IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 12, Issue 1 Ser. V (Jan. – Feb. 2023), PP 26-30
www.iosrjournals.org

Role of Neutrophil Lymphocyte Ratio in Predicting Mortality Rate in Stroke: An Observational Study

Dr. Lahari NRRL*[1], Dr Vasuki Cheekoti[2,] adikonda srikar,
[*1](Postgraduate, Department of General Medicine, ApolloInstitute of Medical Sciences and Research, Hyderabad, Telangana, India)
[2](Postgraduate, Department of General Medicine, Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India)
[3](assistant professor of General medicine, apollo institute of medical sciences and research , Hyderabad)

Abstract:
Background*: Cerebrovascular accident (CVA) or stroke is defined as an acute episode of neurological dysfunction, that lasts for above 24 hours or causes death, with no apparent cause other than a vascular cause. The prognosis of stroke can be detected by assessing the neutrophil-to-lymphocyte ratio (NLR). The current study was undertaken as data was less on the role of NLR in stroke.*
Objective: *This study was done to know the role of NLR in predicting the mortality ratein stroke patients.*
Materials and Methods*: This study was done at tertiary care teaching hospital in the Department of General Medicine at Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India from July 2022 to December 2022. 50 stroke patients were included as per the eligibility criteria.Age, gender, presence or comorbidities, incidence of smoking, NLR and correlation between outcome of stroke and NLR were assessed.*
Results*: Most of the patients were aged 61 to 70 years. Most of the patients were males. Most of the patients had ischemic stroke. Most of the patients had hypertension. 16% is the mortality rate. There is a significant association between NLR and outcome of stroke(mortality).*
Conclusion: *Early management and prevention of stroke complications is very important, which can reduce mortality and improve outcomes. NLR may have potential predictive value in risk stratification of acute ischemic stroke.*
Key Words: *Neutrophil lymphocyte ratio, stroke,Prognostic marker, mortality rate*

Date of Submission: 06-02-2023 Date of Acceptance: 17-02-2023

I. Introduction

Cerebrovascular accident (CVA) or stroke is defined as an acute episode of neurological dysfunction, that lasts for above 24 hours or causes death, with no apparent cause other than a vascular cause.[1]Acute stroke is also called as a CVA. Among two types of strokes, the commonest one is ischemic stroke. It occurs due toimpairment of blood flow to the brain. Presence of hypertension (HTN), diabetes mellitus (DM), dyslipidemia, and addictions like smoking are risk factors for stroke. Stroke, if untreated may lead to pneumonia, deep vein thrombosis (DVT), seizures[2], depression[3], bed sores, limb contractures, headache, involuntary muscle tightening, urinary incontinence[4], and pulmonary embolism.

Stroke was the second most common cause of death globally in 2019, as per the World Health Organization (WHO). It is accountable for 11% causes of death worldwide[6]. Every year, 15 million people suffer a stroke globally. Among them, 5 million die and 5 million will become permanently disabled. It is less common in people aged below 40 years[7].With prompt diagnosis and treatment, most of the patients will be improvedwithin 1st 3 to 6 months of 1st attack of stroke. The prognosis of stroke can be detected by assessing the neutrophil-to-lymphocyteratio (NLR). One study[5] found that NLR was to be linked to an increased risk of severe stroke on admission and primary unfavorable outcome. After a median of 1.13 years of follow-up, high NLR was linked to recurrent ischemic stroke.The current study was undertaken as data was less on the role of NLR in stroke.

Hypothesis: We assume that NLR predicts the prognosis of stroke.
Objective: This study was done to know the role of NLR in predicting the mortality rate amongpatients with stroke.

II. Material And Methods

This observational study was carried out at a tertiary care centre in IndiafromJuly2022toDecember 2022.
Study Design: Observational study
The study is observational, as no therapy was given to patients as a part of the study.
Study Location: This study was done at a tertiary care teaching hospital in the Department of General Medicine at Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India.
Study Duration: July 2022 to December 2022
Sample size: 50 subjects
Sampling procedure: Convenience sampling
Sample size calculation: As per the systematic review done by Jones SP[8], prevalence of stroke varies from 105 to 152 per 1,00,000 persons in India. Considering the high end, the prevalence is 0.152%.
At a confidencelevel of90%, taking error as 1%,the minimum sample size obtained was 41.So, we included 50 patients considering a few dropouts.

