ORIGINAL RESEARCH PAPER

Gastroenterology

NEUTROPHIL-TO-LYMPHOCYTE RATIO (NLR) AS A MARKER IN THE MANAGEMENT OF COVID -19

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ABSTRACT

Background: CoVID-19 infection is associated with increased bed occupancy and mortality. Biochemical predictors are essential to triage the infected patients according to their severity. In this aspect, we had studied the NLR as a biochemical marker to predict the severity of the disease. **Methods:** 95 patients with confirmed CoVID-19 diagnosis, admitted in Kanyakumari Medical College, were taken as a sample and an observational study was conducted. **Results:** NLR is significantly elevated (>9.0) in patients requiring admission in Intensive Care Unit. **Conclusion:** NLR is a simple, useful and cost-effective tool in assessing the severity of the disease at any point of time, in the management of CoVID-19 disease.

INTRODUCTION:

Since December 2019, cases of disease related Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV2), has rapidly spread from the Wuhan Province in China to the whole world. The World Health Organisation (WHO) has officially recognised CoVID-19 as a pandemic and countries worldwide are now facing huge challenges trying to prevent its further spread while also treating the growing number of CoVID-19 patients. In fact, although the majority of cases are usually self-limiting with mild symptoms such as low-grade fever and cough, the disease can be fatal. Serious CoVID-19 patients can develop severe pneumonia, Acute Respiratory Distress Syndrome (ARDS) and multiple organ failure leading to death, the mortality rate higher in the geriatric group with pre-existing chronic diseases.

Clinicians are searching for a reliable prognostic marker that can distinguish patients at risk of developing more severe forms of the disease in order to better manage hospital resources.

The Neutrophil-to-Lymphocyte Ratio (NLR) in peripheral blood has been studied as a systemic inflammatory marker and various studies have shown that it is a valid prognostic factor in various solid tumours and other chronic diseases such as lung, cardiovascular and kidney diseases.

Here we describe the clinical characteristics of hospitalised patients with CoVID-19 and aim to assess predictors of clinical outcome.

AIM:

The severity of COVID 19 infections is assessed by clinical effects, biochemical markers and radiological investigations. A simple and cost effective method in assessing the severity of CoVID-19 infection is required in developing countries. The aim of this study is to assess the reliability of Neutrophil Lymphocyte Ratio (NLR) in assessing the severity of the CoVID-19 infection.

MATERIALS AND METHODS:

A group of 95 patients in Kanyakumari Government Medical College with confirmed CoVID-19 diagnosis, hospitalised in June 2021, were taken as sample group. The diagnosis was confirmed via molecular assay from nasopharyngeal and oropharyngeal swabs. The study is an observational study collecting data at one specific point in time from the patients admitted in CoVID wards. The patients admitted in the General Ward, Intermediate Care Unit and Intensive Care Unit were taken for the study.

Apart from the patients' demographic details, the following data were collected:

1. Date of onset of symptoms and duration of the illness
2. SpO2 at the time of admission
3. CT Severity Index (CTSI)
4. Complete Haemogram

The complete haemogram was taken simultaneously for all patients.

Neutrophil-to-Lymphocyte Ratio (NLR) is calculated by dividing the number of neutrophils by the number of lymphocytes from the peripheral blood smear.

Parametric and Non-parametric tests were used, as deemed appropriate, to compare changes, and logistic regression analyses were used to assess predictors.

RESULTS:

Table 1: Days from Onset of Illness

Day Range	Average NLR		
	Ward	**Intermediate Care Unit**	**ICU**
1 to 5 days	3.447	11.751	5.714
6 to 10 days	8.675	7.243	5.801
11 to 15 days	6.158	13.319	13.610
16 to 20 days	6.033	3.051	7.849
21 to 25 days	6.517	12.588	6.488
26 to 30 days	9.182	13.993	6.538
>30 days	11.250	2.462	13.048

As mentioned in Table 1, the NLR of patients admitted in the General Ward and Intermediate Care Unit was observed to be less than 6 which indicates the viremic phase of the disease. The NLR is above 6 but less than 9 after 6 days in the General Ward and Intermediate Care Unit. NLR is significantly elevated in the patients admitted in the ICU.

