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Association of Red cell distribution width with COVID-19 severity.

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***ABSTRACT**:*
BACKGROUND: SARS Cov2 took the world by a storm claiming millions of life. Though quiescent now it poses an undeniable threat. It has been reported that a variety of indicators can predict the progression of COVID-19 disease and a study of it will help us remain a step ahead when the catastrophe strikes again.
AIM: The aim of this study is to identify if a relationship exists between RDW and the clinical outcome in COVID-19 patients.
METHOD: In this retrospective study, data on 400 RT-PCR confirmed COVID-19 patients from KIMS hospital and research centre , Bengaluru were collected from April 2021to July 2021 . Patient's history,vitals and laboratory reports were collected,clinical outcomes like mortality, admission to intensive care unit and need for mechanical ventilation were analyzed.The cases were categorized into non severe which included category A and B, severe which included category C . Statistical analysis was done using Kruskar Wallis test
RESULT: RDW >14.5 was associated with increased risk of severe disease,intubation and ICU admission.
***CONCLUSION:** Patients with elevated levels of RDW were observed to have higher probability of poor outcomes compared to those without.*

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I. INTRODUCTION:

The severe acute respiratory syndrome coronavirus 2 (SARS-Co V-2) continues to disseminate relentlessly around the world claiming millions of lives. Despite being primarily a respiratory pathogen, COVID-19 develops as a multifactorial dysfunction. Current scientific and clinical research on COVID-19 should therefore emphasize on identifying the demographic, clinical, radiological, and laboratory predictors of undesirable disease progression because doing so will enable expeditious, tailored, and aggressive treatment for patients who may have a higher risk of developing critical disease.

Erythrocyte volume heterogeneity is expressed as red cell distribution width (RDW). RDW is a useful tool for forecasting, monitoring, and directing the therapeutic care of a kaleidoscope ofdiseases.
The aim of this study was to investigate the role of RDW in risk stratification of COVID-19 infection.

II. MATERIALS AND METHODS:

This was a retrospective study conducted on COVID-19 patients enrolled between April 2021 to July 2021.Epidemiological and laboratory data from patients hospitalized for COVID-19 were collected.
Diagnosis of COVID-19 was based on a positive real-time reverse transcriptase polymerase chain reaction (RT-PCR) of an upper respiratory nasopharyngeal/oropharyngeal swab.Disease Progression and severity was estimated by category, ICU admission and mortality.
Kruskal Wallis Test followed by Dunn's post hoc test was used to compare RDW values based on the severity of the COVID patients.ROC analysis was performed to determine the predictive score for RDW for ICU admission & Mortality among COVID patients. The level of significance was set at $P<0.05$.

CATEGORY	PATIENT CHARACTERISTICS
Category A:	Asymptomatic/patents with mild symptoms, Respiratory rate <24/min and SpO2 > 94% at room air
Category B:	Symptomatic patients with mild to moderate pneumonia with no signs of severe disease, Respiratory rate 24-30 /min and SpO2 90-94% at room air

Category C:	Symptomaticpatients with severe pneumonia, Respiratory rate >30/min or SpO2 <90% at room air or <94% with oxygen,ARDS,Septic shock

III. RESULTS:

A total number of 400 hospitalized patients with COVID-19 were enrolledand analyzed.

Table 1: Showing age and gender distribution among study subjects

Age and Gender distribution among study patients			
Variable	Category	n	%
Age	20-40 yrs.	133	33.3%
	41-60 yrs.	102	25.5%
	61-80 yrs.	143	35.8%
	> 80 yrs.	22	5.5%
		Mean	SD
	Mean & SD	52.28	18.49
	Range	20 - 83	
Gender	Males	235	58.8%
	Females	165	41.3%

Median age was 61 years.
58.8% of the study population were males and 41.2% were females

Table 2: Distribution of study subjects on the basis of COVID-19 severity

Distribution of study patients based on severity of COVID-19			
Variable	Category	n	%
Severity	Category A	142	35.5%
	Category B	166	41.5%
	Category C	92	23.0%

Table 3: Distribution of study subjects on the basis of ICU Admission

Distribution of ICU Admissions among study patients			
Variables	Category	n	%
ICU Admission	Yes	136	34.0%
	No	264	66.0%

34% of the study population were admitted to intensive care unit.

