

**Original Research Article**

**REVIEW OF CLINICAL PROFILE AND EARLY MANAGEMENT OF STROKE PATIENTS IN EMERGENCY MEDICINE DEPARTMENT**

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**Abstract**

**Aim:** The aim of this study was to review the clinical profile and early management of stroke patients presenting to the emergency medicine department of a tertiary care hospital.

**Methodology:** A cross-sectional, descriptive study conducted on patients presenting at the emergency department of a tertiary care hospital with symptoms suggestive of cerebrovascular stroke.

**Results:** According to the study results, the mean age of the patients included was found to be 62.7 years, with the highest proportion in the age bracket of 60–69 years, constituting 29% of the total. Young stroke (age 40 or less) comprised 12.5% of all patients. This study found that the median time to casualty arrival was 6.5 hours, and the mean arterial pressure (MAP) of patients on admission was 118.7 mmHg. Also, 21 (61.7%) patients with ICH had a MAP of greater than or equal to 130 mmHg on admission. Among the 200 cases of stroke in this study, most of the cases had an abnormal ECG (71%), with T-wave inversion being the most common abnormality observed.

In the study, only 68 of 200 patients presented to the emergency department in the window period (within 4.5 hours). Out of these 68 patients, 38 were found to have had an ischemic stroke, and 10 underwent thrombolysis. Among other interventions, 28 patients required intubation and mechanical ventilation. Intubation rates were 7% for ischemic stroke patients and 38% for ICH patients.

**Conclusion:** The paucity of community-based studies on stroke has been a hindrance in guiding the development and organization of a stroke policy for our country. Delay in presentation has been one of the major limiting factors in the early thrombolysis of stroke patients. A major impetus is also to be given to addressing modifiable risk factors to reduce the burden of stroke in society. Stroke is a major contributor to morbidity and mortality. To mitigate its impact, it is essential to implement comprehensive strategies and foster cooperation in order to close the gap in stroke care between developed and developing countries.

**Key words:** Central Nervous System, Cerebral Venous Thrombosis, Emergency Department, Subarachnoid Haemorrhage, Transient Ischemic Attacks

## INTRODUCTION

Stroke is a significant cause of disability and mortality worldwide. The current World Health Organization (WHO) definition of stroke (introduced in 1970 and still used) is “rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.” [1] According to the standard definition, transient ischemic attacks (TIA) classify focal symptoms that last for less than 24 hours. [2] For many stroke victims, the Emergency Department (ED) serves as their point of entry into the medical system. Preventing morbidity and mortality in stroke cases requires prompt examination, diagnosis, and treatment in the emergency department. Having a structured approach in the ED improves the capacity to recognize and treat stroke patients. Stroke patients have dynamic changes in their condition during the first few hours, necessitating close monitoring of their changing neurological state, vital signs, and respiratory status and adjusting treatment as necessary. [3] Acute therapeutics for ischemic stroke, such as tissue plasminogen (tPA), were approved by medical authorities more than 20 years ago, emphasizing the need for promptly evaluating stroke patients. The goal for acute management of patients with stroke is to stabilize the patient and complete initial evaluation and assessment, including imaging and laboratory studies, within 60 minutes of patient arrival. [4] The promise of tPA benefiting many stroke victims has not yet been fulfilled. It is necessary to evaluate the advancements made in stroke diagnosis and therapy over the past two decades since tPA was approved for use in patients with ischemic stroke. This study reviews the in-hospital evaluation and management of stroke patients in the ED in a tertiary care hospital.

## MATERIALS AND METHODS

A cross-sectional, descriptive study was conducted on patients presenting at the emergency department of a tertiary care hospital in Ahmedabad with symptoms suggestive of cerebrovascular stroke. The study aimed to evaluate cases of cerebrovascular stroke presented at the department between January 2015 and August 2016.

**Sample Size:** A total of 200 cases of cerebrovascular stroke were included in the study. All cases meeting the pre-defined inclusion and exclusion criteria, admitted to the emergency medicine department between January 2015 and August 2016, were considered.

