

To assess the role of red cell distribution width and neutrophil: Lymphocyte ratio in adults with sepsis

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Abstract

Background: Sepsis and septic shock are one of the leading causes of death worldwide. Rapid and precise diagnosis and appropriate antibiotic therapy is necessary to reduce mortality and morbidity in patients with sepsis. The present study was done for assessing the efficacy of RDW and NLCR as biomarkers in predicting the clinical outcome of patients with sepsis.

Methodology: In this prospective observational study, 155 adult patients of both sex with a diagnosis of sepsis and admitted in the emergency wards and Intensive medical Care unit were included. The source of infection, complications, duration of in-hospital stay, RDW and NLCR were compared between the survivors and non-survivors groups.

Results: Mean age of the patients was 58.4 years. Out of 155, 101 were males while the remaining 54 were

females. Mortality was seen in 19.35percent of the patients. Mean RDW was 15.8 in the case of survivors and 19.6 in the case of non-survivors which was statistically significant with respect to duration of stay. The mean NLCR was 9.26 in survivors and 13.9 in non-survivors, the results are statistically significant. A highly significant and positive correlation of RDW and NLCR with qSOFA score was observed.

Conclusion: RDW and NLCR measured on admission can be used as markers in patients with sepsis.

Keywords: RDW, NLCR, ICU, Diagnosis.

Introduction

Sepsis is one of the most common causes of death among hospitalized patients in the intensive care unit (ICU). It is particularly difficult to diagnose in this setting because of the multiple comorbidities and underlying diseases that these patients present. Epidemiologic data on sepsis

varies depending on the origin of database– community-based or hospital-based, nature of data collection–retrospective chart review, discharge diagnoses, diagnosis in death certificates or prospective observational studies. A robust epidemiological study methodology should be prospective in nature conducted over a prolonged period and should include heterogeneous case mix representative of the disease, thus allowing generalizability of observed data. An apparently surprising observation is that, despite the reduction in mortality, nowadays hospitalized patients have higher rates of organ failure (respiratory, renal, and cardiovascular failure being the most commonly diagnosed) and also a higher probability of experiencing septic shock than only severe sepsis. Without consistent and reproducible criteria the extensive pathophysiology associated with sepsis is difficult to diagnose and treat. A delay in the diagnosis and treatment of sepsis will result in the rapid progression of circulatory failure, multiple organ dysfunction and eventually death. Treatment guidelines are ambiguous. It involves a prolonged hospital stay for patients, while receiving complex therapy. The in-hospital mortality risk of 10% in patients diagnosed with sepsis is widespread and those who develop septic shock increase their mortality risk greater than 40%. Several inflammatory biomarkers have been evaluated in recent years with the high sensitivity, specificity, positive and negative predictive values for the early diagnosis of sepsis as available in literature. The Red Cell Distribution width (RDW) is one of the various biomarkers which have been shown to predict the mortality and morbidity of sepsis. The Red Cell Distribution Width (RDW) is the coefficient of variation of Red Blood Cell (RBC) volume and is a representation of the RBC size heterogeneity of an individual patient.⁸Recent studies have reported that Red Cell

Distribution Width (RDW) is associated with prognosis in Critical Illness, Heart Failure, Acute Myocardial Infarction, Pulmonary Embolism, Pneumonia and Cardiac Arrest. Research has shown that Neutrophil-lymphocyte count ratio (NLCR) may be considered a novel marker of subclinical inflammation. It represents a combination of two markers; neutrophils, which represent the active nonspecific mediator initiating the first line of defence and lymphocytes, representing the regulatory or protective component of inflammation. Neutrophil-lymphocyte ratio (NLR) is calculated by dividing the number of neutrophil count by number of lymphocyte count, usually from peripheral blood sample. **Aims and objectives:** To evaluate the role of red cell distribution width (RDW) and neutrophil- lymphocyte ratio (NLR) in the evaluation of the severity of sepsis cases.

Materials and methods

Type of study - Cross-sectional analytical study

Study place– SMS Hospital & Attached Group of Hospitals, Jaipur

Duration – 2 years (from June 2021 to obtaining desired sample size)

Total sample size: 155.

Basic demographic data, comorbidities, source of a new infection, presenting vital signs was recorded as per the proforma. q-SOFA score and SOFA score was calculated on the fifth day of admission to ICU, to assess the progress of the patient. Blood samples were collected at the time of admission for the following tests. RDW was measured at admission to ICU. The RDW is a measure of variability or red blood cells in size. It may be elevated due to ineffective production or increased destruction of red blood cells. This happens usually in inflammation and infections. Neutrophil to lymphocyte ratio (NLR) was determined by dividing the absolute neutrophil count

by the absolute lymphocyte count. Outcome was assessed.

