Research Article / Araştırma Makalesi

The Impact of Age Over 80 Years on Outcomes in Geriatric Patients with Acute Pancreatitis: A Single Center Experience

Akut Pankreatitli Geriatrik Hastalarda 80 Yaş Üstü Olmanın Sonuçlar Üzerindeki Etkisi: Tek Merkez Deneyimi

[1]Hakan Şıvgın,[2]Abdurrahman Şahin

[1] Tokat Gaziosmanpasa University Medical Faculty, Department of Internal Medicine, Tokat, Türkiye
[2]Tokat Gaziosmanpasa University Medical Faculty, Department of Gastroenterology, Tokat, Türkiye

Abstract: The aim of this study is to evaluate the prognosis and mortality of acute pancreatitis (AP) in older subjects and compare octogenarians (≥80 years) with nonoctogenarians (age <80 years). The medical records of elderly patients who were followed up with the diagnosis of AP at our clinic between January 2018 and December 2021 were retrospectively analyzed. The etiology of AP, comorbidities, laboratory parameters, intensive care unit (ICU) admission, and mortality were noted. Among survivors, one-year mortality status was also recorded. Disease severity, in-hospital mortality and one-year mortality were compared. A total of 206 older patients (60 octogenarian, 146 nonoctogenariean) were recruited to the study. Of them, 115 (56%) were female and the mean age was 76.1±7.3 years. Severity of AP didn't differ between octogenarians and nonctogenarians (p>0.05). ICU admission was seen in 13% of octogenarians and 11% of nonoctogenarians (p>0.05). In-hospital mortality occurred in 8.3% of octogenarians and 6.8% of nonoctogenarians (p>0.05). After discharge, one-year mortality occurred in 20% of octogenarians and 6.6% of nonoctogenarians (p<0.01). In multivariate analysis severe AP (OR:24.940;%95CI:1.013–95.609; p=0.01), ICU admission (OR:10.244;%95CI:1.399–74.990; p=0.01) and chronic kidney disease(CKD) (OR:9.840;%95CI:1.013–95.609; p=0.04) were independent risk factors for in-hospital mortality, and ≥80 years (OR:2.984;%95 CI:1.116–7.980; p =0.03) and neurological disorders (OR:4.424;%95CI:1.480–13.226; p <0.01) were independent factors related to one-year mortality. Our results showed that advenced age has not a significant effect on the course of AP in elderly. Comorbidities play important role in short- and long-term outcomes in elderly. Larger prospective trials are needed to draw more definitive conclusions.
Keywords: Acute pancreatitis, Elderly, Mortality, Octogenarians, Severity

Özet: Bu çalışmanın amacı yaşlı bireylerde akut pankreatitin (AP) prognozunu ve mortalitesini değerlendirmek ve 80 yaş ve üzeri hastaları, 80 yaş altı hastalarla karşılaştırmaktır. Ocak 2018-Aralık 2021 tarihleri arasında kliniğimizde AP tanısı ile takip edilen yaşlı hastaların tıbbi kayıtları retrospektif olarak incelendi. Akut pankreatit nedeni, komorbiditeler, laboratuvar parametreleri, yoğun bakım ünitesine (YBÜ) yatış ve mortalite kaydedildi. Taburcu edilenlerde bir yıllık sağkalım durumu da kaydedildi. Akut pankreatit şiddeti, hastane mortalitesi ve bir yıllık mortalite karşılaştırıldı. Çalışmaya toplam 206 yaşlı hasta (60'ı 80 yaş üzeri, 146'sı 80 yaş altı) dahil edildi. Bunların 115'i (%56) kadındı ve yaş ortalaması 76.1±7.3 yıldı. AP şiddeti 80 yaş üzeri ve altı hastalar arasında farklılık göstermedi (p>0.05). YBÜ'nde yatış 80 yaş üzeri hastaların %13'ünde, 80 yaş altı hastaların %11'inde mevcuttu (p>0.05). Seksen yaş üzeri hastaların %8.3' ünde, 80 yaş altı hastaların %6.8'inde hastane mortalitesi meydana geldi (p>0.05). Yaşayan hastalarda, taburculuk sonrası bir yıllık mortalite 80 yaş üzeri olanların %20'sinde ve 80 yaş altı olanların %6.6' sında görüldü (p<0.01). Çok değişkenli analizde şiddetli AP (OR:24.940; %95CI:1.013–95.609; p=0.01), YBÜ yatışı (OR:10.244; %95CI:1.399–74.990; p=0.01) ve kronik böbrek hastalığı (KBH) (OR:9.840; %95CI:1.013–95.609; p=0.04) hastane mortalitesi için bağımsız risk faktörleriyken, 80 yaş üzeri olmak (OR: 2.984;%95 CI:1.116–7.980; p =0.03) ve nörolojik hastalıklar (OR:4.424;%95CI:1.480–13.226; p <0.01) bir yıllık mortaliteyle ilişkili bağımsız faktörlerdi. Sonuçlarımız ileri yaşın yaşlılarda AP seyri üzerinde belirgin bir etkisinin olmadığını gösterdi. Yaşlılarda, komorbiditeler kısa ve uzun dönem sonuçlarda önemli rol oynamaktadır. Daha kesin sonuçlara varmak için daha büyük prospektif çalışmalara ihtiyaç vardır.
Anahtar Kelimeler: Akut pankreatit, Yaşlılar, Mortalite, Seksen yaş üzeri, Hastalık şiddeti