**Sampling Method:** Inclusion criteria encompassed patients admitted in the emergency medicine department clinically diagnosed with cerebrovascular stroke or diagnosed based on CT scan or MRI reports. Exclusion criteria included patients referred from another medical facility, cases due to trauma or head injury, and patients or their relatives declining voluntary informed consent to participate in the study.

## Tools for Data Collection

Data collection was facilitated using a pre-designed, semi-structured, and pretested schedule.

### Data Collection

Relatives of patients meeting the inclusion criteria were approached and briefed about the study's purpose. They were assured that participation wouldn't disrupt regular health services. Oral consent was obtained from them. If the patient was able to provide voluntary informed oral consent, it was acquired.

Upon securing oral consent, the study schedule was completed using patient records, case sheets, and investigation reports. Additional information, when necessary, was gathered from the patient or their relatives.

### Study Procedure

Upon arrival, stroke-suspected patients underwent emergency triage, evaluating Airway, Breathing, and Circulation. Vital signs, including RBS (Random Blood Sugar), were recorded, and an intravenous line was established. Patients needing intubation due to respiratory distress or a low GCS were intubated, and mechanical ventilation was initiated. Initial assessment collected demographic data, time of stroke onset, and risk factors. Subsequently, patients underwent CT brain scans. The decision to administer tPA was made by the attending neurologist after assessing stroke severity, reviewing CT scans, and completing a thrombolysis checklist. Risks and benefits of thrombolysis were discussed with patients or their next of kin.

Eligible patients received intravenous tPA (0.9mg/kg) in the ED, with 10% given as a bolus over 1 minute, followed by a 1-hour infusion. Neurosurgical consultation was sought for patients with ICH or SAH in CT imaging. Mannitol 1gm/kg was infused as needed. IV antihypertensives were administered per protocol. Ryles tube and Foley catheter insertion were performed if necessary. A bedside 2D echo was conducted for all study patients, and cardiology consultation followed significant findings. Patients not requiring intensive care were transferred to respective medical unit wards. ICU admission candidates remained in the Emergency Medicine unit for initial 24hrs for monitoring and stabilization, then transferred to respective medical or neurosurgical units as needed.

### Data Analysis

Data entry and analysis utilized Statistical Package for Social Sciences (SPSS) software (version 17.0; SPSS Inc, Chicago). Descriptive statistics (mean, SD for continuous variables, frequency & percentage for categorical variables) were employed. Graphical representations were used where appropriate. Statistical tests like Chi-square, Fisher's exact test, and independent sample t-test determined significance (set at 0.05) in proportions or means.

## RESULTS

### 1. Base line characteristics of the study subjects

This study comprised individuals aged 16 to 92 years, with an average age of 62.7 years. The highest proportion of stroke cases occurred in the age range of 60–69 years, constituting 29% of the total, followed by 25% in the 50–59 year range. Young stroke cases ( $\leq 40$  years) accounted for 12.5% of all patients. The gender distribution showed 58% male and 42% female participants, leading to a male-to-female ratio of 1.38:1. Notably, the mean age among women (65.4 years) exceeded that of men (61.2 years). Hypertension was the most prevalent risk factor, affecting 53% (106 patients), followed by tobacco use (32%), previous stroke history (26%), diabetes (24%), dyslipidemia (17%), coronary artery disease (12%), and alcohol

consumption (7%). Additionally, rare occurrences included five cases of rheumatic heart disease and three patients presenting in the postpartum period. (Table 1)

**Table 1: Base line characteristics of the study subjects**

| Variables             | Characteristics                   | Number of patients | Percentage (%) |
|-----------------------|-----------------------------------|--------------------|----------------|
| <b>Age (in years)</b> | >40                               | 25                 | 12.5           |
|                       | <b>40-49</b>                      | 31                 | 15.5           |
|                       | <b>50-59</b>                      | 50                 | 25.0           |
|                       | <b>60-69</b>                      | 58                 | 29.0           |
|                       | >70                               | 36                 | 18.0           |
| <b>Gender</b>         | <b>Male</b>                       | 116                | 58             |
|                       | <b>Female</b>                     | 84                 | 42             |
| <b>Risk factors</b>   | <b>Hypertension</b>               | 106                | 53             |
|                       | <b>Diabetes mellitus</b>          | 48                 | 24             |
|                       | <b>Previous history of stroke</b> | 52                 | 26             |
|                       | <b>RHD</b>                        | 05                 | 2.5            |
|                       | <b>CAD</b>                        | 24                 | 12             |
|                       | <b>Hyperlipidemia</b>             | 34                 | 17             |
|                       | <b>Tobacco</b>                    | 66                 | 32             |
|                       | <b>alcohol</b>                    | 14                 | 07             |
|                       | <b>Atrial fibrillation</b>        | 08                 | 04             |
|                       | Total                             | 200                | 100            |

