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A Prospective Study To Evaluate Severity And Mortality In Acute Pancreatitis By Using Red Cell Distribution Width To Platelet Count Ratio (Rpr) As A Prognostic Marker

Dr. Shubham Bansal[1], Dr. Sumita A. Jain[2], Dr. Raj kumar[3], Dr. Manisha Solanki[4]

[1] *(Department of General Surgery, SMS Medical College, Jaipur, India)*
[2]*(Department of General Surgery, SMS Medical College, Jaipur, India)*
[3]*(Department of General Medicine, PGIMS, Rohtak, India)*
[4]*(Department of General Surgery, SMS Medical College, Jaipur, India)*

Abstract:
Background: *Acute pancreatitis (A.P.) is a state of disease where the pancreas becomes inflamed (swollen) over a short interval of time due to various multifactorial causes which are still under research. The pancreas is a retroperitoneal organ, located behind the stomach, with multiple important visceral structures by it's neighbourhood making it one of the most difficult organ to handle & treat during it's diseased states. Pancreas also harbours various digestive enzymes in their inactive forms that helps in digestion of food particles upon activation in a proper location. When these enzymes get activated in an abnormal location due to many reasons, they start digesting the structures that come in their contact. Acute Pancreatitis is a result of this abnormal activation of pancreatic enzymes that start destroying it's own pancreatic tissue. In order to diagnose & treat this dangerous condition as rapid as possible, we have come with a novel prognostic ratio known as RPR [Red cell distribution width (RDW) to Platelet count Ratio] which not only aids in diagnosing the condition rapidly but will also serve as a prognostic marker to assess the severity of disease based upon it's value obtained at the time of patient admission. From the results of a single CBC sample, we can easily calculate this ratio. In order to ensure it's efficacy, we have correlated this ratio with Modified Atlanta Classification which is currently the most accepted classification system of disease severity.*
Materials and Methods: *In this prospective hospital based observational study, we have randomly selected 102 patients of acute pancreatitis admitted in tertiary care hospital, starting from the day of their admission and followed up for 7 days using RPR ratio. Based on Revised Atlanta Classification System, we have categorised A.P. into mild and moderate /severe category and compared each category with the values of RPR ratio obtained in each patient for better correlation. Additionally we have taken into account age, sex, blood urea nitrogen (BUN) and duration of hospital stay of each patient and correlated them with RPR score in order to check it's efficiency.*
Result: *According to Revised Atlanta Classification, out of 102 patients of Acute Pancreatitis, 70 (68.6%) had mild form while remaining 32 (31.4%) had moderate/severe disease. When RDW, Platelet Count and RPR at different time intervals were compared against severity, it was statistically significant. At all times, RPR was statistically high in moderate/severe group.*
Conclusion: *RPR is a novel, significant prognostic marker that can precisely determine the severity of Acute Pancreatitis.*
Key Word: *Acute Pancreatitis, Red Cell Distribution Width, RPR, Revised Atlanta Classification, Prognostic marker, severity, Tertiary care hospital*

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I. Introduction

One of the most common gastrointestinal reasons for hospital admission is acute pancreatitis (AP), an acute inflammatory condition. In the United Kingdom, there are 150–420 instances of AP per million people, compared to 330–430 cases per million people in the United States.[1] Approximately 20% of individuals have a severe form, although the majority of patients have a moderate, self-limited disease.[2] Three stages make up AP. Enzymatic activation and cellular damage, which cause the first phase's symptoms, are present. A systemic

inflammatory response and an intrapancreatic inflammatory reaction take place in the second phase, which also involves pro-inflammatory and anti-inflammatory mediators. Complications from AP are discussed in the third phase.[1] Since 23% of fatalities attributed to AP occur in the first 3 days and 53% in the first week, early disease severity evaluation is crucial for estimating sequelae and even organ failure.3

To assess the disease's severity, a number of single- and multi-parameter predictors have been described. The Ranson, Glasgow, and APACHE II grading systems, among others, offer helpful hints for assessing the severity and mortality of AP. Several studies have employed specific biological indicators to predict death, including higher C-reactive protein, raised creatinine, high blood glucose, and haemoconcentration at admission.[4]

White blood cell, red blood cell, and platelet counts as well as their morphological indicators, including the red cell distribution width, are all part of the complete blood count, a laboratory test that is extensively used in clinical practise (RDW). Erythrocyte size variability is measured by RDW. Since it is frequently used to distinguish the causes of anaemia, the RDW has been demonstrated to be a helpful marker for celiac disease, colon cancer, and acute coronary syndromes.[5,6]

Red blood cell (RBC) volume divided by mean corpuscular volume (MCV) and multiplied by 100 to express the results as percentages yields red cell distribution width (RDW), a commonly used laboratory parameter that measures the extent of erythrocyte anisocytosis and takes into account the size variability of the circulating erythrocytes.[7] In cases when serum ferritin does not adequately reflect the total iron storage, RDW is a conventional diagnostic for ruling out iron deficiency anemia and contributes to the differential diagnosis of anaemia.[8] Recent research have revealed that RDW has been employed as a powerful and independent prognostic marker in various pathophysiological illnesses, including cancer, rheumatoid arthritis, lung diseases, cardiovascular diseases, and even rheumatoid arthritis.[9]

Additionally, the severity of the disease is correlated with the appearance of haemostatic problems in the acute phase of AP, which range from hypercoagulopathy to widespread intravascular coagulation.[10] In a recent research, Chen et al[11] employed the RDW to platelet ratio to forecast the phases of hepatic fibrosis in patients with chronic Hepatitis B. (RPR). These two measures can be determined quickly, therefore using them will lessen the need for liver biopsy in these individuals. We sought to assess the severity of patients with AP using the RPR ratio at the time of hospital admission since the RPR ratio represents the degree of inflammation.

II. Materials And Methods

Study area: Department of General Surgery, Gastroenterology, General Medicine, SMS Medical College and Hospital, Jaipur

Study design: Hospital based prospective observational study

Study period: After approval from institutional ethics committee to September 2022 or till desired sample size is reached whichever is earlier.

Study population – Patients admitted in wards of SMS Hospital Jaipur for Acute Pancreatitis after taking written informed consent.

Inclusion Criteria:
All the patients of Acute Pancreatitis admitted in SMS hospital after taking written informed consent**.**

Exclusion Criteria:
1. Colorectal cancers.
2. Anaemia at the time of admission.
3. Recent event of acute coronary syndromes (NSTEMI ; STEMI ; UNSTABLE ANGINA).
4. Chronic Liver Disease.
5. Leukemias/lymphomas.
6. Coagulation disorders.
7. Patients not giving consent.

Sample size and sample technique -

Sample size - 102 cases.

Sampling technique - Random selection of patient.

Justification of sample size

- Sample size was calculated 75 subjects at Alpha error 0.05 and power 78.3 % as per seed article predicting RPR ratio as a prognostic marker of severity in acute pancreatitis. In order to increase the efficacy of the study, 102 cases of Acute Pancreatitis were taken.
- Keeping in mind the given duration of the study and concerned patient flow in this setup, it was decided to recruit all available subjects sequentially till the sample size is reached.

Data Collection

A pre-designed proforma was used to collect the data among the study population.[Annexure V].

The study included patients of Acute Pancreatitis admitted in Department of General Surgery, General Medicine & Gastroenterology, SMS Medical college and Hospital, Jaipur who fulfilled selection criteria. RPR at the time of admission was assessed and also serial monitoring of RPR was assessed and a Mean RPR value was calculated for each patient of Acute Pancreatitis.

Procedure Methodology

- A prior informed consent from the participants was taken.
- Proper History & Clinical Examination for diagnosing Acute Pancreatitis.
- The investigations that were under taken are:

Blood investigations - Routine blood examination including –
Complete blood count, differential leucocyte count, PT INR.
Biochemistry - blood sugar, s.urea, S.Creatinine, S. Electrolytes, S.Billirubin, SGOT, SGPT, Alkaline phosphatase, S.Amylase ,S.Lipase, CRP levels.
Serial monitoring of RPR (RDW/PLT counts) ratio at time of admission and 24, 48 and 72 hrs after admission ; on 5th and 7th day.
Radiology Imaging- Chest X Ray , Ultrasonography W/A , CECT W/A .

