Clinical evaluation of the severity of acute pancreatitis in elderly patients

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Abstract

Background and study aims: **Acute pancreatitis incidence in geriatric patients has increased in recent years. The aim of this study is to compare the clinical outcomes, laboratory findings of acute pancreatitis among patients aged 65-74 years, 75-84 years and ≥85 years.**

Patients and methods: **This retrospective study analyzed 500 patients aged 65 years and above, who were diagnosed with acute pancreatitis between 2012 and 2022. They were categorized into three groups based on their age: 65-74 years, 75-84 years, and ≥85 years. The primary outcome of the study focused on comparing the hospital mortality rates among the three age groups. The secondary outcomes involved comparing the length of hospital stay, intensive care unit admission, rates of endoscopic retrograde cholangiopancreatography (ERCP), and cholecystectomy requirement among the three age groups.**

Results: **The study's primary outcome is the significantly higher mortality rate in the oldest age group (p=0.002). In addition, patients with a Bedside index score ≥3, severe pancreatitis according to the revised Atlanta criteria, necrotizing pancreatitis, and drug-induced pancreatitis had significantly higher mortality rates. Hospitalized patients in the intensive care unit also showed a statistically significant increase in mortality rates. Interestingly, the rate of cholecystectomy operations was significantly lower in the group with higher mortality (p=0.030). When evaluated in terms of secondary outcomes, no significant difference was found in all three age groups.**

Conclusions: **The findings of this study indicate that the oldest age group had a significantly higher mortality rate compared to the other age groups. As a result, early diagnosis and prompt treatment are of utmost importance to enhance outcomes in this vulnerable population.** (Acta gastroenterol. belg., **2023,** 86, **401-409**).

Keywords: acute pancreatitis, oldest age, mortality.

Introduction

Acute pancreatitis (AP) is a common gastrointestinal disease associated with significant morbidity and mortality.

The most common etiology of acute pancreatitis is gallstone disease and alcohol use (1). Gallstones are also the most common etiology in the elderly.

As life expectancy rises, the number of elderly individuals continues to grow. While AP typically follows a mild and self-limited clinical course, it is essential to recognize that very elderly patients may exhibit atypical symptoms and have a higher risk of requiring intensive care and experiencing mortality. Despite advancements in treatment and intensive care, severe AP still carries a substantial mortality rate. Therefore, early detection of AP in this vulnerable population is crucial for minimizing morbidity and mortality.

Differentiating between mild and severe pancreatitis poses a challenge for clinicians. Several scoring systems, including Ranson, Accuracy of Acute Physiology and Chronic Health Evaluation (APACHE) II, Atlanta, and Balthazar, have been developed to assess the severity of acute pancreatitis (2,3,4,5). Furthermore, a comprehensive evaluation of comorbidities plays a significant role in predicting mortality.

Moderate to severe AP can lead to both early and late deaths. Patients with severe AP require intensive care treatment and close monitoring.

The elderly population has the highest rate of hospitalization for AP. However, the impact of increasing age on the clinical course of AP and mortality rates remains a subject of controversy due to variations in age definitions across studies (6,7,8). Comparing data across studies becomes challenging due to the variability in defining the elderly age group.

In our study, we aimed to investigate AP etiology, laboratory values, clinical severity and course, need for intensive care hospitalization, need for surgical procedures and mortality rate by dividing patients 65 years of age and older into subgroups.

Materials and methods

Study Design

Between 2012 and 2022, we included 500 patients aged ≥65 years who were admitted to the internal medicine service and diagnosed with acute pancreatitis (AP) in our study. The study protocol received approval from the ethics committee of our hospital on June 21, 2022 (Approval No: 3591).

Participant Selection

In our study, we examined the data of 2000 patients diagnosed with acute pancreatitis. We excluded patients who had missing laboratory and clinical data in the database, those who met the exclusion criteria, and those who were transferred to another hospital during follow-

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up. The data were collected from the electronic records of the patients and evaluated retrospectively. The exclusion criteria included patients aged <65 years, those with chronic pancreatitis, and those with acute post-ERCP pancreatitis.

Definitions

The diagnosis of acute pancreatitis (AP) was established based on the 2012 revised Atlanta criteria, requiring the presence of at least two of the following three criteria: 1. Acute onset of severe, persistent epigastric pain that often radiates to the back, 2. Serum amylase and/or lipase levels at least three times the upper limit of normal, and 3. Characteristic findings of AP observed on abdominal ultrasound (USG) and/or computed tomography (CT) or magnetic resonance imaging (MRI) (4).

