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Factors associated with clinical outcome in geriatric acute cholangitis patients

O. INAN, E.S. SAHINER, I. ATES

Department of Internal Medicine, Ankara City Hospital, Ankara, Turkey

Abstract. – OBJECTIVE: We aimed to determine the risk factors associated with the clinical outcome in cases of acute cholangitis among the geriatric age group.

PATIENTS AND METHODS: Patients aged >65 years hospitalized with the diagnosis of acute cholangitis in an emergency internal medicine clinic were included in this study.

RESULTS: The study population comprised 300 patients. In the oldest-old group, the rates of severe acute cholangitis and intensive care unit hospitalization (39.1% *vs.* 23.2%, $p<0.001$) were higher. The mortality rate was also higher in the oldest-old group (10.4% *vs.* 5.9%, $p=0.045$). The presence of malignancy, ICU hospitalization, decreased platelet levels, decreased hemoglobin levels, and decreased albumin levels were associated with mortality. In the multivariable regression model in which variables associated with Tokyo severity were included, the associated factors for membership in the severe risk group compared to the moderate risk group were decreased platelet count (OR: 0.96; $p=0.040$) and decreased albumin level (OR: 0.93; $p=0.027$). Increasing age (OR: 1.07; $p=0.001$), malignancy etiology (OR: 5.03; $p<0.001$), increasing Tokyo severity (OR: 7.61; $p<0.001$), and decreasing lymphocyte count (OR: 0.49; $p=0.032$) were determined to be associated with ICU admission. Decreasing albumin levels (OR: 0.86; $p=0.021$) and ICU admission (OR: 16.43; $p=0.008$) were determined to be factors associated with mortality.

CONCLUSIONS: Worse clinical outcomes occur among geriatric patients with increasing age.

Key Words:
Aging, Cholecystitis, Frail, Mortality.

Introduction

Acute cholangitis is a gastrointestinal emergency with high mortality[1,2]. It is necessary to quickly evaluate and determine the severity of the case upon application to the emergency department[3]. In cases of severe acute cholangitis, decompression therapy should be applied at the most appropriate time[4,5]. Sepsis, septic shock, and mortality can develop rapidly in cases of severe acute cholangitis that are not treated with decompression at the appropriate time and under emergency conditions[6].

Acute cholangitis can have a serious course in geriatric patients due to degeneration in the gastrointestinal system, accompanying comorbid conditions, drugs used, and lability in the cardiovascular system[7]. In the geriatric age group, infections can have a serious course depending on the aforementioned risk factors and many other unknown factors[8]. Therefore, unknown risk factors and risk factors associated with clinical outcome should be determined quickly and easily from the moment the patient presents to the emergency department.

In our literature review, we found very limited studies on acute cholangitis in the geriatric age group[9-11]. More specifically, we did not find any studies addressing the determination of risk factors related to clinical outcomes in geriatric patients. In order to positively affect the clinical outcomes of geriatric patients, risk factors at the time of patient admission should be determined.

In the present study, we aimed to determine the risk factors associated with clinical outcome in cases of acute cholangitis in the geriatric age group.

Patients and Methods

This study was planned in the Ankara City Hospital Internal Medicine Clinic with a retrospective design in accordance with the 2013 Brazil version of the Declaration of Helsinki and relevant good clinical practice guidelines. The study was approved by the Local Ethics Committee in compliance with all relevant current guidelines and ethical principles.

Patients aged >65 years hospitalized with the diagnosis of acute cholangitis in the Emergency Internal Medicine Clinic were included in this study. Patients were excluded according to the following criteria: signs of infection in any other system; use of immunosuppressive therapy;

Corresponding Author: Osman Inan, MD; e-mail: drosmaninan@gmail.com

malignancy; active rheumatic and autoimmune disease; use of antioxidant or anti-inflammatory drugs; or missing clinical, demographic, or laboratory findings. The diagnosis of acute cholangitis was confirmed according to the 2018 Tokyo criteria and the severity of acute cholangitis was determined according to the 2018 Tokyo criteria[12].

The clinical, demographic, and laboratory findings of the patients were obtained from their electronic files.