Statistical Analysis

Statistical methods for analysis involved descriptive statistics such as mean, standard deviation and frequencies, and inferential statistics including correlation coefficient, independent sample t-test and Chi square test were used. The data was compiled in MS Excel, and other relevant softwares. The data was presented in table & graphs where ever applicable. Data was analyzed as per objectives. P value <0.05 was considered as significant. Inferences were drawn with the help of appropriate of significance.

Ethical Implication :

- Prior to commencement of the study, the research protocol was ethically reviewed.
- Approved by the Ethical Review Committee of S.M.S. Medical College & Hospital , Jaipur.
- Institutional clearance was obtained from the Principal & controller of S.M.S Medical College & Hospital , Jaipur
- Consent was taken from each patient after informing them the objectives of the study, the risks and benefits, confidential handling of personal information, the voluntary nature of participation and the rights to withdraw from study. Detailed study related information was read out and explained in printed hand-out.

III. Result

A total of 102 patients were evaluated.

Table 1- Age wise distribution of cases

Age group (Years)	Number	Percentage
26-35	22	21.6
36-45	62	60.8
46-56	18	17.6
Total	102	100.0

According to age wise distribution, there are 22 (21.6%) pts from 26-35 years, 62 (60.6%) pts from 36-45 years, 18 (17.6%) pts from 46-56 years.

Figure 1- Bar diagram of Age wise distribution of cases

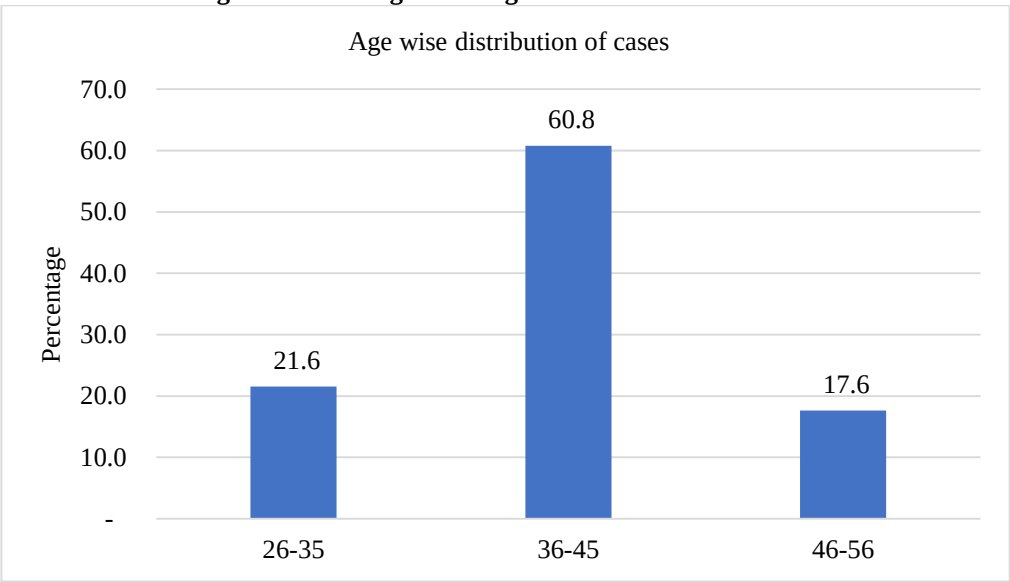

Table 2- Sex wise distribution of cases

Sex	Number	Percentage
Female	40	39.2
Male	62	60.8
Total	102	100.0

There are 40 (39.2%) females and 62 (60.8%) males.

Figure 2- Bar diagram of Sex wise distribution of cases

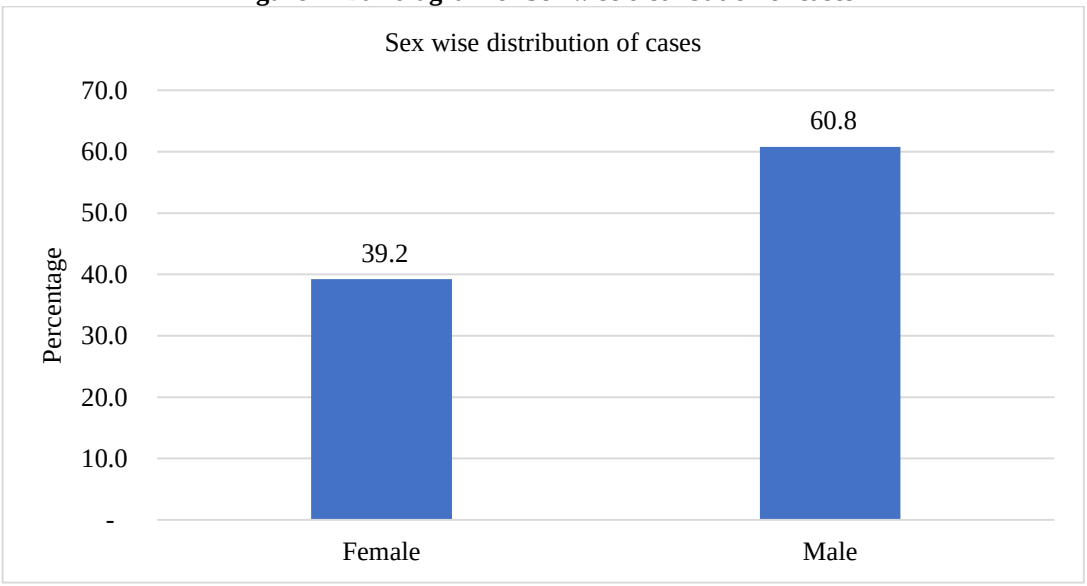

Table 3- Duration of hospital stay in days of cases

Duration of hospital stay (Days)	Number	Percentage
3-7 days	68	66.7
8-14 days	26	25.5
>14 days	8	7.8
Total	102	100.0

68 (66.7%) pts stayed for 3-7 days, 26 (25.5%) pts stayed for 8-14 days, 8 (7.8%) pts stayed for >8 days.

Figure 3- Bar diagram of Duration of hospital stay in days of cases

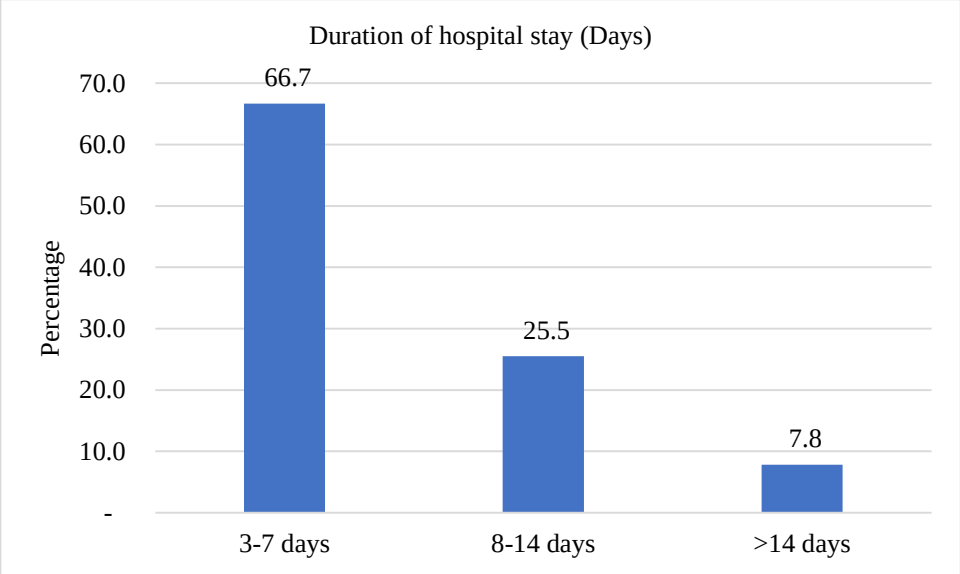

Table 4- Outcome of acute pancreatitis cases

Outcome	Number	Percentage
Dead	24	23.5
Discharge	78	76.5
Total	102	100.0

24 (23.5%) pts were dead, 78 (76.5%) pts were discharged.

