Section: Pathology

Original Research Article

A COMPARATIVE STUDY OF HAEMATOLOGICAL PARAMETERS, D-DIMER, SERUM FERRITIN, HSCRP LEVELS AND ITS SIGNIFICANCE WITH SEVERITY IN COVID 19 PATIENTS BETWEEN THE FIRST AND SECOND WAVES IN A TERTIARY CARE CENTRE

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Abstract

Background: Novel Covid -19, a pandemic disease, presented with increased morbidity and mortality during the second wave compared to the first wave, probably due to the Delta variant. Haematological findings such as lymphopenia and elevated D-dimer levels carry a bad prognosis in patients infected with Covid -19. The aim of the study is to compare the haematological findings and D-dimer among the patients of the first wave and second wave of covid -19 in a tertiary care centre. **Material & Methods:** In our retrospective study, data from 90 blood samples from patients with covid -19 during the first wave and 90 blood samples from patients with covid 19 disease during the peak of the second wave were collected. Demographic data and co-morbidities were recorded for all 180 cases. Complete blood count and D-dimer levels were done for all 180 samples. **Results:** The mean age distribution during the first wave of covid was 42 years, and the second wave was 47 years. Males were commonly affected in the first wave and females in the second wave. Most cases had normal WBC count, but 36 cases had low lymphocyte count in the first wave, and 43 cases had low lymphocyte count in the second wave. Cases with lymphopenia fell under the category of severe disease in both waves. Mean ferritin levels were higher during the second wave compared to the first wave, which was statistically significant with the severity of the disease. **Conclusion:** Inflammatory markers and haematological parameters help assess the severity of nCovid-19 manifestation and initiate aggressive management to prevent mortality.

INTRODUCTION

The coronavirus disease 2019 was a pandemic caused by severe acute respiratory syndrome coronavirus -2 (SARS-CoV-2), first emerged in Wuhan (China) in December 2019 as a deadly disease with high morbidity and mortality worldwide. The first wave of infection peaked in India in September 2020.[1,2]Most patients developed fever, chills, loss of smell and taste and respiratory inconveniences, with higher mortality in older individuals. During the second wave peak in May 2021, younger individuals aged less than 45 years were affected by a shortage of oxygen and ICU care. The infection spread faster than the previous wave due to the mutant virus.[3] The clinical spectrum of disease ranges from asymptomatic cases with upper respiratory tract infection to more severe disease and death. Clinical manifestations include pneumonia, severe acute respiratory syndrome, systemic inflammatory response, venous thromboembolism, septic shock, renal damage and multiorgan failure.

The laboratory parameters such as complete blood count, D-dimer, lactate dehydrogenase, and C-Reactive proteins helped predict the severity of the disease manifestation in covid -19 disease.[4] The laboratory findings like lymphopenia, increased neutrophil-lymphocyte ratio, and systemic

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inflammatory index help predict the disease's severity and inflammatory biomarkers.[5] This study compares the haematological findings and inflammatory biomarkers like D-dimer and their significance with severity among the patients during the first and second waves in a tertiary care hospital in South India.

MATERIALS AND METHODS

In our retrospective observational study, among 180 cases admitted in the isolation ward, 90 cases were included from the first wave from May to July 2020, and another 90 cases were included from the second wave from April to June 2021.

Inclusion Criteria

Adult patients admitted in covid-19 isolation ward with confirmed RT PCR reports, CT chest findings during first wave and second wave.

Exclusion Criteria

Pregnant women, children, patients with deep vein thrombosis, uncontrolled diabetes, post-operative cases and chronic kidney disease patients on dialysis were excluded.

We studied blood samples from 90 patients collected and interpreted during the peak of the first wave of covid -19 disease and 90 patients during the second wave of covid -19 disease. Based on the CT chest findings, cases were classified as mild, moderate and severe. The blood samples were analysed for complete blood count, inflammatory biomarkers like d-Dimer, hsCRP and lactate dehydrogenase. Disease severity was assessed from the hospital data of the patients admitted during the first and second waves of the pandemic in India.

