Similarities and Differences Between Gerontal and Young Patients with Acute Pancreatitis: Evaluation of Clinical Characteristics and Outcomes

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ABSTRACT

Background: Acute pancreatitis is an abrupt inflammatory disease of the exocrine pancreas and it can occur in different severities. It is becoming more common and more mortal in the gerontal population. The aim of our study was to explore the similarities and differences between young and gerontal patients with acute pancreatitis, with a special emphasis on patients over 80 years of age.

Methods: Medical records of patients (n = 1150) with acute pancreatitis were analyzed retrospectively. Several scoring systems including Bedside index for severity in acute pancreatitis, Ranson’s score, Harms score, acute pancreatitis score, Acute Physiologic and Chronic Health Evaluation, Balthazar Grade, Glasgow score, and Japanese severity score were applied at admission. Patients were divided into 3 groups; group I, young group (n = 706), if they were aged < 65 years; group II, older group (n = 338), if they were aged ≥ 65 years to < 80 years; group III, octogenarian group (n = 106), if they were aged ≥ 80 years.

Results: In total, 1150 patients with acute pancreatitis were analyzed. Octogenarian group (n = 42, 39.6%) showed a more severe acute pancreatitis compared to patients in group I (n = 15, 2.1%) and II (n = 50, 14.8%, P < .001). Complications were more common in patients in group III (P < .001). Mortality rate was higher in patients in group III (n = 53, 50.0%) compared to group I (n = 8, 1.1%) and group II (n = 53, 15.7%) (P < .001).

Conclusion: Gerontal patients with acute pancreatitis tend to have more severe disease and systemic and local complications. Mortality rates were higher in older patients compared to younger patients.

Keywords: Acute pancreatitis, gerontal patients, severe disease

INTRODUCTION

Acute pancreatitis (AP) is an abrupt inflammatory disease of the exocrine pancreas causing acinar cell injury with an unpredictable outcome. It is also associated with inflammatory response. Acute pancreatitis can occur in different severities and may present from clinically mild and severe edematous pancreatitis to severe inflammation that can result in death. Acute pancreatitis is associated with substantial morbidity and mortality causing repeated hospitalizations and impairs long-term quality of life. Acute pancreatitis is seen with increasing frequency and more mortally in the gerontal population. Gullo et al. found that although the mortality rate did not increase, the severity of the disease increased in older patients. In many studies, it has been determined that the age factor is directly related to the need for intensive care unit (ICU) admission and mortality. Gerontal patients, especially those over 80 years of age and defined as octogenarians, often present with a severe form of AP and complications such as infected pancreatic necrosis and organ failure that carries a risk of death. In some studies, the situation in local complications was reported different, and no significant difference was found between the gerontal and young populations. Thus, the goals of this research were to explore similarities and differences between gerontal and young patients with AP with a particular emphasis on patients over 80 years of age by means of clinical outcomes. In this study, we studied elderly patients with AP by comparing them with young adult patients in order
Acute pancreatitis is defined: It was calculated from the
18
and by means of the abovementioned scoring systems.
medications, in-hospital mortality, length of hospital stay,
compared by means of complications, co-morbidities,
were aged
80 years or older. Three groups were then
≥
80 years or older. Three groups were then
≥
65 years to
80 years
and large-scale study for the early determination of
mortality in AP.21
b. Ranson’s score: It contains 11 parameters. Five
parameters are evaluated at the time of applica-
tion and 6 parameters are evaluated within the first
48 hours of hospitalization.22
c. Harmless acute pancreatitis score: It consists of
3 parameters and is used to identify patients who
may not require intensive therapy.23
d. Acute Physiology and Chronic Health Evaluation: It
consists of 15 parameters evaluated at the time of
admission to the hospital.24
e. Balthazar Grade: The Balthazar grading scale is a
scoring system based on tomographic imaging of
the pancreas and used to prognosticate the sever-
ity of AP.25

Material and Methods
Medical records of patients (n = 1150) with AP were
analyzed retrospectively. Demographic data including
age and sex were recorded. Severity and complications
of AP, etiology, medications, co-morbidities, biochemi-
cal parameters, and computerized tomography findings
were obtained from medical records. Other parameters
investigated were mortality rate and duration of hos-
pital stay. Several scoring systems including Bedside
index for severity in acute pancreatitis (BISAP), Ranson’s
score, Harmless acute pancreatitis score (HAPS), Acute
Physiology and Chronic Health Evaluation (APACHE II),
Balthazar Grade, Glasgow score, and Japanese severity
score (JSS) were applied at admission in order to estimate
which one best predicts the severity and prognosis of AP.
Clinical and demographic data were collected within the
first 48 hours after hospital admission. Patients under
18 years of age, patients with active terminal malignan-
cies, pregnant patients, patients with clinical symp-
toms before 72 hours, patients with metastatic tumors,
acquired immunodeficiency syndrome, chronic renal fail-
ure, late stage of liver cirrhosis, active tuberculosis, resis-
tant heart failure, immunosuppressive therapy, patients
who were diagnosed with chronic pancreatitis, and whose
demographic and laboratory parameters could not be
reached were excluded from the study. Patients diag-
nosed as having AP were divided into 3 groups accord-
ting to their ages at the time of diagnosis. Group I, young





Main Points

• The number of elderly patients with severe acute
pancreatitis (AP) was higher than younger patients.
• Gerontal patients with AP tend to have more severe
disease, major multiple drug use, and systemic and local
complications.
• Disease severity, presence of local/systemic complications,
major polypharmacy, and increase in serum creatinine and
C-reactive protein levels were risk factors in predicting
mortality in octogenarian patients.
The present study was established in accordance with Helsinki Declaration, and the ethics committee of the Ministry of Health, Ankara City Hospital has approved the research protocol (number: E1-20-660).

