ORIGINAL ARTICLE

The value of hematological parameters in acute pancreatitis

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ABSTRACT

BACKGROUND: Acute pancreatitis (AP) is a common inflammatory disease in the emergency department (ED). This study aims to assess the role of CRP and hematologic parameters in mild/severe AP patients and biliary/nonbiliary AP at the time of admission to the ED.

METHODS: 168 patients who were diagnosed as AP in the ED, and as a control group, 100 patients were included in this study. At the time of application to the ED, the demographic information (age, sex) and the amylase, lipase, CRP, hematological parameters (WBC, MPV, RDW, PLT, NLR) of all patients and the control group were recorded and compared. According to the etiology of the patients, the patients were divided into biliary and nonbilary AP groups and according to the severity, they were divided into mild and severe AP groups, then, the same parameters were evaluated.

RESULTS: Significant differences were found out between WBC, CRP, NLR, MPV and PLT values between patient and the control group ($p<0.001$). The length of hospitalization and the parameters were not significant between the biliary and the nonbiliary group. Ranson and APACHE II scores were correlated with WBC, CRP and NLR. There was a statistically significant difference between the mild and severe AP groups in terms of duration of the hospital stay, CRP, WBC and NLR values ($p=0.003$ for CRP, $p<0.001$ for the others). In severe AP, the cut-off value of NLR was found to be 8.05, sensitivity %93.48, specificity %86.89 and AUC 0.937 ($p<0.001$).

CONCLUSION: The use of parameters, such as WBC, CRP, and NLR, in combination with other diagnostic and prognostic tools in emergency service can provide convenience to clinicians at the time of admission and prognosis.

Keywords: Acute pancreatitis; mean platelet volume; neutrophil-to-lymphocyte ratio; platelet count; red cell distribution width.

INTRODUCTION

Acute pancreatitis (AP) is an important cause of abdominal pain, which is the most common complaint of emergency department (ED). Risk factors and the etiology of the disease affect the outcome of patients with AP.[1] Over 80% of the etiology of AP all over the world is gallstones and alcohol usage.[2] Some studies have reported that biliary AP is more severe and has higher mortality than alcoholic AP.[3] Diagnosis of AP was based on the presence of at least two of the following three criteria: (1) Continuous abdominal pain (2) serum amylase and/or serum lipase level at least three times higher than the normal upper limit and (3) Characteristic findings on abdominal imaging.[4–7]

Serum biomarkers, imaging studies and many scoring systems (Balthazar and early warning score (EWS), Atlanta, Ranson, APACHE score, Glasgow and Imrie scores) are widely used for the assessment of mortality and severity in acute pancreatitis.[4,8,9] Ranson score ≥3, APACHE II score ≥8, and Atlanta score

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≥1 suggests severe AP.[4,10,11] The majority of these scores are impractical for immediate use due to various reasons (such as follow-up, service intensities and need for further investigation). Investigations are underway for new rapid biomarkers to predict the seriousness of AP. Acute pancreatitis is an inflammatory disease that arises from inappropriate intrapancreatic activation of digestive enzymes, the infiltration of neutrophils and macrophages, and the necrosis of pancreatic tissue in its pathogenesis.[6] Platelet count (PLT), mean platelet volume (MPV), neutrophil/lymphocyte ratio (NLR) and red cell distribution width (RDW) and other hematological parameters have been extensively studied in clinical settings, such as critical diseases, pneumonia, acute appendicitis, cerebrovascular and cardiovascular diseases, defined as prognostic factor.[12–15] A complete blood count is a laboratory test with many parameters that can show the inflammatory state in the AP. The advantages of PLT, MPV, NLR, and RDW are that they are easily accessible, and they can be routinely performed in critical patients, including patients with severe AP.[5,7,10,11,16–18] There are studies evaluating the prognosis and mortality of severe AP regarding white blood cell (WBC), C-reactive protein (CRP), PLT, NLR and RDW parameters. However, the correlation between CRP, WBC and NLR and Ranson and APACHE II score system is very rare in the literature. This study was conducted to investigate the possible associations of these hematological parameters in patients with biliary and non-biliary AP and the prognostic value of mild and severe AP.

