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Factors affecting mortality and morbidity in acute pancreatitis

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Abstract

We aimed to reveal the parameters that may be early predictors of mortality and morbidity by examining the data of patients with acute pancreatitis. In this study, demographic, clinical and biochemical parameters of 273 patients treated with the diagnosis of acute pancreatitis between 2010 and 2016 were scanned. Age, sex, comorbidity, history of operation, application method, clinical information about the etiology of pancreatitis, hemogram and biochemical parameters, Ranson values, morbidity and mortality findings were recorded. Of the 273 patients, whose mean age ranged from 18 to 98 (mean±sd: 56.94±19.21), 105 were male and 168 were female. Mortality developed in 3% of the patients (n=8), and a statistically significant difference was found between patients with and without mortality concerning age, the time between symptom and admission, presence of comorbidity, operation, Ranson scores, hypocalcemia and CRP values. Morbidity developed in 49.1% (n=134) of the patients, and when the patients with and without morbidity were compared, statistically significant difference was found concerning the female sex, presence of comorbidity, hyperglycemia, neutrophil to lymphocyte ratio (NLR), BUN, ALT, GGT, CRP, BUN, Ca values and Ranson scores. According to the Logistic Regression Analysis of the parameters that give significant results, Ranson 48th-hour measurements, admission time and age can predict mortality best, respectively, while 48th-hour Ranson value, CRP and NLR can best predict morbidity, respectively.

Keywords: Acute pancreatitis, mortality, morbidity

Introduction

Acute pancreatitis is a non-bacterial inflammation of the pancreas that may regress clinically and histologically or progress to a severe disease, which develops as a result of autodigestion of the gland by the leakage and activation of proteolytic enzymes of the pancreas due to etiological factors. It has no specific treatment and has a high mortality and morbidity rate [1,2].

Acute pancreatitis has a wide spectrum ranging from a self-limiting form with mild edema and inflammation to a severe form that causes hemorrhage and necrosis, which has a high mortality. Therefore, the degree of being affected by the disease and the prognosis of patients differ in proportion to the severity of acute pancreatitis [1,3].

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The extrapancreatic effects of the severe form accompanied by systemic inflammation are acute lung injury and shock, which may lead to death, as well as local fat necrosis [4]. Similarly, the clinical findings of patients may range from mild abdominal pain to hypotension, circulatory disorder, fluid sequestration, electrometabolic disorders and sepsis unresponsive to the treatment. While the mortality rate in mild acute pancreatitis is approximately 1.5-2.2% for all patients, this rate varies between 27-86% in the literature in patients with infected necrotizing pancreatitis [3,5,6].

In this retrospective study, we aimed to analyze patients' data to determine the parameters that may be early predictors of mortality and morbidity.

Materials and Methods

Ethics committee approval was obtained from Kahramanmaras Sutcu Imam University, Medical Faculty Ethics Committee to conduct this study. The present research was prepared in

accordance with the principles of the Declaration of Helsinki. Patients diagnosed with acute pancreatitis in Kahramanmaras Sutcu Imam University, Medical Faculty Hospital were analyzed retrospectively. Patient records were accessed from the hospital information system, and demographic data, laboratory results, radiology reports, patient anamnesis, length of hospital stay and clinical results required for this study were examined and recorded in the study form.

Patient Selection

In this study, 1241 patients over the age of 18 were found by scanning all pancreatic-related diagnoses in the hospital information system between 2005 and 2016 in our hospital records. Four hundred seventy-five of these patients with high levels of amylase and lipase at least once during hospitalization were examined. This study was limited to the years 2010-2016 due to missing data before 2010. Patients under the age of 18, traumatic pancreatitis, pancreatic tumor diagnosis, who gave up treatment and were sent to another center, and with an uncertain diagnosis of pancreatitis were excluded from this study. After the exclusion of them, 273 patients were included in this study.

Study Design

It was decided whether the patients had recurrent attacks or not by looking at whether there was an increase in amylase and lipase levels in all laboratory tests during a different hospitalization or during admission to the emergency department and whether it was mentioned in the anamnesis.

Hemogram values and biochemical values of the patients at admission and after 48 hours were examined. Anamnesis and ultrasonography reports were examined and it was recorded whether there were stones in the gallbladder in the etiology, whether there was a history of alcohol and whether there was another cause in the etiology. Computed Tomography (CT) severity score (CTSS) was calculated for each patient who underwent CT.