## 2. Clinical and diagnostic Features of Patients stroke patients included in the study

This study detailed the prevalent clinical presentations among 200 stroke cases, revealing motor deficit as the most common (73%), followed by sensory deficit (41.5%), speech involvement (32%), altered sensorium (17.5%), instability of gait (7.5%), and seizures (6.5%). The median time to casualty arrival stood at 6.5 hours, with 34% admitted within 4.5 hours, 50% within 6 hours, and 93% within 24 hours. Notably, ICH and SAH cases showed significantly higher rates of ED arrival within 4.5 hours compared to ischemic stroke cases (Chi Square = 32.25,  $p < 0.05$ ). Among stroke cases, 71% had abnormal ECGs, primarily indicating T-wave inversion (34%) and LVH (31%). Bedside transthoracic echocardiography, conducted on all patients, revealed normal results in 54% cases, while 38% exhibited LV hypertrophy, and 11.5% had LV systolic dysfunction, often concomitant with LVH. For those

arriving within the 4.5-hour window, 58% received a CT scan within 30 minutes, and almost 87% within 45 minutes, indicating relatively prompt imaging assessment. (Table 2)

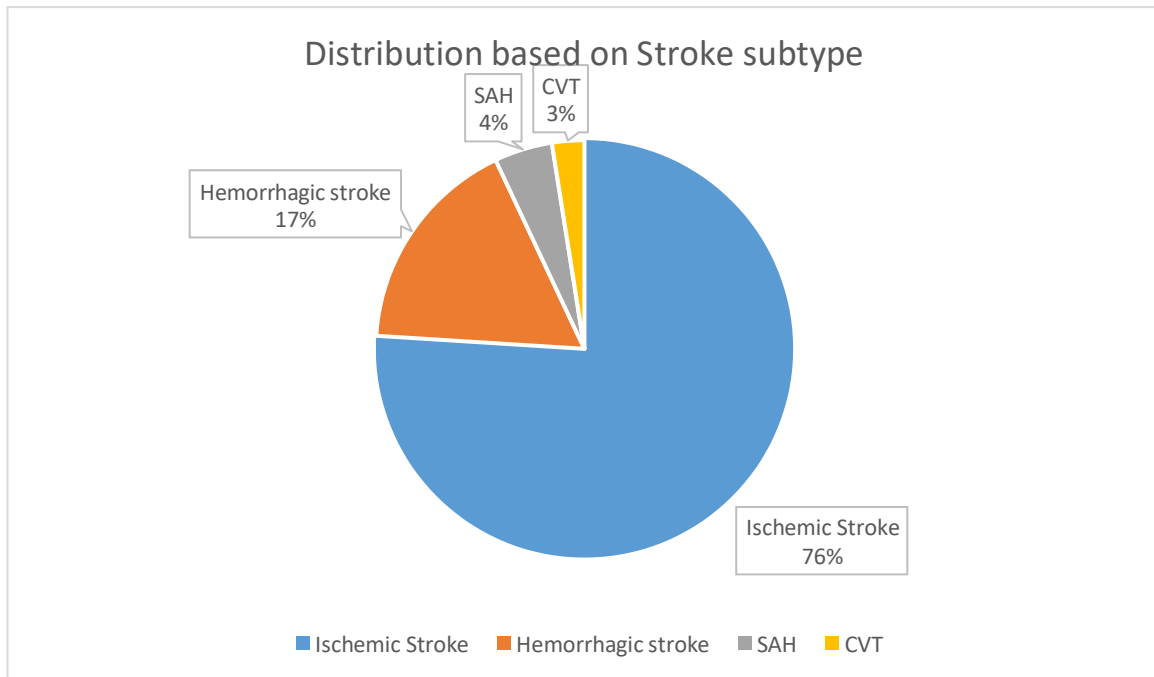
**Table 2: Clinical and diagnostic Features of Patients stroke patients included in the study**

