence was reported in the Nigerian study. Significant heterogeneity is reported from the pooled effect ($I^2=98.6\%$, P-value=0.000) (Fig. 2).

Subgroup analysis for prevalence of post-stroke depression in Africa

Due to high heterogeneity in the pooled estimate, subgroup analysis was conducted to identify the possible source of heterogeneity. The pooled estimate for post-stroke depression using clinical diagnostic tools was (38.53%, 95%CI: 34.07–42.63) and (36.81% 32.09–41.52%) by rating scale. Heterogeneity was 99.0% and 98.1%, respectively. Subgroup analysis by region showed that Central Africa (50.92%, 95% CI: 45.94–55.90) had the highest pooled estimate of depression among stroke survivors with high heterogeneity (92.5%), the lowest pooled estimate was reported from West Africa (35.76%, 95%CI: 31.01–40.51) with high heterogeneity (97.9%) (Table 2).

Meta regression

To detect the sources of heterogeneity, a random effect meta-regression was run by year of publication, region, design, and tool used. To identify causes of heterogeneity, univariate and categorical meta-regression analysis was carried out; the analysis indicated that there was no heterogeneity by sample size ($p=0.831$), publication year ($p=0.667$), Assessment tool used ($P=0.396$), study design ($P=0.123$) and region (West Africa=0.08, North Africa=0.858, Eastern Africa=0.135).

Sensitivity analysis for prevalence of post-stroke depression in Africa

Sensitivity analysis was performed for effect sizes of all of the studies on post-stroke depression to identify the possible source of heterogeneity and to single out the effect of one study on the overall estimate. Two studies were excluded, and the pooled estimate showed no single study effect on the overall Meta-analysis (Fig. 3).

Publication bias for the prevalence of post-stroke depression

The funnel plots had assymmetrical distribution and Eggers' regression test ($p=0.000$) were significant. The Eggers' test results showed that there is a significant publication bias (Fig. 4).

The result of the eggers test also showed that there was a significant publication bias ($P=0.000$), (Table 3).

Cumulative meta-analysis

A cumulative meta-analysis was done to assess how the overall estimate changes as each study was added to the pool (Fig. 5).