Subjects & selection method: The study population was drawn from patients who were admitted into the General medicine ward, with clinical features suspicious of stroke.

Inclusion criteria:
1. Patients aged above 18 years with stroke confirmed as per computed tomographic (CT) findings
2. Either sex
3. Patients or their relatives who provided informed consent to participate in the study.
4. Patients with transient ischemic stroke (TIA).
5. Patients with ischemic stroke only.

Exclusion criteria:
1. Patients with incomplete data
2. Stroke due to trauma or malignancy or active infections /haematological diseases /immunosuppressive agents
3. Patients with previous history of stroke or TIA.

Methodology:
After Involving patients as per the inclusion and exclusion criteria, data collection was done. A detailed history was taken from the patient's relatives. Thorough physical examination, vital signs and systemic examination were done. The data was subjected to statistical analysis and then a conclusion was drawn.

Parameters assessed:
- Age
- Gender
- Presence of smoking
- Presence and types of comorbidities
- Mortality rate
- NLR
- Relation between NLR and mortality rate

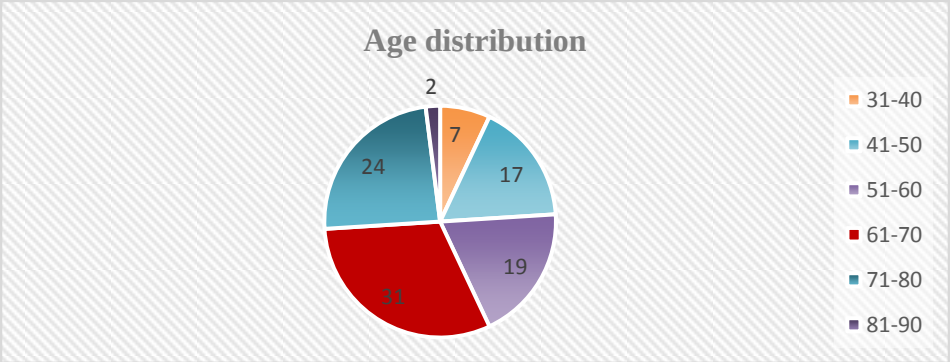
Ethical considerations: Permission was obtained from the Institutional ethical committee attached to the ApolloInstitute of Medical Sciencesand Research before conducting the study. Every patient was explained the whole process and advantages of the study. After he/she accepts, an informed consent form is given in the local language or the patient's understandable language and the person was asked to sign it or put a thumb impression.

Statistical analysis
Data was analyzed using Epi info software version 7.2.5.Results were expressed as percentages and mean with standard deviation. Students unpaired T test was used to compare numerical parameters. Results were presented in tabular forms and graphs in pie and bar diagrams.

III. Results

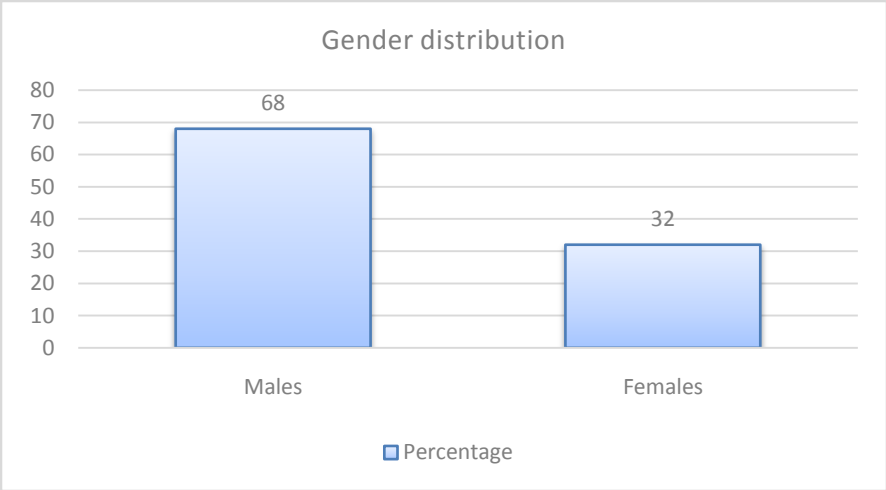
The current study included 50 patients with stroke.
Age: Most of the patients belonged to the age group 61 to 70 years. The mean age was 62.4±6.1 years.

