Original Research Paper

Pathology

CORRELATION BETWEEN PLATELET COUNT, D-DIMER AND DISEASE OUTCOME IN PATIENTS ADMITTED WITH COVID 19 DISEASE IN A TERTIARY CARE CENTRE

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ABSTRACT   Corona virus disease 2019 (COVID 19) is a novel infectious disease which causes a spectrum of disease with respiratory and systemic inflammation which leads to severe disease in 10 – 15 % of patients. Some patients develop a severe proinflammatory state which can be associated with a unique coagulopathy leading to complications like ARDS and DIC. COVID 19 is a disease which lacks established laboratory markers available to evaluate illness severity and disease outcome. COVID 19 patients often have thrombocytopenia (5-41%) and appear to have increased platelet consumption, together with a corresponding increase in platelet production. The degree of D-dimer elevation positively correlates with morbidity in COVID 19 patients. Platelet count and D-dimer may be used as biomarkers to assess disease severity and may be useful for triaging patients and predicting the outcome of disease in resource limited settings.

KEYWORDS : COVID 19, D-dimer, platelet count, mortality

Introduction

Novel Corona Virus (nCoV-19) caused the pandemic in 2020 -21. The main organ system involved was the respiratory system but diffuse inflammation was observed in several patients. Coagulation abnormalities like arterial and venous thrombosis and hypercoagulable state have been observed in various studies in patients admitted with COVID 19 disease. Elevated D-dimer and low platelet counts have been observed in patients. (1,2,3)

Stanley medical college in Chennai was one of the tertiary care centres that treated more than 60000 patients during the COVID 19 pandemic with disease specific mortality of about 1.4 %. This study was undertaken to correlate the relationship between platelet count, D-dimer and disease outcome in mild, moderate and severe COVID 19 diseases among the patients admitted in Stanley medical college over a period of one year.

Aims and Objectives

To correlate the relationship between platelet count, D-dimer and disease outcome in mild, moderate and severe COVID 19 diseases among patients admitted in Stanley medical college.

Methodology
Type of study: Retrospective observational study

Inclusion criteria:

Patients admitted in Stanley medical college COVID 19 wards for one year between June 1st 2020 to May 31st 2021 was taken up for the study.

Methodology: Retrospective analysis of case records of patients admitted in Stanley medical college for COVID 19 disease were taken up for study after getting administrative and ethical clearance from the institutional ethical committee. Demographic data of the patients were collected. The cases were classified as mild, moderate and severe as follows from the admission records

Mild: Mild fever, cough, malaise with no evidence of respiratory distress

Moderate: Pneumonia with no signs of severe disease, Spo2 90% to 94% with dyspnoea and/ or hypoxia, fever, cough and tachypnoea

Severe: Severe pneumonia and ARDS with respiratory rate > 30, Severe respiratory distress and Spo2 <90 %

The platelet count and D-dimer values of these patients at the time of admission were collected and statistically correlated with disease severity and outcomes using appropriate statistical methods.

Exclusion Criteria

COVID 19 positive patients with past history of coagulation dysfunction
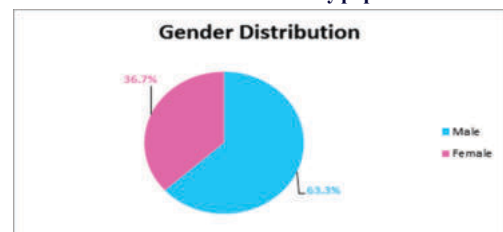COVID 19 positive patients suffering malaria or Dengue

Results:

During the study period 2124 patients had been admitted to Stanley medical college COVID ward.
The demographic data of the patients were as follows

Table 1: Gender distribution

Gender	Number	Percentage
Male	1345	63.3 %
Female	779	36.7 %

Figure 1: Gender Distribution of the study population

Most of the patients admitted were males

Table 2: The age distribution of patients

Age	Number	Percentage
<20	42	1.9%
20-40	454	21.3%
40- 60	785	36.9%
>60	843	39.9%

Most patients admitted were above the age of 20 years which is consistent with data across the world that the younger age group of less than 20 years is not affected much by the virus.

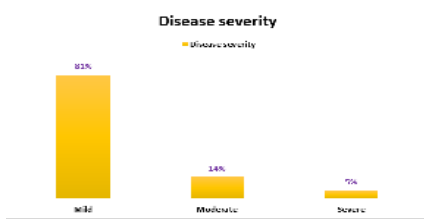**Figure 2: Age Distribution of the study population**
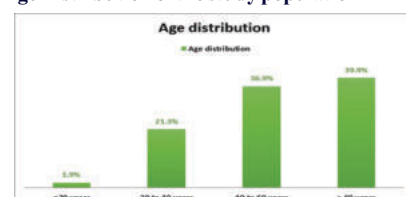
The cases were distributed as per the following disease severity

Table 3: Disease severity

Disease severity	Number	Percentage
Mild	1720	81%
Moderate	298	14%
Severe	106	5%

Figure 3: Disease severity of the study population

This table shows that most of the patients admitted were of the mild category (81%). Moderate and severe cases accounted for 19% of the admissions.