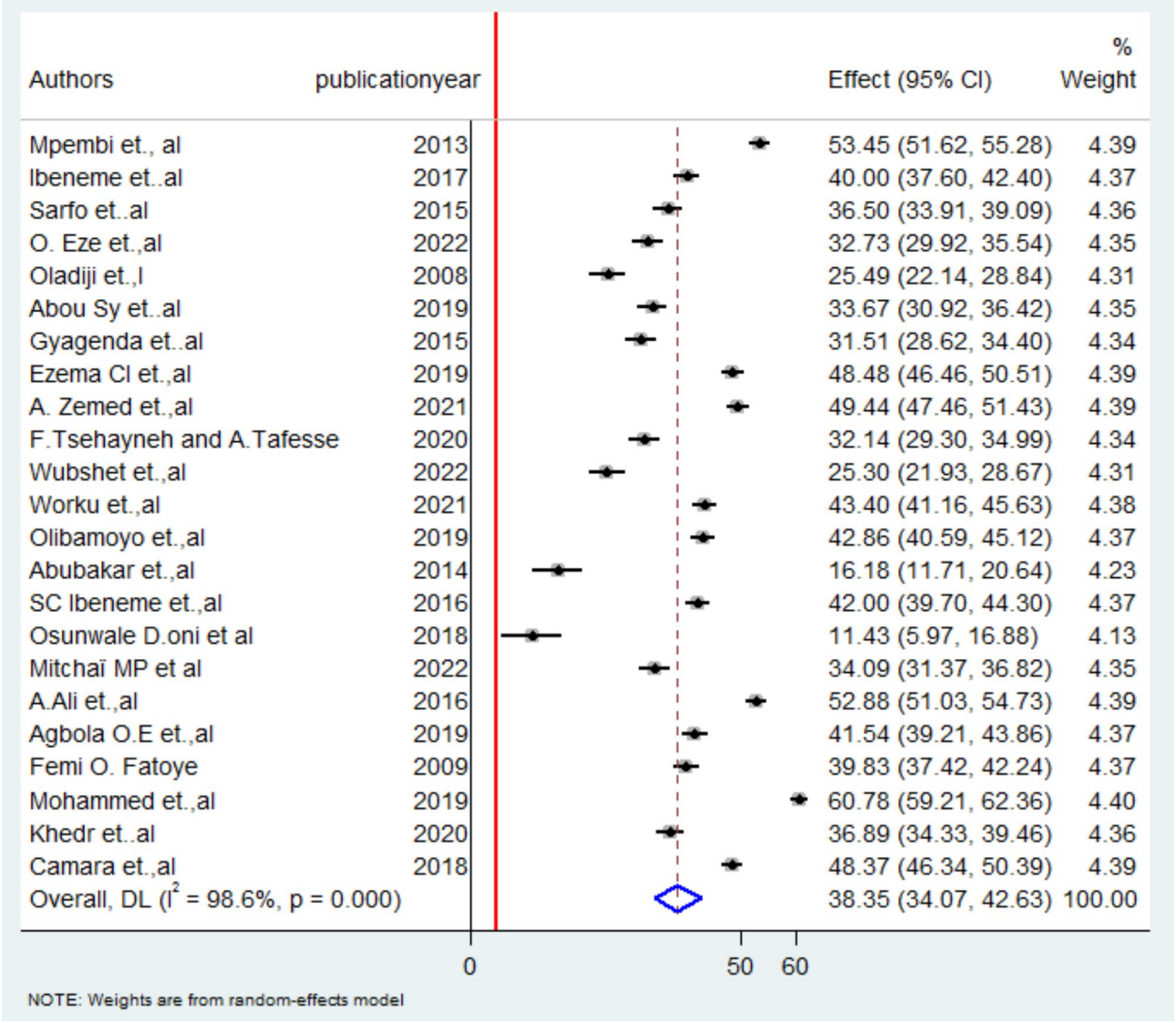

Fig. 2 Forest plot on the pooled prevalence of post-stroke depression in Africa, 2023

Factors associated with post-stroke depression in Africa

Female gender was found to be associated in a total of four studies, and analysis was done to identify factors that could affect post-stroke depression. The pooled Odds ratio using the random effect model is 0.89[95%CI, 0.31–2.52]; females were 11% less likely to have the symptoms/depressive disorders than their male counterparts (p-value=0.000). Heterogeneity was found to be higher, I^2=89.3%). Regarding physical disability, a total of five studies were extracted from respective studies in Africa that have reported factors associated with post-stroke depression in Africa. The pooled estimate of OR of physical disability in Africa was 2.02[95% CI, 1.04–3.94] with no heterogeneity and a fixed-effect model was used, and the overall effect was significant (p=0.038). Those who had physical disability were two times more likely to have post-stroke depression than those without physical disability. Concerning cognitive dysfunction, a total of three studies were identified from databases, and the pooled summary measure of cognitive dysfunction with pooled OR was 4.42[0.11–11.17] with heterogeneity reported to be (I^2=0.0%) and a fixed-effect model was used. Those patients with cognitive dysfunction were 4.4 times more likely to have post-stroke depression than those without cognitive dysfunction, but the overall effect was non-significant. A total of two studies were used to assess the significance of the association between younger age and post-stroke depression; the pooled OR was 0.42[95% CI, 0.04–4.88], and those who are young were 58% less likely to have post- stroke depression than their counterparts. Still, the overall effect was not significant (Fig. 6).

