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Risk Factor Profile And Etiologic Classification (Toast Classification) Of Ischemic Stroke From A Tertiary Care Center From Western Uttar Pradesh India

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ABSTRACT

Introduction: Stroke is an etiologically heterogeneous disease, making it crucial to determine the specific reason for each patient. This is essential because the approach to treatment and long-term prevention strategies can vary significantly. The TOAST classification has proven helpful for the initial classification of strokes and for guiding management plans. However, research on this topic is limited in Western Uttar Pradesh, India. **Aims And Objective:** The objective is to classify the etiology of ischemic stroke patients in Northern India according to the TOAST criteria and to analyze the risk factor profile of these patients.**Material And Methods:** This research was an observational, prospective cohort study carried out at Santosh Medical College in Uttar Pradesh, India. The study included patients diagnosed with ischemic stroke, as defined by World Health Organization criteria, or those who experienced a transient ischemic attack (TIA). Upon admission, data regarding demographics, including age and gender, as well as vascular risk factors, were gathered. The etiological assessment comprised standard blood tests, brain imaging through computed tomography or magnetic resonance imaging, and evaluations using carotid and vertebral Doppler ultrasound, along with echocardiographic examinations. **Results**: In our research, we examined a cohort of 200 patients diagnosed with ischemic stroke, comprising 52% (104) males and 48% (96) females. The highest incidence was observed in the age group of 61-70 years, with 18% of cases occurring in both male and female patients within this range. According to the TOAST classification, 40 patients (20%) were identified as having athero-thrombotic strokes, 80 patients (40%) as cardio-embolic, 42 patients (21%) as lacunar, and 38 patients (19%) as having strokes of undetermined origin. The predominant risk factor was hypertension, affecting 60% of the patients, followed by smoking at 52%, diabetes and obesity both at 28%, and a history of stroke at 12%. **Conclusion:** This research provides valuable insights into the etiological classification and risk factor profile of stroke patients in Western Uttar Pradesh, India. The classification of etiologies is crucial for making immediate treatment decisions, while understanding the risk factor profile is essential for developing long-term strategies, such as secondary prevention of stroke. Our findings indicate that hypertension and smoking are the two predominant risk factors among stroke patients, with cardio-embolic stroke being the most prevalent type according to the TOAST criteria.

KEYWORDS- STROKE, SMOKING, HYPERTENSION ,TOAST.

INTRODUCTION

Stroke is a disease with diverse etiologies, making it crucial to identify the specific cause in each patient, as management and long-term prevention strategies for recurrences can vary significantly. The classification of ischemic stroke subtypes has been extensively researched. Historically, classifications have relied on risk factor profiles, clinical manifestations of the stroke, and results from brain imaging studies. However, there is considerable overlap in clinical and imaging characteristics, which are not unique to any specific subtype of ischemic stroke. Some researchers have categorized strokes based on clinical indicators that predict the size and location of the ischemic lesion, often overlooking the underlying etiology.[1] Other studies have shown that the etiology of a stroke can impact prognosis, with higher mortality rates observed in patients with large-artery atherosclerotic lesions compared to those with lacunar strokes. Additionally, patients with cardioembolic strokes are at a greater risk for recurrent strokes than those with strokes from other causes. The one-month mortality rate following a cardioembolic stroke is also elevated compared to strokes of different origins. Understanding the cause of a stroke is essential for guiding management decisions. Therefore, an initial

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diagnosis of the presumed subtype of ischemic stroke should be based on clinical features. For the Trial of Org 10172 in Acute Stroke Treatment (TOAST), a randomized, placebo-controlled, blinded study involving low molecular-weight heparin administered within 24 hours post-stroke, a classification system was developed to diagnose ischemic stroke subtypes, incorporating elements from existing diagnostic frameworks known as the TOAST classification.[8]

TOAST Classification of Subtypes of Acute Ischemic Stroke include:

i.Large-artery atherosclerosis (embolus/thrombosis)
ii.Cardio embolism (high-risk/medium-risk)
iii.Small-vessel occlusion (lacune)
iv.Stroke of other determined etiology
v.Stroke of undetermined etiology

a. Two or more causes identified
b. Negative evaluation
c. Incomplete evaluation

Atherothrombotic and cardioembolic subtypes encompass patients exhibiting clinical signs of dysfunction in the cortical, brainstem, or cerebellar regions, along with brain imaging that shows infarcts larger than 1.5 cm. For the atherothrombotic subtype, there must be evidence of stenosis exceeding 50% in a relevant intracranial or extracranial artery.