Figure 4- Pie diagram of Outcome of acute pancreatitis cases

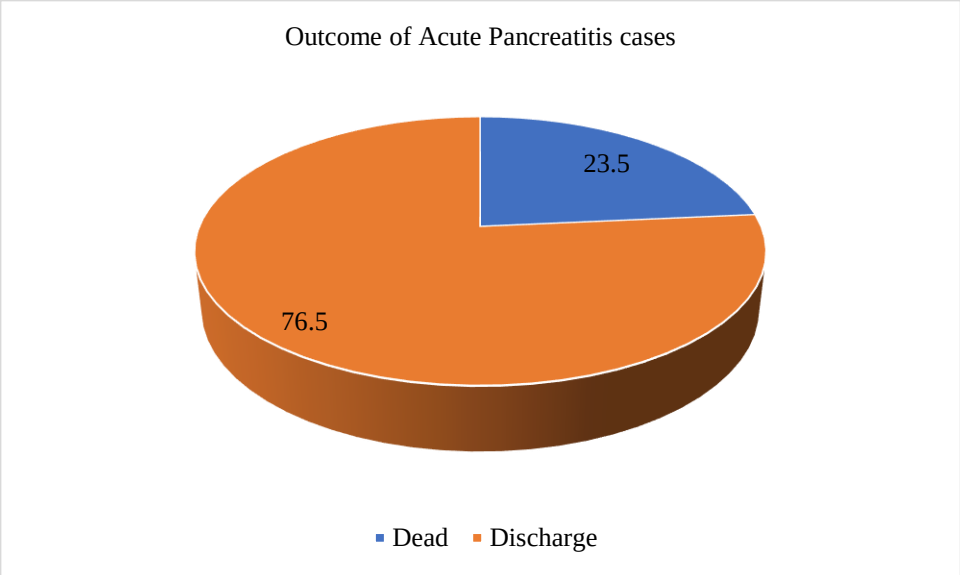

Table 5- Revised Atlanta classification in cases of Acute Pancreatitis

Revised Atlanta classification	Number	Percentage
Mild A.P.	70	68.6
Moderate /Severe A.P.	32	31.4
Total	102	100.0

According to Revised Atlanta classification, in cases of Acute Pancreatitis, 70 (68.6%) had mild A.P, 32 pts (31.4%) had moderate /severe A.P

Figure 5- Pie diagram of Revised Atlanta classification in cases of Acute Pancreatitis

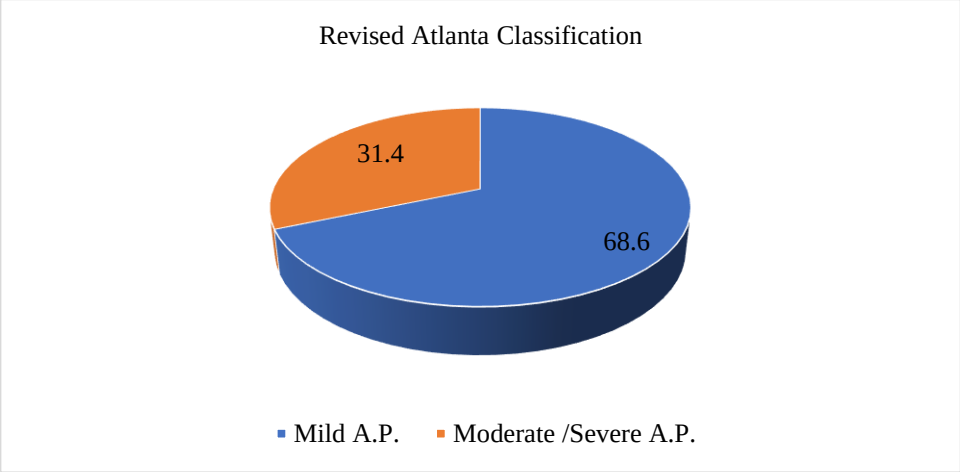

Table 6- Association of outcome with Revised Atlanta classification

Revised Atlanta classification	Outcome		Total
	Dead	Discharged	
Mild A.P.	0	70(100)	70(100)
Moderate /Severe A.P.	24(75)	8(25)	32(100)

X^2=90.930, Df=1, p value<0.001
There was statistically significant association with mortality more in severe pancreatitis as per revised atlanta classification.

Figure 6- Bar diagram of Association of outcome with Revised Atlanta classification

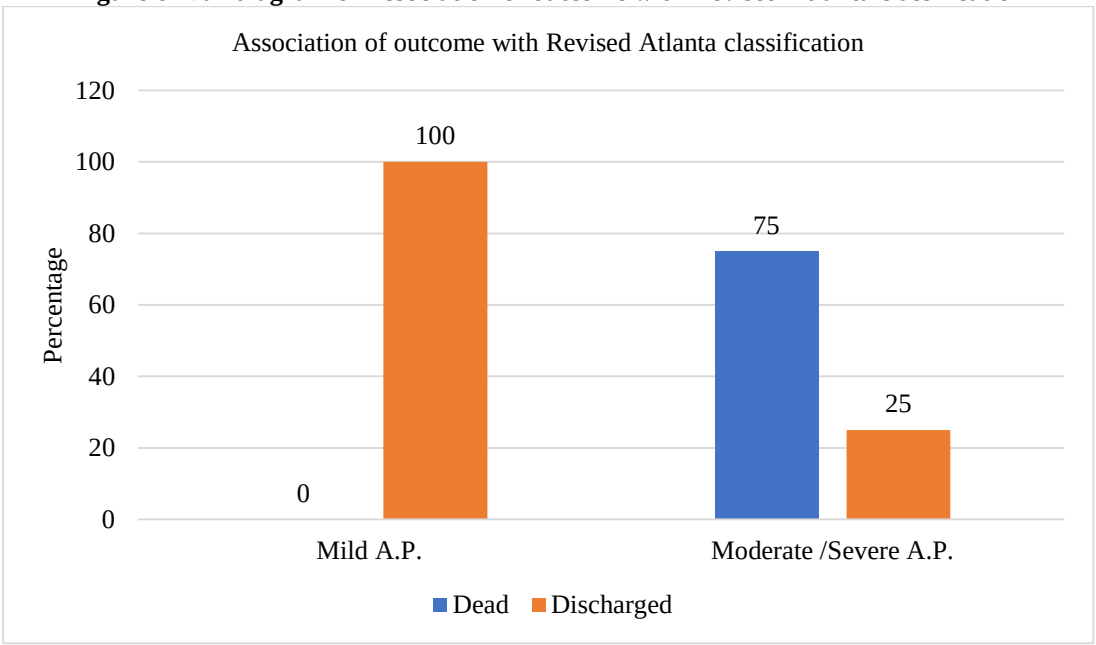

Table 7- Association of Revised Atlanta classification with sex of cases

Revised Atlanta classification	Sex	
	Female	Male
Mild A.P.	27(67.5)	43(69.4)
Moderate /Severe A.P.	13(32.5)	19(30.6)
Total	40(100)	62(100)

X^2=0.039, Df=1, p value=0.844
There was no statistically significant association between gender and severity of pancreatitis as per revised atlanta classification

Figure 7- Bar diagram of Association of Revised Atlanta classification with sex of cases