Whether the patients applied to the emergency department or the outpatient clinic, the number of days before their symptoms started, the duration of hospitalization, whether they were hospitalized in the intensive care unit, mortality information after discharge or during the disease were recorded.

Amylase, lipase, glucose, blood urea nitrogen (BUN), creatinine (CRE), AST, ALT, LDH, total and direct bilirubin, GGT, WBC, neutrophil percentage (NEU%), lymphocyte percentage (LYNF%), hematocrit (Htc 1), platelet counts (PLT 1), C-reactive protein (CRP) values at the first admission of the patients were recorded. In addition, BUN (BUN 48), hematocrit (Htc 48), platelet counts (PLT 48) and partial oxygen pressure (PaO2) and baseline deficit values of the patients after 48 hours were recorded. Estimated fluid sequestrations of the patients within 48 hours were calculated.

The difference between BUN values at the first admission and 48 hours later (BUN 1-BUN 48), whether there is an increase of more than 10% between the hematocrit values at the first admission and 48 hours later, the rate of total and direct bilirubin at the time of admission, the percentage ratio of neutrophils and lymphocytes at the time of admission rate (NEU %/LYNF%), platelet differences during the first application and 48 hours later were calculated.

Comorbid diseases, such as diabetes mellitus (DM) and hypertension (HT), were recorded. In addition, the number of diseases requiring chronic drug use was calculated.

It was recorded whether the patients were operated on due to necrosis or other reasons, whether ERCP was performed, whether complications developed, whether antibiotics were started, which antibiotic was started in patients who were started on antibiotics, and whether they started antibiotic was changed with a stronger antibiotic.

The Ranson scores of the patients at the time of the first admission and within 48 hours were calculated.

It was recorded whether the patients had a cholecystectomy and whether the patients who had cholecystectomy had surgery before or after the acute pancreatitis attack.

We have chosen the following parameters to identify patients with increased morbidity. Patients with a length of stay above the average length of stay, patients who were followed up in the intensive care unit for at least one day due to factors requiring hospitalization, patients who developed complications during their hospitalization, patients who underwent pancreatectomy, patients who underwent ERCP, patients who were started on an antibiotic other than cephalosporin (1st or 3rd generation) or ciprofloxacin.

Statistical analysis

NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, frequency, percentage, minimum, maximum) were used while evaluating the study data. Fisher's Exact test was used to compare qualitative data. The conformity of the quantitative data to the normal distribution was tested with the Shapiro-Wilk test and graphical examinations. Mann-Whitney U test was used for comparisons between two groups of quantitative variables that did not show normal distribution. Logistic regression analysis was used in multivariate assessments. Statistical significance was accepted as $p<0.05$.

Results

In the present study, 273 patients, 38.5% male (n=105), 61.5% female (n=168), who applied to KSU Hospital between 2010 and 2016 were included. The mean age of the patients was 56.94±19.21 (range 18-98) years. While 61.2% (n=167) of the patients applied to the emergency department, 38.8% (n=106) applied to the outpatient clinic. The demographic and clinical information of the patients is given in Table 1 in detail.

In cases with mortality, the mean age, the time between symptom and presentation, drug use and presence of other comorbidities were statistically higher than cases without mortality ($p<0.05$). No statistically significant correlation was found between sex, cholecystectomy and DM incidence and mortality ($p>0.05$) (Table 1).

One of the possible complications (necrosis, abscess, cyst, fluid collection) developed after acute pancreatitis in 11% (n=30) of the patients, and ERCP was performed in 15.4% (n=42) of the patients