Table 2 Sub-group analysis of post-stroke depression in Africa, 2023

Sub-group analysis	variables	Number of studies	Prevalence (95%CI)	Heterogeneity	
				I^2	P-value
Region	Eastern Africa	5	36.41[27.65–45.17]	98.3%	0.000
	Western Africa	14	35.76[31.01–40.51]	97.9%	0.000
	Northern Africa	2	48.86[25.44–72.27]	99.6%	0.000
	Central Africa	2	50.92[45.94–55.90]	92.5%	0.000
	Overall	23	38.35[34.04–42.63]	98.6%	0.000
Study design	CS	19	36.36[31.73-41.00]	98.4%	0.000
	CCS	4	45.15 [36.06–54.59]	99%	0.000
	Overall	23	38.35[34.04–42.63]	98.6%	0.000
Tool used	Clinical assessment	8	38.53[34.07–42.63]	99%	0.000
	Rating scale	15	36.81[32.09–41.52]	98.1%	0.000
	Overall	23	38.35[34.04–42.63]	98.6%	0.000
Sample size	≥ 100	13	40.31[34.63–45.99]	98.7%	0.000
	< 100	10	35.80[29.39–42.21]	98.4%	0.000
	Overall	23	38.35[34.04–42.63]	98.6%	0.000

CS– Cross–sectional CCS– comparative cross sectional

Sensitivity analysis for factors associated with post-stroke depression in Africa

Due to significant heterogeneity for female gender and young age, sub-group analysis was conducted to identify the possible source of heterogeneity. There is no significant heterogeneity found after sub-group analysis. The sensitivity analysis also showed that there is no single study effect.

Publication bias for factors associated with post-stroke depression in Africa

Publication bias was checked for all included studies. It was checked subjectively by using the funnel plot and objectively by using the Eggers test. Based on the findings, the funnel plot was asymmetrical and the Eggers test showed no statistically significant bias. (P=0.627) (Fig. 7).

The eggers test was run and the result showed that there is no significant publication bias (P=0.627) (Table 4).

Discussion

This systematic review and meta-analysis were conducted to assess the pooled prevalence of post-stroke depression and factors associated with it among the African population. The pooled prevalence of post-stroke depression at any time in Africa was 38.35% [95%CI, 34.07-42.63%]. Consistent findings were reported from an observational multi-Center study conducted in Italy with a pooled estimate of 36% [38]. The current systematic review and meta-analysis were higher than a previously conducted systematic review among six Western countries, with a pooled estimate of 33% [10]. The study was also higher than a pooled estimate (29%) obtained from the United Kingdom [39] and also higher than a systematic review and meta-analysis that included 61 observations with a pooled prevalence rate of 31% [40]. A recently published systematic review and meta-analysis that has included 77 articles has reported that the pooled estimate of depression after stroke is 27% [41], which is lower than our meta-analysis. The variation could be due to heterogeneity of the studies, differences in the diagnostic tools used, the socioeconomic status difference and the quality of service provided for chronic non-communicable diseases like stroke, which could significantly vary between the continents. The current meta-analysis was lower than the previous one among the Iranian population, with a reported pooled prevalence of 46.9% [42]. The possible reason could be differences in the source of patient recruitment and underreporting of mood disorders due to communication problems (Aphasia). The other reason could be due to the inclusion of few studies (6 articles) in the Iranian study that might overestimate the pooled prevalence of depression after stroke, and the other possible reason might be the variations in patient characteristics and the differences in the diagnostic tool used for PSD between study populations. Scientific evidence showed that ischemic lesions of ascending monoamine pathways may result in depressive disorders due to abnormal modulation of frontal and cingulate regions involved in mood regulation [43].

The pooled estimate of post-stroke depression using clinical assessment tools was 38.53% and 36.81% by using the rating scale. The clinical assessment had the highest pooled estimate than the rating scale. The possible explanation could be because rating scales had less specificity in diagnosing post-stroke depression [44–46]. The current meta-analysis was higher than a previous meta-analysis in the United Kingdom, which reported 29% by rating scale and 24% by clinical interview [41]. The variation could be due to differences in the case ascertainment of post-stroke depression, and patients with other conditions like sleep disturbances might be misdiagnosed to have post-stroke depression.