MATERIALS AND METHODS

Study Design

A total of 168 patients who were diagnosed with AP in the ED between 01.01.2014–31.07.2016, and as a control group, 100 patients with inclusion and exclusion criteria were included in this study. This study was approved by the Mersin University Clinical Research Ethics Committee (Reference number: 2017/110, dated 14/ 04/2017). The medical records of 168 patients who applied to the emergency department for AP were obtained and analyzed using the "Nucleus and Enlil Medical Information System." All data were analyzed retrospectively. Demographic information (age, sex), amylase, lipase, CRP, hematological parameters (WBC, MPV, RDW, PLT, NLR) of the patient group and control group were recorded. The parameters of both groups were compared. Patients were divided into two groups according to pancreatitis etiology: biliary and non-biliary group. The ultrasonography (USG) findings of the patients were used to determine the etiology. Patients with acute cholecystitis, cholelithiasis and other biliary pathologies were accepted as biliary AP. The patient group with no evidence of stones in the gallbladder or biliary tract on ultrasonography was evaluated as normal and other causes of AP (e.g. hyperlipidemia, alcohol, idiopathic) were detected was defined as non-biliary AP. In addition, the distribution of diagnostic parameters according to the length of stay of AP patients was investigated.

All AP patients were divided into two types according to the severity of the disease: (1) mild AP and (2) severe AP. The severity of the illness was measured by Ranson, APACHE II and Atlanta scores at admission. Ranson score ≥3, APACHE II score ≥8, and Atlanta score ≥1 were categorized as severe AP.[4,10,11] The patients with the values below these scores were accepted as mild AP.

Laboratory Analysis

The electrical impedance method was used in the analyzer (Beckman Coulter LH 780) after obtaining EDTA blood tuber for hemoglobin (Hb), leukocyte count, platelet count, MPV and RDW assay. Serum CRP levels were measured by turbidimetric method (Roche Cobas C 501). The normal reference values of the parameters in our study were Hemoglobin (11.7–16 g/dL), WBC (4.5–10 $x10^3/\mu L$), neutrophil count (1.5–6.7 $x10^3/\mu L$), lymphocyte count (1.5–4 $x10^3/\mu L$), platelet count 150–400 $x10^3/\mu L$), MPV (7.4–10.4 fL), RDW (11.6–14.8%) and serum CRP (0–5 mg/dL).

Exclusion and Inclusion Criteria

Exclusion criteria consisted of heart failure, hematologic disease, malignancy, chronic infection, liver disease, vascular disease, infectious disease other than infection or pancreatitis, failure to access file information, and history of drug use that could affect hematological parameters. For the control group, there was also an exclusion criterion for any other serious illness other than these diseases. Patients included in this study were adults over 18 years of age, patients diagnosed with AP between 01/01/2014 and 31/07/2016, patients without medications can cause low platelet count or platelet dysfunction by affecting platelet count and volume, no infection or inflammatory disease, and control group patients over 18 years of age.

Statistical Analysis

The Shapiro Wilks test was used for the correlation between the parameters and the corresponding normal scores in the biliary and non-biliary groups, that testing the normality of data. Normal distribution was not found to be appropriate for the subgroups. Median and percentage values were given as descriptive statistics of the parameters. The difference between the averages of the parameters was analyzed by Mann-Whitney U test. Receiver Operating Curve (ROC) analyses were performed to determine the cut-off points of continuous measurements. Cut-off, Area Under Curve (AUC) and p-values, sensitivity, selectivity, LR+ and LR- values are given as descriptive statistics. In addition, the separation power on the discrimination of a biliary and non-biliary group of related parameters was evaluated by ROC analysis. Statistical significance was taken as $p<0.05$.

RESULTS

In our study, the mean age of 168 patients diagnosed with pan-

Table 1. Values of CRP and hematological parameters of the patient (AP) and control group

	Control (n=100)	Acute pancreatitis (n=168)	p
	Med [Q1–Q3]	Med [Q1–Q3]	
White blood cell count (x10³/μL)	9.3 [7.5–12.6]	11.25 [8.625–14.375]	<0.001
C-reactive protein (mg/dL)	3 [1–12.75]	9.5 [3–30.5]	<0.001
Neutrophil lymphocyte ratio (x10³/μL)	3 [1–5]	5 [3–9]	<0.001
Mean platelet volume (fL)	8 [8–9]	9 [8–10]	<0.001
Red cell distribution width (%)	13 [13–15]	13 [13–14]	0.418
Platelet count (x10³/μL)	233.5 [195.5–284]	256 [207–307.75]	0.024

Values are expressed as the Median (range).

