VOLUME - 12, ISSUE - 01, JANUARY - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Neurology

THE CLINICAL VALUE OF PLATELET LYMPHOCYTE RATIO (PLR) IN PREDICTING POOR NEUROLOGICAL OUTCOME IN ACUTE HEMORRHAGIC STROKE AS COMPARED TO ACUTE ISCHEMIC STROKE – A PROSPECTIVE COHORT STUDY

Dr Isha Gupta* — Junior Resident, Department of Medicine, MLN Medical College, Prayagraj. *Corresponding Author

Prof Manoj Mathur — MD, Professor, Department of Medicine, MLN Medical College, Prayagraj.

Dr. Kamlesh Kumar Sonkar — DM Neurology, Assistant Professor, Department of Neurology, Medicine, MLN Medical College, Prayagraj.

Prof Poonam Gupta — MD, Professor, Department of Medicine, MLN Medical College, Prayagraj.

Prof Ajeet Kumar Chaurasia — MD, Professor, Department of Medicine, MLN Medical College, Prayagraj.

ABSTRACT

Aim – To assess the prognostic value of Platelet lymphocyte ratio (PLR) in acute hemorrhagic stroke as compared to acute ischemic stroke **Material And Methods** – A Prospective observational study was conducted at MLN Medical College, Prayagraj. A total of 100 adult patients, 50 each of ischemic and hemorrhagic stroke (as per CT/MRI diagnosis) were enrolled in the study, with onset of stroke within 48 hours, after following inclusion and exclusion criterias. **Result** – In-hospital mortality was significantly higher in hemorrhagic (56%) as compared to ischemic stroke (26%) (p=0.002). Mean platelet lymphocyte ratio was significantly higher in hemorrhagic (186.76 +-102.4) as compared to ischemic stroke (128.83 +- 78.3) (p=0.002). In hemorrhagic stroke, higher PLR showed a significant association with mortality (p<0.05) **Conclusion** – PLR was significantly higher in hemorrhagic stroke as compared to ischemic stroke and correlated with higher mortality in hemorrhagic stroke. Therefore, PLR showed a possible prognostic value with respect to mortality in hemorrhagic stroke patients as compared to ischemic stroke.

KEYWORDS : Platelet lymphocyte ratio (PLR), Hemorrhagic stroke, Mortality

INTRODUCTION –

Stroke is a major global health hazard, cause of serious long-term disability and the second leading cause of death worldwide.[1] The platelet-to-lymphocyte ratio (PLR) has been identified as a novel inflammatory marker which helps in prediction of inflammation and subsequent clinical course in a disease, particularly different cardiovascular and cerebrovascular diseases.[2] PLR has the benefit of reflecting upon the condition of both inflammation and thrombosis pathways and is more valuable than either platelet or lymphocyte counts alone.[3] This emerging marker has not been frequently studied with both types of stroke; hence aim of the present study was to find out the role of PLR in patients of stroke (both ischemic and hemorrhagic) and correlating with the final outcome for predicting the prognosis.

MATERIALS AND METHODS –

Study design: Prospective Cohort Study

Study duration & place: 3rd July 2021 to 2nd July 2022, at SRN Hospital, Prayagraj.

Inclusion Criteria:

Age >18years (male or female) presenting to the medicine dept within 48hrs of onset (CT/MRI confirmed cases of CVA)

Exclusion Criteria:

Patients with prior history of stroke, those with intracerebral haemorrhage due to bleeding from brain tumour and haemorrhagic transformation of a cerebral infarct, those with comorbid illness or medications interfering with platelet function and morphology, and those unwilling to participate in the study were excluded.

A total of 100 stroke patients, 50 each of ischemic and hemorrhagic stroke were enrolled in the study and 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. Haematological parameters were assessed.

The patients were followed during the hospital stay and their outcomes were noted.

RESULTS –

The present study was carried out to study the role of platelet to lymphocyte ratio (PLR) in patients of stroke. For this purpose, a total of 100 stroke patients (50 each of ischemic and hemorrhagic type) were enrolled in the study. Overall, age of patients ranged from 30 to 95 years. Mean age of patients was 63.50±13.32 years. Overall, majority of patients were males (68%). Almost one-third (32%) were females. The sex-ratio was 2.13. Fig 1 and 2 shows the age and sex profile of ischemic and hemorrhagic stroke patients respectively.

