Risk Factors, Clinical Features, and Outcomes among Stroke Patients Presenting to Spinal Injury Rehabilitation Centre

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ABSTRACT

Background: Worldwide, stroke is the second leading cause of death and disability. The burden of stroke in countries like Nepal is increasing. The purpose of this study is to describe the epidemiology, clinical features, and functional outcomes of individuals with stroke in a rehabilitation hospital in Nepal.

Methods: A prospective descriptive study was conducted among individuals with stroke presenting for inpatient rehabilitation to the Nepal's first interdisciplinary inpatient stroke rehabilitation unit over a one-year period; from 1 April 2018 – 30 March 2019.

Results: Twenty-four individuals were enrolled, with average age of 56.8 years (SD 11.9, range 38-79). Seventeen patients (71%) presented with ischemic stroke. Hypertension was the most common modifiable stroke risk factor observed, present in 21 (88%) of individuals. Median rehabilitation length of stay was 32.5 days (IQR $15.3 - 68.8$). Median Modified Barthel Index at admission was 25.0 (IQR 8.5-57.0) and at discharge was 67.0 (IQR 46.0-88.0), a statistically significant improvement ($Z = -3.408$, $p = 0.001$). Median Modified Rankin Scale on admission was 5.0 (IQR 4.0-5.0) and at discharge was 4.0 (IQR 3.6-4.8; $Z = -3.276$, $p = 0.001$).

Conclusions: Most individuals with stroke admitted for interdisciplinary stroke rehabilitation demonstrated "severe" levels of disability and dependency on admission, and "moderate" levels of disability and dependency at the time of discharge. Hypertension represents a strategic target for primary and secondary prevention of stroke. With the burden of stroke increasing in Nepal, it is imperative to improve long-term availability and access to comprehensive stroke care for all affected individuals.

Keywords: Nepal; rehabilitation; stroke

INTRODUCTION

Stroke is the second leading cause of death and disability worldwide.[1] The burden of stroke is disproportionately increasing in low- and middle-income countries like Nepal, a trend linked with increases in modifiable risk factors.[2,3] Patients with stroke benefit from coordinated care, and stroke rehabilitation reduces mortality and improves functional outcomes.[4, 5]

Stroke is the fifth leading cause of combined death and disability in Nepal.[6-7] In 2017, Nepal's Ministry of Health partnered with Spinal Injury Rehabilitation Centre (SIRC) to open the country's first inpatient stroke rehabilitation unit. As stroke rehabilitation develops, understanding patient demographics, risk factors, types of stroke, complications, and outcomes is critical to optimizing patient care. To our knowledge, no study has prospectively examined these variables among individuals presenting for inpatient stroke rehabilitation in Nepal.

The aim of this study is to describe the epidemiological and clinical features of individuals with stroke admitted to SIRC for inpatient stroke rehabilitation.

METHODS

A prospective descriptive study was designed to include all individuals with stroke who presented to SIRC over the period of one year, from 1 April 2018 – 30 March 2019. SIRC is a free-standing spinal cord injury and stroke rehabilitation hospital. SIRC has one of the country's only dedicated interdisciplinary stroke rehabilitation units. This 10-bed unit is staffed by physical medicine and rehabilitation physicians, physical therapists, occupational therapists, rehabilitation nurses, one prosthetist/orthotist, rehabilitation psychologist,

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and social worker. SIRC accepts stroke patients from throughout Nepal (following acute stroke treatment) for comprehensive inter-disciplinary rehabilitation.

All individuals admitted to the stroke rehabilitation unit were considered for enrolment. Individuals with haemorrhagic or ischemic stroke were eligible for enrolment in the study. Individuals admitted for neurologic conditions unrelated to stroke were excluded from the study.

All applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research. SIRC's research committee and the Nepal Health Research Council approved the study (Reg.no 242/017). Patients provided written informed consent prior to enrolment.