Table 2. ROC analysis of CRP and hematological parameters in AP patients

Parameters	Cut off	AUC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	LR+ (95% CI)	LR- (95% CI)	p
CRP	>3	0.687 [0.627–0.742]	73.81 [66.5–80.3]	58 [47.7–67.8]	1.76 [1.5–2.1]	0.45 [0.3–0.6]	0.0001
WBC	>11.5	0.631 [0.570–0.689]	47.62 [39.9–55.5]	73.00 [63.2–81.4]	1.76 [1.4–2.2]	0.72 [0.5–1.0]	0.0001
NLR	>2	0.654 [0.594–0.711]	76.79 [69.7–82.9]	47.00 [36.9–57.2]	1.45 [1.2–1.8]	0.49 [0.4–0.7]	0.0001
PLT	>276	0.582 [0.521–0.642]	43.45 [35.8–51.3]	73.00 [63.2–81.4]	1.61 [1.3–2.0]	0.77 [0.5–1.1]	0.0202
MPV	>8	0.685 [0.626–0.740]	69.05 [61.5–75.9]	62.00 [51.7–71.5]	1.82 [1.5–2.2]	0.50 [0.4–0.7]	0.0001
RDW	>15	0.529 [0.467–0.590]	89.29 [83.6–93.5]	20.00 [12.7–29.2]	1.12 [0.8–1.7]	0.54 [0.3–0.8]	0.4335

AP: Acute pancreatitis; ROC: Receiver operating curve; CI: Confidence interval; AUC: Area under the curve; WBC: White blood cell count; CRP: C-reactive protein; MPV: Mean platelet volume; NLR: Neutrophil lymphocyte ratio; RDW: Red cell distribution width; PLT: Platelet count.

creatitis was 48.13±13.28, while the mean age of the control group was 43.95±19.31. There was no statistically significant difference between two groups in the mean age (p=0.058). Among 168 patients, 79 were male (47%) and 89 were female (53%). The number of women in the control group was 54 (54%), while the number of males was 46 (46%). There was no statistically significant difference regarding sex in both groups (p=0.871).

WBC, CRP, NLR, MPV, RDW and PLT parameters of the patient (AP) and control group were compared. There was a statistically significant difference between CRP, WBC, NLR, MPV and PLT levels (p=0.024 for PLT, p<0.001 for others). There was no significant difference between the two groups in terms of RDW value (p=0.418), which is shown in Table 1. According to the results of ROC analysis in patients with AP, the cut-off value of CRP was 3, sensitivity was 73.81%, specificity was 58% and AUC was 0.687, p=0.001. The cut-off value of the WBC was 11.5, the sensitivities were 47.62%, the specificity was 73% and AUC=0.631, p=0.001. The cut-off value of NLR was 2, the sensitivities were 76.79%, the specificity was 47% and the AUC was 0.654, p=0.001. The cut-off value of PLT was 276, sensitivity 43.45%, specificity 73% and AUC=0.582, p=0.0202. The cut-off value of MPV was 8, the sensitivity was 69.05%, the specificity was 62% and the AUC was 0.685, p=0.001. The ROC curve and analysis of CRP and other hematological parameters are shown in Table 2 and Figure 1.

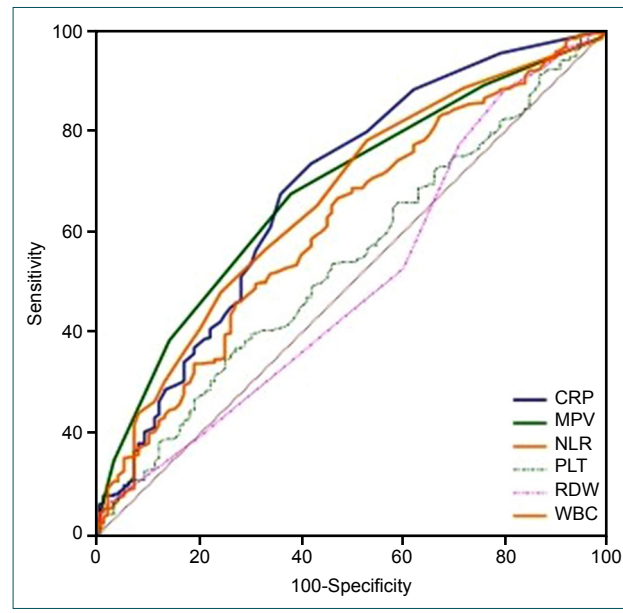

Figure 1. ROC curve of CRP and hematological parameters in AP patients according to the control group.

