Original Research Article

A STUDY OF CLINICAL PROFILE, INFLAMMATORY BIO-MARKERS IN ACUTE ISCHAEMIC STROKE (AIS)

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ABSTRACT

Background: Cerebro-Vascular Accident (CVA) or stroke, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. It is a global health epidemic and a leading cause of disability and morbidity. Ischemic strokes are the most common types accounting for 80-85% of CVA. The crude prevalence of stroke in India is upto 560/ 100000 population.
Materials and Methods: Relevant history with list of risk factors and comorbidities was made. Investigation included complete hemogram, C-Reactive Protein (CRP), Erythrocyte Sediment Rate(ESR). It is an observational cross-sectional study conducted in Department of General Medicine at Basaveshwar Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Kalaburagi.
Results: In 30 AIS patients (mean age 55.4 years), 60% were male. Hemiparesis was the most common complaint (33.3%). The mean hospital stay was 6.3 days. Diabetes (53.3%) and hypertension (46.7%) were the main risk factors, with 63.4% having a sedentary lifestyle. NIHSS scores showed significant correlations with neutrophils, ESR, CRP, NLR (P<0.01), and negative correlations with lymphocytes and platelets (P<0.05). NIHSS scores were also associated with diabetes, hypertension, and lifestyle (P<0.05).
Conclusion: These acute phase reactants and simple ratios are inexpensive, simple and easy bedside measures to assess the severity of AIS with positive correlation to NIHSS and illuminates on prompt prophylactic measures to reduce the inflammation of blood vessels, in the long run can significantly reduce the incidence of stroke.
Keywords: CVA, AIS, CRP.

INTRODUCTION

Stroke or Cerebro-Vascular Accident (CVA), is defined as an abrupt onset of neurological deficit that is attributable to a focal vascular cause. It is a global health epidemic and a leading cause of disability and morbidity.[1] Ischaemic strokes are the most common types accounting for 80-85% of CVA. The crude prevalence of stroke in India is upto 560/100000 population. Hypertension is the most important modifiable risk factor for stroke.[1] Post-ischemic inflammation plays an important role in various stages of cerebral ischemic injury, resulting from stagnant blood flow, activation of intravascular leukocytes and release of pro-inflammatory mediators from the ischemic endothelium, platelet granules, and brain parenchyma.[2] The risk of stroke is associated with increased age, previous stroke or transient ischemic attack, hypertension, smoking, diabetes mellitus, hypercholesterolemia, and atrial fibrillation/flutter. Abnormalities of blood glucose and altered lipid profiles are often associated with stroke and should be taken into consideration for better secondary prevention.[3] High neutrophil count and low lymphocyte count were regarded as correlation factors of unfavorable functional outcomes of acute cerebral infarction.[4] Elevated serum levels of C-reactive protein (CRP) are found in up to three quarters of patients with ischemic stroke. Increase in CRP may reflect a systemic inflammatory response following ischemic stroke, the extent of tissue injury, or concurrent infections.[5]

Aims and Objectives

To study correlation of clinical profile & inflammatory bio-markers in the patients of acute ischemic stroke (AIS).

MATERIALS AND METHODS

Inclusion Criteria
- Age > 18yrs
- Patients diagnosed with first time Acute ischemic stroke clinically & radiologically.

Exclusion Criteria
- Thrombolysis therapy and mechanical endovascular therapy;
- Clinical or laboratory findings in conformity with the presence of acute or chronic infection (e.g., pneumonia, urinary tract infection, inflammation in other sites);
- Surgery, severe trauma or burn within 90 days before the symptom onset;
- Hematologic disorders, rheumatoid immune-related diseases, or malignancy;

- Use of steroids or immunosuppressive agents;
- Severe liver and kidney dysfunction.
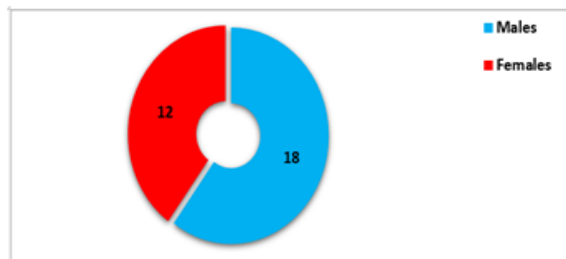- Pregnancy & lactation.

Methodology
- The observational cross-sectional study was done in the department of General medicine, MRMC, Kalaburagi. The data was collected from 30 stroke patients presenting to Emergency Medicine Department of MRMC, Kalaburagi in time period from October 2023-May 2024.
- The patients gender, age, main symptoms at presentation, relevant present & past history with list of risk factors & comorbidities, and routine investigations with CRP, ESR, NLR and PLR were noted and assessed.
- Data was entered into Microsoft excel data sheet and analyzed using SPSS V25. Chi- square test, Fisher exact test, Independent t- test will be applied. Sensitivity and specificity are calculated. $P<0.05$ is considered as statistically significant.

