International Journal of Advanced Research in Medicine

E-ISSN: 2706-9575
P-ISSN: 2706-9567
IJARM 2023; 5(1): 94-97
Received: 27-11-2022
Accepted: 09-01-2023

Dr. Deepshikha Bhalse
PG Student, Department of General Medicine, Sri Aurobindo Medical College & Postgraduate Institute, Indore, Madhya Pradesh, India

Dr. Dolly Joseph
Professor, Department of General Medicine, Sri Aurobindo Medical College & Postgraduate Institute, Indore, Madhya Pradesh, India

Dr. RK Jha
Professor & HOD, Department of General Medicine, Sri Aurobindo Medical College & Postgraduate Institute, Indore, Madhya Pradesh, India

Corresponding Author:
Dr. Deepshikha Bhalse
PG Student, Department of General Medicine, Sri Aurobindo Medical College & Postgraduate Institute, Indore, Madhya Pradesh, India

To study mean platelet volume-platelet count ratio in assessing severity in COVID-19 patients

Dr. Deepshikha Bhalse, Dr. Dolly Joseph and Dr. RK Jha

DOI: https://doi.org/10.22271/27069567.2023.v5.i1b.455

Abstract
Aim and Objectives: The association between platelet mean volume/platelet count ratio (MPR) and new coronavirus infectious disease 2019 (COVID-19) is not completely understood despite the fact that MPR is often regarded as an important marker of inflammatory and infectious disorders.
Materials and Method: COVID-19 RTPCR Positive patients (male and female) seeking medical attention at SAIMS during the period ofFebruary-April 2021 was included. Patients who were less than 18 years old or who suffered from liver disorders were not allowed to participate in this study. The Ethics Committee gave its clearance to this prospective- retrospective study using a cohort.
Results: The Mean Platelet Ratio can be used as an indicator for severity in COVID-19 patients.
Conclusion: Patients diagnosed with COVID-19 who have a high MPR level are at an increased risk for developing severe pneumonia.

Keywords: COVID-19, CRP, RT-PCR

Introduction
Since the first instances of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were reported, the scientific community has been working hard to dispel any lingering uncertainties regarding this dreadful infection and the effects it may have on the health of humans. Although eighty percent of symptomatic infected patients develop mild forms of the disease, it is very important to determine who would develop severe (15 percent) and critical (5 percent) disease because it has enormous implications for the healthcare system, particularly in terms of hospital bed occupancy and availability of resources [1].
Fever, upper respiratory congestion, gastrointestinal problems, and myalgia are some of the most common symptoms [2, 3]. The majority of patients have modest symptoms, however it is possible for certain people (particularly older patients and/or patients with comorbidities) to develop severe symptoms as the disease progresses [2]. Patients who are already in a severe condition might develop complications such as acute respiratory failure, acute respiratory distress syndrome (ARDS), septic shock, metabolic acidosis, and coagulation abnormalities very quickly [4].
With fewer studies it has been seen that the prevalence of MPV is greater in patients who have COVID-19 compared to individuals who do not have SARS-CoV-2 infection [8-10].
The mean platelet volume (MPV) is the size of platelets as determined using automated blood biometry, [11] and the normal value for this measurement is 8.81±1.68 fL [12, 13]. This sign indicates that there are immature platelets present in the blood, which is most likely the result of megakaryocyte hyperproliferation in the bone marrow [14]. Platelets with a larger surface area are more functionally, metabolically, and enzymatically active than those with a lower surface area. They have a higher prothrombotic potential because they include more internal thromboxane A2 and an enhanced expression of procoagulant surface proteins such as p-selectin and glycoprotein IIIa [15]. MPV can also serve as a risk or prognostic marker for cardiovascular, thrombotic, and inflammatory diseases, as well as sepsis.

MPR is defined as mean platelet volume (fL)/platelet count (^109/L) * 100
Mean platelet volume (MPV) has been regarded as a surrogate marker of platelet activation and prognostic indicator for critical patients. It is reported that the combination of MPV and Platelet count ratio could be more clinically significant than these alone indices. As far as we know, not much literature has investigated the relationship between MPV/platelet count ratio (MPR) and the prognosis of COVID-19.

Materials and Methods

Total 412 COVID-19 patients (male and female) seeking medical attention at SAIMS during the period of study were included. The ratio of MPV to platelet was calculated at the time of admission by hemogram of diagnosed cases of COVID-19.

This study time was Prospective-Retrospective. The time period for the study was March 2021-Jan 2021 (Retrospective) and March 2021-May 2021(Prospective).

