The comparison of apache ii scores with neutrophil lymphocyte ratio and red cell distribution width for the prediction of prognosis of patients with acute pancreatitis.

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Abstract

Objective: **Acute pancreatitis is an inflammatory process of pancreatic tissue. Its severity can range from mild inflammation to severe, progressive pancreatic necrosis, and it can lead to multiorgan failure that may have a mortality rate as high as 20% to 30%.**

Materials and Methods: **The aim of this study was to compare the efficacy of acute physiology and chronic health evacuation II (APACHE II) scoring system with neutrophil lymphocyte ratio (NLR) and Red blood cell distribution width (RDW) level in predicting prognosis of patients with acute pancreatitis. Healthy subjects were included as the control group. According to the Atlanta classification system, patients having an APACHE II score of less than 8 were classified as the mild pancreatitis group, and those with an APACHE II score of equal to or greater than 8 were classified as the severe pancreatitis group. Both groups were compared with each other with respect to admission NLR and RDW.**

Results: **The study included a total of 494 patients with a mean age of 59.15 ± 19.46 years, of whom 363 were women and 131 were men. The control group included a total of 47 subjects with a mean age of 57.34 ± 7.17, of whom 18 were men and 29 were women. When we compared the control and patient groups with respect to NLR and RDW values, we found significant differences between both groups. The severe pancreatitis group had a significantly higher mean NLR compared to the mild pancreatitis group. The dead patients had higher NLR and RDW values compared to the surviving ones, although only the NLR difference between the dead and surviving patients reached statistical significance.**

Conclusion: **Both NLR and RDW are elevated in acute pancreatitis, although only NLR should be considered as a readily available, inexpensive, and useful marker for predicting disease severity and mortality.**

Keywords: Neutrophil lymphocyte ratio; APACHE score; Ranson criteria; Imrie scores

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Introduction

Acute pancreatitis Acute pancreatitis (AP) is an inflammatory process of pancreatic tissue, which can affect other distant organ systems. Its severity can range from mild inflammation to severe, progressive pancreatic necrosis, and it can lead to multiorgan failure that may have a mortality rate as high as 20% to 30% [1]. Several scoring systems have been proposed to determine its severity. Among these, Balthazar [2,3] and The Early Warning Score (EWS) [4] are calculated from computed tomography findings and physical examination. Other scoring systems (Ranson criteria, APACHE score, Glasgow and Imrie scores), on the other hand, require combined use of clinical and laboratory variables. While definitive diagnosis can be made at the end of 48 hours in Ranson and Imrie scores, The Acute Physiology and Chronic Health Evaluation II (APACHE II) score enables physicians to make prognostic predictions at the time of hospital admission [5]. Therefore, there is an ongoing need for a universally accepted, easy-to-use, and highly sensitive parameter for predicting acute pancreatitis severity.

Serum markers as procalcitonin, interleukin-6, and interleukin-8, known to be useful markers for predicting AP severity, cannot be widely used due to their cost, unsuitability for clinical use, and limited availability. Total white blood cell count is a routinely used hematological test that is used in various scoring systems to determine acute pancreatitis severity. Neutrophil-Lymphocyte ratio (NLR) has been found superior to total white blood cell count for predicting prognosis [6]. Red blood cell distribution width (RDW) reflects erythrocyte distribution volume. Inflammatory markers such as C-reactive protein, erythrocyte sedimentation rate, and IL6 have been linked to increased RDW level [7,8]. This study aimed to compare the efficacy of APACHE II scoring system with Neutrophil Lymphocyte Ratio and RDW level in predicting prognosis of patients with acute pancreatitis.