Statistical Analysis

Statistical analysis was performed using SPSS 20 for Windows (IBM Corp., Armonk, NY, USA). Normal data distribution was evaluated by the Shapiro-Wilk test. Numeric variables with and without normal distribution were plotted as mean ± standard deviation and median [25th and 75th interquartile range (IQR)], respectively. Categorical variables were indicated as numeric and percentile values. Chi-square, Yates correction, and Fisher exact tests were used for comparisons of categorical data. The Student's *t*-test or Mann-Whitney U test was used for comparisons of numeric variables between the two groups according to the distribution of normality. ANOVA testing (post-hoc: Bonferroni test) or the Kruskal-Wallis H test (post-hoc: Dunn test) was used for comparisons of numeric variables between the Tokyo severity groups according to the distribution of normality. Logistic regression analysis was used to identify factors associated with ICU admission. Cox regression analysis was used to identify factors associated with in-hospital mortality. Values of $p<0.05$ were considered significant in statistical analysis.

Results

The study population consisted of 300 patients, including 215 cases of choledocholithiasis (71.7%), 27 benign biliary stenosis (9.0%), 47 malignancy (15.7%), and 11 other causes of cholangitis (3.7%). The characteristic findings of the patients are provided in Table I in detail. In the oldest-old group, the percentage of women (57.4% *vs.* 48.6%, $p=0.002$), Tokyo 2018 severe risk group (36.5% *vs.* 25.4%, $p<0.001$), and intensive care unit (ICU) hospitalization rate (39.1% *vs.* 23.2%, $p<0.001$) were higher, while the median duration of time in the ward was lower (8 days *vs.* 9 days, $p=0.032$). Median neutrophil level (9.4 *vs.* 8.9, $p<0.001$), median urea (53 *vs.* 40, $p<0.001$), median C-reactive protein (CRP) (89 mg/dL *vs.* 68 mg/dL, $p=0.004$), and median procalcitonin (2.2 *vs.* 1.2, $p=0.050$) were higher in the oldest-old group than the group of patients under 80 years of age, while median levels of lymphocytes and platelets and mean hemoglobin and albumin levels were lower (Table I). In the oldest-old group, the rates of composite outcomes (23.5% *vs.* 11.4%, $p<0.001$) and mortality (10.4% *vs.* 5.9%, $p=0.045$) were higher.

According to Tokyo severity ratings, 39% of the patients had mild acute cholangitis, 31.3% moderate, and 29.7% severe acute cholangitis. It was determined that the median urea levels, median CRP levels, and median procalcitonin levels were lower in the mild group compared to the other Tokyo severity groups, while median platelet levels and mean albumin levels were higher. Median platelet levels, median gamma-glutamyl transferase levels, and mean albumin levels were lower in the severe group than the moderate group, while median urea, median INR levels, mean platelet volume, and mean platelet distribution width levels were higher (Table II).

Among the patients with ICU hospitalization, mean age, malignancy rate, median neutrophil count, median urea, median total bilirubin, and median CRP were higher (Table III). The presence of malignant etiology, ICU hospitalization, decreased platelet levels, decreased hemoglobin levels, and decreased albumin levels were associated with mortality (Table IV).

In the multivariable regression model, in which the variables associated with Tokyo severity were included, the associated factors of the moderate risk group compared to the mild risk group were found to be increasing age (OR: 1.05; $p=0.042$), decreasing platelet count (OR: 0.98; $p=0.002$), increasing urea (OR: 1.03; $p<0.001$), and decreasing albumin (OR: 0.92; $p=0.025$). Associated factors for the severe risk group compared to the moderate risk group were decreasing platelet count (OR: 0.96; $p=0.040$) and decreasing albumin (OR: 0.93; $p=0.027$).

Increasing age (OR: 1.07; $p=0.001$), malignancy etiology (OR: 5.03; $p<0.001$), increasing Tokyo severity (OR: 7.61; $p<0.001$), and decreasing lymphocyte count (OR: 0.49; $p=0.032$) were identified as associated factors of ICU admission. Decreasing albumin levels (OR: 0.86; $p=0.021$) and ICU admission (OR: 16.43; $p=0.008$) were found to be associated with mortality (Table V).