ORCID ID of the authors: HŞ. 0000-0001-5008-6576, AŞ. 0000-0001-5477-9492

Received 05.01.2024 ***Accepted*** 29.02.2024 ***Online published*** 06.03. 2024

Correspondence: Hakan ŞIVGIN – Tokat Gaziosmanpasa University Medical Faculty, Department of Internal Medicine, Tokat, Türkiye
e-mail : sivginhakan@gmail.com

1. Introduction

The improvement of living standards and health conditions in the last decades has led to gradual increase in elderly population all over the world as well as in Turkey. According to the current data from the Turkish Statistical Institute, the average life expectancy in Turkey is 74.8 years for men and 80.3 years for women (1). In many countries, including Turkey, the elderly or older is defined as having a chronological age of 65 years or older. Older adults constitute a heterogeneous population that shows differences in their physical and mental function, cognitive status, and social aspects (2). Individuals aged 80 years or older, which is named as octogenarians, constitute a group of people that requires more intensive care and follow-up.

Acute pancreatitis (AP) is identified as the acute inflammation of the pancreatic gland and, is one of the most common gastrointestinal emergencies with high mortality (3). While gallstones and alcohol represent the main causes of AP, no etiology is found in up to 30% of patients and AP is defined as idiopathic in this group (4). The clinical picture varies from self-limiting acute localized inflammation of pancreas to severe multi-organ failure. Disease severity and prognosis is predicted by the revised Atlanta Classification. The severity is graded as mild, moderately severe and severe according to the revised Atlanta Classification. Mortality rate varies from 5% in mild cases up to 30% in those patients with infected pancreatic necrosis (5).

With the ageing of the population, an increasing number of elderly patients have begun to experience acute disorders including AP (6). Acute pancreatitis presents with more severe course in elderly patients with longer hospital stay and higher rate of intensive care unit (ICU) admission (7). Diagnosing of AP is more difficult in older patients compared to younger adults. The symptoms usually occur later and, tend to be nonspecific during presentation. The intensity of pain may be lower. Mild increases in amylase may be related to other gastrointestinal disorders (8). In the course of disease, elderly patients deteriorate more easily compared to younger ones. Furthermore, the high comorbidity rate in the elderly population may result in severe consequences in AP. Age is a component of several AP severity indices like Ranson's criteria, the Modified Glasgow Prognostic Score, the bedside index of severity in acute pancreatitis (BISAP) and, Acute Physiology and Chronic Health Evaluation (APACHE) II score (9). Though most studies have demonstrated a higher mortality rate in older patients, a more severe course without increased mortality was demonstrated in other studies (5). Hence, it is necessary to determine the outcomes and clinical traits of AP in this specific population and apply required medical and interventional treatment is crucial for them (3). In the current study we aimed to focus on the clinical course of AP, including severity of AP, ICU admission, in hospital mortality and one-year all-cause mortality, among elderly patients, especially in octogenarian ones.

2. Materials and Methods

In this retrospective study, elderly patients with AP (≥ 65 years-old), who were treated at Gastroenterology Clinic of Tokat Gaziosmanpasa University Hospital between January 2018 and December 2021, were enrolled. Elderly patients were classified as nonoctogenarians between 65-80 years of age and octogenarians over 80 years of age. The diagnosis was made based on the presence of at least two of the three features: characteristic abdominal pain consistent with AP, serum amylase or lipase values at least three times greater than the upper limit of normal value, and radiological findings consistent with AP. Among elderly patients with AP, patients who had insufficient clinical and follow-up data were excluded from the study. Patients with recurrent pancreatitis were enrolled only at first admission.