Materials and methods

This retrospective study was approved by the local ethics committee of Medical Faculty of Dicle University and it included patients over the age of 18 who were diagnosed with

acute pancreatitis and admitted to hospital after presenting to our emergency department with abdominal pain, nausea, and vomiting between February 2009 and May 2014. Demographic properties (age, sex etc.), biochemical (glucose, lactate dehydrogenase (LDH), aspartate aminotransferase (AST) etc.) complete blood count, and arterial blood gas parameters were reviewed, the resulting data and results of prognostic scoring systems (APACHE II) were recorded on standard study forms. Patients less than 18 years old and those with chronic pancreatitis or pancreatic or hematological malignancies, missing data to preclude calculation of prognostic scoring systems, and missing medical data were the exclusion criteria. Forty-seven age- and sex-matched healthy subjects were included as the control group. According to the Atlanta classification system, patients having an APACHE II score of less than 8 were classified as the mild pancreatitis group, and those with an APACHE II score of equal to or greater than 8 were classified as the severe pancreatitis group [9]. Both groups were compared with each other with respect to admission NLR and RDW.

Statistical analysis

The results were given as mean+ Standard Deviation (SD). Univariate statistical analyses were performed with the Chi-Square test for categorical variables and with the student's t test for continuous variables. Means of multiple group were compared using Oneway ANOVA and Bonferroni correction was used as the Post-Hoc test for the differences between groups. A p value less than 0.05 was considered statistically significant.

Results

The study included a total of 494 patients with a mean age of 59.15±19.46 years, of whom 363 were women and 131 were men. The control group included a total of 47 subjects with a mean age of 57.34±7.17, of whom 18 were men and 29 were women. There were no significant differences between the patient and control groups with respect to gender distribution and age (p=0.089 and p=0.188, respectively).

As for the clinical and demographic properties of the patients, the severe pancreatitis group had a significantly higher mean age (p<0.001). Fever, dyspnea, angina, tachycardia, and ileus were significantly higher in the severe pancreatitis group. Peripancreatic fluid among local complications and renal and respiratory complications among systemic complications were significantly more common in the severe pancreatitis group (p<0.001). Mortality rate was also significantly higher in the severe pancreatitis group (p<0.001). The clinical and demographic properties of the patient group were shown on **[Table 1]**.

When we compared the control and patient groups with respect to NLR and RDW values, we found significant differences between both groups (p<0.001). The severe pancreatitis group had a significantly higher mean NLR compared to the mild pancreatitis group (p=0.005). The severe pancreatitis group had a higher mean RDW compared to the mild pancreatitis group, although this difference was not statistically significant (p=0.335). The NLR and RDW values of the control and patient groups were shown on **[Table 2]**.

A comparison of the NLR and RDW values with respect to clinical outcome revealed that the dead patients had higher NLR and RDW values compared to the surviving ones, although only the NLR difference between the dead and surviving patients reached statistical significance (p=0.007 and p=0.141, respectively). The NLR and RDW values of the surviving and dead patients were shown on **[Table 3]**.

Discussion

The main The main finding of our study is the significantly higher mean NLR and RDW values in both mild and severe pancreatitis groups compared to the control group. Neutrophils and lymphocytes are important components of total white blood cell count. Neutrophils are released as a result of the activation of the inflammatory cytokines, proteolytic enzymes, and free oxygen radicals cascade that results from pancreatic tissue breakdown and inflammation [10]. Previous studies have indicated a relationship between acute pancreatitis and low lymphocyte count [11,12], which is related to apoptosis

Table 1: *Clinical and demographic properties of the patient group*

Property	Mild Pancreatitis n=300	Severe Pancreatitis n=194	Total n=494	p
Gender				
Male	72	59	131	0.119
Female	228	135	363	
Age	51.74 ± 17.97	70.60 ± 15.82	59.15 ± 19.46	<0.001
Clinical signs and symptoms				
Nausea	279	184	463	0.453
Vomiting	273	182	455	0.307
Fever	85	91	176	<0.001
Dyspnea	50	78	128	<0.001
Angina	12	34	46	<0.001
Tachycardia	7	24	31	<0.001
Ileus	-0	4	4	0.023
Complications				
None	238	107	345	<0.001
Peripancreatic fluid	48	56	104	0.001
Pseudocyst	8	9	17	0.312
Abscess	1	2	3	0.564
Renal complication	8	36	44	<0.001
Respiratory complication	14	52	66	<0.001
Clinical Outcome				
Surviving	299	179	478	<0.001
Death	1	15	16	