Table 1. Demographic and clinical data of patients by mortality

		Mortality (-) (n=265)	Mortality (+) (n=8)	p
Sex	Male	101 (38.1)	4 (50.0)	[a]0.489
	Female	164 (61.9)	4 (50.0)	
Age (year)	Median (Q1-Q3)	55 (42-72)	70.5 (64.5-78)	[b]0.030*
Admission	Emergency	161 (60.8)	6 (75.0)	[a]0.490
	Outpatient	104 (39.2)	2 (25.0)	
Time between symptom and admission (day)	Mean±SD	2.23±2.41	5.63±4.53	[c]0.418
	Min-Max (Median)	1-20 (2)	2-15 (3.5)	
Cholecystectomy	No	164 (61.9)	4 (50.0)	[a]0.172
	Yes	48 (18.1)	3 (37.5)	
	Opere before admission	53 (20.0)	1 (12.5)	
Diabetes mellitus	No	217 (81.9)	5 (62.5)	[a]0.172
	Yes	48 (18.1)	3 (37.5)	
Hypertension	No	193 (72.8)	3 (37.5)	[a]0.043*
	Yes	72 (27.2)	5 (62.5)	
Other comorbidity	No	192 (72.5)	2 (25.0)	[a]0.008*
	Yes	73 (27.5)	6 (75.0)	
Drug use due to chronis disease	No	138 (52.1)	1 (12.5)	[a]0.034*
	Yes	127 (47.9)	7 (87.5)	
ICU	No	209 (78.9)	_-	[a]0.001**
	Yes	56 (21.1)	8 (100)	
Length of hospital stay (days)	Median (Q1-Q3)	6 (4-8)	14 (10-22)	[b]0.001**
	<8 days	176 (66.4)	1 (12.5)	[a]0.003**
	≥8 days	89 (33.6)	7 (87.5)	
Complication	No	237 (89.4)	6 (75.0)	[a]0.215
	Yes	28 (10.6)	2 (25.0)	
Pancreatectomy	No	261 (98.5)	6 (75.0)	[a]0.011*
	Yes	4 (1.5)	2 (25.0)	
Antibiotic therapy	No	49 (18.5)	1 (12.5)	[a]1.000
	Yes	216 (81.5)	7 (87.5)	
Changing antibiotic therapy	No	239 (90.2)	6 (75.0)	[a]0.193
	Yes	26 (9.8)	2 (25.0)	
ERCP	No	224 (84.5)	7 (87.5)	[a]1.000
	Yes	41 (15.5)	1 (12.5)	
Morbidity	No	131 (49.4)	0 (0)	[a]0.007**
	Yes	134 (50.6)	8 (100)	

[a]Fisher Exact Test [b]Mann Whitney U Test [c]Fisher Freeman Halton Test
**p<0.01 *p<0.05

due to increased jaundice, and pancreatectomy was performed in 2.2% (n=6) of patients due to necrosis (Table 1).

Ranson score measurements at the time of admission range from 0 to 4, with a mean of 1.24±1.10; the median value is 1. Ranson scores measured in the first 48 hours ranged from 0 to 5, with a mean of 1.04±1.05; the median value is 1. The Ranson admission and the Ranson 48th-hour measurements of the cases with mortality were higher than those without mortality (p<0.05, and p<0.01, respectively (Table 2), which was statistically significant.

WBC, Glu, LDH, AST, Hct, Hct 48th hour, total/direct bilirubin ratio, PLT difference, NLR, PaO2, base deficit, lipase, amylase, Cre, ALT, ALP, Neu%, GGT, Lynf% and CTSS scores did not show a statistically significant difference according to the presence of mortality (p>0.05). Although it was not statistically significant, the BUN measurements of the cases with mortality at the time of admission were higher than those without mortality despite

being close to significance (p>0.05). CRP, BUN 48th hour and Ca+2 48th hour values of patients with mortality were higher than those without mortality (p<0.05) (Table 2), which was statistically significant.

Age, presence of hypertension, the time between symptom and admission, pancreatectomy, length of hospital stay, Ranson 48th hour and CRP effects, which were observed to be significant in univariant evaluations, were evaluated with logistic regression analysis. When the variables thought to have an effect on mortality were evaluated with Backward (Conditional) Logistic regression analysis, the model was significant (p<0.01). It was observed that the effects of age, the time between symptom and presentation, and Ranson 48th hour on mortality were statistically significant (respectively; p:0.048; p:0.028; p:0.001). Although other variables included in the analysis were significant in univariate evaluations, they became meaningless in the model (p>0.05). It was observed to be higher with increasing age, with a one-unit increase in age having a risk of mortality ODDS of 1.120 (95% CI: 1.02-1.25); the ODDS of the time from symptom to presentation was 1,440 (95% CI: 1,040 to 1,994); the ODDS of Ranson's 48th-hour measurements was 10,780 (95% CI: 2,635-44,094) (Table 3).

While the areas under the ROC curve obtained to estimate mortality were determined as 97.3% standard error of 10% for Ranson 48th-hour measurements, for age, this rate is 72.5% with a standard error of 5.5%; for the period between symptom and presentation, this rate was 85.3% and the standard error was 5%.

Mortality is best estimated by Ranson's 48th-hour measurements, then the time between symptom and presentation, and then the patient's age (Table 3).

