

Clinico Investigatory Profile of Acute Stroke - A Prospective Longitudinal Study along Sea Coast Population of Rural South India

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Abstract: ***Introduction:** Stroke is the incoming epidemic of 21st century. Approximately 55 million people had a stroke at some time in the past. In the case of stroke, "Tissue is Brain." Understanding the clinico-investigatory profile of stroke will effectively guide health care professionals to treat patients of stroke. In this study we tried to explore the clinico-investigatory profile in acute stroke patients. **Materials and Methods:** Current study is a prospective longitudinal study on a total of 653 acute stroke patients presenting to the departments of Neurology, Emergency medicine of Narayana Medical college, over a period of 2 years (April 2018 to March 2020). **Results:** Out of 653 acute stroke patients, motor weakness was the major symptom (54.82%), followed by deviation of mouth (47.17%) that are mostly non progressive. Median length of hospital stay was six days. Aphasia (50.69%), Dysarthria (50%), facial weakness (47.17%) were the major examination findings. Majority of the patients had mild GCS (74.4%) at admission. Major laboratory abnormality noted were as follows- abnormal 2D Echo (61.4%), haemodynamically significant doppler finding (59.26%) and fasting glucose (58.81%). NL ratio was low in 302 patients (46.3%). Out of the 564 ischemic stroke patients, most common pathology was small vessel occlusion (43.3%) while out of 79 hemorrhagic stroke patients most common site of bleed was capsuloganglionic (55%). In hospital stroke complications were dominated by aspiration pneumonia (12.4%), sepsis (7.81%) and bed sores (4.13%) **Conclusions:** Ischemic stroke is the most common acute stroke with motor weakness as the predominant symptom and most of the symptoms are non progressive in nature. More than 50% of the patients have abnormal 2D echo, Doppler and fasting glucose levels. Aspiration pneumonia is the most common in hospital complication. The knowledge about the clinico-investigatory profile helps the physician with better evaluation, treatment and prognostication. Hence, Understanding this profile is of cardinal importance for a better outcome.*

Keywords: stroke, imaging, leukocyte count, Glasgow coma scale

1. Introduction

According to WHO, stroke is the 'incoming epidemic' of the 21st century¹. Overall ischemic strokes account for about 80% of all strokes in India and intracranial atherosclerosis tends to be commoner.²⁻⁴ Nearly 90% of stroke victims had one or more modifiable risk factors. Driven by increasing size of aging populations, and escalating prevalence of risk factors such as hypertension, tobacco use, unhealthy diet, physical inactivity, stroke is becoming a major cause of premature death and disability in developing countries.⁵

In case of stroke "Time is Brain".^{6,7} For each minute, if the large vessel ischemic stroke is untreated, on average patient loses 1.9 million nerve cells, 13.8 billion synapses, and 12 km of axonal fibers.⁸ Hence timely treatment of acute stroke is critical to prevent mortality and morbidity.

Understanding the epidemiological, demographic, and

clinico-investigatory profile of stroke will effectively guide health care professionals to treat patients of that particular region in time and also help policy makers to tackle the rising burden of stroke. Hence the present study was undertaken to evaluate the clinical and investigatory profile of acute stroke.

2. Materials and Methods

The present study was done at the Department of Neurology, Narayana Medical College, Nellore for a period of 18 months from December 2018 to May 2020. The current study was a prospective longitudinal hospital based study and was approved by the Institute Ethics committee. Total of 653 patients were analyzed which were acute stroke patients of outpatients and inpatients of Neurology and emergency departments.

A proforma was prepared, including a detailed clinical history, examination, and requisite investigations available

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at Narayana hospital. Patients were interviewed at the time of admission (patients who could not participate in the interview due to speech/ language involvement or altered sensorium, the by standers were interviewed). The questions were asked as a one-to-one interview in local vernacular language. All the patients were assessed clinically through a detailed history and clinical examination. As the registry hospital receives numerous patients from the sea coast-port area, which is a habitat for diverse people from various states like Tamilnadu, Orissa, Andhra and Telangana, it may represent the population of south Indian population.

