Original Article

A Study of Clinical Profile and Subtypes of Acute Ischemic Stroke in a Tertiary Care Center

Siddharth Raghuvanshi

Assistant Professor, Department of Medicine, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India

Abstract

Background: Stroke is a major public health problem and has high mortality and morbidity rate. There is great variability seen in clinical presentation and etiology of stroke patients. Ischemic stroke needs to be classified into subtypes, for proper treatment and prognosis.

Objective: To study the clinical pattern of stroke and to identify the risk factors in various subtypes of acute ischemic stroke according to Trial of Org 10172 in acute stroke treatment (TOAST) criteria.

Materials and Methods: This was an observational non-interventional study, where a total of 240 consecutive patients of both sex and age more than 20 years of age presenting as first-ever acute stroke were evaluated in the Department of Medicine, Chirayu Medical College and Hospital, Bhopal. Ischemic stroke patients were further classified into subtypes as per TOAST classification.

Results: In our study, 175 patients (72.9%) had ischemic stroke and 65 patients (27.1%) had hemorrhagic stroke. The mean age was 53.02 ± 14.38 years in ischemic stroke group and 52.84 ± 12.45 years in hemorrhagic stroke group. Overall stroke patients included 172 (71.67%) males and 68 (28.33%) females (M: F = 2.53:1). In ischemic stroke patients, 130 (74.28%) were males and 45 (25.71%) were females. In hemorrhagic group, 42 (64.61%) were males and 23 (35.38%) were females. Overall index stroke was on the left side in 113 (47.08%) patients, and it was on the right side in 125 (52.08%) patients. 2 (0.08%) patients also had bilateral stroke (thalamus). Almost similar proportion of laterality was seen in ischemic and hemorrhagic stroke patients. Most common risk factors were dyslipidemia (62.86%), hypertension (52.57%), smoking (41.14%), and diabetes (29.14%). As per the TOAST classification of ischemic stroke, it was observed that 72 cases (41.1%) had large vessel atherothrombotic disease, 27 cases (15.4%) had small vessel disease (lacunar infarcts), 28 cases (16%) had cardioembolic strokes, 4 cases (2.2%) had stroke due to determined etiology, and 44 cases (25.1%) had stroke of undetermined etiology.

Conclusion: Most of the patients had ischemic stroke as compared to hemorrhagic stroke. It was more common in males. Most patients had large vessel disease. The study contributes to understanding of demographic characteristics, risk factors, and stroke subtypes in acute ischemic stroke. Large vessel atherosclerosis is the most common subtype, as in other Asian studies. The importance of various risk factors among ischemic stroke subtypes should be stressed for prompt preventive strategies and treatment.

Key words: Ischemic stroke, Risk factors, TOAST criteria

INTRODUCTION

Stroke is one of the leading causes of morbidity and mortality worldwide.[1] Ischemic strokes account for 50-85% of all strokes worldwide.[2] Stroke case - fatality defined as the proportion of events that are fatal within 28 days post stroke averages 30%.[3] Stroke is also a leading cause of disability in adults. Among the stroke survivor each year, 30% requires assistance with activities of daily living, 20% requires assistance with ambulation, and 16% requires institutional care leading to serious long-term physical and mental disabilities among survivors.[4] Thus, it is apparent that stroke is a major public health problem and has high mortality and morbidity rate.

Ischemic stroke has subtypes with variable underlying pathogenesis and studies on ischemic stroke as a whole without subtype classification may inadequately evaluate risk

Corresponding Author: Dr. Siddharth Raghuvanshi, Department of Medicine, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India. E-mail: raghusiddharth@gmail.com

factors. Thus, ischemic stroke needs proper classification into its subtypes, which helps in proper diagnosis, treatment, prognostication, and in research. Subtyping of stroke reduces the heterogeneity of ischemic stroke phenotype.[5] There are very few studies on stroke subtype classification in India.

Objective

The aim of this study was to evaluate the clinical pattern of stroke and to identify the various risk factors in subtypes of acute ischemic stroke according to the Trial of Org 10172 in Acute Stroke Treatment (TOAST) criteria.

MATERIALS AND METHODS

This was an observational and non-interventional study, where a total of 240 consecutive patients of both sex and age more than 20 years presenting as first-ever acute stroke were evaluated in the Department of Medicine, Chirayu Medical College and Hospital, Bhopal. This study was done with the following inclusion and exclusion criteria:

Inclusion Criteria

1. Subjects aged older than 20 years
2. The diagnosis of acute stroke (ischemic/hemorrhagic) based on clinical evaluation and imaging (computed tomography [CT]-head/magnetic resonance imaging [MRI] brain).

