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THE PROGNOSTIC SIGNIFICANCE OF RED CELL DISTRIBUTION WIDTH (RDW) AND NEUTROPHIL-LYMPHOCYTE RATIO (NLR) IN ACUTE PANCREATITIS

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ABSTRACT **Background:** Hematological prognostic markers like red cell distribution width (RDW) and neutrophil to lymphocyte ratio (NLR) may be useful. The purpose of this study was to explore the validity of NLR & RDW in anticipating the outcome of patients with acute pancreatitis, as well as to find out the appropriate cut-off levels which allow patients to be classified into mild (MAP) and severe acute pancreatitis (SAP) groups within the first 48 hours of hospital admission.**Methods:** All patients who visit to the emergency department with acute pancreatitis, studied their clinical, imaging, length of stay, and hematological parameters, including RDW and NLR. Sensitivity, Specificity, and the optimal cut off value of NLR and RDW were used to assess diagnostic accuracy. **Results:** The study included 40 patients having acute pancreatitis, of which 21 (52.5 %) had an increased RDW, and 32 (80 %) had an increased NLR. The average length of stay in these patients was apparently longer (10.5 v 8.5 days; p = 0.01). 21 (52.5%) cases who had both a raised RDW and a raised NLR had an increased risk. No deaths noted in the study. Four cases of ICU admissions (10%) with the mean length of hospital stay of 9.6 days were recorded. An AUC of 0.63& 0.755for RDW and NLR respectively in anticipating the requiring for intensive care admission. For the patient to be admitted in to critical care, the optimal cut off for RDW is 14.65 %, with a sensitivity value of 46.70% and a specificity value of 80.0%, while RDW had cutoff of 15.5, with sensitivity value of 33 % and a specificity value of 89.40%. The optimal value for NLR cut off for admission into intensive care unit (ICU) was 8.01, with sensitivity value of 86.70% and specificity value of 64.70%, while an NLR value of 5 and over had a sensitivity value of 93.30% and a specificity value of 39.40%. **Conclusions:** Acute pancreatitis presented with an raised RDW and NLR on the day of admission are independent individual predictors of the need for ICU admission. Patients with acute pancreatitis who have high RDW and NLR on admission have a higher risk of a longer hospital stay.

KEYWORDS : Acute Pancreatitis, NLR, RDW

INTRODUCTION:

Acute Pancreatitis is a condition that is associated with pancreatic inflammation characterized by acute pain in the abdomen and evidence of abnormal pancreatic enzyme levels in the serum. It is divided into two types: mild acute pancreatitis and necrotizing or severe acute pancreatitis with multi- organ dysfunction.

RDW is a laboratory variable is routinely measured as part of the complete blood picture. It is a measurement of erythrocyte anisocytosis, which is the difference in the size of circulating red blood cells. NLR is a simple measurement of systemic inflammation that is calculated using parameters that are typically included with a full blood count report. In this study, we proposed a value of 5 as the upper limit of normal (ULN).A higher NLR proposed as a simple hematological marker of poor outcome in acute pancreatitis.

AIMS AND OBJECTIVES

AIM:

The goal of this study was to identify the validity of NLR & RDW in predicting the patients with acute pancreatitis, as well as to find the best cut-off levels for classifying subjects into mild (MAP) and severe (SAP) groups within the first 48 hours of hospitalization.

OBJECTIVES:

- To validate the NLR and RDW levels for predicting the severity of AP.
- To predict the ICU admission, morbidity and mortality in patients with severe acute pancreatitis by measuring cut-off levels of NLR and RDW.

MATERIALS AND METHODS

Source of data

Patients with signs and symptoms of acute pancreatitis admitted at Govt. General Hospital, Department of General Medicine ward in Kurnool Medical College, Andhra Pradesh.

Method of collection of data

Cases admitted as in-patients of various medical wards of govt. hospital.

Study design

Prospective, analytical Observational study.

Randomization:

Simple random

Sample size

$n=[(Za/2+Z\beta)^2\times(SD\times2]/ d^2$ n=Sample Size
Zα/2 = Z value at 5% error (1.96)Zβ=Zvalue at 20%(0.84) SD=average standard deviation of the character = (SD1+SD2)/2 d-Clinically relevant effect (taken as 0.5)
n= 40

Study duration

18 months duration from December 2019 to June 2021.

Inclusion criteria:

- Adults of aged≥ 14 years of either sex.
- Patients with features of acute pancreatitis

Exclusion criteria:

- Age < 14 years
- Traumatic / Autoimmune pancreatitis
- Patients with metabolic causes
- Tumor or liver failure

Procedures:

A detailed history of the current illness, previous illnesses, personal history, smoking, alcohol consumption, history of any renal stones, cardiovascular disease, thyroid disease The RDW and NLR can be obtained as part of the routine investigations of patients with AP, incurring no extra cost and appearing to correlate with outcome. Continuous RDW and NLR monitoring on the first day of admission provides a dynamic reflection of the fluctuating course of AP, with optimal NLRs fluctuates with changes in patient status.

