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Original Research Article

Hematological Profile and Study of Inflammatory Markers in COVID 19

Vigneshwaran S[1], Ramya N[2], Prabhu Shankar S[3*]

[1]Department of General Medicine, Trichy SRM Medical College Hospital & Research Centre, Tiruchirapalli, Tamilnadu, 621105, India
[2]Professor, Department of General Medicine, Trichy SRM Medical College Hospital & Research Centre, Tiruchirapalli, Tamilnadu, 621105, India
[3]Professor, Department of General Medicine, Trichy SRM Medical College Hospital & Research Centre, Tiruchirapalli, Tamilnadu, 621105, India

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Abstract: ***Background*:** NLR has historically been used as a predictor of morbidity and mortality in patients with COVID -19.Inflammatory markers serum ferritin, C-reactive protein (CRP) and serum LDH have been reported to be significantly associated with the high risks of the development of severe COVID19. ***Aims*:** To correlate with total lymphocyte count (TLC) and Neutrophil lymphocyte ratio (NLR) in assessing the clinical course of COVID 19 and to study the role of inflammatory markers in assessing the severity and clinical course of COVID 19. ***Methods*:** The study was done as a cross sectional study among 519 patients who admitted in Trichy SRM medical college hospital and research centre. All adults of both sexes diagnosed with COVID 19 were included in study by consecutive sampling and patients with known chronic inflammatory conditons, autoimmune disorders, malignancy were excluded from the study. The total lymphocyte count and neutrophil lymphocyte ratio were recorded and blood CRP, serum LDH, ferrtin, D dimer were done and correlated with the disease severity and clinical course of COVID. ***Results*:** Among 518 patients, 257(49.6%) patients were in the age group of 46 to 65 years and 309 (59.7%) patients were males and 209 (40.3%) were females. Neutrophil Lymphocte ratio was 3-2.5 in (30.9%) patients. Duration of stay in hospital was 11-14 days for 82 patients in that C reactive protein was positive for 55(67%) patients, serum ferritin range was 270-700 in 38(46.4%) patients, serum LDH range was 250-500 in 42(51.2%) patients and D-dimer was above 500 in 19(23.2%) patients. ***Conclusion*:** NLR and higher inflammatory markers correlates well with severity of disease and duration of hospitalization in COVID 19 patients.

Keywords: COVID 19, NLR ratio, serum ferritin, serum LDH, C-reactive protein, D-dimer.

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing coronavirus disease 2019 (COVID-19) has rapidly evolved from an epidemic outbreak in Wuhan, China [1] into a pandemic infecting more than 1 million individuals all over the world. COVID-19 is a systemic infection with a significant impact on the hematopoietic system and hemostasis. Lymphopenia may be considered as a cardinal laboratory finding, with prognostic potential and Neutrophil to Lymphocyte Ratio (NLR) may also have prognostic value in determining severe cases [2, 3]. Neutrophil to Lymphocyte Ratio (NLR) which can be obtained from a Complete Blood Count (CBC) with differential count by dividing the absolute neutrophil count and absolute lymphocyte count. NLR has historically been used as a predictor of morbidity and mortality in patients with COVID -19. NLR is a cheap and a readily available indicator of inflammation in patients suffering from COVID-19 [4]. Inflammatory markers such as serum lactic acid dehydrogenase (LDH),,serum ferritin, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and interleukin-6 (IL-6) have been reported to be significantly associated with the high risks of the development of severe COVID19 [5]. High levels of inflammatory markers, including C-reactive protein (CRP), ferritin and D-dimer, high

***Corresponding Author:** Prabhu Shankar S
Professor, Department of General Medicine, Trichy SRM Medical College Hospital & Research Centre, Tiruchirapalli, Tamilnadu, 621105, India

neutrophil-to-lymphocyte ratio and increased levels of inflammatory cytokines and chemokine shave been observed in patients with severe diseases [6].

Aims and Objective of the study:

1. To correlate with total lymphocyte count(TLC) and Neutrophil lymphocyte ratio(NLR) in assessing the clinical course of COVID 19
2. To study the Rrole of inflammatory markers in assessing the severity and clinical course of COVID 19.

