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RDW AS A PREDICTOR OF SEVERITY OF ACUTE PANCREATITIS

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Abstract:

Background and objective: *Acute pancreatitis is the acute reversible inflammation of pancreatic parenchyma ranging from mild inflammation with minimal local and systemic effects to severe necrosis of the pancreatic tissue and multi organ failure. Early assessment of severity and early prediction of the risk of morbidity and mortality is the key to proper and timely management. Over the last decade, Red Cell Indices especially Red Cell Distribution Width or RDW has emerged as a marker of acute inflammation and has been used as a predictor of mortality and morbidity in acute pancreatitis. This study was conducted to assess the predictive value of RDW in determining the severity of acute pancreatitis and also to assess its prognostic value in determining acute pancreatitis mortality, multi organ failure and ICU admission in Pakistani population.*

Methods and Material: *110 patients presenting to surgical ER of Holy Family Hospital Rawalpindi with acute pancreatitis (diagnosed on the basis of raised serum lipase) were retrospectively included in the study. CTSI or CRP levels were used as gold standard to assess severity of acute pancreatitis. RDW levels at admission were recorded for all patients. ROC curves were used to assess the predictive value of RDW in determining the severity, morbidity and mortality related to acute pancreatitis.*

Results: *A positive correlation was found between RDW levels and no. of days of ICU stay (r=0.230, p=0.019). On the ROC curve, RDW only weekly predicted the severity of acute pancreatitis with area under curve of 0.659. At a cut off value of 15.25, RDW predicted severe pancreatitis with a sensitivity of 71.4% and specificity of 56.8%. RDW is a better predictor of acute pancreatitis severity and mortality in men. At a cutoff score of 15.25 RDW predicted mortality with a sensitivity of 100% and specificity of 61.8%, with AUC of 0.735 on the ROC curve.*

Conclusion *is a reliable predictor of acute pancreatitis severity and mortality.*

Key Words*: Red cell indices, RDW, acute pancreatitis*

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INTRODUCTION:

Acute pancreatitis is the acute reversible inflammation of pancreatic parenchyma and is considered a surgical emergency. It presents a spectrum of severity ranging from mild inflammation with minimal local and systemic effects to severe necrosis of the pancreatic tissue and multi organ failure. The reported incidence of acute pancreatitis is between 4.6 and 100 cases per 100,000 population across Europe.[1] While exact incidence in Pakistan is unknown, it has been found that up to 33% patients present with severe pancreatitis, with a mortality rate of 13.3% and morbidity in up to 50% cases.[2,3] Early assessment of severity and early prediction of the risk of morbidity and mortality is the key to proper and timely management. Several scoring systems like Ranson, APACHE, BISAP, and Glasgow score have been designed to this effect. According to UK guidelines, CRP levels of >150, APACHE 2 score >8 and CTSI 8-10 correlates with severe acute pancreatitis.[4]

Over the last decade, Red Cell Indices especially Red Cell Distribution Width or RDW has emerged as a marker of acute inflammation. RDW is a routinely reported parameter in blood complete picture or CBC profile. Previously, it was used only in relation to anemias, but studies have shown it to be a promising factor used to assess the severity of a variety of acute conditions including stroke, autoimmune diseases, acute heart failure and infections. [5] Studies conducted in China and Iran show that at values of 14. 35 and 14.55 RDW could predict mortality in patients of acute pancreatitis with a sensitivity of 88.2% and 80% respectively. [6, 7] Similarly, it has been found that greater RDW values at admission are associated with higher rate of ICU admission. [8] However there are studies that suggest that RDW is not effective in predicting acute pancreatitis severity. [9]

Most commonly used prognostic scores for acute pancreatitis like Ranson, CRP and CTSI require special laboratory and radiological tests which are both time consuming and costly. Whereas RDW is an inexpensive, routinely reported baseline parameter tested in all patients admitted with acute pancreatitis. Also, very little to no literature is available from Pakistan. Therefore, we conducted this study to assess the predictive value of RDW in determining the severity of acute pancreatitis and also to assess its prognostic value in determining acute pancreatitis mortality, multi organ failure and ICU admission in Pakistani population.

METHODS AND MATERIAL:

This retrospective cohort study was carried out at Holy Family Hospital, Rawalpindi. A total of 110 patients who presented to the surgical ER with acute pancreatitis between January 2017 and June 2019 were retrospectively included in the study. Patients' files and hospital records were thoroughly examined and data about their demographics and laboratory investigations was collected using a pre designed questionnaire. At presentation all patients had baseline blood complete picture, LFTs, RFTs, serum amylase and lipase levels done (parameters used in the study were RDW, RDW to platelet ratio, and RDW to lymphocyte ratio). For all patients who were confirmed to have acute pancreatitis based on elevated serum lipase levels, contrast enhanced CT scan was done to assess the severity. CRP levels were used in patients who could not undergo a CT scan. The outcomes studied were in-hospital mortality, multi organ failure, no. of days of hospital stay and no. of days of ICU stay.

