VOLUME - 12, ISSUE - 05, MAY - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Internal Medicine

CAN ERYTHROCYTE SEDIMENTATION RATE BE USEFUL TO DETERMINE SEVERITY OF ACUTE ISCHEMIC STROKE?

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ABSTRACT

Background: Stroke also known as cerebrovascular accident (CVA), as the term denotes is a disease that affects the arteries leading to and within the brain. It ischaracterized by "rapidly developing clinical symptoms and/or signs; focal and at times global loss of brain function, with symptoms lasting >24 hours or leading to earlier death, and with no apparent cause other than that of vascular origin"(1) Ischemic stroke occurs when a vessel supplying blood to the brain is obstructed. (2) Atherosclerosis is central mechanism behind majority of ischemic thromotic stroke especially in those which occurs in adults. It is now well-established that inflammation is a key component of the disease that persists in the artery wall up until the final pathophysiologic stages, which reflect plaque instability and ultimately plaque rupture leading to ischemic stroke.(3) This study was done to evaluate ESR which is an age old inflammatory marker and its value at baseline and its correlation to severity of stroke. **Aim:** To determine the correlation of ESR at baseline with the severity of stroke and its usefull in determining severity of acute ischemic stroke. **Materials & methods:** A prospective observational study was carried out at Department of Medicine, SRN Hospital, Motilal Nehru Medical College Prayagraj. 150 Patients were screened out of which 108 could well fit inclusion and exclusion criteria required for this study. Study included MRI/CT confirmed cases of new onset ischemic stroke presenting to the Medicine department within 48 hrs of onset of both genders and age > 18 years. Details of the diagnosis of stroke were ascertained using history, examination and imaging findings (CT/MRI). Clinical severity of stroke was assessed using the Glasgow Coma Scale and national institute of health stroke scales(NIHSS Score) **Results:** There were 55.6% study subjects above 65 years with a median age of 68.50 years. 64.8% study subjects having moderate stroke, 17.6% in moderate to severe stroke and 17.6% in severe stroke based on NIHSS score. Mean ESR in total patient of acute ishemic storke was 22.67 mm/hr which was higher than normal ESR i.e 12-14 mm/hr. Mean ESR was considerably higher in patient of severe stroke (25.81 mm/hr) as compared to that in moderate to severe stroke(17.89 mm/hr) and that in moderate stroke (15.89 mm/hr), it is also well correlated to GCS score where mean ESR was 31.44 mm/hr in very severe stroke compared to 16.53 mm/hr in mild category. Even in mild category mean ESR was higher than normal ESR. **Conclusion**- ESR was higher in patient of severe stroke as compared to that in moderate stroke. Thus ESR can be used as a marker to predict severity of acute ischemic stroke.

KEYWORDS :

INTRODUCTION

Stroke also known as cerebrovascular accident (CVA), as the term denotes is a disease that affects the arteries leading to and within the brain. It can be defined as a clinical syndrome characterized by "rapidly developing clinical symptoms and/or signs; focal and at times global loss of brain function, with symptoms lasting >24 hours or leading to earlier death, and with no apparent cause other than that of vascular origin." Ischemic stroke occurs when a vessel supplying blood to the brain is obstructed. Ischemic strokes account for approximately 80% to 88% of all strokes. Nearly all patients with large artery atherothrombotic infarctions have considerable pre-existing risk factors for cerebrovascular atherosclerosis.

Thus atherosclerosis is central mechanism behind majority of ischemic thromotic stroke especially in those which occurs in adults. It is now well-established that inflammation is a key component of the disease that persists in the artery wall up until the final pathophysiologic stages, which reflect plaque instability and ultimately plaque rupture. Several atherosclerotic plaque-specific cells, such as monocyte-derived macrophages and T-lymphocytes, have the capacity to produce and secrete mediator molecules, such as cytokines, chemokines, growth-factors, enzymes, and disintegrins, which promote the progression of lesions by activating endothelial cells and smooth muscle cells, and ultimately weaken a vulnerable plaque by matrix degradation of its fibrous cap. A study of 565 symptomatic carotid plaques discovered a high prevalence of symptoms that indicate unstable plaque (such as cap rupture in 56.7%, a big lipid core in 59.6%, and a prominent inflammatory infiltration in 66.9%), and discovered that several of these markers, particularly inflammation, were most prevalent in individuals with recent cerebral ischemic episodes, especially following stroke. [4] Thus it can be reasonably said that ischemic stroke broadly occurs by following mechanism:

1. Rupture of unstable plaque causing acute occlusion of cerebral arteries
2. Gradual growth of unstable plaque leading to lacunar infarcts
3. Migration of emboli from a distant source to cerebral vasculature causing infarct

Thus it can be easily said that inflammation is bound to play a central role in pathogenesis of ischemic stroke. So greater the inflammation greater is the risk of ischemic stroke and worse is the prognosis. Therefore based on this we wanted to find correlation between level of inflammatory marker ESR and prognosis of patient. If found any, it could be comfortably said that suppression of inflammation could result in better prognosis or atleast if factor attributed to inflammation could be modified disease course could be altered.

MATERIALS AND METHODS

Source Of Data

The present study was carried out at Department of Medicine, SRN Hospital, Motilal Nehru Medical College. Prayagraj.

Study Population

Adult patients (> 18 years), referred to Department of Medicine, MLN Medical College, Prayagraj, with signs and symptoms suggestive of stroke.

Study Design Prospective observational Study

Sample Size 150 Patients were screened out of which 108 could well fit inclusion and exclusion criteria required for this study

Inclusion Criteria
- MRI/CT confirmed cases of new onset ischemic stroke
- Presenting to the Medicine department within 48 hrs of onset.
- Both genders, age > 18 years.

Exclusion Criteria
- Patient of hemorrhagic stroke
- Patient with raised TLC count(tlc >11000 cells/mm3)
- Renal dysfunction(BUN >14-23 mg/dl & Creatinine >0.9-1.3 mg/dl in male and 0.7-1.1 mg/dl in female) [33]
- Anemia or current use of iron, folic acid supplement
- Pregnancy
- Patient with history of immunological disorder

After enrolment, demographic characteristics were noted. Details of the diagnosis of stroke were ascertained using history, examination and imaging findings (CT/MRI). Clinical severity of stroke was assessed using the Glasgow Coma Scale and national institute of health stroke scales(NIHSS Score)

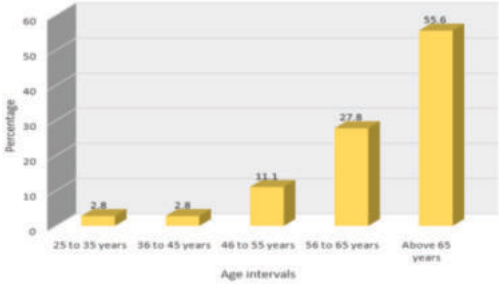
The clinical severity of stroke was graded as follows:
GCS > 12- Mild
GCS 9-12 - Moderate
GCS 6-8 - Severe
GCS<6 - Very severe

Stroke severity may be stratified on the basis of NIHSS scores as follows:[36]
- Severe: 21-42
- Moderate to Severe: 16-20
- Moderate: 5 – 15
- Minor: 1 – 4

RESULTS

Table 1: Age distribution of study population.

Age intervals	Frequency	Percent
25 to 35 years	3	2.8
36 to 45 years	3	2.8
46 to 55 years	12	11.1
56 to 65 years	30	27.8
Above 65 years	60	55.6
Total	108	100.0



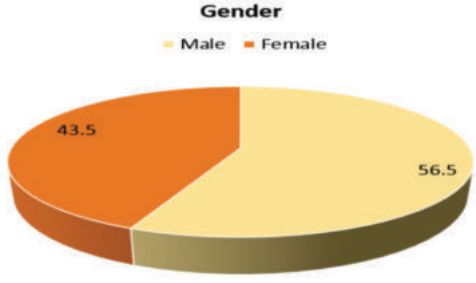


Table 2: Mean comparison of clinical parameters according to NIHSS score severity levels of patients.