Demographic, clinical, and laboratory data were retrieved for assessment of disease severity and clinical outcomes. Age, gender, comorbid diseases including diabetes mellitus (DM), hypertension (HT), coronary heart disease (CHD), heart failure, chronic kidney

disease (CKD), neurological disorders and pulmonary disorders were recorded. Etiology of AP was determined as biliary or non-biliary. Laboratory parameters on admission and at the second day of admission were also recorded. Severity of AP was determined using the revised Atlanta Classification, and graded as mild, moderately severe and severe. Ranson's criteria scores and BISAP scores were also recorded. Ranson's score ≥3 and BISAP score ≥3 were accepted as severe AP. Data about length of hospitalization and ICU admission were obtained from hospital records. Outcomes included in-hospital AP related mortality and one-year all-cause mortality.

2.1. Statistical analysis

Statistical analysis was performed using SPSS v 20.0 (IBM, New York, USA). Continuous variables were expressed as means and standard deviations or medians and standard error of mean. Categorical variables were expressed as frequencies and percentages. Student t test was used to compare normally distributed continuous variables and Mann–Whitney U test was used to compare non-normally distributed continuous variables. The chi-square test or Fisher's exact test was utilized for categorical variables. Logistic regression analysis was used for univariate and multivariate analyses to investigate factors associated with in-hospital mortality and one-year all-cause mortality. Variables with a significant p level (<0.05) in univariate logistic regression analysis were used in the multivariate logistic analysis. Results were expressed as odds ratio (OR) with 95% confidence interval (CI). Values of $p < 0.05$ were accepted as statistically significant in all comparisons.

2.2. Tables

Table 1. Demographic and clinical features of octogenarians and nonoctogenarians with acute pancreatitis

Variable	**Octogenarians (>80 years) (n=60)**	**Nonoctogenarians (65-80 years) (n=146)**	***p***
Age (years)	85±5	72±5	**<0.01**
Gender, female n (%)	35 (58%)	80 (55%)	0.64
Etiology, biliary n (%)	43 (72%)	117 (80%)	0.19
Comorbid illnesses, n (%)			
Diabetes Mellitus	6 (10%)	37 (25%)	**0.01**
Hypertension	37 (62%)	93 (64%)	0.78
Coronary heart disease	18 (30%)	37 (25%)	0.49
Heart failure	13 (22%)	17 (12%)	0.06
Mental and Neurological Disorders	10 (%17)	13 (%9)	0.11
Chronic kidney disease	3 (5%)	10 (7%)	0.76
Pulmonary Disorders	12 (20%)	20 (14%)	0.26
Severity			
Revised Atlanta Class, n (%)			0.22
Mild	22 (37%)	69 (47%)	
Moderately Severe	30 (50%)	54 (37%)	
Severe	8 (13%)	23 (16%)	
Ranson's score ≥3, n (%)	28 (47%)	60 (41%)	0.46
BISAP score ≥3, n (%)			
	19 (31%)	33 (23%)	0.17
ICU admission, n (%)	8 (13%)	16 (11%)	0.63
Length of stay, median (25%-75%)	7 (5-9)	6 (5-9.5)	0.59
In-hospital mortality, n (%)	5 (8.3%)	10 (6.8%)	0.77
One-year mortality, n (%)	11/55 (20%)	9/136 (6.6%)	**< 0.01**

BISAP, Bedside index of severity in acute pancreatitis; ICU, Intensive Care Unit.

Table 2. Laboratory parameters of octogenarians and nonoctogenarians with acute pancreatitis on admission and at second day of admission