According to the 2012 revised Atlanta criteria, mild AP is defined by no organ dysfunction, local or systemic complications, moderate AP by transient (<48 hours) organ dysfunction, the presence of local or systemic complications, and severe AP by persistent dysfunction of one or more organs for more than 48 hours.

If gallstones or biliary sludge were detected on imaging, those with bile duct stones were considered as biliary pancreatitis. Elevated liver tests especially, an elevated alanine transaminase level more than three times upper limit is suspected of biliary etiology. Alcohol-induced pancreatitis was defined in males with a history of regular use of 40 g of ethanol per day and 20 g of ethanol per day in females for at least 5 years (6). A serum triglyceride level >1000 mg/dl was considered as hypertriglyceridemia in the etiology of pancreatitis (6). Those for whom no etiologic cause could be found were considered idiopathic.

The Charlson comorbidity index was calculated to assess the comorbid conditions of each patient (9).

Patients, clinical information collection and bio-chemical analyses

The patients were divided into 3 groups according to their age as 65-74 years, 75-84 years and ≥85 years. We collected a comprehensive set of data from the patients. This included information on age, gender, smoking, alcohol use, comorbid diseases, Charlson comorbidity score, history of previous cholecystectomy, clinical presentation (abdominal pain, nausea, vomiting, fever, jaundice, dyspnea, confusion, hematemesis, diarrhea, constipation), etiology of acute pancreatitis (biliary, hypertriglyceridemia, alcohol, drug, idiopathic), presence of necrotizing pancreatitis, bedside index of severity in AP (BISAP) score, severity of acute pancreatitis according to revised Atlanta criteria, and a range of laboratory findings (leukocyte, hemoglobin, hematocrit, PaCO2 (partial pressure of carbon dioxide), urea, creatinine, alanine aminotransferase (ALT), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), amylase, lipase, total bilirubin, direct bilirubin, c reactive protein (CRP), albumin, calcium, sodium, potassium). Serum urea, creatinine, ALT, AST, total bilirubin, direct bilirubin, calcium, sodium, potassium, CRP, amylase, lipase and albumin were analyzed on the Cobas 8000 C702 module (Roche Diagnostics, Manheim, Germany). Hemogram parameters, leukocyte, hemoglobin and hematocrit were analyzed on the Mindray BC6800 module (Shenzhen, China). Arterial blood gas parameter, PaCO2 was analyzed on the Rapid Lab Blood Gas Analayzer & Co-OX 1265 module (Siemens Healthcare Diagnostics, Newyork, USA).

Outcomes

The study had two main outcomes. The primary outcome focused on comparing hospital mortality among the three different age groups. The secondary outcomes involved comparing the length of hospital stay, rates of intensive care unit (ICU) admission, and the need for endoscopic retrograde cholangiopancreatography (ERCP) and cholecystectomy among the three age groups.

Statistical analysis

The conformity of the variables to normal distribution was evaluated graphically and with the Shapiro Wilk's test. The mean and standard deviation was used as the descriptive statistics of the variables with normal distribution; The median (minimum; maximum) was used as descriptive statistics of the variables that were not found to be normal distribution.

Pearson Chi-square test was used to identify the relationship between age groups and diabetes mellitus, hypertension, chronic renal disease, chronic obstructive pulmoner disease, cerebrovascular disease, ischemic heart disease, malignancy, history of cholecystectomy, symptoms, etiology, BISAP score, revised Atlanta classification 2012, intensive care unit admission, ERCP and mortality. One-way analysis of variance (One-Way Anova) was used to compare the difference between age groups according to their hemoglobin, hematocrit, PaCO2, calcium, potassium levels. Kruskal Wallis analysis of variance was used to compare the difference according to the Charlson Comorbidity Index, length of hospital stay , length of intensive care unit stay and other laboratory values. For the difference between the groups, Bonferonni corrected pairwise comparison results were analyzed.

IBM SPSS Statistics 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.) and MS-Excel 2016 programs were used for statistical analysis and calculations. A value of $p< 0.005$ was accepted as statistically significant.