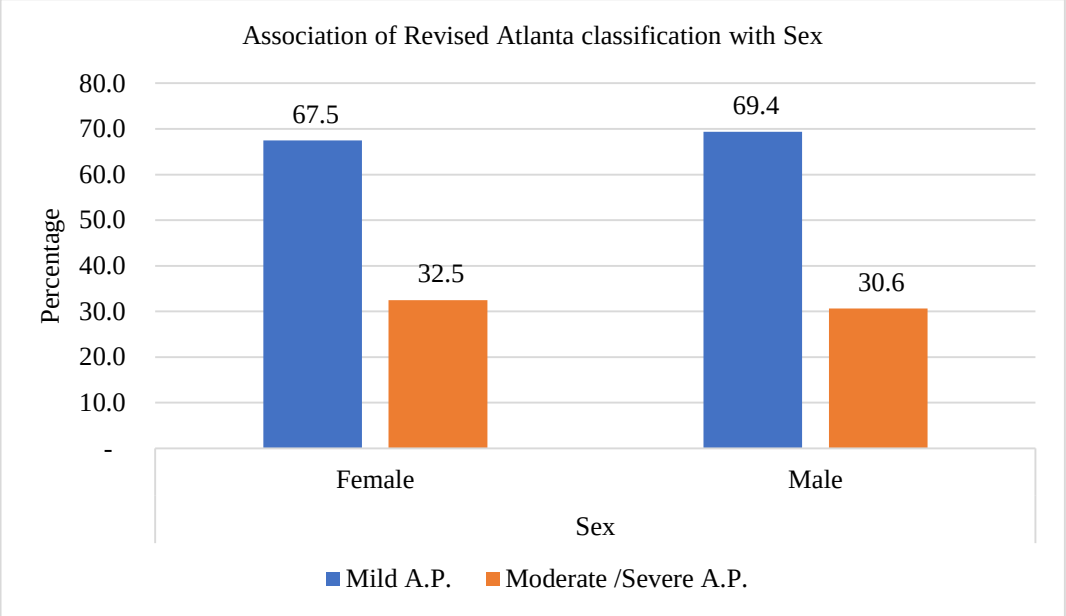

Table 8- Association of Revised Atlanta classification with age group of cases

Age group (Years)	Revised Atlanta classification		Total
	Mild A.P.	Moderate/Severe A.P.	
26-35	21(95.5)	1(4.5)	22(100)
36-45	42(67.7)	20(32.3)	62(100)
46-56	7(38.9)	11(61.1)	18(100)

X^2 = 14.770, Df= 2; p value<0.001

There was statistically significant association between age and severity of pancreatitis as per revised atlanta classification. As age increased, severity also increased.

Figure 8- Bar diagram of Association of Revised Atlanta classification with age group of cases

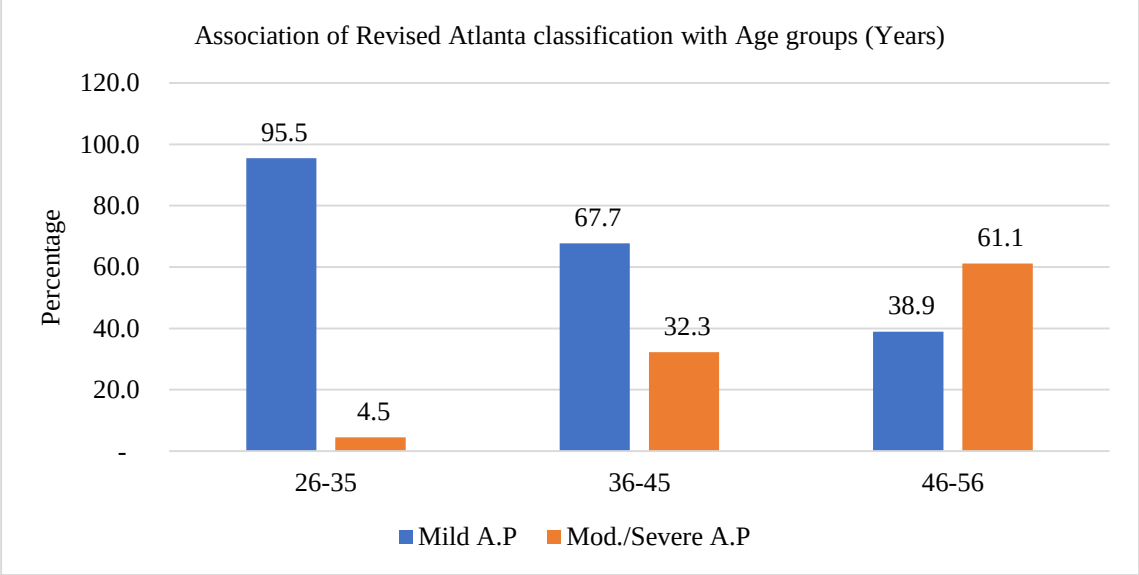

Table 9- Association of outcome with age group of cases

Age group (Years)	Outcome		Total
	Dead	Discharge	
26-35	1(4.5)	21(95.5)	22(100)
36-45	14(22.6)	48(77.4)	62(100)
46-56	9(50)	9(50)	18(100)

X^2 = 11.447, Df= 2; p value=0.003
There was statistically significant association between age and severity of pancreatitis as per revised atlanta classification. As age increased, outcome also worsened.

Figure 9- Bar diagram of Association of outcome with age group of cases

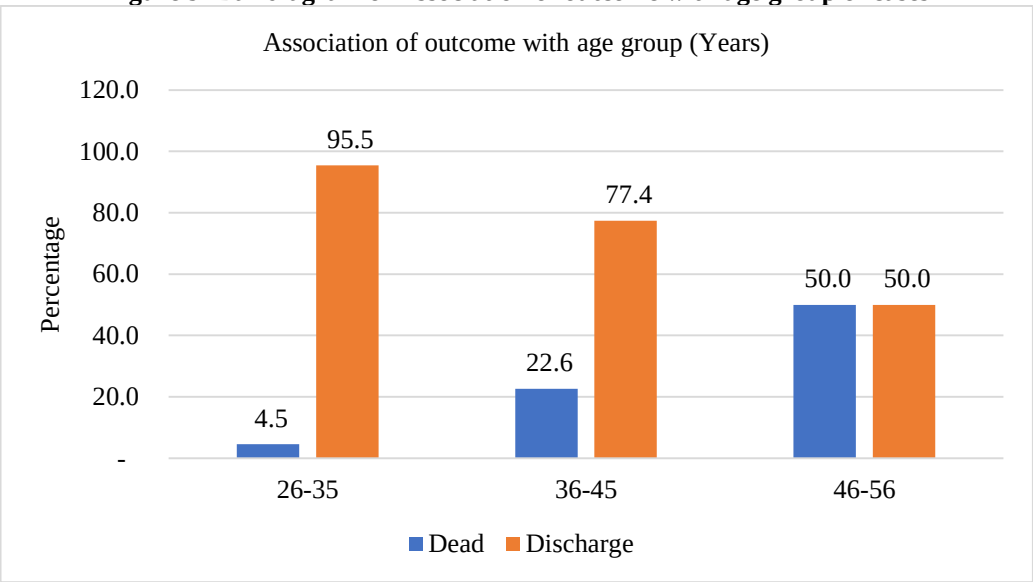

Table 10- Association of outcome with sex of cases

Sex	Outcome		Total
	Dead	Discharge	
Female	8(25)	32(75)	40(100)
Male	16(25.8)	46(74.2)	62(100)

Chi-square = 0.190 with 1 degree of freedom; p value= 0.663
There was no statistically significant association between gender and outcome as per revised atlanta classification.