Laboratory measurements:

Serum Amylase, Lipase, total protein, creatinine, total bilirubin, lactate dehydrogenase, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels.

The Red cell distribution width (RDW) & NLR determined by calculate the ratio between the absolute neutrophil and lymphocyte counts on at day 0, 24 hrs and 48hrs, and this correlated with clinical severity.

After 48 hours patient classified as mild/ severe acute pancreatitis by based on clinical, biochemical and radiological criteria.

Imaging:
- Ultrasound- Abdomen
- CT/CECT abdomen

A diagnosis of Acute Pancreatitis required two of three features:
- Prolonged abdominal pain characteristic of AP
- Three fold elevation of serum amylase/lipase levels above the normal range
- Characteristic findings of AP on abdominal ultrasonography and/or CT scan.

Statistical analysis
Analysis that id performed statistically using SPSS 23.0 (IBM, Chicago, Illinois).Continuous variables presented as mean.The receiver operating characteristic (ROC) curve was utilised to assess the asses the role of RDW and NLR in determining the requirement for critical care admission in the hospital.

RESULTS
Severity of pancreatitis:
72.50 % of study subjects are categorised as mild acute pancreatitis, and 27.5% are of severe form of acute pancreatitis.

Age distribution:
In the current study, there were 5 patients (12.5%) patients in <30 years age group, 11 patients (27.5%) in 31- 40 years age group, 15 patients (37.5%) in 41-50 years in group, and 9 patients (22.5%) in >50 years age group respectively.

The 31- 50 year age group had the majority of the patients (n=16), followed by the >50 year age group (n=9) and <30 year age group(n=5).

The average age of the cases was 43.025±8.73years. In our study group, 100% of patients were male Among the patients with severe acute pancreatitis, three developed pancreatic pseudocysts, accounting for 27.27%, six patients has developed pancreatic necrosis, accounting for 54.54 %, one case developed acute renal failure, accounting for 9.09 %, and one of the case have developed multiple organ dysfunction syndrome, accounting for 9.09 %.

In the current study, 32 patients (80%) had an NLR value more than 5 on admission, and none died, whereas no patient with an NLR less than 5 died. Three patients with raised NLR on the day ofadmission required ICU care (7.5 percent; RR 8.137, p=0.01), and the average length of hospital stay in among these patients was significantly long (10.5 v 8.5 days; p = 0.01).

In the current study, NL ratio at presentation (0 hours) was 6.8 and 10.8 in Mild and Severe Acute Pancreatitis, with significant difference between them (p<0.001). NL ratio at 24 hours) was 5.7 and 9.0 in Mild and Severe Acute Pancreatitis, with significant difference between them (p<0.001). Whereas, NL ratio at 48 hours was 4.2 and 5.2 in Mild and Severe Acute Pancreatitis, with significant difference between them

In the study at present, RDW at presentation (0 hours) was 14.2 and 15.7 in Mild and Severe Acute Pancreatitis, with significant difference between them (p<0.001). RDW at 24 hours) was 13.8 and 14.9 in Mild and Severe Acute Pancreatitis, with significant difference between them (p<0.001). Whereas, RDW at 48 hours was 13.5 and 14.8 in Mild and Severe Acute Pancreatitis, with significant difference between them with p value of <0.001.

In the study at present, of the total 14 patients (35%) had a RDW > 15.5 on presentation. No patients in thisstudy died (mortality rate 0%). Three of patients on the day ofadmission with raised RDW required intensive care unit (ICU) (7.5 percent; RR 3.521; p=0.01). The average duration of stay in the hospital for those with elevated RDW was 11.7 days, compared to those with normal RDW was about 7.40 days (p=0.222).On t-statistical analysis of NLR and RDW in Acute Pancreatitis showed varied results. The mean NLR shows significant difference among different treatment time intervals in Mild Acute Pancreatitis. In severe Acute Pancreatitis, mean NLR shows significant difference among different treatment time intervals. Whereas, the mean RDW does not shows significant difference among different treatment time intervals in Mild Acute Pancreatitis and also in severe Acute Pancreatitis.

By observing RDW, In both moderate acute and severe pancreatitis, no significant changes in RDW values were seen at 0, 24, or 48 hours. It's important to note, however, there is a significant distinction between mild and severe pancreatitis, an elevated RDW has been noted. At 0 hr and 24 hr, this difference is more pronounced than at 48 hr.

In the study at present, RDW showed no much change in values after 0, 24, and 48 hours in both mild and severe pancreatitis. However, there is a much difference between mild and severe pancreatitis, with an elevated in RDW is noted in severe form of acute pancreatitis. This difference is highly pronounced at 0 hour, 24 hour, and 48 hour intervals.