Graph 1: Shows the age distribution of patients



Gender: Most of the patients were males. 68% were males and 32% were females.

Graph 2 shows gender distribution of patients



Outcome: 8 patients expired in the current study.

Incidence of smoking: Smoking was seen in 42% of patients.

Table 1 shows incidence of smoking among patients

Smoking	No of patients	% of patients
Yes	21	42%
No	29	58%

Comorbidities:

Hypertension was the most common comorbidity seen, followed by diabetes.

Overall diabetes was seen in 28% of patients, and overall hypertension was seen in 42% of patients and coronary artery disease was seen among 40% of patients. Multiple comorbidities were seen in various patients.

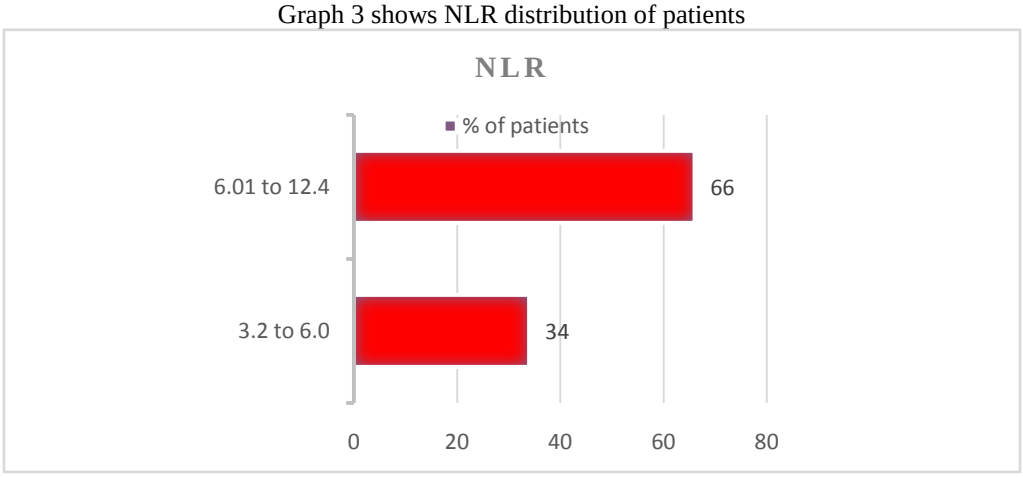
Table 2 shows the incidence of various comorbidities among study patients

Comorbidities	No of patients	% of patients
Diabetes mellitus	14	28%
Hypertension	24	42%
Coronary artery disease	20	40%
Hyperlipidemia	18	36%

Mean NLR:

Most of the patients had NLR 6.01 to 12.4. The mean NLR was 8.28±1.2

Graph 3 shows NLR distribution of patients



Relation between NLR and outcome:

There is a significant difference in NLR and outcome in this study. NLR was more in patients who were expired in the hospital. This indicates significant association between NLR and outcome.

Table 3 shows association between NLR and outcome

OUTCOME	NEUTROPHILLYMPHOCYTERATIO	
	MEAN	SD
DEAD	10.578	0.81
ALIVE	6.93	0.24
Unpairedttest		
P value - 0.0001		

IV. Discussion

The neutrophil-to-lymphocyte ratio (NLR) is a simple ratio between the neutrophil and lymphocyte counts, is a biomarker that reflects the balance between acute inflammation and chronic inflammation– neutrophil count with adaptive immunity (lymphocyte count). NLR could predict the outcome and disease course among patients with Ischemic stroke cerebral hemorrhage, sepsis and infectious diseases, cancer, COVID-19[9-13].

