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Research Article

### IN HOSPITAL MORTALITY DETERMINATION IN PANCREATITIS BY RED BLOOD CELL DISTRIBUTION WIDTH

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**Abstract:**

**Objective:** In recent years, great importance has been attached to the width of red blood cell distribution (RDW) when making clinical decisions as well as determining the severity of disease. This study was conducted to assess the baseline RDW level to predict in-hospital mortality from pancreatitis.

**Methods:** This was a descriptive analytical study conducted on 100 patients with acute pancreatitis in the emergency department of the District Headquarters hospital Rawalpindi for six months duration from October 2019 to March 2020. In this study, the baseline RDW level was taken from patients with acute pancreatitis presenting to the emergency department, and we observed them after the patients were admitted. The results of admission (mortality or discharge) of patients were also recorded, and we finally assessed the predictive value of the RDW in determining the patient outcomes in hospital.

**Results:** In our study, 47 patients were male and 53 patients were female. The average RDW in patients was  $13.82 \pm 1.69$ . Five patients died during the study. The mean RDW in deceased and other patients was  $16.44 \pm 4.22$  and  $13.68 \pm 1.37$ , respectively ( $p < 0.001$ ). A cut-off value of 14.55 for the RDW with a sensitivity of 80% and a specificity of 85% was determined to predict mortality in patients.

**Conclusion:** Based on the results of our studies, the baseline RDW level is an independent prediction of in-hospital mortality due to pancreatitis, but not the need for surgery or admission to an intensive care unit (ICU).

**Key words:** pancreatitis, mortality, prognosis

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**INTRODUCTION:**

Clinical signs of inflammatory pancreatic disease, also called acute pancreatitis, can only be accompanied by mild abdominal pain or low blood pressure due to serious illness, metabolic disorders, sepsis, third range, organ failure and shock<sup>1-2</sup>. This is one of the most common surgical emergencies. It is a seriously mild, self-limiting and sometimes fatal disease. The mortality rate of acute pancreatitis is variable and ranges from 3.8% to 40%<sup>3-4</sup>. Early diagnosis of pancreatitis and immediate initiation of treatment to reduce mortality is important<sup>5-6</sup>.

In recent years, it has been very careful to determine the breadth of red blood cell distribution (RDW) in clinical decisions and the severity of the disease<sup>3-4</sup>. The normal RDW reference value is between 12.8% and 1.2% if given in the CV, and 42.5-3.5 if reported in SD. Quantitative change in circulating red blood cells (RBC) is RDW. High RDW values show large differences in the size of circulating red blood cells and exhibit different pathological conditions<sup>5-6</sup>. Low RDW values statistically show greater uniformity of size in red blood cells, although not clinically relevant. However, when iron therapy begins and the body responds to treatment, the RDW increases the production of new normocytic cells until the end of treatment, and normal hematopoiesis begins, where the RDW returns to its normal range<sup>7-8</sup>. RDW increases in other hematopoietic diseases, such as megaloblastic anemia, but in thalassemia is normal<sup>9</sup>.

**METHODS:**

This descriptive-analytical study was performed on 100 patients with acute pancreatitis in the emergency department of District Headquarters hospital Rawalpindi for six months duration from October 2019 to March 2020. Inclusion criteria included all patients admitted to the emergency department with acute pancreatitis. We excluded patients with a positive history of anemia (iron, folate or vitamin B12 deficiency), patients with hemolytic anemia, patients with liver disease, and patients who did not consent to participate in the study (Fig. 1). We used sensitivity (48%) and specificity (96%) of RDW in predicting mortality, which was recorded in the study by Senol *et al*. To determine the sample size, taking into account 1% incidence of pancreatitis, 80% strength and 95% CI, we used Dr. Lin Naing (9). The sampling strategy was a convenient method to achieve the final sample size. This study examined all patients who were admitted to the emergency department and met the inclusion criteria. After admission, demographic data (including gender, age, symptoms and signs) of patients who complained of acute abdominal pain and were highly suspected

of pancreatitis (symptoms such as nausea, vomiting and epigastric tenderness) were recorded. Blood samples were then delivered to the laboratory for serum amylase and RDW determination. Serum amylase was measured with a photometer (Biotechnica BT-3000, Italy) and RDW was measured with micromachining technology (Automated Hematology Analyzer, Japan). Normal serum amylase and its unit of measure were up to 100 and IU / L, respectively; the normal level of the RDW and its units of measurement was 13.2 and percent, respectively. In order to confirm the diagnosis, we performed computed tomography of the abdomen and pelvis with oral and intravenous contrast (Siemens SOMATOM Emotion 6, Germany) for all patients. All CT scans were reported by a radiologist, a faculty member of this university. All patients with acute pancreatitis were admitted and the results such as mortality, frequency of complications and need for surgery were assessed. We also calculated the Acute Physiology and Chronic Health Evaluation (APACHE) II score. The obtained data was entered into SPSS 17.0 (SPSS Inc, Chicago). To describe the data, we used descriptive statistical analysis (frequency, percent, mean  $\pm$  SD). To compare quantitative data, we used the t-test and ROC (receiver characteristic curve), sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), Youden index (J) and cut-off point for RDW and APACHE II results to determine the need for surgery, ICU admission, admission-related complications and mortality.