Figure 10- Bar diagram of Association of outcome with sex of cases

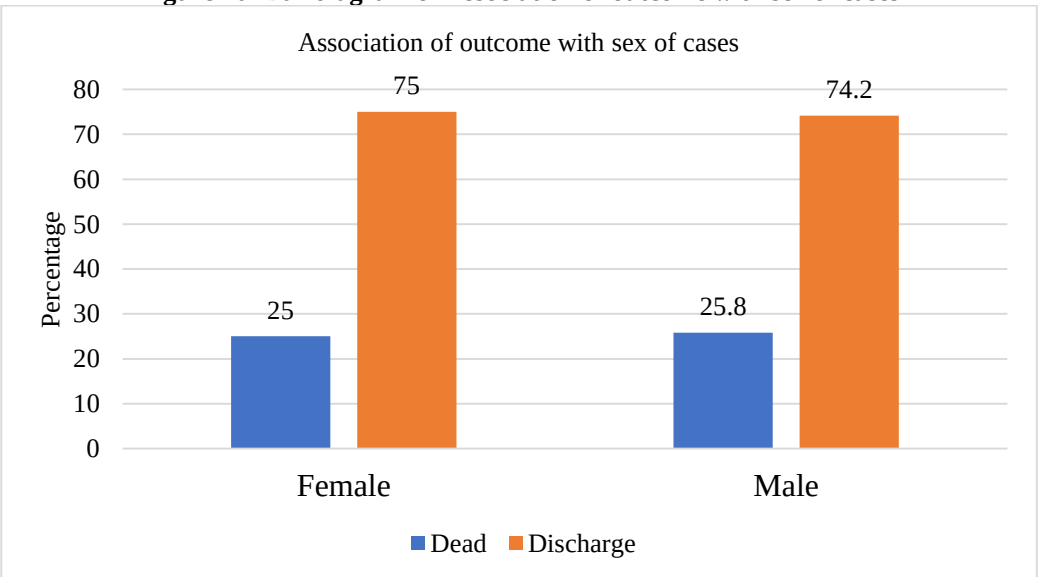

Table 11- Mean difference in RDW at different time intervals

RDW	Mild A.P.		Moderate/Severe A.P.		Test of significance
	Mean	SD	Mean	SD	
Day 1	18.86	1.76	31.63	6.23	t=15.893, DF=100, p value<0.001
Day 2	24.02	2.58	31.98	7.21	t=8.199, DF=100, p value<0.001
Day 3	23.61	2.28	33.18	6.27	t=11.284, DF=100, p value<0.001
Day 5	23.9	2.43	33.44	6.74	t=10.502, DF=100, p value<0.001
Day 7	24.27	2.6	33.36	7.3	t=8.860, DF=90, p value<0.001

When RDW at different time intervals was compared against severity, it was statistically significant. At all time intervals, RDW was high in moderate/severe group.

Figure 11- Bar diagram of Mean difference in RDW at different time intervals

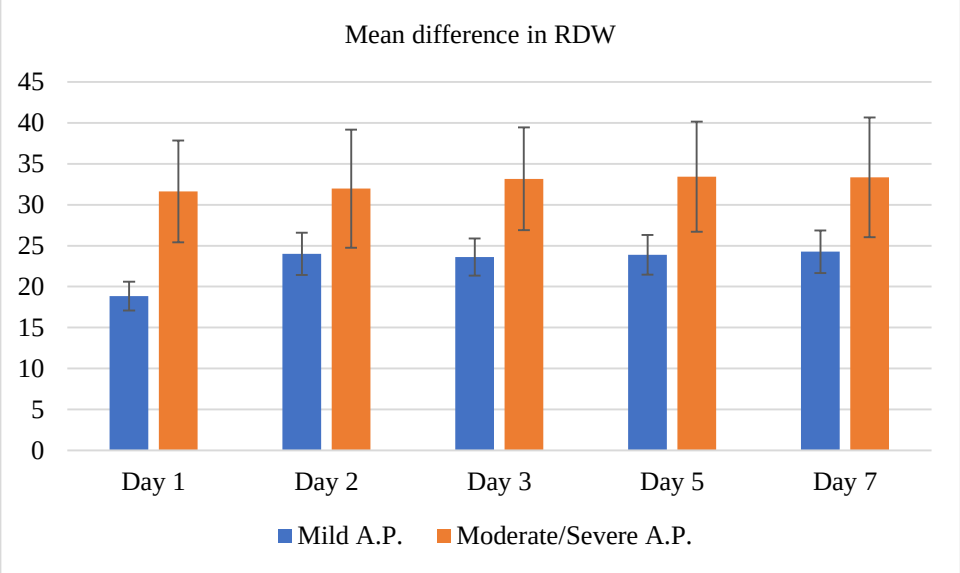

Table 12- Mean difference in RPR at different time intervals

RPR	Mild A.P.		Moderate/Severe A.P.		Test of significance
	Mean	SD	Mean	SD	
Day 1	0.0000427	0.0000035	0.0000798	0.0000095	t=28.710, DF=100, p value<0.001
Day 2	0.0000432	0.0000047	0.0000808	0.0000094	t=27.502, DF=100, p value<0.001
Day 3	0.0000431	0.0000045	0.0000826	0.0000097	t=28.211, DF=100, p value<0.001
Day 5	0.0000562	0.0000018	0.0000846	0.0000100	t=23.007, DF=100, p value<0.001
Day 7	0.0000586	0.0000022	0.0000787	0.0000072	t=6.091, DF=24, p value<0.001

When RPR at different time intervals was compared against severity, it was statistically significant. At all time intervals, RPR was high in moderate/severe group.

Figure 12- Bar diagram of Mean difference in RPR at different time intervals

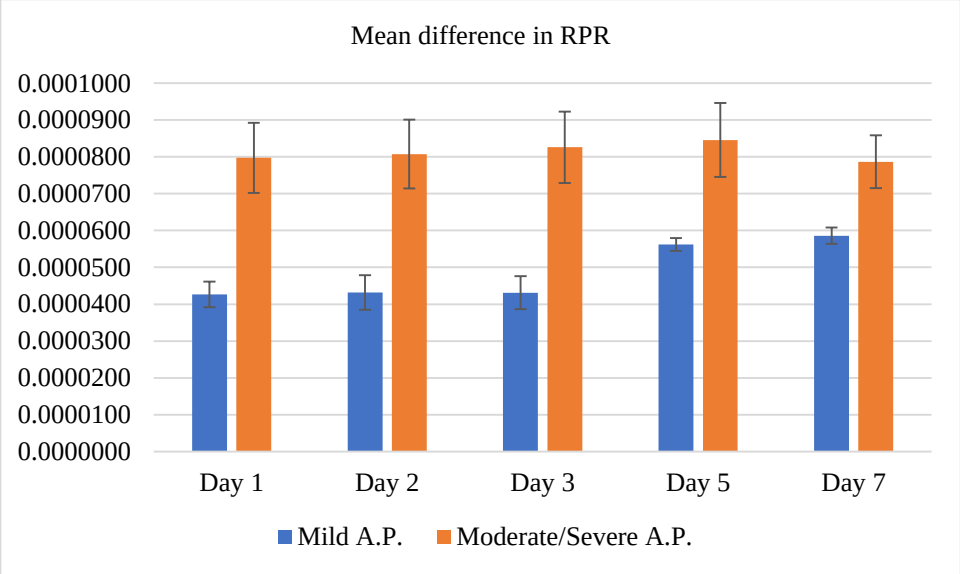

Table 13- Mean difference in platelet count at different time intervals

Platelet count	Mild A.P.		Moderate/Severe A.P.		Test of significance
	Mean	SD	Mean	SD	
Day 1	87,114.29	42,816.27	49,062.50	13,979.10	t=4.898, DF=100, p value<0.001
Day 2	75,114.29	28,320.39	47,937.50	11,771.86	t=5.215, DF=100, p value<0.001
Day 3	76,200.00	38,005.19	47,000.00	12,899.11	t=4.227, DF=100, p value<0.001
Day 5	74,971.43	26,920.69	47,156.25	13,882.25	t=5.509, DF=100, p value<0.001
Day 7	75,442.86	30,280.64	49,045.45	12,442.16	t=3.973, DF=90, p value<0.001

When platelet count at different time intervals was compared against severity, it was statistically significant. At all time intervals, platelet count was high in moderate/severe group.