Neutrophil lymphocyte ratio
The current study found a significant difference in NLR between mild and severe pancreatitis, with anelevated in NLR is found in severe form of acute pancreatitis. This difference is more pronounced at 0 hr and 24 hrs than at 48 hrs. Similarly, in acute pancreatitis, the NLR ratio is higher when compared to the general population, with a greater increase observed in the first 24 hours than in the first 48 hours.

In our study, we found no significant difference in values at 0, 24, and 48 hours in both mild acute and severe pancreatitis. However, there is a substantial difference between mild and severe pancreatitis, with an elevatedlevels of RDW is noted in severe acute form of pancreatitis. This difference is much pronounced at 0 hr and 24 hrs than at 48 hrs.

The current study found a significant difference between mild and severe pancreatitis, with an elevated levels of NLR is observed in severe form of acute pancreatitis. This difference is much pronounced at 0 hr and 24 hrs than at 48 hrs. In acute pancreatitis, the increased NLR ratio when compared, than in the general population; a greater increase is seen in first 24 hours than in the first 48 hours.

During the study course, 21 patients (52.5 percent) had both RDW and an NLR is raised which is greater than 5. In this group, there was no mortality (0%) and three admissions to critical care (7.5 percent; RR 4.941; p 0.001). Although notsignificant statistically, the average length of stay in this study of patients was extended (11.1 v 7.9 days; p = 0.125).

Overall, there is no deathsin this study (mortality rate 0%), four ICU admissions (10%) and the mean duration of stay in hospital was 9.6 days. The three ICU admissions in our study occurred in Both RDW and NLR elevated.

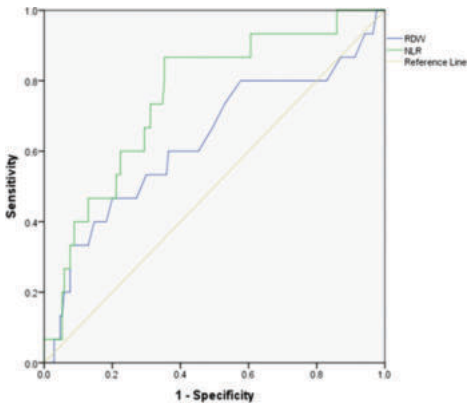

Figure 18. ROC curve for NLR & RDW levels to predict criticalcareadmission

DISCUSSION
A total of 40 male patients with a mean age of 43.025±8.7 years (range 18 to 59) were admitted, with 27.5 percent having severe acute pancreatitis and 72.5 percent having mild acute pancreatitis. In this study, alcohol was the most frequent cause of acute severe pancreatitis. RDW was above the upper limit of normal in 14 (35%) of the patients (ULN). In three cases, this was associated with a substantially increased likelihood of ICU admission. The average duration of stay in hospital for patients with RDW greater than 15.5 was 11.7 days,

compared to 7.4 days for patients with normal RDW.

On admission, 32 (80%) patients had an NLR greater than 5, which increase the risk of critical care admission (7.5 %, RR 8.137, p=0.01).

The average length of stay in hospital admission was significantly prolonged in these patients (10.5 v 8.5 days; p = 0.01).

There was an increased risk in 21 (52.5 %) of the cases that had both a raised RDW and a raised NLR. There was no mortality and three critical care admissions (7.5 %; RR 4.941; p< 0.001).

Although not statistically significant, the average length of stay in this study of patients was extended (11.1 v 7.9 days; p= 0.125).

There were no deaths and four ICU admissions (ten percent), and the average length of hospital stay was 9.6 days.

RDW had an AUC of 0.63 in anticipating the requirement for critical care admission, while NLR had an AUC of 0.755.

For admission in to critical care, the optimal cut off for RDW was 14.65 %, with a sensitivity of 46.7 % and a specificity of 80 %, while RDW of 15.5 % had a sensitivity of 33.3 % and a specificity of 89.4 %.

The optimal NLR cut off for ICU admission was 8.01, with a sensitivity of 86.7 % and a specificity of 64.7 %, while an NLR of 5 had a sensitivity of 93.3% and a specificity of 39.4%.

RDW and NLR can detectthe patients who are at a higher risk of developing severe acute pancreatitis at emergency.

CONCLUSION

The most frequent cause of acute severe pancreatitis in this study was alcohol.

Elevated RDW and NLR on admission are the independent predictors of the need for ICU or HDU admission.

Patients with acute pancreatitis who have both RDW and NLR elevated at the time of presentation have a higher risk of death.

An elevated NLR on admission predicts a prolonged length of stay in the hospital for patients with acute pancreatitis.

Intensive care, aggressive rehydration, appropriate use of antibiotics, nutritional support and delayed surgical intervention as much as possible at least till the third week of the illness, all this constitute the management of the patient in the first phase of the disease.

As RDW and NLR are easily obtained from routine investigations reported in complete blood count, and they does not need additional cost and economically feasible, especially in scare resource centres. They have an advantage over other prognostic scoring systems, which require 48 hours to calculate. The RDW and NLR values act as independent predictors of outcome, and helps in early assessment of outcomes and early interventions.

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