Variable	Octogenarians (>80 years) (n=60)	Nonoctogenarians (65-80 years) (n=146)	*p*
On admission			
WBC ($\times 10^6$/L)	13100±720	13070±410	0.83
Hemoglobin (g/dL) *	12.7±2.1	13.4±1.9	**0.02**
Hematocrit (%) *	38.0±6.3	39.9±5.6	**0.03**
Platelet ($\times 10^9$/L) *	221±76	241±85	0.12
ALT (U/L)	147±17	228±16	**<0.01**
AST (U/L)	239±33	280±21	0.07
Calcium (mg/dL)*	9.1±0.7	9.2±0.6	0.35
BUN (mg/dL)	24±1.6	21±0.8	0.12
Creatinine (mg/dL)	1.27±0.16	1.20 ± 0.08	0.47
Amylase (U/L)	1430±131	1785±96	**<0.01**
Lipase (U/L)	2295±201	2937±230	0.20
CRP (mg/L)	45.0±9.0	36.5±3.8	0.76
At 48 hours of admission			
WBC ($\times 10^6$/L)	10835±750	10200±425	0.66
Hemoglobin (g/dL)*	11.5±2.0	12.1±1.7	**0.03**
Hematocrit (%)*	34.3±5.9	36.3±5.0	**0.02**
Platelet ($\times 10^9$/L)*	192±70	204±73	0.33
ALT (U/L)	124±43.1	138±15.8	**<0.01**
AST (U/L)	115±46.1	102±23.0	0.37
Calcium (mg/dL)*	8.6±0.7	8.7±0.8	0.72
BUN (mg/dL)	19±1.5	18±1.2	0.21
Creatinine (mg/dL)	1.15±0.12	1.21 ± 0.10	0.99
CRP (mg/L)	128.2±11.8	128.0±8.2	0.92

(*) Mann–Whitney U test
ALT, Alanine aminotransferase; AST, Aspartate transaminase; BUN, Blood Urea Nitrogen; CRP, C reactive protein. WBC, White Blood Cell.

Table 3. Demographic and clinical factors associated with in-hospital mortality

Variable	Dead (n=15)	Alive (n=191)	*p*
Age (years)	75±1.8	76.2±7.3	0.77
Gender, female/ male n(%)	5 (33%) / 10 (67%)	110 (58%) / 81 (42%)	0.10
Etiology, biliary n(%)	11 (73%)	149 (78%)	0.75
Comorbid illnesses, n (%)			
Diabetes Mellitus	3 (20%)	40 (21%)	0.93
Hypertension	10 (67%)	120 (63%)	0.76
Coronary heart disease	5 (33%)	56 (26%)	0.55
Heart failure	3 (20%)	27 (14%)	0.46
Mental and Neurological Disorders	0 (0%)	23 (12%)	**0.01**
Chronic kidney disease	5 (33%)	8 (4%)	**< 0.01**
Pulmonary Disorders	3 (20%)	29 (15%)	0.70
Severity			
Revised Atlanta Class, n (%)			**< 0.01**
Mild	1 (7%)	90 (47%)	
Moderately Severe	2 (13%)	82 (43%)	
Severe	12 (80%)	19 (10%)	
Ranson's score ≥3, n(%)	11 (73%)	77 (40%)	**0.01**
BISAP score ≥3, n(%)	13 (87%)	39 (20%)	**< 0.01**
ICU admission, n (%)	11 (73%)	13 (7%)	**< 0.01**

BISAP, Bedside index of severity in acute pancreatitis; ICU, Intensive Care Unit.

Table 4. Multivariate logistic regression analysis for in-hospital mortality in acute pancreatitis

	Univariate analysis			Multivariate analysis		
Variable	**OR**	**%95 CI**	***p***	**OR**	**%95 CI**	***p***
Chronic kidney disease	11.437	3.161 – 41.381	**< 0.01**	9.840	1.013 – 95.609	**0.04**
Revised Atlanta, SAP	36.211	9.378 – 139.815	**< 0.01**	24.940	1.860 – 334.330	**0.01**
Ranson's score ≥3	4.071	1.251 – 13.254	**0.02**	0.167	0.008 – 3.379	0.24
BISAP score ≥3	25.333	5.487 – 116.059	**< 0.01**	2.217	0.150 – 32.725	0.56
ICU admission	37.654	10.517 – 134.807	**< 0.01**	10.244	1.399 – 74.990	**0.02**

BISAP, Bedside index of severity in acute pancreatitis; ICU, Intensive Care Unit; SAP, Severe acute pancreatitis.