Results

Participant characteristics and clinical symptoms

A total of 500 patients aged ≥65 years with acute pancreatitis (AP) were included in the study. Among

Table 1. — **Descriptive statistics for age groups of patients and their relationships**

Variable	65-74 n (%)	75-84 n (%)	85+ n (%)	Test Statistics	
				c^2	p
Gender					
Female	125 (56.3)	108 (60.0)	66 (67.3)	3.452	0.178
Male	97 (43.7)	72 (40.0)	32 (32.7)		
Smoking	63 (28.4)	53 (29.4)	16 (16.3)	**6.424**	**0.040**
Diabetes Mellitus	82 (36.9)	57 (31.7)	25 (25.5)	4.191	0.123
Hypertension	159 (71.6)	122 (67.8)	68 (69.4)	0.707	0.702
Chronic Renal Disease	20 (9.0)	18 (10.0)	9 (9.2)	0.121	0.941
COPD*	30 (13.5)	34 (18.9)	12 (12.2)	3.054	0.217
Cerebrovascular Disease	17 (7.7)	23 (12.8)	9 (9.2)	3.000	0.223
Ischemic Heart Disease	53 (23.9)	47 (26.1)	22 (22.4)	0.521	0.771
Malignancy	28 (12.6)	19 (10.6)	13 (13.3)	0.583	0.747
Cholecystectomy History	24 (10.8)	15 (8.3)	8 (8.2)	0.935	0.626
Abdominal Pain	217 (97.7)	173 (96.1)	88 (89.8)	**10.395**	**0.006**
Nausea	143 (64.4)	124 (68.9)	67 (68.4)	1.032	0.597
Vomiting	111 (50.0)	108 (60.0)	53 (54.1)	4.012	0.135
Fever	16 (7.2)	20 (11.1)	18 (18.4)	**8.818**	**0.012**
Jaundice	31 (14.0)	27 (15.0)	6 (6.1)	4.965	0.084
Dyspnea	11 (5.0)	14 (7.8)	8 (8.2)	1.768	0.413
Confusion	9 (4.1)	7 (3.9)	7 (7.1)	1.802	0.406
Gallstones	173 (77.9)	141 (78.3)	80 (81.6)	0.595	0.743
Hypertriglyceridemia	1 (0.5)	0 (0)	0 (0)	1.255	0.534
Alcohol	5 (2.3)	2 (1.1)	0 (0)	2.668	0.263
Drug	5 (2.3)	3 (1.7)	1 (1.0)	0.612	0.736
Idiopathic	36 (16.2)	31 (17.2)	17 (17.3)	0.098	0.952
Necrotizing Pancreatitis	5 (2.3)	3 (1.7)	0 (0)	2.198	0.333
Bedside Index (BISAP score)					
< 3	113 (51.1)	91 (50.6)	42 (42.9)	2.038	0.361
≥ 3	108 (48.9)	89 (49.4)	56 (57.1)		
Revised Atlanta Classification					
Mild	109 (49.1)	73 (40.6)	36 (36.7)	6.686	0.153
Moderately	103 (46.4)	94 (52.2)	53 (54.1)		
Severe	10 (4.5)	13 (7.2)	9 (9.2)		
Intensive Care Unit Admission	12 (5.4)	13 (7.2)	8 (8.2)	1.015	0.602
ERCP**	35 (15.8)	36 (20.0)	10 (10.2)	4.541	0.103
Mortality	5 (2.3)	8 (4.4)	11 (11.2)	**12.055**	**0.002**
Cholecystectomy	54 (24.3)	31 (17.2)	8 (8.2)	**12.081**	**0.002**
Percutaneous Cholecystostomy	1 (0.5)	1 (0.6)	1 (1.0)	0.380	0.827

*Chronic Obstructive Pulmonary Disease, **Endoscopic retrograd cholangiopancreatography.

them, 60% (n=299) were female and 40% (n=201) were male. The patients were divided into three age groups: Group 1 (youngest-old, aged 65-74), Group 2 (middle-old, aged 75-84), and Group 3 (oldest-old, aged ≥85). Group 1 had 222 patients, Group 2 had 180 patients, and Group 3 had 98 patients. There was no statistically significant difference in gender distribution among the three age groups. However, the oldest group had a statistically significantly higher smoking rate (p=0.040). There were no significant differences in the prevalence of accompanying diseases among the three age groups (Table 1).