	NIHSS score						ANOVA test	
	Moderate stroke		Moderate to Severe stroke		Severe stroke		F value	P -value
	Mean	SD	Mean	SD	Mean	SD		
HB	12.77	1.33	11.97	1.22	11.69	1.28	5.27	0.007
TLC	8215.00	1582.32	8347.89	1821.80	9362.64	1994.73	4.01	0.021
Polymorph	74.38	10.10	74.91	7.13	77.45	6.93	1.71	0.186
Lymphocytes	17.84	9.39	17.73	6.83	15.33	5.77	1.65	0.197
Platelet	1.82	.72	2.38	1.39	1.86	.63	3.30	0.041
S. Urea	27.47	6.79	29.16	7.09	33.79	9.49	5.04	0.008
Sr. creatinine	.94	.21	1.05	.23	1.09	.24	3.27	0.042
SGOT	38.16	13.46	35.84	22.22	43.74	30.11	0.82	0.442
SGPT	42.21	23.04	35.79	29.33	39.80	23.41	0.340	0.712
HBA1C	6.68	1.23	7.38	2.10	6.49	1.49	2.39	0.096
Total Cholesterol	190.21	50.23	194.11	54.47	177.53	44.87	1.20	0.307
LDL	90.42	27.91	98.47	41.87	80.19	31.30	2.61	0.078

Above table shows the mean wise distribution of hematological parameters according to the NIHSS score. There was a significant difference found in hemoglobin, total leucocytes, platelet, urea and creatinine with p values of 0.007, 0.021, 0.041, 0.008 and 0.042 respectively.

Table 3: Distribution of NIHSS score levels of patients in study population.

NIHSS score	Frequency	Percent
Moderate stroke	19	17.6
Moderate to Severe stroke	19	17.6
Severe stroke	70	64.8
Total	108	100.0

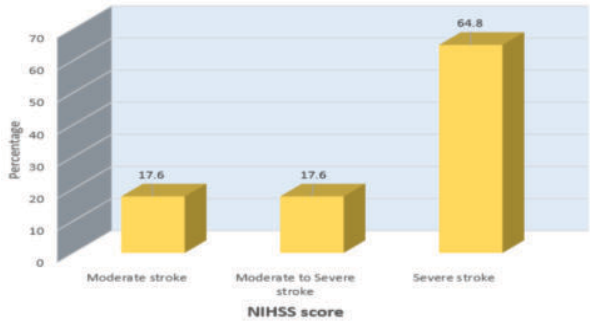


Table 4: Mean comparison of ESR according to NIHSS score severity levels of patients.

	NIHSS score						ANOVA test	
	Moderate stroke		Moderate to Severe stroke		Severe stroke		F value	p-value
	Mean	SD	Mean	SD	Mean	SD		
ESR	15.89	4.50	17.89	4.45	25.81	6.80	26.79	<0.001

Mean ESR was 15.89±4.50 in moderate stroke, 17.89±4.45 in moderate to severe stroke and 25.84±6.80 in severe stroke individually. The association of ESR with NIHSS score was found to be significant.

Table 5: Correlation of ESR with NIHSS score.

Correlations			
		NIHSS Score	ESR
NIHSS SCORE	Pearson Correlation	1	.790**
	Sig. (2-tailed)		<0.001
	N	108	108
**. Correlation is significant at the 0.01 level (2-tailed).			

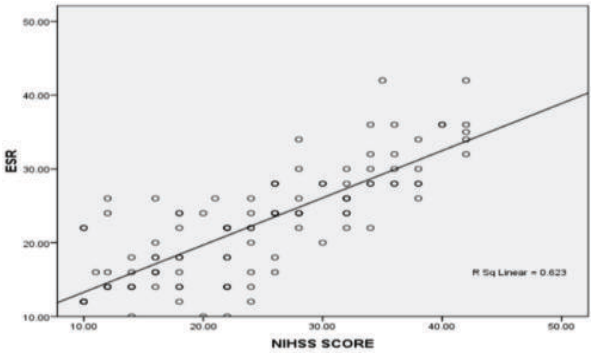


Table 6: Correlation of ESR with GCS score.

Correlations			
		GCS SCORE	ESR
GCS SCORE	Pearson Correlation	1	-.809**
	Sig. (2-tailed)		<0.001
	N	108	108
**. Correlation is significant at the 0.01 level (2-tailed).			