A detailed clinical examination was done, and neurological deficits were identified. Relevant blood investigations in pathology like complete blood count, neutrophil-lymphocyte ratio and ESR (automated hematology analyzer microcapillary method), biochemical analysis of FBS and PPBS (Glucose oxidase-peroxidase, FBS: 70-110mg/dl, PPBS:80-160mg/dl), HbA1c (HPLC- High performance Liquid Chromatography;4.5-6.5%), Renal Function Test (RFT) (blood urea, serum creatinine), Serum Electrolytes (Na+, K+). Serum lipid profile, coagulation profile, chest X-ray, electrocardiography, echocardiography, and retroviral screening were done to

identify the underlying pathophysiological mechanism and aetiology. Radiological Investigations (CT & MR IMAGING BRAIN) were done for the confirmation of Stroke after a detailed history and clinical examination.

3. Statistical Methods

Demographic, lab parameters, clinical symptoms and signs were considered as Primary observed variables. Descriptive analysis was performed by the mean, standard deviation for quantitative variables, whereas frequency, and proportion for categorical variables.

Non-normally distributed quantitative variables were summarized by the mean or median and interquartile range (IQR)

4. Results

A total of 653 acute stroke patients were included in the study; among them, the ischemic group comprises 86.4% (n=564), and hemorrhagic stroke group 12.1% (n=79), and the cortical venous thrombosis group 1.4% (n=10).

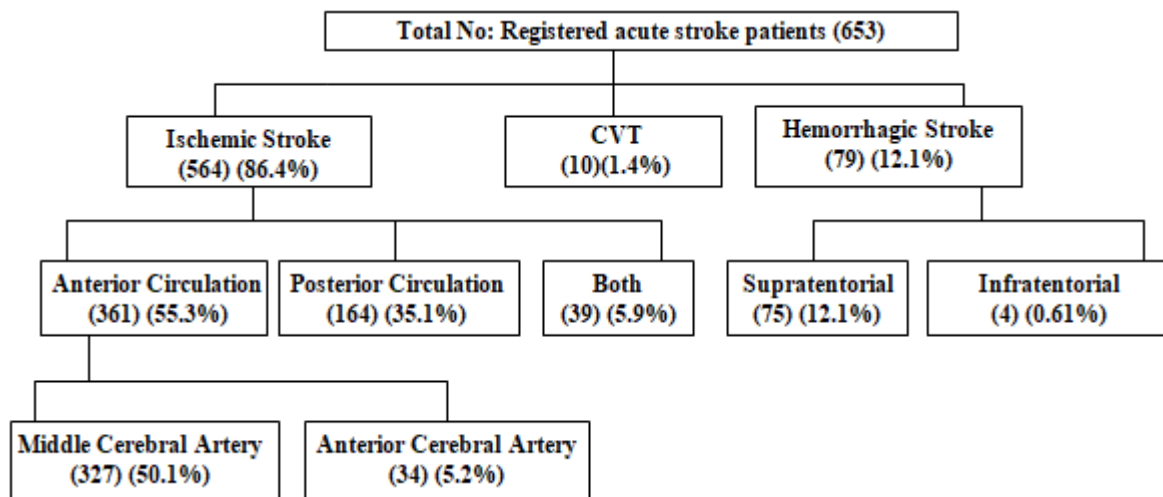


Figure 1: Type of Index Stroke

As illustrated in above figure 1, among 564 ischemic stroke patients, anterior circulation stroke was seen in 361 (55.3%) and posterior circulation stroke was seen in 164 patients (25.1%), and multi vascular stroke was seen in 39 (6%). In anterior circulation strokes, 34 (5.2%) patients had an anterior cerebral artery, and 327 (50.1%) had middle cerebral artery pathology. Among 79 hemorrhagic stroke patients, the supratentorial bleed was seen in 75 patients (94.9%) and infratentorial bleed in 4 patients (5.1%).