Statistical Analysis

Data were analysed using SSPS software with the help of a statistician.

RESULTS

The mean age distribution during the first wave of Covid was 42 years, and during the second wave, 47 years. During the first wave, males were commonly affected compared to females, but during the second wave, females were more affected than males. [Table 1]

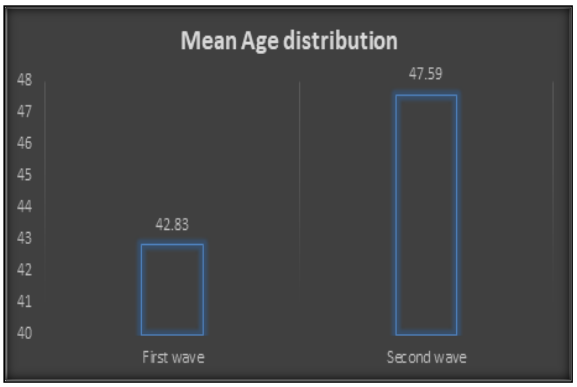

Figure 1: Age distribution

Females are more severely affected in both the first and second waves of Covid infection; overall severity increases with the second wave of infection, as shown in Figure 1.

Other haematological parameters like total WBC count, neutrophil count and lymphocyte count were also measured and compared among the first and second waves.

In most cases, the total WBC count was normal in both the first and second waves. Neutrophil count was comparatively high in both waves of Covid. Lymphocyte count was normal in 51 cases, high in 3 cases and low in 36 cases among the first wave. Lymphocyte count was low in 47 cases and normal in 43 cases among the second wave. Most lymphopenia cases fall under severe disease in both the first and second waves. [Table 2]

Ferritin levels were found to be high in both first-wave and second-wave cases, but the mean value of serum ferritin was higher in the second wave when compared to the first wave (Figure 2).

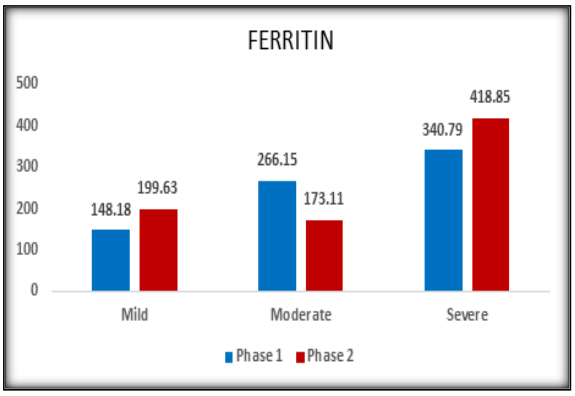

Figure 2: Ferritin during the first and second wave

The mean value of d-dimer is elevated in both waves in severe disease, but it is found to be very high during the second wave in severe cases. D- dimer was almost found to be normal in mild cases during the first wave and second waves. During the second wave, the mean value was high in cases with moderate severity. D- dimer values are statistically significant with disease severity on comparing two groups by one-way ANOVA test (P value -0.000) (Figure 3).

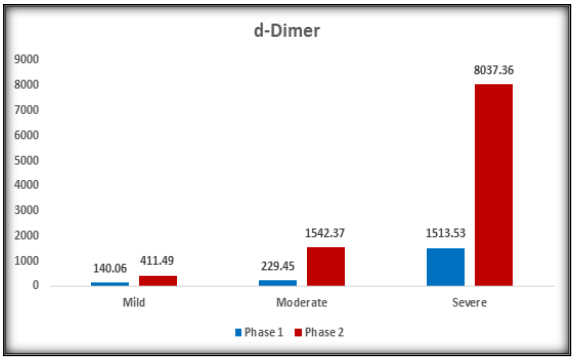

Figure 3: d-Dimer during the first and second wave

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Table 1: Severity of disease among males and females during the first and second wave