**Statistical Analysis**

Analysis of the data was made in Statistical Package for the Social Sciences version 23 (IBM Corp.; Armonk, NY, USA). A descriptive statistical analysis was performed for baseline characteristics. Descriptive statistics are shown as mean ± standard deviation for variables with normal distribution and as median (min-max) for variables with non-normal distribution. The significance of the difference between the means in the presence of 2 groups was calculated with the t-test, and the significance of the difference between the median values was calculated with the Mann–Whitney test. In cases where there are more than 2 groups, the significance of the difference in terms of means was researched with the analysis of variance test, and the significance of the difference in terms of median values was researched with the Kruskal–Wallis test. When there were 2 groups, for variables showing statistical significance, appropriate post hoc tests were used. Receiver operating characteristic (ROC) analysis was used to determine whether BISAP, HAPS, BALTAZAR, RANSON, JSS, GLASGOW, and APACHE score variables were distinctive for the variables of mortality, need for intensive care, systemic disease, and local complications. For the distinctive score values, the cut-off value was determined according to the Youden index (i.e., the value at the highest point of sensitivity and selectivity was accepted as the cut-off). For sensitivity and selectivity, CIs are given for the determined cut-off value. Multivariate logistic regression analysis was performed to determine the independent risk factors affecting mortality in those aged >80 years. In multivariate logistic regression analysis, as a result of univariate analysis, the affecting parameters were determined and taken as candidate variables for multivariate analysis, and the resulting model was obtained by testing with the backward method. The risk coefficients and CIs of the significant variables are indicated. Odds ratios (OR) and CIs for significant parameters were determined. A P-value less than .05 was considered significant.

**RESULTS**

In total, 1150 patients with AP were analyzed in 3 groups (group I: n = 706, <65 years of age, group II: n = 338, 65–80 years, and group III: n = 106, >80 years). Demographic characteristics, disease severity, complications, medication-associated comorbidities, and detailed results of investigated parameters were illustrated in Table 1. The mean age of the patients was 57.85 ± 16.7 years, and 581 (50.5%) were men. As for etiologic causes, biliary causes were found in 89.6% (n = 95) of patients in group III, 72.2% (n = 244) in group II, and 47.6% (n = 336) in young patients (P < .001). While 101 (14.3%) of patients in group I had hypertriglyceridemia as a cause of AP, 32 (9.5%) patients had alcohol-related AP in group I and 7 (6.6%) of patients in group II were diagnosed as having idiopathic AP. Elderly patients aged >80 years or older (n = 42, 39.6%) showed a more severe AP compared to patients in group I (n = 15, 2.1%) and II (n = 50, 14.8%, P < .001). Major polypharmacy was more common in group III (n = 77, 72.6%) compared to patients in groups I and II (P < .001). Both systemic and local complications were more common in patients in group III compared to groups I and II (P < .001). Mortality rate was higher in patients in group III (n = 53, 50%) compared to group I (n = 8, 1.1%) and group II (n = 53, 15.7%) (P < .001). Differences in patients with and without mortality in groups II and III were shown in Tables 2 and 3. There were no differences by means of gender and etiology of AP in group II and age, gender, and etiology of AP in group III. When surviving patients were compared in groups II and III, there were no differences in gender, etiology of AP, systemic and local complications, and ICU admission (Table 4). In multivariate analysis, presence of severe AP (OR: 26.76, 95% CI: 3.16–226.37, P < .003), acute necrotic collection and walled-off necrosis (OR: 3.45, 95% CI: 1.01–11.78, P < .048), major polypharmacy (OR: 1.18 95% CI: 0.42–3.66, P < .043), creatinine >2.4 mg/dL (OR: 2.15, 95% CI: 0.92–20.6, P < .031), and C-reactive protein (CRP) >40 (OR: 1.1, 95% CI: 1–2.79, P < .001) were found as independent factors affecting mortality in group III (Table 5). All scoring systems used in this study were capable of predicting mortality; however, APACHE predicted mortality with a sensitivity of 90% (95% CI: 80–96) and specificity of 92% (95% CI: 82–97) (Table 6). The ROC analysis of the scoring systems used to determine mortality in the Octogenarian age group is given in Figure 1.