The most common clinical symptoms in all three age groups were abdominal pain, nausea, and vomiting. However, abdominal pain was found to be statistically significantly lower in the oldest group (p=0.006). Fever was observed to be statistically significantly higher in the oldest group (p=0.012). Hematemesis was reported in only one male patient aged 79. Diarrhea was present in 23 patients, while constipation was observed in 15

Table 2. — **Comparison of the differences in laboratory results according to patients in terms of age groups**

Variable	65 - 74 Mean ± S.D.	75 - 84 Mean ± S.D.	85+ Mean ± S.D.	p
Hemoglobin	12.91 ± 1.93	12.41 ± 1.83	12.20 ± 1.72	**0.008**
Hematocrit	38.79 ± 5.30	37.57 ± 5.00	36.95 ± 5.01	**0.031**
$PaCO_2$	37.89 ± 6.40	38.59 ± 6.86	36.37 ± 6.13	0.100
Calcium	8.80 ± 0.61	8.63 ± 0.58	8.52 ± 0.64	**<0.001**
Potassium	3.96 ± 0.51	3.99 ± 0.57	3.95 ± 0.52	0.735
	65 - 74 Median (Min.; Max.)	**75 - 84 Median (Min.; Max.)**	**85+ Median (Min.; Max.)**	**p**
CCI*	2.00 (0.00; 7.00)	2.00 (0.00; 5.00)	2.00 (0.00; 6.00)	0.552
Leukocyte	11.95 (2.76; 31.10)	10.84 (2.86; 25.30)	13.12 (4.47; 23.81)	0.326
Urea	42.0 (19.0; 265.0)	46.0 (21.0; 198.0)	52.5 (23.0; 271.0)	**<0.001**
Creatinine	0.96 (0.32; 7.21)	0.96 (0.44; 5.15)	0.95 (0.49; 3.07)	0.747
ALT	56.0 (6.0; 515.0)	63.00 (5.00; 444.00)	77.5 (5.0; 447.0)	0.989
AST	37.0 (10.0; 402.0)	43.00 (6.00; 559.00)	54.5 (13.0; 731.0)	0.356
LDH	221.0 (118.0; 911.0)	222.0 (128.0; 663.0)	215.5 (122.0; 849.0)	0.789
Amylase	720.0 (107.0; 3417.0)	646.0 (153.0; 5629.0)	464.5 (103.0; 2604.0)	0.243
Lipase	795.0 (101.0; 8801.0)	1032.0 (107.0; 6748.0)	1007.5 (100.0; 6035.0)	0.364
TB**	0.87 (0.27; 16.66)	1.07 (0.14; 9.98)	0.98 (0.18; 6.07)	0.719
DB***	0.32 (0.06; 14.63)	0.45 (0.08; 7.89)	0.36 (0.09; 6.02)	0.854
CRP	76.58 (0.86; 494.10)	74.40 (1.92; 296.61)	85.37 (0.5; 326.9)	0.054
Albumin	3.65 (1.85; 4.50)	3.47 (1.96; 4.40)	3.34 (2.10; 4.70)	**<0.001**
Sodium	140.0 (131.0; 151.0)	138.0 (128.0; 149.0)	140.0 (132.0; 148.0)	0.323
LHS****	9.00 (2.00; 42.00)	9.00 (1.00; 35.00)	8.00 (1.00; 34.00)	0.804
ICUS*****	0.00 (0.00; 32.00)	0.00 (0.00; 10.00)	0.00 (0.00; 28.00)	0.577

*Charlson Comorbitide Index; ** Total Biluribin; *** Direct Biluribin; ****Length of Hospital Stay; *****Intensive Care Unit Stay.

patients. No statistically significant differences were found among the three age groups regarding other clinical symptoms such as nausea, vomiting, jaundice, dyspnea, and confusion (Table 1).

Results on outcomes

The primary outcome analysis revealed a significantly higher mortality rate in the oldest-old group compared to the other age groups (p=0.002). This finding indicates a higher risk of death within this specific population. Mortality was observed in 5 patients (2.3%) within the 65-74 age group, 8 patients (4.4%) within the 75-84 age group, and 11 patients (11.2%) within the 85-year age group and above. However, when assesing the secondary outcomes, no statistically significant differences were observed among the three age groups regarding the need for intensive care unit (ICU) hospitalization, length of hospital stay, and the need for endoscopic retrograde cholangiopancreatography (ERCP) as a surgical procedure. Notably, cholecystectomy was found to be significantly lower in the oldest-old group compared to the other two age groups (p=0.002) (Table 1). Among the 500 patients included in the study, percutaneous cholecystostomy was performed in only 3 patients (0.6%).

Comparison of risk scoring, comorbidities and laboratory parameters by age groups

No statistically significant difference was found among the three age groups in terms of the BISAP score and revised Atlanta 2012 criteria, which are important indicators of the severity of acute pancreatitis (AP).

There was no statistically significant difference in terms of Charlson comorbidity index, length of hospital stay and need for admission of intensive care unit in all three age groups. A statistically significant difference in the laboratory values of hemoglobin, hematocrit, calcium and albumin was found in all three age groups (Table 2).