Gender	Covid Phase	Severity			Total	P-value
		Mild	Moderate	Severe		
Male	I	37	11	6	54	0.071
	II	18	11	10	39	
	Total	55	22	16	93	
Female	I	22	7	7	36	0.009*
	II	15	23	13	51	
	Total	37	30	20	87	

Table 2: Lymphocyte Count during the first and second wave

Lymphocyte Count		Normal	Low	High	Total	P-value
Phase I	Mild	47	9	3	**59**	0.000**
	Moderate	4	14	0	**18**	
	Severe	0	13	0	**13**	
	Total	**51**	**36**	**3**	**90**	
Phase II	Mild	28	5	0	**33**	0.000**
	Moderate	14	20	0	**34**	
	Severe	1	22	0	**23**	
	Total	**43**	**47**		**90**	

Table 3: One-Way ANOVA for different stages in severity

Parameters	1st wave		2nd wave	
	F	P-value	F	P-value
Ferritin	4.86	0.010	4.996	0.009
hs-CRP	0.706	0.497	1.898	0.156
d-dim	30.131	0.000	136.244	0.000
wbc1	0.438	0.647	0.624	0.538
Neutrophil1	30.525	0.000	16.517	0.000
Lymphocy1	33.163	0.000	16.766	0.000

DISCUSSION

In our study, the mean age of presentation in the first wave was 42 years, and in the second wave, it was 47 years. A study by Mohammed Asghar et al. (6) showed that the mean age of presentation during the first was 56 years, and in the second wave, it was 65. A study by Matsunaga,[7] showed that the median age of presentation during the first wave was 56 years, in the second wave 50 years, and in the third wave, it was 64 years.

During the first wave, males were commonly affected compared to females, but during the second wave, females were more affected than males. Our findings were similar to the study by Jalali et al.; women are more affected in the second wave compared to males, and during the first wave, males were more vulnerable compared to females, probably due to smoking and lifestyle changes.[8] A study by Ajay Pradhan et al,[9] showed that males were more vulnerable to severe disease when compared to females. However, in our study, the number of females affected by severe disease was more than males with severity, probably due to less sample size studied.

In our study, the total WBC count was within the normal range in both waves of Covid 19 disease. In a study by Zhang et al,[10] among 140 hospitalised patients who were diagnosed with COVID-19 showed that the leukocyte count was within normal ranges in 68.1% of patients, increased in 12.3% of patients, and decreased in 19.6% of patients. In our study, lymphopenia was associated with the severity of disease manifestation in both the first and second waves. Most cases with moderate and severe disease were found to have lymphocytopenia, which is statistically significant (p-value 0.000).

Most studies showed that lymphopenia was between 40% and 91.6% in COVID-19 patients and can be used as a prognostic marker. In a study conducted by BE FAN and colleagues, even though patients had lymphopenia, most lymphocytes are characterised as reactive lymphocytes. A study by Chan et al,[11] showed alteration in the lymphocyte subset, and lymphopenia was significant.

Inflammatory biomarkers like D-dimer were found to be a sensitive predictor of mortality in a study by Marimuthuet al.[12] In our study, the mean level of D-dimer was >8000ng/ml, which correlates with severe disease manifestation as a result of a severe inflammatory process. A study by YumengYao,[13] showed a significant correlation between the D-dimer level and the disease severity based on the CT chest findings and clinical guidelines.

CONCLUSION

Haematological findings like lymphopenia and elevated D-dimer levels significantly correlate with the severity of the disease in both waves of nCovid-19. Elevated D-dimer levels >8000ng/dl significantly correlate with severe disease manifestation due to severe inflammatory response. In conclusion, inflammatory markers and haematological parameters help assess the severity of nCovid-19 manifestation and initiate aggressive management to prevent mortality. A drawback of this study was an association of these parameters with co-morbidities

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like diabetes, hypertension and pregnancy was not included.

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