**DISCUSSION**

In this study, we carried out a retrospective analysis on gerontal and octogenarian patients with AP by comparing demographic, clinical, and laboratory findings at the onset in 3 different age groups. Patients aged <65 years
Table 1. Demographic, Clinical Characteristics, and Investigated Laboratory Parameters and Results of Scoring Systems in Patients Aged Over 65 Years and 80 Years

|                      | All Patients (n = 1150) | <65 (n = 706) | 65-80 (n = 338) | ≥80 (n = 106) | P     |
|----------------------|-------------------------|---------------|-----------------|---------------|-------|
| **Age**              |                         |               |                 |               |       |
|                      | 57.85 ± 16.76           | 47.62 ± 12.25 | 70.51 ± 4.15    | 85.73 ± 3.75  | <.001 |
| **Gender (F/M)**     |                         |               |                 |               |       |
| Absent               | 541 (47%)               | 507 (71.8%)   | 32 (9.5%)       | 2 (1.9%)      | <.001 |
| Minor                | 411 (35.8%)             | 153 (21.7%)   | 231 (68.3%)     | 27 (25.5%)    | <.001 |
| Major                | 198 (17.2%)             | 46 (6.5%)     | 75 (22.2%)      | 77 (72.6%)    | <.001 |
| **Polypharmacy**     |                         |               |                 |               |       |
| Absent               | 541 (47%)               | 507 (71.8%)   | 32 (9.5%)       | 2 (1.9%)      | <.001 |
| Minor                | 411 (35.8%)             | 153 (21.7%)   | 231 (68.3%)     | 27 (25.5%)    | <.001 |
| Major                | 198 (17.2%)             | 46 (6.5%)     | 75 (22.2%)      | 77 (72.6%)    | <.001 |
| **Severity**         |                         |               |                 |               |       |
| Mild AP              | 658 (57.2%)             | 509 (72.1%)   | 135 (39.9%)     | 14 (13.2%)    | <.001 |
| Moderately severe AP | 385 (33.5%)             | 182 (25.8%)   | 153 (45.3%)     | 50 (47.2%)    | <.001 |
| Severe AP            | 107 (9.3%)              | 15 (2.1%)     | 50 (14.8%)      | 42 (39.6%)    | <.001 |
| **Etiology**         |                         |               |                 |               | <.001 |
| Biliary cause        | 675 (58.7%)             | 336 (47.6%)   | 244 (72.2%)     | 95 (89.6%)    |       |
| Alcohol-induced      | 105 (9.1%)              | 72 (10.2%)    | 32 (9.5%)       | 1 (0.9%)      |       |
| Post-ERCP            | 45 (3.9%)               | 33 (4.7%)     | 11 (3.3%)       | 1 (0.9%)      |       |
| Hypertriglyceridemia | 105 (9.1%)              | 101 (14.3%)   | 4 (1.2%)        | 0             |       |
| Hypercalcemia        | 7 (0.6%)                | 2 (0.3%)      | 4 (1.2%)        | 1 (0.9%)      |       |
| Autoimmune pancreatitis | 19 (1.7%)              | 19 (2.7%)     | 0               | 0             |       |
| Idiopathic           | 109 (9.5%)              | 84 (11.9%)    | 18 (5.3%)       | 7 (6.6%)      |       |
| Medications          | 20 (1.7%)               | 11 (1.6%)     | 9 (2.7%)        | 0             |       |
| Pancreatic duct injury | 20 (1.7%)              | 14 (2.0%)     | 6 (1.8%)        | 0             |       |
| Anatomic or physiologic pancreatic anomalies | 27 (2.3%) | 21 (3%) | 5 (1.5%) | 1 (0.9%) |       |
| Biliary obstruction (IPMN, Pancreas Ca) | 18 (1.6%) | 13 (1.8%) | 5 (1.5%) | 0 |       |
| Mortality            | 114 (9.9%)              | 8 (1.1%)      | 53 (15.7%)      | 53 (50%)      | <.001 |
| Duration of Hospitalization | 7.75 ± 4.3 | 5.58 ± 3.44 | 9.86 ± 4.67 | 15.51 ± 8.25 | <.001 |
| ICU/EICU admission   | 133 (11.6%)             | 18 (2.5%)     | 63 (18.6%)      | 52 (49.1%)    | <.001 |
| **Systemic complications** | 115 (10%) | 17 (2.4%) | 52 (15.4%) | 46 (43.4%) | <.001 |
| Pleural effusion      | 76 (6.6%)               | 10 (1.4%)     | 36 (10.6%)      | 30 (28.3%)    |       |
| Vascular complication | 11 (0.9%)               | 2 (0.3%)      | 5 (1.47%)       | 4 (3.6%)      |       |
| Acute respiratory distress syndrome | 31 (2.69%) | 4 (0.6%) | 15 (4.43%) | 12 (11.3%) |       |
| Renal insufficiency  | 40 (3.4%)               | 5 (0.7%)      | 19 (5.6%)       | 16 (15.1%)    |       |
| Coronary artery disease | 32 (2.78%)            | 5 (0.7%)      | 16 (4.7%)       | 11 (10.3%)    |       |
| Multiorgan failure   | 29 (2.5%)               | 4 (0.6%)      | 15 (4.43%)      | 10 (9.43%)    |       |
| **Local complications** | 507 (44.1%) | 212 (30%) | 163 (48.2%) | 78 (73.5%) | <.001 |
| Acute peripancreatic fluid collection | 397 (34.5%) | 192 (27.2%) | 141 (41.7%) | 54 (60.9%) |       |
| Pancreatic pseudocyst | 89 (7.73%)             | 36 (5.1%)     | 36 (10.7%)      | 17 (16%)      |       |
served as a control group. Moreover, we analyzed factors that might affect mortality and used various risk scoring systems in order to predict mortality. Biliary lithiasis is the most common etiology of AP followed by alcohol-induced AP in all patients. However, hypertriglyceridemia was more frequent in younger patients compared to older patients, and idiopathic pancreatitis is in the third place in patients over 80 years (octogenarian) of age. Xin et al investigated 169 patients with severe AP and found that biliary pancreatitis was the most common reason in all patients, but it was more prevalent in the elderly (64.9% vs 37.3%, \( P = .0006 \)). In the study conducted by Koziel et al in which 963 patients with a diagnosis of AP were examined, it was determined that cholelithiasis is one of the most important etiological factors of AP among elderly patients. This has been attributed to physiopathological conditions that increase with age, such as lithogenic bile, delayed gallbladder emptying, and dilation of the bile duct. Classification of the severity of AP is important in terms of providing optimal treatment, identifying patients who will be hospitalized in ICUs, and predicting local and systemic complications that may occur. Elderly patients with AP are at higher risk of serious complications such as pancreatic necrosis and related deaths. In the current study, the number of elderly patients with severe AP was higher than younger patients. Losurdo et al investigated 42 gerontal patients (65-102 years) and found that elderly patients displayed more severe Atlanta scores and concluded that elderly patients had a more severe course of AP but there were no differences in mortality or number of local complications. Medications may be one of the etiologic factors of AP in approximately 10% due to polypharmacy. In our study, older patients were using more medications than the controls. Polypharmacy was observed in 72.6% of patients aged \( > 80 \) years and 22.2% of patients aged between 65 and 80 years. However, number of patients with polypharmacy was lower in younger patients (n = 198, 17.2%, \( P < .001 \)). It has been reported that local complications such as abscess, pseudocyst, and

