

Disease Burden of Stroke in Bangladesh from 2015 to 2023 in Patients Receiving Rehabilitation: A Protocol for a Retrospective Cohort Study

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Abstract:

Background: Stroke is a serious public health concern that has a significant impact on the global disease burden. It has significant social, economic, and healthcare consequences worldwide. To assess the total number of healthy years lost due to premature death and disability-related limitations, the World Health Organization (WHO) developed the disability-adjusted life years (DALYs) measure.

Methods: We will conduct a retrospective cohort study and include all stroke patients who received rehabilitation services at the Centre for Rehabilitation of Paralyzed (CRP) in Bangladesh from 2015 to 2019. Relevant data will be extracted from The CRP PDMS database, which includes data for 1835 patients and covers all divisions of Bangladesh. The primary outcome will be to calculate the disease burden of stroke by using DALYs, the level of disability, and the reason for the mortality rate in Bangladesh. Demographic characteristics and study outcomes will be summarised using descriptive statistics, Inferential statistics will be conducted, employing Pearson correlation for parametric data and either chi-square or Spearman rank correlation for nonparametric data. Multivariable logistic regression will be performed to determine the clinical variables associated with a worse clinical outcome.

Ethics and dissemination: The study was approved by the Institute of Physiotherapy, Rehabilitation & Research (IPRR) (The Academic Institute of Bangladesh Physiotherapy Association) Ethics Committee (BPA-IPRR/IRB/992/07/2023/663). The study's results will be published in peer-reviewed scientific journals and showcased at national and international conferences.

Study Implication: Stroke is one of the major causes of prolonged disability. The prolongation of disease and disability leads to health-related, social and economic burdens. Usually, it's difficult to determine by the person and family level about the disease burden. On the other hand, the severity of stroke and post-stroke complications can be prevented by avoiding the risk factors. So, the study of finding the disease burden of stroke and the result of the implemented protocol of stroke can guide the management and awareness of prevention.

Keywords: Stroke, Disease Burden, DALYs, Bangladesh, Rehabilitation

Introduction:

Stroke is a significant public health issue that contributes significantly to the worldwide disease burden [1]. Stroke is the prototypical condition that

both disables and kills people [2]. Stroke is one of the most prevalent debilitating diseases, the second leading cause of mortality, and the third leading cause of disability in adjusted life years [3]. A stroke is traditionally characterized as a neurological impairment caused by abrupt focal damage to the

central nervous system induced by a vascular source, such as a subarachnoid haemorrhage, cerebral infarction, or intracerebral haemorrhage [4].

Stroke is a significant factor in the disease burden worldwide, with substantial social, economic, and healthcare implications [5]. The impact of a particular illness or health condition on a community is measured as the disease burden, considering factors like mortality, morbidity, disability, and the associated social and economic consequences. The burden of stroke is not only associated with the direct consequences of the condition, such as mortality and disability, but also with the long-term care and rehabilitation needed by stroke survivors [6]. The disease burden is calculated using DALYs, which provide a standardized way to compare the burden of different diseases and conditions. The World Health Organization (WHO) created the disability-adjusted life years (DALYs) measure to calculate the total number of healthy years lost as a result of premature death and disability-related restrictions [2]. Disability-adjusted life years are the total number of Years Lost cause of Disability (YLD) and Years of Life Lost (YLL) due to premature death. The number of years a person has lived with the disability is multiplied by a disability weight that reflects the degree of the disability to determine the YLD in a population. The value of this weight ranges from 0 to 1; 0 means no burden, and 1 means mortality. The YLL is calculated as the years when a death happens earlier than expected. The estimated number of years is frequently set to be equal to the number of remaining years that a person of a certain age may desire to live on average or the statistical life expectancy at birth [7].

There are 62 million stroke survivors worldwide, and there are an estimated 17 million people who have experienced their first stroke. Stroke is the 2nd leading global reason of death for people over 60, behind heart disease. Nearly six million people worldwide pass away from a stroke per year [8]. Stroke is a significant issue in Asia, home to more than 60% of the world's population and many of its "developing" nations. The epidemiology of stroke across Asia has revealed a broad range of fatalities, incidence, prevalence, and illness burden. In low- and lower-middle-income nations, stroke incidence was 70%, and stroke-related fatalities were 87% [9]. In terms of mortality rate and burden, Japan has the lowest rate (706.6 strokes per 100,000 people), and Singapore has the highest rate (804.2 strokes per 100,000 people), while Indonesia and Mongolia have the highest rates (4309.8 strokes per 100,000 people and 193.3 strokes per 100,000 people, respectively) [10]. Stroke is a severe health issue, the primary cause of disability in Bangladesh, and 3rd leading cause of mortality. As stated by the World Health Organization, Bangladesh has the 84th-highest stroke fatality rate in the world [11]. Bangladesh had a stroke prevalence of 11.39 per 1000 adult population, which is higher than that of other low- and middle-income nations (5.36 to 10.40 per thousand) but much lower than that of high-income countries (26-80 per thousand) [12].