Table 3. Correlation of hematologic parameters with Ranson and APACHE II scores

		Ranson	APACHE II	WBC	CRP	NLR	MPV	RDV	PLT
Ranson	Pearson Correlation	1	0.424	0.421	0.200	0.628	0.080	0.181	0.056
	P	–	<0.001	<0.001	0.009	<0.001	0.300	0.019	0.469
APACHE II	Pearson Correlation	0.424	1	0.275	0.062	0.412	0.008	0.052	-0.011
	P	<0.001	–	<0.001	0.426	<0.001	0.920	0.506	0.891

APACHE-II: Acute Physiology and Chronic Health Evaluation-II; WBC: White blood cell count; CRP: C-reactive protein; MPV: Mean platelet volume; NLR: Neutrophil lymphocyte ratio; RDW: Red cell distribution width; PLT: Platelet count.

Table 4. Demographic features and laboratory values in mild and severe AP patients

	Mild AP (n=122, 72.6%)	Severe AP (n=46, 27.4%)	p
Sex, n (%)			
Male	57 (46.7)	21 (45.7)	0.901
Female	65 (53.3)	25 (54.3)	
Ultrasonography, n (%)			
Nonbiliary	26 (21.3)	11 (23.9)	0.717
Biliary	96 (78.7)	35 (76.1)	
Age, Mean±SD	47.45±12.46	50.39±15.71	0.258
Mean platelet volume (fL), Mean±SD	9.51±1.24	9.79±1.29	0.195
Amylase U/L, Mean±SD	1407.86±1330.86	1574.93±1103.96	0.449
White blood cell count (x10^3/μL), Mean±SD	10.646±3.398	14.792±4.691	<0.001
Hospital stay (days), Median (range)	4 (3–5)	5 (4–9.25)	<0.001
Lipase U/L, Median (range)	1123,50 (677–1578)	1200 (945.5–2433.75)	0.237
C-reactive protein (mg/dL), Median (range)	7.70 (3.16–26.11)	17.15 (7.37–53.09)	0.003
Neutrophil lymphocyte ratio (x10^3/μL), Median (range)	4.16 (2.57–6.59)	13.95 (9.51–19.33)	<0.001
Red cell distribution width (%), Median (range)	13.65 (12.9–14.5)	14.00 (13.28–15.05)	0.092
Platelet count (x10^3/μL), Median (range)	246.5 (208.5–308.25)	266 (199.5–306.5)	0.519

AP: Acute pancreatitis; SD: Standard deviation.

The amylase, lipase, WBC, CRP, NLR, MPV, RDW, PLT values and duration of hospital stay of the biliary and non- biliary AP group were compared. The median value of the amylase in the biliary group was 1300 [569–2670], while the median value of the lipase was 1200 [846–2180]. The median value of the amylase in the non- biliary group was 370 [168.5–683.5], while the median value of the lipase was 811 [441.5–1181.5]. There was a statistically significant difference between both groups of amylase and lipase values (p<0.001). There was no statistically significant difference between the biliary and non-biliary AP groups in duration of hospital stay and other parameters (WBC, CRP, NLR, MPV, RDW, PLT) (p>0.05).

The relation of hematological parameters with Ranson and APACHE II scores in patients with acute pancreatitis was investigated. Correlation of Ranson score with APACHE II score (r=0.424, p<0.001), WBC (r=0.421, p<0.001), CRP (r=0.200, p=0.009), NLR (r=0.628, p<0.001) and RDW (r=0.181, p=0.019) was determined. Correlation of the APACHE II score with the Ranson score (r=0.424, p<0.001), WBC (r=0.275, p<0.001) and NLR (r=0.412, p<0.001) was found (Table 3).