In the current study, 50 patients were included. 16% is the morality rate. Smoking was seen in 42% of patients. Hypertension was the most common comorbidity seen, followed by diabetes.

Overall diabetes was seen in 28% of patients, and overall hypertension was seen in 42% of patients and coronary artery disease was seen among 40% of patients. Multiple comorbidities were seen in various patients. Most of the patients had NLR 6.01 to 12.4. The mean NLR was 8.28±1.2. There is a significant difference in NLR and outcome in this study. NLR was more in patients who were expired in the hospital. This indicates significant association between NLR and outcome in the current study.

In the study done by **Yang Y[14],** in China, 524 patients were having stroke. Among them, females were more compared to males. Gender preponderance is in contrast to the current study findings.

In the study of Zhang **FL[15]**, among 4052 patients included with stroke, the mean age was found to be 54.85±9.30 years. The prevalence of stroke increases with age. Stroke was significantly higher in men than in women. This finding was similar to the current study finding.

In the study done by **Putala**[16]in 2012, patients with 1st episode of ischemic stroke aged 15 to 49 years were included. Dyslipidemia was seen in 45.8% patients of stroke.HTN was seen in 35.9% patients. Smoking was seen in 48.7% stroke patients.Diabetes was seen in 8% patients. Coronary heart disease was seen in 6% patients.This shows high incidence of comorbidities among stroke patients, similar to our study.

Tokgoz[17]did a retrospective study that included 255 patients with acute infarction who got admitted in 24 hours of symptom onset. 71 of 255 patients expired during the follow-up period. In our study, 9 patients of 81 died in 1 month, as 19 patients died during hospital stay. The median NLR was statistically more among the mortality group compared with the survival group, similar to our study findings.

V. Conclusion

The current study showed a positive association between raised NLR and mortality risk in stroke patients. Early management and prevention of stroke complications is very important, which can reduce mortality and improve outcomes.NLR may have potential predictive value in risk stratification of acute ischemic stroke. It can be obtained quickly and easily from blood cell count.We concluded that higher NLR can predict post-stroke mortality risk. The study is self-sponsored and there are no conflicts of interest.

References

[1]. Sacco RL, Kasner SE, Broderick JP, Caplan LR, Connors JJB, Culebras A, et al. An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association: A statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2013;44(7):2064–89. Available from: http://dx.doi.org/10.1161/STR.0b013e318296aeca

[2]. Olsen TS, Høgenhaven H, Thage O. Epilepsy after stroke. Neurology. 1987; 37:1209–11.

[3]. Robinson RG, Szetela B. Mood change following left hemispheric brain injury. Ann Neurol. 1981; 9:447–53.

[4]. Patel M, Coshall C, Rudd AG, Wolfe CD. Natural history and effects on 2-year outcomes of urinary incontinence after stroke. Stroke. 2001; 32:122–7.

[5]. Xue J, Huang W, Chen X, Li Q, Cai Z, Yu T, Shao B. Neutrophil-to-Lymphocyte Ratio Is a Prognostic Marker in Acute Ischemic Stroke. J Stroke Cerebrovasc Dis. 2017 Mar;26(3):650-657. doi: 10.1016/j.jstrokecerebrovasdis.2016.11.010. Epub 2016 Dec 9. PMID: 27955949.

[6]. Andersen, Klaus Kaae; Olsen, Tom Skyhøj; Dehlendorff, Christian; Kammersgaard, Lars Peter "Hemorrhagic and Ischemic Strokes Compared: Stroke Severity, Mortality, and Risk Factors". Stroke. 2009; 40 (6): 2068–2072. doi:10.1161/STROKEAHA.108.540112. ISSN 0039-2499. PMID 19359645. S2CID 1506706.

[7]. Reeves MJ, Bushnell CD, Howard G, Gargano JW, Duncan PW, Lynch G, Khatiwoda A, Lisabeth L. Sex differences in stroke: epidemiology, clinical presentation, medical care, and outcomes. Lancet Neurol. 2008 Oct;7(10):915-26. doi: 10.1016/S1474-4422(08)70193-5. Epub 2008 Aug 21. PMID: 18722812; PMCID: PMC2665267.

