Review article

Stroke survivors in low- and middle-income countries: A meta-analysis of prevalence and secular trends

Martinsixtus C. Ezejimofor [a,*], Yen-Fu Chen [b], Ngianga-Bakwin Kandala [a,c,d], Benedeth C. Ezejimofor [a], Aloysius C. Ezeabasili [e], Saverio Stranges [a,d], Olalekan A. Uthman [b,f,g]

[a] Division of Health Sciences, University of Warwick Medical School, Coventry CV4 7AL, UK
[b] Warwick-Centre for Applied Health Research and Delivery (WCAHRD), Division of Health Sciences, University of Warwick Medical School, Coventry, UK
[c] Department of Mathematics and Information Sciences, Faculty of Engineering and Environment, Northumbria University, Newcastle upon Tyne NE1 8ST, UK
[d] Department of Population Health, Luxembourg Institute of Health (LIH), 1A-B, rue Thomas Edison, L-1445 Strassen, Luxembourg
[e] School of the Built Environment, University of Salford, M5 4WT, UK
[f] Department of Public Health (IHCAR), Karolinska Institutet, Stockholm, Sweden and Department of Infectious Diseases, Karolinska University Hospital, Stockholm, Sweden
[g] Centre for Evidence-Based Health Care, Stellenbosch University, Tygerberg 7505, South Africa

ARTICLE INFO

ABSTRACT

Purpose: To provide an up-to-date estimate on the changing prevalence of stroke survivors, and examines the geographic and socioeconomic variations in low and middle-income countries (LMICs).

Methods: We searched MEDLINE, EMBASE, SCOPUS and Web of Science databases and systematically reviewed articles reporting stroke prevalence and risk factors from inception to July 2015. Pooled prevalence estimates and secular trends based on random-effects models were conducted across LMICs, World Bank regions and income groups.

Results: Overall, 101 eligible community-based studies were included in the meta-analysis. The pooled crude prevalence of stroke survivors was highest in Latin America and Caribbean (21.2 per 1000, 95% CI 13.7 to 30.29) but lowest in sub-Saharan Africa (3.5 per 1000, 95% CI 1.9 to 5.7). Steepest increase in stroke prevalence occurred in low-income countries, increasing by 14.3% annually while the lowest increase occurred in lower-middle income countries (6% annually), and for every 10 years increase in participants' mean age, the prevalence of stroke survivors increases by 62% (95% CI 6% to 147%).

Conclusion: The prevalence estimates of stroke survivors are significantly different across LMICs in both magnitude and secular trend. Improved stroke surveillance and care, as well as better management of the underlying risk factors, primarily undetected or uncontrolled high blood pressure (HBP) are needed.

© 2016 Published by Elsevier B.V.

Contents

* Corresponding author at: Division of Health Sciences, University of Warwick Medical School, University of Warwick, Coventry CV4 7AL, UK.
  E-mail address: m.c.ezejimofor@warwick.ac.uk (M.C. Ezejimofor).

1. Introduction

Recent global estimates found that stroke ranked as the second commonest cause of death with 5.9 million stroke-related deaths in 2010 [1]. This number is expected to increase to 7.8 million by 2030 in the absence of significant global public health response [2]. Despite the infectious disease scourge, low- and middle-income countries (LMICs) account for over 78% disability adjusted life years (DALYs) from stroke, which is at least 7 times the DALYs lost in high-income countries [1]. Disentangling the drivers of global mortality and morbidity has led to targeted regional and national investments in cardiovascular health resulting in about 40% reduction of stroke burden between 1970 and 2008 in high income countries [3]. Surprisingly, the trend is the opposite in LMICs with a rise of over 100% of stroke prevalence within the same period [3]. The increase and changing pattern of stroke prevalence in LMICs has mostly been attributed to rapid economic development and combined effects of demographic (particularly population growth and aging), epidemiological and nutritional transitions currently occurring [4]. As the global population older than 65 years of age continues to increase by approximately 9 million people per year in LMICs, this predicts a higher stroke prevalence with increased burden particularly in Asia and Latin America [5].

Though there are existing reviews that had looked at prevalence of stroke in LMICs and regions such as Africa and Latin America [6–9], to the best of our knowledge there is no recent attempt to compile studies on prevalence of stroke survivors across different geographic regions in LMICs. Since the publication of these reviews, there have been an increasing number of new studies from these regions. While we recognized that in order to provide a complete picture on the burden of stroke in LMIC, it is important to collate data on both prevalence of survivors and case-fatality rates, we choose to focus on the prevalence of survivors in this study because of the problem of absences and low-quality data on mortality in resource limited settings. There is virtually absence of death registry in most LMICs, in few countries were such data exist, death-certificate coding varies significantly. In addition, data on cause of death are usually not from standard vital registration, but usually from verbal autopsy, sibling histories, or police reports [6]. This study therefore, aimed to provide more accurate estimates on the prevalence of stroke survivors and secular trends in LMICs in order to inform decision regarding policy responses and public health intervention across many geographic regions, socioeconomic and populations' subgroups.

2. Methods

2.1. Protocol and registration

This systematic review rationale and methods were specified in advance and documented in a protocol which was published in the PROSPERO register (CRD42014015129) [10].

2.2. Search strategy

We conducted a thorough literature search to identify relevant studies on stroke prevalence in LMICs. Electronic databases of MEDLINE, EMBASE, SCOPUS and Web of Science were searched from inception to July 2015 without any language restriction. Relevant journals and reference lists of included primary articles were also scrutinized for additional studies that could have been omitted from the database searches. The following combinations of controlled review terms and keywords covering the study characteristics were used. These include: outcomes; "stroke", "cerebrovascular disease", "cerebrovascular accident", "brain infarction", "brain stem infarctions", "cerebral infarction," study design; "surveillance", "survey", "population based", "community based", and low- and middle-income countries; including all individual countries (Supplementary Table 1).

2.3. Data extraction and eligibility criteria

Three authors (ME, AE and EB) evaluated the eligibility of studies obtained from the literature search using a predefined protocol. They independently extracted, compared and merged the data on studies that met the selection criteria. In cases of discrepancy, agreement was reached by consensus. We included only community-based studies that reported prevalence of stroke 'survivors' and conducted in LMICs as defined by World Bank [11]. We also included only studies that used WHO's definition of stroke, "rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting longer than 24 hour, unless interrupted by death, with no apparent cause other than that of vascular origin" [12], however, we allowed less rigorous case ascertainment due to inadequate facilities in most LMICs. Studies that reported prevalence of stroke using some elements of the Sudlow–Warlow criteria [13] for stroke incidence were also included.

2.4. Assessment of methodological quality

Two authors (ME and AE) independently evaluated the methodological and reporting quality of each study using the modified version of Newcastle-Ottawa Scale (Supplementary Table 2). Essentially, we graded the risk of bias in each study as low, moderate, high or unclear according to five study areas namely; selection of participants (selection bias), sample size, detection instrument (outcome measurement tool), adjustment for confounding and (controlled) and detection accuracy. Examination of potential publication bias using funnel plots and Egger's test was also conducted on the pooled studies.