Table I. Demographic and clinical findings of patients with acute cholangitis-

Variables	All population n=300	Age		p
		65-79 years n=185	≥80 years n=115	
Demographic findings				
Age, years	77.2±8.0	71.9±4.3	85.7±4.2	<0.001*
Gender, n (%)				
Female	156 (52.0)	90 (48.6)	66 (57.4)	0.002*
Male	144 (48.0)	95 (51.4)	49 (42.6)	
Etiology, n (%)				
Choledocholithiasis	215 (71.7)	127 (68.6)	88 (76.5)	0.191
Benign biliary stenosis	27 (9.0)	20 (10.8)	7 (6.1)	
Malignancy	47 (15.7)	30 (16.2)	17 (14.8)	
Other	11 (3.7)	8 (4.3)	3 (2.6)	
TOKYO severity, n (%)				
Mild	117 (39.0)	92 (49.7)	25 (21.7)	<0.001*
Moderate	94 (31.3)	46 (24.9)	48 (41.7)	
Severe	89 (29.7)	47 (25.4)	42 (36.5)	
Duration of service, days	9 (6-13)	9 (6-14)	8 (5-12)	0.032*
ICU hospitalization, n (%)	88 (29.3)	43 (23.2)	45 (39.1)	<0.001*
Duration of ICU, days	6 (3-9.5)	6 (3-11)	6 (3-9)	0.490
Laboratory findings				
WBC (10^3/μL)	10.8 (7.8-14.1)	10.9 (8-13.9)	10.5 (7.6-14.2)	0.001*
Neutrophil (10^3/μL)	9 (6.2-12.7)	8.9 (6.2-12.7)	9.4 (6.2-12.8)	<0.001*
Lymphocyte (10^3/μL)	0.8 (0.5-1.2)	0.8 (0.5-1.3)	0.7 (0.5-1.1)	<0.001*
Monocyte (10^3/μL)	0.4 (0.3-0.6)	0.4 (0.3-0.6)	0.5 (0.3-0.6)	0.479
Platelet (10^3/μL)	229.5 (171-290)	234 (175-306)	224 (162-272)	<0.001*
Hemoglobin (g/dL)	12.7±1.7	12.9±1.8	12.4±1.6	<0.001*
UREA (mg/dL)	44.5 (34-62.5)	40 (30-57)	53 (42-71)	<0.001*
ALT (U/L)	161.5 (91-281)	165 (87-280)	155 (92-282)	0.001*
AST (U/L)	166 (87.5-307.5)	162 (84-308)	208 (92-304)	0.434
ALP (U/L)	286 (194-450)	282 (184-441)	289 (200-453)	0.179
GGT (U/L)	384.5 (225-635.5)	415 (216-684)	358 (238-597)	0.084
Total bilirubin (mg/dL)	4.5 (2.8-6.8)	4.4 (2.7-6.9)	4.5 (2.8-6.7)	0.853
Direct bilirubin (mg/dL)	3.1 (1.8-5)	3.1 (1.7-5)	3.1 (2-4.9)	0.858
Albumin (mg/dL)	37.7±5.0	38.4±5.0	36.4±4.7	<0.001*
CRP (mg/L)	75 (35-127.5)	68 (26-119)	89 (50-132)	0.004*
Procalcitonin (μg/L)	1.6 (0.3-10.2)	1.2 (0.2-9.5)	2.2 (0.5-10.2)	0.050*
INR	1.2 (1.1-1.3)	1.2 (1.1-1.3)	1.2 (1.1-1.4)	0.001*
MPV (fL)	8.7±1.2	8.8±1.3	8.7±1.1	<0.001*
PDW (fL)	57.5±10.7	57.3±11.1	57.8±10.2	0.019*
Composite outcome, n (%)	48 (16.0)	21 (11.4)	27 (23.5)	<0.001*
Mortality, n (%)	23 (7.7)	11 (5.9)	12 (10.4)	0.045*
Duration of hospitalization, day	10 (7-15)	10 (7-15)	10 (7-15)	0.002*

Data are mean±standard deviation or median (IQR), or number (%). *: $p<0.05$ indicates statistical significance.
ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; CRP, C-reactive protein; GGT, gamma-glutamyl transferase; ICU, intensive care unit; INR, international normalized ratio. MPV, mean platelet volume; PDW, platelet distribution width; WBC, white blood cell.

Table II. Demographic and clinical findings according to Tokyo severity.