Previous studies have revealed a high incidence of stroke-related mortality among the Bangladeshi population. However, crucial details regarding post-rehabilitation outcomes, such as mortality rates, causes of death, and levels of disability among participants, remain unexplored. There have been very few studies about the disease burden of stroke in Bangladesh, but none of those studies used DALYs to calculate the burden of stroke. My study's goal will be to calculate the disease burden of stroke by using DALYs, the level of disability, and the reason for the mortality rate in Bangladesh. The study objectives are: (1) To explore the Socio-demographic information of the participants; (2) To find the mortality rate and cause of death; (3) To identify the level of disability; (4) To find out the cost-effective analysis of respondents. Through this study, both the participants and rehabilitation professionals will benefit because, after that, they will be aware of the burden of stroke and able to understand the reason for mortality, mortality rate, and level of disability, which will shed further light on steps being taken for prevention of mortality and secondary complication.

Methodology:

Study design

Retrospective cohort studies are conducted in the present and look back in time to investigate medical outcomes or occurrences. In this intricate symphony of investigation, researchers delve into existing records, uncovering a treasure trove of past data. A retrospective cohort observational study will be used to achieve the study's goal of gathering data efficiently.

Study Population and Sampling Technique

In this study, the sample population will consist of stroke patients who received rehabilitation services at the Stroke Rehabilitation Unit of the Centre for the Rehabilitation of the Paralyzed (CRP) from January 2015 to December 2019, representing patients from all over Bangladesh. The process of deciding on the quantity and kind of study participants is known as sampling. The researcher will choose a Simple random sampling technique. Simple random sampling is a crucial statistical method for creating a representative sample from a larger population. Its key feature lies in the equal chance that each individual in the population has of being selected for the sample. This method ensures that bias is minimized and that the characteristics of the sample can be used to make reliable inferences about the entire population.

Eligibility criteria:

Respondents will be eligible for enrollment in the study if they meet the following criteria: (1) Patients with stroke who received rehabilitation services at CRP from January 2015 to December 2019, (2) Age range between 30 years to 80 years, (3) Both males and females will be included, (4) Willing voluntary participants. Exclusion criteria will be (1) patients who were not confirmed to have had a stroke and (2)

Participants who have had strokes for more than nine years will not be included.

Sample size:

The sampling process will be simple random sampling. The sample size will be estimated with a 95% confidence interval, a 1.0 design efficacy, a 5% margin of error, and a total population of 1835 patients, resulting in a calculated sample size of 318. But in this study, the sample size will be 518. The process will be performed using Epi Info version 7.2.0.

Data collection methods

Data will be collected from hospital records, telephone interviews, and home visits and by collecting phone numbers from a Plant Design Management System (PDMS) database of CRP of stroke survivors who received rehabilitation services at the Centre for the Rehabilitation of Paralyzed (CRP) in Bangladesh from 2015 to 2019. Initially, data collectors will take the phone numbers from the hospital record and then call the respondents to explain the study's goal. The researcher will inform the subjects up front that they can choose not to respond to any questions during the questionnaire's completion, and they will be free to leave the study whenever they desire. Participants will receive guarantees that no private information will be

disclosed. If the respondents agree to participate in the study, a data collector will visit the participants' homes and collect the data. To get approval from each volunteer participant, a verbal consent form will be utilized. Once the participants consent, a standard questionnaire will be used to determine the nature of the complaint and gather demographic information. The English questionnaire will be translated into Bengali to facilitate communication with participants or their family members. The questionnaire will include sections for socio-demographic information, stroke-related questions, questions related to (DALYs), and questions about disability levels. The data collection will start approximately on 1st February 2024.

Study procedure:

A clear diagram of the study procedure has been given in Figure 1 to meet the quality by Strengthening the Reporting of Observational Studies in Epidemiological (STROBE) requirements. From January 2015 to December 2019, a group of trained data collectors will collect telephone numbers from the PDMS of CRP database, and data collectors will call from these phone numbers and home visits of the participants.

