

# Current Stroke Burden in Ghana: A Comprehensive Systematic Review Protocol

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## ABSTRACT

**Introduction:** There is a lack of data summarizing the current burden of stroke in Ghana. The establishment of data on the current burden, incidence, and mortality of stroke in this country may guide decision-making toward interventions to curb the stroke burden. This protocol aims to describe the methods for a systematic review of the literature on the incidence, prevalence, and mortality of strokes in Ghana.

**Methods and design:** We will perform a comprehensive search strategy of relevant abstracts and articles published from 1st May, 2013 to 31st May, 2020 related to prevalence or incidence or mortality in Ghana. Relevant articles will be searched from electronic databases including MEDLINE (PubMed), CINAHL (EBSCO), Web of Science, and PsycINFO (EBSCOhost). Full text of eligible studies will be included if they estimated one of the following epidemiological measures: burden, incidence and mortality. Studies that will meet the eligibility criteria will be assessed for overall study quality, reliability and risk of bias, using design-specific criteria.

We will appraise the included studies' reporting and methodology quality and perform a quantitative summary of reported outcomes where applicable.

**Discussion:** Existing knowledge on the incidence or prevalence, or mortality of strokes in Ghana are limited. This review aims to present relevant information that will inform local policy on cardiovascular diseases and future research. The final report of this protocol, in the form of a scientific paper, will be published in a peer-reviewed journal and findings will be submitted to relevant health authorities. We also plan to update the review in the future to monitor changes and guide health service and policy solutions.

**Keywords:** Stroke, Burden, Mortality of stroke, Incidence of stroke

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## ABBREVIATIONS

WHO: World Health Organization; LMICs: Lower-middle-income countries; PRISMA-P: Preferred Reporting Items for Systematic reviews and Meta-Analyses Protocols; OSF: Open Science Framework; MeSH: Medical Subject Headings; PICO: Patient/population, intervention, comparison and outcomes; SPSS: Statistical Package for the Social Sciences; IBM: International Business Machines; GRADE: Grading of Recommendations Assessment, Development and Evaluation

## INTRODUCTION

Stroke is a syndrome characterized by the sudden onset of neurological deficit and vascular pathology of the brain (Lopez AD, *et al.*, 2006). It is the leading cause of sudden morbidity and mortality globally, with a number of the survivors remaining permanently disabled (Bradberry JC, *et al.*, 2004). It is one of the neurological conditions mostly avoidable because many of its risk factors such as smoking, hypertension, alcohol, tobacco use, obesity, high cholesterol, unhealthy diets, physical inactivity, and diabetes are preventable either by medications or lifestyles changes (Donkor ES, *et al.*, 2014).

Stroke is ranked as the second leading cause of death globally, with fifteen million people suffering from the disease annually, of whom 5 million are left permanently disabled, and 5.5 million death recorded annually worldwide (Donkor ES, 2018). The World Health Organization (WHO) estimates that stroke occurs every 5 seconds worldwide, putting massive burdens on the community and family (Grysiewicz RA, *et al.*, 2008; Johnson W, *et al.*, 2016). This makes the disease a significant global health problem (Kamalakkannan S, *et al.*, 2017).

Sub-Saharan Africa is undergoing an epidemiological transformation directed by socio-demographic and lifestyle changes

(Connor MD, *et al.*, 2007). Stroke deaths in the sub-continent are ranked the highest globally (Sarfo FS, *et al.*, 2017). WHO has reported that the burden of stroke mortality in Lower-Middle-Income Countries (LMICs), for instance, Ghana, can be reduced by the offering of quality and standardized care (Asplund K, 2005).

Several studies have also confirmed an increase in stroke burden in Ghana, with a one-month in-hospital case fatality as high as 41%-43% (de Graft Aikins A, *et al.*, 2012). Sanuade OA, *et al.*, 2013 did a systematic review of knowledge of stroke in Ghana. However, the studies included in their review were studies done in the two major cities in Ghana, Accra and Kumasi. Therefore, there was a lack of population-based studies that represent the other regions of the country. The systematic review predicted an increase in the burden of stroke in Ghana due to urbanization and aging. Furthermore, there is a paucity of information on the trend of stroke mortality in Ghana. Thus, this review will be done to build upon the work of Sanuade OA, *et al.* to include studies on stroke from other regions of Ghana and present the current evidence on the disease in Ghana to inform future actions and research.

## Objective

The systematic review will aim to perform a comprehensive review and analysis into the current burden of stroke in Ghana. The research questions that will be addressed are:

- What is the incidence of stroke in Ghana?
- What is the prevalence of stroke in Ghana?
- What is the mortality of stroke in Ghana?

## METHODS

### Protocol and registration

This protocol was developed based on the recommendations

from the Preferred Reporting Items for Systematic reviews and Meta-Analyses Protocols (PRISMA-P) statements (Moher D, *et al.*, 2015; Shamseer L, *et al.*, 2015). The completed PRISMA-P list box is available as additional file 1. The protocol was registered on the Open Science Framework (OSF) with trial registration number: <https://doi.org/10.17605/OSF.IO/MW3H8>. Under the circumstance of any revision to this protocol post-dissemination, the reason and the date for the revision will be published in the Open Science Framework register to ensure tracking of any changes.