A total of 122 (72.6%) patients (57 males and 65 females) with a mean age of 47.45±12.46 were found to have mild AP diagnosis according to the severity scores performed at the time of emergency department admission. The remaining 46 (27.4%) patients (21 males and 25 females) were diagnosed with severe AP and their mean age was 50.39±15.71. Of the patients with mild AP, 26 (21.3%) were non-biliary AP and 96 (78.7%) were biliary AP. 11 of the severe AP patients (23.9%) were non- biliary AP and 35 (76.1%) were biliary AP. A statistically significant difference was found between the mild and severe AP groups for the duration of hospital stay, CRP,

Table 5. ROC analysis of CRP and hematological parameters in patients with severe AP compared to mild AP group

Parameter	Cutoff	AUC [CI]	p	Sensitivity [CI]	Specificity [CI]	LR+ [CI]	LR- [CI]
CRP	>6.63	0.647 [0.57–0.72]	0.0016	80.43 [66.1–90.6]	45.90 [36.8–55.2]	1.49 [1.2–1.8]	0.43 [0.2–0.8]
WBC	>11700	0.781 [0.711–0.841]	<0.0001	76.09 [61.2–87.4]	67.21 [58.1–75.4]	2.32 [1.7–3.1]	0.36 [0.2–0.6]
NLR	>8.05	0.937 [0.89–0.97]	<0.0001	93.48 [82.1–98.6]	86.89 [79.6–92.3]	7.13 [4.5–1.3]	0.075 [0.03–0.2]
PLT	>253000	0.532 [0.454–0.61]	0.5330	63.04 [47.5–76.8]	51.64 [42.4–60.8]	1.3 [1.0–1.7]	0.72 [0.5–1.1]
RDW	>14.7	0.584 [0.506–0.660]	0.0905	39.13 [25.1–54.6]	79.51 [71.3–86.3]	1.91 [1.2–3.2]	0.77[0.6–1.0]
MPV	>9.4	0.592 [0.52–0.67]	0.0667	71.74 [56.5–84]	49.18 [40.0–58.4]	1.41 [1.1–1.8]	0.57 [0.4–0.9]

ROC: Receiver operating curve; AP: Acute pancreatitis; CI: Confidence interval; AUC: Area under the curve; WBC: White blood cell count; CRP: C-reactive protein; MPV: Mean platelet volume; NLR: Neutrophil lymphocyte ratio; RDW: Red cell distribution width; PLT: Platelet count.

WBC and NLR (p=0.003 for CRP, p<0.001 for others). No significant difference was found between the two groups for other parameters (p>0.05). This situation is shown in Table 4.

According to ROC analysis results in severe AP patients, the cut-off value of CRP was 6.63, sensitivity 80.43%, specificity 45.90% and AUC 0.647, p=0.0016. The cut-off value of WBC was 11.7, sensitivity was 76.09%, specificity was 67.21%, and AUC was 0.781, p<0.0001. The cut-off value of NLR was 8.05, sensitivity was 93.48%, sensitivity was 86.89%, and AUC was 0.937, p<0.001. The ROC curve and analysis of CRP, WBC, NLR and other hematological parameters are shown in Table 5 and Figure 2.

The median values of patients who were hospitalized for seven days and fewer than seven days were analyzed respectively. The median values were (19.5 [5.5–103.5] vs. 8 [3–26], p=0.033) for CRP, (14.15 [11375–16850] vs. 10.5 [8400–13900], p<0.001) for WBC, (8 [4–14.75] vs. 5 [2–8], p=0.008) for NLR and (10 [9.25–11] vs. 9 [8–10] p=0.001) for MPV. However, there was no statistically significant difference between the amylase, lipase, RDW and PLT median values of the inpatients (p>0.05).