Bonferroni-corrected pairwise comparisons were used to investigate the origin of significant differences in variables in the groups. The analysis revealed statistically significant differences in hemoglobin levels between the youngest-old and oldest-old groups, with higher hemoglobin values observed in the youngest-old group ($p < 0.05$). Similarly, a significant difference in hematocrit levels was found between the youngest-old and oldest-old groups, with higher values observed in the youngest-old group ($p < 0.05$). Furthermore, a statistically significant difference in calcium levels was observed between the youngest-old group and both the middle-old and oldest-old groups, with the highest calcium values observed in

Table 3. — **Pairwise comparisons of laboratory results by age groups**

Variable	Age	Age	p
Hemoglobin	65 - 74	75 - 84	0.080
		85+	**0.013**
	75 - 84	85+	0.960
Hematocrit	65 - 74	75 - 84	0.137
		85+	**0.048**
	75 - 84	85+	1.000
Calcium mg/dl	65 - 74	75 - 84	**0.015**
		85+	**<0.001**
	75 - 84	85+	0.370
Urea mg/dl	65 - 74	75 - 84	**0.046**
		85+	**<0.001**
	75 - 84	85+	**0.013**
Albumin u/l	65 - 74	75 - 84	**0.002**
		85+	**<0.001**
	75 - 84	85+	0.164

the youngest-old group and the lowest in the oldest-old group ($p < 0.05$). Urea levels were found to be higher in both the middle-old and oldest-old groups compared to the youngest-old group, and a significant difference was detected between the middle-old and oldest-old groups, with the lowest urea values observed in the youngest-old group and the highest in the oldest-old group ($p < 0.05$). Moreover, there was a statistically significant difference in albumin levels between the youngest-old group and both the middle-old and oldest-old groups, with the highest albumin values observed in the youngest-old group and the lowest in the oldest-old group ($p < 0.05$) (Table 3).

Results on predictors of outcome

Comparison between patients with and without mortality revealed several significant findings. The incidence of diabetes mellitus was significantly higher in patients without mortality ($p=0.004$), while symptoms such as jaundice, dyspnea, and confusion were more prevalent in patients with mortality. Acute pancreatitis due to gallstones was more common in patients without mortality, whereas drug-induced pancreatitis and necrotizing pancreatitis were more frequent in patients with mortality (Table 4).

Furthermore, mortality was significantly higher in patients with a BISAP score of ≥3, severe acute pancreatitis according to the revised Atlanta criteria, intensive care unit (ICU) admission, and longer ICU stay ($p<0.001$) (Table 4, 5). The rate of cholecystectomy was higher in patients without mortality, while no significant differences were observed in terms of ERCP and percutaneous cholecystostomy (Table 4).

Regarding laboratory values, patients with mortality had significantly lower albumin levels ($p<0.001$). Additionally, leukocyte count, urea, LDH, total bilirubin, direct bilirubin, and CRP levels were significantly higher in patients with mortality (Table 5).

Discussion

The clinical picture of AP in the very elderly population is different. Although the most common etiology is biliary pancreatitis, in patients aged 85 years and above, the occurrence of abdominal pain was significantly lower, while the presence of fever was significantly higher.

Age is an important factor in several scoring systems used to predict the severity of pancreatitis, such as APACHE II, BISAP score, and Ranson criteria. In our study, we did not find a significant difference in the classification of AP severity among the age groups based on the BISAP score and the 2012 revised Atlanta criteria. However, we observed that the mortality rate was significantly higher in the oldest-old group. A study by Li et al. also found that the BISAP score effectively assessed the severity of the disease, pancreatic necrosis, and mortality in elderly patients with AP (10). In our study, we suggest that the BISAP score and risk classification based on the revised Atlanta criteria can potentially predict the risk of mortality in elderly patients with AP. It is worth noting that different studies have categorized elderly patients into various age groups using different classifications, which makes it challenging to compare the findings and establish a standard classification for elderly patients with AP. Further research is needed in this area to develop a standardized approach and improve the management and prognosis of AP in elderly individuals.

While risk scoring systems are valuable tools in predicting the severity of acute pancreatitis (AP), they should not replace clinical assessment. It is important to recognize that elderly patients with mild AP should still be closely monitored due to the presence of comorbidities commonly associated with this population.