Variables	TOKYO severity			p
	Mild n=117	Moderate n=94	Severe n=89	
Demographic findings				
Age, years	**74.3±7.6**	79.5±7.5	78.7±7.7	<0.001*
Gender, n (%)				
Female	60 (51.3)	52 (55.3)	44 (49.4)	0.714
Male	57 (48.7)	42 (44.7)	45 (50.6)	
Etiology, n (%)				
Choledocholithiasis	82 (70.1)	69 (73.4)	64 (71.9)	0.534
Benign biliary stenosis	15 (12.8)	6 (6.4)	6 (6.7)	
Malignancy	16 (13.7)	14 (14.9)	17 (19.1)	
Other	4 (3.4)	5 (5.3)	2 (2.2)	
Duration of service, days	9 (7-13)	8 (6-12)	8 (5-15)	0.673
ICU hospitalization, n (%)	14 (12.0)	23 (24.5)	51 (57.3)	<0.001*
Duration of ICU, days	6 (2-8)	5 (3-9)	6 (4-10)	0.338
Laboratory findings				
WBC (10^3/μL)	**9 (7-11)**	12.9 (10-16.3)	11.4 (8.1-15.2)	<0.001*
Neutrophil (10^3/μL)	**7.4 (5.4-9.1)**	11.5 (8.4-15)	10.3 (6.8-13.5)	<0.001*
Lymphocyte (10^3/μL)	**0.9 (0.6-1.3)**	0.7 (0.4-1.1)	0.7 (0.4-1)	<0.001*
Monocyte (10^3/μL)	0.4 (0.3-0.6)	**0.5 (0.4-0.6)**	0.4 (0.3-0.6)	0.006*
Platelet (10^3/μL)	**254 (204-313)**	**231 (188-274)**	**180 (120-243)**	<0.001*
Hemoglobin (g/dL)	12.8±1.5	12.9±1.7	12.5±2.0	0.300
UREA (mg/dL)	**38 (28-51)**	**44 (34-56)**	**65 (44-87)**	<0.001*
ALT (U/L)	196 (95-305)	175 (105-285)	**132 (72-237)**	0.034*
AST (U/L)	180 (88-348)	189 (96-307)	135 (84-260)	0.496
ALP (U/L)	288 (185-539)	287 (198-432)	261 (197-354)	0.497
GGT (U/L)	445 (245-795)	433.5 (263-656)	**329 (179-485)**	0.001*
Total bilirubin (mg/dL)	**3.3 (2-4.8)**	5.3 (3.6-7.9)	4.9 (3.6-8.8)	<0.001*
Direct bilirubin (mg/dL)	**2.4 (1.3-3.3)**	3.7 (2.3-5.7)	3.6 (2.6-6.8)	<0.001*
Albumin (mg/dL)	**39.6±4.4**	**37.8±4.7**	**35.0±4.8**	<0.001*
CRP (mg/L)	**55 (22-98)**	84.5 (44-131)	102 (44-158)	<0.001*
Procalcitonin (μg/L)	**0.7 (0.2-3.7)**	**2 (0.4-9.3)**	**5.1 (0.8-26.9)**	<0.001*
INR	1.1 (1.1-1.2)	1.1 (1.1-1.3)	**1.4 (1.2-1.8)**	<0.001*
MPV (fL)	8.5±1.1	8.7±1.2	**9.1±1.4**	0.003*
PDW (fL)	55.4±8.3	56.4±11	**61.2±12.6**	0.006*
Composite outcome, n (%)	8 (6.8)	11 (11.7)	29 (32.6)	<0.001*
Mortality, n (%)	5 (4.3)	4 (4.3)	14 (15.7)	0.007*
Duration of hospitalization, day	9 (7-13)	9.5 (6-14)	**12 (8-17)**	0.008*

Data are mean±standard deviation or median (IQR), or number (%). *: $p<0.05$ indicates statistical significance. Groups that differed in post-hoc analyses are indicated by bold characters. ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; CRP, C-reactive protein; GGT, gamma-glutamyl transferase; ICU, intensive care unit; INR, international normalized ratio; MPV, mean platelet volume; PDW, platelet distribution width; WBC, white blood cell.