Table 1: Clinical symptoms details(N=653)

Variable	Frequency	Percentage
Weakness	Present	358 54.82%
	Absent	295 45.18%
Altered level of consciousness	Present	107 16.39%
	Absent	546 83.61%
Headache	Present	112 17.15%
	Absent	541 82.85%
Vomiting	Present	65 9.95%

Giddiness	Absent	588	90.05%
	Present	55	8.42%
Double vision	Absent	598	91.58%
	Present	21	3.22%
Blurring of vision	Absent	632	96.78%
	Present	91	13.94%
Seizures	Absent	562	86.06%
	Present	37	5.67%
Difficulty in speech	Absent	616	94.33%
	Present	280	42.88%
Difficulty in swallowing	Absent	373	57.12%
	Present	78	11.94%
Drooping of the upper eyelid	Absent	575	88.06%
	Present	77	11.79%
Deviation of mouth	Absent	576	88.21%
	Present	308	47.17%
Unsteadiness of the gait	Absent	345	52.83%
	Present	155	23.74%
Tingling and paraesthesias of	Absent	498	76.26%
	Present	78	11.94%

one half of body	Absent	575	88.06%
Pain over half of thebody	Present	210	32.16%
	Absent	443	67.84%
Dysphagia	Present	14	2.14%
	Absent	639	97.86%
Hoarseness of voice	Present	299	45.79%
	Absent	354	54.21%
Symptoms progression	Progressive	273	41.81%
	Static	348	53.29%
	Improving	32	4.90%

As illustrated in above table 1, the most common symptom in our study group was Weakness- 358 (54.82%), followed by deviation of mouth in 308 (47.17%). Among 653 individuals, 348 (53.29%) patients had a static state of symptoms, while 273 (41.81%) had progressive symptoms, and 32 (4.9%) showed improvement of symptoms before arriving to the registry hospital.

Table 2: Clinical findings details (categorical variables) (N=653)

Variable		Frequency	Percentage
Pallor	Present	52	7.96%
	Absent	601	92.04%
BP	Abnormal	353	54.06%
	Normal	300	45.94%
Heart rate	Abnormal	64	9.80%
	Normal	589	90.20%
Temperature	Abnormal	26	3.98%
	Normal	627	96.02%
Respiratory rate	Abnormal	333	51.00%
	Normal	320	49.00%
GCS grading at admission	Severe	69	10.57%
	moderate	98	15.01%
	Minor	486	74.43%
Higher Mental Functions	Abnormal	210	32.16%
	Normal	443	67.84%
Dysarthria	Present	327	50.08%
	Absent	326	49.92%
Aphasia	Present	331	50.69%
	Absent	322	49.31%
Sensory	Abnormal	326	49.92%
	Normal	327	50.08%
Cerebellar system	Abnormal	89	13.63%
	Normal	564	86.37%
Gait	Abnormal	331	50.69%
	Normal	322	49.31%
NIHSS at admission	Severe	155	23.74%
	Moderate to Severe	49	7.50%
	Moderate	275	42.11%
	Mild	174	26.65%

As illustrated in above table 2, GCS on arrival to the registry hospital was graded into minor, moderate and severe grades. Among 653 patients, 486 (74.43%) were in minor grade, 98 (15.01%) were in moderate grade, and 69 (10.57%) in severe grades. NIHSS grade at admission in stroke patients, 174 (26.65%) patients had mild, 275 (42.11%) patients had moderate, 49 (7.5%) patients had moderate to severe, and 155 (23.74%) patients had severe.

Table 3: Laboratory Investigations details (categorical variables) (N=653)

VARIABLE	Frequency	Percentage	
Blood Sugar at admission	Abnormal	328	50.23%
	Normal	325	49.77%
Carotid/Vertebral Doppler findings	Abnormal	387	59.26%
	Normal	266	40.74%
ECHO findings	Abnormal	401	61.41%
	Normal	252	38.59%
Hemoglobin	Abnormal	352	53.91%
	Normal	301	46.09%
Total leukocyte count	Abnormal	237	36.29%
	Normal	416	63.71%
Platelet count	Abnormal	69	10.57%
	Normal	584	89.43%
Neutrophil/ Lymphocyte (3.21-5.89)	>= 5.90 (High)	155	23.74%
	3.21 - 5.89 (Normal)	196	30.02%
	<= 3.20 (Low)	302	46.25%
Total Cholesterol	Abnormal	294	45.02%
	Normal	359	54.98%
Triglycerides	Abnormal	277	42.42%
	Normal	376	57.58%
HDL	Abnormal	309	47.32%
	Normal	344	52.68%
LDL	Abnormal	171	26.19%
	Normal	482	73.81%
Creatinine	Abnormal	177	27.11%
	Normal	476	72.89%
Sodium	Abnormal	322	49.31%
	Normal	331	50.69%
Potassium	Abnormal	64	9.80%
	Normal	589	90.20%
Random glucose	Abnormal	312	47.78%
	Normal	341	52.22%
Fasting glucose	Abnormal	384	58.81%
	Normal	269	41.19%
Post prandial glucose	Abnormal	327	50.08%
	Normal	326	49.92%
HbA1c	Abnormal	302	46.25%
	Normal	351	53.75%