After providing consent, all individuals with stroke were enrolled and data were collected prospectively from admission to discharge. Data collected were based on the International Consortium for Health Outcomes Measurement Stroke Data Collection Reference Guide[7] and included:

Patient demographics: age, gender, ethnicity, living location, living situation (alone, independent/ dependent, with family, other).

Type of stroke (ischemic, intracerebral haemorrhage, TIA, or unspecified).

Severity of Stroke (measured by Retrospective Assessment of Admission NIH Stroke Scale Severity Algorithm when possible).

Premorbid and current modifiable stroke risk factors: previous stroke, coronary artery disease, atrial fibrillation, diabetes mellitus, hypertension, dyslipidemia, smoking status, alcohol use, overweight/ obesity.

Non-modifiable stroke risk factors: age, gender, ethnicity, family history period.

Initial treatment: transportation method (by themselves, with family assistance, EMS), location (specific hospital and unit), duration of symptoms, diagnostic techniques, interventions, secondary prevention, length of acute hospital stay.

Rehabilitation treatment and outcomes: 10-meter walk test: collected on admission and discharge, if able. The 10-meter walk test is an internationally accepted performance measure that assesses walking speed in individuals with stroke. It has excellent test-retest reliability, excellent intra- and interrater reliability, and excellent correlation with functional dependence in instrumental activities of daily living.[8]

Modified Rankin Scale (mRS): collected on admission and discharge. The mRS is a widely utilized global disability measure. The mRS has excellent test-retest reliability, excellent intra-rater reliability, and adequate-to-excellent inter-rater reliability among individuals with stroke.[9]

Modified Barthel Index: collected on admission and discharge. The Modified Barthel Index is a commonly used performance measure among individuals with stroke that assesses activities of daily living, functional mobility, and gait. It is based on the Barthel Index which has greater sensitivity and reliability compared to the original Barthel Index.[10,11]

Length of rehabilitation stay

Complications: recurrent stroke, infection (pneumonia, UTI), seizure, depression, venous thromboembolism, pressure ulcer, pain, spasticity, contracture, falls, gastrointestinal bleeding, death

Discharge location

After study enrolment, data were obtained from direct patient interviews and also extracted from medical records. Data were entered into a single, encrypted, password protected SPSS database (IBM Corporation, Version 26, New York, USA). Two individuals (authors CCG and AK) cross-checked and verified all data entered for accuracy. Data were analysed using descriptive statistics. Univariate analysis included frequency distribution, central tendency and dispersion (mean and standard deviation for demographics with median and interquartile range utilized for skewed data).

RESULTS

During the 12-month period, 55 individuals with various neurological diagnoses were admitted to the stroke unit. Of these, 26 were eligible with ischemic or haemorrhagic stroke, of which 24 provided written consent to be enrolled (see Figure 1). The average age among individuals with stroke was 56.8 (SD 11.9, range 38-79), with a male-to-female ratio of 1.4 (Table 1).

Seventeen (71%) individuals presented with ischemic stroke. Pre-existing or newly diagnosed hypertension

was the most common modifiable stroke risk factor observed, present in 21 (88%) individuals. Detailed risk factors are shown in Table 2.

Table 1. Patient demographics.

Age Range, y	No. (%) of Patients (N = 24)
<55	11 (46)
55-64	6 (25)
65-74	5 (21)
75+	2 (8)
Men	14 (58)
Mean age (SD)	56.8 (11.9)

Table 2. Risk factors among individuals with stroke.

