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ECONOMIC BURDEN OF POST-STROKE DISABILITY ON LOW-INCOME FAMILIES: A CROSS-SECTIONAL ANALYSIS

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ABSTRACT

Background: *Stroke is a major type of long-term disability globally and places great stress on health services systems. The impact of stroke for low-income individuals extends beyond just medical costs, as it can create a cyclical effect of poverty. The purpose of this research is to quantify the direct and indirect economic costs associated with post-stroke disability among socio-economically disadvantaged households. For this research, a cross-sectional design was utilized to compare outcomes of low-income individuals who have suffered from post-stroke functional limitations. Data collection was accomplished using structured interviews of patients and review of financial records to identify the cost of healthcare and the loss of productivity.*

Methods: *For this research, a cross-sectional design was utilized to compare outcomes of low-income individuals who have suffered from post-stroke functional limitations. Data collection was accomplished using structured interviews of patients and review of financial records to identify the cost of healthcare and the loss of productivity.*

Results: *The findings of this preliminary research indicate that these households experience a large amount of catastrophic health expenditures. The economic burden experienced by household is the result of both acute care, as well as long-term rehabilitative care; additionally, there is an opportunity cost associated with the informal caregiver support provided by family members.*

Conclusion: *Disability from stroke creates an untenable economic burden on low-income families. There is a pressing need for inclusive social security programs and subsidized rehabilitation services to reduce the economic burden experienced by these households.*

Keywords: *Post-stroke disability, Economic burden, Low-income households, Direct and indirect costs, Cost of illness (COI), Health financing, Socioeconomic impact*

INTRODUCTION

A stroke is not just something that occurs in a hospital but has become a social and economic disaster for those who don't have much money. In poorer countries, once someone has had a stroke and is getting treated but no longer has insurance coverage or money for ongoing treatment, they will face many difficulties as they try to manage their disabilities over time. This article will look at how disabilities resulting from strokes can act as "poverty traps" by looking at the expense of long-term care and how that expense will result in declining wealth for households after someone suffers a stroke.

Literature Review

Stroke significantly affects the number of life years adjusted for disability and is a key driver of long-term socio-economic impact around the globe. The World Health Organization states that stroke is at the top of the global ranking of causes of mortality and morbidity, particularly in light- to-middle-income countries (LMICs). The economic impact of stroke extends beyond hospitalisation of the patient with long-term rehabilitation/additional care needs the patient and family will incur.

Many research studies have shown that the impact of stroke on the economy has multidimensional (direct/indirect) aspects. For example, as point to the impact of stroke on family stability; both direct/indirect costs of stroke can have a big impact on family stability; incidences of indirect costs (such as productivity loss) can exceed medical costs for families. Valery L. Feigin's work on stroke highlights long-term dependence caused by stroke-related disability that results in increased burden for the primary caregiver and reduced income for the family.

Sven Rajsic completed a systematic review of stroke costs around the world and found that the cost of care after a stroke increases as time passes, largely because of ongoing rehabilitation, the need for assistive devices, and repeated visits to hospitals. The findings of Rajsic's study are congruent with the COI framework for your research which divides the cost of illness into three types: direct medical, direct non-medical, and indirect costs.

In low- and middle-income countries (LMICs) such as Pakistan, the consequences of these costs are compounded by underdeveloped health insurance systems and high levels of out-of-pocket (OOP) payments. Studies have shown that large proportions of healthcare financing in LMICs are derived from the income of households, leaving many families with not enough funds to pay for necessary medical services. Because of this, many families are forced to resort to "distress financing," which includes borrowing, selling assets, and altering consumption patterns to reflect a lower level of spending.

More recently, increasing attention has been paid in the public health literature to the concept of stroke being a "poverty trap." For example, households with a member who has suffered a stroke have endured both increased costs for healthcare and a reduction in their ability to earn a wage, which limits their ability to be economically productive. Family members often take on the burden of caregiving for stroke patients that they would have otherwise earned wages if they were actively working.

Although there is much evidence across the globe, a research gap exists at the local level with studies on very poor families around the world. Most studies on hospital costs fail to report their indirect and long term socio-economic effects. Therefore, this research provides an analytical context and an analysis of household economy by demonstrating these hidden costs associated with caregiving (i.e., hidden costs) due to long-term disability.

Research Questions

Based on your study objectives and literature:

Primary Research Question

- What is the total economic burden (direct and indirect costs) of post-stroke disability on low-income families?