**RESULTS:**

In this study, we evaluated 100 patients with acute pancreatitis. Of the patients, 47 were male and 53 were female. The mean  $\pm$  SD of all patients was 56.31  $\pm$  16.80 years. About 26 patients experienced gallstones. The mean duration of zero per os (NPO) in patients was 3.6  $\pm$  1.4 days. Mean  $\pm$  SD of hospitalization time was 6.47  $\pm$  2.48 days. During hospitalization, 14 patients required ICU admission, 5 patients died (due to postoperative complications, sepsis and acute tubular necrosis), 5 patients required surgery (due to necrotising pancreatitis or gallbladder stones), and 10 patients had complications on admission (intubation, sepsis and mortality). Table 1 presents vital signs and paraclinical symptoms of patients. Table 2 shows the mean ( $\pm$  SD) of RDW and APACHE II rates of patients based on ICU admission, surgery needs, admission complications, and mortality and comparison between groups. As shown in Table 2, there was a significant statistical difference between the RDW and APACHE II scores in patients with admission complications and in-hospital mortality. To predict admission complications in patients, we used the ROC curve to determine the RDW and APACHE II scores.

Figure 2A shows the predicted RDW value on ICU admission since the AUC was 0.81 for the RDW and 0.78 for the APACHE II score. Cut-off point of 13.95 for the RDW (sensitivity 80%, specificity 71%, Youden index 0.51, 0.73 PPV, 0.78 NPV, 2.75 LR + and 3.55 LR-) and 8.5 for the result APACHE II (sensitivity 90%, specificity 67%, 0.57 Youden Index, 0.74 PPV, 0.87 NPV, 2.72 LR +, and 6.7 LR-) was determined to predict admission complications in patients. Figure 2B shows the predictive value of the RDW and APACHE II

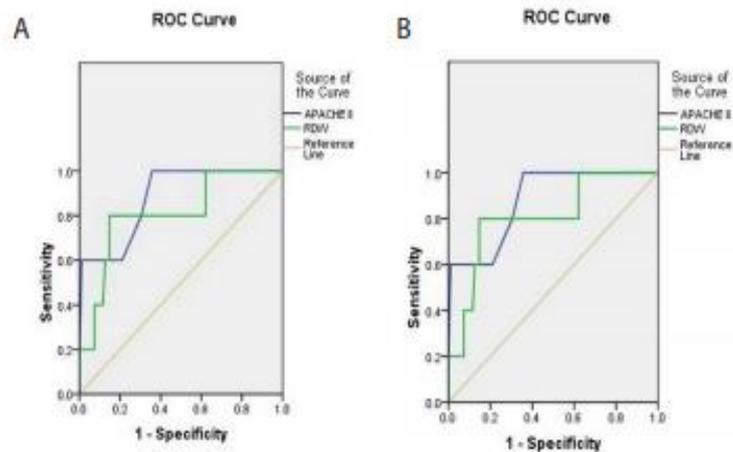
scores for mortality in patients with acute pancreatitis because the AUC was 0.81 for RDW and 0.88 for APACHE II scores. Cut-off point of 14.55 for the RDW (80% sensitivity, 85% specificity, 0.65 Youden index, 0.84 PPV, 0.81 NPV, 5.33 LR + and 4.25 LR-) and 9.5 for the result APACHE II (80% sensitivity, 69% specificity, 0.49 Youden index, 0.72 PPV, 0.77 NPV, 2.58 LR + and 3.45 LR-) was determined to predict mortality in patients