| Demographic, Clinical Characteristics, and Investigated Laboratory Parameters and Results of Scoring Systems in Patients Aged Over 65 Years and 80 Years (Continued) | All Patients (n = 1150) | <65 (n = 706) | 65-80 (n = 338) | ≥80 (n = 106) | \( P \) |
|---|---|---|---|---|---|
| Acute necrotic collection and walled-off necrosis | 92 (8%) | 11 (1.6%) | 42 (12.4%) | 39 (36.8%) |  
| Comorbidities | 549 (47.7%) | 165 (23.3%) | 286 (84.6%) | 98 (92.4%) | <.001 |
| Cardiovascular comorbidities | 219 (19%) | 65 (9.2%) | 109 (32.2%) | 45 (42.4%) |  
| Pulmonary comorbidities | 66 (5.7%) | 3 (0.4%) | 28 (8.3%) | 35 (33.1%) |  
| Renal comorbidities | 186 (16.1%) | 46 (6.5%) | 91 (26.9%) | 49 (46.2%) |  
| Neurological | 59 (5.1%) | 2 (0.3%) | 18 (5.3%) | 29 (27.3%) |  
| Diabetes | 201 (17.4%) | 84 (11.8%) | 68 (20.1%) | 49 (46.2%) |  
| Hypertension | 268 (23.3%) | 96 (13.6%) | 94 (27.8%) | 78 (73.8%) |  
| Fatty liver | 229 (19.9%) | 125 (17.7%) | 73 (21.5%) | 31 (29.2%) |  
| BISAP | 1 (0-5) | 0 (0-4) | 1 (0-5) | 3 (2-5) | <.001 |
| HAPS | 0 (0-3) | 0 (0-3) | 1 (0-3) | 1 (0-3) | <.001 |
| Ranson | 2 (0-8) | 2 (0-8) | 2 (0-8) | 4 (1-8) | <.001 |
| APACHE-II | 2 (0-12) | 1 (0-12) | 4 (0-12) | 5 (2-12) | <.001 |
| Balthazar | 2 (0-8) | 1 (0-8) | 4 (1-10) | 6 (1-10) | <.001 |
| Glasgow | 1 (0-8) | 0 (0-4) | 2 (0-8) | 4 (2-8) | <.001 |
| JSS | 0 (0-9) | 0 (0-3) | 3 (1-9) | 4 (1-9) | <.001 |
| WBC (×10⁹/L) | 8.23 ± 4.05 | 8.55 ± 4.15 | 7.85 ± 3.89 | 7.32 ± 3.63 | <.001 |
| Creatinine (mg/dL) | 1.24 ± 0.78 | 1.09 ± 0.93 | 1.57 ± 1.22 | 1.76 ± 0.99 | <.001 |
| Albumin (g/dL) | 4.02 ± 1.38 | 4.09 ± 1.7 | 3.92 ± 0.6 | 3.83 ± 0.61 | .003 |
| C-reactive protein (mg/L) | 45.21 ± 33.52 | 38.33 ± 29.9 | 50.62 ± 43.9 | 73.94 ± 60.83 | <.001 |
walled-of necrosis do not increase in older patients compared to young patients; nevertheless, systemic complications are found to be increased in various studies.\textsuperscript{17,28} Kayar et al\textsuperscript{32} reported that the development of local and/or systemic complications was significantly higher in the elderly group and concluded that age and severity were independent risk factors in the development of systemic complications. In our study, both systemic and local complications were significantly encountered in older patients, especially in patients over the age of 80 years.

