# THE RELATIONS BETWEEN NEUTROPHIL-LYMPHOCYTIC RATIO AND DIFFERENT COMORBIDITIES IN CORONAVIRUS-INFECTED PATIENTS

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## ABSTARCT

**Objective:** The study's aim was to determine the neutrophil-to-lymphocyte ratio (NLR) is most helpful predictor factor for COVID-19-related serious illness.

**Methods:** A total of 51 patients with COVID-19 infection with laboratory-confirmed reports were enrolled in this study: Age, neutrophil-to-lymphocyte (LYMLYM) ratio (NLR), an examination, and comparison. Data analysis, compilation, and report writing were completed based on the acquired data. Using SPSS.ver-23, standard statistical procedures were used to analyze the mean and standard deviation, as well as the Pearson correlation. If p<0.05, it is deemed significant.

**Results:** The mean hemoglobin level was 12.44±3.55%, the mean platelet count was 1.95±0.65 cumm, the mean white blood cell count was 17400 ±6455.22 cumm, and the mean NLR was 5.72±1.24. When we looked at people who had hypertension, diabetes mellitus, and high cholesterol, we found that the NLR value was significantly higher in people with these diseases (p=0.05).

**Conclusion:** We found that NLR is an excellent way to predict COVID-19-infected patients who are likely to get a lot of other illnesses and have a lot of problems early on.

**Keywords:** Covid-19, Neutrophil-to-lymphocyte ratio, Diabetes mellitus, Hypertension, Hyperlipidemia.

## INTRODUCTION

Coronaviruses are a type of virus that can be found all over the world. Members of this family have been linked to common colds as well as serious disorders such as the Middle-East respiratory syndrome and severe acute respiratory syndrome. In December 2019, the 2019 coronavirus disease (COVID-19) was determined to be the cause of unexplained viral pneumonia in Wuhan, China, and the World Health Organization acknowledged this virus on January 12, 2020. COVID-19 was claimed to have spread throughout Hubei Province, China, and even to other countries the following month [2].

The majority of people infected with the novel coronavirus had mild-to-moderate sickness, with severe illness frequently leading to dyspnea after 1 week. Acute disease patients rapidly progressed to acute respiratory failure, acute respiratory distress syndrome, metabolic acidosis, coagulopathy, and septic shock. The early identification of critical disease risk factors facilitated proper supportive care and quick access to the intensive care unit (ICU) when necessary. Patients with mild-to-moderate illness require general seclusion and ICU care. Unless the condition advances, no treatment is required. As a result, an early prognostic prediction may aid in reducing mortality and alleviating medical resource shortages. Huang *et al.* [3] found that lymphopenia was common in COVID-19 patients. Furthermore, the baseline neutrophil-to-lymphocyte ratio (NLR) has been demonstrated to be an accurate short-term predictor of people's health. We performed correlation analysis to see how different variables linked with one another, such as NLR, epidemiological history, comorbidity, and other laboratory tests.

## METHODS

It was a study that was carried out in the future – a study conducted at MGM Medical College and Hospital's Department of General Medicine. A total of 51 patients with laboratory-confirmed COVID-19 infection were enrolled in the study. Age, NLR, inspection, and comparison the

study were conducted and followed up for 6 months (January 2020–June 2021) at the in-patient department of general medicine. Data analysis, compilation, and report writing were accomplished using the acquired data. Using SPSS.ver-23, standard statistical procedures were employed to calculate the mean and standard deviation, as well as the correlation. It is considered significant if p<0.05.

A general survey, systemic evaluation, and other pertinent systemic inquiries were all part of the clinical examinations. A laboratory investigation, primarily a complete blood count, is performed.

### Variables to consider

Men and women were different in terms of their ages, gender, education, occupation, religion, and place of residence. Other risk factors (hypertension [HTN], hyperlipidemia, and type 2 diabetes) and hematological abnormalities are also present.

### Statistical analysis

On the basis of the acquired data, data analysis, compilation, and report writing were completed. Standard statistical methods were used to analyze the mean and SDSD, as well as the Pearson correlation, using SPSS.ver-23. If p<0.05, it is deemed significant.