Table 2: CTSI and NLR

CTSI Severity	Average NLR		
	Ward	Intermediate Care Unit	ICU
Mild	3.567	10.979	10.309
Moderate	7.577	9.065	9.534
Severe	7.003	8.579	9.406

From Table 2, it can be inferred that the NLR in patients admitted in Intermediate Care Unit and ICU were more than 9. Irrespective of the CT findings patients admitted in the General Ward had NLR values less than 9.

Table 3: Comparison of SpO2 and NLR

SpO2	Average NLR		
	Ward	Intermediate Care Unit	ICU
>90	5.849	9.563	12.480
81 to 90	6.985	9.165	7.640
71 to 80	11.125	7.311	9.875
<=70		11.250	16.548

SpO2 at the time of admission correlates well with the NLR. The patients admitted in the General Ward with SpO2 less than 80% had elevated NLR.

DISCUSSION:

Many studies on the feasibility of NLR in predicting prognosis of patients with SARS-CoV2 infection have been published recently.

Table 4: NLR Distribution

NLR Range	Ward	Intermediate Care Unit	ICU	Overall
<3.5	20.5%	8.7%	18.2%	16.8%
3.6 to 6.0	23.1%	17.4%	9.1%	16.8%
6.1 to 9.0	33.3%	47.8%	27.3%	34.7%
>9.0	23.1%	26.1%	45.4%	31.7%

In the current study of 95 hospitalised patients, a higher NLR was associated with a more severe outcome. As inferred from Table 4 above, majority of patients (44.1%) admitted in the Intensive Care Unit have a NLR>9. In the Intermediate Care Unit, the majority of patients have NLR between 6.0 to 9.0. In the General Ward, the NLR is on a still lower scale.

Table 5

	Mean NLR
Ward	6.498
Intermediate Care Unit	9.020
Intensive Care Unit	10.492

An overview of the NLR amongst the admissions in General Ward, Intermediate Care Unit and Intensive Care Unit showed mean values of 6.498, 9.020 and 10.492 respectively. This depicts that higher the NLR, more intensive is the care required.

With an increasing number of CoVID19 cases and the limited healthcare facility, early prediction of CoVID-19 severity and mortality is crucial. Compared with other laboratory parameters that predict the prognosis of CoVID-19, such as Interleukin-6 (IL-6), D-dimer levels, C-reactive protein and erythrocyte sedimentation rate; NLR is more practical for clinical application as it is easily obtained in routine blood tests [1,2]. Due to the low cost and no need for specific essay equipment, NLR remains a simple, accessible, near real-time, and cost-effective biomarker, especially for healthcare facilities with limited medical resources [3].

NLR values were previously reported to vary with age and sex,

thus, NLR must be interpreted carefully [4]. Studies have also reported NLR to be race-specific, where different average NLR values were found in different populations [5,6]. However, the meta-regression analysis showed that the associations between NLR and CoVID-19 severity and mortality were independent of age, gender, and underlying diseases [7].

CONCLUSION:

NLR is a simple, useful and cost-effective tool in assessing the severity of the disease at any point of time in the management of CoVID-19 disease.

Though a fixed cutoff could not be achieved, the following conclusions can be arrived at:

1. NLR more than 9.0 necessitates admission in the Intensive Care Unit
2. NLR between 6.0 to 9.0 requires Intermediate Care Unit.
3. Serial assessment of NLR is useful in assessing the patient response to the medical management.

CONTRIBUTION STATEMENT:

Data collection by Dr Prabhakaran, Dr Santosh Raj, Dr Sandya, Junior Residents, Kanyakumari Government Medical College, Asaripallam

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