# STUDY OF ROLE OF PLATELET COUNT AND MEAN PLATELET VOLUME IN EVALUATING THE DISEASE SEVERITY IN COVID 19 INFECTION-OUR EXPERIENCE AT TERITARY CARE HOSPITAL.

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**ABSTRACT**

**INTRODUCTION:** Patients Infected with CORONA VIRUS- 2019 (COVID-19) showed changes in their platelet counts and Mean platelet volume (MPV). The present study was aimed to observe any association between lowered platelet counts with mean platelet volume (MPV) from the corana positive individuals.

**METHODS:** It is a prospective study from 1-8-2020 to 30-9-2020 .Patients who presented with complaints of Fever, sore throat, body pains, cough, breathlessness, diarrhoea were evaluated at the triage area of the Hospital. Throat swab was taken and RT-PCR was done and only 200 confirmed cases were included in the study. Patient blood samples were collected and processed in SYSMAX 5 -part Haematology analyser in the Hospital Central Laboratory. The patients CBP, Platelet count and MPV were tabulated.

**RESULTS:** Out of 200 COVID-19 confirmed cases, the numbers of males were 145 (72.5%) and females 55 (27.5%). Most of the patients belonged to age group 50 years (25.5%), 60yrs age group (21%). The Maximum age in our study group was 80 years, minimum age was 19 years and mean age was 50 years. In our study it was noticed that Severe thrombocytopenia was seen in one patient with platelet count 38,000/μL,(0.5%), Moderate thrombocytopenia was seen in two patients(1%) and mild thrombocytopenia was seen in 12 (6%) cases. In our

study only fifteen cases (7.5%) showed thrombocytopenia. The MPV for all fifteen cases were studied and MPV was in Range of 9.6- 11.8 fl.

**CONCLUSION:** Low platelet count and high MPV are associated with disease severity. Platelet count is one of easy cheap method for the assessing the disease severity along with other parameters

**Key words:** Platelet count, Mean Platelet Volume, COVID -19, thrombocytopenia.

**INTRODUCTION:**

In the year December 2019, a series of acute atypical respiratory disease occurred in Wuhan, China. This rapidly spread from Wuhan to other areas. It was soon identified that a novel Coronavirus was responsible for this outbreak. The novel Coronavirus was named as the severe acute respiratory distress syndrome coronavirus-2 (SARS- COV-2) due to its high homololgy to SARS-COV (1). The disease caused by this virus was called Corona virus disease 19 (COVID-19) and the pandemic was declared by world health organisation (WHO). COVID-19 is an enveloped single stranded RNA virus which binds to an intrinsic membrane protein with enzymatic activity called ACE-2 receptors, which activates the renin angiotensin aldosterone system. These ACE-2 receptors are expressed on endothelial cells, pulmonary alveolar cells, heart, kidney cells. These receptors shows 10 fold more affinity for SARS-Cov-2 virus than the SARS- Cov-1. (2-4)

Similar to SARS in 2003 Hematological changes in COVID -19 patients include lymphopenia and thrombocytopenia. Abnormal coagulation is a common complication of COVID-19 and is manifested by pulmonary vascular leakage, intravascular thrombosis, and disseminated intravascular coagulation. The SARS-CoV-2 virus does not appear to have intrinsic procoagulant effects itself; rather, the coagulopathy is most likely the result of the profound COVID-19 inflammatory response and endothelial activation/damage (5).

Despite administering the standard thrombo prophylaxis, incidence of both arterial and venous thrombosis remains more (6). Three Other viruses which cause the same hypercoagubility state are Severe Acute Respiratory Syndrome Virus and Middle East Respiratory Syndrome (7, 8). H1N1 influenza carried an 18-fold increased risk of developing VTE (9).

Thrombocytopenia at admission in COVID-19 patients was associated with a 4.24-fold increased risk of inpatient mortality in a study from Wuhan (10). This dropping platelet counts in patients with COVID-19 could suggest a severity of disease and worsening of thrombotic state (11). This thrombocytopenia may be mild platelet count generally between $100-150 \times 10^9/L$ and the count may vary with disease severity (12, 13). Although many cases of thrombocytopenia have been reported in patients with severe viral pneumonia and thus is a suggestive clinical characteristic of COVID-19, the association of baseline platelets and changes with adverse COVID-19 outcome remains unclear.

A mean platelet volume (MPV) test measures the average size of your platelets. In healthy subjects it typically ranges between 7.2 and 11.7 fL (14). It's closely related to a platelet count. A high MPV means that platelets are larger than average and are usually young a sign that bone marrow is producing too many platelets. Low platelet count and a high MPV level,

it suggests that the bone marrow is rapidly producing platelets. This may be because older platelets are being destroyed, so the bone marrow is trying to compensate (15).