| Variables                | Characteristics                | Number of patients | Percentage (%) |
|--------------------------|--------------------------------|--------------------|----------------|
| <b>Clinical features</b> | <b>Motor Deficit</b>           | 146                | 73.0           |
|                          | <b>Speech involvement</b>      | 64                 | 32.0           |
|                          | <b>Sensory deficit</b>         | 83                 | 41.5           |
|                          | <b>Instability of gait</b>     | 15                 | 7.50           |
|                          | <b>Seizure</b>                 | 13                 | 6.50           |
|                          | <b>Altered sensorium</b>       | 35                 | 17.5           |
| Time to ED arrival (hrs) | <3 hrs                         | 46                 | 23.0%          |
|                          | <4.5 hrs                       | 68                 | 34.0%          |
|                          | < 6 hrs                        | 95                 | 47.5%          |
|                          | <24hrs                         | 186                | 93.0%          |
|                          | >24hrs                         | 14                 | 07.0%          |
| <b>ECG changes</b>       | Normal                         | 58                 | 29.0%          |
|                          | T wave inv.                    | 68                 | 34.0%          |
|                          | ST depression                  | 42                 | 21.0%          |
|                          | Prolonged QTc                  | 54                 | 27.0%          |
|                          | LVH                            | 62                 | 31.0%          |
|                          | Q wave                         | 37                 | 18.5%          |
|                          | Atrial fibrillation            | 08                 | 04.0%          |
|                          | CHB                            | 01                 | 0.5%           |
| PVC                      | 08                             | 04.0%              |                |
| <b>ECHO findings</b>     | Normal                         | 108                | 54.0%          |
|                          | LV systolic dysfunction        | 23                 | 11.5%          |
|                          | LV hypertrophy                 | 76                 | 38.0%          |
|                          | Significant valvular pathology | 05                 | 02.5%          |

**3. Distribution of stroke patients with respect to stroke subtypes**

In this study highlighted ischemic stroke as the predominant type, affecting over three-quarters of cases (76%). Hemorrhagic stroke followed, observed in 17% of patients (34), while subarachnoid hemorrhage (SAH) was present in 4.5% (9 patients), and cerebral venous thrombosis (CVT) in 2.5% (5 patients).( Figure 1)