In a study by Bath et al., it was noted that risk severity and comorbidity scores did not reliably predict outcomes in elderly patients with AP. They recommended considering endoscopic retrograde cholangiopancreatography (ERCP) in eligible elderly patients with AP caused by gallstones (11). The presence of comorbidities in the elderly can complicate the early assessment of AP severity, as increasing age often leads to higher scores on severity scoring systems.

Another study by Di Mauro et al. found that a Charlson comorbidity index >4 was associated with higher disease severity and mortality in AP patients. They also suggested that, if feasible, cholecystectomy should be considered for elderly patients with gallstones (12). Murata et al. demonstrated that comorbidities in elderly AP patients were associated with longer hospital stays and in-hospital mortality, with cardiovascular and renal diseases being particularly linked to mortality (13). However, another study indicated that the presence of comorbidities did not necessarily have a negative

Table 4. — **Descriptive statistics of patients mortality groups and their relationships**

Variable	Mortality		Test Statistics	
	No n (%)	Yes n (%)	c^2	p
Gender				
Female	283 (59.5)	16 (66.7)	0.494	0.482
Male	193 (40.5)	8 (33.3)		
Smoking	126 (26.5)	6 (25.0)	0.025	0.873
Diabetes Mellitus	162 (34.0)	2 (8.3)	**8.507**	**0.004**
Hypertension	335 (70.4)	14 (58.3)	1.572	0.210
Chronic Renal Disease	45 (9.5)	2 (8.3)	0.035	0.852
COPD*	73 (15.3)	3 (12.5)	0.150	0.706
Cerebrovascular Disease	46 (9.7)	3 (12.5)	0.194	0.660
Ischemic Heart Disease	117 (24.6)	5 (20.8)	0.174	0.677
Malignancy	56 (11.8)	4 (16.7)	0.474	0.491
Cholecystectomy History	44 (9.2)	3 (12.5)	0.284	0.594
Abdominal Pain	457 (96.0)	21 (87.5)	2.741	0.098
Nausea	315 (66.2)	19 (79.2)	1.738	0.187
Vomiting	256 (53.8)	53 (66.7)	1.529	0.216
Fever	51 (10.7)	3 (12.5)	0.073	0.788
Jaundice	57 (12.0)	7 (29.2)	**6.050**	**0.014**
Dyspnea	24 (5.0)	9 (37.5)	**39.048**	**<0.001**
Confusion	16 (3.4)	7 (29.2)	**34.671**	**<0.001**
Gallstones	379 (79.6)	15 (62.5)	**4.009**	**0.045**
Hypertriglyceridemia	1 (0.2)	0 (0)	0.098	0.754
Alcohol-Induced	7 (1.5)	0 (0)	0.694	0.405
Drug-Induced	7 (1.5)	2 (8.3)	**6.088**	**0.014**
Idiopathic	79 (16.6)	5 (20.8)	0.293	0.588
Necrotizing Pancreatitis	5 (1.1)	3 (12.5)	**8.442**	**0.004**
Bedside Index (BISAP score)				
< 3	245 (51.6)	1 (4.2)	**25.333**	**<0.001**
≥ 3	230 (48.4)	23 (57.1)		
Revised Atlanta Classification				
Mild	218 (45.8)	0 (0.0)	**77.409**	**<0.001**
Moderately	242 (50.8)	8 (33.3)		
Severe	16 (3.4)	16 (66.7)		
Intensive Care Unit Admission	20 (4.2)	13 (54.2)	**92.531**	**<0.001**
ERCP	77 (16.2)	4 (16.7)	0.004	0.949
Cholecystectomy	92 (19.3)	1 (4.2)	**4.682**	**0.030**
Percutaneous Cholecystostomy	3 (0.6)	0 (0.0)	0.296	0.586

* Chronic Obstructive Pulmonary Disease.

impact on the clinical course of AP (14). In our study, no statistically significant difference was observed in the Charlson comorbidity index when comparing patients with and without mortality (p=0.344).

In our study, patients with mild AP were primarily managed conservatively and typically discharged within one week. Among elderly patients with AP, cholecystectomy was performed approximately one month after discharge. It is essential to consider the individual characteristics and comorbidities of elderly patients when determining the appropriate management approach for AP. Close monitoring and timely interventions, such as cholecystectomy, should be considered based on the patient's condition and risk factors.

Regarding the etiology of AP in patients aged 65 and over, biliary pancreatitis was found to be the most common cause. Idiopathic cases were the second most common cause. Some idiopathic cases are believed to be associated with biliary microlithiasis, which highlights the importance of repeat transabdominal ultrasound for improved sensitivity and diagnostic accuracy (15,16).