Figure 13- Bar diagram of Mean difference in platelet count at different time intervals

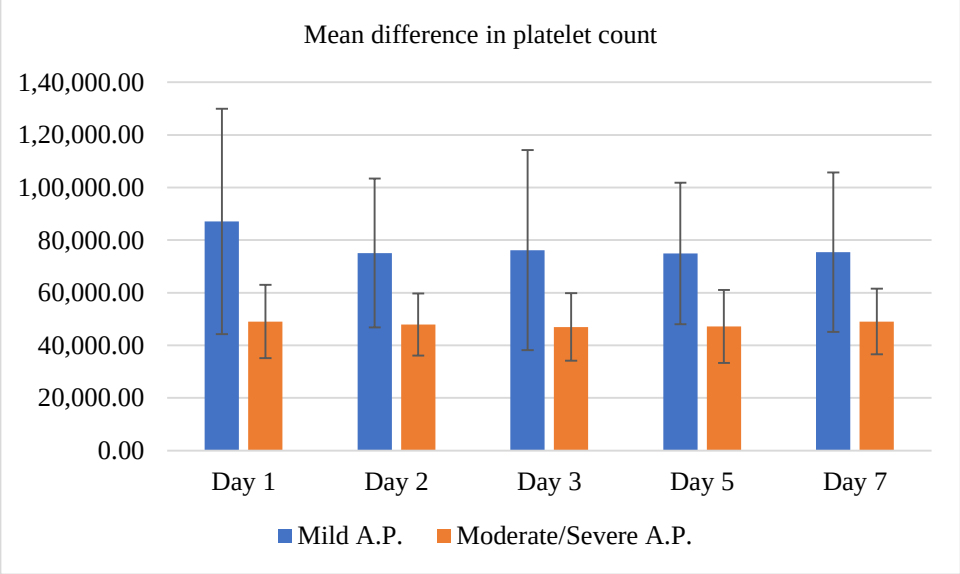

Table 14- Mean difference in BUN at different time intervals

BUN	Mild A.P.		Moderate/Severe A.P.		Test of significance
	Mean	SD	Mean	SD	
Day 1	49.93	1.95	85.5	6.42	t=0.892, DF=100, p value<0.001
Day 2	56.71	2.9	89.78	7.78	t=0.510, DF=100, p value<0.001
Day 3	54.94	2.75	91.09	8.69	t=3.377, DF=100, p value<0.001
Day 5	53.19	2.56	93.22	8.34	t=2.311, DF=100, p value<0.001
Day 7	53.23	2.65	96.91	8.14	t=2.958, DF=90, p value<0.001

When BUN at different time intervals was compared against severity, it was not statistically significant on days 1 and 2. But on days 3 to 5, it was statistically significant with elevated levels in moderate/severe cases as per revised Atlanta classification.

IV. Discussion

Although the majority of acute pancreatitis patients experience a moderate course of the illness, severe cases need further care due to their high morbidity and fatality rates. In cases of severe acute pancreatitis, the mortality rate may reach 80%.[14] Therefore, it is essential to diagnose and treat patients as soon as possible in order to maximize organ support and stop irreversible organ failure.

The severity of the disease can be determined using a number of straightforward predictors. In clinical practice, a number of grading systems, including Ranson, Glasgow, and APACHE II, are helpful. These rating scales are anticipated to offer insightful information while determining severity. The Ranson score, however, was shown to be insufficient to predict the severe form of disease with lower positive and negative predictive values by a meta-analysis of 110 studies.[15] Additionally, it has been claimed that SIRS, rather than the APACHE II scoring system, is more accurate at determining the severity of the disease at the time of admission.[16] In a study by Cetinkaya E et al[12], the Ranson criteria were used to compare the RPR's performance, and it was discovered that the RPR was more sensitive than this severity score. In our study, we assessed the severity of acute pancreatitis as per revised Atlanta classification and compared with RPR to know its prognostic implication.

In a different investigation, hemoconcentration brought on by fluid loss in a third space was identified as the only consistent predictor of AP severity. Patients with hemoconcentration should be monitored in an intensive care unit with a focus solely on aggressive fluid resuscitation. Patients who have a hematocrit level below 44%-47% on admission and who do not respond to resuscitation within 24 hours are at risk of developing necrotizing pancreatitis. Absence of hemoconcentration reflects a benign course of the disease because hemoconcentration typically indicates pancreatic necrosis.[17,18] Numerous other serum markers, including C-reactive protein, urinary trypsinogen activation peptide, procalcitonin, polymorphonuclear elastase, interleukins-1, 6, 8 and 10, antithrombin III (AT III), and platelet activating factor, have also been investigated to predict the severity of the disease.[19] In terms of clinical utility, each of these markers has some restrictions. C-reactive protein and procalcitonin, for instance, are non-specific and take longer to provide results. The specific marker of protease activation, urine trypsinogen activating peptide, cannot yet be tested.[13]

The pathophysiology of AP is heavily influenced by inflammatory mediators, which also affect hemostasis and cause coagulation disorders. These include disseminated intravascular coagulation and intravascular thrombosis. An early-stage mediator of inflammation, platelet activating factor stimulates the production of other cytokines and activates platelets, neutrophils, and mast cells. Reduced platelet count, fibrinogen, and AT III levels are caused by coagulopathy caused by tissue factor, another crucial component in the coagulation cascade.[20] Prothrombin and platelet counts declined in a study of 27 patients with acute pancreatitis.[21,22] Another study found that within the first week following hospitalisation, plasma prekallikrein, AT III, and platelet count all decreased.[19]

In several circumstances, including heart illness, strokes, infections, and peripheral artery disease, the RDW, a measure of erythrocyte size variability, has been described as a predictor of mortality.[23] The RDW was examined by Hu et al[23] in diverse hepatic conditions. The RDW was higher in patients and positively connected with bilirubin, creatinine levels, prothrombin time, and negatively correlated with platelet count and albumin level. The RDW was also raised in patients. The RDW was a more stable measure because red blood cells have a longer half-life than bilirubin and albumin.

Sepsis-related proinflammatory cytokines impair erythrocyte survival, damage cell membranes, retard maturation, and promote the release of larger and more numerous reticulocytes, which raises RDW. High levels of oxidative stress can also decrease erythrocyte survival and boost the discharge of big premature erythrocytes into the circulation. An RDW on the first day of septic shock was found to be substantially linked with mortality and morbidity, according to research by Sadaka et al.[24]

The RDW was elevated in various pathological situations, including acute pancreatitis, as was previously mentioned. Some of the inflammatory cytokines that contribute to pancreatitis' pathogenesis impact hemostasis and cause irregular coagulation. Chen et al investigated the RPR in a recent study to predict the phases of hepatic

fibrosis in people with chronic hepatitis B. They observed that this ratio supplied the maximum value of liver fibrosis, therefore they claimed that using such a straightforward and non-invasive procedure would eliminate the need for liver biopsy. A higher RDW level was shown to be an independent predictor of mortality in AP patients in research by Senol et al.[25] Based on this investigation, we evaluated whether RPR would be helpful in determining AP patient mortality. Then, when our patients were admitted to the hospital, we examined these parameters.

To lower the rates of morbidity and mortality, early illness severity assessment and therapeutic actions are crucial. An intensive care unit admission, oxygen delivery optimization, and maintenance of tissue perfusion are all required for severe AP. Early blood volume restoration is linked to better outcomes[26], therefore diligent monitoring of patients with AP increases survival. We discovered that the RPR could predict mortality in patients with AP, which is consistent with the connections indicated above. These two indices will enable us to determine the mortality rate of this condition. The CBC is a straightforward and affordable laboratory test that is frequently used in clinical practice.

In this investigation, we discovered that RPR could be a valuable and significant marker for predicting the mortality of patients with acute pancreatitis if it is used in clinical practice with the associated examinations.

Revised Atlanta Classification:

According to Revised Atlanta classification, in cases of Acute Pancreatitis, 70 (68.6%) had mild A.P, 32 pts (31.4%) had moderate /severe A.P. In a similar study by Barad JK et al[27], 31 patients were having mild form of acute pancreatitis (MILD AP Group), whereas 29 patients were having moderately severe or severe form of the disease (SEVERE AP Group).

Age:

According to age wise distribution, there are 22 (21.6%) pts from 26-35 years, 62 (60.6%) pts from 36-45 years, 18 (17.6%) pts from 46-56 years. There were statistically significant associations between age and severity of pancreatitis, age and outcome as per revised Atlanta classification. As age increased, severity also increased and outcome also worsened. Similarly, Wang D et al also observed a positive correlation with age. Few studies found contrasting results. Yalçın MS et al observed that mean age was 56.25 ±18.3 years (52.66 ±14.4 in males; 59.84 ±20.2 in females) and it was not statistically significant. In a study by Barad JK et al[27], mean age was 38.86 (range 15 to 72). Association of age was found to be nonsignificant with the disease outcome.

