Outcome of Patients at Four Weeks in Relation to the Type of Stroke (Ischaemic versus Haemorrhagic) at a Tertiary Care Centre in India

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ABSTRACT

BACKGROUND
Indians are at a higher risk of stroke-related death than Caucasians. There is insufficient information regarding proportion of ischemic and haemorrhagic strokes and associated mortality from India.

METHODS
Stroke patients with haemorrhagic and ischemic strokes were compared with regard to stroke severity, and mortality at 4 weeks in a tertiary care centre in India.

RESULTS
Out of 323 enrolled patients, 77.4% had ischemic strokes and 22.6 had intracranial bleed. Only 1.85% of patients could reach hospital within 4.5 hours. According to NIHSS 64.08% patients had mild to moderate stroke, and 35.9% had severe stroke. Mortality was 17.8% in ICH patients and 8.4% in ischemic stroke patients. The most common cause of mortality was infection (70.58%).

CONCLUSIONS
The proportion of strokes is higher in Indian population. Mortality is higher in haemorrhagic stroke patients. Therefore, they need to be monitored more aggressively. Infection needs to be controlled at all levels with stringent measures, since it is a leading cause of mortality.

KEYWORDS
Stroke, Brain Ischemia, Intracranial Haemorrhages, Incidence

BACKGROUND

Like all developing countries, stroke is fast emerging as a major public health problem in India.[1] Population based estimates confirm a rising trend in both incidence and prevalence of stroke in India. There is insufficient information on the proportion of ischemic and haemorrhagic strokes from India, as most studies have not included neuroimaging. In a population-based study done in Kolkata, infarction was found in 68% of cases.[2] the prognosis for functional recovery after a stroke is influenced by various clinical and medical factors. The main predictors are age, co-morbid illnesses, sex, severity of the initial deficit, severity and size of the infarct, aetiology and location of stroke, time interval from the onset to reach the hospital and the type of medical care, including stroke unit, stroke team, and stroke pathway.[3] Patients with acute ischemic stroke are at high risk of neurologic and medical complications like space occupying oedema formation, haemorrhagic transformation of infarct, epileptic seizures, infections, aspiration and venous thromboembolism. Most complications occur during the first four days of admission. Patients should be monitored closely for early detection of these complications.

In population based studies, case fatality rates in the first month of ischemic stroke range between 8% and 15% while the mortality in ICH cases is much higher 30 to 50%.[4] The most common causes of death in the first few days are cerebral oedema leading to herniation, infections, myocardial infarction, arrhythmias and respiratory failure. Compared with developed nations, stroke mortality rates among Indians have been found to be two to three times higher, suggesting thereby that Indians are at a higher risk of stroke- related death than Caucasians.[5]

METHODS

The study was carried out in Army Hospital (Research & Referral), which is a tertiary care hospital for the armed forces. The study consisted of all indoor and outdoor patients of acute stroke, irrespective of gender. The sample was a mix of patients with urban and rural background. Study was carried out between December 2018 and December 2019. It was an observational study. Prior approval was obtained from the ethical committee. All cases of fresh stroke above 15 years of age reporting, referred, or transferred to this hospital (within two weeks of ictus) were included in the study. Follow up cases of stroke (stroke onset beyond 2 weeks) and patients in whom stroke could not be confirmed by neuro imaging were excluded from the study.

Data Collection Technique and Tools
Patients were included in the study after an informed consent from them or their immediate relatives. Detailed history was obtained from the patient or relatives. All patients were subjected to detailed general and neurological examination, and specific features noted down along with

severity of stroke based on NIHSS and ICH scores were also noted for all intra cerebral bleed patients.

Following clinical evaluation, patients underwent the following investigations: complete haemogram, blood sugar levels (fasting and post prandial), lipid profile (12- hour fasting state), and other metabolic parameters. All patients were subjected to chest radiography (for any evidence of cardiomegaly), 12 lead ECG, and 2D echocardiography to detect cardiac abnormalities. Neuroimaging was performed in all in the form of non-contrast CT head and MRI brain (T1, T2, flair, diffusion studies) while Magnetic Resonance Angiography (MRA) brain was carried out in selected cases. All patients were assessed at 4 weeks for functional outcome based on the Modified Rankin Scale, and mortality was also noted with evaluation as to cause of death.

Data were analysed in a descriptive manner and p-values were calculated using the chi-square test.

RESULTS

A total of 339 patients were screened out of which 323 patients were finally included in the study. All patients were evaluated for demographic characteristics, clinical profile, and outcome over a period of four weeks. There were 190 males and 133 females. Males were more in both the groups (ischemic - 56%; ICH - 68.5%), although the difference between the two sexes was more prominent in ICH group (table 4; Figure 3). However, this difference was not found to be statistically significant (p = 0.056).

Ischemic strokes were higher in number (total of 250 patients) (77.4%) as compared to ICH (total of 73 patients) (22.6%). This distribution of stroke patients between ischemic and ICH was found to be statistically significant (p <0.001) (table 1).