As illustrated in above table 3, the most common abnormal finding 2D-ECHO was seen in 401 (61.4%), and Doppler finding was seen in 387 (59.26%) patients. In our study group with stroke, neutrophil-lymphocyte ratio (NLR) is low in 302(46.25%) patients, 196 (30.02%) patients had normal NLR between 3.21-5.89, 155(23.74%) had high NLR.

Table 4: In hospital stroke management time line details (continuous variables)(N=653)

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Duration from arrival to nurse visit [mins]	653	.00	270.00	14.3266	17.14119
Duration from arrival to stroke specialist consultation [hours]	653	.11	77.50	3.9508	6.34922
Duration of hospital stay [days]	653	.00	28.00	7.1340	4.03769

As illustrated in above table 4, in hospital management time line details were as follows- Mean duration from patient hospital arrival to nurse visit was 14.32 minutes; Mean duration from patient hospital arrival to stroke specialist consultation was around 4 hrs; Mean duration of hospital stay was 7 days.

Table 5: In hospital stroke management time line details (categorical variables) (N=653)

Variable	Frequency	Percentage	
Duration from arrival to swallow assessment	> 6 Hours	70	10.72%
	< 6 Hours	107	16.39%
	No	476	72.89%

As illustrated in above table 5, in hospital management time line details were as follows- duration from patient hospital arrival to swallow assessment was < 6 hours in 107 patients, >6 hours in 70 patients.

Table 6: In hospital stroke complications details (N=653)

Variable	Frequency	Percentage	
Recurrent stroke	Present	11	1.68%
	Absent	642	98.32%
Cardiogenic shock	Present	7	1.07%
	Absent	646	98.93%
Aspiration pneumonia	Present	81	12.40%
	Absent	572	87.60%
Sepsis	Present	51	7.81%
	Absent	602	92.19%
Bed sore	Present	27	4.13%
	Absent	626	95.87%

As illustrated in above table 6, among total stroke patients the following complications were noted, 11 patients (1.7%) had recurrent stroke, cardiogenic shock 7 (1.1%), aspiration pneumonia 81 (12.4%), sepsis 51 (7.81%) and bed sore in 27 (4.1%).

5. Discussion

The present study is a prospective longitudinal study conducted in a tertiary care teaching hospital. In the present study, all the patients with acute stroke, who satisfied all the inclusion and exclusion criteria, admitted to the department of Neurology were followed up throughout the course in the hospital were analyzed to describe the clinical profile, laboratory parameters along with Treatment and rehabilitative measures.

6. Examination and Findings

The type of stroke determines the clinical and radiological findings. Dysarthria (50%), Aphasia (50.69%), Abnormal BP, Abnormal Respiratory rate, and Abnormal gait were the major examination findings in the present study. Wouters A et al.⁹, in their study, observed that most ischemic stroke patients presented with headache (71.7%), aphasia (60.0%), and facial palsy (58.3%). Similarly, the common clinical presentations among hemorrhagic stroke patients were headache (78.6%), followed by aphasia (60.7%), and vomiting (57.1%). Abnormal HMF was seen in 32.16% of patients in the present study. Dhiman D et al.¹⁰ (2018), in their study on subjects living in the sub-Himalayan region, observed that Neurological weakness (90%) was the most common symptom at presentation in ischemic stroke followed by the facial drop (68%) and speech disturbance (46%). They also observed that in hemorrhagic stroke, the most common symptoms at presentation were Neurological weakness (84%), facial drop (45%), Altered sensorium (47%), and speech disturbance

