Review article

Prevention, management, and rehabilitation of stroke in low- and middle-income countries

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ABSTRACT

Although stroke incidence in high-income countries (HICs) decreased over the past four decades, it increased dramatically in low- and middle-income countries (LMICs). In this review, we describe the current status of primary prevention, treatment, and management of acute stroke and secondary prevention of and rehabilitation after stroke in LMICs. Although surveillance, screening, and accurate diagnosis are important for stroke prevention, LMICs face challenges in these areas due to lack of resources, awareness, and technical capacity. Maintaining a healthy lifestyle, such as no tobacco use, healthful diet, and physical activity are important strategies for both primary and secondary prevention of stroke. Controlling high blood pressure is also critically important in the general population and in the acute stage of hemorrhagic stroke. Additional primary prevention strategies include community-based education programs, polypill, prevention and management of atrial fibrillation, and digital health technology. For treatment of stroke during the acute stage, specific surgical procedures and medications are recommended, and inpatient stroke care units have been proven to provide high quality care. Patients with a chronic condition like stroke may require lifelong pharmaceutical treatment, lifestyle maintenance and self-management skills, and caregiver and family support, in order to achieve optimal health outcomes. Rehabilitation improves physical, speech, and cognitive functioning of disabled stroke patients. It is expected that home- or community-based services and tele-rehabilitation may hold special promise for stroke patients in LMICs.

Contents

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1. Introduction

According to World Health Organization (WHO) Global Health Estimates in 2012, stroke was the second leading cause of death and the third leading cause of disability-adjusted life years (DALYs) lost globally [1]. A systematic review that synthesized 12 population-based studies from 10 low- and middle-income countries (LMICs) and 44 studies from 18 high-income countries (HICs) found significant disparities in stroke incidence trends between HICs and LMICs. Over the past four decades, stroke incidence decreased 42% in HICs, but increased more than 100% in LMICs. From 2000 to 2008, estimated stroke incidence rates in LMICs surpassed those in HICs by about 20% [2].

Stroke has created heavy social and economic burdens in LMICs. In China in 2004, the average cost for a stroke admission was two times the annual income of rural residents, and the cost of stroke care for the government-funded hospitals increased 117% annually between 2003 and 2007 [3]. The global burden of stroke reflects a pressing need for well-designed strategies to help track current trends as well as to curb the projected spread of stroke worldwide, especially in LMICs.

In this review, we present evidence of modifiable and other risk factors for stroke and then discuss current trends in primary prevention, treatment, and management of stroke during the acute phase, as well as secondary prevention of and rehabilitation after stroke, with a focus on cost-effective strategies in LMICs, where such evidence exists. However, our review of current literature has revealed that evidence on comparative cost-effectiveness of stroke prevention and management strategies in LMICs is far from adequate. Finally, the review concludes with recommendations for policy-makers and future research directions.

2. Risk factors for stroke

Increased stroke incidence is largely associated with aging and urbanization and propelled by the increasing prevalence of key risk factors, especially in LMICs. The INTERSTROKE study, a large international case–control study of risk factors for incidence of stroke in 22 countries including LMICs, found evidence of 10 significant modifiable risk factors, including history of hypertension, current smoking, diabetes mellitus, waist-to-hip ratio, diet risk score, physical inactivity, alcohol intake, psychosocial stress and depression, cardiac causes, and ratio of

apolipoproteins B to A1 [4]. Non-modifiable risk factors related to hereditary or natural processes include age, sex/gender, and race/ethnicity. Relative risks, odds ratios, and hazard ratios associated with risk factors for stroke are summarized in Table 1.

3. Surveillance, screening and diagnosis

3.1. Surveillance

Few LMICs have the necessary funding and resources either to establish surveillance networks or to register data for detecting health trends in the population. The WHO recommends a stepwise stroke surveillance approach (STEPS Stroke) for collecting data and monitoring trends. STEPS Stroke recommends collecting three types of data: information on stroke patients admitted to heath facilities (step 1), number of fatal stroke events in the community (step 2), and estimated number of non-fatal stroke events in the community (step 3). A study synthesizing STEPS Stroke surveillance in nine sites in India, the Islamic Republic of Iran, Mozambique, Nigeria, and the Russian Federation showed that STEPS Stroke surveillance is possible and feasible in low-resource settings [25].

3.2. Screening for populations at high risk for stroke

Screening for stroke risk factors provides an excellent opportunity to identify and educate those at high risk. It usually includes surveys of demographic and lifestyle information, blood pressure measurement, carotid bruit detection, cholesterol measurement, blood glucose tests, and education on warning signs or symptoms, such as transient ischemic attack, and heart-related symptoms, such as atrial fibrillation. Similar to surveillance initiatives, a step-wise approach is suggested for screening. At a most basic level, screening for risk factors may include collection of information on demographics and lifestyle, such as diet, physical activity, and smoking or alcohol use. A second tier of screening might include data obtained from physical examination, including height, weight, girth, and blood pressure measurements. A final tier might include laboratory measures, such as blood glucose and cholesterol levels. In resource-poor settings, where clinical tests may be inaccessible and unaffordable, patient history and physical examinations may be more cost-effective for stroke screening.