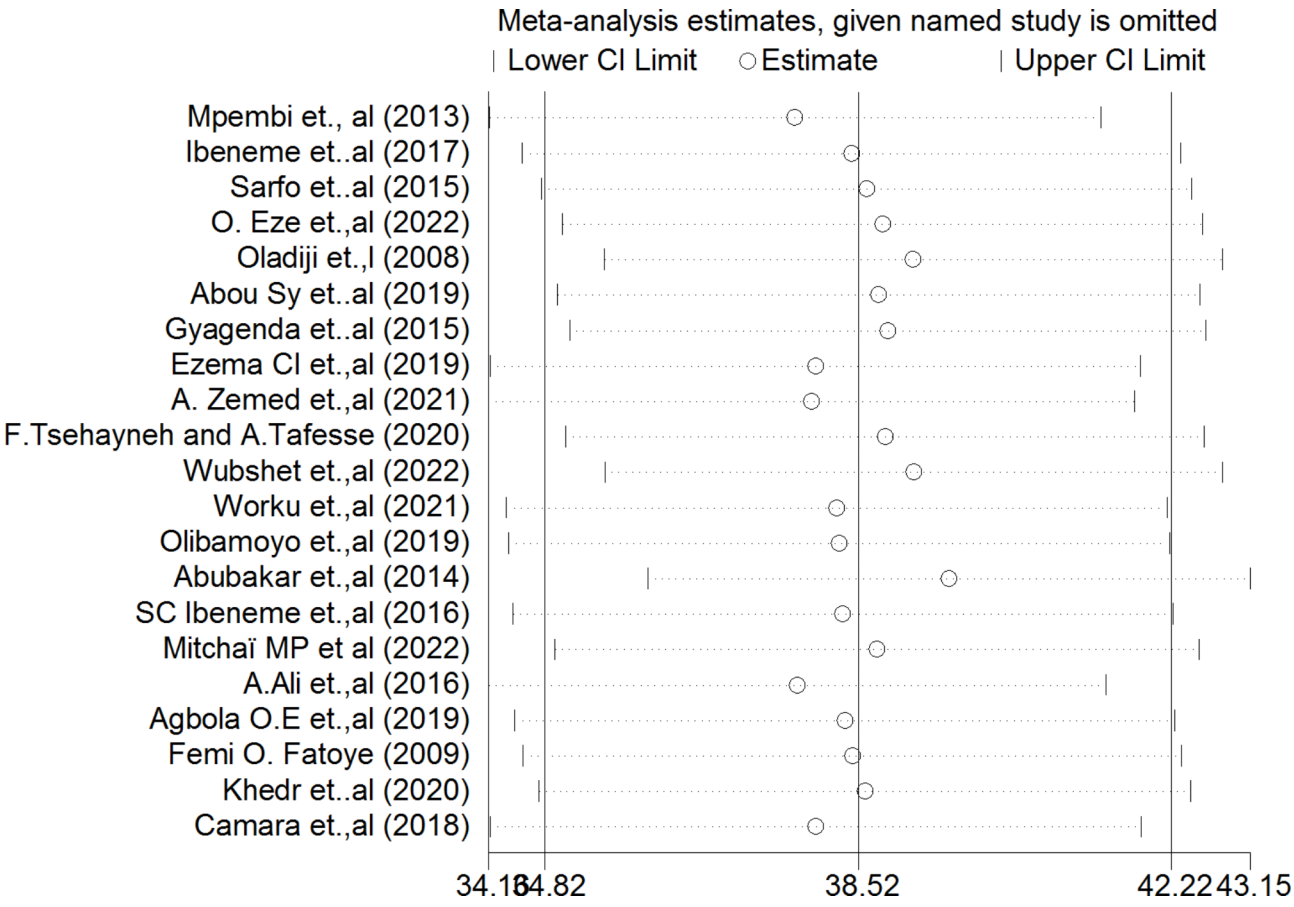

Fig. 3 Result of sensitivity analysis after exclusion of two studies [13, 30] in Africa,2023