In the case of the cardioembolic subtype, it is essential to identify a high or medium risk cardiac source of embolism. The lacunar subtype is characterized by a classic clinical lacunar syndrome, which lacks signs of cerebral cortical dysfunction, and presents with normal findings on computed tomography or magnetic resonance imaging, or a pertinent brainstem or subcortical hemispheric lesion measuring less than 1.5 cm in diameter.[3]

Strokes classified as having undetermined etiology involve patients with two or more identified causes, those who have undergone a negative evaluation, or individuals with incomplete assessments. Strokes attributed to other determined etiologies include patients with uncommon stroke causes such as non-atherosclerotic vasculopathies, hyper-coagulable states, or hematologic disorders. In terms of stroke subtypes, small vessel occlusion was diagnosed in 20.5% of cases, large-artery atherosclerosis in 7.2%, cardioembolism in 17.8%, other determined etiologies in 22.3%, and undetermined etiology in 23.5%. Evaluating risk factors for acute stroke is crucial for the secondary prevention of stroke.[5] The four predominant risk factors include hyperlipidemia (53.1%), smoking (49.8%), hypertension (45.8%), and a family history of stroke (29.3%). Approximately 10% of stroke patients exhibit significant stenosis (≥50%) in the carotid and vertebral arteries. Additionally, around 25-30% present with significant intracranial stenosis, with atherosclerosis being the leading cause of this condition.[7]

Aims And Objectives

To determine risk factor profile in ischemic stroke patients and etiologic classification of ischemic stroke patients based on TOASTcriteria.

MATERIAL AND METHODS

Our study was an observational, prospective cohort study.The study population consisted of consecutive ischemic stroke patients admitted in department of medicine over a period of 1.5 years in Santosh medical college located in Western Uttar Pradesh, india.

Inclusion Criteria - Patients with Ischemic stroke (according to the World Health Organization criteria) or transient ischemic attack (TIA) .

Clinical Protocol : Information was collected on demographic information (age, sex), vascular risk factors, history of atrial fibrillation, history of myocardial infarction or ischemic stroke, use of antiplatelet or anticoagulant medications before stroke, blood pressure (systolic and diastolic) at admission, and National Institutes of Health Stroke Score Scale (NIHSS) collected at admission.[2] The following vascular risk factors were examined: hypertension (defined as use of antihypertensive medication, systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg before stroke onset or 2 weeks after stroke onset); diabetes (defined as taking oral antidiabetic medication or insulin or fasting plasma glucose ≥ 126 mg/dL or glycated hemoglobin level ≥ 6.5%); hyperlipidemia (defined as use of lipid-lowering medication or serum cholesterol ≥ 220 mg/dL); smoking; and obesity (defined as BMI ≥ 30 kg/m2).

The etiological workup included complete blood count, erythrocyte sedimentation rate, liver and kidney function, glucose and lipid levels, protein electrophoresis, and coagulation studies. Computed tomography and/or magnetic resonance imaging of the brain, carotid and spinal Doppler studies, and transthoracic echocardiography (M-mode, 2-dimensional and Doppler studies) were performed in all patients.

The following parameters were recorded on ECHO: atrial dimensions (atrial dilation was defined as end-systolic diameter > 40 mm), spontaneous left atrial echo contrast, intracardiac thrombus, left ventricular ejection fraction (LVEF), persistent ovality of patent foramen, hypokinetic ventricular wall area, diastolic dysfunction, and left ventricular hypertrophy. All patients under the age of 55 underwent contrast-agitated saline ECHO (transthoracic/transesophageal) to screen for right-to-left shunts. Stroke etiology

classification was based on the criteria of the "Six Organizations 10172 Trials in Acute Stroke Treatment Criteria" study. Statistical analysis data were stated as mean ± SD and percentages. Categorical variables were compared using Pearson's chi-square test. Quantitative variables were analyzed using independent two-sample t tests and Mann-Whitney U tests. A p value of less than 0.05 was considered statistically significant. Analyses were performed using SPSS 16..

DISCUSSION

Ischemic stroke is an important public health problem. It is an etiologically heterogeneous disease, and identification of a specific cause has important clinical implications. Our study included 200 patients with ischemic stroke, of which 52% (104) were men and 48% (96) were women .