MATERIALS AND METHODS

The study was done as a cross sectional study among 519 patients who admitted in Trichy SRM medical college hospital and research centre at Tiruchirapalli, Tamilnadu, South India. This study was done during June 2020 to January 2021 after obtaining proper Institutional ethical committee approval. All adults of both sexes diagnosed with COVID 19 by reverse transcription polymerase chain reaction (*RT-PCR)* were included in study by consecutive sampling and patients with known history of chronic inflammatory conditons, autoimmune disorders and any malignancy were excluded form this study. The total lymphocyte count(TLC) and Neutrophil lymphocyte ratio(NLR) were recorded and blood C reactive protein (CRP),serum lactatedehydrogenase (LDH), serum ferrtin, D-dimer were done and correlated with the disease severity and clinical course of COVID. All collected data were analysed by the SPSS software (version 22, IBM Corporation, Armonk, New York, United States).

RESULTS

Among 518 patients, 257(49.6%) patients were in the age group of 46 to 65 years and 309 (59.7%) patients were males and 209 (40.3%) were females. In (85%) patients total WBC count were in range between 4000-11000 and <4000 in (8.7%) patients (Figure 1). Absolute lymphocyte count was >1000 for (70.7%) of patients and 700-1000 in (22.8%) patients (Figure 2). Neutrophil Lymphocte ratio was <3.1 in (60.8%) of patients, 3-2.5 in (30.9%) patients and >5 in (8.3%) patients (Figure 3). C reative protein was positive in 299(57.7%) of patients. 285(55.2%) patients have serum ferritin level <250 and 184(35.5%) patients have range between 270-700. 285(55%) patients had serum LDH level <250 and 213(41.1%) had serum LDH in range between 250-500 and >500 in 20 patients. 445(85.9%) patients had D dimer value <500 and above 500 in 73(14.1%) patients (Table 1). Duration of stay in hospital was 11-14 days for 82 patients in that C reactive protein was positive for 55(67%) patients, serum ferritin range was 270-700 in 38(46.4%) patients, serum LDH range was 250-500 in 42(51.2%) patients and D-dimer was above 500 in 19(23.2%) patients (Table 1).

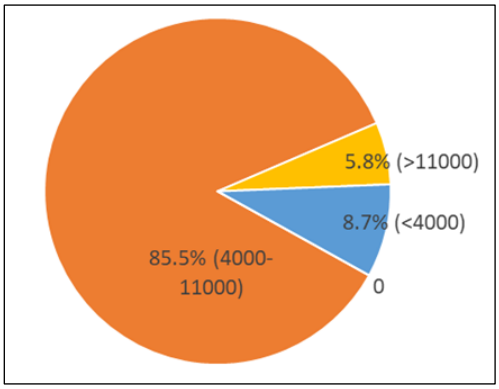

Figure 1: Total WBC count

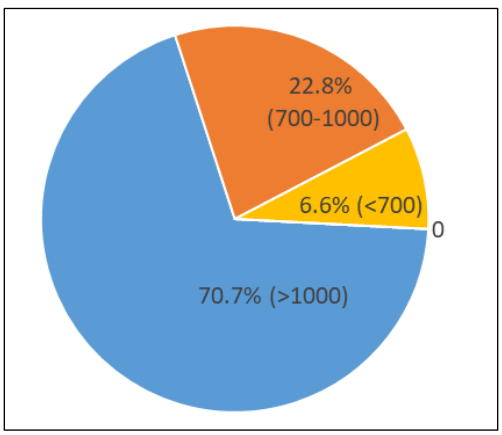

Figure 2: Absolute Lymphocyte count

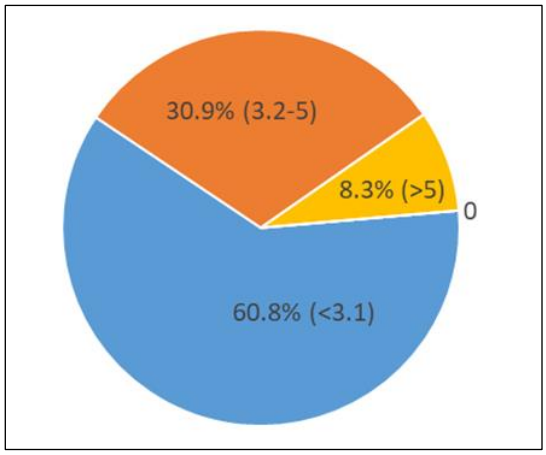

Figure 3: Neutrophil Lymphocyte Ratio (NLR)