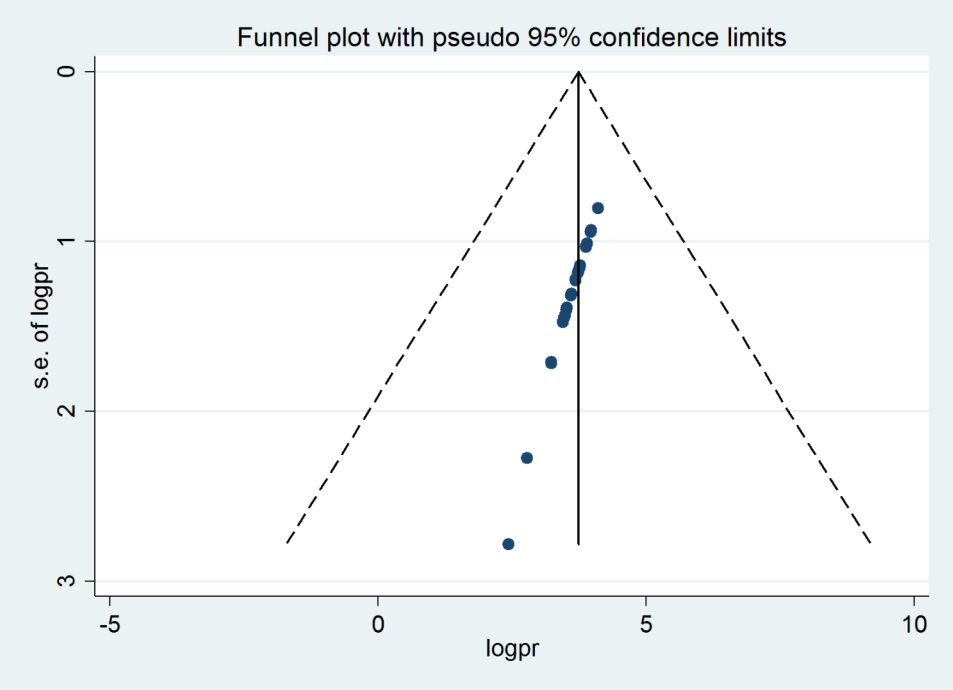

Fig. 4 Funnel plot to assess the publication bias for prevalence of post-stroke depression in Africa, 2023

Table 3 Egger's test for assessment of prevalence of post-stroke depression in Africa, 2023

Std_Eff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
slope	4.819251	.0186798	257.99	0.000	4.780405	4.858098
bias	-.914593	.015366	-59.52	0.000	-.9465485	-.8826376