A high MPV suggests increased platelet production, which is associated with reduced survival rates, in several types of cancers, hyperthyroidism, heart disease, diabetes, vitamin D deficiency, high blood pressure, stroke, atrial fibrillation. A low MPV means platelets are smaller than average. Smaller platelets tend to be older, so a low MPV could mean bone marrow isn't producing enough new ones. The present study was aimed to observe any association between lowered platelet counts with MPV from the corona positive individuals.

**Materials and methods:**

Our present study was a prospective randomised control study from 200 patients, data analysis, and comparison done between lowered platelet counts with mean platelet volume (MPV) from the corona positive individuals who referred to department of pathology, Government Medical College/Hospital, Suryapet, Telangana, this study was conducted for duration of 2 months (August and September 2020).

**Inclusion criteria:** Patients with above 18 years patients whose diagnoses were confirmed with RT- PCR were included in the study were included.

**Exclusion criteria:** Patients with haematological diseases, those diagnosed with cancer, those using drugs that may affect platelet functions, pregnant women, and those <18 years of age were excluded from the study.

**Sample collection:** Demographics include age, gender, hypertension, diabetics and heart diseases. Laboratory investigations include Throat swab test and RT-PCR confirmed cases were further investigated CBP, NLR, PLR, blood grouping and RH typing, LFT. CBP was processed in Sysmax 5 part analyser with standard protocols. All information was obtained and analysed with standard excel programme.

**RESULTS:**

**Table 1: The tabular representations of age distribution of Covid -19 patients**

| AGE | TOTAL | PERCENTAGE |
|---|---|---|
| 1-10YRS | 00 | 00 |
| 11-19YRS | 00 | 00 |
| 20-29YRS | 20 | 10% |
| 30-39 YRS | 30 | 15% |
| 40-49 YRS | 32 | 16% |
| 50-59 YRS | 51 | 25.5% |
| 60-69YRS | 40 | 20% |
| 70-79 YRS | 21 | 10.5% |
| 80-89 YRS | 06 | 3% |
| **TOTAL** | **200** | **100%** |

Table 1 shows that, males were 145 (72.5%) and the females were 55 (27.5%). Present study also shows the age distribution, where 25.5% of the patients belong to 50 years age group, whereas, 21% were 60 yrs age group. Maximum age was 80 years, minimum age 19 years and mean age was 50 years.

In our study we studied the platelet count and MPV changes in COVID -19 confirmed cases. We divided the platelet count into 7 groups shown in the table 2

Most of the patients platelet count at the time of admission showed that it is in the range of 2,00,000/µL to 2,50,000/µL. Thrombocytopenia divided into Mild, Moderate, Severe. Mild thrombocytopenia is 100,000-150,000/µL. Moderate thrombocytopenia is 50,000-1,00,000/µL. Severe thrombocytopenia is < 50,000/µL.

**Table 2: Distribution of platelet count in Covid -19 patients**

| PLATELET COUNT | TOTAL NUMBER | PERCENTAGE |
|---|---|---|
| <50,000/µL | 01 | 0.5% |
| 51,000/µL-1,00,000/µL | 02 | 1% |
| 1,01,000/µL-1,50,000/µL | 12 | 6 % |
| 1,51,000/µL-2,00,000/µL | 35 | 17.5 % |
| 2,01,000/µL -2,50,000/µL | 44 | 22% |
| 2,51,000/µL-3,00,000/µL | 21 | 10.5% |
| 3,01,000/µL- 3,50,000/µL | 30 | 15% |
| 3,51,000/µL -4,00,000/µL | 21 | 10.5% |
| 4,01,000/µL - 4,50,000/µL | 08 | 4% |
| 4,51,000/µL -5,00,000/µL | 07 | 3.5% |
| > 5,00,000/µL | 19 | 9.5% |
| **TOTAL** | **200** | **100%** |

Severe thrombocytopenia was seen in one patient with platelet count 38,000/µL, (0.5%) Moderate thrombocytopenia seen in two (1%) patients. Mild thrombocytopenia seen in 12(6%) cases.MPV also categorised shown in the table 3.

**Table 3: Distribution of mean platelet volume in Covid -19 patients**

| MPV | TOTAL NUMBER | PRECENTAGE |
|---|---|---|
| 7.0 -7.9fl | 02 | 1% |
| 8.0-8.9fl | 24 | 12% |
| 9.0-9.9fl | 81 | 40.5% |
| 10.0-10.9fl | 58 | 29% |
| 11.0-11.9fl | 29 | 14.5% |
| 12-12.9fl | 04 | 2% |
| 13-13.9fl | 01 | 0.5% |
| 14-14.9fl | 01 | 0.5% |
| **TOTAL** | **200** | **100%** |