Table 5. — **Comparison of the differences in laboratory results according to patients in terms of mortality groups**

Variable	Mortality			
	No Mean ± S.D.	Yes Mean ± S.D.	Test Statistics	
			t	p
Hemoglobin	12.62± 1.86	12.50±2.03	0.310	0.756
Hematocrit	38.03± 5.10	37.72± 5.92	0.289	0.773
$PaCO_2$	38.01± 6.17	34.91±9.85	1.419	0.170
Albumin	3.51 ± 0.48	3.05 ± 0.60	**3.997**	**<0.001**
Calcium	8.77± 0.58	8.58± 0.85	1.113	0.277
Potassium	4.00± 0.51	4.05 ± 0.64	-0.420	0.678
	Mortality			
	No **Median (Min.,Max.)**	**Yes** **Median (Min.,Max.)**	**z**	**p**
CCI*	2.00 (0.00; 7.00)	2.00 (0.00; 4.00)	-0.947	0.344
Leukocyte	11.84 (2.76; 31.10)	14.42 (4.94; 25.30)	**-2.108**	**0.035**
Urea	45.50 (19.00; 265.00)	58.00 (22.00; 271.00)	**-3.170**	**0.002**
Creatinine	0.96 (0.32; 7.21)	0.98 (0.51; 2.19)	-1.693	0.090
ALT	63.00 (5.00; 515.00)	47.00 (7.00; 400.00)	-0.648	0.517
AST	42.00 (6.00; 731.00)	44.50 (10.00; 231.00)	-0.841	0.400
LDH	213.00 (118.00; 911.00)	284.50 (179.00; 683.00)	**-3.161**	**0.002**
Amylase	634.50 (107.00; 5629.00)	584.50 (103.00; 3282.00)	-1.484	0.138
Lipase	957.00 (101.00; 8801.00)	1250.00 (100.00; 5414.00)	-1.933	0.053
Total bilirubin	0.95 (0.14; 8.58)	1.17 (0.37; 16.66)	**-2.204**	**0.028**
Direct bilirubin	0.37 (0.06; 7.89)	0.49 (0.16; 14.63)	**-2.526**	**0.012**
CRP	74.40 (0.50; 494.10)	117.70 (2.10; 396.00)	**-2.506**	**0.012**
Sodium	139.00 (131.00; 151.00)	140.50 (128.00; 147.00)	-0.095	0.924
LOHS**	9.00 (1.00; 42.00)	9.00 (1.00; 35.00)	-0.488	0.626
ICUS***	0.00 (0.00; 32.00)	2.00 (0.00; 28.00)	**-9.434**	**<0.001**

*Charlson Comorbidity Index; **Length of hospital stay, days; ***Length of Intensive Care Unit stay, days.

In our study, alcohol and hypertriglyceridemia were identified as rare causes of AP in elderly patients. The low prevalence of alcohol-induced pancreatitis in our study population may be attributed to the relatively low prevalence of alcoholism in Turkey. Regarding AP caused by hypertriglyceridemia, we observed one case in our study. The patient had a triglyceride level of 2256 mg/dl. The exact threshold level at which hypertriglyceridemia triggers AP is not well defined. However, when the triglyceride level exceeds 1000 mg/dl, the risk of developing AP is approximately 5%. At levels above 2000 mg/dl, the risk increases to 10-20% (17).

In our study, we found the rate of newly diagnosed pancreatic cancer in patients with AP to be 1% (5 out of 500 patients). Of these cases, 2 patients were in the 65-74 age group, 2 patients were in the 75-84 age group, and 1 patient was in the ≥85 age group. In the study conducted by Munigala et al., they emphasized that AP may be the first presentation of pancreatic cancer in a significant number of patients and that pancreatic cancer should be routinely considered as a potential cause of AP in individuals aged 40 years and older (18). They reported that approximately 1.5% of patients were diagnosed with pancreatic cancer following an AP attack.

Diagnosing drug-induced pancreatitis in the elderly can be challenging due to polypharmacy. Obtaining a comprehensive medical history from the patient and their caregivers is crucial to identify potential medication-related causes. In our study, drug-induced pancreatitis accounted for 1.8% of AP cases.