Morbidity was statistically significantly higher in female and patients using antibiotics (p<0.05). Age, presentation type, duration of symptom presentation, cholecystectomy operation status did not differ significantly concerning increased morbidity (p>0.05) (Table 4).

Of the cases with morbidity, 45.1% were admitted to the intensive care unit, 67.6% hospitalized for eight days or more; the presence of complications in 21.1%; pancreatectomy in 4.2%; there was a change in antibiotic therapy in 19.7% and ERCP performed in 29.6% (Table 5).

Table 2. Laboratory results by mortality. Ranson and CTSS scores

	Mortality(-) (n=265)	Mortality (+) (n=8)	[b] p
	Median (Q1-Q3)	Median (Q1-Q3)	
WBC	11150 (8360-13910)	12645 (7105-18750)	0.689
Glucose	130 (105-163)	134 (116.5-279)	0.268
LDH	279 (214-396)	345.5 (179-643.5)	0.659
AST	182 (73-332)	215 (77-701)	0.601
Htc (Admission)	39 (36-43)	33.5 (33-39.5)	0.058
Htc 48.hour	35 (32-39)	33 (30-36)	0.144
BUN (Admission)	14 (10-19)	17.5 (14-34.5)	0.074
BUN 48.hour	9 (7-14)	33.5 (11.5-45.5)	0.003**
Ranson (Admission)	1 (0-2)	2 (1-3)	0.027*
Ranson 48.hour	1 (0-1)	3.5 (3-4)	0.001**
PLT	256450 (207600-315000)	312000 (272000-452000)	0.638
NLR	6.9 (3.8-12.6)	11.2 (7-17.4)	0.149
CTSS	1 (0-2)	1 (0-4)	0.843
Ca+2 48. hour	8.4 (8-8.8)	7.5 (6-7.9)	0.003**
PaO2	64.5 (57-71.5)	56 (47-66)	0.149
Base excess	1.2 (-2.3-2.7)	3.7 (-6.5-11)	0.593
Lipase	2956 (1971-5034)	2364 (1461.5-3653)	0.183
Amylase	1060 (561-1638)	665.5 (284-1418.5)	0.386
Creatinin	0.8 (0.6-1)	0.8 (0.6-1.5)	0.533
ALT	170 (71-321)	106.5 (57-382)	0.601
ALP	142.5 (92.5-220.5)	150.5 (91-423.5)	0.681
Total Bilirubin	1.6 (0.9-3)	1.3 (0.7-13.9)	0.884
Direct Bilirubin	0.8 (0.4-1.9)	1 (0.3-10.2)	0.502
GGT	211 (71-414)	286 (55.5-317.5)	0.833
Neu%	81 (73-87)	86 (75.5-89)	0.304
Lynf%	12 (7-19)	7.5 (5.5-12.5)	0.143

[b]Mann Whitney U Test Q1: %25 Percentil Q3:%75 Percentil **p<0.01 *p<0.05

Table 3. Multivariate Logistic regression and ROC analysis for mortality

					Area Under the Curve				
			%95 CI		Area	Std. Error(a)	P	95% ConfidenceInterval	
	P	ODDS	Lower	Upper				Upper	Lower
Age	0.048*	1.120	1.000	1.255	0.725	0.055	0.030	0.618	0.833
Time between symptom and admission	0.028*	1.440	1.040	1.994	0.973	0.010	<0.001	0.953	0.994
Ranson 48.hour	0.001**	10.780	2.635	44.09	0.853	0.050	0.001	0.756	0.951