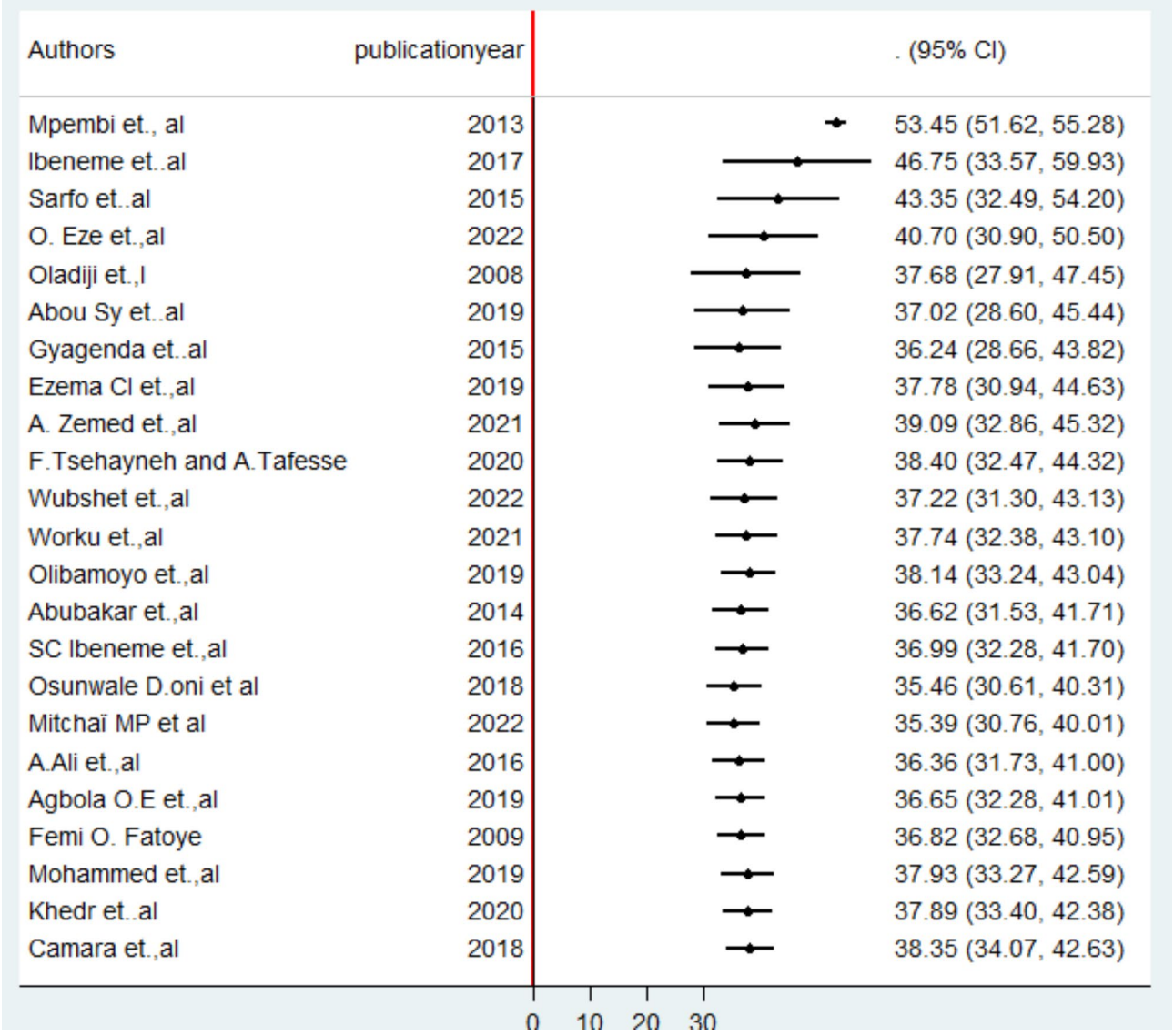

Fig. 5 Cumulative meta-analysis on the pooled estimate of post-stroke depression in Africa, 2023

According to the sub-group analysis, Central Africa (50.92%, 95% CI: 45.94–55.90) had the highest pooled estimate of post-stroke-depression and the lowest pooled estimate was reported from West Africa (35.76%, 95%CI: 31.01–40.51). The possible explanation for the regional variation of post-stroke depression could be due to the sample size difference; variations in diagnostic modalities and the time of depression assessment after a stroke incident could also contribute to the pooled variation.

In the current meta-analysis, female gender was not found to be significantly associated with post-stroke depression, but it was significant among four primary studies conducted in Africa. Inconsistent findings were reported from a multi-centre study conducted in Italy

