

Original Article**Patient Age and Outcome in Ischemic Stroke****Bikram Prasad Gajurel*, Ragesh Karn, Reema Rajbhandari, Rajeev Ojha**

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Article Received: 18th October, 2022; Accepted: 24th December, 2022; Published: 31st December, 2022**DOI: <https://doi.org/10.3126/jonmc.v11i2.50379>****Abstract****Background**

Age is the most important prognostic factor in ischemic stroke. This study was carried out in patients with ischemic stroke to describe the association of age of the patients with stroke severity at presentation and at three months.

Materials and Methods

The data, which were collected retrospectively from hospital records, were re-analyzed by using the Statistical Package for the Social Sciences (SPSS) version 26. Age was divided into younger (≤ 50 years) and older (> 50 years) based on standard definition. Age was also divided into younger (< 60 years) and older (≥ 60 years) based on the Senior Citizens Act of Nepal. The associations were analyzed by using Chi-square test.


Results

One hundred and fifty-three patients were included in the study. The mean age of the patients was 60.9 years. There was no statistically significant association between baseline stroke severity and the age groups defined both ways. However, at three months more younger patients had good outcomes (44.4% good outcome vs 25.6% poor outcome in patients ≤ 50 years, $p = 0.03$; 52.8% good outcome vs 31.6% poor outcome in patients < 60 years, $p = 0.02$). More older patients had poor outcomes at three months (74.4% poor outcome vs 55.6% good outcome in patients > 50 years, $p = 0.03$; 68.4% poor outcome vs 47.2% good outcome in patients ≥ 60 years, $p = 0.02$).

Conclusion

There was no significant association between young and old patients and the baseline stroke severity; however, more younger patients had good outcomes compared to older patients at three months, the differences being significant.

Keywords: Age of onset, Ischemic Stroke, Nepal, Prognosis

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Introduction

Stroke is a focal neurological deficit of sudden onset and is presumed to be due to vascular cause. Ischemic stroke occurs when the blood supply to the brain is cutoff either due to occlusion of the blood vessels by a thrombus or due to hypoperfusion of the brain parenchyma. Hemorrhagic stroke occurs when there is a rupture of the blood vessel in the brain resulting in bleeding into the brain parenchyma. Ischemic strokes are the commoner of the two types of the stroke.

As stroke is a major cause of devastating disabilities, the rehabilitation of these results in the expenditure of expensive resources that too for a very prolonged period of time. Because of this important reason, factors that predict functional recovery after stroke are highly desirable and have been extensively studied in the developed world. Large scale studies on the outcomes and predictors of stroke in general in Nepal are not available. In a small study in central Nepal, the three months outcome of patients with ischemic stroke was 51.8% patients achieving full independence, 19.6% dependent and 28.6% dead [1].

Age is considered the most important factor and has been widely accepted as prognostically very useful [2]. This retrospective study was thus carried out to describe the association of the age of the patients with stroke severity at presentation and with three months outcome in patients with ischemic stroke at a tertiary care hospital in Nepal.

Materials and Methods

This is a retrospective descriptive study that was carried out in the inpatient and the outpatient units of the department of neurology of Tribhuvan University Teaching Hospital (TUTH), Kathmandu, Nepal. The data of the patients were retrieved from hospital discharge summary and patient records kept as part of research projects in the department of neurology. All patients, aged more than 18 years, who were discharged with the diagnosis of ischemic stroke from January 2021 to December 2021, were included in the study. Ethical approval to carry out the study was obtained from the Institutional Review Committee of Tribhuvan University Institute of Medicine. The diagnosis of ischemic stroke was based on clinical findings supported with radiological findings. The information about age and sex of the patients, baselines stroke severity and the stroke outcome at three were collected in self designed proforma. The severity of ischemic stroke at presentation was measured with the National Institute of Health Stroke Scale (NIHSS). The stroke

severity was grouped into no stroke (NIHSS score 0), minor stroke (NIHSS score 1-4), moderate stroke (NIHSS score 5-15), moderate to severe stroke (NIHSS 16-20) and severe stroke (NIHSS score 21-42). The outcome at three months was measured with the modified Rankin Scale (mRS). A good outcome was defined as the mRS score of two or less and a poor outcome was defined as the mRS score of three or more. Age was divided into two categories for statistical analysis. In one category, age was divided into two groups of younger (≤ 50 years) and older (> 50 years) patients based on standard definition [3]. Another category of age groups was based on the Senior Citizens Act, 2063 of the Government of Nepal which defines elderly as those who are 60 years old and above[4]. The data were entered into and analyzed by using the Statistical Package for the Social Sciences (SPSS) version 26. Severity at baselines and outcomes at three months were compared with the age groups of the patients by using the Chi-square test and the difference was considered significant if the p value was less than 0.05. Descriptive statistic in the form of frequencies, percentages, mean, medians and standard deviations were also used to describe relevant data.