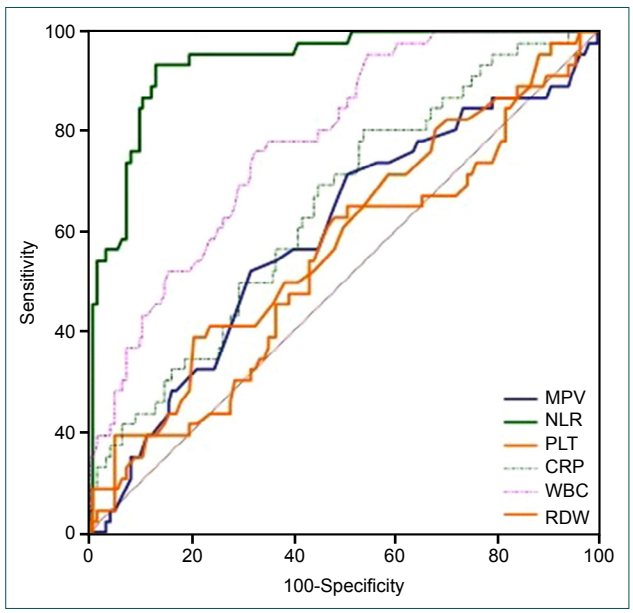

Figure 2. ROC curve of CRP and haematological parameters in patients with severe AP.

DISCUSSION

It is important that the diagnostic tests for diagnosing and in the clinical evaluation of the prognosis of acute pancreatitis should be fast and simple, inexpensive and potentially widely available. Hematological parameters (WBC, NLR, MPV, RDW, PLT) and especially CRP have been studied in many cases, such as stroke, heart failure, pneumonia, pancreatitis and rheumatologic diseases. The elevation of CRP, WBC, NLR and RDW in such diseases and low PLT and MPV values are considered as poor prognostic indicators.[5,7,10–13,16–18]

White blood cells, NLR, and CRP are usually prominent as indicators of acute inflammation.[8,19,20] High CRP value is often accepted as an important determinant of violence in AP. In particular, the CRP value measured within 48 hours from the onset of symptoms was found to be significant for the diagnosis of severe AP with 80–86% sensitivity and 61–84% specificity. CRP value within 48 hours from the onset of symptoms was found to be significant for necrotizing pancreatitis with specificity over 80%.[21] In a study by Khanna et al.,[9] CRP value was found to be 100% sensitive and 81.4% specific for the detection of pancreatic necrosis. The disadvantage of CRP as a marker is the late peaking (48–72 h) and non-specificity as an inflammatory marker. Similarly, the number of WBCs ($12.2x10^3$/L) at the time of admission in mild AP patients was significantly higher than that of healthy subjects ($6.3x10^3$/L).[16] In our study, CRP and WBC values were found higher in AP patients than the control group. In other studies, NLR was found to be higher in AP patients.[17,20] In a study conducted in our country, the cut-off value for NLR with 86% sensitivity and 88% specificity was found to be 2.81.[22] In another AP study, sensitivity for NLR 2.6 cut-off value was defined as 92.9% and specificity as 41.4%.[17] In our study, NLR was found to be high in AP patients (Cut-off value >2, sensitivity 76.79%, specificity 47% and AUC 0.654). NLR is significantly higher in cases with more severe cases,

especially in gastrointestinal cases (appendicitis and cholecystitis).[19] Azab et al.[8] reported that NLR was better than WBC, without anticipating the undesirable consequences of AP. This study also showed that 44.7 NLR cut-off value was determined as a simple indicator of AP severity. However, Binnetoğlu et al.[23] concluded that NLR was a controversial issue in determining the prognosis of AP, although the study reported that the NLR reported an increase in AP, especially in the first 48 hours. In a study of 146 patients by Suppiah et al.,[10] NLR was found to be significantly higher in patients with severe AP in the first three days than in the other patients. This study concluded that NLR elevation was significantly associated with severe AP for the first 48 hours after admission and was an independent negative prognostic marker in AP. In this study, sensitivity was 63–90% and specificity was 5–57%.