Discussion

In this study, we aimed to determine the risk factors associated with clinical outcome among geriatric patients with acute cholangitis. Previous studies have shown an increase in the prevalence of complications related to biliary diseases with increasing age. Serious comorbid conditions accompanying geriatric age contribute to the increased and more serious courses of these complications.

Table III. Factors associated with hospitalization of the intensive care unit.

Variables	TOKYO severity		p
	No n=212	Yes n=88	
Demographic findings			
Age, years	76.1±7.7	79.9±7.9	<0.001*
Gender, n (%)			
Female	115 (54.2)	41 (46.6)	0.227
Male	97 (45.8)	47 (53.4)	
Etiology, n (%)			
Choledocholithiasis	160 (75.5)	55 (62.5)	0.019*
Benign biliary stenosis	20 (9.4)	7 (8.0)	
Malignancy	24 (11.3)	23 (26.1)	
Other	8 (3.8)	3 (3.4)	
TOKYO severity, n (%)			
Mild	103 (48.6)	14 (15.9)	<0.001*
Moderate	71 (33.5)	23 (26.1)	
Severe	38 (17.9)	51(58.0)	
Duration of service, days	9 (7-13)	7 (2-15)	0.025*
Laboratory findings			
WBC (10^3/μL)	10.7 (7.6-13.6)	11.5 (8.4-15.1)	0.103
Neutrophil (10^3/μL)	8.8 (5.9-12.1)	9.7 (7.1-13.4)	0.045*
Lymphocyte (10^3/μL)	0.8 (0.5-1.3)	0.6 (0.4-1)	0.040*
Monocyte (10^3/μL)	0.5 (0.3-0.6)	0.4 (0.3-0.6)	0.240
Platelet (10^3/μL)	233.5 (190.5-290)	212 (144.5-291)	0.048*
Hemoglobin (g/dL)	12.7±1.7	12.7±1.9	0.965
UREA (mg/dL)	42.5 (32-58)	52 (39-72)	<0.001*
ALT (U/L)	164.5 (94.5-286)	153 (82-247)	0.349
AST (U/L)	165 (86.5-311)	176 (92.5-305.5)	0.907
ALP (U/L)	267.5 (185-440.5)	320 (212.5-454)	0.116
GGT (U/L)	401 (238.5-659)	371 (206.5-564.5)	0.349
Total bilirubin (mg/dL)	4 (2.4-6.1)	5.5 (3.8-9.3)	<0.001*
Direct bilirubin (mg/dL)	2.8 (1.6-4.4)	4.1 (2.6-6.8)	<0.001*
Albumin (mg/dL)	38.4±4.7	35.9±5.3	<0.001*
CRP (mg/L)	68(33.5-114)	100 (41.5-158)	0.008*
Procalcitonin (μg/L)	1.5(0.3-9.3)	2 (0.5-12.9)	0.128
INR	1.1(1.1-1.3)	1.3 (1.1-1.5)	<0.001*
MPV (fL)	8.7±1.2	8.9±1.2	0.153
PDW (fL)	56.7±10.5	59.3±11.1	0.058
Composite outcome, n (%)	1(0.5)	47 (53.4)	<0.001*
Mortality, n (%)	1(0.5)	22 (25.0)	<0.001*
Duration of hospitalization, day	9(7-13)	14 (9-21)	<0.001*

Data are mean±standard deviation or median (IQR), or number (%). *: $p<0.05$ indicates statistical significance. ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; CRP, C-reactive protein; GGT, gamma-glutamyl transferase; ICU, intensive care unit; INR, international normalized ratio; MPV, mean platelet volume; PDW, platelet distribution width; WBC, white blood cell.

In our study, the highest rate of cholecystitis was found among patients with acute cholangitis. In addition, the rate of cholecystitis was found to be higher in patients aged 80 and over compared to those in the age group of 65-79. In the study of Thomas et al[10] conducted with geriatric patients, the mean age was 82 years and cholecystitis was found to be the most common cause of cholangitis among the patients. In the same study, poor clinical outcomes, such as ICU admission, 90-

Table IV. Factors associated with in-hospital mortality in patients with acute cholangitis.