Figure 1 : Distribution of stroke patients with respect to stroke subtypes



**4. Blood pressure (MAP) on hospital admission**

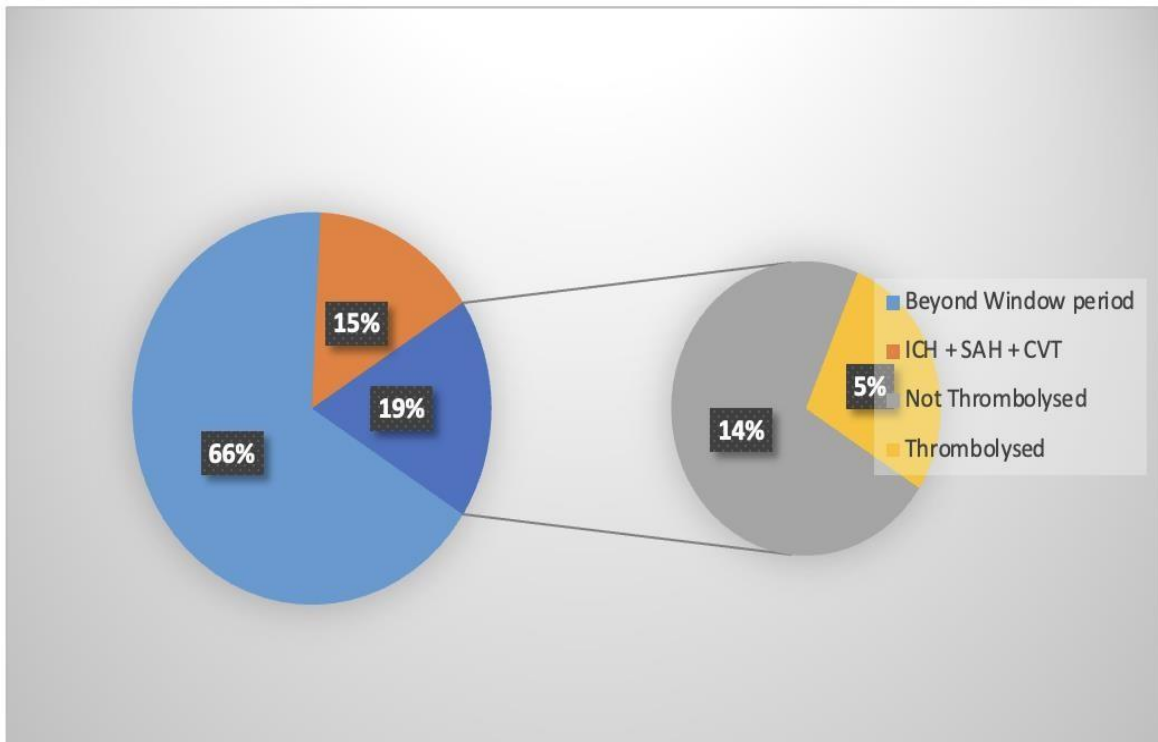
The average mean arterial pressure (MAP) upon admission for all patients was 118.7 mmHg. Among those with intracerebral hemorrhage (ICH), 61.7% presented with a MAP of 130 or higher. The majority of patients fell within the MAP range of 100-119 mmHg. Calculated using the formula  $MAP = Diastolic\ B.P + (Systolic\ B.P - Diastolic\ B.P)/3$ , the mean MAP for ICH or SAH cases (130.94 mmHg) significantly exceeded that of ischemic stroke cases (116.53 mmHg) [t statistic = 5.52, p < 0.05].

**Table 4: Table 3: Blood pressure (MAP) on hospital admission**

| Blood Pressure (MAP) | Ischemic stroke | ICH | CVT | SAH | TOTAL |
|----------------------|-----------------|-----|-----|-----|-------|
| <= 99                | 17              | -   | 02  | 01  | 20    |
| 100-109              | 34              | 02  | 02  | 01  | 39    |
| 110-119              | 37              | 06  | 01  | 03  | 47    |
| 120-129              | 29              | 05  | -   | 02  | 36    |
| 130-139              | 18              | 10  | -   | 02  | 30    |
| >140                 | 17              | 11  | -   | -   | 28    |
| Total                | 152             | 34  | 05  | 09  | 200   |

**5. Number of Patients Receiving rtPA.**

In this study, 68 Of 200 patients presented to the emergency department in the window period (within 4.5 hours). Out of these 68 patients, 38 patients were found to have Ischemic stroke, and 10 patients underwent thrombolysis.



### 6. Patient requiring intubation and mechanical ventilation

Out of the 200 patients included in this study, 28 patients required intubation and mechanical ventilation. Intubation rates were 7% for ischemic stroke patients and 38% for ICH patients [Chi Square = 27.56,  $p < 0.05$ ].

### 7. Disposition of Patients

Amongst the 200 patients, 57 (28.5%) patients were shifted to ICU, as they required intensive care. This also included patients receiving rtPA. A total of 7 patients were transferred to neurosurgical unit after consultation with them.

## DISCUSSION

Demographics, risk factors, clinical presentations, arrival times to the Emergency Department (ED), blood pressure at admission, ECG changes, echocardiographic findings, CT completion times, use of recombinant tissue plasminogen activator (rtPA), necessity for mechanical ventilation, and patient outcomes are just a few of the aspects of stroke cases that are examined in this study. The mean age of stroke patients in this study was 62.7 years, aligning with various Asian studies such as Naik et al [5], Awad SM et al [6] and Maskey et al. [7]. Notably, the Mumbai and Trivandrum registries reported mean ages of 66 and 67 years, respectively. However, the Bangalore study exhibited a notably younger mean age of 54.5 years. Additionally, a significant portion of patients fell within the age range of 61-70 years, consistent with other studies like Ukoha Ob et al. [8] and Maskey et al. [7]. Stroke occurrences in the young age group (40 years or younger) constituted 12.5% of cases in this study, aligning closely with Abdu Sallam et al. [9] but contrasting with the Trivandrum registry's 3.8% incidence. Gauri et al. [10] reported a higher prevalence of young stroke at 19% of all cases. This study noted a male predominance among stroke patients, akin to findings in various other studies [10]. Additionally, a higher proportion of women below 30 years old were observed due to cerebral venous thrombosis (CVT). Hypertension was present in 53% of patients,