Stroke Type	Number of Patients	%
Infarct / Ischaemic	250	77.40
Bleed / Haemorrhagic	73	22.60
Table 1. Distribution of Types of Stroke		

Majority of the patients were in the age group of 51 to 60 years (37.15%), closely followed by 41 to 50 year's age group (24.46%). The distribution of patients in the given age groups was found to be statistically significant (p <0.001). In ICH, more patients were above 60 years of age (52.04%) (table 2). The age distribution as per type of stroke was found to be significant in all age groups (p <0.001) except patients greater than 70 years (p = 0.157).

Age (in Years)	Bleed	Infarct
15 - 40	07	23
41 - 50	13	66
51 - 60	15	105
61 - 70	28	50
> 70	10	06
Table 2. Age Distribution as per Type of Stroke (n = 323)		

In ICH group our study showed basal ganglia bleed to be the most common site (56.17%) followed by thalamic bleeds (26.03%), lobar bleeds (13.69%), and cerebellar

involvement (4.10%). In ischemic group 29.2% of total infarcts involved frontal, parietal and lateral temporal cortex in various combinations. This was followed by ganglio-capsular region involvement in 26% (Internal capsule: 19.6%, Basal ganglia: 6.32%) and sub cortical white matter in 22.4%. Among Vertebro-basilar artery infarcts, the medial occipital cortex was most commonly involved (6.7%), followed by cerebellum (2.8%) and thalamus (5.2%). Midbrain (2.8%), medulla (2%) and pons (2%) were the other regions involved. Table 3 depicts the time interval from stroke onset to hospitalisation. Only 1.85% patients reached the hospital within 4.5 hours.

Time Interval (Hours)	Number of Patients	%
0 – 4.5	06	1.85
4.5 - 12	86	26.62
12 – 24	130	40.24
> 24	101	31.29
Table 3. Time Interval from Stroke Onset to Hospitalisation (n = 323)		

Severity of Stroke - National Institute of Health Stroke Scale (NIHSS) was applied in all patients to assess severity at admission. A total of 64.08% patients had mild to moderate stroke, and 35.9% had severe stroke (table 4, figure 1).

| NIHSS	Number of Patients	%
Mild Stroke (≤ 6)	90	27.86
Moderate (7-10)	117	36.22
Moderately Severe (11-15)	88	27.25
Severe (≥ 16)	28	8.67
Table 4. Severity of Stroke Based on NIHSS		

Figure 1. Severity of Stroke Based on NIHSS
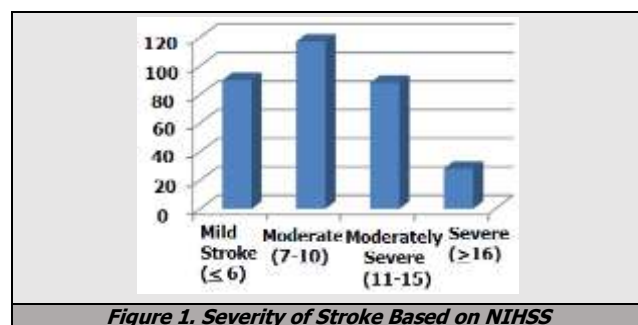
Functional Outcome - Functional outcome was assessed using the modified ranking score (MRS) at 04 weeks. 47.05% patients had an MRS score of 02. Functional outcome was better in ischemic patients (table 5).

MRS	Bleed (n = 60)	Infarct (n = 229)	Total	%
0				
1	02	21	23	7.96
2	17	93	110	38.06
3	32	96	128	44.29
4	9	11	20	6.92
5		02	02	0.69
Table 5. MRS at 4 Weeks (n= 289)				

Mortality - A total of 34 patients (10.52%) expired. Mortality was 17.8% in ICH patients and 8.4% in ischemic stroke patients (figure 2, 3).

Figure 2. Mortality at 4 Weeks (n= 34) (10.52%)

Figure 3. Mortality as per Site of Bleed
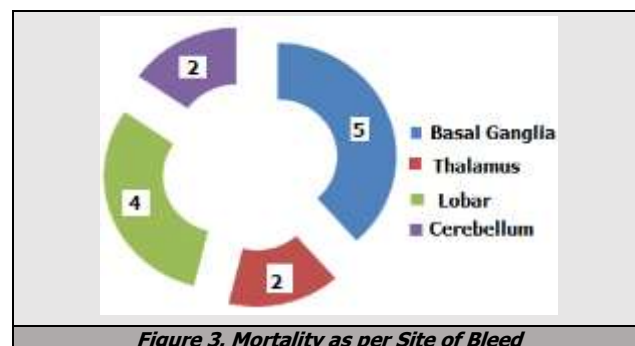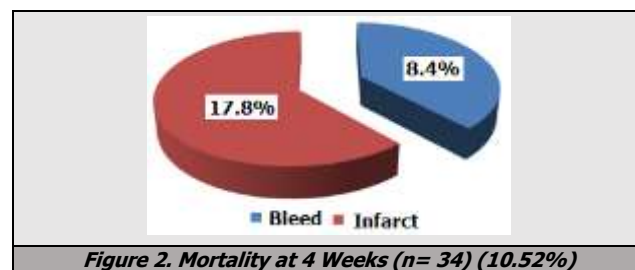
Causes of mortality: Figure 4 shows the various causes of mortality. Infection was the most common cause of mortality seen in 70.58% (n=24) patients. Sex distribution in mortality: Mortality in males was 58.82% and 41.18% in females (Table 6).

