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Platelet-To-Lymphocyte Ratio, a Novel Biomarker to Predict the Severity of COVID-19 Patients

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Abstract

Background and Aims

The global mortality rate for coronavirus disease 2019 (COVID-19) is 3.68%, but the mortality rate for critically ill patients is as high as 50%. Therefore, the exploration of prognostic predictors for patients with COVID-19 is vital for prompt clinical intervention. Platelet-to-lymphocyte ratio (PLR), a novel inflammatory marker, has been suggested to predict the severity of COVID-19 patients. Our study aims to explore the correlation of platelet to lymphocyte ratio in the severity, prognosis and outcome of patients with COVID-19.

Material and Methods

The present study was conducted at RNT Medical College Udaipur. This study was done over a period of one month after getting approval from institutional ethics committee. Written and informed consent from patients were taken. In this study 74

patients admitted in COVID wards and ICU were taken if they found COVID19 RTPCR positive and COVID 19 RTPCR negative patients were excluded.

Results

In our study out of 74(100%) patients 55(74.3%) were male and 19(25.7%) were female, mean of platelets with standard deviation on admission was 2.2(0.9) and mean of spo_2 with standard deviation was 94.6(4.3). severity of COVID19 according to spo_2 of patients was decided , 37.8% patients have spo_2 normal >97%,32.4% were mild seek spo_2 was 95-97%,20.3% patients were moderate seek spo_2 was 91-94% and 9.5% patients were severe seek spo_2 was <90%. Out of 74(100%) patients, 2(2.7%) patients required mechanical ventilation and 72(97.3%) patients maintained spo_2 on room air, nasal prong, face mask oxygen support. In our study in severe category, 2(28.6%) patients died and in moderate category 1(6.7%) patient died and no death occurred in mild and normal category patients and p value for this was 0.004 which was significant. Median of PLR at admission in alive patients was 0.1 and dead patients was 0.5, Mann Whitney U value for this was 31 and p value was 0.03, mean spo_2 at admission was 86.7% in dead patients and 94.9% in alive patients, Mann Whitney U value for this was 17.5 and p value was 0.01 which was significant. In our study PLR at admission with COVID19 severity was decided, in normal patients mean rank was 34.05, in mild seek category mean rank was 34.29, in moderate seek category mean rank was 43.77 and in severe seek category mean rank was 48.86, Kruskal Wallis test chi square value was 4.7 and p value was .018.

Discussion

37.8% patients maintained spo_2 normal >97%, 32.4% patients maintained spo_2 95-97% (mild seek), 20.3% patients maintained spo_2 91-94% (moderate seek) and 9.5% patients maintained spo_2<90% (severe seek). Out of these patients, 2.7% patients required mechanical ventilation and 97.3% patients maintained spo_2 on room air, nasal prong, facemask oxygen support. In severe category, 28.6% patients died and in moderate category 6.7% patient died and no death occurred in mild and normal category patients and p value for this was 0.004 which was significant. In our study as PLR increases severity of COVID19 illness increases.

Conclusion

In our study as PLR increases severity of COVID19 illness increases, so PLR can be a good predictor for severity, prognosis and outcome in COVID19 patients.

Key words:- PLR(platelet to lymphocyte ratio), COVID19, RTPCR

Introduction

Coronavirus Disease 2019 (COVID-19) is a disease caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a virus thought to start as a zoonotic infection in Wuhan in late December 2019.[1] The disease was declared by the World Health Organization (WHO) as a pandemic on 11 March 2020 and has infected more than 100 countries worldwide.

COVID-19 is known for being infectious and simultaneously manifesting in different organs aside from the pulmonary system.[2-4] Patients infected with COVID-19 present a wide range of clinical conditions – ranging from asymptomatic infections, minimal symptoms to fatal respiratory distress. Although the majority of COVID-19 cases were classified as mild, involving flu-like symptoms to mild pneumonia, up to 20% of mild/moderate cases progressed to acute respiratory distress syndrome (ARDS).[5]Additionally,

patients with relatively normal clinical conditions can rapidly deteriorate and worsen within a few days, making clinical presentation an unreliable prognostic predictor of COVID-19. Thus, a more objective indicator is required to accurately assess and stratify the prognosis of COVID-19 patients upon admission to healthcare services.Immunological studies have shown that high levels of proinflammatory cytokines, known as a cytokine storm, are the hallmark characteristic of severe COVID-19 cases. This extreme elevation of cytokines causes a massive proinflammatory response resulting in Multiple Organ Dysfunction Syndrome (MODS) and ARDS, which subsequently leads to mortality in COVID-19 patients.[6] Therefore, in theory, inflammatory markers can be used to assess the severity and mortality risk of COVID-19 patients.