### Inclusion criteria

The following requirements should be met by studies to be considered in the review:

- **Types of studies:** population-based cross-sectional studies, cohort studies, and follow-up studies published from 1st May 2013 to 31st May 2020, which reported prevalence, mortality, and any type of stroke incidence in any gender aged 18 years and above in Ghana.
- **Types of articles:** only published articles in English will be eligible for inclusion. Conference abstracts that present enough information on the sample size, data collection process, and data analysis will be included.
- **Population:** healthy adults aged 18 years and above living in Ghana.
- **Outcome measures:** the primary outcome is the prevalence or incidence, or mortality of strokes. Secondary outcomes include the proportion of different strokes and the presence of co-morbidities.
- **Setting/context:** the review will consider only studies done in Ghana.

### Exclusion criteria

The following studies will be excluded:

- **Population:** studies involving persons younger than 18 years old in a defined population such as those having mental disorders.
- **Types of articles:** letter to the editor, review articles, short communications, case reports, book chapters, expert opinion commentaries, and thesis or dissertations.
- **Type of outcome measure:** studies whose primary outcome is a self-reported stroke or transient ischemic attack.
- **Geographical area:** studies conducted outside Ghana.

## LITERATURE REVIEW

Literature for the review will be sourced via a search of major electronic databases, specifically, MEDLINE (EBSCO), CINAHL (EBSCO), Web of Science, and PsycINFO (EBSCO host) from 1st May 2013 to 31st May 2020. Additional literature will be searched from grey areas such as reference list of selected studies. The PICO approach (Moher D, *et al.*, 2015; O'Connor AM, *et al.*, 2014) will be used in the literature search based on these concepts:

- the population: (18 years old adults)
- type of measure: (mortality or incidence or prevalence)
- outcome: (increase in strokes)
- the geographic area: (Ghana)

Strategies for literature search will be based on MeSH terms (Medical Subject Headings) using an appropriate set of keywords to delimit the concepts 'stroke'. These searches will be combined using the Boolean (AND/OR) logic operator to increase the yield of appropriate studies. The study team will review the proposed search terms with necessary adjustments made before running the search. The search strategy will be developed using MEDLINE (PubMed) and then adapted for other databases. Two reviewers, JA and EW, will independently search the electronic databases for relevant studies to be considered for this systematic review. The relevant studies' bibliographies will also be

screened for articles of interest. Authors of conference proceedings and abstracts that will be obtained from the database will be contacted where possible for full results of the abstracts. The search records of JA and EW will be compared, and entered into the Endnote X8 citation manager. Disagreements that may arise over the comparison of JA and EW's search results, as would be shown by a Kappa co-efficient of less than 0.6, will be settled in consultation with the third reviewer (KBM). The pool of records will be subjected to the removal of duplicates by JA before screening titles and abstracts.

### Screening and selection of studies

This review's screening and selection process will include the titles and abstracts screening and the full-text screening. The titles and abstracts screening will be performed independently by JA and EW, with KBM acting as an arbiter when a consensus cannot be reached between JA and EW. Studies that pass this stage will further be subjected to full-text screening. The set inclusion and exclusion criteria would be employed in the screening stages. The citation list of studies that pass the full-text screening for final inclusion into this comprehensive review will be screened to identify any additional articles that meet the eligibility criteria. Full-text articles that are not available online will be requested from the correspondent authors. A PRISMA diagram indicating details of articles included and excluded at each screening stage of the study selection process will be provided (Figure 1).

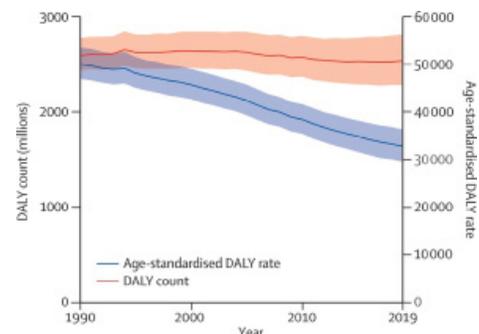


Figure 1: Global and age-standardised rates, 1990-2019

### Data extraction

The relevant data would be extracted independently by the two reviewers (JA and EW) in a data extraction form designed in Microsoft Excel. Any disagreement in the extracted data will be addressed by consensus or dialogue with a third reviewer (KBM). The relevant data would be extracted using a Microsoft Excel sheet. The data to be extracted would include the name of the first author, year of publication, study period, study objectives, the geographic region in Ghana, study design, sample size, study period, significant findings, limitations, and conclusion

### Assessment of the quality of studies

The selected studies' quality will be assessed using a risk assessment tool (Mensah KB, *et al.*, 2018) developed and validated for quantitative cross-sectional studies. The tool assesses the study validity based on responses to these questions:

- Was the sample likely to be representative of the study population?
- Was a response rate mentioned in the study?
- Was the instrument used reliable?
- Was the instrument used valid?
- Was it a primary data source?
- Was incidence or prevalence or mortality of stroke?