[8]. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, Kalkonde Y, Lightbody CE, Maulik PK, Srivastava PM, Pandian JD, Kulsum P, Sylaja PN, Watkins CL, Hackett ML. Stroke in India: A systematic review of the incidence, prevalence, and case fatality. Int J Stroke. 2022 Feb;17(2):132-140. doi: 10.1177/17474930211027834. Epub 2021 Jul 2. PMID: 34114912; PMCID: PMC8821978.

[9]. Eslamijouybari M, Heydari K, Maleki ,Moosazadeh M, Hedayatizadeh-Omran A, Vahedi L, et al . "Neutrophil-to-Lymphocyte and Platelet-to-Lymphocyte Ratios in COVID-19 Patients and Control Group and Relationship with Disease Prognosis". Caspian J Intern Med. 2020: 11 (Supplement 1).

[10]. Forget P, Khalifa C, Defour JP, Latinne D, Van Pel MC, De Kock M. What is the normal value of the neutrophil-to-lymphocyte ratio? BMC Res Notes. 2017 Jan 3;10(1):12. doi: 10.1186/s13104-016-2335-5. PMID: 28057051; PMCID: PMC5217256.

[11]. Zahorec, R. "Ratio of neutrophil to lymphocyte counts--rapid and simple parameter of systemic inflammation and stress in critically ill". BratislavskeLekarskeListy. Bratisl Lek Listy. 2001: 102 (1): 5–14. PMID 11723675.

[12]. Sato, Hiroshi; Tsubosa, Yasuhiro; Kawano, Tatsuyuki. "Correlation Between the Pretherapeutic Neutrophil to Lymphocyte Ratio and the Pathologic Response to Neoadjuvant Chemotherapy in Patients With Advanced Esophageal Cancer". World Journal of Surgery. 2012: 36 (3): 617–622. doi:10.1007/s00268-011-1411-1. PMID 22223293. S2CID 13393640.

[13]. Xue J, Huang W, Chen X, Li Q, Cai Z, Yu T, Shao B. Neutrophil-to-Lymphocyte Ratio Is a Prognostic Marker in Acute Ischemic Stroke. J Stroke Cerebrovasc Dis. 2017 Mar;26(3):650-657. doi: 10.1016/j.jstrokecerebrovasdis.2016.11.010. Epub 2016 Dec 9. PMID: 27955949.

[14]. Yi, X., Luo, H., Zhou, J. *et al.* Prevalence of stroke and stroke related risk factors: a population based cross sectional survey in southwestern China. *BMC Neurol*.2020. **20**, 5. https://doi.org/10.1186/s12883-019-1592-z

[15]. Zhang FL, Guo ZN, Wu YH, Liu HY, Luo Y, Sun MS, Xing YQ, Yang Y. Prevalence of stroke and associated risk factors: a population based cross sectional study from northeast China. BMJ Open. 2017 Sep 3;7(9):e015758. doi: 10.1136/bmjopen-2016-015758. PMID: 28871014; PMCID: PMC5589000.

[16]. Putaala J, Yesilot N, Waje-Andreassen U, Pitkäniemi J, Vassilopoulou S, Nardi K, et al. Demographic and geographic vascular risk factor differences in European young adults with ischemic stroke: the 15 cities young stroke study: The 15 cities young stroke study. Stroke [Internet]. 2012;43(10):2624–30. Available from: http://dx.doi.org/10.1161/STROKEAHA.112.662866

[17]. Tokgoz S, Kayrak M, Akpinar Z, Seyithanoğlu A, Güney F, Yürüten B. Neutrophil lymphocyte ratio as a predictor of stroke. J Stroke Cerebrovasc Dis. 2013 Oct;22(7):1169-74. doi: 10.1016/j.jstrokecerebrovasdis.2013.01.011. Epub 2013 Mar 14. PMID: 23498372.

Dr. Lahari NRRL, et. al. "Role of Neutrophil Lymphocyte Ratio in Predicting Mortality Rate in Stroke: An Observational Study." *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, 12(1), 2023, pp. 26-30.