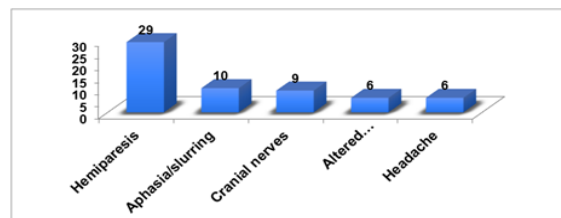# RESULTS

Table 1: Age wise distribution of patients

Age in years	Number of patients	Percentage
≤ 40	4	13.3
41—60	15	50.0
61—80	10	33.4
>80	1	3.3
Total	30	100.0
Mean ± SD	55.40 14.84	

Study observes that, majority of patients 15 (50.0%) were belongs to the age group of 41—60 years, followed by 10 (33.4%) of patients were belongs to the age group of 61—80 year, 4 (13.3%) of patients were belongs to the age of ≤40 years and 1 (3.3%) of patients age in the range of >80 years. Minimum age of patient was 22 years and maximum age of patient was 84 years. The mean age of patients was 55.40 years. Study observed that; Male patients were predominant 18 (60.0%) and 12 (40.0%) of patients were females. Male to Female ratio was 1.5:1

Figure 2: presents History of Acute Ischaemic Stroke (AIS) patients

Out of 30 AIS sample patients, 18 (60.0%) of patient's duration of hospital stay was in the range of 5—9 days and 9 (30.0%) patient's duration of hospital stay was <5 days. The mean duration of hospital stay was 6.30 days.

Study reveals that, majority 22 (73.4%) of patients were seen the morbidity and each 4 (13.3%) of patients were seen mortality and none respectively.

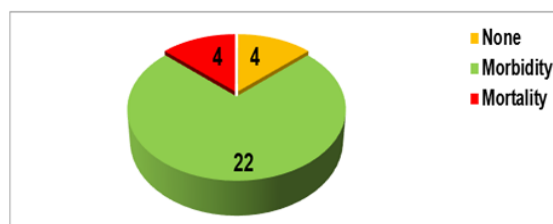Figure 1: presents gender wise distribution of patients

Study observed that; majority of patient's history of complaints was hemiparesis, 10 (33.3%) of patient's history of complaints was aphasia/slurring, 9 (30.0%) of patient's history of complaints was cranial nerves, each 6 (20.0%) of patient's history of complaints was altered sensorium and headache respectively.

Figure 3: study outcome wise distribution of AIS patients.

Table 2: Risk factors wise distribution of AIS patients.

Risk factors	Categories	Number of patients	Percentage
Diabetes Mellitus	Present	16	53.3
	Absent	14	46.7
Hypertension	Present	14	46.7
	Absent	16	53.3
Ischemic heart disease	Present	2	6.7
	Absent	28	93.3
Alcohol	Yes	8	26.7
	No	22	73.3
Smoking	Yes	14	46.7
	No	16	53.3
Tobacco	Yes	3	10.0
	No	27	90.0
Lifestyle	Active	1	3.3
	Moderate	10	33.3
	Sedentary	19	63.4

Study observed that; 53.3% of patients were seen the risk factor of diabetes mellitus, 46.7% of patients were seen the risk factor of hypertension, 6.7% of patients were seen the risk factor of IHD, 26.7% of patients had the habit alcohol, 46.7% of patients had the habit smoking, 10% of patients had the habit tobacco. Only 3.3% of patients were seen active lifestyle, 33.3% of patients were seen moderate lifestyle and majority of patient's lifestyle was sedentary i-e seen in 63.4% Study reveals that; out of 30 AIS patients; as per NIHSS scores 14 (46.6%) of patients were seen minor stroke, 8 (26.7%) of patients were seen moderate stroke, 6 (20.0%) of patients were seen moderate/sever stroke and 2 (6.7%) of patients were seen sever stroke.