(46%). In the present study, 15% of the study patients had a moderate GCS, while 10.57% had severe GCS. According to NIHSS grading, 42.11% had moderate NIHSS while 23.74% had severe NIHSS. In the study by Nepal G et al.¹¹ (2019), 27.2% had a mild stroke, 61.2% had a moderately severe stroke, 8.3% had a severe stroke, and 3.1% had a very severe stroke. The median baseline NIHSS was 4 with an inter quartile range of 2 to 7 in the study by Wouters A et al.⁹ Likewise, by mRS grading at admission, 50.84% of patients were dependent on daily activities in the present study. In the study by Nepal G et al.¹¹ (2019), 12.3% had no significant disability, 23.2% had a slight disability, 13.2% had a moderate disability, 25.9% had a moderately severe disability, and 25.4% had a severe disability based on mRS. Dhiman D et al.¹⁰ (2018), in their study, also observed that 39% of their subjects had poor outcomes as described by mRS>3. They observed that over all, patients with hemorrhagic stroke had poorer outcomes at three months. 61.41% of the study patients in the present study had abnormal Echocardiography.

7. Summary of In-Hospital Management

Stroke is one of the leading contributors of disability worldwide, leading to hospitalization of the subjects. The median length of hospital stay was 6 days, with an IQR of 5 to 8 days in the present study. Similar to the present study, the median length of hospital stay was 5.55±3.29 days. Greater than half of the patients (57.8%) remained in the hospital for five or fewer days in the study by Kefale B et al.¹² The mean length of the hospital stay was 6 ± 3.24 days in the study by Gadisa DA et al.¹³, similar to the present study. In their study, 63.1% had a hospital stay of ≤ 5 days. However, it was higher in the present study (IQR of 5 to 8 days), with 75% having a median hospital stay of more than five days. The time from onset of stroke to hospitalization was more than 12 hours in 80% of subjects in the study by Kefale B et al.¹² In the present study, the median duration from arrival to admission was 4.13 hours while the duration from the arrival of the patient to the arrival of stroke specialist was 2.11 hours. A nurse attended the patient in a median duration of 12 minutes from his arrival to the hospital in the present study. The present study is one of the few studies providing data on the timings of in-hospital management. Similar data is lacking from most of the studies done before. In the present study, Physiotherapy was performed in 90.4% of patients. Speech therapy was given for 26.2%, while Psychotherapy was performed on 23.4% of patients. There is a lack of standard stroke care protocol in hospitals in India, leading to various delays from arrival to admission to treatment.

The In Hospital Complications

Brain edema due to increased intracranial pressure, swallowing difficulties/ dysphagia, and epileptic seizures are common neurological complications after stroke. Regarding complications in the present study, 1.7% had a recurrent stroke, 1.1% had a cardiogenic shock, 12.4% had aspiration pneumonitis, 7.8% had sepsis, and 4.1% had bedsores. There can be physical disabilities like spasticity or hemiplegia, aphasia, dysphagia, and eye problems after stroke. Besides, there can be trouble in thinking and mood disorders. Gadisa D A et al.¹³, had also observed that 21.6%

of their patients had developed complications like aspiration pneumonia during admission. 3.7% in their study developed increased ICP while 0.9% developed bedsores. Similar to the present study, 32.5% had complications in the study by Kefale B et al.¹² Aspiration pneumonia (64.4%), Increased ICP (29.4%), Septic shock (14.9%), Bedsores (11.9%), and others were the complications seen in their study.

8. Conclusions

Weakness was the major symptom in 54.82% of the patients, followed by deviation of mouth (47.17%), Hoarseness of voice (45.79%), and difficulty in speech /slurring of speech (42.88%). The symptoms were progressive in 41.81% of patients, while they were static in 53.29% of the patients. The symptoms were improving only in 4.9% of the patients. Dysarthria (50%), Aphasia (50.69%), Abnormal Blood pressure, Abnormal respiratory rate, and Abnormal gait were the major examination findings. Abnormal HMF was seen in 32.16% of patients. 15% of the study patients had a moderate GCS, while 10.57% had severe GCS. According to NIHSS grading, 42.11% had moderate NIHSS while 23.74% had severe NIHSS. 50.84% of patients were dependent on daily activities based on mRS grading at admission. 61.41% of the study patients had an abnormal echo. The median length of hospital stay was 6 days with an IQR of 5 to 8 days. With regards to complications, 1.7% had a recurrent stroke, 1.1% had a cardiogenic shock, 12.4% had aspiration pneumonia, 7.8 % had sepsis, and 4.1% had bed sores.

Conflict of Interest: None

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