Secondary Research Questions

1. How do direct medical, direct non-medical, and indirect costs contribute to overall household expenditure?
2. What is the relationship between severity of disability (e.g., mRS score) and out-of-pocket expenditure?
3. To what extent does post-stroke disability lead to catastrophic health expenditure among low-income households?
4. What are the major drivers of indirect costs, particularly caregiver productivity loss?

5. How do low-income families cope with the financial burden (e.g., loans, asset sales, reduced consumption).

Methodology

Study Design and Setting

This study employs a **cross-sectional design** to provide a snapshot of the economic challenges faced by families at a specific point in their recovery journey (at least 6 months post-stroke). The research was situated in public sector tertiary care hospitals that primarily serve the urban and rural poor.

Participants and Sampling

- **Inclusion Criteria:** Patients aged 18 and above with a confirmed diagnosis of ischemic or hemorrhagic stroke, presenting with a Modified Rankin Scale (mRS) score of 3 or higher (indicating moderate to severe disability).
- **Socio-economic Status:** Participants were screened based on a monthly household income falling below the national poverty line or lower-middle-income threshold.
- **Sampling:** A purposive sampling technique was utilized to ensure a diverse representation of disability types (e.g., motor, speech, and cognitive deficits).

Data Collection Tools

A validated **Cost-of-Illness (COI)** framework was used to categorize expenses:

1. **Direct Medical Costs:** Consultation fees, hospital stays, diagnostic tests, and medications.
2. **Direct Non-Medical Costs:** Transportation to clinics, home modifications, and specialized dietary requirements.
3. **Indirect Costs:** Calculated using the **Human Capital Approach**, measuring the loss of earnings for both the patient and the primary family caregiver.

Category	Variable	Operational Definition	Measurement Tool/Method
Socio-demographic	Age	Age of patient in years	Self-report / Medical record
	Gender	Male / Female	Self-report
	Household income	Monthly income in PKR (below poverty threshold)	Structured questionnaire
	Education level	Highest level of education attained	Self-report
Clinical Variables	Type of stroke	Ischemic or hemorrhagic stroke	Medical records
	Severity of disability	Functional status measured using Modified Rankin Scale (mRS ≥3)	Clinical assessment
	Duration since stroke	Time since stroke occurrence (months)	Medical record / Self-report
Direct Medical Costs	Hospital expenses	Costs of admission, consultations, diagnostics, medication	Patient bills / receipts
Direct Non-Medical	Transportation cost	Travel expenses for hospital visits	Self-report
	Home modification cost	Expenses for disability-related home adjustments	Self-report
	Dietary expenses	Additional nutritional costs due to illness	Self-report
Indirect Costs	Patient productivity loss	Loss of income due to inability to work	Human Capital Approach

Category	Variable	Operational Definition	Measurement Tool/Method
	Caregiver productivity loss	Income loss of family member providing care	Structured interview
	Time spent caregiving	Average hours/day spent by caregiver	Self-report
Outcome Variable	Total economic burden	Sum of direct + indirect costs	Calculated variable
	Catastrophic health expenditure	Health expenses exceeding ≥10–25% of household income	Standard CHE threshold calculation

Data Analysis

Quantitative data were analyzed using **SPSS v26.0**. Descriptive statistics (means and percentages) were used to summarize demographic data and cost distributions. Correlation coefficients were calculated to determine the relationship between the severity of disability and the total economic out-of-pocket (OOP) expenditure.

Discussion

In summary, this research demonstrates that a substantial and multidimensional economic burden is borne by low-income households due to the post-stroke disability. Financial instability is caused by both direct and indirect costs. In the case of stroke, they add further support to the conceptualization of stroke as both a clinical event and a socioeconomic shock that leads to long-term poverty.

A second key finding is that indirect costs, especially from productivity losses and informal caregivers, make a disproportionately large contribution to total costs. Previously, healthcare systems and policy methods have treated direct medical expenditures as the most serious consideration; but we found that the value of caregiving in terms of lost productivity frequently exceeds the costs incurred for direct medical treatment. Our findings support earlier work in the economics literature, which has shown that the indirect contribution of caregiving is significantly understated when assessing the cost of illness.

Finally, the reliance upon unpaid family caregivers, most commonly women, adds another dimension to gendered economic vulnerability arising out of historical and entrenched sociocultural structures.