Variables	Survival		Univariable Regression 95% CI			
	Alive n=277	Death n=23	HR	lower	upper	p
Demographic findings						
Age, years	77.0±7.9	79.4±8.5	1.017	0.963	1.074	0.543
Gender, n (%)						
Female	147 (53.1)	9 (39.1)	ref			
Male	130 (46.9)	14 (60.9)	0.828	0.329	2.081	0.688
Etiology, n (%)						
Choledocholithiasis	205 (74.0)	10 (43.5)				
Benign biliary stenosis	27 (9.7)	0	0.01	0.01	1.58	0.983
Malignancy	35 (12.6)	12 (52.2)	3.50	1.42	8.63	0.007*
Other	10 (3.6)	1 (4.3)	0.61	0.07	5.46	0.657
TOKYO severity, n (%)						
Mild			ref			
Moderate			0.912	0.243	3.424	0.891
Severe			1.696	0.578	4.980	0.336
Duration of service, days	9 (6-13)	10 (1-18)	0.950	0.800	1.080	0.126
ICU hospitalization, n (%)	66 (23.8)	22 (95.7)	23.527	3.081	179.654	0.002
Duration of ICU, days	6 (4-9)	6.5 (3-14)	1.008	0.969	1.049	0.701
Laboratory findings						
WBC (10^3/μL)	10.8 (7.8-13.9)	11.4 (7.2-15.3)	0.997	0.937	1.061	0.925
Neutrophil (10^3/μL)	9.1 (6.2-12.7)	8.9 (5.7-13.5)	0.994	0.932	1.061	0.865
Lymphocyte (10^3/μL)	0.8 (0.5-1.2)	0.8 (0.6-1.1)	1.307	0.606	2.817	0.495
Monocyte (10^3/μL)	0.4 (0.3-0.6)	0.5 (0.3-0.6)	1.016	0.243	4.252	0.982
Platelet (10^3/μL)	230 (172-287)	219 (164-355)	1.004	1.000	1.008	0.029*
Hemoglobin (g/dL)	12.8±1.7	11.9±2.2	0.779	0.615	0.987	0.039*
UREA (mg/dL)	46 (34-62)	44 (36-82)	1.011	0.990	1.023	0.067
ALT (U/L)	168 (95-285)	81 (38-123)	0.994	0.988	0.999	0.017*
AST (U/L)	180 (92-313)	115 (68-218)	0.998	0.994	1.001	0.142
ALP (U/L)	276 (191-432)	423 (304-573)	1.000	0.999	1.001	0.760
GGT (U/L)	396 (238-652)	312 (169-535)	0.999	0.998	1.001	0.307
Total bilirubin (mg/dL)	4.3 (2.7-6.5)	5.2 (3.9-11.7)	1.011	0.960	1.065	0.680
Direct bilirubin (mg/dL)	3 (1.8-4.7)	4 (2.8-9.2)	1.017	0.948	1.092	0.636
Albumin (mg/dL)	38.1±4.6	32.0±5.7	0.841	0.775	0.913	<0.001*
CRP (mg/L)	74 (35-128)	96 (24-123)	0.999	0.993	1.005	0.736
Procalcitonin (μg/L)	1.8 (0.3-10.8)	1.3 (0.6-5.3)	0.984	0.957	1.012	0.265
INR	1.2 (1.1-1.3)	1.3 (1.2-1.6)	0.818	0.321	2.087	0.674
MPV (fL)	8.7±1.2	9.0±1.2	0.961	0.687	1.345	0.817
PDW (fL)	57.3±10.4	59.6±14.3	1.022	0.981	1.064	0.299
Duration of hospitalization, day	10 (7-14)	14 (7-37)	-	-	-	-

Data are mean±standard deviation or median (IQR), or number (%). *: $p<0.05$ indicates statistical significance. ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; CRP, C-reactive protein; GGT, gamma-glutamyl transferase; ICU, intensive care unit; INR, international normalized ratio; MPV, mean platelet volume; PDW, platelet distribution width; WBC, white blood cell.

day mortality, and 1-year mortality and hospital stay were more common among frail patients[10]. In our study, the rate of severe cholangitis was found to be higher among patients aged 80 and over according to the Tokyo 2018 classification compared to those in the 65-79 age group. The rate of patients hospitalized in the ICU was higher than that among the oldest-old group. In addition,

Table V. Associated factor for endpoints.