The study included COVID-19 RTPCR patients >18 years of age who were seeking medical care at SAIMS Hospital. The study excluded Patients not giving informed consent, COVID-19 positive patients with past history of coagulation dysfunction and COVID-19 positive patients suffering from malaria or dengue were excluded.

The Investigations used was Complete Blood Count (Haemoglobin/Red Blood cell count/Packed cell volume/Platelet count/Total leucocyte count/Mean platelet volume), Inflammatory Markers (CRP and D dimer, COVID-19 RTPCR, and HRCT Chest.

Data collection and methods

Clinical, laboratory and radiological data were collected from case reports and medical records of the patients were checked retrospectively. Their Haemogram and inflammatory semarkers were done at the time of admission for prospective study. Samples of Peripheral blood were collected into tubes with ethylenediamine tetracetic acid.

Statistical analysis

SPSS version 25.0 analyzed the Excel data when it was loaded. Quantitative (numerical variables) data was given as mean and standard deviation, whereas qualitative (categorical variables) data was provided as frequency and percentage. The student t-test was used to compare the two groups' mean values, while the chi-square test analyzed their frequency differences. If p0.05, it was statistically significant.

Results

Table 1: Demographic profile and distribution of study participants

Variable		N	%
Age	Less than 30 Year	100	40.0
	31-40 Year	56	22.4
	41-50 Year	35	14.0
	51-60 Year	34	13.6
	More than 60 Year	25	10.0
	Mean±SD	39.17±14.57	
Gender Hypertension Diabetes Mellitus Cardiovascular	Male	140	56.0
	Female	110 38 42 32	44.0 38% 42% 32%
MPV	<7.5	26	10.4
	7.5-11.50	166	66.4
	>11.50	58	23.2
	Mean±SD	9.98±1.94	
Platelet Count	<1.5 lakh	53	21.2
	1.5-4.5 Lakh	181	72.4
	>4.5 Lakh	16	6.4
	Mean±SD	2.87±1.77	
MPR	<4.59 (low)	165	66%
	≥4.59 (high)	85	34%
	Mean±SD	4.59±2.78	
D Dimer	Normal <200	117	46.8
	Raised ≥200	133	53.2
	Mean±SD	737.15±1681	
CRP HRCT CHEST	Normal <0.5	113	45.2
	Raised >0.5	137	54.8
	Mean±SD Less than 50 Percent More than 50 Percent	168.27±472.89 131 62.38% 79 37.6%	
Duration of Hospital Stay	Upto 5 days	51	20.4
	6-10 days	176	70.4
	>10 days	23	9.2
	Mean±SD	7.26±3.08	
O2 requirement	Yes (NIV +NRBM)	144	57.6
	No	106	42.4
Severity	Severe	211	84.4
	Mild	39	15.6
Outcome	Died	79	31.6
	Survived	171	68.4