A few theories have been put up to explain the origin of the severity of AP in elderly people. Aging humans exhibit a pre-existing proinflammatory state that triggers innate immunity and upregulates the adrenergic autonomic nervous system. It has been shown that older patients with infection produce more cytokines (interleukin-6, interleukin-8, and tumor necrosis factor) than younger patients. These results lend credence to the idea that ageing weakens the immune system and increases inflammation.[33] On the other hand, greater AP severity in the elderly population has been linked to decreased production of innate pancreatic proteins with protective effects. Local difficulties could result from this, which would be exacerbated by multiorgan failure made possible by the proinflammatory state. Finally, gut barrier degradation in the elderly may result in an increase in bacterial translocation. This could prolong multiorgan failure and the inflammatory response throughout the body. Along with intestinal overexpression of COX2, which in turn raises intestinal permeability, elderly also have lower expression of genes that promote the development of intestinal intercellular junction proteins including occludin, zonula occluden-1, and junctional adhesion molecule-A.[34]

Sex:

There are 40 (39.2%) females and 62 (60.8%) males. There was no statistically significant associations between gender and severity of pancreatitis, gender and outcome as per revised Atlanta classification. In a similar study by Cetinkaya E et al[12], there were 43 males and 59 females. In a study by Barad JK et al[27], there were 31 males and 39 females. Gravito-Soares M et al found most males (58.2% vs 51.6%; $p = 0.228$). Yalçın MS et al observed that 80 patients (44%) were male and 100 patients were female. In general, men are more likely than women to get acute pancreatitis brought on by alcohol, while women are more likely to develop biliary pancreatitis.

Duration of hospital stay:

68 (66.7%) pts stayed for 3-7 days, 26 (25.5%) pts stayed for 8-14 days, 8 (7.8%) pts stayed for >8 days. In a similar study by Cetinkaya E et al[12], it was not statistically significant.

Outcome:

24 (23.5%) pts were dead, 78 (76.5%) pts were discharged. There was statistically significant association with mortality more in severe pancreatitis as per revised Atlanta classification. In a study by Barad JK et al[27], a total of 49 patients were cured of the disease and discharged and 11 patients died of the disease. There was

statistically significant association with mortality more in severe pancreatitis. Gravito-Soares M et al observed that the mortality rate was 8.8% (16/182) of all cases associated with severe AP (17.6%; 16/91). In Zhang FX et al study, 22 survived (survival group) and 20 died (non-survival group).

RDW:

When RDW at different time intervals was compared against severity, it was statistically significant. At all-time intervals, RDW was high in moderate/severe group. In a similar study by Cetinkaya E et al[12], it was statistically significant. Senol K et al. found that an elevated RDW level upon admission is an independent predictor of mortality in individuals with acute pancreatitis in a research involving 102 patients.[25] Similar results were also attained in 2013 by Balta S. et al. They discovered that 14.35 was the best cut-off value to predict death (sensitivity: 88.2%; specificity: 91.8%). In another near similar study by Takeuchi et al[31], RDW cut-off was taken as 13.7 and found that 83 (28%) had severe disease with bad prognosis. According to studies by Wang D et al and Yao J et al, patients with AP who had the highest RDW had the lowest Ca, total protein, albumin, hemoglobin and white blood cell count, but high mortality rates. Goyal H et al found that high admission RDW can be used as a biomarker to identify the AP patients who are at high risk of mortality. According to Gravito-Soares M et al, RDW is a straightforward routine parameter that is available at admission. They demonstrated that, in comparison to traditional prognostic scoring methods, RDW0h > 13.0 and RDW0h-to-total serum calcium ratio > 1.4 were excellent predictors of severity, while RDW0h > 14.0 and RDW0h-to-total serum calcium ratio > 1.7 were extremely good predictors of death. As per Zhang FX et al study, RDW was higher in the non-surviving patients than in the surviving patients. Additionally, they reported that RDW has superior predictive value compared to the APACHE II and SOFA scores. Zhang T et al discovered that the ICU admission ratio was noticeably higher in AP with RDW 13.55%. They came to the conclusion that RDW is likely a valuable prognostic measure of AP severity and that it is favorably associated with AP severity. Other studies by Karabulut KU et al, Ganji A et al, Kolber W et al, Rezan TK et al, Kilic MO et al and Yalcin MS et al also established statistical significance of RDW in assessing the severity and prognosis of acute pancreatitis. Contrastingly, Ylmaz EM et colleagues found that RDW was not a particular measure for predicting prognosis in AP, instead they suggested that the CRP/albumin ratio is a simple, affordable, and reliable marker.

RPR:

When RPR at different time intervals was compared against severity, it was statistically significant. At all-time intervals, RPR was high in moderate/severe group. In a similar study by Cetinkaya E et al[12], it was statistically significant. In a study by Barad JK et al[27], the mean RPR value in mild acute pancreatitis group was 0.038 as compared to 0.068 in the severe acute pancreatitis group. In ROC curve analysis, it was found that at a cut of value of 0.045 RPR has a sensitivity of around 90% and specificity of around 73% in predicting the severity of the disease. A high RPR value was found to be significantly associated with a negative outcome. In another near similar study by Takeuchi et al[31], RPR cut-off was taken as 0.71 and found that 74 (25%) had severe disease with bad prognosis. As per another study by Ge X et al[32], RPR is higher in non-survivors than in survivors (p 0.001). With an area under receiver-operating characteristic curve (AUC) of 0.7367, which was higher than that of other scales (AUC = 0.6022), it showed a moderately strong predictive performance for mortality. It was discovered that the Harrell's C-index was 0.8523, indicating an increased prognostic value based on RPR. The connection between RPR and result was further supported by the in vivo tests. It showed that the development of inflammation is what causes the continual change in RPR post-injury, which stressed the need of limiting inflammatory response in therapeutic treatment. RPR as a whole is a promising readily accessible predictor of mortality. The nomogram that results from it can be applied in settings with low resources, making it a suggestion as a prognosis evaluation tool for acute pancreatitis at all levels of the healthcare system.

Platelet count:

When platelet count at different time intervals was compared against severity, it was statistically significant. At all time intervals, platelet count was high in moderate/severe group. In a similar study by Cetinkaya E et al[12], it was statistically significant. Numerous investigations have demonstrated that acute pancreatitis' aetiology involves platelet activation.[28] In 24 people with acute pancreatitis, Akbal E et al evaluated various platelet properties.[29] The progression, thrombocyte counts, hemoglobin, and mean platelet volume were all found to be negatively correlated (MPV). Disseminated Intravascular Coagulation (DIC) markers were linked to the prognosis of acute pancreatitis, according to Maeda K et al.[30]

BUN:

When BUN at different time intervals was compared against severity, it was statistically significant on days 1, 2, 3, 5 & 7 with elevated levels in moderate/severe cases as per revised Atlanta classification. In a similar study by Cetinkaya E et al[12], BUN was significant. Some biological indicators might be utilized to detect organ

dysfunction sooner. Serial BUN readings of AP patients on admission, at 24 and 48 hours, and at 72 hours were found to be more accurate predictors of in-hospital mortality than serial hemoglobin/hematocrit tests in a large observational cohort research.[13] Those investigators also noted that a single precise prognostic measure that was strongly correlated with the probability of mortality was the degree of BUN increase.

Complete blood counts are routinely performed on all patients admitted indoors, so if a variable from complete blood counts, such as RPR, can predict the severity of the disease in acute pancreatitis early on, it will be very helpful for us to determine which patients need more in-depth examinations or special care, and we can allocate our resources accordingly. We were able to confirm from this investigation that RPR is a reliable indicator of illness severity in people with acute pancreatitis.

V. Conclusion:

- This study was conducted to correlate the RPR ratio with Revised Atlanta classification of Acute Pancreatitis to assess it's significance as a prognostic marker in disease severity.
- According to Revised Atlanta classification, in cases of Acute Pancreatitis, 70 (68.6%) had mild A.P, 32 pts (31.4%) had moderate /severe A.P.
- According to age wise distribution, there are 22 (21.6%) pts from 26-35 years, 62 (60.6%) pts from 36-45 years, 18 (17.6%) pts from 46-56 years. There was statistically significant association between age and severity of pancreatitis as per revised atlanta classification. As age increased, severity also increased.
- There are 40 (39.2%) females and 62 (60.8%) males. There was no statistically significant association between gender and severity of pancreatitis as per revised atlanta classification.
- 68 (66.7%) pts stayed for 3-7 days, 26 (25.5%) pts stayed for 8-14 days, 8 (7.8%) pts stayed for >8 days.
- 24 (23.5%) pts were dead, 78 (76.5%) pts were discharged. There was statistically significant association with mortality more in severe pancreatitis as per revised atlanta classification.
- When RDW, platelet count and RPR at different time intervals was compared against severity, it was statistically significant. At all time intervals, RDW was high in moderate/severe group.
- When BUN at different time intervals was compared against severity, it was not statistically significant. At all time intervals, BUN was almost similar in both groups.
- Complete blood counts are done on all patients who are admitted to the hospital. If a variable from complete blood counts, like RPR, can predict the severity of acute pancreatitis early on, it will be very helpful for us to figure out which patients need more in-depth exams or special care, and we can use our resources in the best way possible. From this investigation, we were able to confirm that RPR is a reliable way to tell how sick someone is with acute pancreatitis.