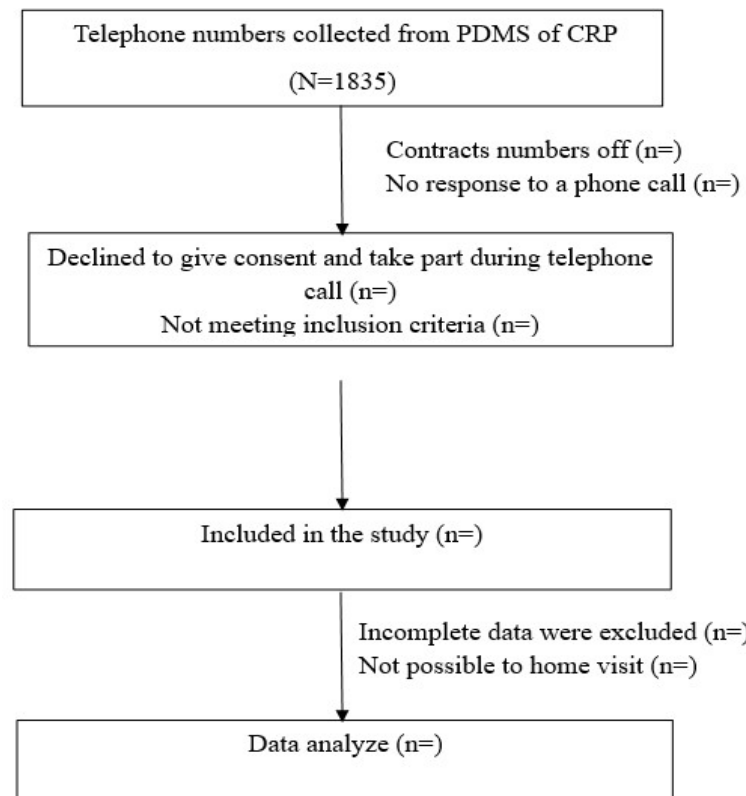


Figure 1: STROBE Chart of the study

Outcome Measurement tools

A semi-structured questionnaire, Including

- DALYs calculation Scale
- Modified Rankin Scale(mRS)

DALYs Calculation:

The DALYs will be calculated for every member of the cohort by using the YLD and YLL. The disability weight of an illness, the time of beginning (duration),

the time of death, and the anticipated time of death are significant factors in determining YLD and YLL [7]. The following formula was used to compute the two components of the DALYs index:

$$\text{DALYs} = \text{YLL} + \text{YLD}$$

$$\text{YLL} = N \times L$$

$$\text{YLD} = I \times DW \times L$$

Where,

N=Number of Death

L=Life expectancy of country – age of death. (In Bangladesh, the life expectancy of a woman is 74.1 years while a man is 70.6 years) [13].

I= Incidence of the Disease (Incidence of stroke in Bangladesh is 0.94) [14]

DW= Disability weight

Disability weight is a weight component that indicates how seriously an illness or accident has affected a person's health. A score of 0 indicates perfect health, whereas a value of 1 indicates death.

L=Duration of disease until remission or death

Modified Rankin Score (mRS)

The most popular outcome metric in stroke clinical trials is the Modified Rankin Score (mRS). This scale is designed to evaluate a patient's level of disability or functional impairment following a stroke. Graded on a scale from zero to six, it meticulously quantifies a patient's level of disability. It provides a consistent method for assessing their general quality of life and capacity to carry out everyday tasks. From complete independence (score 0) to severe disability (score 5) and, ultimately, fatality (score 6), the mRS paints a comprehensive portrait of a patient's post-stroke condition, aiding clinicians in treatment decisions and researchers in assessing the effectiveness of interventions [15].

Data Analysis:

The well-defined systematization and interpretation of data through mathematical rules and procedures is called statistical analysis (DePoy and Gitlin, 2015). Statistical analysis will be performed using Statistical Package for Social Science (SPSS) version 23. Descriptive statistics will be conducted according to the nature of the data. Mean and standard deviation will be calculated for parametric data, while frequency distribution will be presented for non-parametric data. Inferential statistics will be conducted, employing Pearson correlation for parametric data and either chi-square or Spearman rank correlation for nonparametric data. The alpha value will be set to $P < .05$.

Ethical Consideration

The study was approved by the Institute of Physiotherapy, Rehabilitation & Research (IPRR) (The Academic Institute of Bangladesh Physiotherapy Association) Ethics Committee (BPA-IPRR/IRB/992/07/2023/663). Regarding informed consent, potential participants will be approached by a clinical team member and provided with details about the study. Initially, contact will be made via phone, and those interested will receive the study's information

sheet and consent form through the same medium. For those opting to join, the data collection team will visit their homes, where participants or their careers will provide written consent after receiving comprehensive written and verbal details about the study. We'll ensure that this agreement is documented in writing. Notably, no individual's identity will be disclosed in any dissemination. Only collective findings will be shared, and we'll carefully adjust any information that might lead to the identification of a participant in any resulting publications or presentations. Participants retain the right to withdraw from the study until their data has been anonymised, after which identification or removal of their information won't be feasible.