A direct correlation of Ranson and APACHE II score with WBC, CRP and NLR was determined in our study. CRP, WBC and NLR values were higher in severe AP. Especially in severe AP, the sensitivity of NLR was 93.48%, specificity was 86.89% and AUC was 0.937 and cut-off value was 8. The most widely used clinical prognostic scores include Ranson criteria and APACHE II classification system. The two scoring systems are commonly used to identify patients with severe pancreatitis who have an increased risk of complications: Ranson's criteria and APACHE II. A Ranson score ≥3, or an APACHE II score ≥8 indicates severe pancreatitis.[4,10,11] Limitations of Ranson's criteria include a 48-hour time requirement for score determination and a lack of ability to reassess severity at later points during the hospitalization. The APACHE II scoring system allows determination of severity on admission and at any point during the hospital course; however, the complexity of scoring may limit its use. Therefore, it may be possible to predict AP prognosis much more easily with WBC, CRP, and NLR in patients with AP clinical, laboratory, and imaging findings. Some studies on acute pancreatitis have reported that the height of RDW is proportional to the severity of inflammation, and patients with high RDW values may have higher mortality. It has been reported that RDW can be used in evaluating acute pancreatitis severity with other scoring systems.[7,24] In another study, the RDW value (12.6±0.59) at admission in mild AP patients was significantly lower than that of healthy subjects (13.42±0.85). However, in the same study, RDW (14.4±1.06) was significantly higher in patients with severe AP than in healthy subjects.[16] In the study of Akbal et al.,[25] similar to our data, there was no significant difference between the healthy and the patient group and between the mild and severe AP for the RDW value. The RDW value was not meaningful in our work because it was only measured on admission to the hospital.

A study examining the condition of the platelets and remission of the disease showed that platelets were directly involved in the systemic inflammatory process and contributed to the formation of AP.[26] Median and mean platelet counts were significantly lower in patients with severe AP and in patients who died of AP. Generally, patients without thrombocytopenia showed good prognosis. Meanwhile, with the treatment of AP, platelet counts increased within just a few days.[11] In a case report, serious thrombocytosis, as well as thrombocytopenia, may be seen in AP.[27] On the contrary, another study found out that PLT and RDW were not effective in determining the mortality of AP cases within the first 48 hours.[18] In several studies, there were no significant differences between patients with AP and healthy groups in terms of PLT numbers at the time of admission.[16,17] The increase in MPV showing platelet activation has been described as an independent risk factor for different clinical situations in the literature.[28–30] In a study of AP, no difference was found between baseline and remission MPV levels in 24 AP patients. Compared with the healthy group, the MPV value at the time of admission was higher in the patient group.[25] Similarly, in another study, the number of MPV in AP patients was found to be significantly higher than in healthy individuals.[16] In all these studies, the findings suggest that the severity of systemic inflammation is related to platelet volume. In our study, the number of PLT and MPV values in the AP at the time of admission was higher than the control group, even though it was in the normal reference interval. There was no difference between the mild and severe AP groups regarding PLT number and MPV value. Biliary causes (64–70%) take place on the top and idiopathic causes (24–31%) are in the second place in some studies which were conducted in Turkey.[31,32] When the etiologies of these patients were examined in detail, gallstones were determined as 40%, idiopathic causes 25.6%, alcohol 22% and post-ERCP 3.9%.[2] In our study, 77.9% of the 168 patients with AP were classified as biliary AP, while 22.1% were classified as non-biliary AP. 23.9% of severe AP patients were non-biliary AP and 76.1% were biliary AP. The data obtained in our study are consistent with the literature in this regard. In our study, no significant difference was found between CRP and hematological parameters (WBC, NLR, MPV, RDW, PLT) between biliary and non-biliary AP groups. In our country, Turkey, related to AP, Kara et al.[20] reported that the WBC is an important inflammatory mediator in the discrimination between the biliary and non-biliary AP, on the other hand, the sensitivity and specificity are low. In the same study, there were no significant differences between the biliary and non-biliary groups in terms of PLT and NLR. In one study, serum CRP levels measured during admission did not show a significant difference between alcohol-dependent AP and biliary AP groups.[3] In the same study, levels of serum amylase and lipase were significantly higher in the biliary AP group than in the alcoholic AP group.[3] Similar to our study, Okuturlar et al.'s[5] study showed that the amylase and lipase values in the biliary AP group were higher than the nonbiliary AP group.

The average length of stay in the hospital for acute pancreatitis patients was reported to be 4–14 days.[2,3,7,16] Thus, we admitted an average length of stay in hospital is 7-day in our study, and the relationship between CRP and hematologic parameters was evaluated. CRP, WBC, NLR and MPV values

were higher in patients with a stay over seven days, amylase, lipase, RDW, and PLT mean values were not statistically significant. CRP value was found to be 19.5 mg/dL on average in hospitalized patients over seven days. Cetin et al.[33] found out that 7th day CRP was associated with necrotizing pancreatitis with a sensitivity of 71% and specificity of 74% when the cut-off value was accepted as 10 mg/dL. In the study of Azab et al.,[8] the NLR level was significantly longer than in the hospital (average duration of stay 6.2 days). High WBC, CRP, NLR and MPV values in AP patients with a longer hospital length of stay (more than seven days) may be associated with the severity of inflammation in pancreatitis. Patients with severe AP in our study had a longer stay in the hospital and WBC, CRP, and NLR values of these severe AP patients were also higher.