Although the mortality rate of severe AP has been reported to be as high as about 20%-25%,\textsuperscript{33} recent data indicated that the global mortality rate of patients with AP is predicted to be at 2%-5%.\textsuperscript{34} In our study, mortality rate was 9.9\% (n = 114) in the whole study population. However, older patients had a mortality rate of 50\% over the age of 80 and 15.7\% >65 years of age. These numbers are significantly higher compared to younger patients. In patients who died over the age of 80, duration of hospitalization, the presence of systemic/local complications, and severity of pancreatitis were different from patients who have survived. However, age, gender, presence or absence of polypharmacy, and etiology of pancreatitis were similar. In multivariate analysis of patients

| Table 2. Differences Between Patients aged 65-80 Years with and without Mortality | Mortality (n = 53) | No Mortality (n = 285) | P  |
|---------------------------------|------------------|----------------------|----|
| Age                             | 74.17 ± 3.64     | 69.83 ± 3.38         | <.001 |
| Gender (F/M)                    | 26/27 (49.1%/50.9\%) | 140/145 (49.1%/50.9\%) | .754 |
| Polypharmacy                     |                  |                      |    |
| Absent                           | 2 (3.8\%)        | 30 (10.5\%)          | <.001 |
| Minor                            | 29 (54.7\%)      | 202 (70.9\%)         | <.001 |
| Major                            | 22 (41.5\%)      | 53 (18.6\%)          | <.001 |
| Acute pancreatitis according to morphological features |                |                      |    |
| Edematous                        | 10 (18.9\%)      | 194 (68.1\%)         | <.001 |
| Necrotizing                      | 43 (81.1\%)      | 91 (31.9\%)          | <.001 |
| According to the severity, acute pancreatitis |            |                      |    |
| Mild                             | 1 (1.9\%)        | 134 (47\%)           | <.001 |
| Moderately                       | 12 (22.6\%)      | 141 (49.5\%)         | <.001 |
| Severe                           | 40 (75.5\%)      | 10 (3.5\%)           | <.001 |
| Etiology                         |                |                      |    |
| Biliary cause                    | 42 (79.2\%)      | 202 (70.9\%)         | .684 |
| Alcohol-induced                  | 3 (5.7\%)        | 29 (10.1\%)          |      |
| Post-ERCP                        | 1 (1.9\%)        | 10 (3.5\%)           |      |
| Hypertriglyceridemia             | 1 (1.9\%)        | 3 (1.05\%)           |      |
| Hypercalcemia                    | 1 (1.9\%)        | 3 (1.05\%)           |      |
| Autoimmune pancreatitis          | 0                | 0                    |      |
| Idiopathic                       | 4 (7.5\%)        | 14 (4.9\%)           |      |
| Medications                      | 0                | 9 (3.1\%)            |      |
| Pancreatic duct injury           | 0                | 6 (2.1\%)            |      |
| Anatomic or physiologic pancreatic anomalies | 1 (1.9\%) | 4 (1.4\%) |      |
| Biliary obstruction (IPMN, Pancreas Ca) | 0 | 5 (1.75\%) |      |
| Duration of Hospitalization      | 24.26 ± 14.54    | 7.19 ± 5.16          | <.001 |
| ICU/EICU admission               | 52 (98.1\%)      | 11 (3.85\%)          | <.001 |
| Recurrent acute pancreatitis (+/-) | 4/49 (7.5%/92.5\%) | 10/275 (3.5%/96.5\%) | .721 |
| Systemic complications           | 40 (75.4\%)      | 12 (3.1\%)           | <.001 |
| Pleural effusion                 | 26 (49\%)        | 10 (3.5\%)           |      |
| Vascular complication            | 2 (3.8\%)        | 3 (1.05\%)           |      |
| Acute respiratory distress syndrome | 7 (13.2\%) | 8 (2.8\%) |      |

| Table 2. Differences Between Patients aged 65-80 Years with and without Mortality (Continued) | Mortality (n = 53) | No Mortality (n = 285) | P  |
|---------------------------------|------------------|----------------------|----|
| Renal insufficiency             | 9 (16.9\%)       | 10 (3.5\%)           |      |
| Coronary artery disease         | 8 (15.1\%)       | 8 (2.8\%)            |      |
| Multiorgan failure              | 7 (13.2\%)       | 8 (2.8\%)            |      |
| Local complications             | 43 (81.1\%)      | 120 (42.1\%)         | <.001 |
| Acute peripancreatic fluid collection | 20 (37.7\%) | 121 (42.4\%) |      |
| Pancreatic pseudocyst           | 13 (24.5\%)      | 23 (8.1\%)           |      |
| Acute necrotic collection and walled-off necrosis | 17 (32\%) | 19 (6.6\%) |      |
| BISAP                           | 4 (1-5)          | 2 (1-4)              | <.001 |
| HAPS                            | 2 (0-3)          | 0 (0-3)              | <.001 |
| Ranson                          | 4 (1-8)          | 2 (2-8)              | <.001 |
| APACHE-II                       | 6 (2-12)         | 3 (2-6)              | <.001 |
| Balthazar                       | 4 (1-10)         | 3 (1-7)              | <.001 |
| Glasgow                         | 4 (2-8)          | 2 (2-6)              | <.001 |
| JSS                             | 4 (2-9)          | 3 (2-9)              | <.001 |
over the age of 80 years, presence of moderate/severe pancreatitis, systemic and local complications, major polypharmacy, serum creatinine level (>2.4 mg/dL), and CRP level (>40 mg/dL) remained significantly associated with mortality. Although age is an important risk factor for multisystem organ failure, data regarding increased mortality from AP in older patients remain controversial.\(^1\)\(^,\)\(^10\) Fan et al\(^3\)\(^5\) investigated 268 patients with AP and reported a mortality rate of 5.9% in younger patients and 21.3% in patients >70 years of age.\(^8\)\(^0\) The heterogeneity in the clinical presentation of AP and identifying severe AP patients are important concerns for clinicians. Therefore, an accurate risk scoring system at the onset of the disease is an important issue to guide disease prognosis and clinician treatment choices. We used 7 scoring systems in order to define which one best predicts the mortality in patients with AP over 80 years of age. Acute Physiology and Chronic Health Evaluation scoring system had a sensitivity of 90% and specificity of 92% with a cut-off value of 5.5 in predicting mortality. Teng et al retrospectively investigated 653 patients with AP by means of APACHE II score, Ranson’s, BISAP, HAPS, and