Results

Mean RDW width at admission among subjects with Q-SOFA one, two and three was 14.62, 14.82 and 15.36 respectively. On comparing, the results were found to be statistically significant. Mean RDW width at admission among subjects with mortality, improved outcome and worsened outcome was 15.68, 14.43 and 15.12 respectively. On comparing, the results were found to be statistically significant. Mean NLR at admission among subjects with Q-SOFA one, two and three was 3.96, 4.95 and 5.26 respectively. On comparing, the results were found to be statistically significant. Mean NLR at admission among subjects with mortality, improved outcome and worsened outcome was 5.13, 3.82 and 4.89 respectively. On comparing, the results were found to be statistically significant.

RDW Width at admission with q-SOFA

Q-SOFA	Number	Mean	p- value
One	31	14.62	0.000 (Significant)
Two	58	14.82	
Three	66	15.36	
Total	155	14.98	

RDW Width at admission and outcome

Outcome	Number	Mean	p- value
Mortality	22	15.68	0.012 (Significant)
Improved	72	14.43	
Worsened	61	15.12	
Total	155	14.98	

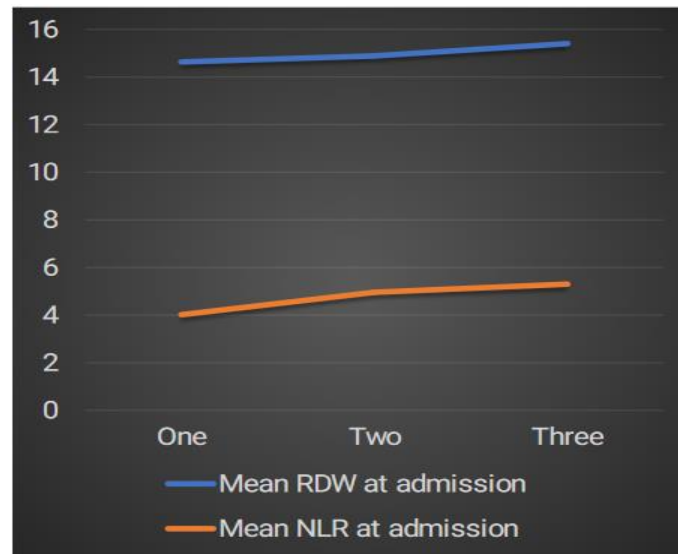
NLR at admission with q-SOFA

Q-SOFA	Number	Mean	p- value
One	31	3.96	0.002 (Significant)
Two	58	4.95	
Three	66	5.26	
Total	155	5.01	

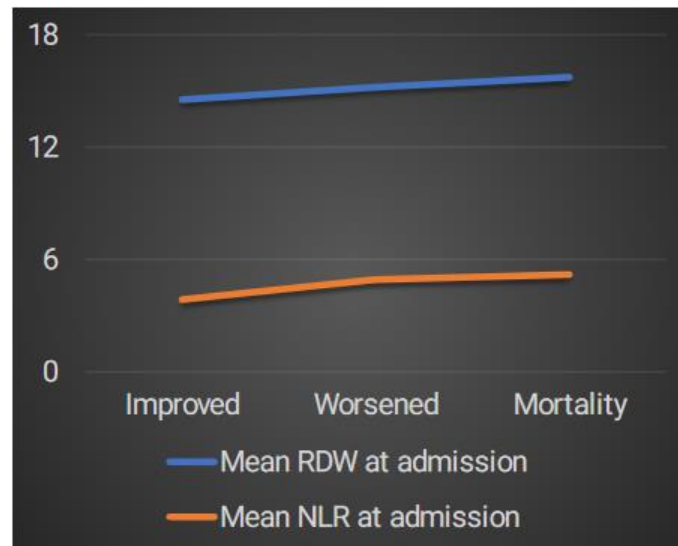
NLR at admission and outcome

Outcome	Number	Mean	p- value
Mortality	22	5.13	0.001 (Significant)
Improved	72	3.82	
Worsened	61	4.89	
Total	155	5.01	

RDW width and NLR at admission- Qsofa



RDW width and NLR at admission- Outcome



Discussion

In our study there was a good correlation between RDW and qSOFA score. In our study RDW correlated well with the outcomes and as the RDW increased the outcome of the patients worsened.

In another study conducted by Han et al, RDW not only predicted short term mortality but also had a good correlation with the 4-year mortality rate.

In our study also RDW value predicted a worse outcome.

In the study by Jandial A, they found that an RDW showed significant correlation with mortality in sepsis patients. Red cell distribution width (RDW) is routinely done as a part of the routine blood count. Various studies have shown that it may be used as a prognostic marker in hypertension, coronary artery disease, stroke, and acute kidney injury. It has also been shown to correlate with all-cause mortality and nutritional status.

In critically ill patients the “neutrophil-lymphocyte ratio” (NLR) is a simple, rapid and inexpensive novel marker of inflammation and stress.

It has also been found to have predictive value in patients with suspected bacteremia in medical emergencies; and also found to be associated with short-term and long-term clinical outcomes in critically ill patients.

Conclusion

We found that RDW correlated well with qSOFA score in sepsis patients and offered a clinically reliable cut off for prognostication of sepsis. We found Neutrophil lymphocyte ratio to be of limited clinical value as it lacked a discernible cut off and had a weak association with clinical outcome.

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