References:

[1]. Stevenson K, Carter CR. Acute pancreatitis. Surgery. 2013;31:295–303
[2]. Al Mofleh IA. Severe acute pancreatitis: pathogenetic aspects and prognostic factors. World J Gastroenterol. 2008;14:675–684.
[3]. Isenmann R, Rau B, Beger HG. Early severe acute pancreatitis: characteristics of a new subgroup. Pancreas. 2001;22:274–278.
[4]. Pitchumoni CS, Patel NM, Shah P. Factors influencing mortality in acute pancreatitis: can we alter them? J Clin Gastroenterol. 2005;39:798–814
[5]. Lippi G, Filippozzi L, Montagnana M, Salvagno GL, Franchini M, Guidi GC, Targher G. Clinical usefulness of measuring red blood cell distribution width on admission in patients with acute coronary syndromes. Clin Chem Lab Med. 2009;47:353–357.
[6]. Spell DW, Jones DV, Harper WF, David Bessman J. The value of a complete blood count in predicting cancer of the colon. Cancer Detect Prev. 2004;28:37–42.
[7]. England JM, Down MC. Red-cell-volume distribution curves and the measurement of anisocytosis. Lancet 1974;1:701–3.
[8]. Demir A, Yarali N, Fisgin T, et al. Most reliable indices in differentiation between thalassemia trait and iron deficiency anemia. Pediatr Int 2002;44:612–16.
[9]. Makhoul BF, Khourieh A, Kaplan M, et al. Relation between changes in red cell distribution width and clinical outcomes in acute decompensated heart failure. Int J Cardiol 2013;167:1412–16
[10]. Kakafika A, Papadopoulos V, Mimidis K, Mikhailidis DP. Coagulation, platelets, and acute pancreatitis. Pancreas. 2007;34:15–20.
[11]. Chen B, Ye B, Zhang J, Ying L, Chen Y. RDW to platelet ratio: a novel noninvasive index for predicting hepatic fibrosis and cirrhosis in chronic hepatitis B. PLoS One. 2013;8:e68780.
[12]. Çetinkaya E, Şenol K, Saylam B, Tez M. Red cell distribution width to platelet ratio: new and promising prognostic marker in acute pancreatitis. World Journal of Gastroenterology: WJG. 2014 Oct 10;20(39):14450.
[13]. Wu BU, Bakker OJ, Papachristou GI, Besselink MG, Repas K, van Santvoort HC, Muddana V, Singh VK, Whitcomb DC, Gooszen HG, Banks PA. Blood urea nitrogen in the early assessment of acute pancreatitis: an international validation study. Archives of internal medicine. 2011 Apr 11;171(7):669-76.
[14]. Pitchumoni CS, Patel NM, Shah P. Factors influencing mortality in acute pancreatitis: can we alter them?. Journal of clinical gastroenterology. 2005 Oct 1;39(9):798-814.
[15]. De Bernardinis M, Violi V, Roncoroni L, Boselli AS, Giunta A, Peracchia A. Discriminant power and information content of Ranson's prognostic signs in acute pancreatitis: a metaanalytic study. Crit Care Med 1999; 27: 2272-2283
[16]. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Mortele KJ, Banks PA. Early systemic inflammatory response syndrome is associated with severe acute pancreatitis. Clin Gastroenterol Hepatol 2009; 7: 1247-1251
[17]. Baillargeon JD, Orav J, Ramagopal V, Tenner SM, Banks PA. Hemoconcentration as an early risk factor for necrotizing pancreatitis. Am J Gastroenterol 1998; 93: 2130-2134

[18]. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas 2000; 20: 367-372
[19]. Lee WS, Huang JF, Chuang WL. Outcome assessment in acute pancreatitis patients. Kaohsiung J Med Sci 2013; 29: 469-477
[20]. Kakafika A, Papadopoulos V, Mimidis K, Mikhailidis DP. Coagulation, platelets, and acute pancreatitis. Pancreas 2007; 34: 15-20
[21]. Lasson A, Ohlsson K. Consumptive coagulopathy, fibrinolysis and protease-antiprotease interactions during acute human pancreatitis. Thromb Res 1986; 41: 167-183
[22]. Aasen AO, Kierulf P, Ruud TE, Godal HC, Aune S. Studies on pathological plasma proteolysis in patients with acute pancreatitis. A preliminary report. Acta Chir Scand Suppl 1982; 509: 83-87
[23]. Hu Z, Sun Y, Wang Q, Han Z, Huang Y, Liu X, Ding C, Hu C, Qin Q, Deng A. Red blood cell distribution width is a potential prognostic index for liver disease. Clin Chem Lab Med 2013; 51: 1403-1408
[24]. Sadaka F, O'Brien J, Prakash S. Red cell distribution width and outcome in patients with septic shock. J Intensive Care Med 2013; 28: 307-313
[25]. Şenol K, Saylam B, Kocaay F, Tez M. Red cell distribution width as a predictor of mortality in acute pancreatitis. Am J Emerg Med 2013; 31: 687-689
[26]. Gardner TB, Vege SS, Chari ST, Petersen BT, Topazian MD, Clain JE, Pearson RK, Levy MJ, Sarr MG. Faster rate of initial fluid resuscitation in severe acute pancreatitis diminishes in-hospital mortality. Pancreatology 2009; 9: 770-776
[27]. BARAD JK, DEBATA D, NATH VG, SAHOO A, DEBATA PK, KAR PK, DASH JR, DASH B. RPR (Red Cell Distribution Width to Platelet Ratio): As a Prognostic Marker in Acute Pancreatitis. Journal of Clinical & Diagnostic Research. 2019 Jun 1;13(6).
[28]. Osada J, Wereszczynska-Siemiatkowska U, Dabrowski A, Dabrowska MI, Platelet activation in acute pancreatitis Pancreas 2012 41(8):1319-24
[29]. Akbal E, Demirci S, Koçak E, Köklü S, Başar O, Tuna Y, Alterations of platelet function and coagulation parameters during acute pancreatitis Blood Coagulation Fibrinolysis 2013 24(3):243-46
[30]. Maeda K, Hirota M, Ichihara A, Ohmuraya M, Hashimoto D, Sugita H, Applicability of disseminated intravascular coagulation parameters in the assessment of the severity of acute pancreatitis Pancreas 2006 32(1):87-92
[31]. Takeuchi H, Abe M, Takumi Y, Hashimoto T, Miyawaki M, Okamoto T, Sugio K. Elevated red cell distribution width to platelet count ratio predicts poor prognosis in patients with breast cancer. Scientific reports. 2019 Feb 28;9(1):1-7.
[32]. Ge X, Zhu L, Li W, Sun J, Chen F, Li Y, Lei P, Zhang J. Red cell distribution width to platelet count ratio: a promising routinely available indicator of mortality for acute traumatic brain injury. Journal of Neurotrauma. 2022 Jan 1;39(1-2):159-71.
[33]. Kudoh A, Katagai H, Takazawa T, Matsuki A. Plasma proinflammatory cytokine response to surgical stress in elderly patients. Cytokine. 2001 Sep 1;15(5):270-3.
[34]. Baeza-Zapata AA, García-Compeán D, Jaquez-Quintana JO, Scharrer-Cabello SI, Del Cueto-Aguilera ÁN, Maldonado-Garza HJ. Acute pancreatitis in elderly patients. Gastroenterology. 2021 Dec 1;161(6):1736-40.

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