Table 5. Demographic and clinical factors associated with one-year all-cause mortality among survivors from an acute pancreatitis event

Variable	**Dead (n=20)**	**Alive (n=171)**	***p***
Age (years)	82±1.6	75.5±7.1	**<0.01**
Gender, female n (%)	12 (60%)	98 (57%)	1.00
Etiology, biliary n (%)	13 (65%)	136 (80%)	0.16
Comorbid illnesses, n (%)			
Diabetes Mellitus	3 (15%)	37 (22%)	0.77
Hypertension	9 (45%)	111 (65%)	0.09
Coronary heart disease	7 (35%)	43 (25%)	0.42
Heart failure	6 (30%)	21 (12%)	**0.04**
Mental and Neurological Disorders	7 (35%)	16 (9%)	**<0.01**
Chronic kidney disease	0 (0%)	8 (5%)	1.00
Pulmonary Disorders	4 (20%)	25 (15%)	0.51
Severity			
Revised Atlanta Class, n (%)			0.63
Mild	3 (13%)	16 (9%)	
Moderately Severe	7 (35%)	75 (44%)	
Severe	10 (50%)	80 (47%)	
Ranson's score ≥3, n(%)	8 (40%)	69 (40%)	1.00
BISAP score ≥3, n(%)	5 (25%)	34 (20%)	0.57
ICU admission, n (%)	7 (35%)	16 (9%)	**<0.01**

BISAP, Bedside index of severity in acute pancreatitis; ICU, Intensive Care Unit.

Table 6. Multivariate logistic regression analysis for all-cause one-year mortality among survivors from an acute pancreatitis event

	Univariate analysis			Multivariate analysis		
Variable	**OR**	**%95 CI**	***p***	**OR**	**%95 CI**	***p***
Age ≥ 80 years old	3.528	1.371 – 9.079	**< 0.01**	2.984	1.116 – 7.980	**0.03**
Mental and Neurological Disorders	5.216	1.820 – 4.954	**< 0.01**	4.424	1.480 – 13.226	**< 0.01**
Heart failure	3.061	1.061 – 8.834	**0.04**	2.566	0.836 – 7.876	0.10
ICU admission	1.616	0.332 – 7.874	0.55	-	-	-

ICU, Intensive Care Unit.

3. Results

Among 436 patients with diagnosis of AP, 206 of them were over 65 years old and included in the study. Octogenarian group consisted of 60 patients and 146 patients were in the nonoctogenarian group. One hundred and fifteen patients (56%) were female and the mean age was 76.1±7.3 years. The most common cause of AP was gallstone related disorders in 72% of octogenarians and 80% of individuals under 80 years of age (p=0.19). While DM was less common in octogenarians (10% vs 25%, p=0.01), other comorbidities didn't differ between groups (for all, p>0.05) (Table 1).

Among laboratory parameters upon admission, hemoglobin (12.7±2.1 g/dL vs 13.4±1.9 g/dL, p=0.02), hematocrit (38.0±6.3 vs 39.9±5.6, p=0.03), ALT (147±17 U/L vs 228±16 U/L, p < 0.01) and amylase (1430±131 U/L vs 1785±96 U/L, p < 0.01) were lower in octogenarians. Similarly, hemoglobin (11.5±2.0 g/dL vs 12.1±1.7 g/dL, p=0.03), hematocrit (34.3±5.9 vs 36.3±5.0, p=0.02) and ALT (124±43.1 U/L vs 138±15.8U/L, p < 0.01) were different between groups at 48 hours of admission. Other laboratory parameters didn't differ between groups (Table 2).

According to the revised Atlanta classification, there was no difference between octogenarians and nonoctogenarians (p=0.22). Patients who had SAP consisted of 13% of patients over 80 years old and 16% of patients under 80 years old. Forty-seven percent of patients in octogenarian group and 41% of nonoctogenarians had a Ranson's score ≥3 (p=0.46). Thirty-one percent of octogenarians and 23% of nonoctogenarians had a BISAP score ≥3 (p=0.17). Eight patients (13%) of octogenarians and 16 patients (11%) of nonoctogenarians were admitted to ICU (p=0.63). Five patients (8.3%) in octogenarian group and 10 patients (6.8%) in nonoctogenarian group died during hospitalization for AP (p=0.77). After discharge of survivors, one-year mortality was 20% in octogenarian group and 6.6% in nonoctogenarian group (p<0.01) (Table 1).