The two reviewers (JA and EW) will independently assess the selected studies' quality and describe them as having a low, moderate, or high

risk of bias.

### Data analysis and synthesis

The study characteristic will be presented in tables using descriptive statistics. The primary outcomes are incidence or prevalence or mortality of stroke. The correlation between these findings and the demographic, co-morbidities, geographical regions, and socio-economic factors in bivariate or multivariable analysis will be reported.

The prevalence or incidence or mortality data and other relevant factors such as co-morbidities or risk factors will be presented as a narrative synthesis. The prevalence or incidence or mortality will be presented as a proportion, and summary measures of co-morbidities or risk factor-stroke association presented as odds ratios. If statistically suitable, incidence or prevalence, or mortality estimates from studies with the same stroke type will be pooled together to give a single summary assessment through a random-effects meta-analysis (DerSimonian R and Laird N, 1986).

We will report pooled and crude estimates of prevalence or incidence or mortality of stroke in 5-year periods over 2013-2020 to present trends. Furthermore, we will assess the temporal trends in the incidence or prevalence, or mortality of stroke using cumulative meta-analysis (Kaze AD, *et al.*, 2017; Lau J, *et al.*, 1995).

We will examine heterogeneity by inspecting forest plots in addition to the chi-squared test on Cochran's Q (alpha set at 0.1) statistic (Cochran WG, 1954). The I<sup>2</sup> test will also be used to explore the heterogeneity by setting the cut-points for low, moderate, and high degrees of heterogeneity at 25%, 50%, and 75%, respectively (Higgins JP, *et al.*, 2003). A sub-group analysis will be carried out to evaluate the causes of any heterogeneity and assess the pooled incidence or prevalence or mortality of stroke by age group, sex, geographical region, methodology, and year of publication. We will undertake a sensitivity analysis to explore the outcome of excluding articles with a high-risk of bias on the overall incidence or prevalence or mortality and relationships. The reporting of bias will be established using funnel plot asymmetry if more than ten relevant articles are listed, and Egger's test (Egger M, *et al.*, 1997). The data analysis will be done using the IBM SPSS statistical package (IBM Corp. Version 20.0 Armonk, NY, USA) and RevMan 5.3 programs.

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines will be used to assess the selected articles' quality of evidence (Balslem H, *et al.*, 2011). The evaluation of evidence by the GRADE criteria is based on the risk of bias, directness (generalizability), consistency (heterogeneity), precision (statistical significance of effect measures), and publication bias and rated as high, moderate, low or very low. The risk of bias will be adapted from the Hoy D, *et al.*, 2012 tool developed for incidence or prevalence studies.

### DISCUSSION

This comprehensive analysis and synthesis protocol would serve as a guideline for conducting a review of the burden of stroke in Ghana. With this protocol, we hope to adequately gather current evidence on the incidence, prevalence, and mortality of stroke in Ghana. Also, the protocol, when subjected to peer review, would improve the quality of the systematic review to be conducted. The findings will be published in peer-reviewed open access journals and presented at regional and international conferences. It will also be shared with the Ministry of Health of Ghana and other health departments within the country to promote discussion at both local and international levels, thereby informing policymakers. This review will add to the knowledge of stroke's burden and its associated risk factors, comorbidities, and lifestyle practices among the Ghanaian population. The results will help the country commit to favourable policies and programs for the population, in line

with the World Health Organization's global strategy on health.

### CONCLUSION

This protocol describes a comprehensive and reproducible procedure to systematically estimate the incidence or prevalence, or mortality of stroke in the Ghanaian population. It seeks to conform to the best practices at every stage of the protocol development to ascertain high-quality output. It is anticipated that the systematic review results would stimulate national efforts to promote cardiovascular health in the country.

### LIMITATIONS

- This systematic review would be limited by the paucity of studies evaluating the incidence of stroke in Ghana.
- This is the only protocol that would be followed by the systematic review, therefore inferences concerning outcomes cannot be reliably made.
- Another possible setback could be the dominance of clinic-based studies, the poor-quality data and the heterogeneity of diagnostic method of stroke.
- There may be a possibility of under-representation of some geographical areas in the review in Ghana.

### DECLARATIONS

#### Availability of data and materials

Data sharing is not relevant to this article because no datasets were generated or analysed during the current study.

#### Author contributions

JA: Study conception, search strategy development, literature search, study selection, data extraction and management, methodological quality assessment, filtering of citations, manuscript development.

EW: Search strategy review, literature search, study selection, data extraction and management, and filtering of citations.

KBM: Study conception, search strategy development, manuscript review, settlement of disputes between JA and EW, review supervision.

VB: Study conception, review coordination, manuscript review and review supervision.

FO: Study conception, review coordination, manuscript review and review supervision.

All authors have read and approved the final manuscript for publication.

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