Exclusion Criteria

1. Patients with stroke-like conditions due to systemic diseases such as infections and trauma
2. All hemorrhagic stroke patients who have posttraumatic, drug-induced (e.g., anticoagulant-induced), and those with bleeding diathesis-related etiologies will be excluded
3. Patients in whom the whole investigation protocol was not possible.

Clinical Definition of Acute Stroke

Clinically, the stroke will be defined as per the WHO definition. According to the WHO, stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal and at times global (applied to patients in deep coma and those with subarachnoid hemorrhage) loss of cerebral function with symptoms lasting more than 24 hrs or leading to death, with no apparent cause other than that of vascular origin.[6]

All the patients fulfilling the definition of acute stroke were subjected to CT scan head (plain) and MRI brain involving standard sequences of T1WI, T2WI, fluid attenuation inversion recovery image, diffusion-weighted imaging with apparent diffusion coefficient and gradient echo imaging. All the patients were assessed clinically through detailed history and clinical examination. From the history, various

demographic variables were collected including age, sex, history of transient ischemic attack/stroke, hypertension, diabetes mellitus, coronary artery disease, prestroke disability, smoking, and family history of stroke. Routine hematological and biochemical tests including Hb, total leukocyte count, erythrocyte sedimentation rate, blood sugar, and lipid profile were done. Electrocardiogram (ECG), echocardiography, and carotid Doppler study were done in all patients. After the availability of the results of all investigations, ischemic stroke patients were grouped according to the TOAST subtypes.[7]

Statistical Analysis

All the data were fed on excel spreadsheet, and statistical analyses were made using Epi Info version 3.3.2.

RESULTS

Age and Sex

The age range of the study group was 24-88 years. The study group included 172 (71.67%) males and 68 (28.33%) females (M: F = 2.53:1). 175 patients (72.9%) had ischemic stroke and 65 patients (27.1%) had hemorrhagic stroke. The mean age was 53.02 ± 14.38 years in ischemic stroke group and 52.84 ± 12.45 years in hemorrhagic stroke group. In ischemic stroke patients, 130 (74.2%) were males and 45 (25.8%) were females. In hemorrhagic group, 42 (64.6%) were males and 23 (35.4%) were females (Tables 1 and 2).

Age Distribution

Overall about half (55%) of stroke patients were in the age group 41-60 years, 18.3% patients were of age ≤40 years, and 27.5% of patients were having age more than 60 years (Table 3).

Routine Investigations

The routine laboratory investigations revealed normal renal functions and liver functions in all the cases. ECG showed evidence of ischemia in 14 patients, left ventricular

Table 1: Type of index stroke

Type of stroke	Number of patients n (%)
Ischemic	175 (72.9)
Hemorrhagic	65 (27.1)
Total	240 (100.0)

Table 2: Mean age of patients as per gender and stroke type

Gender	Ischemic stroke		Hemorrhagic stroke	
	n	Mean age (years±SD)	n	Mean age (years±SD)
Male	130	54.42±12.24	42	51.21±12.03
Female	45	51.16±12.72	23	55.23±13.21
Total	175	53.02±14.38	65	52.84±12.45

hypertrophy in 10 patients, and atrial fibrillation in 6 patients.

Index Stroke Characteristics
Type of index stroke
In our study, 175 patients (72.9%) had ischemic stroke and 65 patients (27.1%) had hemorrhagic stroke (Table 1).

Laterality of index stroke
Overall index stroke was on the left side in 113 (47.08%) patients and it was on the right side in 125 (52.08%) patients. 2 (0.08%) patients also had bilateral stroke (thalamus). Almost similar proportion of laterality was seen in ischemic and hemorrhagic stroke patients (Table 4).

Etiological Evaluation of Ischemic Stroke
There were 175 cases of ischemic stroke in our study. The TOAST classification was used to classify these cases based on etiology. Besides the clinical features, other investigations done to classify these cases were routine investigations such as blood sugar, lipid profile, MRI (brain), intracranial MR angiography, transthoracic echocardiography, and carotid Doppler. Only in cases in which no abnormality could be detected on these primary investigations, extensive battery of investigations was done to find out any other determined etiologies of stroke.

Thus, using TOAST classification, it was observed that 72 cases (41.1%) had large vessel atherothrombotic disease, 27 cases (15.4%) had small vessel disease (lacunar infarcts), 28 cases (16%) had cardioembolic strokes, 4 (2.2%) cases had stroke due to determined etiology, and 44 cases (25.1%) had stroke of undetermined etiology (Table 5).