Table 4. Demographic and clinical data of patients by morbidity

		Morbidity (-) (n=131)	Morbidity(+) (n=142)	Morbidity(+) (n=142)p
Sex	Male	40 (30.5)	65 (45.8)	[a]**0.010***
	Female	91 (69.5)	77 (54.2)	
Age (year)	Mean±SD	58.15±18.52	55.82±19.83	[b]**0.320**
Admission	Emergency	80 (61.1)	87 (61.3)	[d]**0.973**
	Outpatient	51 (38.9)	55 (38.7)	
Time between symptom and admission (day)	Median (Q1-Q3)	4 (4-5)	8.5 (7-12)	[c]**0.067**
Cholecystectomy	No	83 (63.4)	85 (59.9)	[d]**0.297**
	Yes	27 (20.6)	24 (16.9)	
	Opere before admission	21 (16.0)	33 (23.2)	
Diabetes mellitus	No	112 (85.5)	110 (77.5)	[d]**0.122**
	Yes	19 (14.5)	32 (22.5)	
Hypertension	No	98 (74.8)	98 (69.0)	[a]**0.288**
	Yes	33 (25.2)	44 (31.0)	
Other comorbidity	No	100 (76.3)	94 (66.2)	[a]**0.065**
	Yes	31 (23.7)	48 (33.8)	
Drug use due to chronis disease	No	75 (57.3)	64 (45.1)	[a]**0.044***
	Yes	56 (42.7)	78 (54.9)	
Antibiotic therapy	No	37 (28.2)	13 (9.2)	[d]**0.001****
	Yes	94 (71.8)	129 (90.8)	

[a]Fisher Exact Test [b]Mann Whitney U Test [c]Fisher Freeman Halton Test [d]Student t Test
Q1: %25 Percentil Q3:%75 Percentil
**p<0.01 *p<0.05

Among the laboratory parameters of the cases with morbidity, Glucose, BUN at admission and BUN at the 48th hour were statistically significantly higher (p<0.05). No significant difference was found in WBC, LDH, AST and hematocrit values (p>0.05). In addition, 48th hour Ranson score and NLR were statistically significantly higher. When other laboratory parameters were examined, 48th-hour calcium and ALT levels were significantly low (p=0.001, p=0.001, respectively), and CRP levels were significantly higher (p=0.001) (Table 6) in patients with morbidity.

The effects of sex, glucose, BUN 48th hour, WBC, Ranson 48th hour, NLR, Ca+2 48th hour, ALT, AST, GGT and CRP, which were observed to be significant in univariant assessments of risk factors affecting morbidity, were evaluated by logistic regression analysis. When the variables thought to affect morbidity were evaluated with Backward (Conditional) Logistic regression analysis, the model was significant (p<0.01). It was observed that the effects of sex, Ranson 48th-hour score and ALT on morbidity were statistically significant (respectively; p: 0.043; p: 0.001; p: 0.016). Although other variables included in the analysis were significant in univariate evaluations, they became meaningless in the model (p>0.05). The ODDS value obtained for the morbidity risk of the male sex was 1.796 (95% CI: 1.070-3.326); the ODDS of Ranson's 48th-hour measurements was determined as 2,590 (95% CI: 1.808-3,711), and it was observed that a unit increase in ALT had a 0.998 (95% CI: 0.998-1,000)-fold increase in the risk of morbidity. When the areas under the ROC curve obtained to estimate morbidity were evaluated, the ratio for Ranson's 48th-hour measurements was 74.4% and its standard error was 4.2%; for NLR, this ratio was 56.4% with a standard error of 5.5%; the rate for CRP was 64.4% standard error 4.9%; the rate for CTSS was 54.9%, with a standard error of 5.3%. For ALT measurements, this rate was 85.3% and the standard error was 5%.

In estimating morbidity, Ranson's 48th-hour measurements were the best predictor, followed by CRP; it was later found as NLR (Table 7).

Table 5. Evaluation of Descriptive Characteristics by Morbidity

		Morbidity(+) (n=142)
ICU	**No**	**78 (54.9)**
	Yes	64 (45.1)
Hospitalization time	<8 gün	46 (32.4)
	≥8 gün	96 (67.6)
Complication	No	112 (78.9)
	Yes	30 (21.1)
Pancreatectomy	No	136 (95.8)
	Yes	6 (4.2)
Changing antibiotic therapy	No	114 (80.3)
	Yes	28 (19.7)
ERCP	No	100 (70.4)
	Yes	42 (29.6)