Results

Out of 153 patients included in the study, 78 (51%) were male. The mean age of the patients was 60.9 years (standard deviation of 16.6, range 18-92 years). The mean NIHSS and MRS scores were 11.5 (standard deviation of 7.8, range 1-31) and 3.5 (standard deviation of 1.5, range 0-6) respectively. The distributions of stroke severity based on NIHSS scores and the mRS scores were as shown in Figures 1 and 2. The associations of different age categories with stroke severity on presentation and at three months were as presented in Tables 1 and 2.

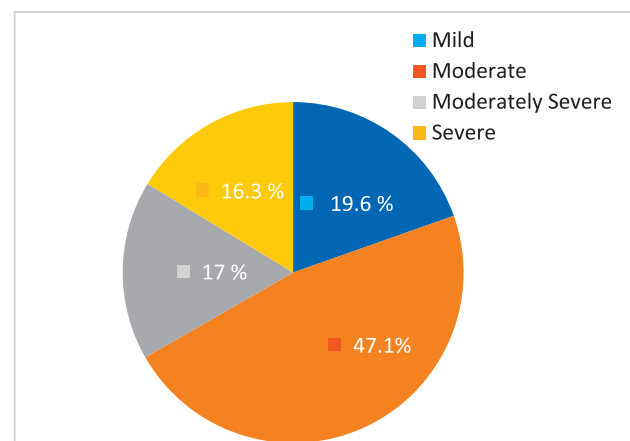


Figure 1: Distribution of stroke severity on admission based on the NIHSS scores.



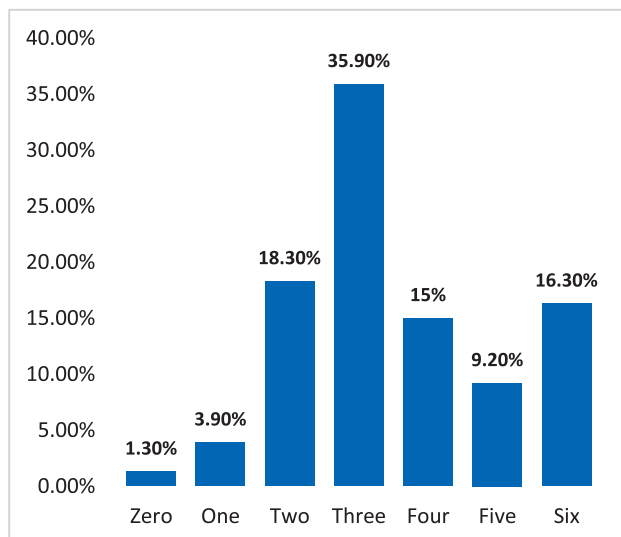


Figure 2: Distribution of stroke outcome at three months based on the mRS score.

Table 1: Association of the age of the patients with stroke severity on admission.

Variables	NIHSS				p-Value
	Mild	Moderate	Moderately Severe	Severe	
Age ≤ 50	9 (30%)	25 (34.7%)	7 (26.9%)	5 (20%)	0.56
>50	21 (70%)	47 (65.3%)	19 (73.1%)	20 (80%)	
Age <60	11 (36.7%)	28 (38.9%)	10 (38.5%)	7 (28%)	0.80
≥ 60	19 (63.3%)	44 (61.1%)	16 (61.5%)	18 (72%)	
Total	30	72	26	25	

Table 2: Association of the age of the patients with stroke outcome at three months.

Variables	Good Outcome	Poor Outcome	p-Value
Age ≤ 50	16 (44.4%)	30 (25.6%)	0.03
>50	20 (55.6%)	87 (74.4%)	
Age <60	19 (52.8%)	37 (31.6%)	0.02
≥ 60	17 (47.2%)	80 (68.4%)	
Total	36	117	

Discussion

Age is a powerful predictor of functional outcomes after stroke [2]. We have divided the patients into two categories, young and old, based on two standards. The international standard for the cut off of younger and older patients with stroke being 50 years, with patients less than or equal to 50 years defined as young and those above 50 years defined as old [3]. We also used the criteria set forward by the Senior Citizens Act of the Government of Nepal which defines elderly as those who are 60 years old and above [4]. Our

study shows that there is no statistically significant association between the baseline stroke severity and the two age groups defined in both ways (Table 1). There is, however, statistically significant association between the stroke outcome at three months and the patient age groups defined in both ways. More proportions of younger patients with ischemic stroke had good outcomes (44.4% good outcome vs 25.6% poor outcome in patients ≤ 50 years with $p=0.03$; and 52.8% good outcome vs 31.6% poor outcome in patients < 60 years with $p=0.02$) and more older patients with ischemic stroke had poor outcomes (74.4% poor outcome vs 55.6% good outcome in patients > 50 years with $p=0.03$; and 68.4% poor outcome vs 47.2% good outcome in patients ≥ 60 years with $p=0.02$) and the differences were statistically significant (Table 2).

