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Community-based interventions to prevent stroke in low-income and middle-income countries: a protocol for a systematic review and meta-analysis

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ABSTRACT

Introduction Stroke is the second leading cause of death and morbidity across the globe. In low-income and middle-income countries (LMICs), it has become an overwhelming burden over the past few decades. This burden is escalating at a much greater pace compared with that of high-income countries. It is considered the most frequent cause of adult disability that affects the quality of life. 'Prevention' is one of the key components to combating stroke. In this regard, community-based interventions can play a vital role in improving population-level health and well-being. Considering the escalating trend of stroke in LMICs, this systematic review aims to map the available community-based interventions in preventing stroke and to conduct further analysis regarding the effectiveness of the identified interventions.

Methods and analysis We have searched Medline, Web of Science and Scopus using a comprehensive search strategy in October 2021. Two reviewers will independently perform screening, data extraction and risk of bias (ROB) assessment. The ROB assessment and applicability of results of eligible studies will be performed using the Cochrane ROB tool for assessing randomised controlled trials and the ROBANS (Risk Of Bias Assessment tool for Non-randomised Studies) to assess non-randomised studies. A random-effect model meta-analysis will be used to calculate pooled results and to obtain weighted OR and risk ratio of incidence of stroke along with corresponding 95% CI.

Ethics and dissemination The results will be disseminated through publishing in a peer-reviewed journal and public presentations at relevant national and international conferences. Ethical approval is not required as this is a systematic review of publicly available data.

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This systematic review protocol followed the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines.
⇒ As the focus of the review will be low-income and middle-income countries, it will exclude related articles on community-based interventions for stroke prevention in high-income countries.
⇒ The review will consider studies only published in English that may exclude potentially related articles published in other languages.

INTRODUCTION

Globally, stroke is considered the second leading cause of death after ischaemic heart disease though this rank varies across countries and regions.[1–3] The rate of stroke has doubled in the past four decades in low-income and middle-income countries (LMICs).[3] In LMICs, the number of the elderly population is increasing, and simultaneously, the LMICs have reached a demographic transition resulting in increased prevalence of hypertension, dyslipidaemia, obesity and diabetes mellitus which triggers the increasing incidence of stroke.[4–8] LMICs bear over 80% of the global burden of stroke but unfortunately, they have only 20% of the global resources to combat this.[5] Apart from the death rate, stroke is also a second leading cause of disability. Studies showed that in most cases, stroke survivors lead a difficult life with physical disabilities and sometimes with mental instability that relies on others' support. This leads to an enormous human and economic burden.[1] Therefore, it is becoming a major public health concern. With the support from National Governments, some poorer countries initiated and implemented population-based primary prevention strategies that were proved as effective.[9] Among the four components of addressing stroke (surveillance, prevention, acute care and rehabilitation), 'prevention' is considered the key component to combat this accelerated burden.[3]

Primary stroke prevention refers to the treatment of individuals without a history of stroke, whereas secondary stroke prevention refers to that of individuals who have already had a stroke or transient ischaemic attack.[10] Primary prevention of stroke includes lifestyle modifications and measures to control

blood pressure, cholesterol levels and other associated diseases such as diabetes mellitus and atrial fibrillation, etc.[11] Community-based prevention can play a significant role to enhance the effectiveness of interventions related to lifestyle modification and treatment adherence.[12] Here, risk factors include unhealthy nutrition over a long duration, smoking, physical inactivity, excessive alcohol assumption and depression.[2 12] Community can play a role in curbing these risk factors by making the best use of knowledge regarding stroke, its sign and risk factors. Community-based interventions are typically designed considering human behaviour and social contexts in a low-resource setting.[12] However, among community people, a knowledge gap regarding stroke and its risk factors is reported in previous studies.[4] In addition, cultural, political, psychosocial and economic factors play an important role in programme implementation. In this regard, community-oriented programmes can help to overcome the possible obstacles and build a bridge to help individuals and communities to be successful in preventing escalating non-communicable diseases (NCDs) like stroke.[4]

Community-based interventions were widely used in developed countries in preventing NCDs.[12] Comparatively, there is a paucity of community-based health intervention programmes and research in the context of developing countries.[13] Even though, some studies have reported community-based interventions to combat NCDs in the context of developing countries. Krishnan *et al* (2010) showed that community-based intervention was able to combat NCDs through improving lifestyles in Ballabgarh in India and Depok in Indonesia. In those cities, community-based interventions were implemented through advocacy and medication, individual empowerment (developing skills), enhancing the social environment and community empowerment and reorienting available health services.[14] Similarly, a 'bottom-up approach' was used in an urban informal settlement in Kenya involving healthcare front-liners in communities to help the community members in making decisions about their health choices that drawn a major impact on the reduction of NCDs.[15]

Following these successful lessons learnt, the developing countries with low-resource settings can conduct similar activities to prevent stroke.[4 12] In this context, this study aims to synthesise evidence on the effective community-based prevention of stroke among adults in LMICs to enrich the policymakers with knowledge in making better decisions regarding stroke prevention.