### Table 3. Differences Between Patients Aged 80 Years and Older with and Without Mortality

|                        | Mortality (n = 52) | No Mortality (n = 54) | P    |
|------------------------|-------------------|----------------------|------|
| Age                    | 85.98 ± 3.95      | 85.48 ± 3.56         | .58  |
| Gender (F/M)           | 21/31             | 24/30 (40.4%/59.6%)  | .284 |
| Polypharmacy           |                   |                      |      |
| Absent                 | 1 (1.9%)          | 1 (1.9%)             | .55  |
| Minor                  | 10 (19.2%)        | 17 (31.5%)           | .414 |
| Major                  | 41 (78.9%)        | 36 (66.6%)           | .082 |
| Acute pancreatitis     |                   |                      |      |
| according to           |                   |                      |      |
| morphological features |                   |                      |      |
| Edematous              | 15 (28.8%)        | 25 (46.3%)           | .137 |
| Necrotizing            | 37 (71.1%)        | 29 (53.7%)           | .07  |
| According to the       |                   |                      |      |
| severity, acute        |                   |                      |      |
| pancreatitis           |                   |                      |      |
| Mild                   | 1 (1.9%)          | 13 (24.1%)           | <.001|
| Moderately             | 13 (25%)          | 37 (68.5%)           | <.001|
| Severe                 | 38 (73.1%)        | 4 (7.4%)             | <.001|
| Etiology               |                   |                      |      |
| Biliary cause          | 48 (92.3%)        | 47 (87%)             | .91  |
| Alcohol-induced        | 0                 | 1 (1.8%)             |      |
| Post-ERCP              | 0                 | 1 (1.8%)             |      |
| Hypertriglyceridemia   | 0                 | 0                    |      |
| Hypercalcemia          | 0                 | 1 (1.8%)             |      |
| Autoimmune pancreatitis|                  |                      |      |
| Idiopathic             | 4 (7.7%)          | 3 (5.5%)             |      |
| Medications            | 0                 | 0                    |      |
| Pancreatic duct injury | 0                 | 0                    |      |
| Anatomic or            | 0                 | 1 (1.8%)             |      |
| physiologic pancreatic |                  |                      |      |
| anomalies              |                   |                      |      |
| Biliary obstruction    | 0                 | 0                    |      |
| (IPMN,Pancreas Ca)     |                   |                      |      |
| Duration of Hospitalization | 20.06 ± 13.97 | 10.86 ± 7.98         | <.001|
| ICU/EICU admission     | 49 (94.2%)        | 3 (5.5%)             | <.001|
| Recurrent acute        | 3/49              | 3/51 (5.8%/94.2%)    | .45  |
| pancreatitis (+/-)     | (5.6%/94.4%)      |                      |      |
| Systemic complications | 32 (61.5%)        | 14 (25.9%)           | <.001|
| Pleural effusion       | 21 (40.3%)        | 9 (16.6%)            |      |
| Vascular complication  | 2 (3.8%)          | 2 (3.7%)             |      |

### Table 3. Differences Between Patients Aged 80 Years and Older with and Without Mortality (Continued)

|                        | Mortality (n = 52) | No Mortality (n = 54) | P    |
|------------------------|-------------------|----------------------|------|
| Acute respiratory      |                   |                      |      |
| distress syndrome      | 6 (11.5%)         | 6 (11.1%)            |      |
| Renal insufficiency    | 8 (15.3%)         | 8 (14.8%)            |      |
| Coronary artery disease| 6 (11.5%)         | 5 (9.25%)            |      |
| Multiorgan failure     | 6 (11.5%)         | 4 (7.4%)             |      |
| Pleural effusion       | 21 (40.3%)        | 9 (16.6%)            |      |
| Local complications    | 42 (80.7%)        | 36 (66.6%)           | <.001|
| Acute peripancreatic   | 30 (57.7%)        | 24 (44.4%)           |      |
| fluid collection       |                   |                      |      |
| Pancreatic pseudocyst  | 11 (21.1%)        | 6 (11.1%)            |      |
| Acute necrotic         | 25 (48.1%)        | 14 (25.9%)           |      |
| collection and         |                   |                      |      |
| walled-off necrosis    |                   |                      |      |
| BISAP                  | 4 (1-5)           | 2 (1-5)              | <.001|
| HAPS                   | 2 (1-3)           | 1 (1-3)              | <.001|
| Ranson                 | 6 (2-8)           | 4 (2-8)              | <.001|
| APACHE-II              | 8 (2-12)          | 4 (2-8)              | <.001|
| Balthazar              | 6 (1-10)          | 4 (1-10)             | <.001|
| Glasgow                | 6 (2-8)           | 2 (2-6)              | <.001|
| JSS                    | 6 (2-9)           | 4 (2-9)              | <.001|
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Table 4. Differences Between Alive Patients Aged 65-80 Years and Over 80 Years