Table 1: Showing age and gender-wise distribution of patients in our study.

Age Group	**Male**	**Female**	**Total**
21-30	2 (1%)	2(1%)	3 (1.5%)
31-40	0	2(1%)	1(0.5%)
41-50	2 (1%)	8(4%)	9(4.5%)
51-60	136 (17%)	20(10%)	55(27.5%)
61-70	36 (18%)	36(18%)	76(38%)
71-80	24 (12%)	20(10%)	44(22%)
81-90	4 (2%)	16(2%)	10(5%)
91-100	2 (1%)	4 (2%)	2(1%)
Total	104 (52%)	96(48%)	200(100%)

The peak age at onset was 61-70 years. In this age group, 18% of the cases were male and 18% of the cases were female. Classifying the patients according to the TOAST criteria, 40 (20%) of the patients were found to have atherothrombotic stroke, 80 (40%) to have cardioembolic stroke, 42 (21%) to have lacunar stroke, and 38 (19%) to have cryptogenic stroke.[6]

Table 2 : Showing Etiologic Subtype Of Stroke (As Per Toast Classification).

TOAST CLASS	NO OF PATIENT	%
ATHEROTHROMBOTIC	40	20
CARDIOEMBOLIC	80	40
LACUNAR	42	21
UNDETERMINED	38	19
TOTAL	200	100

We classified the patients into four classes because we did not test the patients for rare causes of stroke, such as hyper-coagulability or vasculitis, and 10 of them were classified as having a stroke of cryptogenic origin. His study included 200 patients with ischemic stroke and classified the patients according to the TOAST etiology subtypes: 80 (40%) were diagnosed with cardioembolic, 40 (20%) with atherothrombotic, 42 (21%) with lacunar, and 38 (19%) with ischemic stroke of cryptogenic origin.[3]

In our study 28 % of patients were diabetics and 60 % were hypertension .

Table 3 : Showing Prevalence Of Different Risk Factors In Our Stroke Patients.

Variable	**Number of patients (percentage)**
Hypertension	120 (60%)
Diabetes	56 (28%)
Obesity	56 (28 %)
Smoker	104 (52%)
TIA	36 (18%)
Stroke History	24 (12%)

These findings 11 were consistent with study by Koudstaal PJ. et al who reported 27.3% of patients with stroke. In our study 52 % of patients 104 were smokers. In the study by Koudstaal PJ. et al , 37% of stroke patients were smokers. This difference in smoking prevalence is probably due to the different smoking prevalence in different communities. In our study, 28% of patients were obese. Similar results were obtained in their study: 24.1% of patients were obese. In our study, TIA was reported in 18% of patients; similar results were obtained by Ammons SB, et al .They reported TIA in 14.9% of patients. In our study, 10% of patients had a history of stroke.[10,11]

These results 12 are consistent with the study by Ammons SB, et al. reported myocardial infarction in 14% of patients. In our study, the mean hemoglobin and creatinine values were 13.30 ± 0.98 g/dL and 0.91 ± 0.14 mg/dL, respectively, and these results are consistent with the study by Ammons SB, et al.[10]

Table 4 : Showing Lipid Profile, Hemoglobin, Creatinine In Our Stroke Patients.

Variable		Mean (SD)
Lipid Profile (mg/dl)	HDL	37.4 +/- 8.3
	LDL	94.15+/-23.1
	Cholesterol	219.4+/-41.2
	Triglycerides	257.6+/-91.4
Haemoglobin (gm/dl)		13.1+/-0.91
Creatinine (mg/dl)		0.81+/-0.12

And mean cholesterol, HDL, LDL and triglycerides levels were 219.4±41.2 mg/dl, 37.4±8.3 mg/dl, 94.15±23.1 and 257.6±91.4 respectively.

CONCLUSION

Stroke represents a significant public health concern. This research provides valuable insights into the etiological classification and risk factor profile of stroke patients in western Uttar Pradesh, India. The classification of etiologies aids in making prompt treatment decisions, while understanding the risk factor profile is essential for developing long-term strategies, such as secondary prevention of stroke. Our findings indicate that hypertension and smoking are the two primary risk factors among stroke patients, with cardio-embolic stroke being the most prevalent type according to the TOAST criteria.

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