METHODS AND ANALYSIS

The protocol of this systematic review has been registered in PROSPERO—The International Prospective Register of Systematic Reviews. This systematic review will be conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) checklist (online supplemental file 1 (PRISMA-P Checklist)).[16] In addition, the results of the literature search and screening will be presented in a PRISMA flow diagram.

Search strategy

A comprehensive search strategy has been developed covering the major electronic bibliographic databases (Medline through PubMed, Web of Science and Scopus). To develop the search strategies of databases mentioned above, we used different relevant terms, keywords and synonyms such as 'stroke' or 'cerebrovascular disease', 'community engagement' or 'community involvement' or 'community-based intervention', etc. (table 1). The comprehensive search strategy developed for Medline/PubMed has been demonstrated in table 1 and the search terms for LMICs have been provided in online supplemental file 2. The detailed search strategy for different databases has been provided in online supplemental file 3. In addition, references cited in the included articles will also be searched to include all the relevant studies. If requires, we will also communicate with the authors of the included articles for further information. Studies published between 2000 and 2021 only in English will be included. No restrictions will be applied to the study designs, sex and urban–rural setting. The adult

Table 1 Comprehensive search strategy for Medline/PubMed

Search no	Search terms
1	'communit*' (All Fields) OR 'outreach' (All Fields) OR 'outreaches' (All Fields) OR 'outreaching' (All Fields) OR 'engage*' (All Fields) OR 'empower*' (All Fields) OR 'awareness' (MeSH Terms) OR 'awareness' (All Fields) OR 'aware' (All Fields) OR 'awarenesses' (All Fields) OR 'aware*' (All Fields) OR 'mobilis*' (All Fields) OR 'mobiliz*' (All Fields) OR 'community-based intervention' (All Fields) OR 'public education' (All Fields) OR 'community education' (All Fields) OR 'health education' (All Fields) OR 'knowledge increase' (All Fields)
2	'stroke' (MeSH Terms) OR 'stroke' (All Fields) OR 'strokes' (All Fields) OR 'stroke s' (All Fields) OR ('ischaemic stroke' (MeSH Terms) OR ('ischaemic' (All Fields) AND 'stroke' (All Fields)) OR 'ischaemic stroke' (All Fields)) OR 'cerebral stroke' (All Fields) OR 'cerebrovascular stroke' (All Fields) OR 'cerebral haemorrhage' (All Fields)
3	LMICs*
4	1 AND 2 AND 3

*Search terms for LMICs have been provided as online supplemental file 2.
LMICs, low-income and middle-income countries.

population aged >18 years will be considered. This review will not include any unpublished or grey literature.

Study selection criteria

Studies will be included based on the following inclusion criteria: (1) consider only the adult population aged >18 years; (2) studies focus on the community-based intervention to prevent stroke. This review will focus only on stroke (or cerebral-vascular diseases). Any study focusing on heart disease along with stroke will be included but the data only on stroke will be considered for analysis. This review will consider both primary and secondary prevention of stroke; (3) studies conducted in LMICs; (4) all primary studies (randomised controlled trials (RCTs), quasi-experimental, comparative cross-sectional, case–control, cohort, qualitative study, before–after study) will be included and (5) any study focusing both pharmacotherapy and behavioural intervention will be included but the review will consider only the data related to behavioural therapy.

Studies will not be eligible if—(1) the intervention is not community-based; (2) the intervention does not focus on prevention of stroke; (3) the intervention focus only on cardiovascular diseases; (4) the study reports clinical and pharmacological trial; (5) systematic reviews, reviews, editorial, conference proceedings, commentary, opinion, case-report, case-series; (6) the study focuses on population <18 years and (7) articles in languages other than English.

Screening and data extraction

Screening and study selection will be performed according to the selection criteria and the full articles will be retrieved for closer examination. Screening of the title and abstract of the literature retrieved from the search will be done by two researchers independently to identify relevant studies for full-text review. Full articles of potentially relevant studies will be reviewed by two researchers independently against the eligibility criteria. The lead researcher will resolve disputes and randomly check the included full texts.