|                      | No Mortality (n = 285) Group 2 | No Mortality (n = 54) Group 3 | P     |
|----------------------|--------------------------------|------------------------------|-------|
| Age                  | 69.83 ± 3.38                   | 85.48 ± 3.56                 | <.001 |
| Gender (F/M)         | 140/145 (49.1%/50.9%)          | 24/30 (44.4%/55.6%)          | .945  |
| Polypharmacy         | Absent 30 (10.5%)               | 1 (1.9%)                     | <.001 |
|                      | Minor 202 (70.9%)               | 17 (31.5%)                   |       |
|                      | Major 53 (18.6%)                | 36 (66.6%)                   |       |
| Acute pancreatitis   | According to morphological features |                             |       |
|                      | Edematous 194 (68.1%)          | 25 (46.3%)                   | <.001 |
|                      | Necrotizing 91 (31.9%)          | 29 (53.7%)                   |       |
| According to the severity, acute pancreatitis |                     |                             |       |
| Mild                 | 134 (47%)                      | 13 (24.1%)                   | <.001 |
| Moderately           | 141 (49.5%)                    | 37 (68.5%)                   | <.001 |
| Severe               | 10 (3.5%)                      | 4 (7.4%)                     | .013  |
| Etiology             | Biliary cause 202 (70.9%)      | 47 (87%)                     | .75   |
|                      | Alcohol-induced 29 (10.1%)     | 1 (1.8%)                     |       |
|                      | Post-ERCP 10 (3.5%)            | 1 (1.8%)                     |       |
|                      | Hypertriglyceridemia 3 (1.0%)  | 0                             |       |
|                      | Hypercalcemia 3 (1.0%)         | 1 (1.8%)                     |       |
|                      | Autoimmune pancreatitis 0      | 0                             |       |
|                      | Idiopathic 14 (4.9%)           | 3 (5.5%)                     |       |
|                      | Medications 9 (3.1%)           | 0                             |       |
|                      | Pancreatic duct injury 6 (2.1%)| 0                             |       |
|                      | Anatomic or physiologic pancreatic anomalies 4 (1.4%) | 1 (1.8%) |       |
|                      | Biliary obstruction (IPMN, Pancreas Ca) 5 (1.75%) | 0 |       |
|                      | Biliary cause Duration of Hospitalization 7.19 ± 5.16 | 10.86 ± 7.98 | <.001 |
|                      | ICU/EICU admission 11 (3.85%)  | 3 (5.5%)                     | .46   |
|                      | Recurrent acute pancreatitis (+/-) 10/275 (3.5%/96.5%) | 3/51 (6.6%/94.4%) | .587  |
|                      | Systemic complications 12 (3.1%) | 14 (25.9%)                   | .431  |
|                      | Pleural effusion 10 (3.5%)     | 9 (16.6%)                    |       |
| Vascular complication | 3 (1.05%)                     | 2 (3.7%)                     |       |
| Acute respiratory distress syndrome | 8 (2.8%) | 6 (11.1%) |       |
| Renal insufficiency  | 10 (3.5%)                      | 8 (14.8%)                    |       |
| Coronary artery disease | 8 (2.8%) | 5 (9.25%) |       |
| Multiorgan failure   | 8 (2.8%)                       | 4 (7.4%)                     |       |
| Local complications  | 120 (42.1%)                    | 36 (66.6%)                   | .532  |
| Acute peripancreatic fluid collection | 121 (41.4%) | 24 (44.4%) | .102  |
| Pancreatic pseudocyst | 23 (8.1%)                      | 6 (11.1%)                    | .312  |
| Acute necrotic collection and walled-off necrosis | 19 (6.6%) | 14 (25.9%) | .244  |

SOFA scoring systems and reported that Ranson’s score and APACHE-II showed the highest sensitivity in predicting SAP (92.6% and 80.2% respectively), ICU admission (100%), and mortality (100%). SOFA and BISAP showed lowest sensitivity in predicting SAP (13.6%, 24.7% respectively), ICU admission (40.0%, 25.0% respectively) and mortality (50.0%, 25.5% respectively).36

The limitation of this study includes its retrospective nature, and selection bias is always an important issue in studies with a retrospective design. The use of 7 scoring systems in predicting the mortality rate and the number of patients in each group is large enough, and the investigation of multiple factors that might play a role in the prediction of mortality is the strength of our study.

Patients aged 80 years of age and over constitute a unique group compared to other adult groups due to many factors such as decreased cardiac reserve, multiple drug use, and relatively late diagnosis. Biliary complications are at the forefront in this patient group, as in other patient groups, however, according to the literature, cholecystectomy
Table 5. Factors Affecting Mortality in the Group Over 80 Years and Their Uni- and Multivariant Analysis