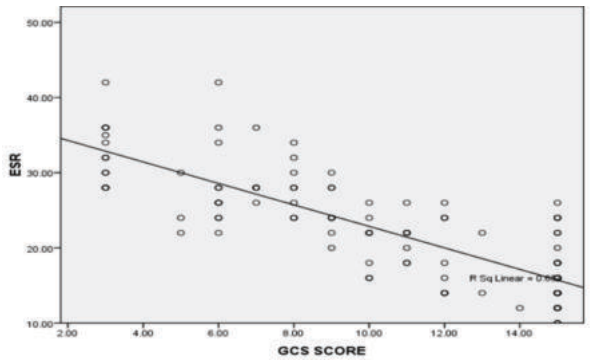


Table 7: ESR mean comparison according to mortality in study population.

	MORTALITY				t value	p value
	Yes		No			
	Mean	SD	Mean	SD		
ESR	30.63	5.20	19.62	5.69	9.22	<0.001

In subjects of mortality, mean ESR was 30.63±5.20. There was a significant difference found in ESR with p value of <0.001.

DISCUSSION

Over a eighteen month period from 2021 to 2022, current study was conducted on 108 patients in department of medicine, Moti Lal Nehru medical college & SRN Hospital, Prayagraj.

Stroke is one of the most common disease which is responsible for large number of mortality and morbidity worldwide. Numerous research have conducted over the past regarding various aspects of stroke ranging from its risk factor, pathogenesis, treatment. However incidence of stroke seems to be rising which is much attributed to changing lifestyle, though with time prognosis of disease has improved but still morbidity and mortality that the patient will suffer is a matter of question. This is because of the fact that first investigation often done i.e NCCT head tells that whether stroke is hemorrhagic or not. But in cases of non hemorrhagic stroke often NCCT head of patient is normal or if not normal, it do not suggest extent of disease in early period. Thus it is left to clinical judgement which is a subjective thing.

After years of research still we don't have any biochemical parameter which could be suggestive of severity of stroke. This study is an attempt to see prognostic significance of age old inflammatory marker ESR, CRP and Serum ferritin in patients of acute ischemic stroke.

Amit shanker et al in study on ESR as marker of atherosclerosis in ischemic stroke found that average ESR was higher in patient of ischemic stroke that was 27.89 mm/hr but in this study they did not accounted for severity of stroke. In a similar study conducted by Salim seluck comoglu et al where they included 158 patients and concluded that ESR level on admission do not reflect severity of stroke which is in constrast to results found in our study. In another study done by A. chomaro et al where they concluded that ESR is independent predictor of short term storke outcome and they found significant association between increased ESR and clinical deterioration during first 24 hours of onset.

So out of 3 studies related to relevance of ESR and acute ischemic stroke 2 found association of ESR with acute ischemic stroke while one study didn't pointed to the same fact. In our study mean age of patient was 67.05 years, 83.05 patients were of age greater than 55 years. Amongst which 56.5% were males and 43.5% were females. 49.1% of the patient were known hypertensive and 34.3% of the patient were diabetics.

Patients were divided into groups on the basis of their NIHSS score into 4 groups. In our study none of the patient was in mild severity category, while 17.6% of the patient were there in each of moderate and moderate to severe category and 64.8% were in severe category. Mean NIHSS score was 24.68 which lies in severe category. Mean values of different parameters were assessed in each category. Mean TLC, SGOT, SGPT, serum urea, serum creatinine were elevated in severe stroke when compared to others.

Mean ESR was calculated in each category, mean ESR was 15.89 mm/hr in moderate, 17.89 mm/hr in moderate to severe and 25.81 mm/hr in severe category. This suggest that mean ESR was greatest in severe category and least in moderate category. In our study mean ESR was greater i.e 23.66 mm/hr in females compared to males i.e 21.92 mm/hr. In study by Amit shankar et al which showed ESR to be a marker of atherosclerosis our study desired to relate its value with severity of ischemic stroke

CONCLUSIONS

- Mean ESR in total patient of acute ishemic storke was 22.67 mm/hr which was higher than normal ESR i.e 12-14 mm/hr
- Mean ESR was considerably higher in patient of severe stroke (25.81 mm/hr) as compared to that in moderate to severe stroke(17.89 mm/hr) and that in moderate stroke (15.89 mm/hr), it is also well correlated to GCS score where mean ESR was 31.44 mm/hr in very severe stroke compared to 16.53 mm/hr in mild category
- Even in mild category mean ESR was higher than normal ESR.
- Thus this study shows a positive correlation of ESR with severity of acute ischemic stroke and can be used as a predictor of mortality in acute ischemic stroke patients

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