consistent with Mahajan et al. [11] and the Bangalore study, while the Trivandrum study reported a high incidence of 83.2%. Diabetes affected 24% of cases in this study, comparable to the Bangalore study but differing from the Trivandrum registry's 50% and Mahajan et al.'s 9%. Tobacco use was noted in 32% of patients, aligning with Bangalore and Trivandrum studies. Dyslipidemia impacted 17% of patients, akin to the Trivandrum study's 25.5%. Alcohol incidence was notably low, potentially due to state regulations prohibiting alcohol consumption.

Ischemic stroke was the most common type in this study, consistent with the Bangalore and Trivandrum studies. Conversely, the Kolkata study reported a higher incidence of intracranial hemorrhage (ICH) at 32%. Motor deficit, speech, and sensory impairments were common stroke features in this study. Motor deficit (73%) and sensory deficit (41.5%) were the primary clinical presentations, aligning with studies by S K Mahajan et al. [11] and SS Rathore et al. [12]. Speech disturbances were found in 32% of cases in this study, differing from SK Mahajan et al. [11] but resembling SS Rathore et al. [12].

Around 23% of patients arrived within the first three hours, and 47.5% within six hours, comparable to Srivastava et al. [13]. However, these rates were lower compared to studies in developed nations like Agyeman et al. [14], indicating delayed presentation in developing countries due to educational and pre-hospital facility limitations. Notably, stroke subtype influenced arrival time, with ICH patients arriving earlier than those with infarction, contrary to Srivastava et al. [13] but in line with YU et al. [15].

Almost 70% of patients presented with a mean arterial pressure (MAP) >110 mmHg, and 61% of ICH patients had a MAP >130 mmHg, akin to findings by Carlberg et al. [16]. Ischemic changes like T wave inversion (34%) and ST depression (21%) were observed, similar to Goldstein et al. [17]. Left ventricular hypertrophy (LVH) was found in 31% of patients, aligning with Goldstein et al. QT prolongation (27%) differed from Goldstein et al.'s 45%, potentially due to different stroke types studied. Left ventricular hypertrophy (38%) and left systolic dysfunction (11.5%) were the most common abnormalities, resembling findings by Bansal et al. [18] and Marco R et al. [19].

The median time for CT completion was 33 minutes in this study, slightly exceeding the NINDS recommendation of 25 minutes. However, 45% of patients had their CT scans completed within 25 minutes, aligning with studies by Batmanian et al. [20].

In this study, 19% of ischemic stroke patients presented within the window period, with 5% receiving rtPA, echoing the limited usage reported in previous Indian studies by Pandian et al. [21], Mysore and Rural South India Challenges such as delayed presentation, lack of affordability, and public awareness hinder rtPA administration in developing nations. Approximately 14% of total patients required mechanical intubation, consistent with Gujjar et al. [22]. Of the 200 patients, 7 were shifted for neurosurgical intervention, while about 28% required ICU admission, mainly based on their level of consciousness and the need for intensive therapeutic procedures or rtPA administration.

This comparative analysis showcases the spectrum of stroke demographics, clinical presentations, management, and disparities across various studies, emphasizing the



complexities and nuances in stroke care and outcomes, particularly in the context of disparities between developed and developing nations.

## CONCLUSION

Paucity of community based studies on stroke has been a hinderence in guiding the development and organization of a stroke policy for our country. Delay in presentation has been one of the major limiting factors in early thrombolysis of stroke patients. A major impetus is also to be given on addressing the modifiable risk factors to reduce the burden of stroke in the society. Stroke is major contributor to morbidity and mortality. To mitigate its impact, it is essential to implement comprehensive strategies and foster cooperation in order to close the gap in stroke care between developed and developing countries.

**CONFLICT OF INTEREST:** Nil

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