Risk Factor	No. (%) of Patients (N = 24)
Hypertension	21 (88)
Diabetes	8 (33)
Smoking	7 (29)
Overweight/Obesity	7 (29)
Dyslipidaemia	5 (21)
Prior Stroke	4 (17)
Atrial Fibrillation	2 (8)

Median time from symptom onset to acute hospital arrival was 2.0 hours (IQR 0.6 – 7.9). Time to presentation for individuals with ischemic stroke specifically is presented in Figure 2, with the 4.5-hour thrombolysis treatment cut-off window identified. Median length of stay during acute hospitalization was 12.0 days (IQR 7.5 – 18.0).
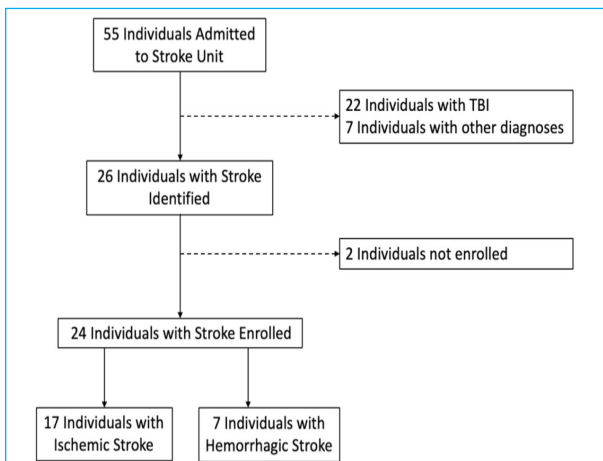

Figure 1. Stroke study enrolment.

Among individuals with ischemic stroke, 16 (94.1%) were discharged from acute care on antiplatelet therapy (aspirin, clopidogrel, or both). Fifteen (88%) were

discharged appropriately on statin therapy. Twelve (72%) had a lipid panel documented during acute care. Among the 21 hypertensive individuals with ischemic or haemorrhagic stroke, 19 (91%) were discharged on antihypertensive therapy.
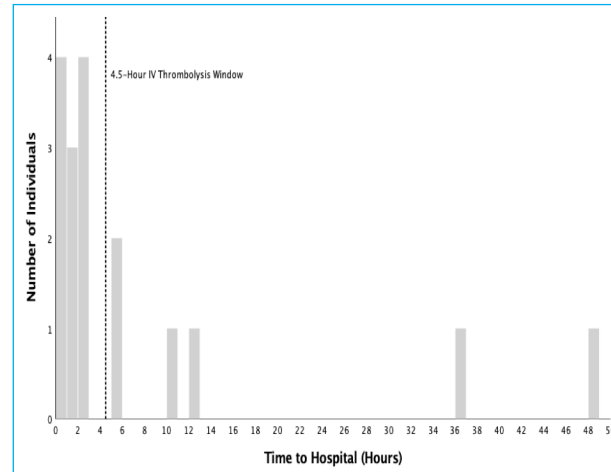

Figure 2. Time from symptom onset to hospital arrival among individuals with ischemic stroke.

Median time to rehabilitation was 15.0 days (IQR 10.3 – 72.5). Median rehabilitation length of stay was 32.5 days (IQR 15.3 – 68.8). Median Modified Barthel Index (MBI) on admission was 25.0 (IQR 8.5 – 57.0), consistent with "severe" dependency. Median MBI at the time of discharge from rehabilitation was 67.0 (IQR 46.0 – 88.0), indicating "moderate" dependency. Median modified Rankin Scale (mRS) on admission was 5.0 (IQR 4.0-5.0), consistent with "severe disability." Median discharge mRS was 4.0 (IQR 3.6-4.8), indicating "moderately severe disability." Data were insufficient to retrospectively identify stroke severity based on acute hospital admission documentation. Additionally, most of our patients were non-ambulatory and therefore the 10-meter walk test was not routinely utilized.

One (4%) patient died prior to discharge from rehabilitation. Autopsies are not routinely done in our setting, and the specific cause of death was unknown. Among common stroke-related complications, four (17%) individuals developed pneumonia, three (13%) individuals developed pressure ulcers during acute care, and two (8.3%) developed urinary tract infection. One (4%) individual required temporary ventilator support for respiratory failure, and one (4%) had a seizure following his stroke. No patients that we know of developed venous thromboembolism or gastrointestinal bleeding. Data were incomplete regarding pain and spasticity requiring treatment.