The disagreement between reviewers regarding the decision on the inclusion of articles will be resolved by a detailed discussion with the lead reviewer and consensus among the review team. Besides, for every excluded article, the reasons for the exclusion will be recorded thoroughly using 'prioritisation and sequential exclusion' technique.[17] Since the systematic review will be guided by PRISMA guidelines, a flow diagram will be provided demonstrating the summary of all included and excluded articles.

A standard data extraction format with coding will be developed using an excel spreadsheet and piloted on two eligible studies. The data extraction format will be used to extract the descriptive factors from included articles. Two reviewers will independently extract data from each selected article. Once the team is in consensus, by solving any kind of confusion, the data extraction format will be utilised to compile the extracted data. The data extraction form will consist of the following items (if reported by the primary studies):

- General information: study title, author(s), year of publication, study country, study settings (community setting or hospital setting), study design.
- Population characteristics such as age, gender, residence status (urban or rural), health insurance status, stroke status
- Intervention approach: primary/secondary prevention
- Types of intervention, components of the intervention, duration of intervention, duration of follow-up
- Types of the control arm, description of any standard care used as the comparator
- Sample size, the attrition rate
- Outcome measures

Any other related data reported in the primary studies will be considered. For the qualitative studies, we will consider the themes, subthemes and related quotes for the narrative synthesis.

Risk of bias assessment

The risk of bias (ROB) will be assessed by two reviewers independently. For RCTs, the ROB will be assessed using the Cochrane ROB tool.[18] According to the Cochrane guidelines, six specific domains of bias are considered including selection bias, performance bias, detection bias, attrition bias, reporting bias and the other bias. Reviewers will provide their judgements following the guidelines and make comments on whether studies are at high ROB. For assessing selection bias, 'allocation concealment' and 'random sequence generation' will be considered. The reviewers will explore the performance and detection bias through assessment of blinding at the level of the participants, implementers and outcome assessors, while those lost to follow-up will be considered to assess attrition bias. Selective reporting and presentation of outcomes will also be considered. Apart from those, there will be a search for any other potential bias.[18] To assess the ROB in the non-randomised studies, the ROBANS (Risk of Bias Assessment tool for Non-randomised Studies) tool will be used.[19] This tool contains six domains: the selection of participants, confounding variables, the measurement of exposure, the blinding of the outcome assessments, incomplete outcome data and selective outcome reporting.[19] Any disagreements between the reviewers while assessing the ROB of the included articles will be resolved by discussion, and if necessary, a senior reviewer will opine to make a consensus. After assessing the 'ROB', the study will be presented methodologically as 'low', 'medium' or 'high' ROB against each domain.

Descriptive analysis and meta-analysis

Following the review question, this proposed study will capture both quantitative and qualitative studies. The effective measures can be found in terms of the risk ratio and OR of the incidence of stroke, risk difference

or a number needed to treat, mean difference or a standardised mean difference. Based on the homogeneity (similar studies reporting the same intervention and same outcome), we will pool the results using a random-effects model meta-analysis to obtain the weighted OR or risk ratio with a corresponding p-value and 95% CI. In this case, it is to be mentioned that, we will pool data only when we will get the study with a similar design having similar interventions and outcomes. If we get studies with huge variations in sample size, a sensitivity analysis will be conducted considering the larger studies and smaller studies separately. Besides, a forest plot will be made for the outcome measures to analyse the effectiveness of the intervention for the prevention of stroke in the target population group. For qualitative studies, the thematic analysis method will be adopted to synthesise descriptive and qualitative data. The findings will be coded a priori and emergent themes, which will be later compared and combined to conduct the narrative synthesis.

Based on the findings of extracted data, additional outcomes will be analysed as subgroups or subsets to present country, location or gender-specific analysis.

Assessment of heterogeneity and publication bias

The heterogeneity between the included studies will be estimated by using I^2 statistics and Q statistics of the χ^2 test. If requires, the source of heterogeneity will be examined by conducting a subgroup analysis or meta-regression. Publication bias will be addressed using Egger's test and graphically presented using a funnel plot.

Ethics and dissemination

No human subjects will be involved in this review as participants. Based on the completion of the analysis, a manuscript will be developed for publication in a peer-reviewed journal. In addition, we will present the findings at National and International conferences. To disseminate the findings of this research among policymakers, physicians and public health researchers, we will use a wider arena such as journals, seminars, social media, and daily newspapers.

Patient and public involvement

During the conception and development of the review protocol, there was no involvement of the patient and the public.