Large scale studies addressing outcomes of ischemic stroke in Nepal are not available. In a small study conducted in 56 patients with ischemic stroke at a tertiary care hospital in Nepal, age was negatively associated with three months outcome; however, this study has not specifically defined the age cutoffs that could predict the chances of good and poor outcomes [1]. In another small-scale study with 24 patients with stroke, the functional outcome was not correlated with any of the prognostic factors [5].

Several studies in South-East Asia have suggested age as an important predictor of stroke severity. Most studies have used only discharge disability as a marker of stroke outcome. In a large scale study involving 2066 patients with ischemic strokes in India, younger age was strongly associated with excellent outcomes [6]. In a multicentric observational study involving 874 patients with ischemic stroke in Pakistan, older patients were found to have more complications, more death rates during hospital stay and a higher mRS scores at discharge compared to younger patients [7]. Similar conclusions were deduced by the findings of a hospital based stroke registry in Bangladesh that included 679 patients with stroke which concluded that age more than 70 years was strongly associated with stroke outcome at discharge [8].

Similar conclusions have been drawn in studies done in developed world. In a study conducted by a tertiary care university hospital in Italy, higher age was strongly associated with death [9]. In a multi-centre study that was carried out in Netherlands, the hazard ratios for death were 3.33 (2.97-3.73) for age over 65 years after ischemic stroke [10]. In a Canadian prospective study of prediction of functional recovery of 105 patients with a stroke which was carried out over a period



of two years, a 2-year period, a lower age at stroke onset was the only significant predictors of long term improvement [11].

Elderly patients usually have a higher risk of subsequent complications and thereby lower chances to recover from their stroke. Almost all studies which have used age as their prognostic index have found it to be negatively correlated with outcome at or after discharge [12-14]. Age probably has negative impact on functional outcome since older people have more comorbidities compared to younger people. Comorbidities are important variables in stroke that both increase the incidence and worsen the short- and long-term outcomes [15]. Past studies that included animal models of aging and comorbidities have established that comorbidities like hypertension, diabetes, obesity and dyslipidemia dramatically increased the susceptibility of the brain tissue to ischemic damage which ultimately resulted in poorest functional outcomes [16]. The impact of these medical conditions, which are associated with important contributions to final outcome of stroke, were given little attention in earlier days [17]. Multiple epidemiological studies have since established that patients who have more comorbidities have worse short- and long-term outcomes compared to their healthy counterparts even when recent advances of thrombolysis and thrombectomy are taken into account [18-20].

Another important factor that has an important contribution to recovery after brain lesions is neural plasticity. There has been a tremendous growth in the literature concerning motor learning, neuroplasticity and functional outcome after brain lesions [21]. Our brain cells have a variety of intrinsic abilities which allows them to adapt to a variety of stimuli which can ultimately change their microscopic and biochemical properties. This amazing phenomenon of neural plasticity can lead to highly appreciable recoveries. There is evidence that appropriate training and rehabilitation procedures can modify and enhance the neuroplasticity process [21]. Loss of neural plasticity with ageing may contribute to less functional recovery after stroke, even though enhancing existing neuroplasticity of surviving neurons by using various means can improve functional outcome after stroke [22, 23].

This study has important limitations. This is a retrospective study carried out on data collected from hospital records. The accuracy of data entered into the hospital records cannot be guaranteed all the time. This is also a small single center study so it will not represent the whole population of ischemic stroke in Nepal. The numbers of

cases may not represent actual population who would visit the hospital as the time frame included the COVID-19 pandemic. Another important limitation is that this study has analyzed only age and not addressed other factors that could contribute to functional outcome after stroke. The most important of these factors are comorbidities which we have not studied due to inadequate information on the hospital records. Large scale studies incorporating risk factors, comorbidities, disease modifying treatments and rehabilitation strategies are desirable in the future to assess the overall scenario of outcome and prognostic factors that represent the true situation existing in Nepal.

Conclusion

There is no statistically significant association between young and old patients with ischemic stroke and the baseline stroke severity. There is, however, statistically significant association between young and old patients with ischemic stroke and the stroke outcome at three months. More proportions of younger patients with ischemic stroke have good outcomes and more proportion of older patients with ischemic stroke has poor outcomes at three months. The differences are statistically significant.

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Conflict of interest: None

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