Platelet-to-lymphocyte ratio (PLR) is a novel marker of inflammation, which is inexpensive and readily available in clinical settings. PLR has been used in various diseases, such as cardiovascular diseases and autoimmune diseases, as a predictor of inflammation and mortality.[7,8] Due to the rapid involvement of inflammatory processes in COVID-19, severe COVID-19 patients have demonstrated elevated PLR levels on admission.[9,10] and PLR ratio changes with severity of disease and continuation of treatment. This suggests the potential use of this inflammatory marker to determine the prognosis of COVID-19 patients, especially in resource-limited settings. Therefore, this study aims to review the prognostic value of PLR levels on admission and during treatment course to determine the severity, prognosis and outcome of COVID-19 patients.

Observations

Table 1

Gender	N	%
Female	19	25.7
Male	55	74.3
Total	74	100

Table 2

Biochemical Parameters

	N		
Platelets on Admission	69	Mean(SD)	2.2(0.9)
Overall mean SPO2 on admission	74	Mean(SD)	94.6(4.3)

Table 3

Spo_2 for Severity of COVID19

SPO2	Severity	N	Percent
>97%	Normal	28	37.8
95-97%	Mild	24	32.4
91-94%	Moderate	15	20.3
<90%	Severe	7	9.5
Total		74	100.0

Table 4

Outcome status of Patients according to Severity of COVID19

		Outcome status		Total
		Dead	Alive	
Severity of COVID 19	Normal	0 (0)	28 (39.4)	28 (37.8)
	Mild	0 (0)	24 (33.8)	24 (32.4)
	Moderate	1 (33.3)	14 (19.7)	15 (20.3)
	Severe	2 (66.7)	5 (7)	7 (9.5)
	Total	3 (100)	71 (100)	74 (100)
Chi Value=13.3, Df=3, P=0.004*				
*P <0.05 is significant				

Table 5

Parameters	Values of Central Tendency	Outcome status		Mann Whitney U Value, P Value
		Dead(N=3)	Alive (N=71)	
PLR at admission	Median(IQR)	0.5(0.2-0.5)	0.1(0.1-0.3)	31, 0.03*
SPO2 at admission	Mean (SD)	86.7(6.1)	94.9(3.9)	17.5, 0.01*
*P <0.05 is significant				

Table 6

	Covid 19 Severity	N	Mean Rank	Kruskalwallis Test Chi square value=4.7, Df=3, P=0.18
PLR at admission	Normal	28	34.05	
	Mild	24	34.29	
	Moderate	15	43.77	
	Severe	7	48.86	
	Total	74		

Table 7

		Outcome status		Total (%)
		Dead (%)	Alive (%)	
Need for Mechanical ventillation	No	1 (33.3)	71 (100)	72 (97.3)
	Yes	2 (66.7)	0	2 (2.7)
	Total	3 (100)	71 (100)	74 (100)
Chi square value=48.6, DF=1, P= <0.001 Likelihood ratio=14.5 Risk of being dead with respect to being alive by use of Mechanical ventilator is 71.4 times,95% CI=10-500)				

Table 8

Need for Invasive/Mechanical Ventilation

No	Frequency	Percent
Yes	72	97.3
Total	2	2.7

Table 9

	Need For MV	N	Mean (SD)	Mean Rank	Mann Whitney
PLR at admission	No	72	0.18(0.19)	36.9	U value=29, P value=0.1
	Yes	2	0.3(0.21)	59	

Discussion

In our study 74.3% patients were male and 25.7% were female, mean of platelets with standard deviation on admission was 2.2(0.9) and mean of spo_2 with standard deviation was 94.6(4.3). 37.8% patients maintained spo_2 normal >97%, 32.4% patients maintained spo_2 95-97% (mild seek), 20.3% patients maintained spo_2 91-94% (moderate seek) and 9.5% patients maintained spo_2<90% (severe seek). Out of these patients, 2.7% patients required mechanical ventilation and 97.3% patients maintained spo_2 on room air, nasal prong, face mask oxygen support. In severe category, 28.6% patients died and in moderate category 6.7% patient died and no death occurred in mild and normal category patients and p value for this was 0.004 which was significant. In our study as PLR increases severity of COVID19 illness increases.

Conclusion

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