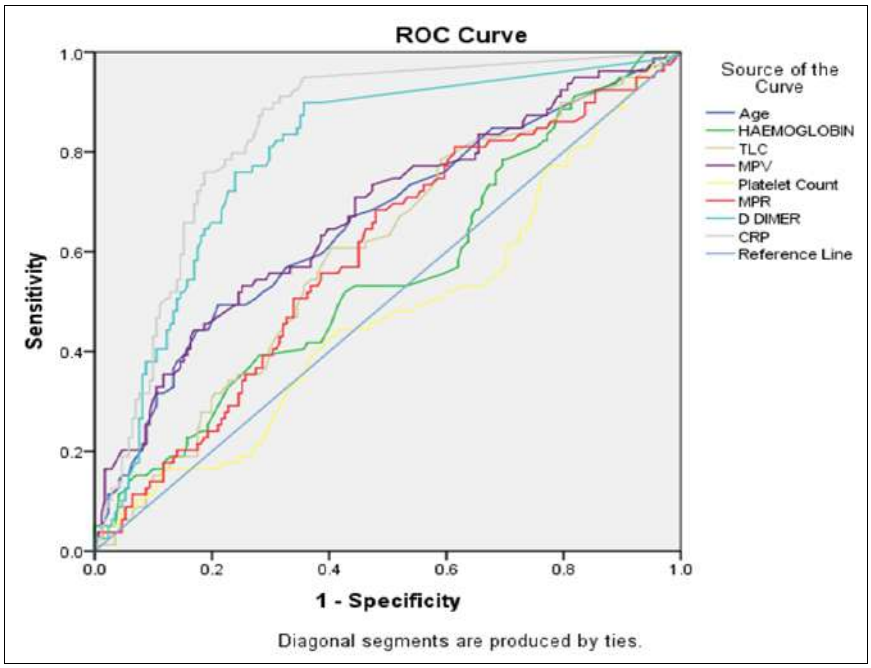
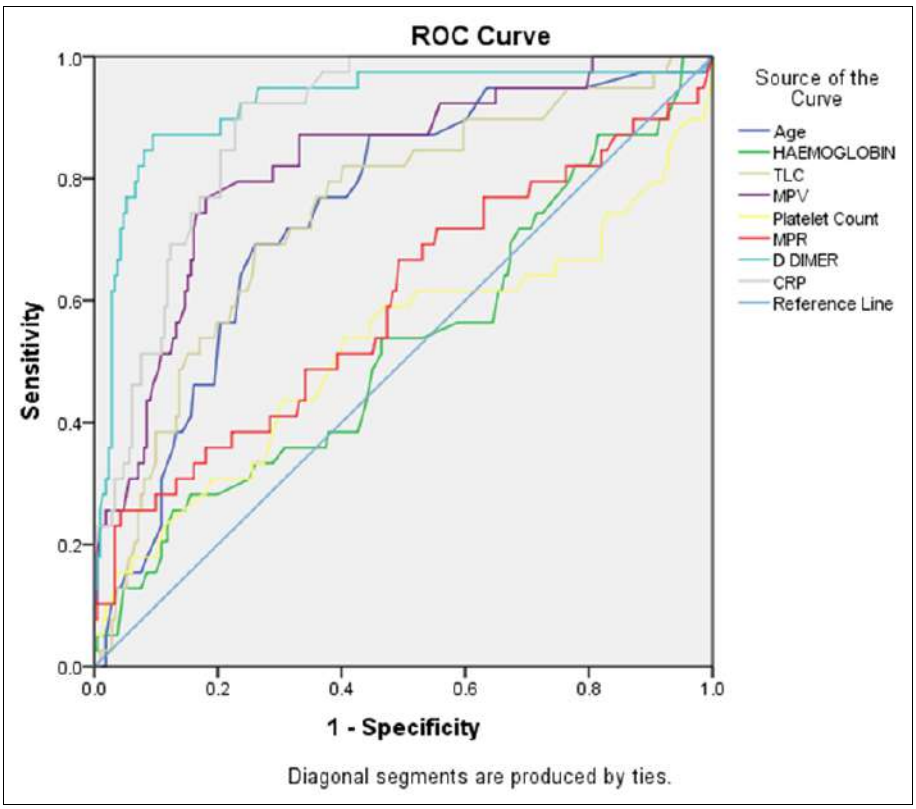


Table 2: ROC curve to predict severity of COVID-19

Area Under the Curve					
Test Result Variable(s)	**Area**	**P value**	**Cut-off value**	**Sensitivity and Specificity at defined cut-off value**	
				Sensitivity	**Specificity**
Age	0.657	<0.001	40.5	53.2%	69.6%
HAEMOGLOBIN	0.553	0.181	12.75	53.2%	55%
TLC	0.598	0.013	11050	39.2%	70.2%
MPV	0.673	<0.001	11.22	49.4%	76%
Platelet Count	0.474	0.511	2.375	49.4%	43.9%
MPR	0.591	0.021	3.53	64.6%	53.8%
D DIMER	0.794	<0.001	701.835	41.8%	87.7%
CRP	0.839	<0.001	78.665	62%	84.8%

Table 3: ROC curve to predict survival

Area Under the Curve					
Test Result Variable(s)	**Area**	**P value**	**Cut-off value**	**Sensitivity and Specificity at defined cut-off value**	
				Sensitivity	**Specificity**
Age	0.744	<0.001	40.5	71.8%	68.7%
HAEMOGLOBIN	0.526	0.603	12.75	53.8%	53.6%
TLC	0.743	<0.001	11050	69.2%	73.9%
MPV	0.823	<0.001	11.22	79.5%	76.8%
Platelet Count	0.524	0.638	2.375	61.5%	47.9%
MPR	0.595	0.059	3.53	66.7%	50.7%
D DIMER	0.921	<0.001	701.835	87.2%	90.5%
CRP	0.889	<0.001	78.665	82.1%	79.6%



Results The median age was 39.17 +/-14.57 years. Males were 140 (56%) and females were 110 (44%). 38% of study population was found to be hypertension and 42% were diabetic. The median days from symptom onset to admission were 7.26+/- 3.08 days. In patients who had mild illness and got discharged had a median duration of hospital stay of 6 days. Out of 210 patients about 131 (62.38%) patients had less than 50 Percent involvement while 79 (37.6%) had more than 50 Percent lung involvement.