| Factors                                      | Univariate Analysis | Multivariate Analysis |
|----------------------------------------------|---------------------|-----------------------|
|                                              | OR      | 95% CI | P    | OR      | 95% CI | P    |
| Gender                                       | 1.53    | 0.70-3.32 | .285 |          |        |      |
| Etiology                                     | 1.05    | 0.84-1.31 | .677 |          |        |      |
| According to the severity, acute pancreatitis|         |         |      |          |        |      |
| Mild                                         | 0.54    | 0.24-1.22 | .138 |          |        |      |
| Moderately                                   | 4.69    | 0.56-39.52 | .015 | 1.65    | 0.19-14.12 | .04  |
| Severe                                       | 169.7   | 16.14-1769.59 | <.001 | 26.76   | 3.16-226.37 | .003 |
| Systemic complications                       | 70.23   | 18.14-271.91 | <.001 | 4.3-92.6 | .019  |      |
| Local complications                          |         |         |      |          |        |      |
| Acute peripancreatic fluid collection        | 2.09    | 0.96-4.57 | .065 |          |        |      |
| Pancreatic pseudocyst                        | 1.49    | 0.52-4.28 | .454 |          |        |      |
| Acute necrotic collection and walled-off necrosis | 23.33   | 7.26-75.01 | <.001 | 3.45    | 1.01-11.78 | .048 |
| Polypharmacy                                 |         |         |      |          |        |      |
| Minor                                        | 1.14    | 0.07-18.87 | .928 |          |        |      |
| Major                                        | 1.82    | 0.73-4.52 | .015 | 1.18    | 0.42-3.66 | .043 |
| HB                                           | 1.02    | 0.82-1.26 | .853 |          |        |      |
| WBC                                          | 1.06    | 0.95-1.18 | .323 |          |        |      |
| Creatinine (>2.4 mg/dL)                      | 20.32   | 7.34-56.50 | <.001 | 2.15    | 0.92-20.6 | .031 |
| Albumin                                      | 0.77    | 0.41-1.47 | .437 |          |        |      |
| C-reactive protein (>40 g/L)                 | 2.02    | 1.01-3.4 | <.001 | 1.1     | 1-2.79 | <.001 |
| BUN                                          | 1.02    | 0.99-1.04 | .066 |          |        |      |
| T.Bil                                        | 1.00    | 0.88-1.14 | .944 |          |        |      |
| D.Bil                                        | 1.01    | 0.86-1.19 | .882 |          |        |      |
| AST                                          | 1.00    | 0.79-1.18 | .008 |          |        |      |
| ALT                                          | 1.00    | 0.82-1.19 | .077 |          |        |      |
| LDH                                          | 0.99    | 0.91-1.12 | .186 |          |        |      |

Table 6. Comparison of BISAP, HAPS, RANSON, JSS GLASGOW, and APACHE Scorings in Determining Mortality in Group 3 Patients

| Group 3 Mortality | Area (95% CI)   | P    | Cut-Off Value | Sensitivity (95% CI) | Specificity (95% CI) |
|-------------------|-----------------|------|---------------|----------------------|----------------------|
| BISAP             | 0.92 (0.90-0.99) | <.001| 2.5           | 0.92 (0.82-0.97)     | 0.90 (0.79-0.96)     |
| HAPS              | 0.83 (0.75-0.90) | <.001| 1.5           | 0.49 (0.36-0.62)     | 0.98 (0.90-0.99)     |
| BALTAZAR          | 0.83 (0.75-0.91) | <.001| 2.5           | 0.90 (0.80-0.96)     | 0.60 (0.46-0.72)     |
| RANSON            | 0.78 (0.69-0.87) | <.001| 3.5           | 0.75 (0.62-0.85)     | 0.71 (0.58-0.82)     |
| JSS               | 0.92 (0.89-0.97) | <.001| 3.5           | 0.84 (0.69-0.89)     | 0.94 (0.84-0.98)     |
| GLASGOW           | 0.91 (0.87-0.98) | <.001| 2.5           | 0.89 (0.77-0.95)     | 0.86 (0.75-0.93)     |
| APACHE            | 0.94 (0.91-1.00) | <.001| 5.5           | 0.90 (0.80-0.96)     | 0.92 (0.82-0.97)     |
is significantly less performed in this patient group due to comorbid diseases. Therefore, recurrent pancreatitis attacks can be seen more frequently in these patients. Therefore, invasive procedures such as delayed cholecystectomy and ERCP should be planned carefully, especially in octogenarian patients, and the indications should be evaluated periodically. This seems to be the most important step in preventing possible mortality.\(^{37}\) As stated in the multivariate analysis performed in our study, a secondary and another important factor is the management of existing polypharmacy in these patients. Multiple drug use, from parasympathomimetic agents to antiaggregants or analgesics, delays admission to hospital in octogenarian patients, increases possible odian sphincter dysfunction, bleeding or cardiac-respiratory-renal organ dysfunctions. This prevents invasive interventions that can be done in the early period, as well as delays hospitalization time and therefore hospital stay, and increases deaths.\(^{38}\) For this reason, the approach that should be taken is to strictly question the patient in terms of polypharmacy, especially in the octogenarian age group, at the earliest possible stage of admission to the hospital with AP clinic.

In conclusion, this study highlights the differences and similarities between gerontal and younger patients with AP. Gerontal patients with AP tend to have more severe disease, major multiple drug use, and systemic and local complications. Biliary cholelithiasis was the main etiologic factor in all patients, however, hypertriglyceridemia was found in the second line as an etiologic factor in younger patients. Mortality rates and duration of hospitalization were higher in older patients compared to younger patients. Disease severity, presence of local/systemic complications, major polypharmacy, and increase in serum creatinine and CRP levels were risk factors in predicting mortality in patients over the age of 80 years.

**Ethics Committee Approval:** This study was approved by the ethics committee of Ministry of Health, Ankara City Hospital (number: E1-20-660).

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