Table 2: *NLR and RDW values of the control and patient groups*

Parameter	Groups	p value
NLR (% mean ± SD)	Control (2.81 ± 1.41) Mild (10.60 ± 10.66)	<0.001
	Severe (13.85 ± 13.17)	<0.001
	Mild (10.60 ± 10.66) Severe (13.85 ± 13.17)	0.005
RDW (% mean ± SD)	Control (12.68 ± 1.41) Mild (16.30 ± 1.67)	<0.001
	Severe (16.55 ± 1.86)	<0.001
	Mild (16.30 ± 1.67) Severe (16.55 ± 1.86)	0.335
*NLR reference range: 0.58% to 11.5%. RDW reference range: 11.6% to 16.8%.		

Table 3: *NLR and RDW values of the surviving and dead patients*

Parameter	Surviving n=478	Dead n=16	p value
NLR (% mean ± SD)	11.45 ± 11.38	24.58 ± 16.92	0.007
RDW (% mean ± SD)	16.37 ± 1.73	17.18 ± 2.07	0.141
*NLR reference range: 0.58% to 11.5%. RDW reference range: 11.6% to 16.8%.			

and lymphocyte dysfunction [13,14]. Furthermore, it has also been reported that a high neutrophil count, along with a low lymphocyte count, was associated with adverse events in several other medical and surgical disorders [15,16,17]. As a result, an increase in neutrophil count occurs with a simultaneous decrease in lymphocyte count, increasing the NLR ratio. We similarly found an increased NLR in the patient group. RDW has been formerly linked to ineffective erythropoiesis, inflammation, renal function, and nutritional status; it has also been regarded as a useful marker for prediction of clinical outcomes [8]. However, available studies on RDW have typically studied its predictive power for short-term prognosis in chronic conditions (such as cancer, chronic liver disease, cardiovascular disorders etc.) [7]. Unlike previous studies, we for the first time detected a higher RDW level in an acute inflammation compared to the control group.

Despite being a self-limiting inflammatory process, acute pancreatitis can lead to serious consequences in 20-25% of patients [18,19]. APACHE II score is the gold standard scoring system in which many parameters are incorporated [20,21]. Simple tests using serum markers of inflammation such as procalcitonin, interleukin-6, and interleukin-8 have also been found useful in predicting acute pancreatitis severity. However, these tests are impractical for the use in emergency department since they are both expensive and not widely available [21-24]. Both NLR and RDW can be readily available for any patient in emergency due to being parameters which can be obtained as a result of complete blood count analyses. Similar to previous studies [25,6], our study indicated that NLR was significantly higher in severe acute pancreatitis compared to mild acute pancreatitis, suggesting that it may be used for predicting acute pancreatitis severity as an inexpensive, widely available, and easily calculable marker. In contrast, despite being elevated in acute pancreatitis, RDW was not useful for predicting its severity.

The mild form of acute pancreatitis is a self-regressive condition where supportive treatment is usually sufficient whereas the severe form can cause a mortality rate as high as 10% to 30% [18]. In our study patients with the severe form had a mortality rate of 7.74%. Both Aravind et al. and Basem et al. reported that NLR was useful for predicting acute pancreatitis severity, although they did not specified any information about its predictive power for mortality [25,6]. We additionally showed that NLR was significantly higher in dead patients than the surviving ones, and it can be used a useful marker for predicting mortality. However, RDW was ineffective in predicting neither severity nor mortality.

Conclusion

NLR and RDW are elevated in acute pancreatitis. Despite being elevated in acute pancreatitis, RDW was not useful for predicting its severity. Although only NLR should be considered as a readily available, inexpensive, and useful marker for predicting disease severity and mortality.

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