Death during hospitalization due to AP was seen in 7.3% of geriatric subjects. The median age was 75 years and two-thirds of them was male. While CKD was more common in mortal patients (33% vs 4%, p<0.01), none of the patients who had neurological disorders died during hospitalization (Table 3). At the univariate analysis, a higher in-hospital mortality rate was associated with severe AP according to revised Atlanta classification (OR: 36.211; 95% CI: 9.378–139.815; p <0.01), Ranson's score ≥3 (OR: 4.071; 95% CI: 1.251–13.254; p=0.02), BISAP score ≥3 (OR: 25.333; 95% CI: 5.487 – 116.059; p < 0.01), ICU admission (OR: 37.654; 95% CI: 10.517–134.807; p <0.01) and CKD (OR: 11.437; 95% CI: 3.161–41.381; p <0.01) (Table 4). Multivariate analysis confirmed that severe AP according to the revised Atlanta classification (OR: 24.940; 95% CI: 1.013–95.609; p=0.01), ICU admission (OR: 10.244; 95% CI: 1.399–74.990; p=0.01) and CKD (OR: 9.840; 95% CI: 1.013–95.609; p=0.04) were independent risk factors for in-hospital mortality (Table 4).

Of the 191 patients who survived after the AP event, a total of 20 patients (10.5%) died within one year. Among them, 11 patients (20%) was in octogenarian group and 9 patients (6.6%) was in nonoctogenarian group. The median age of dead patients was 82 years (range 68–92) and 60% of them were female. The incidence of heart failure (30% vs 12%, p=0.01) and neurological disorders (35% vs 9%, p <0.01) was higher among dead cases compared to living cases. One year mortality was not related to the severity of AP event, it was more common among patients who had admitted to ICU during hospitalization for AP (35% vs 9%, p <0.01). A comparison of demographic and clinical factors between dead and living patients after hospital discharge is presented in Table 5. In multivariate regression analysis, to be in octogenarian group (OR: 2.984; 95% CI: 1.116–7.980; p =0.03) and to have neurological disorders (OR: 4.424; 95% CI: 1.480–13.226; p <0.01) were independent factors related to one-year mortality (Table 6).

4. Discussion

There is scarce data in the literature on the outcomes of AP in octogenarians and the impact of AP on the short- and long-term survival of octogenarians. In the present study we demonstrated that in-hospital mortality rate and AP severity were similar in octogenarians and younger ones. On the other hand, one-year mortality was higher in octogenarians and there was no impact of the AP severity on one-year mortality.

The major etiological factor was found as gallstones among our study population. A study from Europe reported an increased incidence of AP among patients aged over 65 years and, cholelithiasis was the main factor in elderly, especially in Mediterranean area (10). In a recent study from China, the main etiology was biliary in 88.6% of patients over

80 years old and, 79.6% of patients aged between 60-80 years old (3). Another study comparing octogenarian AP patients with AP patients aged between 65 and 80 years old from Turkiye showed that biliary etiology was responsible from 74.8% of octogenarians and 81.0% of nonoctogenarians (11). Mentioned study also showed that while neurological disorders were more common, DM was less common among octogenarian patients with AP. These findings were comparable with our results.

Acute pancreatitis is a common medical emergency, and older patients have unique features related to AP. Because their response to treatment may differ from young adults and, the presence of several comorbidities and frailty lead to vulnerability to organ failures and make treatment more difficult. It was demonstrated in a meta-analysis including 194,702 AP patients, a continuous, linear increase in the incidence of severe AP and mortality up to 60 years old with a rate of 0.193%/year and 0.086%/year, respectively (12). In the aforementioned study, while a rapid increase in mortality rate was found over 60 years old, severity of AP remained in linear slightly elevated pattern. The authors concluded that higher rate of comorbidities in geriatric population may explain the rapid increase in mortality. A national database study of 184,763 patients with biliary AP showed that 41% of cases were in the elderly group, and SAP and mortality showed an age-related increase in elderly cases, with higher rates in cases over 85 years of age (13).

Many studies have reported that higher mortality rate is evident in elderly (5, 6, 14). A recent multicenter study from Turkiye demonstrated a mortality rate of 1.6% in patients with AP (15). In our study, in-hospital mortality related to AP was 8.3% in octogenarians and 6.8% in nonoctogenarians. As expected, we had higher mortality rate in our elderly population. Di Mauro et al. found mortality rate among octogenarian patients with AP as 8% and, only 25% of deceased patients had biliary etiology (16). Similarly, Sahiner et al. found no difference in-hospital mortality between octogenarians (7.1%) and nonoctogenarians (6.5%) (11). On the contrary, Yu et al. showed that mortality related to AP was 16.3% in patients over 80 years-old and 8.9% in patients between 60-80 years-old and, to be over 80 years old and organ failure were independent predictors of mortality in elderly AP patients(3).