All data was analyzed using SPSS version 22. Receiver operator character curves were used to assess the prognostic value of red cell indices, using CT severity index or CRP levels as gold standard. ROC curves were also used to calculate the predictive value of RDW for MOF and mortality in acute pancreatitis. Pearson Product Correlation was used to assess correlation between RDW levels and length of hospital and ICU stay.

RESULTS:

Out of a total of 110 patients included in the study, 36 (32.7%) were males and 73 (66.4%) were females. The mean age of patients was 43.52 years, ranging from 12 to 80 years. Based on either CT severity index or CRP levels, 54 (49.1%) patients were found to have mild, 27 (24.5%) moderate and 28 (25.5%) severe pancreatitis. Mean length hospital stay of the patients was 11.63 days (SD +- 7.697). 5 patients (4.5%) had in hospital mortality, 12 (10.9%) developed multi organ failure and 37 (33.6%) patients required ICU admission.

A positive correlation was found between RDW levels and no. of days of ICU stay (r=0.230, p=0.019) with higher levels of RDW being associated with increased no. of days of ICU stay. Also a strong positive correlation was found between RDW to lymphocyte ratio and no. of days of hospital stay (r=0.267, p=0.013); and RDW to lymphocyte ratio to no. of days of ICU stay (r=0.255, p=0.009).

On the ROC curve, RDW only weekly predicted the severity of acute pancreatitis with area under curve of 0.659. At a cut off value of 15.25, RDW predicted severe pancreatitis (correlating with CTSI 8-10 or CRP>150) with a sensitivity of 71.4% and specificity of 56.8%). RDW was found to be a poor predictor of both mortality (AUC=0.556) and multi organ failure (AUC=0.603) in acute pancreatitis.
It was found that RDW was a better predictor of acute pancreatitis severity and mortality in men. At

a cutoff value of 15.25, RDW predicted severe pancreatitis with sensitivity of 69.2 % and specificity of 73.9% with an AUC of 0.716 on the ROC. Similarly, RDW predicted mortality in men with acute pancreatitis with an AUC of 0.735 on the ROC. At a cutoff score of 15.25 RDW predicted mortality with a sensitivity of 100% and specificity of 61.8%.

DISCUSSION:

Red cell distribution width is a parameter that measures the heterogenicity of erythrocyte size or volume. In ineffective erythropoisis, immature RBCs are released in the circulation, these immature erythocytes are larger than normal RBCs and hence increase RDW. The exact pathophysiology of raised RDW in acute pancreatitis is not known. It has been proposed that inflammation impairs bone marrow function, iron metabolism and erythropoisis and that RDW is marker of acute inflammation.[5]

We included patients in the study through consecutive sampling and it was no surprise that 73% of the patients were females, as the most common type of pancreatitis in Pakistan is biliary pancreatitis and chollithiasis is more comon in women.[10] 25.5% patients presented with severe acute pancreatitis. In hospital mortality was seen in 5 cases. 12 patients developed multi organ failure, out of whom 2 patients developed AKI, 7 ARDS and 2 had a significant cardiac event. RDW predicted severe pancreatitis at a cutoff value of 15.25 in 71.4% cases, with an AUC of 0.659 on ROC. This cutoff RDW value was considerably highter compared to other studies carried out in China and Iran where the cutoff was 14.35 and 14.55 respectively[6, 7] A strong positive correlation was found between RDW and length of ICU stay (r=0.230, p value =0.019. An interesting finding of the study was that RDW was a better predictor of mortality and severity of acute pancreatitis in men. At a cutoff value of 15.25, RDW predicted severe acute pancreatitis 69.2% and mortality with a sensitivity of 100% in men. Such a finding was not observed in previous studies conducted on this topic. A major weekness of our study is its retrospective design; this did not allow us to follow the patients after discharge and also limited our access to some hospital records. Also our study was limited to one center only and hence our findings cannot be generalized. Our study is unique as it is the first of its kind to be conducted in Rawalpindi and we hope that these finding would serve to inspire further research on the topic with a greater and demographically diverse sample population, and a better study design.

CONCLUSION:

RDW is a reliable predictor of acute pancreatitis severity and mortality.

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