## RESULTS

**Age distribution among the study population**

| Age in Year | Number of Cases | Percentage |
|---|---|---|
| 40–50 | 6 | 11.8 |
| 51–60 | 19 | 37.3 |
| 61–70 | 17 | 33.3 |
| 71–80 | 09 | 17.6 |
| Total | 51 | 100 |
| Mean and SD value | 57.39±6.28 | |

The majority of the patients were in the age group of 51–60 years (37.3%), followed by 61–70 years (33.3%), and 71–80 years (17.6%). The least common age group was 40–50 years, involving only 11.8% of patients. The mean age of study subjects was 57.39±6.28 years.

### Sex distribution among the study population

| Sex | Number of Cases | Percentage |
|---|---|---|
| Male | 38 | 74.5 |
| Female | 13 | 25.5 |
| Total | 51 | 100 |
| M: F | 2.92:1 | |

Male cases were predominantly higher than females. About 74.5% of cases were male, while 25.5% were female. The male-to-female ratio was 2.92:1.

### Sociodemographical profile among the study population

| ??? | Number of Cases | Percentage |
|---|---|---|
| Educational Status | | |
| Primary | 2 | 3.9 |
| Upper primary | 3 | 5.9 |
| Madhyamik | 20 | 39.2 |
| Higher secondary | 8 | 15.7 |
| Graduate | 10 | 19.6 |
| Higher education | 8 | 15.7 |
| Occupational Status | | |
| Worker | 4 | 7.9 |
| Farmer | 1 | 2.0 |
| Businessmen | 9 | 17.6 |
| Service | 25 | 49.0 |
| Housewife | 12 | 23.5 |
| Religion | | |
| Hindu | 44 | 86.3 |
| Muslim | 7 | 13.7 |
| Residence | | |
| Rural | 09 | 17.6 |
| Urban | 42 | 82.4 |

The patients studied have sociodemographic statuses, such as educational status, occupational status, religion, and residential status. Regarding the academic level, the majority of the patients were educated with Madhyamik education (39.2%), followed by primary (3.9%), graduation (19.6%), and higher education (15.7%). In terms of occupational status, the majority of the patients were servicemen (17.6%), housewives (23.5%), workers (7.9%), and farmers (7.3%). About 2.0% were business people, and 17.66% were farmers. 86.3% were Hindus among all the participants, and 13.7% were Muslims. About 82.4% lived in urban areas, while 17.6% were from rural areas.

### Risk factors among the study population

| Comorbidities | Number of cases | Percentage |
|---|---|---|
| Hypertension | | |
| Present | 28 | 54.9 |
| Absent | 23 | 45.1 |
| Diabetes mellitus | | |
| Present | 39 | 76.5 |
| Absent | 12 | 23.5 |
| Hyperlipidemia | | |
| Present | 18 | 35.3 |
| Absent | 33 | 64.7 |

In this study, 54.9% of the people who took part in it had high blood pressure, diabetes, or hyperlipidemia. About 45.1 (76.5%) of the people who took part in this study also had diabetes or hyperlipidemia.

### Hematological parameters include the neutrophil-to-Lymphocyte ratio levels in study participants

| Hematological parameters | Mean±SD |
|---|---|
| Hemoglobin (%) | 12.44±3.55 |
| Platelet Count (cumm) | 1.95±0.65 |
| WBC (Cumm) | 17400±6455.22 |
| Neutrophil and lymphocyte ratio | 5.72±1.24 |

WBC: White blood cell

The mean hemoglobin level was 12.44%, the mean platelet count was 1.95±0.65 cumm, the mean white blood cell (WBC) count was 17400±6455.22 cumm, and the mean NLR was 5.72±1.24.

### Comparisons of neutrophil-lymphocyte ratio among patients with presence or absence of different risk factors

| Comorbidities | Number of cases | NLR Mean SD | p-value |
|---|---|---|---|
| Hypertension | | | |
| Present | 28 | 5.213±0.68 | 0.0001 |
| Absent | 23 | 3.112±0.41 | |
| Diabetes mellitus | | | |
| Present | 39 | 5.426±0.77 | 0.003 |
| Absent | 12 | 3.254±0.59 | |
| Hyperlipidemia | | | |
| Present | 18 | 5.821±0.62 | 0.001 |
| Absent | 33 | 3.321±0.44 | |

NLR: Neutrophil-lymphocyte ratio

People who have HTN, diabetes, and high cholesterol have a significantly higher NLR value (p=0.05) when compared to people who don't have these diseases.