Table 3: Correlation between NIHSS score and CRP, ESR, neutrophil to lymphatic ratio (NLR), platelet to lymphocyte ratio (PLR)

Correlation	Correlation coefficient	P-value and Significance
NIHSS score v/s Neutrophils	r = +0.509	P<0.01 HS
NIHSS score v/s Lymphocytes	r = -0.449	P<0.01, HS
NIHSS score v/s Platelets	r = -0.480	P<0.01, HS
NIHSS score v/s ESR	r = +0.463	P<0.01, HS
NIHSS score v/s CRP	r = +0.390	P<0.05, S
NIHSS score v/s NLR	r = +0.684	P<0.01, HS
NIHSS score v/s PLR	r = 0.083	P>0.05, NS
NIHSS score v/s TC	r = +0.235	P>0.05, NS
NIHSS score v/s TG	r = 0.097	P>0.05, NS
NIHSS score v/s HDL	r = 0.009	P>0.05, NS
NIHSS score v/s LDL	r = 0.102	P>0.05, NS

Study reveals that; there was statistically highly significant positive correlation of NIHSS scores with Neutrophils, ESR, CRP, NLR (P<0.01). And also statistically highly significant negative correlation of NIHSS scores with Lymphocytes, Platelets (P<0.01) and (P<0.05). But there was statistically no significant correlation of NIHSS scores with PLR, TC, TG, HDL and LDL (P>0.05)

Table 4: Comparison of NIHSS categories with risk factors

Risk factors	Categories	No. of pats.	NIHSS score				P-value and significance
			Minor stroke N=14	Moderate stroke N= 8	Moderate sever stroke N=6	Sever stroke N=2	
DM	Present	16	5	4	5	2	P =0.023, S
	Absent	14	9	4	1	0	
HTN	Present	14	4	4	5	2	P = 0.032, S
	Absent	16	10	4	1	0	
Alcohol	Yes	8	2	3	2	1	P = 0.418, NS
	No	22	12	5	4	1	
Smoking	Yes	14	5	4	4	1	P = 0.456, NS
	No	16	9	4	2	1	
Tobacco	Yes	3	2	0	1	0	P = 0.638 NS
	No	27	12	8	5	2	
Lifestyle	Active	1	1	0	0	0	P = 0.032, S
	Moderate	10	8	1	1	0	
	Sedentary	19	5	7	5	2	

Study reveals that; there was statistically significant association between categories of NIHSS scores with risk factors of DM, HTN and Lifestyle (P<0.05). Alcoholic and smokers had observed more number of

severity of stroke but statistically not significant (P>0.05).

DISCUSSION

Ischemic strokes, primarily caused by vessel narrowing due to atherosclerosis, are the most common worldwide. Modifiable risk factors include hypertension, diabetes, smoking, and alcohol, while non-modifiable ones include age, sex, and genetics. Hemorrhagic strokes may result from subarachnoid or intracerebral bleeding. To reduce stroke burden, India's NPCDCS program emphasizes a multidisciplinary approach targeting non-communicable disease prevention and management.[6] In a study by Tirandi et al. reported that post-stroke inflammation significantly contributes to parenchymal damage, identifying cytokines, adipokines, and adhesion molecules as potential therapeutic targets. However, clinical translation has been limited due to the dual role of inflammation in both early injury and later recovery. They emphasized that the effects of inflammation vary depending on stroke type, reperfusion, age, and comorbidities, advocating for a patient-specific approach to improve outcomes.[2] A study done by Kumar et al. reported that the most common age group presenting with stroke was 61–80 years (47%), followed by 41–60 years (46%). Ischemic stroke (60%) was more prevalent than hemorrhagic stroke (40%), with a higher incidence in males. Common comorbidities included alcohol use, smoking, hypertension, diabetes, anemia, and proteinuria.[3] A comparable Indian study by Nayak et al. reported ischemic stroke as the most common subtype in young adults, with a consistent male preponderance. Similar trends were observed in both Indian and international studies, particularly among the 15–45 age group. Sedentary occupations appeared more common among stroke cases, though no clear pattern was established.[7] Increased C-reactive protein and leukocyte counts were associated with poorer prognosis in acute stroke. Proinflammatory markers and blood-brain barrier damage were more prominent in patients with symptomatic atherosclerosis compared to those without clinical signs of atherosclerosis. Early inflammatory responses appeared linked to greater post-stroke neurological deficits.[8] In a study by Natalia et al., elevated plasma CRP levels were shown to significantly predict a higher risk of ischemic stroke and TIA in the elderly over 12 to 14 years of follow-up. Men in the highest CRP quartile had twice the risk (RR = 2.0) and women nearly three times the risk (RR = 2.7) compared to those in the lowest quartile, with the association remaining significant after adjustment for major cardiovascular risk factors.[9]

CONCLUSION

Screening of hypertension, diabetes, dyslipidemia and proteinuria in people aged >40yrs to be considered & strict control of already diagnosed should be done with routine follow ups. The acute phase reactants like CRP & ESR, and simple ratios like NLR & PLR are inexpensive, simple and easy bedside measures to assess the severity of AIS with positive correlation to NIHSS scale. Prompt prophylactic measures to reduce inflammation of blood vessels by measuring these parameters in the long run can significantly reduce the incidence of stroke.

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