The study conducted by Moreau et al. demonstrated that performing cholecystectomy in patients with gallstones, regardless of whether they had a previous pancreatitis attack or not, significantly reduced the risk of recurrent pancreatitis to a level comparable to the general population (19). In our study, there was no statistically significant difference in the history of previous cholecystectomy and in the rate of endoscopic retrograde cholangiopancreatography (ERCP) among all three age groups. While it is widely believed that surgical procedures in the elderly might be poorly tolerated due to comorbidities and diminished organ function, age alone should not serve as a prognostic indicator (20, 21). Lukens et al. found high success rates and minimal complications in elderly patients undergoing ERCP, while Peker et al. demonstrated the safety of laparoscopic cholecystectomy with low morbidity and mortality rates (22,23). However, surgical intervention for biliary tract

conditions proves to be a safe treatment option, even in the oldest age group. The rate of cholecystectomy was lower in the oldest age group (8.2%), possibly reflecting a preference to avoid surgery among elderly patients and physicians. It is important to consider the elderly population who are unable to undergo cholecystectomy due to accompanying comorbidities.

In the study by Patel et al., it was observed that ERCP was more commonly performed in elderly patients with AP, while cholecystectomy was less frequently performed (24). In our study, the rate of ERCP performed in patients aged 65 years and above was 16.2%, and the rate of cholecystectomy was 18.6%. We found that ERCP did not affect the mortality rate, but the mortality rate was significantly lower in patients who underwent cholecystectomy (p=0.03). The most common etiologies of acute pancreatitis in our study were gallstone-related and idiopathic cases. Biliary microlithiasis may account for some cases of idiopathic acute pancreatitis. We hypothesize that the lower mortality rate observed in patients who underwent cholecystectomy in our study could be attributed to the resolution of underlying biliary microlithiasis. However, further evidence is needed to fully understand the underlying mechanism. Additionally, this finding suggests that there is a subgroup of elderly individuals who could potentially benefit from early cholecystectomy.

In our study, we observed that individuals aged 85 and over had higher BUN values and lower albumin levels at admission compared to the other age groups.Elevated BUN values indicate intravascular volume loss and have been linked to the severity of AP in previous studies (25, 26). Thus, proper fluid and electrolyte replacement are crucial for managing this vulnerable population. The interpretation of low albumin levels in AP patients is debated, as it can indicate both malnutrition and inflammation. However, we did not assess the risk of malnutrition using a mini nutritional assessment test in our study. As CRP values were similar across the age groups, we hypothesized that the low albumin levels in the oldest-old group might be linked to malnutrition. Therefore, it is important to avoid unnecessarily prolonging the discontinuation of oral intake in geriatric patients.

Uomo et al. showed that age and comorbidities have a limited effect on the course and outcomes of AP (27).

Treating elderly patients with AP can be challenging due to the presence of comorbidities. In our study, you did not find a statistically significant difference in terms of chronic diseases such as diabetes mellitus, hypertension, previous cerebrovascular event, COPD, and the Charlson comorbidity index among the three age groups.

The relationship between age and the severity of AP has been reported differently in various studies. While some studies have found a correlation between age and AP severity, others have not. The study by Lankisch et al. indicated that both etiology and age have a limited effect on the course of AP, suggesting that other factors may play a more significant role (28). However, in our study, we observed a relationship between age and the severity of AP, highlighting the importance of age as a potential factor in determining the disease course.

In the study by Somasekar et al., a higher mortality rate of 25% was reported in patients over 80 years of age after the diagnosis of AP (29). In our study, the mortality rate in the oldest-old group was found to be 11.2%.

In our study, a high mortality rate was detected in patients aged 85 and above. Furthermore, the severity of the disease was higher in patients who experienced mortality. In the study conducted by Fan et al., it was found that patients over the age of 75 with acute pancreatitis (AP) had a mortality rate of 21.3%. Interestingly, this mortality rate was primarily associated with comorbidities in the elderly rather than complications directly related to AP (30). Similarly, another study observed a high mortality rate and severe disease course among patients aged 80 and older with AP (31). Additionally, beyond comorbidities, the frailty of elderly patients may further impact the severity of the disease and mortality, as it can pose challenges to treatment.

Our study has some limitations, such as its retrospective and single-center design. It is important to acknowledge the limitations of our study, such as its retrospective and single-center design. Prospective studies with larger sample sizes are needed to validate and expand upon the findings of our study.

In conclusion, the high mortality rate observed in the oldest age group in our study highlights the need for improved risk assessment models that incorporate frailty assessment along with existing risk scores to accurately predict the severity of AP in elderly patients. Early diagnosis, as well as the development of diagnostic and treatment modalities that can improve outcomes, are crucial for this vulnerable and fragile population. Further research is needed to advance our understanding of AP in the elderly and to optimize their management.

Conflict of interest

The author declare no conflict of interest.

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