Table 6. Laboratory results. Ranson and CTSS scores by morbidity

	Morbidity (-) (n=131)	**Morbidity(+) (n=142)**	**[b]p**
	Median (Q1-Q3)	**Median (Q1-Q3)**	
WBC	10920 (8140-13000)	11295 (8530-15110)	0.063
Glucose	122 (101-161)	136 (109-174)	0.033*
LDH	287 (222-423)	270 (197-379)	0.2
AST	243 (119-462)	135 (54-267)	0.889
Htc (Admission)	39 (36-42)	39.5 (36-43)	0.975
Htc 48.hour	35 (32-39)	36 (32-39)	0.185
BUN (Admission)	13 (10-19)	14 (11-20)	0.010*
BUN 48.hour	9 (6-12)	10 (7-16)	0.003**
Ranson (Admission)	1 (0-2)	1 (0-2)	0.196
Ranson 48.hour	1 (0-1)	1 (1-2)	0.001**
PLT	246000 (206000-309000)	266000 (214000-317000)	0.602
NLR	5.7 (3.6-11.6)	8.4 (4.1-12.9)	0.050*
CTSS	1 (0-2)	2 (0-3)	0.099
Ca^{+2} 48. hour	8.5 (8.1-9.1)	8.2 (7.9-8.7)	0.001**
PaO_2	68 (58-72)	64 (54-70)	0.31
Base excess	1.5 (0.5-3.4)	1.2 (-3.6-2.8)	0.336
Lipase	3074 (2147-5433)	2714.5 (1736-4630)	0.096
Amylase	1119 (624-1828)	978.5 (455-1591)	0.206
Creatinin	0.8 (0.6-1)	0.8 (0.6-1)	0.587
ALT	232 (96-428)	142.5 (46-274)	0.001**
ALP	150 (97-224)	134 (86-232)	0.356
Total Bilirubin	2 (1-3.2)	1.5 (0.8-2.7)	0.046*
Direct Bilirubin	1.1 (0.4-2.2)	0.7 (0.3-1.7)	0.001**
GGT	241 (90-454)	195.5 (47-374)	0.046*
CRP	11 (4.3-52.4)	33 (9.6-107)	0.001**

Mann Whitney U Test Q1: %25 Percentil Q3:%75 Percentil **p<0.01 *p<0.05

Table 7. Multivariate Logistic regression and ROC analysis for mortality

	%95 CI				Area Under the Curve				
						Area	Std. Error(a)	P	95% ConfidenceInterval
	P	ODDS	Lower	Upper					Upper Lower
Age	0.043*	1.796	1.070	3.326	**Ranson 48.hour**	0.744	0.042	<0.001	0.662 0.827
Ranson 48. Hour	0.001**	2.590	1.808	3.711	**NLR**	0.564	0.055	0.227	0.457 0.671
ALT	0.016*	0.998	0.997	1.000	**ALT**	0.387	0.055	0.032	0.278 0.495
					Ca 48.hour	0.342	0.048	0.003	0.247 0.437
					CRP	0.644	0.049	0.006	0.549 0.740
					CTSS	0.549	0.053	0.358	0.444 0.653

Discussion

While the conservative approach in treating acute pancreatitis provides rapid recovery in most cases, necrosis, systemic inflammatory response syndrome and multiorgan failure develop in the severe form [7]. Although there has been a decrease in mortality due to the developments observed in recent years, some patient groups still face increased risk [8]. In the literature, the rate of severe pancreatitis is reported to be 15-20% [9]. In our study, we see that 85.3% of our patients had mild pancreatitis and 14.7% had severe pancreatitis at the time of the first admission, in accordance with the literature, according to the Ranson scoring system. When we calculate according to the 48th hour, we see that 90.1% of our patients are in the group of patients with mild pancreatitis and 8.9% in the group of patients with severe pancreatitis.

Acute pancreatitis is most commonly seen in the fourth and sixth decades [10]. The mean age of our patient group was also 56, which is consistent with the literature. The mean age of our eight patients who developed mortality was 71, which was statistically significant. The mean age of our patient group without mortality was calculated as 56.5. However, concerning morbidity, the mean age of both groups was close to each other.

Although gallstones and long-term alcohol use are involved in the etiology of 60-80% of acute pancreatitis cases, the etiological causes may vary significantly according to geographical regions. Other etiological causes include ERCP, idiosyncratic drug reactions, hypertriglyceridemia, anatomical changes, genetic predisposition and other rare causes [11]. In the etiology of our patients, there were gallstones in 195 (71.4%) patients, idiopathic causes in 49 (17.9%) patients, hyperlipidemia in 14 (5.1%) patients, renal failure in six (2.2%) patients, Antiepileptic drug use in four (1%) patients, alcohol use in four (1.5%) patients, and hyperparathyroidism in 1 (0.4%) patient. Consistent with the literature, we see that gallstones are the most common etiological factor in our patient group.