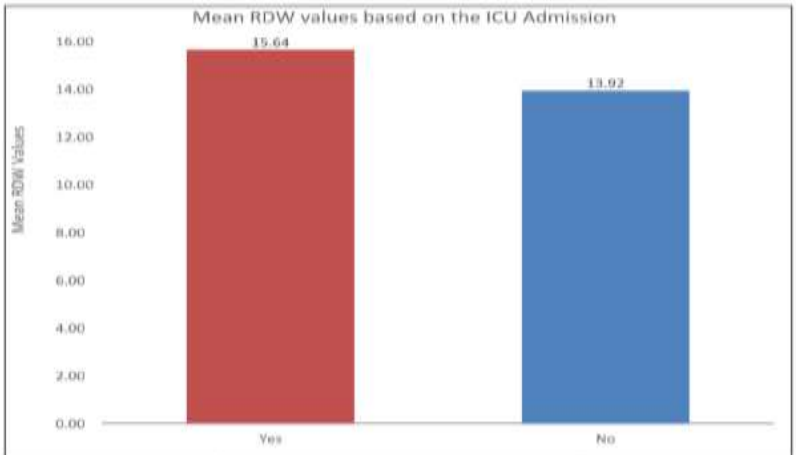

Figure1 : Bar Graph showing mean RDW values among patients admitted in ICU and non ICU setting.

Table 4: Mortality rate among study subjects

Distribution of Mortality rate among study patients			
Variables	Category	n	%
Mortality	Non-survivor	60	15.0%
	Survivor	340	85.0%

15% of the study subjects succumbed to the disease.

Figure 2: Bar graph comparing mean RDW value among survivors and non- survivors

Mean RDW value among non survivors was 16.05 and survivors was 14.23

Table 5: Comparison of mean RDW value with COVID-19 category based on severity

Comparison of mean RDW values based on the severity of the disease using Kruskal Wallis Test followed by Mann Whitney Post hoc Test								
Severity	N	Mean	SD	Min	Max	P-Value [a]	Sig. Diff	P-Value [b]
Category A	142	13.79	1.76	12.0	18.8	<0.001*	A vs B	<0.001*
Category B	166	14.28	1.47	11.8	21.0		A vs C	<0.001*
Category C	92	16.06	1.49	13.5	23.0		B vs C	<0.001*

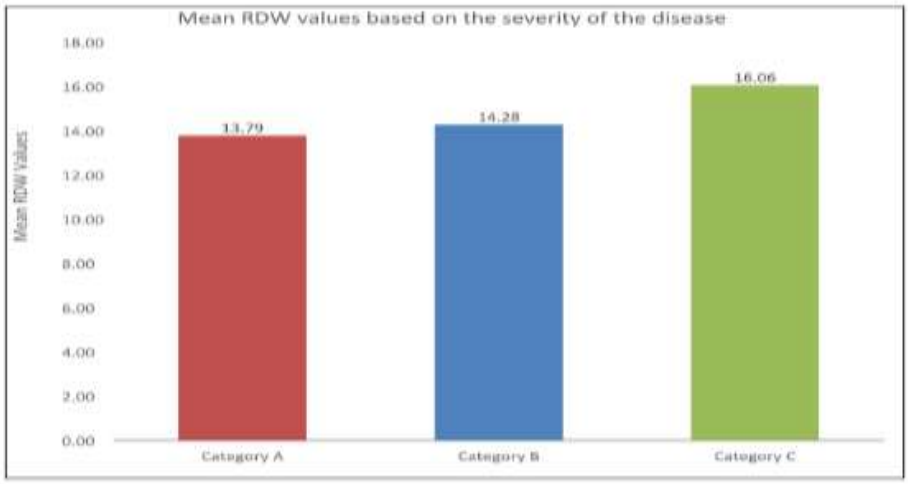

Figure 3 : Bar Graph comparing mean RDW value based on severity of the disease.
RDW value was highest among category C patients followed by category B and the least in category A

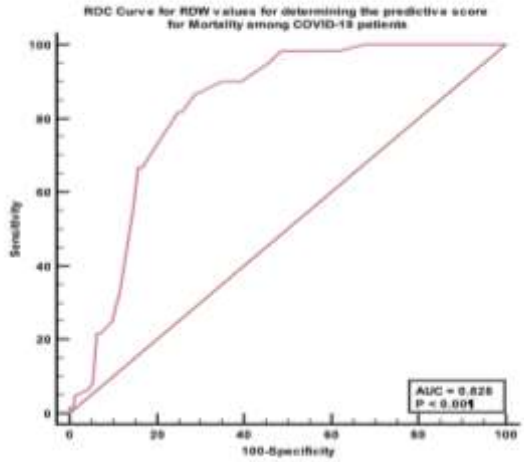

Figure 4: ROC curve for RDW value for determining the predictive score for mortality among COVID-19

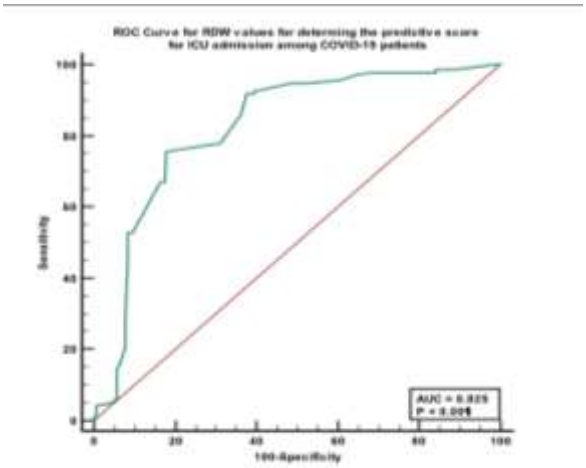

Figure 5: ROC curve for RDW value for determining the predictive score for ICU admission among COVID-19 patients.