### Correlation between Neutrophil-Lymphocyte ratio versus different risk factors

| Correlations | NLR | Hyperlipidemia | Hypertension | Diabetes Mellitus |
|---|---|---|---|---|
| NLR | | | | |
| Pearson Correlation | 1 | −0.729** | −0.745** | −0.722** |
| p-value | | 0.0001 | 0.0001 | 0.0001 |
| No of sample | 51 | 51 | 51 | 51 |

**p=0.01, correlation is significant (HS), NLR: Neutrophil-lymphocyte ratio

The Pearson correlation was established between HTN, diabetes mellitus, and hyperlipidemia with a NLR. It shows that all the parameters are negatively correlated with the NLR (p=0.001).

### Final Outcome

| Outcome | Number of Cases | Percentage |
|---|---|---|
| No death within 7 days | 07 | 13.7 |
| Recovery | 35 | 68.6 |
| No, follow-up (Due to communication gap) | 09 | 17.7 |

The final outcome of the present study shows that 68.6% (35) patients were recovered, while the mortality rate was 13.7% (7), and nine (17.7%) were unavailable for follow-up due to communication gaps.

## DISCUSSION

Since the COVID-19 pneumonia outbreak in December 2019, there have been 2,000–4,000 new confirmed cases of infection every day in India, with the number of severe cases and deaths growing daily. According to a recent study, 26% of patients needed ICUICU. Care died, with a death rate of 4.3%. The number of patients in Wuhan and other areas is rapidly increasing[4,5]. The current issue is the scarcity of medical resources,

particularly critical care resources. The early detection of severe illness and risk stratification management will aid in the alleviation of a few medical help and may reduce mortality. Recent research has linked low lymphocyte-to-C-reactive protein ratios [6], platelet-to-lymphocyte ratios [7], and thrombocytopenia [8] to severe disease. Furthermore, smoking and chronic obstructive pulmonary disease (COPD) have been linked to COVID-19 [9]. Due to the small number of respondents, this may not have had an impact on the current study's findings (a total of ten smoking and six COPD patients).

The COVID-19 pneumonia is not severe in the early stages, but critical individuals deteriorate after 7–14 days and develop a state of severe pneumonia and acute respiratory failure. The patients who died as a result of COVID-19 infection were generally elderly and had comorbidities [10]. The critically ill individuals in the trial were all over the age of 50. The disease's progression was linked to a drop in lymphocyte count. It is unknown why lymphopenia is linked to severe illness. COVID-19 has been postulated to act on T lymphocytes, and T lymphocyte destruction is a major factor in the patient's condition deteriorating [11]. In addition, people who are very sick usually have a lot of leukocytes, because damaged cells cause a lot of inflammation in the lungs, which is mostly caused by pro-inflammatory macrophages and granulocytes [12]. The NLR was a common way to figure out how bad bacterial infections were and how well patients with pneumonia and other illnesses were going to do [11].

This study looked at the data of 51 people who had COVID-19 pneumonia, and it looked at their baseline characteristics, as well as how their laboratory and imaging features changed over time as they got sick. The independent risk factors influencing the occurrence of critical illness were investigated. According to the findings, NLR was the most important predictive factor for progression. The average hemoglobin level was 12.44±3.55%, the average platelet count was 1.95±0.65 cumm, the average WBC count was 17400±6455.22 cumm, and the average NLR was 5.72±1.24. The Pearson association between HTN, diabetes, hyperlipidemia, and NLR was established. It demonstrates that all metrics are inversely linked with the NLR (p=0.001). It was discovered that 68.6% (35) of the patients were recovered, while the mortality rate was 13.7% (7), and nine (17.7%) were unable to be followed up on due to a communication breakdown.

The previous research has shown that the MuLBSTA score, which includes six signs, can provide an early warning about the mortality of viral pneumonia [13]. This score includes age, smoking history, HTN, bacterial coinfection, lymphopenia, and multilobular infiltration. The CURB-65 score was frequently utilized to assess 30-day mortality in community-acquired pneumonia patients [14]. Furthermore, the prediction effects of the NLR-CURB-65 models were found to be superior to those of the original models. However, NLR was a simple predictive index.

## CONCLUSION

Our results suggest that the NLR value may be a paraclinical marker and that NLR is a predictive factor for the early-stage prediction of COVID-19-infected patients who are likely to acquire various comorbidities and severe illnesses.

## AUTHORS' CONTRIBUTIONS

Contribute equally.

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