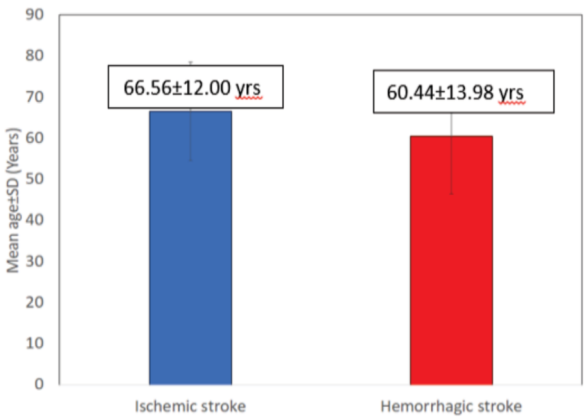

Fig. 1: Comparison of mean age of ischemic and hemorrhagic stroke patients

Table 1 shows that Mean platelet-lymphocyte ratio (PLR) was significantly higher in hemorrhagic (186.76 +-102.4) as compared to ischemic stroke (128.83 +- 78.3) (p=0.002). TLC, Neutrophils, Lymphocytes, Monocytes and PDW also showed a significant difference between the two groups.

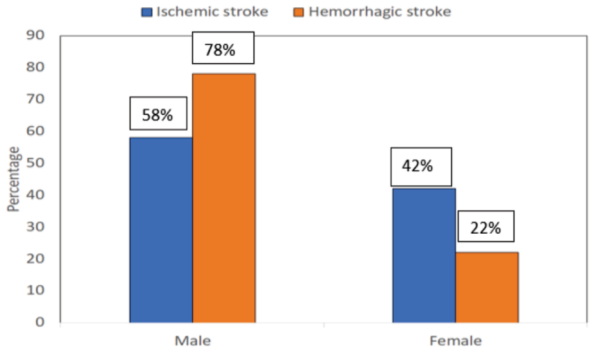

Fig. 2: Comparison of Sex profile of ischemic and hemorrhagic stroke patients

Table 1: Comparison of hematological parameters, platelet indices and PLR between ischemic and hemorrhagic stroke patients

SN	Parameter	Ischemic stroke (n=50)		Hemorrhagic stroke (n=50)		Statistical significance	
		Mean	SD	Mean	SD	't'	'p'
1.	Hb (g/dl)	12.27	2.10	12.69	1.76	-1.08	0.281
2.	TLC ('000/cumm)	10.71	3.94	13.54	4.64	-3.28	0.001
3.	Neutrophils (%)	76.19	12.22	84.23	7.52	-3.96	<0.001
4.	Lymphocytes (%)	15.42	7.37	10.73	5.92	3.51	0.001
5.	Monocytes (%)	6.73	2.60	5.01	2.24	3.54	0.001
6.	PC (lakhs/cumm)	1.57	0.90	1.54	0.66	0.20	0.841
7.	MPV(fl)	10.06	1.68	10.25	1.29	-0.63	0.529
8.	PDW	15.00	2.82	16.26	3.12	-2.11	0.037
9.	PCT	0.15	0.07	0.14	0.06	0.44	0.658
10.	PLR	128.83	78.30	186.76	102.4	-3.17	0.002
11.	RDW	14.29	3.80	13.66	1.37	1.11	0.271

Table 2 depicts Mean duration of hospital stay was significantly shorter in hemorrhagic stroke (3.88±2.32 days) as compared to that in ischemic stroke (5.08±2.75 days) (p=0.020).

Also, Mortality rate was significantly higher in hemorrhagic stroke (56%) as compared to ischemic stroke (26%) group (p=0.002).

Table 2: Comparison of hospital stay and mortality between ischemic and hemorrhagic stroke patients

SN	Parameter	Ischemic stroke (n=50)		Hemorrhagic stroke (n=50)		Statistical significance	
		Mean	SD	Mean	SD	't'	'p'
1.	Duration of hospital stay	5.08	2.75	3.88	2.32	2.36	0.020
		No.	%	No.	%	2	P
2.	Mortality	13	26.0	28	56.0	9.30	0.002

Table 3: Association of PLR with mortality in stroke patients

SN	Parameter	Expired		Survival		Statistical significance	
		Mean	SD	Mean	SD	t	'p'
1.	PLR (Hemorrhagic stroke)	227.28	111.04	135.18	60.36	3.5	0.001
2.	PLR (Ischemic Stroke)	127.1	97.05	120.44	72.14	0.09	0.927

Table 3 shows that higher PLR is significantly associated with mortality in hemorrhagic stroke (p=0.001) but not related with mortality in Ischemic stroke (p=0.927)

DISCUSSION –

The present study was a pilot study as an attempt to justify the clinical utility of PLR in predicting poor neurological outcome in terms of mortality in acute hemorrhagic stroke as compared to acute ischemic stroke. In the present study, age of patients ranged from 30 to 95 years. Mean age of patients was 63.50±14.32 years. Mean age of ischemic stroke patients was significantly higher (66.56±12 years) as compared to that of hemorrhagic stroke patients (60.44±13.98 years). Overall, there was a male preponderance (68%). It was observed that mean PLR was significantly higher in hemorrhagic stroke as compared to ischemic stroke (p=0.002). Mean duration of hospital stay was significantly shorter in hemorrhagic stroke as compared to that in ischemic stroke (p=0.020). Also, Mortality rate was significantly higher in hemorrhagic stroke as compared to ischemic stroke group (p=0.002). Moreover, it was observed in our study that mean PLR was significantly higher in hemorrhagic stroke patients who expired than in those who survived suggesting the prognostic value of PLR in hemorrhagic stroke. Similar results were obtained by Zhang W et al wherein they concluded that higher PLR was significantly associated with short-term neurological outcome in ICH patients, however they didn't compare between ischemic and hemorrhagic stroke.[4]