Patients with baseline RDW>14.5% presented with more progressive disease compared to patients with baseline RDW<14.5% indicated by significant differences in ICU admission and increased risk of mortality

IV. DISCUSSION:

In-hospital mortality was more likely for patients with greater RDW values upon admission (i.e., > 14.5%) than for those with lower values.

While several theories have been proposed about the molecular mechanism of RBC participation in COVID-19, the high inflammatory dependent variation of anisocytosis stands out as the most plausible idea.

More particular, research has shown that several acute and chronic proinflammatory situations cause RDW readings to significantly rise.

It is now evident that an abnormal, dysregulated, and exaggerated proinflammatory response, which results in cytokine storm and is now known to be a primary cause of lung injury and multiple organ dysfunction syndrome.

This is what drives the harmful clinical progression of SARS-CoV-2 infection. The production of erythropoietin has been reported to be decreased by many of the proinflammatory cytokines upregulated in COVID-19, such as tumour necrosis factor (TNF-α) and interleukin (IL)-1.

Additionally, RDW has been demonstrated to be a strong predictor of unfavourable outcomes in patients with sepsis, bacterial super-infections are relatively common in patients with severe SARS-CoV-2 illness. It was thought that the SARS virus might directly infect hematopoietic stem/progenitor cells through CD13 or CD66a, curtailing its growth and apoptosis.

In COVID-19 individuals with severe sickness, anisocytosis may develop as a result of disturbed erythropoiesis as a consequence of the hypoxic disease itself.

Compared to other measurements that are more expensive,time-consuming and need specialized approaches, RDW is a low cost parameter . RDW can be provided several times daily for real-time monitoring of a patient's clinical course of illness because it is automatically generated by majority of the haematological analyzers.

In light of the fact that an increased RDW value has been shown to significantly predict patient mortality and that the long-term clinical effects of COVID-19 patients recovering after a severe illness are still largely unknown, research should be planned to determine whether RDW may also be useful for predicting the course of this disease after recovery.

V. CONCLUSION:

RDW measured at admission was related with a statistically significant increase in mortality in this analysis of patients hospitalized for COVID-19. RDW, a routine investigation maybe useful in predicting outcomes especially in resource limited settings.

REFERENCES

[1]. Higgins JM, Mahadevan L. Physiological and pathological population dynamics of circulating human red blood cells. Proc Natl AcadSci USA. (2010)107:20587–92. doi: 10.1073/pnas.1012747107

[2]. Patel HH, Patel HR, Higgins JM. Modulation of red blood cell population dynamics is a fundamental homeostatic response to disease. Am J Hematol(2015) 90:422–8. doi: 10.1002/ajh.23982

[3]. Salvagno GL, Sanchis-Gomar F, PicanzaA,Lippi G. Red blood cell distribution width: A simple parameter with multiple clinical applicationsCrit Rev Clin Lab Sci. 2015; 52(2): 86–105.

[4]. Jelkmann W. Proinflammatory cytokines lowering erythropoietin production. J Interferon cytokine Res. 1998 Aug; 18(8): 555–9.

[5]. Hu ZD, Lippi G, Montagnana M. Diagnostic and prognostic value of red blood cell distribution width in sepsis: a narrative review. ClinBiochem. 2020 Mar; 77: 1–6.

[6]. Zhu X, Ge Y, Wu T, Zhao K, Chen Y, Wu B,et al. Co-infection with respiratory pathogens among COVID-2019 cases. Virus Res. 2020Aug; 285: 198005.

[7]. Yang M, Li CK, Li K, Hon KL, Ng MH, Chan PK, et al. Hematological findings in SARS patient and possible mechanisms (review) [review]. Int J Mol Med. 2004 Aug; 14(2): 311–5.

[8]. Soliz J, Schneider-Gasser EM, Arias-Reyes C,Aliaga-Raduan F, Poma-Machicao L, Zubieta-Calleja G, et al. Coping with hypoxemia:could erythropoietin (EPO) be an adjuvant treatment of COVID-19? RespirPhysiol Neurobiol.2020 Aug; 279: 103476.

[9]. Taneri PE, Gomez-Ochoa SA, Llanaj E, Raguindi PF, Rojas LZ, Wyssmann BM, et al.Anemia and iron metabolism in COVID-19: A systematic review and meta-analysis. MedRxiv 2020: 2020.06.04.20122267.

[10]. Fernandez R, Cano S, Catalan I, Rubio O,Subira C, Masclans J, et al. High red blood cell distribution width as a marker of hospital mortality after ICU discharge: a cohort study. J Intensive Care. 2018 Nov; 6(1): 74.

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