Disease severity is the main predictor of poor outcome in AP. Several prognostic indices or classifications have been used to predict mortality and morbidity. As mentioned earlier, age is one of determinants in most indices. Of them, the most widely used are Ranson's criteria, BISAP and modified Atlanta classification. Several studies have reported higher Ranson's scores or BISAP scores in octogenarian patients compared to nonoctogenarians and younger adults (17, 18). In-hospital mortality related to AP is mostly because of organ dysfunction which involved in modified Atlanta classification. We demonstrated that severe AP according to the Atlanta classification was an independent predictor of death during AP event. On the other hand, Ranson's criteria and BISAP were unsatisfactory to predict mortality in multivariate analysis. Therefore, it is reasonable to prefer the revised Atlanta classification, which does not include an age component, in predicting disease severity in elderly.

Another predictor of in-hospital mortality was preexisting CKD. Acute kidney injury (AKI) is a serious complication of AP, with an incidence reaching up to 70% in patients with severe AP (19). Renal impairment and electrolyte disturbances significantly increases the risk of mortality, especially in patients who had preexisting CKD. Mortality was seen in one-third of patients who had CKD and only 4% of patients who had normal renal functions. Interestingly, none of AP patients with CKD dead died after hospital discharge. Instead, mortality rate was higher in patients who had heart failure and neurological disorders. Intensive care unit admission for AP event was also higher among dead patients that die after discharge. In multivariate analysis, age over 80, and neurological disorders were predictors of one-year mortality after discharge of an AP event. This may be explained by the fact that most patients who had preexisting neurological disorders or heart failure are monitored

closely in the ICU during the AP event. Moreover, in the current study it was demonstrated that one-year all cause mortality was not related with index AP event. Instead, it was closely related with age and neurological disorders. It is well known that mental and neurological disorders like stroke, Parkinson's disease or dementia are more common among older patients and, the mortality rate increases in these patients (20-22). Our one-year mortality results can be explained by this fact.

There are some limitations of the current study. First, because of the single-center retrospective feature of the study, potential biases could derive from the study design. All data were retrospectively collected, and hence, some data on demographic and clinical features might be missing and/or inaccurate. Due to single-center design, patient number might be insufficient to judge on predictive factors for mortality, and larger-scale prospective studies are needed. We don't have a group of adult patients under 65 years old, so we couldn't compare geriatric patients with other adults. Therefore, our results cannot be generalized to all adult AP patients. Finally, we also don't have an octogenarian control group without AP for the assessment of factors causing long term mortality in octogenarians.

Consequently, we investigated demographic and clinical factors affecting severity of AP, AP related mortality and long-term mortality in the current study. Our results showed that to be over 80 years old doesn't influence clinical course of AP among older subjects. Furthermore, our analysis revealed that acute pancreatitis had no impact on long-term survival if treated appropriately. Comorbidities should be taken into account for poor short- and long-term outcomes in elderly.