The disease outcome among the cases were as follows

Table 4: Disease outcome among the admitted patients

Disease severity	Survived N (%)	Died N (%)	Total N (%)	p value
Mild	1634 (83%)	86 (55.5%)	1720 (81%)	0.000***
Moderate	283 (14.3%)	15 (9.6%)	298 (14%)	
Severe	52 (2.7%)	54 (34.9%)	106 (5%)	
Total	1969 (100%)	155 (100%)	2124 (100%)	

p value calculated by pearson's chi square < 0.001***- which is highly significant association between disease severity & outcome This table reflects the fact that most of the mortality is in the severe and moderate cases while most with mild disease survive. The mortality linearly increases with the disease severity.

Table 5: Association between Platelet count and outcome among patients with mild disease:

Platelet count among mildly diseased patients	Survived N (%)	Died N (%)	Total N (%)	p value
<50000	6 (0.3%)	3 (3.4%)	9 (0.5%)	0.14
50000 - 150000	224 (13.7%)	31 (36.1%)	255 (14.8%)	
>150000	1404 (86%)	52 (60.5%)	1456 (84.7%)	
Total	1634 (100%)	86 (100%)	1720 (100%)	

p value by chi square test >0.05 – not significant

Table 6: Association between Platelet count and outcome among patients with moderate disease:

Platelet count among moderately diseased patients	Survived N (%)	Died N (%)	Total N (%)	p value
<50000	10 (3.5%)	1 (6.7%)	11 (3.7%)	0.30
50000 - 150000	25 (8.8%)	2 (13.3%)	27 (9.1%)	
>150000	248 (87.7%)	12 (80%)	260 (87.2%)	
Total	283 (100%)	15 (100%)	298 (100%)	

p value by chi square test >0.05 – not significant

Table 7: Association between Platelet count and outcome among patients with Severe disease:

Platelet count among severely diseased patients	Survived N (%)	Died N (%)	Total N (%)	p value
<50000	0 (0%)	4 (7.4%)	4 (3.8%)	0.010*
50000 - 150000	10 (19.2%)	8 (14.8%)	18 (17%)	
>150000	42 (80.8%)	42 (77.8%)	84 (79.2%)	
Total	52 (100%)	54 (100%)	106 (100%)	

p value < 0.05* - calculated by Fisher's exact chi square test implies significant association

This table shows that low platelet count is significantly associated with disease outcome particularly among severely diseased patients.

Table 8: D-Dimer distribution among the various groups

D-Dimer	<500	>500	Total	p value
Moderate(S/D)	120 (83.3%)	178 (68.5%)	298 (73.8%)	0.014*
Severe (S/D)	24 (16.7%)	82 (31.5%)	106 (26.2%)	
Total	144 (100%)	260 (100%)	404 (100%)	

p value < 0.05* - calculated by pearson's chi square test implies significant association

D-dimer was not done routinely in all patients. Due to logistic considerations, it was done only in moderate and severe cases. The available data alone was taken into consideration for analytical purposes. Again, D-dimer has a significant association with disease outcome.

Discussion:
The Global pandemic of COVID 19 spread across nations in 2020 – 21. In India, the first case was reported from Kerala in January 2020 and peak cases in the first wave were reported in 2021 September. It tapered down by January 2021, but the second wave started by March 2021 and continued till July 2021. Around 28 lakh cases were reported from India in this period and 4 lakh lives were lost.

The main organ involvement was the respiratory system and many patients presented with pneumonia. But it was observed that the disease caused diffuse inflammation involving various organ systems and patients had various other abnormalities including hyperglycaemia, arrhythmias, myocardial injury heart failure, shock, venous thromboembolism and pulmonary embolism, encephalopathy, exuberant inflammatory response akin to cytokine release syndrome. (1)

SARS – CoV 2, later christened NOVEL CORONA VIRUS 19 acts by binding to the intrinsic membrane protein Angiotensin converting enzyme2 with enzymatic activity that is found in lung pneumonocytes, endothelial cells, kidneys and heart. Binding of the virus to the alveolar cells and activation of the inflammatory cascade is postulated to be the cause of pneumonia and development of ARDS in severe cases. (1,2)

High incidence of various thromboembolic events has been observed in various studies in patients admitted with COVID 19. Venous and arterial thrombosis and hypercoagulable state has been observed in patients with COVID 19 illness. This could be due to the binding of virus to the endothelial cells causing endothelial damage and triggering inflammation. (1)

Recent autopsy studies have demonstrated viral inclusion particles and apoptosis in endothelial cells, microthrombi and increased angiogenesis.

This study was undertaken to correlate the platelet count and D-dimer values with varying severity of the disease. The demographic data shows that most of the affected patients were males above the age of 20 years. This correlates with the observation that most patients less than 20 are not much affected by the virus.

The disease outcome also correlates with the observation that most mild patients survive and mortality is more in moderate and severe cases and mortality is linearly increased with the disease severity at admission.

Platelet counts in this study shows significant correlation with disease severity and outcomes and hence platelet counts can be used as surrogate marker for prognostication purpose in resource limited settings.

D-dimer values show a similar correlation with disease severity and can be used as a biomarker in settings where it is affordable. Cost considerations may be the limiting factor in resource limited settings.

CONCLUSION

COVID 19 causes respiratory and systemic inflammation which leads to severe disease in 5-10 % of patients. Severe COVID 19 infections can lead to complications like ARDS and DIC. Platelet count has been correlated with disease severity in various studies. Platelet count and D-dimer may be used as biomarkers to assess disease severity and may be useful for triaging patients and predicting the outcome of disease in resource limited settings.

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