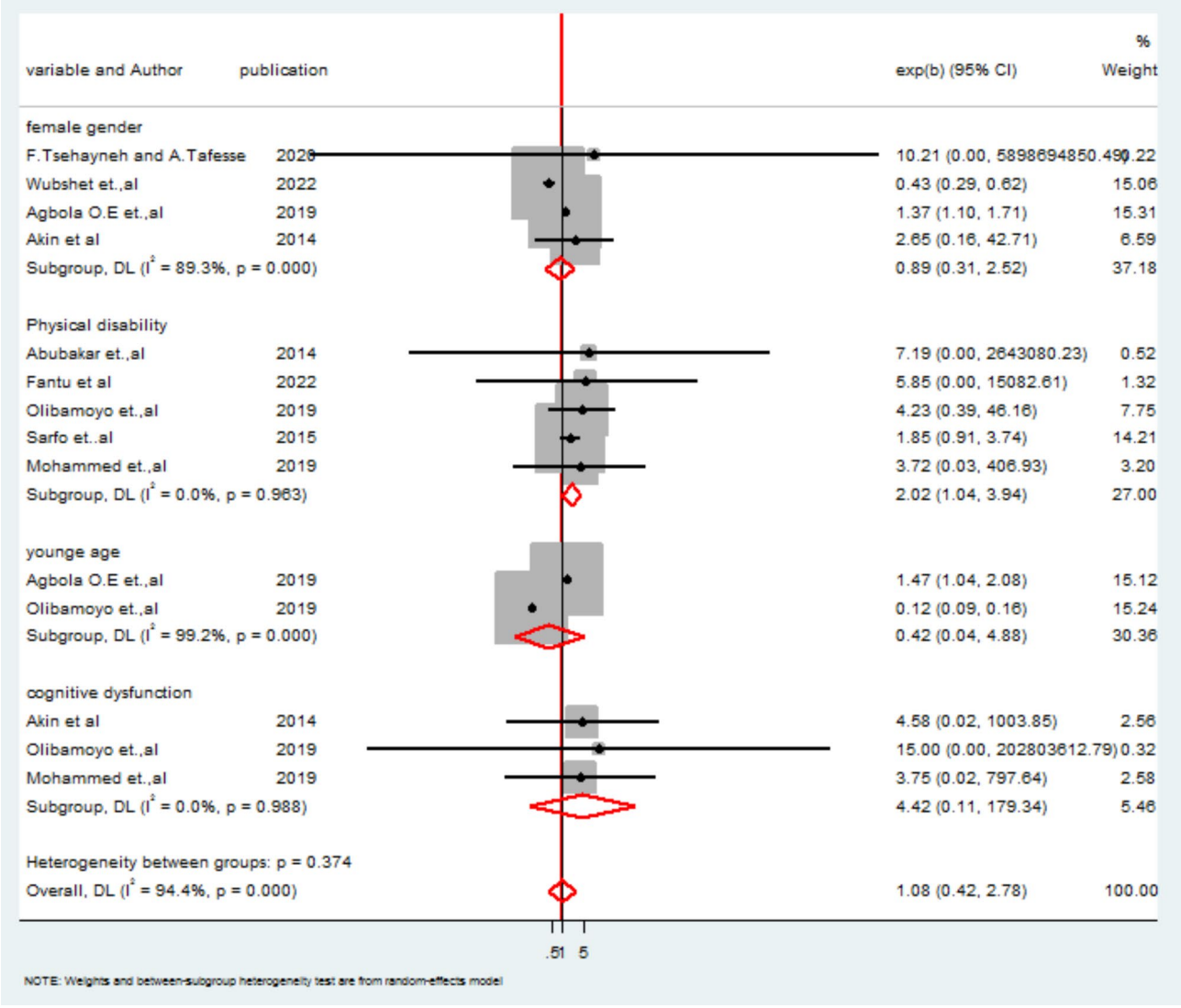

Fig. 6 Forest plot on factors associated with post-stroke depression in Africa, 2023

[38]. Physical disability was found to be significantly associated with post-stroke depression in Africa. Consistent findings were reported from a study conducted elsewhere [47]. Physical disability can negatively affect the quality of life of stroke patients by affecting their optimal recovery and rehabilitation [48]. Inconsistent findings were reported from a study conducted in Norway [49], implying no association between physical disability and post-stroke depression. This association could be explained by the assumption of the multifactorial causal pathway (genetics, behavioural and environmental factors) of depression. The possible cause of depression could also be due to post-stroke impairment manifested by the inability to do a daily activity, which is consistently associated with post-stroke depression. The relationship between PSD and cognitive impairment has been well-established by previous meta-analyses [43]. Still, in the current meta-analysis, there is no significant association between post-stroke depression and cognitive impairment. Being younger is not significantly associated with post-stroke depression in the recent systematic review and meta-analysis.

Strength and limitation

This is the first systematic review and meta-analysis conducted in African regions to assess the prevalence and factors associated with post-stroke depression. The limitation is that we did not specify minor/major depressive disorders and also the assessment of depression was at any given time after the stroke and not specific.