**Table 1.** Vital signs and paraclinical findings of the patients

Variables	Minimum	Maximum	Mean $\pm$ SD
Systolic blood pressure (mm Hg)	90	185	125.94 $\pm$ 16.57
Diastolic blood pressure (mm Hg)	60	100	76.31 $\pm$ 9.92
Heart rate, bpm	60	115	82.66 $\pm$ 9.32
Respiratory rate (per minute)	12	24	16.48 $\pm$ 1.77
RDW (%)	11.20	23.80	13.82 $\pm$ 1.69
APACHE II score	1	25	7.94 $\pm$ 3.69
BUN (mmol/L)	6.00	109.00	19.04 $\pm$ 12.94
Cr (mg/dL)	0.50	13.50	1.2030 $\pm$ 1.30
BS (mg/dL)	76.00	1299.00	156.27 $\pm$ 135.79
Amylase (IU/L)	57.00	6500.00	1417.28 $\pm$ 1357.41
ALT (IU/L)	8.00	1110.00	112.22 $\pm$ 151.88
AST (IU/L)	12.00	1211.00	89.65 $\pm$ 143.00
ALP (IU/L)	83.00	1586.00	351.33 $\pm$ 280.38
LDH (IU/L)	201.00	2553.00	509.63 $\pm$ 288.08
Ca <sup>++</sup> (meq/L)	0.10	10.80	8.68 $\pm$ 1.13
Total Bilirubin (mg/L)	0.20	24.00	2.52 $\pm$ 3.22
HCO <sub>3</sub> (mmol/L)	9.00	32.10	19.52 $\pm$ 5.16
PaCO <sub>2</sub> (mm Hg)	18.40	58.00	33.61 $\pm$ 9.13
pH	7.16	7.54	7.36 $\pm$ 0.08

**Table 2.** Mean ( $\pm$ SD) of RDW and APACHE II score of patients

Variables	Frequency	RDW ( <i>P</i> value)	APACHE II score ( <i>P</i> value)
Admission to ICU			
Yes	14	14.33 $\pm$ 1.26	9.28 $\pm$ 3.91
No	86	13.74 $\pm$ 1.75 (0.230)	7.72 $\pm$ 3.63 (0.142)
Need for surgery			
Yes	5	13.78 $\pm$ 9.33	8.80 $\pm$ 1.79
No	95	13.82 $\pm$ 1.73 (0.954)	7.89 $\pm$ 3.76 (0.596)
Admission complication			
Yes	10	15.61 $\pm$ 3.13	11.00 $\pm$ 2.94
No	90	13.62 $\pm$ 1.34 (<0.001)	7.60 $\pm$ 3.62 (0.005)
Mortality			
Yes	5	16.44 $\pm$ 4.22	15.20 $\pm$ 6.38
No	95	13.68 $\pm$ 1.37 (<0.001)	7.56 $\pm$ 3.11 (<0.001)



**Figure 2.** ROC for patients' RDW and APACHE II score based on predicting (A) admission complications and (B) mortality in patients .

### DISCUSSION:

Various results were used to determine mortality or complications in patients with pancreatitis, including APACHE II score, Ranson criteria and serum C-reactive protein (CRP) levels. These results, with the exception of CRP, are achieved by collecting multiple data in a time-consuming and complex computing process. Drw levels have recently been introduced to estimate mortality in patients with pancreatitis.

Acute pancreatitis is mostly self-limiting, accompanied by complications/outlets, and the mortality rate is less than 2%. However, almost 20% of attacks go towards acute and severe pancreatitis. The overall mortality rate for pancreatitis was 4-7%. Mortality in patients with acute pancreatitis is associated with multiorgan dysfunction syndrome (MODS) and septic complications. In recent years, fashion is the leading cause of death. In these patients, mortality occurs in 2 stages: the first week of systemic inflammatory response syndrome (SIRS) and MODS are accompanied by infections 1-3 weeks after MODS. There are many studies on mortality or frequency of complications in normal patients with heart disease, cancer, stroke, peripheral vascular disease, kidney disease, infection, respiratory and acute diseases, as well as taunting primary levels<sup>9-10</sup>. Most of these studies, which were conducted on survival studies, showed RDW as a determinant of patient mortality. In addition, DRW has been introduced as a determinant of complications such as myocardial infarction heart failure, although studies have not been able to predict the severity of cancer or stroke with DRW (20-24), but the RDW strongly predicts mortality in known stroke patients. The results of our study show that the DRW cutting point cannot be determined to estimate the need for surgery and the need for admission to intensive care, with 80% sensitivity and 85% specificity for the RDW,

14.55% of the cut point has been determined as mortality, and 85% of the cutting point is 80% sensitivity and 71% rdw-specific. In this study, although the RDW did not anticipate other results, significant results were obtained only to determine the mortality and acceptance complications of patients based on the initial RDW level<sup>11-12</sup>. In our study, only five patients died. In addition, our results showed that the RDW level is higher than in other patients who have been admitted to intensive care due to severe symptoms or die from exacerbation of the disease. This study is the second study conducted after Senol and his colleagues conducted a study showing the value of the primary RDW level in determining mortality in patients with acute pancreatitis<sup>13-15</sup>.

One limitation was that it was not possible to investigate all cases of emergency during sampling. In addition, there was no control group due to the descriptive design of the study.

### CONCLUSION:

This study showed that the initial RDW level is an independent factor for predicting in-hospital mortality in pancreatitis but not for determining the need for surgery or admission to the ICU. However, further studies should be performed on a larger sample size and in other medical centers.

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