**Table 4: Comparison of various blood parameters between normal healthy individuals and thrombocytopenic patients groups.**

| BLOOD PARAMETERS | THROMBO CYTOPENIA | NON-THROMBO CYTOPENIA | P- VALUE |
|---|---|---|---|
| | MEAN± SD | MEAN±SD | |
| HEMOGLOBIN g/L | 12.9±2.16 | 12.8±2.08 | 0.8 |
| WBC COUNT×10⁹/L | 8.4±5.5 | 10.2±1.18 | 0.5 |
| PLATELETCOUNT×10⁹/L | 112±268 | 308±120 | 0.07 |
| MEANPLATELETVOLUME, fL | 11.8±0.82 | 9.95±1.07 | 0.0030 |
| NLR-NEUTROPHIL LYMPHOCYTE RATIO | 7.67± 9.11 | 6.64±5.45 | 0.5 |
| PLR PLATELET LYMPHOCYTE RATIO | 165± 135 | 253±184 | 0.07 |

Present study also compared the different parameters in thrombocytopenic patients and normal platelet count patients. In our study thrombocytopenic patients presents with low platelet count and high Mean platelet volume, indicating that bone marrow is producing young platelets with high MPV compared to non thrombocytopenia patients, severity of the disease also supported by high neutrophil lymphocyte ratio and low lymphocyte count and white blood cell count in thrombocytopenic patients.

**DISCUSSION:**

COVID-19 infection a newly rapidly emerging infection  with wide range of disease severity, clinical identification of biomarkers that could predicts the disease severity are needed for guiding the clinical care. In this study we found that a laboratory parameter platelet count that can easily differentiate between COVID patients with or without severe disease.

In our study we found that in our hospital patients with thrombocytopenia have more MPV value with Mean 11.8 compared to  the normal platelet count patients which shows Mean of 10.0, immature platelets with high granular content, residual MRNA and increased platelet volume with high immature platelet fraction(IPF) ranges from 3.3% to 8.6% (16). HB percentage is equal in both the groups, compared to the normal platelet count patients, thrombocytopenia patients have the high white blood cell count and Neutrophil to Lymphocyte Ratio.

Liu et al., (10) showed that COVID-19 patients with thrombocytopenia had a statistically significantly larger mean platelet volume (MPV, median 10.3 fL) than CO-VID-19 patients with retained platelet counts (median 9.9 fL). and he found that thrombocytopenia at admission was associated with  almost three times higher mortality than that in patients without thrombocytopenia; platelet count was an independent risk factor for COVID-19 mortality; and the dynamic changes of platelets were mostly related to death during treatment, and also found that after adjustment for potential confounders, platelets and PCT (platelet crit) were independent risks for mortality In our study it was 11.8 Mean in thrombocytopenic patients.

Neslihan Ozcelik et al.,(17) studied the platelet count and platelet parameter study in COVID -19 patients and Influenza patients it was noted that the MPV and MPV/platelet ratio were

significantly lower and absolute eosinophil count and PDW level were significantly higher in the COVID- 19 patients than in the influenza patients.

Wei-jie-Guan et al., (18) study on 1099 with clinical symptoms admitted in Wuhan hospital, they found that on admission, lymphocytopenia was present in 83.2% of the patients, thrombocytopenia in 36.2% with median platelet count 137,500 in disease severe patients and leukopenia in 33.7%. Most of the patients had elevated levels of C-reactive protein; less common were elevated levels of alanine aminotransferase, aspartate aminotransferase, creatine kinase, and d-dimer. Patients with severe disease had more prominent laboratory abnormalities (including lymphocytopenia and leukopenia) than those with nonsevere disease.

In Indian studies Pranjal Kashiv et al., (190 conducted study on 500  COVID- 19 patients they observed the  difference in platelet count before and  after the treatment with mean of platelet count before treatment was 241.22 and after treatment was 274.23 with P- value less than <0.001.

Sukrita Bhattacharjee et al., (20) studied the immune thrombocytopenia in COVID -19 patient's also known as immune thrombocytopenia purpura (ITP) new onset thrombocytopenia after excluding the several factors that cause the thrombocytopenia and defined by a platelet count $<100 \times 10^9$/L, classically presents with petechiae or purpuric rashes (21).

Diagnosis of ITP in patients with COVID-19 is a major diagnostic as well as therapeutic challenge, owing to presence of multiple concomitant conditions including Disseminated Intravascular Coagulation, sepsis, antibiotic use, heparin prophylaxis, and thromboembolic events. A distinct coagulopathy with high risk of thrombosis has also been observed in moderate-to-severe COVID-19 patients with sepsis-induced coagulopathy (SIC) score or disseminated intravascular coagulation (DIC) score (22).

In Naveen Bansal study (23) they concluded that thrombocytopenia is observed in both dengue and COVID- 19. Therefore, careful screening of patients, performing dengue testing in suspected patients with COVID- 19 and meticulous interpretation of the laboratory investigations will be required in the dengue season in India for prompt isolation and appropriate management of the patients.

**CONCLUSION:**
Uniquely to COVID-19, variability in disease severity is observed as it ranges from asymptomatic to critical.  In this study, we found that platelet count may be a simple, economic, rapid and commonly available laboratory parameter that could easily differentiate between COVID patients with or without severe disease.

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