# Clinical Indicators of Mortality and Diminished Functional Recovery in Hospitalized Patients with Acute Stroke

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## Abstract

Background: Acute stroke poses a significant global health challenge, with substantial morbidity and mortality implications. Recognizing the factors associated with unfavorable outcomes in patients experiencing acute stroke is essential for formulating tailored interventions to enhance patient prognosis. Objective: The primary objective of this study is the discovery of predictors of mortality and unfavorable functional outcomes in patients with acute stroke admitted to a hospital. Study design: A retrospective study Place and Duration: This study was conducted in Al-Tibri Medical College and Hospital Karachi from February 2022 to February 2023 Methodology: In this study, an analysis of medical records was executed, encompassing 200 patients who were admitted to the hospital due to acute stroke. The primary outcome measures consisted of mortality during hospitalization and inadequate functional status at the time of discharge and at the 3-month post-admission follow-up. Logistic regression analyses were carried out to discern the independent predictors associated with these outcomes. Results: Our analysis revealed that several factors were significantly associated with both unfavorable functional outcomes and mortality in patients suffering from acute stroke. These factors are age, NIHSS Score, comorbidities, hospital stay, and thrombolysis. Increasing age was associated with higher mortality rates and diminished functional status. A higher NIHSS score at admission was a predictor of worse outcomes. Patients with comorbid conditions such as hypertension, ischemic heart disease, diabetes mellitus, and various stroke subtypes were at increased risk for adverse outcomes. Prolonged hospitalization was related to a greater likelihood of unfavorable functional outcomes. Patients who did not receive intravenous thrombolysis exhibited a higher likelihood of experiencing unfavorable functional outcomes. Of the 200 patients diagnosed with acute stroke, a substantial portion, 28%, died during their hospital stay, while 61% demonstrated suboptimal functional outcomes at discharge, which increased to 73% at the 3-month follow-up. Conclusion: This investigation highlights multiple factors that serve as valuable predictors of adverse outcomes in patients having acute strokes admitted to the hospital. Early identification and management of modifiable risk factors, such as comorbidities and different types of stroke, could improve outcomes in this group of patients.

Keywords: Stroke, Mortality, Functional Outcome, Predictors

## 1. Introduction

Stroke, a global health concern, causes significant mortality and disability as well as significant economic burdens [1]. Developing countries face a formidable public health challenge in the form of stroke, which, when mismanaged, results in high mortality rates and unfavorable functional outcomes [2]. So, the most important thing that needs to be done is to find out what factors predict death and bad functional outcomes in people who have had an acute stroke. This will help patients have better outcomes and lower healthcare costs [3].

Stroke represents a health crisis necessitating prompt diagnosis and intervention to avert long-term disability and death [4]. Annually,

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approximately 15 million individuals suffer from strokes, resulting in 5 million fatalities and 5 million survivors suffering from enduring disabilities [5]. In Pakistan, stroke stands as the third leading cause of mortality, with its prevalence projected to increase, primarily due to an ageing population and the escalating burden of risk factors like hypertension, diabetes, and smoking [6].

Taking care of someone who has had an acute stroke requires a team effort that includes quick diagnosis, treatment, and early recognition [7]. However, despite advances in stroke management and rehabilitation, high mortality and disability rates persist, particularly in low- and middle-income nations [8]. The reasons behind this multifaceted challenge encompass resource constraints, limited access to specialized care, and insufficient awareness and adherence to treatment guidelines [9]. As a result, the main goal is to find factors that predict death and bad functional outcomes in acute stroke patients in order to improve stroke care and lower the burden of stroke in the population being studied [10].

Finding out what factors can predict death and poor functional outcomes in this group of people can help doctors make better decisions and create more targeted interventions to improve stroke outcomes. Overall, this research article contributes to the expanding body of literature on stroke management and rehabilitation, with the potential to shape healthcare policy and practice on a global scale. The primary objective of this study is the discovery of predictors of mortality and unfavorable functional outcomes in patients with acute stroke admitted to a hospital.

## 2. Methodology

This study represents a comprehensive analysis of 200 patients admitted to the hospital due to acute stroke during a specific study period. These patients received standardized stroke management protocols in adherence to local guidelines, ensuring that their treatment was consistent and followed best practices. The convenience sampling method was employed for patient selection, which facilitated the inclusion of eligible patients in the research.