Table 1: Duration of stay in relation to Inflammatory markers

Total			Duration of hospital stay- In days								P Value
			<7 days		7-10 days		11-14 days		>14 days		
Characteristics	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	
C- Reactive protein											
Positive	299	57.7%	66	40.2%	148	63.8%	55	67%	30	75%	.000
Negative	219	42.3%	98	59.8%	84	36.2%	27	33%	10	25%	
Ferritin											
<270	286	55.2%	108	65.9%	130	56%	35	42.7%	13	32.5%	
270-700	184	35.5%	45	27.5%	91	39.2%	38	46.4%	10	25%	.000
700-1000	34	6.5%	9	5.4%	7	3%	5	6%	13	32.5%	
>1000	14	2.7%	2	1.2%	4	1.8%	4	4.9%	4	10%	
LDH											
<250	285	55%	114	69.5%	123	53%	36	44%	12	30%	.000
250-500	213	41.1%	45	27.5%	103	44.4%	42	51.2%	23	57.5%	
>500	20	3.9%	5	3%	6	2.6%	4	4.8%	5	12.5%	
D-dimer											.000
<500	445	85.9%	153	93.3%	205	88.3%	63	76.8%	24	60%	
>500	73	14.1%	11	6.7%	27	11.7%	19	23.2%	16	40%	

DISCUSSION

Among 518 patients, 257(49.6%) patients were in the age group of 46 to 65 years and 309 (59.7%) patients were males and 209 (40.3%) were females. This was reported in our previous study which showed majority of patients were male gender compared to female gender [7]. The reason might be males go outside more during lockdown period. In (85%) patients total WBC count were in range between 4000-11000 and <4000 in (8.7%) patients. Absolute lymphocyte count was >1000 for (70.7%) of patients and 700-1000 in (22.8%) patients. Neutrophil lymphocte ratio was <3.1 in (60.8%) of patients and 3-2.5 in (30.9%) patients and >5 in (8.3%) patients. This was significant with the study done by Tadesse Z *et al*., observed that NLR of 5.86 and above was an effective threshold value in predicting the severity of disease with a sensitivity of 92.2% and a specificity of 75% and significantly associated with longer hospital stay and also strong predictive mortality factor in COVID-19 patients [8]. C reative protein was positive in 299(57.7%) of patients in that 55(67%) patients had 11-14 days of hospital stay. This was significant with the study done by Zeng F *et al*., shows inflammatory markers such as C- reactive protein was positively correlated with severity of COVID 19 [9]. In our study 184(35.5%) patients have serum ferritin range between 270-700 in that 38(46.4%) patients have longer duration of hospital stay (11-14days) which indicates the severity of COVID 19 and this was significant with the study done by Carubbi F *et al*., observed that rise in serum ferritin level are associated with severe pulmonary involvement and high mortality rate in COVID patients [10]. In our study 213(41.1%) had serum LDH value in range between 250-500 in that 42(51.2%) patients had longer hospital stay (11-14 days) and D-dimer was above 500 in 73(14.1%) patients in that 16(40%) patients had longer duration of hospital stay more than 14 days which indicates the severity of disease and high mortality risk. This was similar to the study done by Marimuthu *et al*., shows that D-dimer value were sensitive predictor in hospital mortality due to COVID infection and correlate with duration of hospitalization and need for oxygen/invasive mechanical ventilation in hospitalised COVID-19 patients [11]. In our study we observed that NLR ratio and inflammatory markers predict mortality and severity of the disease and helps in early decision-making in inpatient management especially in resources limited area.

CONCLUSION

We conclude that the Neutrophil lymphocyte ratio (NLR) is a cheap and a readily available indicator of inflammation in patients suffering from COVID-19 and useful to predict mortality and severity of the disease. Higher level of inflammatory markers such as C-Reactive Protein, serum ferritin, serum LDH, D-dimer correlates well with the severity and duration of hopitalization in COVID 19 patients.

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