This study's findings demonstrated the extent to which CHE occurs creating substantial gaps in having financial protection from health risks across the system. Without complete insurance coverage, many households resort to stressful forms of financing (e.g. borrowing from family or friends, liquidating assets, or decreasing necessary consumption) to pay for their healthcare costs. This finding also supports other findings across LMICs where the majority of healthcare financing comes from individuals and families making OOP payments. Specifically, we demonstrated that the financial burden of health persists long after the acute phase following a diagnosis of stroke; thus showing the chronicity of the economic burden of strokes.

The other major finding was that disability severity and total costs have a positive correlation, demonstrating that persons with higher levels of functional impairment cost more in terms of rehabilitation services, assistive devices, and supportive care than people with lower levels of disability. As a result, it is imperative that people with higher levels of disability have access to early intervention and rehabilitation services to prevent the long-term economic consequences related to their health and wellness.

Thirdly, from a health systems perspective, there are major structural differences regarding access to healthcare services through public facilities. Although public facilities provide subsidized acute care, very few public facilities provide rehabilitation services that are accessible and affordable. Therefore, patients with stroke elbow will often either go without rehabilitation services or use costly services provided by private facilities.

Critical Analysis

There are many important discussion points regarding the study, though it does provide

significant insight. Firstly, its design being cross-sectional does not allow for any causal inference to be made; instead it is simply a useful comparable snapshot of the household economic burden of stroke in low to middle income settings. Longitudinal studies would be ideal for capturing the changing nature of the costs incurred over time.

Secondly, while the Cost of Illness (COI) framework is commonly used and is the current standard, it does not adequately capture intangible costs associated with chronic disabilities (psychological distress, loss of quality of life and stigma) as they cannot be measured directly or economically. These costs, which are particularly relevant to chronic disabilities may be substantial.

Thirdly, The use of the Human Capital Approach to determine productivity loss will likely produce an overestimation of indirect costs in areas where there is a large informal labour market. However, it is a widely accepted and comparable methodology for health economic evaluations.

Finally, The study's focus on low-income groups increases its policy relevance however it does decrease its generalisability to higher-income groups. However, as disadvantaged groups are disproportionately affected by the burden of stroke, the study's focus is certainly warranted and necessary.

Policy Implications

The findings of this study have several important implications for health policy and system strengthening:

1. Enhancing Financial Protection Against Health Risks

There is an important opportunity for expanding Universal Health Coverage (UHC) to include rehabilitation and long-term care that are required to rehabilitate individuals after stroke/brain injury. The existing, available insurance policies that cover health services could be improved by expanding what they cover so that people do not incur unexpected out-of-pocket expenses and do not experience catastrophic health care spending.

2. Integrating Rehabilitation into Health Systems

Health systems must move away from being primarily focused on providing acute-care services towards a system that also provides access to rehabilitation services and includes the provision of comprehensive care over time. Providing affordable rehabilitation services at the primary and secondary levels of care will significantly decrease the incidence of long-term disability and associated costs.

3. Support for Informal Caregivers

Given the substantial role of family caregivers, policies should recognize and support them through:

- Caregiver allowances or financial incentives
- Training programs to improve caregiving efficiency
- Psychosocial support services

4. CBR Assistance to Improve Access via Local Services

Localised public health initiatives (CBR) provide increased access to rehab-type services whilst allowing patients and their families to reduce transportation and any additional types of costs incurred through travelling far away for care. CBR remains a good option for accessing these types of services especially in rural and hard-to-access locations.

5. Prevention Strategies

The focus on investing in primary prevention (BP, changes in lifestyle, and early detection) help to mitigate both stroke-related incidence and the related economic consequences.

6. Health Financing Reform

There needs to be a decreased reliance on OOP payments through tax-based or insurance-based financial systems. The ability to strategically purchase and subsidise core stroke services will enable improved equity and accessibility to stroke care provisions.

Conclusion of Discussion

This study highlights that the ongoing financial costs associated with having a disability after experiencing a stroke go beyond direct medical care, including long-term costs associated with

work, finances and social activities. To effectively deal with these issues will require a shift in thinking towards inclusive service delivery and providing additional financial support to populations at greatest risk of being impacted by stroke-related disability. Without this kind of investment in interventions, stroke will continue to be one of the leading contributors to poor health status and poverty for people living in low-resource countries.

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