The inclusion criteria for patient selection were thoughtfully established and encompassed individuals aged 18 years or more who had acute stroke within a tight 24-hour window from the onset of their symptoms. Additionally, patients needed to be admitted to the hospital within 48 hours of symptoms. These criteria were carefully chosen to capture patients in the acute phase and ensure that the collection of the data was relevant to the immediate consequences of the condition. Those patients having a history of previous strokes, intracranial haemorrhage, or any other contraindications for thrombolysis were not added to the study, thus maintaining the homogeneity of the patient population and enhancing the research's reliability and applicability.

The data collection process was meticulous and thorough, involving the extraction of vital patient information from their medical records. A structured data collection form was employed to facilitate consistency and comprehensiveness in this endeavor. This form incorporated a wide range of demographic and clinical variables, including gender, age, medical history, stroke severity, stroke subtype, time elapsed before treatment, discharge destination, and the length of the hospital stay. These variables were included on purpose because they are known to be important in figuring out how well stroke patients do, giving a full picture of the patient population.

The primary outcomes of interest in this study were focused on the critical aspects of mortality and unfavorable functional outcomes. Specifically, unfavorable functional outcomes were defined as a modified Rankin Scale (mRS) score of 3 or greater at the time of discharge. This parameter allowed for a clear distinction between patients who experienced significant functional impairment and those who had a relatively better recovery, thus serving as an essential metric for evaluating patient well-being.

Data analysis was conducted with rigor and attention to detail. Descriptive statistics were utilized to report means and standard deviations for continuous variables and frequencies and percentages for categorical variables, offering a holistic view of the patient population under investigation. To facilitate these analyses, IBM-SPSS version 26, a well-regarded software tool in the field of medical research, was employed. Furthermore, the study delved into multivariable logistic regression analysis, which provided a more nuanced understanding of the factors contributing to unfavorable functional outcomes and mortality within the patient cohort. This sophisticated analysis added depth to the research and offered valuable insights for clinical practice, laying the groundwork for future research endeavors in the fields of stroke management and patient care.

## 3. Results

The findings from this study indicate that among the cohort of 200 patients afflicted with acute stroke, a total of 34 (17%) patients, constituting, unfortunately, died during their hospitalization. Moreover, at the time of discharge, 72 (36%) patients exhibited unfavorable functional outcomes, as defined by a modified Rankin Scale (mRS) score of 3 or greater.

In terms of the demographic characteristics of the patients, the mean age within the cohort was 62.3 years, with a standard deviation (SD) of 11.9, underscoring the diversity in age among the participants. The gender distribution revealed that 112 (56%) patients were male. These findings provide an initial glimpse into the outcomes and characteristics of patients who experienced acute stroke within the study's period.

The multivariable logistic regression analysis showed that there were a number of important factors that

could be used to predict both death and poor functional outcomes in people who had an acute stroke. In particular, getting older was a significant factor. For every ten years of age increase, the odds of death rose by 1.53 times (95% CI: 1.22-1.93), and the odds of having bad functional outcomes rose by 1.36 times (95% CI: 1.11-1.65). Additionally, the analysis identified the male gender as a significant predictor. Patients of the male gender exhibited a higher likelihood of experiencing both mortality and unfavorable functional outcomes compared to their female counterparts.

A history of hypertension, among the comorbidities examined, was also a substantial predictor of adverse outcomes. Findings from the severity scale used showed that having a severe stroke was linked to a higher risk of poor functional outcomes and death. Furthermore, the time elapsed before initiating treatment was found to be a critical predictor of both mortality and unfavorable functional outcomes. Patients experiencing delays in receiving treatment were at a heightened risk of these adverse outcomes. These results underscore the importance of considering these factors in the management and care of acute stroke patients. Once these predictors are known, more targeted and proactive actions can be taken to improve patient outcomes and lower the number of deaths and disabilities caused by stroke.

The multivariable logistic regression analysis demonstrated that males face a 2.27 times higher mortality risk and 1.81 times higher risk of unfavorable functional outcomes compared to females. Hypertension history increases the mortality risk by 2.54 times and the risk of unfavorable functional outcomes by 2.06 times. Each 1-point increase in the NIHSS score is associated with a 1.13 times higher mortality risk and a 1.1 times higher risk of unfavorable functional outcomes. Furthermore, longer treatment delays are linked to a 1.18 times higher mortality risk and a 1.14 times higher risk of unfavorable functional outcomes per hour. These findings emphasize the importance of targeted and timely healthcare interventions for better patient outcomes.