Figure 4. Causes of Mortality
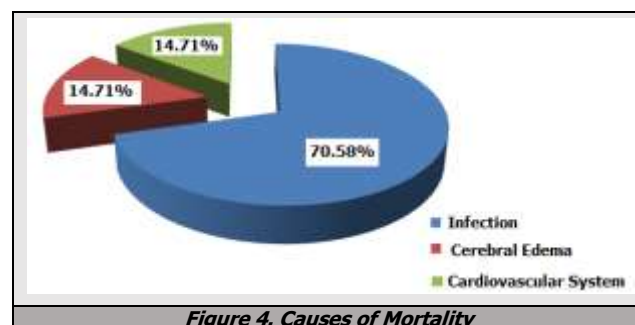
Sex	Number of Patients	%
Male	20	58.82
Female	14	41.18
Table 6. Sex Distribution in Mortality (n = 34)		

DISCUSSION

The present study was carried out at the Department of Neurology, Army Hospital (research & referral) - a tertiary care Centre for the Indian armed forces. A total of 323 patients of stroke were evaluated over the study period with the aim of categorizing their clinical profile and outcome. In our study, the incidence of Ischemic strokes was higher (77.4%) than ICH (22.6%), consistent with findings of several past studies on stroke.[6] The maximum number of patients were in the age group of 51 to 60 years (37.15%). 24.45% patients were in the age group of 41 to 50 years and 24.15% in the age group of 61 to 70 years. Males in our study comprised 58.82% of the total study sample, while females were only 41.17%.

In this study, only 1.85% patients reached the hospital within the golden period. Around 72% of patients reached the hospital only after 12 hours of stroke onset. In Kay et al.[7] among the 773 stroke patients admitted in one year, 63% arrived at hospital within 12 hours, 76% within 24 hours, and 85% within 48 hours of ictus. In the United States Stroke Data Bank, conversely, about half of the patients were admitted by 12 hours and two thirds by 24 hours after onset.[8] in this study, severity of stroke was assessed based on NIHSS. Moderate stroke was most common and seen in 36.22%, followed by mild stroke in 27.86% and moderately severe in 27.24%. Severe stroke constituted 8.66% of total patients. In General, two-thirds of patients had mild to moderate stroke. The Modified Rankin Scale was applied to assess the treatment outcome at 4 weeks.

Among the 323 patients in our study, 7.96% of patients were able to carry out their usual daily activities and 38.06% of patients had mild disability in doing their daily chores. A significant proportion of patients (44.29%) had moderate disability, while 6.92% had moderately severe and severe disability. Patients of ICH were found to have more disability compared to infarct patients. According to the Barcelona stroke registry,[9] the functional limitation at the time of discharge was absent in 28% of patients, followed by mild disability in 22%, moderate disability in 12% and the severe disability was seen in 8%. The mean duration of hospital stay in this study was 23 days. According to Mohr et al., [10] up to 60% of patients require some assistance in daily activity two weeks after ischemic stroke. Compared to this study, our study showed similar number in mild and severe disability, whereas the percentage of moderate disability was more in our study.

In our study, 34 patients were dead on or before 4 weeks and the mortality rate was 10.52%. The commonest cause of death was infection (Pneumonia, Urinary tract infections and Septicemia), which was responsible for 70.58% of total deaths, followed by cerebral oedema in 14.7%, and myocardial infarction in 14.7%. According to the Rochester Epidemiologic Project, the risk for death after first ischemic stroke is 7% at 7 days, 14% at 30 days, 27% at 1 year, and 53% at 5 years.[11] In the Barcelona stroke registry[9], 30 day mortality rate for ischemic stroke was 12% and the most frequent complication was infection, seen in 14.5% of patients similar to our study.

The Trivandrum Stroke Registry [12] reported that the 28th day case fatality rate in both ischemic and haemorrhagic strokes was 24.5%, while the Lausanne stroke registry[13] reported that the overall mortality rate was 5.9% for ischemic strokes, of which 86.4% of total deaths were directly or indirectly due to stroke. In ICH patients, various studies have reported a mortality rate of 19-50% at 30 days.[14] Hier et al.[15] reported infections as the most common medical complication (30.5%) followed by arrythmias (8.4%).

CONCLUSIONS

The proportion of strokes is higher in Indian population. Mortality is higher in haemorrhagic stroke patients. Therefore, they need to be monitored more aggressively. Infection needs to be controlled at all levels with stringent measures, since it is a leading cause of mortality.

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