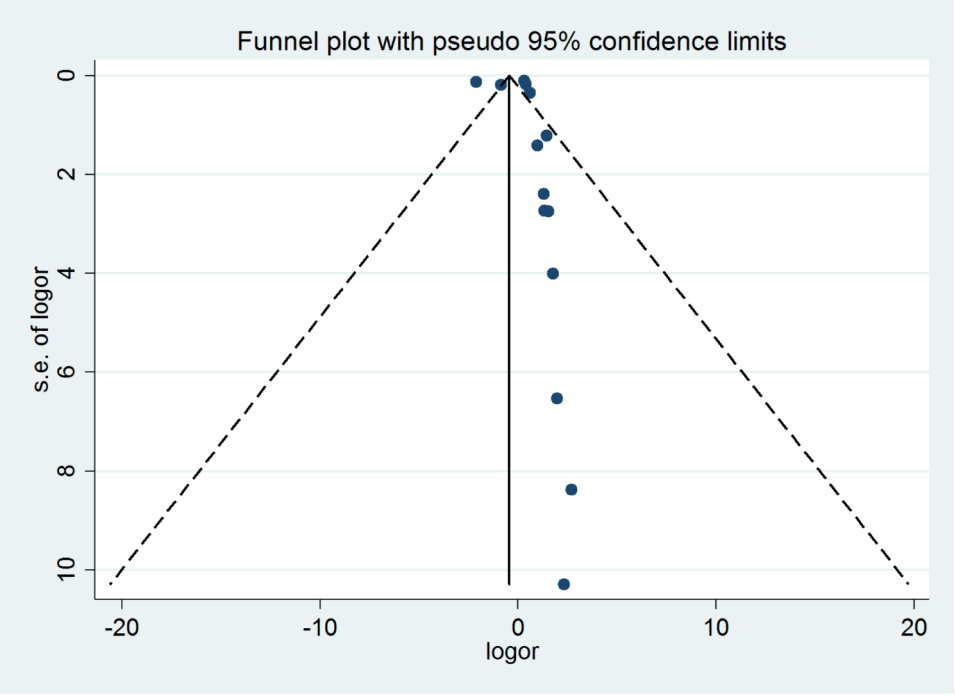

Fig. 7 Funnel plot for factors associated with post-stroke depression in Africa, 2023

Table 4 Eggers Test for factors associated with post-stroke depression in Africa, 2023

Number of studies = 14 Root MSE = 4.347

Std_Eff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
slope	-.5633776	.3940794	-1.43	0.178	-1.422003	.2952478
bias	.7423544	1.48825	0.50	0.627	-2.500265	3.984973

Test of H0: no small-study effects P = 0.627

Conclusion and recommendations

Conclusion

The pooled prevalence (estimate) of post-stroke depression at any time after stroke was 38.35% which is relatively higher than worldwide figures. The pooled estimate of post-stroke depression using clinical assessment tools was 38.53% and 36.81% by using the rating scale. Central Africa (50.92%) had the highest pooled estimate of PSD followed by West Africa (35.76%). Physical disability was significantly associated with the incidence/prevalence of post-stroke depression.

Recommendations

Based on the findings, the following recommendations were made

- Early screening of depression should be incorporated and encouraged to stroke patients as a routine care in health care facilities.
- Health governing bodies in African regions should collaborate with stakeholders to manage the burden and long term effects of post-stroke depression.
- Effective diagnostic and treatment interventions should be provided for patients with stroke in order to alleviate the consequences of physical disability (impairment).

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Author contributions
B.G.: Conception of research protocol, study design, literature review, data extraction, data analysis, interpretation and drafting the manuscript. A.M: data analysis, interpretation, reviewing the manuscript, and quality assessment. All authors have read and approved the manuscript.

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Data availability
Data will be available upon request of the corresponding author.

Declarations

Ethical approval and consent to participate
Ethical approval was not sought for the present study because this article is a review. Informed consent was not sought for the present study because this article is a systematic review.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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