DISCUSSION

This study describes the continuum of care from symptom onset to discharge from inpatient rehabilitation for individuals with stroke in Nepal. Our findings highlight key clinical and health systems actions needed to improve and expand stroke care in our setting.

Hypertension was the most common modifiable stroke risk factor in this patient population, identified in 88% of individuals. This is consistent with multiple studies conducted in Nepal that have reported incidences of 32% to 61%.[12-16] The largest of these studies, by Thapa et al., retrospectively analyzed all 1017 stroke patients presenting to an acute hospital and found hypertension among 55%.[12] As evidenced by the INTERSTROKE study, hypertension is the single most important modifiable stroke risk factor worldwide, contributing to both haemorrhagic and ischemic stroke.[17] As it is an easily detected and treatable condition, targeted programs to prevent, diagnose, and treat hypertension are needed. Diabetes and smoking were the next most common modifiable stroke risk factors at 33% and 29%, respectively. Diabetes and smoking rates have also been high in previous studies.[12-16] Thapa et al., in 2013 studied risk factors among patients with stroke in an ICU and found 4.5% with diabetes and 59.4% smokers.[14] Shrestha et al., studied 160 individuals with stroke in a teaching hospital and found 60.5% of individuals were smokers while 10% had diabetes.[16] These modifiable risk factors also represent strategic targets for primary and secondary prevention of stroke.

Efforts to improve time to acute care and time to rehabilitation have the potential to reduce morbidity and mortality among individuals with stroke. Notably, eleven (65%) individuals with ischemic stroke presented to acute care within the target 4.5-hour window from symptom onset and may have benefited from thrombolysis. Only one (6%) received thrombolysis. Nepal et al., specifically studied prehospital delay and IV thrombolysis use among individuals with ischemic stroke at a major teaching hospital in Kathmandu.[18] They found that 20% of individuals with ischemic stroke arrived to acute care within the thrombolytic window, while 13% of these eligible individuals actually received thrombolysis. Early arrival was significantly associated with daytime onset of symptoms, awareness of stroke symptoms and appropriate response, and distance to the hospital. As thrombolysis is one of the only interventions that has the potential to restore blood flow to the brain and reduce brain infarction, addressing these barriers to care is critical.

Modified Barthel Index and mRS scores showed improvement at the time of discharge from rehabilitation. This functional improvement is consistent with current evidence that rehabilitation reduces dependency and improves functional outcomes.[5] However, given "moderate" levels of disability and dependency observed in this patient population, future health systems planning should include the provision of long-term comprehensive medical and rehabilitation care for individuals with stroke. Of additional note, nearly half of those patients admitted to the stroke unit had other disabling neurological diagnoses—primarily traumatic brain injury. While these patients were excluded from the study, clearly additional neurorehabilitation needs are significant.

With the increasing burden of stroke in Nepal, priority must be given to improve comprehensive stroke care. Beginning comprehensive stroke management as soon as possible, with dedicated acute stroke units and early referral to inpatient stroke rehabilitation care will reduce complications and improve individuals' function and quality of life.[4, 5] In order to make this happen, dedicated stroke units within major tertiary level hospitals are needed. These units should be staffed by an interdisciplinary team specializing in stroke that includes: physicians, nurses, therapists (physiotherapy, occupational therapy, speech language pathology), psychologists, assistive technologists, social workers, nutritionists, and vocational specialists.

Limitations of the study include limited generalizability, as this data represents patients presenting to only one rehabilitation hospital. Incomplete documentation from both acute and rehabilitation hospital stays resulted in gaps in data, specifically related to stroke severity and complications.

CONCLUSIONS

With the burden of stroke increasing in Nepal, it is imperative that we improve availability and access to long-term comprehensive stroke care for all affected individuals. Population-based studies are required to better understand the burden of stroke in Nepal. Additional studies should examine implementation of thrombolysis for acute ischemic stroke, early rehabilitation services, risk factor reduction, and long-term follow up of individuals with stroke.

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