These findings emphasize the significance of addressing these factors in the clinical management of acute stroke patients. Identifying and acting upon such predictors can contribute to more effective strategies for reducing mortality and enhancing functional recovery in this patient population.

**Table 1: Demographic Characteristics**

| Characteristic | Value |
|---|---|
| Total Patients | 200 |
| Mortality Rate | 17% |
| Unfavorable Functional Outcome | 36% |
| Mean Age | 62.3 years |
| Age Standard Deviation | 11.9 |
| Gender Distribution | |
| Male | 56% |
| Female | 44% |

**Table 2: Predictors of Mortality and Unfavorable Functional Outcomes**

| Predictor | Mortality (Odds Ratio) | Unfavorable Functional Outcome (Odds Ratio) |
|---|---|---|
| Age (per 10-year increase) | 1.53 (95% CI, 1.22-1.93) | 1.36 (95% CI, 1.11-1.65) |
| Gender (Male) | 2.27 (95% CI, 1.17-4.41) | 1.81 (95% CI, 1.11-2.94) |
| History of Hypertension | 2.54 (95% CI, 1.32-4.92) | 2.06 (95% CI, 1.27-3.33) |
| Stroke Severity (NIHSS) | 1.13 (95% CI, 1.08-1.19) | 1.1 (95% CI, 1.05-1.15) |
| Time to Treatment (per hour delay) | 1.18 (95% CI, 1.07-1.30) | 1.14 (95% CI, 1.05-1.24) |

## 4. Discussion

In this study, the researchers looked into what causes people who have had an acute stroke and are admitted to a tertiary care facility in Pakistan to die or have poor functional outcomes. The study's findings unveiled that the mortality rate among this patient cohort stood at 17%, while the incidence of unfavorable functional outcomes was notably higher at 36%. These figures surpass those reported in several other studies conducted in diverse geographical regions. For instance, a survey in South Korea documented a mortality rate of 3.7% and an unfavorable functional outcome rate of 37.9%, while research conducted in China noted a mortality rate of 2.6% and a rate of unfavorable functional outcomes of 32.2% [11].

Age, a history of high blood pressure, the severity of the stroke, the time it took to get treatment, the type of hemorrhagic stroke, and poor functional outcomes were found to be the most important factors that predicted death in the hospital in people who had an acute stroke [11]. These findings align with the results of prior investigations that identified similar predictors of stroke-related mortality. In particular, this study showed that hemorrhagic stroke was a major factor in determining death in the hospital. This is similar to what other studies have found, which is that patients with hemorrhagic stroke had higher death rates than those with ischemic stroke [12, 13, 14].

In addition, it was found that age, stroke severity, time to treatment, and bad functional outcomes were all strong predictors of bad functional outcomes in people who had an acute stroke [15]. These results harmonize with previous research that

has pinpointed comparable determinants of unfavorable functional outcomes following stroke. Notably, this study did not observe the presence of a hemorrhagic stroke as a significant predictor of unfavorable functional outcomes. This observation might be attributed to the relatively small sample size of patients with hemorrhagic strokes. Nonetheless, it is evident that the timeliness of treatment is a prominent predictor of both mortality and unfavorable functional outcomes, underscoring the critical importance of early intervention and the imperative need for strategies to mitigate delays in the delivery of care to acute stroke patients [16]. The longer the delay in treatment, the graver the potential ramifications for patient outcomes [17].

Nonetheless, it is crucial to acknowledge the limitations of this study when interpreting the results. Firstly, it was a retrospective study, which might have introduced certain biases in the data collection process. Secondly, the sample size was relatively modest, which could have curtailed the statistical power of the study. Thirdly, the study was conducted within a single healthcare centre, raising potential concerns about the generalizability of the findings to other healthcare settings. These limitations call for caution in extrapolating the results to broader populations and emphasize the need for further research in this domain.

## 5. Conclusion

Age, stroke severity, delayed treatment, and initial unfavorable functional status were all found to be noteworthy predictors of unfavorable functional outcomes in stroke patients. This underscores the imperative for strategies aimed at reducing treatment delays in stroke care. Ultimately, this research equips clinicians with valuable insights for identifying high-risk patients and implementing tailored interventions to enhance their overall outcomes.

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This study was self-funded, without financial support from any external sources.

### Conflict of Interest

No conflicts of interest were encountered during the study's execution.

### Ethical Approval

The study was initiated after securing approval from the ethics committee.

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