DISCUSSION

Considering the uprising trend of stroke prevalence and incidence in LMICs, the implementation of effective preventive measures is crucial. However, the situation is becoming multifaceted due to comorbidity and risk factors such as diabetes and hypertension. In addition, some social and cultural barriers interrupt the effectiveness of the preventive strategies. In these circumstances, there is a need for an effective strategy for prevention that can be able to prevent stroke effectively. To the best of our knowledge, this will be the first systematic review that will synthesise evidence regarding the community-based prevention of stroke among adults in LMICs. We anticipate that the results of this review will support physicians and policymakers to guide in reducing stroke in adults. It will also endorse future research needs based on identified gaps and alleviate the pathway to end stroke prevalence across the globe.

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Contributors IN, DSB and KMS-U-R conceptualised the research plan and designed the protocol. IN and KMS-U-R developed the search strategy. IN and DSB defined the data extraction process as well as the methodological appraisal of the studies. KMS-U-R helped to develop the statistical analysis plan. IN drafted the initial manuscript. DSB and KMS-U-R reviewed, provided critical thoughts and edited the manuscript. Then, KMS-U-R approved the final manuscript before submission and contributed to the final written manuscript. KMS-U-R is the guarantor of this review.

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REFERENCES

1 Avan A, Digaleh H, Di Napoli M, *et al*. Socioeconomic status and stroke incidence, prevalence, mortality, and worldwide burden: an ecological analysis from the global burden of disease study 2017. *BMC Med* 2019;17:1–30.
2 Singh A, Jenkins C, Calys-Tagoe B, *et al*. Stroke investigative research and education network: public outreach and engagement. *J Community Med Health Educ* 2017;7. doi:10.4172/2161-0711.1000518. [Epub ahead of print: 24 04 2017].
3 Owolabi MO, Gebregziabher M, Akinyemi RO, *et al*. Randomized trial of an intervention to improve blood pressure control in stroke survivors. *Circ Cardiovasc Qual Outcomes* 2019;12:e005904.
4 Katan M, Luft A. Global burden of stroke. paper presented at: seminars in neurology2018.
5 Owolabi M, Johnson W, Khan T, *et al*. Effectively combating stroke in low- and middle-income countries: placing proof in Pragmatism—The Lancet neurology Commission. *J Stroke Med* 2018;1:65–7.
6 Xiao N, Long Q, Tang X, *et al*. A community-based approach to non-communicable chronic disease management within a context

of advancing universal health coverage in China: progress and challenges. *BMC Public Health* 2014;14:1–6.
7 Béjot Y, Bailly H, Graber M, *et al*. Impact of the ageing population on the burden of stroke: the Dijon stroke Registry. *Neuroepidemiology* 2019;52:78–85.
8 Sanuade OA, Dodoo FN-A, Koram K, *et al*. Prevalence and correlates of stroke among older adults in Ghana: evidence from the study on global ageing and adult health (SAGE). *PLoS One* 2019;14:e0212623.
9 Andrew F. Stroke—prevention is better than cure.
10 Paciaroni M, Bogousslavsky J. Primary and secondary prevention of ischemic stroke. *Eur Neurol* 2010;63:267–78.
11 Ezekowitz JA, Straus SE, Majumdar SR, *et al*. Stroke: strategies for primary prevention. *Am Fam Physician* 2003;68:2379–86.
12 Nissinen A, Berrios X, Puska P. Community-Based noncommunicable disease interventions: lessons from developed countries for developing ones. *Bull World Health Organ* 2001;79:963–70.
13 Philip PM, Kannan S, Parambil NA. Community-Based interventions for health promotion and disease prevention in noncommunicable diseases: a narrative review. *J Educ Health Promot* 2018;7:141.
14 Krishnan A, Ekowati R, Baridalyne N, *et al*. Evaluation of community-based interventions for non-communicable diseases: experiences from India and Indonesia. *Health Promot Int* 2011;26:276–89.
15 Mwiti B, Ambole A, Osanjo L. 'Bottom up'approach: A community-based intervention in fighting non-communicable diseases in urban informal settlements Kenya. *East Afr Med J* 2018;95:2123–31.
16 Page MJ, McKenzie JE, Bossuyt PM. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372.
17 Saif-Ur-Rahman KM, Hasan M, Hossain S, *et al*. Prioritization and sequential exclusion of articles in systematic reviews. *Campbell Systematic Reviews* 2022;18:e1229.
18 Higgins JP, Savović J, Page MJ. Assessing risk of bias in a randomized trial. In: *Cochrane Handbook for systematic reviews of interventions*, 2019: 205–28.
19 Kim SY, Park JE, Lee YJ, *et al*. Testing a tool for assessing the risk of bias for nonrandomized studies showed moderate reliability and promising validity. *J Clin Epidemiol* 2013;66:408–14.