Risk Factor Assessment of Ischemic Stroke Patients
Among ischemic stroke patients, 92 (52.57%) patients were hypertensive, 51 (29.14%) patients were diabetic, 110 (62.86%) patients had dyslipidemia, and 72 (41.14%) patients were smokers. History suggestive of coronary artery disease was present in 10 (5.71%) patients, atrial fibrillation was present in 6 (3.43%) patients, and 8 (4.57%) patients had rheumatic heart disease. 24 (13.71%) patients had history of transient ischemic attack or previous stroke (Table 6).

DISCUSSION

The mean age of our stroke patients was 53.02 ± 14.38 years for ischemic stroke and 52.84 ± 12.45 years for hemorrhagic stroke which was relatively younger than those seen in the Western studies. In the Indian subcontinent, stroke happens nearly a decade earlier than West and young strokes constitute about 20% of stroke population in India;[8,9] at least in the clinical studies, although in some recent epidemiological studies, the overall proportion of younger stroke patients was lesser.[10] In both ischemic and hemorrhagic stroke types, about half of the patients were in age group 41-60 years. This may probably because the demographic profile of the Indian population is having a relatively large young base and small top.[8,9] Our study cohort also had a sizable number, i.e., 42 (17.5%) patients who were 40 years of age or less and 66 (27.5%) were aged more than 60 years. These figures are generally in agreement with hospital-based cohort described in Indian studies.[8,9] The gender distribution showed an M:F ratio of 2.89:1 in ischemic stroke and 1.83:1 in hemorrhagic stroke patients. This gender difference possibly resulted from inherent social bias, in which female patients are less likely to be admitted to hospital compared to male patients. Our study was comparable to other Indian studies on stroke patients where greater preponderance was seen among males.[8,11] In our study, 175 (72.9%) patients had ischemic stroke, whereas 65 (27.1%) patients had hemorrhagic stroke. This is consistent with the reported proportion of ischemic stroke of 68% from community-based studies to 80% from hospital-based study.[12,13] We classified 175

Table 3: Age distribution of patients as per stroke type

Age range (years)	n (%)		
	Ischemic	Hemorrhagic	Total
20-40	32 (18.28)	10 (15.3)	42 (17.5)
41-60	92 (52.5)	40 (61.5)	132 (55.0)
61-80	49 (28.0)	15 (23.0)	64 (26.6)
>80	2 (1.14)	0	2 (0.83)
Total	175 (100.0)	65 (100.0)	240 (100.0)

Table 4: Laterality of index stroke

Laterality	n (%)		
	Ischemic stroke	Hemorrhagic stroke	Total
Right	93 (53.1)	32 (49.2)	125 (52.08)
Left	80 (45.7)	33 (50.8)	113 (47.08)
Bilateral	02 (1.14)	0 (0)	2 (0.08)
Total	175 (100.0)	65 (100.0)	240 (100)

Table 5: Etiology of index acute ischemic stroke by TOAST criteria

TOAST category	n (%)
LV	72 (41.1)
SV	27 (15.4)
CE	28 (16.0)
Determined etiology	04 (2.2)
Undetermined	44 (25.1)
Total	175 (100.0)

Table 6: Risk factor profile of ischemic stroke patients

Risk factor	n (%)
Hypertension	92 (52.57)
Diabetes	51 (29.14)
Dyslipidemia	110 (62.86)
Smoking	72 (41.14)
Tobacco chewing	18 (10.28)
Coronary artery disease	10 (5.71)
Atrial fibrillation	6 (3.43)
RHD	8 (4.57)
History of stroke/TIA	24 (13.71)

ischemic stroke patients according to the TOAST subtypes.[7] Maximum numbers of patients 72 cases (41.1%) had large vessel atherothrombotic disease, 27 cases (15.4%) had small vessel disease. (lacunar infarcts), 28 cases (16%) had cardioembolic strokes, 4 (2.2%) cases had stroke due to specific determined etiology, such as Takayasu's arteritis, and 44 cases (25.1%) had stroke of undetermined etiology. Our findings were consistent with the available Indian data of ischemic stroke subtypes.[14] A hospital-based registry of Southern India[14] has attributed 41% of strokes to large artery atherosclerosis, 18% to lacunar causes, 10% to cardioembolic causes, 4% to specific causes, and the remaining 27% of the cases to undetermined etiology. We had a slightly greater proportion of cardioembolic strokes possibly due to the fact that our center is a tertiary care center catering various cardiac illnesses and cardiac interventions.

CONCLUSION

Incidence of stroke is on rise in our country. Most of the patients had ischemic stroke as compared to hemorrhagic stroke. The sex distribution of stroke patients showed that it was more common in males. Most patients had large vessel disease. There should be emphasis on the various risk factors of ischemic stroke subtypes for preventive strategies and treatment.

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