39 patients developed to severe pneumonia during the course of our disease study. As compared with severe pneumonia, patients developed higher MPR levels than the low MPR group. The mean MPR was found to be 4.59+/-2.78 which was taken as the cut off value for two groups. Among the critically ill patients (211 patients) 79 people died (31.6%) and 171 (68.4%) had a good survival rate. It was found that CRP levels (p value 0.001 and duration of stay were significant with high MPR levels in our study population along with d dimer levels). The MPR levels had a sensitivity of 64.6 which was above high of rest parameters indicating that severity in patients has a direct impact on high MPR levels

Discussion

Recent research suggested that the ratio of monocytes to lymphocytes might be used to distinguish COVID-19-19 patients from healthy participants, and that the ratio of neutrophils to lymphocytes might be a viable marker for determining the severity of COVID-19 [19, 20]. These results revealed that the dynamic alteration of hemocytes was of enormous clinical value, and as a result, it became a focus of research.

When an infection first takes place, there is an increase in the release of a number of inflammatory cytokines. These cytokines include interleukin -1 (IL -1, IL -3 and IL -6 as well as tumour necrosis factor (TNF). This leads to an increase in thrombopoietin and the expression of young platelets in the blood stream, both of which are responsible of MPV. The predictive usefulness of MPR for COVID-19 has not been studied so far. Hence we tried to look into the connection between MPR and COVID-19. Our study found that median age was 39.17 years with 56% males over rest female which was close to study by Jhosef fransk *et al*. did a cohort study on 64 patients in Highlands of Peru and found that 48.5 years as median age with women 51.6% over males (vice versa). The median time to develop severe pneumonia from onset of symptoms was 7.11 days and mean platelet volume was 9.63 +/-0.84 and we found mean mpv 9.98+/-1.94 in our study. Our study found that only 37.6% of total study participants had HRCT findings more than 50 percent lung involvement while in a study by Jhosef fransk *et al*. 60.38% patients had progressive CT findings.

In another study conducted in Southern China which was a retrospective study which aimed at dividing the two population into low and high MPR groups i.e less than 7.44 and more than 7.44 as mean values and it was found that higher MPR group had a cut off value of 7.44 and 64.2% people had a progressive HRCT changes with higher CRP levels (Mean 11.89) which is close to our study which found that the higher MPR group had a death rate of 31.6% and MPR showing a significant p value with the CRP and d dimer levels.

Our study found that both the CT findings and the C-reactive protein (CRP) levels differed significantly between the two MPR groups. These changes were statistically significant. When compared to the group with a high MPR, the group with a low MPR had a proportion of patients with extensive lung infection that was lower. A strong positive association was found between MPR and CRP.

Conclusion

According to the findings of our research, MPR is a helpful indicator that can assist determine whether or not COVID-19 patients would develop severe pneumonia. The early implementation of MPR helps reduce the scarcity of medical resources while also being favourable to the hierarchical management of the risks posed by patients.

Study Limitations

A sample size of large participants could have helped to bring all the other risk factors for severity.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Wu Z, McGoogan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72,314 Cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020;323:1239-1242.
2. Chen N, Zhou M, Dong X, *et al*. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507-513.
3. Chan KW, Wong VT, Tang S. COVID-19-19: an update on the epidemiological, clinical, preventive and therapeutic evidence and guidelines of integrative Chinese-western medicine for the management of 2019 novel coronavirus disease. Am J Chin Med. 2020;48(3):737-762.
4. Huang C, Wang Y, Li X, *et al*. Clinical features of patients infected with 2019 novel coronavirus in Wuhan. China. LANCET. 2020;395 (10223):497-506.
5. Wang D, Hu BO, Hu C, *et al*. Clinical characteristics of 138 hospitalized patients with 2019 Novel coronavirus-infected pneumonia in Wuhan, China. JAMA; c2020.
6. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al*. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395:497-506.
7. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, *et al*. Clinical course and risk factors for mortality of adult in patients with COVID-19-19 in Wuhan, China: A retrospective cohort study. Lancet. 2020;395:1054-1062.
8. Yun H, Sun Z, Wu J, Tang A, Hu M, Xiang Z. Laboratory data analysis of novel coronavirus (COVID-19-19) screening in 2510 patients. Clin Chim Acta. 2020;507:97.

How to Cite This Article

B Deepshikha, J Dolly, Jha RK. To study mean platelet volume-platelet count ratio in assessing severity in COVID-19 patients. International Journal of Advanced Research in Medicine. 2023;5(1):94-97.