Discussion:

Stroke is one of the most prevalent debilitating diseases, the second leading cause of mortality, and the third leading cause of disability in adjusted life years. Between November 2020 and October 2021, the Department of Physical Medicine and Rehabilitation at Bangabandhu Sheikh Mujib Medical University conducted a comprehensive cross-sectional study involving 77 participants. The study unveiled a mean age of 52.58 years among the participants, with a noteworthy majority—29.9%—falling within the 41–50 age group [16]. Another cross-sectional study was conducted at the National Institute of Neurosciences and Hospital, Dhaka-1207, Bangladesh, in the year 2022; the study involved 25,287 participants; all participants were more male than female with a mean age of 39.9 years, and the majority of the participants 19.6% were in the 41–50 years group [12]. Post-stroke mortality rates over defined periods might be limited in Bangladesh, available data often encompasses broader stroke-related mortality rates. As per existing records, the reported stroke-related mortality rate in Bangladesh stands at approximately 18.74% [17]. In India, Sudharsanan et al. noted that between 2011 and 2013, a total of 229 individuals passed away due to strokes, equating to a stroke mortality rate of 125.3 per 100,000 person-years [18]. Comorbidity is prevalent among stroke victims. Approximately 75% to 99% of stroke patients have comorbidity. Rehab is negatively impacted by comorbidity and multi-comorbidity, which can also lead to worse functional results and higher expenses [19]. Among the 103 stroke patients who visited CRP between December 2015 and May 2016, a cross-sectional survey was conducted using a convenient sample. This study revealed that 23% of patients had diabetes, 44.6% had a history of smoking, and 57.6% of patients had a history of hypertension [20]. According to another study, out of 495 stroke survivors, 25.1% were current smokers, 75.1% had hypertension, and 79.3% had additional comorbidities, such as diabetes mellitus (24.7%), heart failure (16.5%), coronary artery disease (28.8%), and peripheral arterial disease (10.9%) [21]. Siobhan et al. reported that during a 15-year follow-up, 262 (21%) of the 2625 individuals had survived to be 15 years old; of these, 33.8% had mild impairment, 14.3% had

moderate disability, and 15.0% had severe disability [22]. Variations in post-stroke care costs per patient per month were evident across studies, particularly between inpatient and outpatient settings. Reported figures stood at \$1515 for inpatient care and \$820 for outpatient care. Remarkably, the USA topped the list for both inpatient and outpatient post-stroke care expenses at \$4644 per patient per month, followed by Denmark (\$3026), The Netherlands (\$2214), and Norway (\$2147). Conversely, Italy (\$845), the UK (\$866), and Germany (\$871) reported the lowest expenditures in this regard [23]. In India, the total DALYs lost due to stroke amounted to 3068 per 100,000 person-years, with a notably higher burden observed among men compared to women, standing at 3195 versus 2937 per 100,000 person-years, respectively [18]. In Iran, between 2011 and 2017, the burden of stroke nearly doubled, soaring from 2453.44 DALYs to 5269.68 DALYs. Specifically for ischemic stroke, the YLL and the YLD were 18,867.62 and 460.13, respectively. Contrastingly, for hemorrhagic stroke, these figures were 7918.60 and 615.40, respectively. Notably, ischemic stroke accounted for more DALYs than hemorrhagic stroke, and the overall burden of stroke was higher in men than in women [1]. According to the WHO, In Bangladesh, the DALYs lost per 1000 individuals due to stroke amounted to 485, and the age-standardized DALYs rate per 100,000 people for stroke was reported at 864 [11]. Additionally, males experienced a more significant burden of stroke than women did, which is in line with the findings of several research [5,24]. It is consistent with previously published data indicating more YLLs than YLDs [1]. The rising trend in stroke-related death-associated long-term disability (DALYs) in Bangladesh appears to be caused by an ageing population and a rise in life expectancy. Experiencing a stroke reduces a person's life expectancy by approximately one-third [25]. Through this study, both the participants and rehabilitation professionals will benefit because, after that, they will be aware of the burden of stroke and able to understand the reason for mortality, mortality rate, and level of disability, which will shed further light on steps being taken for prevention of mortality and secondary complication.

Dissemination:

The study's results will be published in peer-reviewed scientific journals and showcased at national and international conferences.

Data availability:

This article does not have associated underlying data.

Patient and public involvement:

Patients and the public will actively engage in this research's design, implementation, reporting, or dissemination plans.

Competing Interests

The authors have stated that they have no competing interests.

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