Adrian F et al studied the role of PLR in acute ischemic stroke and concluded that high PLR was an independent risk factor for poor outcomes in acute MCA ischemic stroke.[5] These findings were supported by the study done by Sharma D et al wherein they concluded that high PLR was associated with poor functional outcome (NIHSS) and can be used a prognostic marker in acute ischemic stroke.[6]

In a similar study conducted by Xu et al in Acute Ischemic Stroke, it was concluded that higher PLR levels were independently associated with an unfavorable outcome and death at 3 months in patients treated with Intravenous Thrombolysis.[7]

Although, PLR was higher in acute ischemic stroke patients who expired, but it was not statistically signficant in our study.

This study was one of the very few studies done in Indian subcontinent where there was a head-to-head comparison between acute hemorrhagic and acute ischemic stroke in terms of PLR and its association with mortality. Moreover, this study also threw light upon the significance of PLR as a poor prognostic marker in hemorrhagic stroke, an area of interest which remains unexplored by many researchers. Further studies on larger sample size are needed to corroborate these findings and assess the prognostic role of PLR in both types of strokes.

CONCLUSION –

The present study concluded that PLR was significantly higher in hemorrhagic as compared to ischemic stroke, and was associated with higher mortality in hemorrhagic stroke. Hence, PLR showed a possible prognostic value with respect to mortality in hemorrhagic stroke.

PLR can be calculated from a CBC report and hence it is a simple, cost effective and routinely available test which has emerged as a novel inflammatory marker. It can thus be used easily for predicting poor neurological outcome and mortality in stroke patients.

Conflict Of Interest: None

Limitation: Despite the best efforts, our study had few limitations:

1. The sample size of our study was small involving only single centre patients of acute ischemic stroke and acute

haemorrhagic stroke which might not be representative of the overall stroke population.
2. Owing to lack of long term follow up for our patients, we cannot comment whether PLR is a useful predictor of long-term prognostic outcome in patients with stroke or not.
3. Our study was carried out in a tertiary care centre where the cases are either serious or referred thus justifying the higher than usual mortality of both strokes in our study. Our study may thus be biased towards more serious cases.

REFERENCES –

1. Loscalzo J, Kasper DL, Longo DL, Fauci AS, Hauser SL, Jameson JL, et al. chapter 426 Introduction to Cerebrovascular Diseases. In: Harrison's® principles of internal medicine. New York: McGraw Hill; 2022.
2. Yan YK, Huang H, Li DP, Ai ZY, Sun Z. Prognostic value of the platelet-to-lymphocyte ratio for outcomes of stroke: a systematic review and meta-analysis. Eur Rev Med Pharmacol Sci 2021; 25 (21): 6529-6538
3. Sharma D, Gandhi N. Role of Platelet to Lymphocyte Ratio (PLR) and its Correlation with NIHSS (National Institute of Health Stroke Scale) for Prediction of Severity in Patients of Acute Ischemic Stroke. J Assoc Physicians India. 2021 Jan;69(1):56-60.
4. Zhang W, Shen Y. Platelet-to-Lymphocyte Ratio as a New Predictive Index of Neurological Outcomes in Patients with Acute Intracranial Hemorrhage: A Retrospective Study. Med Sci Monit. 2018 Jun 27;24:4413-4420. doi: 10.12659/MSM.910845.
5. Felix Adrian, Anak Agung Ayu Putri Laksmidewi, Ida Bagus Kusuma Putra, I Made Oka Adnyana, I Gusti Ngurah Budiarsa, Tommy Sarongku, et al. High platelet to lymphocyte ratio as a risk factor for poor outcome in acute ischemic stroke patient. Neurology Asia. 2022;27(2):231–7.
6. Sharma D, Gandhi N. Role of Platelet to Lymphocyte Ratio (PLR) and its Correlation with NIHSS (National Institute of Health Stroke Scale) for Prediction of Severity in Patients of Acute Ischemic Stroke. J Assoc Physicians India. 2021 Jan;69(1):56-60.
7. Xu J-H, He X-W, Li Q, Liu J-R, Zhuang M-T, Huang F-F, et al. Higher platelet-to-lymphocyte ratio is associated with worse outcomes after intravenous thrombolysis in acute ischaemic stroke. Frontiers in Neurology. 2019;10.