Variables	OR	95% CI		p
		Lower	Upper	
TOKYO severity				
Moderate *vs*. Mild				
Age	1.05	1.01	1.10	0.042*
Platelet	0.98	0.97	0.99	0.002*
UREA	1.03	1.02	1.05	<0.001*
Albumin	0.92	0.85	0.99	0.025*
		Nagelkerke R^2= 0.314, p< 0.001*		
Severe *vs*. Moderate				
Platelet	0.96	0.92	0.99	0.040*
Albumin	0.93	0.87	0.99	0.027*
		Nagelkerke R^2= 0.298, p< 0.001*		
ICU admission				
Age	1.07	1.03	1.11	0.001*
Etiology, n (%)				
Choledocholithiasis	ref			
Benign biliary stenosis	1.58	0.58	4.34	0.372
Malignancy	5.03	2.21	11.48	<0.001*
Other	1.59	0.33	7.68	0.562
Tokyo Severity				
Mild	ref			
Moderate	1.59	0.73	3.49	0.246
Severe	7.61	3.62	16.01	<0.001*
Lymphocyte	0.49	0.26	0.94	0.032*
		Nagelkerke R^2= 0.357, p< 0.001*		
Mortality	HR			
Albumin	0.86	0.76	0.98	0.021*
ICU admission	16.43	2.10	128.52	0.008*
		-2Log Likelihood=137.5, p<0.001*		

*: p<0.05 indicates statistical significance. CI, confidence interval; HR, hazard ratio; ICU, intensive care unit; OR, odds ratio.

the mortality rate was found to be higher among patients aged ≥80 compared to those aged 65-79 years. When we analyzed the risk factors associated with ICU admission, age was found to be associated with ICU admission. In other words, there was an increase in admission to intensive care with increasing age.

In a study conducted by Chan et al[9] that included 457 geriatric patients, no difference was found in terms of in-hospital mortality, 30-day mortality, or 90-day mortality among patients aged ≥80 compared to those in the 65-79 age group. No difference was found between the groups in terms of length of hospital stay. In our study, while the clinical outcome differed in the oldest-old group compared to those in the age group of 65-79, no difference was found in terms of length of hospital stay. In the case of aging, severe sarcopenia and fragility generally lead to decreased heart function, impaired drug metabolism in the liver[13], decreased body muscle ratio, and functional and metabolic deterioration in the gastrointestinal system[14-17]. Poor outcome is more likely in the case of acute events that occur in the course of aging due to the deterioration of these vital functions. Therefore, acute cholangitis occurring among patients aged 80 years and older, as seen in the results of our study, may cause worse clinical outcomes compared to those in the 65-79 age group.

According to these results, in geriatric patients admitted to the emergency department, the diagnosis of the patient should be made quickly, the severity of acute cholangitis should be determined, and rapid decompression and medical treatment

should be initiated if necessary. However, in patients aged 80 and over, hospitalization in the intensive care unit is required for closer follow-up of the patient, taking into account the severity of the disease, acute cholangitis etiology, and laboratory parameters according to Tokyo 2018.

Limitations

The most important limitation of our study is that it was retrospective. However, since the clinical and demographic findings of the participants included in the study were recorded in detail, the negative impact of this limitation on the study was minimal.

Conclusions

In our study, the rates of severe cholangitis, mortality, and hospitalization in the intensive care unit were found to be higher among acute cholangitis patients aged 80 years and older than those in the 65-79 age group. Age, severe cholangitis, malignant etiology, albumin, and admission to the intensive care unit were found to be risk factors associated with poor clinical outcome in geriatric patients.

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Conflict of Interest

The authors declared no conflict of interest.

Ethical Approval

Ankara City Hospital Ethics Committee, Decision Date/No: 06.2022/E2-22-2066. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013.

Informed Consent

Informed consent was obtained from all participants included in the study.

Authors' Contribution

Concept – O.I., E.S.S. and İ.A.; Design – O.I., E.S.S. and İ.A.; Supervision – O.İ., E.S.S. and I.A.; Data collection &/or processing – E.S.S. and O.I.; Analysis &/or interpretation – O.I., E.S.S. and I.A.; Literature search – O.I., E.S.S. and I.A.; Data collection &/or processing – O.I., E.S.S. and I.A.; Writing – E.S.S.; Critical review – O.I., E.S.S. and I.A.

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