In conclusion, our study aimed to evaluate the value of parameters, such as CRP, WBC, NLR, MPV and PLT, in AP patients at the time of admission. Parameters, such as CRP, WBC, NLR, MPV and PLT, found significant in AP. The same parameters were not found to discriminate between the biliary and non-biliary AP groups. Amylase and lipase values were higher in biliary AP. WBC, CRP, NLR and MPV were higher in long-term hospitalised patients. The high level of these parameters can provide clues to that AP patients may stay longer in the hospital. This study revealed that the correlation between Ranson and APACHE II prognostic scoring systems and WBC, CRP, NLR values is new and important information. Sensitivity, specificity and AUC value of NLR are better, especially when predicting the severity of the disease. It may be possible to predict AP prognosis much more easily with WBC, CRP, and NLR in patients with AP clinical, laboratory, and imaging findings.

Limitations

The most important limitations of our study are retrospective study and small sample sizes. However, long-term outcomes, complications, and mortality have not been studied. We should note that only one measurement of the evaluated parameters has been taken into account. In addition, acute changes in haematological parameters due to technical reasons, such as haemolysis and possible changes over time, have not been evaluated. Although close attention has been paid to time constraint between the first blood sampling and laboratory analysis when selecting patient groups, this issue may not be fully standardized given that this study is retrospective.

Conflict of interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZET*

Akut pankreatitte hematolojik parametrelerin değeri

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AMAÇ: Akut pankreatit (AP), acil serviste sık görülen bir enflamatuvar hastalıktır. Bu çalışmanın amacı, acil servise başvuru sırasında biliyer ve nonbiliyer AP'li hafif ve şiddetli AP hastalarında C-reaktif protein (CRP) ve hematolojik parametrelerin rolünü değerlendirmektir.
GEREÇ VE YÖNTEM: Kontrol grubu olarak 100 hasta ve acil serviste AP tanısı alan 168 hasta çalışmaya dahil edildi. Kontrol grubunun ve AP hastaların demografik bilgileri (yaş, cinsiyet), amilaz, lipaz, CRP, hematolojik parametreler (beyaz kan hücresi sayımı [WBC], ortalama trombosit hacmi [MPV], kırmızı hücre dağılım genişliği [RDW], trombosit sayımı [PLT], nötrofil-lenfosit oranı [NLR]) kaydedildi ve karşılaştırıldı. Hastalar, AP etiyolojisine göre biliyer ve nonbiliyer grup olarak ayrıldı. Hastalığın şiddetine göre, hafif ve şiddetli AP olarak iki grup oluşturuldu, aynı parametreler değerlendirildi.
BULGULAR: Hasta ve kontrol grubu arasında WBC, CRP, NLR, MPV ve PLT değerleri arasında anlamlı fark bulundu ($p<0.001$). Ranson ve APECHE II skorlaması WBC, CRP ve NLR ile korele idi. Hafif ve şiddetli AP grupları arasında, hastanede yatış süresi, CRP, WBC ve NLR değerleri arasında istatistiksel olarak anlamlı bir fark vardı (CRP için $p=0.003$, diğerleri için $p<0.001$). Ciddi AP'de NLR'nin kestirim değeri 8.05, sensitivite %93.48, spesifite %86.89 ve AUC: 0.937 olarak bulundu ($p<0.001$).
TARTIŞMA: Beyaz kan hücresi sayımı, CRP ve NLR gibi parametrelerin acil serviste diğer diagnostik ve prognostik araçlarla birlikte kullanılması, başvuru ve prognoz sırasında klinisyenlere kolaylık sağlayabilir.
Anahtar sözcükler: Akut pankreatit; kırmızı hücre dağılım genişliği; nötrofil-lenfosit oranı; ortalama trombosit hacmi; trombosit sayısı.

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