REFERENCES

1. https://data.tuik.gov.tr/Bulten/Index?p=Hayat-Tablolari-2020-2022-49726. (Access on: December 22, 2023)
2. Papapostolou S, Dinh DT, Noaman S, Biswas S, Duffy SJ, Stub D, et al. Effect of Age on Clinical Outcomes in Elderly Patients (>80 Years) Undergoing Percutaneous Coronary Intervention: Insights From a Multi-Centre Australian PCI Registry. Heart Lung Circ. 2021;30(7):1002-13.
3. Yu B, Li N, Li J, Wan J, He W, Zhu Y, et al. The Clinical Characteristics of Acute Pancreatitis in Gerontal Patients: A Retrospective Study. Clin Interv Aging. 2020;15:1541-53.
4. Nesvaderani M, Eslick GD, Vagg D, Faraj S, Cox MR. Epidemiology, aetiology and outcomes of acute pancreatitis: A retrospective cohort study. Int J Surg. 2015;23(Pt A):68-74.
5. Quero G, Covino M, Fiorillo C, Rosa F, Menghi R, Simeoni B, et al. Acute pancreatitis in elderly patients: a single-center retrospective evaluation of clinical outcomes. Scand J Gastroenterol. 2019;54(4):492-8.
6. Baeza-Zapata AA, Garcia-Compean D, Jaquez-Quintana JO, Collaborators. Acute Pancreatitis in Elderly Patients. Gastroenterology. 2021;161(6):1736-40.
7. Goldacre MJ, Roberts SE. Hospital admission for acute pancreatitis in an English population, 1963-98: database study of incidence and mortality. BMJ. 2004;328(7454):1466-9.
8. Koziel D, Gluszek-Osuch M, Suliga E, Zak M, Gluszek S. Elderly persons with acute pancreatitis - specifics of the clinical course of the disease. Clin Interv Aging. 2019;14:33-41.
9. Lee DW, Cho CM. Predicting Severity of Acute Pancreatitis. Medicina (Kaunas). 2022;58(6).
10. Roberts SE, Morrison-Rees S, John A, Williams JG, Brown TH, Samuel DG. The incidence and aetiology of acute pancreatitis across Europe. Pancreatology. 2017;17(2):155-65.
11. Sahiner ES, Acehan F, Inan O, Aslan M, Altiparmak E, Ates I. Characteristics and clinical outcomes of patients over 80 years of age with acute pancreatitis. Eur Geriatr Med. 2022;13(4):1013-22.
12. Marta K, Lazarescu AM, Farkas N, Matrai P, Cazacu I, Ottoffy M, et al. Aging and Comorbidities in Acute Pancreatitis I: A Meta-Analysis and Systematic Review Based on 194,702 Patients. Front Physiol. 2019;10:328.
13. Patel K, Li F, Luthra A, Hinton A, Lara L, Groce R, et al. Acute Biliary Pancreatitis is Associated With Adverse Outcomes in the Elderly: A Propensity Score-Matched Analysis. J Clin Gastroenterol. 2019;53(7):e291-e7.

14. Carvalho JR, Fernandes SR, Santos P, Moura CM, Antunes T, Velosa J. Acute pancreatitis in the elderly: a cause for increased concern? Eur J Gastroenterol Hepatol. 2018;30(3):337-41.
15. Koksal AS, Tozlu M, Sezgin O, Oguz D, Kalkan IH, Altintas E, et al. Acute pancreatitis in Turkey: Results of a nationwide multicenter study. Pancreatology. 2023.
16. Di Mauro D, Wijesurendere CN, Attanasio A, Fulgenzi CAM, Elkhuffash I, Ricciardi E, et al. Outcome of acute pancreatitis in octogenarians: A retrospective study. JGH Open. 2020;4(3):461-5.
17. Asfuroglu Kalkan E, Kalkan C, Kacar S, Barutcu S, Yuksel M, Gucbey Turker O, et al. Similarities and Differences Between Gerontal and Young Patients with Acute Pancreatitis: Evaluation of Clinical Characteristics and Outcomes. Turk J Gastroenterol. 2022;33(10):874-84.
18. Kayar Y, Dertli R, Konur S. Clinical outcomes of acute pancreatitis in elderly patients: An experience of single tertiary center. Pancreatology. 2020;20(7):1296-301.
19. Wajda J, Dumnicka P, Maraj M, Ceranowicz P, Kuzniewski M, Kusnierz-Cabala B. Potential Prognostic Markers of Acute Kidney Injury in the Early Phase of Acute Pancreatitis. Int J Mol Sci. 2019;20(15).
20. Mackenbach JP, Karanikolos M, Looman CW. The rise of mortality from mental and neurological diseases in Europe, 1979-2009: observational study. BMC Public Health. 2014;14:840.
21. Czira ME, Baune BT, Roesler A, Pfadenhauer K, Trenkwalder C, Berger K. Association between neurological disorders, functioning, and mortality in the elderly. Acta Neurol Scand. 2014;130(5):283-91.
22. Dumurgier J, Tzourio C. Epidemiology of neurological diseases in older adults. Rev Neurol (Paris). 2020;176(9):642-8.

Ethic

Ethics Committee Approval: The study was approved by Tokat Gaziosmanpasa University Interventional Clinical Research Ethical Committee (Decision no: 22-KAEK-073, Date: 31.03.2022).

Informed Consent: The authors declared that it was not considered necessary to get consent from the patients because the study was a retrospective data analysis.

Authorship Contributions: Authorship Contributions: Idea/concept: A.S. Design: H.A, A.S. Data Collection: H.A, A.S. Data Processing: H.A. Analysis/Comment: H.A, A.S. Literature research/review: H.A, A.S. Writing: A.S.

Copyright Transfer Form: Copyright Transfer Form was signed by all authors.

Peer-review: Internally peer-reviewed.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support