Of our eight patients who developed mortality, four had hypertension, two had diabetes mellitus, and one had both. The presence of comorbid disease was statistically significantly higher in patients with morbidity. Shen et al. concluded in a study they conducted that diabetes is associated with an increased risk of both mild and severe pancreatitis, and this relationship is stronger in female patients and younger patients [12]. Similarly, Yang et al., in a meta-analysis called Type 2 Diabetes and increased risk of acute pancreatitis, concluded that Type 2 Diabetes is strongly associated with an increased risk of pancreatitis [13].

Suppiah et al. found that the values of NLR measured for each day in the first three days in patients with severe acute pancreatitis were significantly higher than in other patients. In addition, they concluded that high NLR was significantly associated with severe pancreatitis during the first 48 hours after admission and was an independent negative prognostic marker in acute pancreatitis [14]. In our study, we observed that the neutrophil/lymphocyte ratio (NLR) at the time of admission was high in our cases with both mortality and morbidity, and this increase was statistically significant in patients with morbidity.

In all risk factor assessments, BUN was described as the most effective marker. There was a continuous correlation between serially measured BUN levels and complications of acute pancreatitis. Studies have shown that there is a significant correlation between the amount of BUN change and the risk of mortality [15]. In our study, patients who developed mortality and morbidity had high BUN values at the time of admission, and this elevation was statistically significant in patients who developed morbidity. BUN values measured at the 48th hour were statistically significantly higher in our patients who developed both mortality and morbidity. The fact that the BUN value does not improve and remains high despite appropriate fluid therapy indicates that fluid sequestration is high and adequate renal perfusion is not achieved. Therefore, it should be emphasized that mortality may develop in patients with high BUN measurements and that these patients should be approached more carefully.

Among the Ranson criteria, hypocalcemia, which is evaluated within 48 hours of the development of acute pancreatitis, is also associated with the severity of acute pancreatitis and pancreatic necrosis. The exact pathogenesis is not clearly understood, but it is suggested that it may be related to the binding of calcium in the process of fat necrosis and the change in the level of parathormone in the circulation during acute pancreatitis [16]. In our study, the 48th hour Ca+2 values of our patients who developed both mortality and morbidity were statistically significantly low.

In predicting the severity of acute pancreatitis, serum CRP, urinary trypsinogen activation peptide, procalcitonin, polymorphonuclear elastase, pancreatitis-associated protein, procarboxypeptidase-B,

carboxypeptidase B activation peptide, serum trypsinogen-2, phospholipase A-2, serum amyloid protein-A, Serum markers, such as antithrombin III, PAF, IL-1,6,8 and 10, TNF-α or soluble TNF receptor, and various genetic polymorphisms are also parameters that have been studied in different studies [17]. However, it has been argued by some authors that most serum markers are difficult to reach in general clinical practice due to their limited predictive value and low availability [18]. In our study, CRP was measured in 233 patients at the time of admission, and it was statistically significantly higher in both our mortality and morbidity groups.

Limitations

Since our study was retrospective, APACHE II and BISAP scores could not be calculated and evaluated. One hundred fourteen of the patients included in our study had CT performed at the time of admission or in case of necessity during the clinical process, and CT could not be performed in 159 patients as it was not deemed necessary. In addition, the fact that CT was taken at different times in our patients with acute pancreatitis made it challenging to calculate the predictive value of our CTSS score. Since most of the patients included in our study had MRCP examinations at different times, the MRI severity index or the predictive value of MR-related morbidity and mortality could not be measured. Since BMI was not measured in our patient group, the contribution of obesity to morbidity and mortality in the acute pancreatitis process could not be discussed. Pancreatitis developing after ERCP could not be evaluated since the ERCP procedure is performed for therapeutic rather than a diagnosis in our clinic. Only patients who required ERCP during acute pancreatitis were considered.

Conclusion

Acute pancreatitis is a multifaceted disease that may be mortal in some patients and cause significant morbidity, and many factors are responsible for its prognosis. The course and severity of acute pancreatitis differ from patient to patient, according to the underlying etiology, the presence of additional disease, and the resistance and response of the patients to the disease. Therefore, it is extremely important to follow a fast and easy algorithm in the approach to all patients. Although some laboratory values or other parameters were early predictors of mortality and morbidity in our study, many high-volume and multidimensional studies are still needed for the early evaluation of disease severity and the determination of more specific parameters affecting mortality and morbidity.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
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Ethical approval
The study protocol was approved by Kahramanmaras Sutcu Imam University, Medical Faculty Ethics Committee (Date: 07.04.2021 No: 2021/07). The study complied with the Declaration of Helsinki.

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