ORIGINAL RESEARCH

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Analysis of Infection Factors According to the Results of Culture of Patients more than 65 Years Old, who Applied to University Affiliate 3rd Stage Hospital Emergency Department with Findings of Infection

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Abstract

Objective: Today, the elderly population is increasing and the emergency service applications are increasing for this reason. In elderly patients, infection findings are not specific as in younger patients, and atypical findings are more common in elderly patients. In this study, it was aimed to analyze the infectious agents detected in patients aged 65 and over who applied to the emergency department with signs or suspicion of infection and to draw attention to this issue.

Materials and Methods: Our study was planned as a single-center and retrospective observational study. Our study included 1,503 patients who were admitted to the emergency department between January 1, 2019 and January 1, 2020, and who met the study criteria, among whom infectious diseases were considered in the evaluation. The demographic, disease and outcome data of the patients were recorded. For statistical significance, $p<0.05$ was accepted as the significance level.

Results: In our study, 51.2% of 1,503 cases were male and 48.8% were female. The mean age of the cases was 76.45±7.49 years in men and 78.73±7.99 years in women. The most common reasons for admission were disordered general condition, abdominal pain and dyspnea; the most common foci of infection are pneumonia, urinary tract infection and biliary tract diseases, respectively; the most common infectious agents were *Escherichia coli*, *Streptococcus pneumoniae*, and methicillin-resistant *Staphylococcus aureus*, respectively. 70.1% of the cases were hospitalized in the ward, 22.4% in the intensive care units, and mortality was observed in 7.8% of the cases. Mortality was found to be higher in cases with *Pseudomonas auroginosa* and *Acinetobacter baumannii*.

Conclusion: It was determined that elderly patients came to the emergency department with more atypical complaints, they were at higher risk of mortality due to infection than younger patients, and resistant infectious agents were more common in these patients and caused mortality.

Keywords: Geriatrics, infectious, mortality, emergency

Introduction

Because of many important developments, such as the successes in the fight against infectious diseases, the point reached for treating diseases, and the improvement of living conditions, life expectancy at birth is increasing, and accordingly, the number of population in the world and in our country is increasing day by day. It is estimated that the world population will double in the next 20 years and that our country will become the most populous country in Europe in terms of elderly population 2050 [1]. With this increase in the elderly population, diseases seen in old age gain importance; infectious diseases also take their place in this context.

As we age, deformations occur in the anatomical structures of the human body. However, due to many factors such as aging in the immune system, increased comorbidity and nutritional problems, elderly people are predisposed to infectious diseases and inadequate responses is given to infections [2,3]. In the case of infection in elderly patients due to these reasons, rapid deterioration in the general clinical condition can be observed.

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In the elderly patient group, infection often progresses atypically and classic symptoms and signs of infection may not be present [4]. Falling or delirium may be the main finding of infection in elderly patients. Often, this patient group may present to the emergency services with atypical findings such as loss of appetite, weakness, falls, changes in consciousness, deterioration in daily activities and oral intake, confusion and delirium, rather than typical signs of infection. Organ failure that develops after community-acquired infections are seen at a higher rate in elderly patients than in younger patients.

Although fever is one of the main symptoms of infectious diseases, there may be no fever response even in severe infectious diseases in elderly patients. Again, this age group may present with atypical findings and complaints. Therefore, when evaluating the infection status in elderly patients, detailed anamnesis, comprehensive physical examination and laboratory evaluation should be performed and interpreted accurately [5].

All kinds of infections can be encountered in elderly patients. Many situations can occur within these species, from community-acquired infections to hospital infections [6]. These infections can be caused by bacterial, viral, fungal and parasitic origin. Urinary system infection, pneumonia, skin and soft tissue infections, gastroenteritis and post-invasive infections are common infections. Among these infections, the most common are urinary tract infection (28%), pneumonia (25%), and skin (18%) [7].

Infectious diseases are in the top 10 among the causes of hospitalization in patients over the age of 65, and in the top 5 among the causes of death over the age of 65. There is an increase in morbidity and mortality due to infectious diseases in this age group due to delays in diagnosis and treatment, weak immune response in elderly patients, and therefore the severe course of infections. In the literature, it is stated that infections play a role in 1/3 of deaths in the elderly and organ failure is more common than in young people [4].

In our study, it was aimed to analyze the infectious agents detected by culture results in patients aged 65 and over who applied to the Izmir Katip Celebi University, Ataturk Training and Research Hospital Emergency Service with the suspicion of infectious diseases, to reorganize empirical treatments considering these data, and to attract attention to this subject.

Materials and Methods

Study Design

Our study was conducted at a single center and was retrospective. The study was initiated after obtaining approval from the Izmir Katip Celebi University Local Ethics Committee of the hospital (decision no: 524, date: 09.01.2020). Patients admitted to Izmir Katip Celebi University, Ataturk Training and Research Hospital Emergency Service between January 1, 2019 and January 1, 2020 were retrospectively screened. Patients who were thought to have systemic infection findings after admission were included in the study. The automation system and emergency room patient files were reviewed and duplicate entries were excluded from the study.

Patient Selection

Patients admitted to our emergency department between January 1, 2019 and January 1, 2020 were identified. Cases were defined on the basis of the international diagnostic codes (International Statistical Classification of Diseases-10) in the automation system. Patients aged 65 and over who presented with signs of infection and had no missing data were included in the study. Patients whose data could not be accessed through the system and whose culture results could not be found were excluded from the study. One thousand seven hundred and eighty four patients who met the inclusion criteria were identified. Among these patients, 162 patients with missing data and 119 patients whose culture results could not be reached were excluded from the study. Among the remaining cases, the study was conducted with 1,503 patients.

Data Collection

A retrospective data analysis was performed in this study. The data were scanned through the hospital automation system and archive samples. Patients who met the inclusion and exclusion criteria were included in the study. The obtained data were recorded in the previously created study form. Demographic characteristics such as patient protocol numbers, names and surnames, gender, age; vital signs of patients (systolic blood pressure, diastolic blood pressure, pulse, fever); alanine transaminase (ALT), aspartate transaminase (AST), white blood cell (WBC), C-reactive protein (CRP) values, complete urinalysis results and factors determined in blood culture results were recorded from the tests taken at the emergency admission.

Statistical Analysis

Data were analyzed with SPSS Package Program version 20.0. Number, percentage, mean, standard deviation, median, minimum and maximum were used in the presentation of descriptive data. The conformity of the data to the normal distribution was evaluated with the Kolmogorov-Smirnov test. Pearson chi-square test was used in the analysis of categorical variables. T-test was used to compare two independent numerical data and Kruskal-Wallis test was used to compare triple numerical data. $P<0.05$ was accepted as statistical significance level.

Results

A total of 1,503 patients were included in the study. 51.2% (n=770) of the cases were male and 48.8% (n=733) were female. The mean age of the cases was 77.56±7.82 (65-105)

years, the mean age in women was 78.73±7.99 (65-105) years, and the mean age in men was 76.45±7.49 (65-96) years were detected. The mean age was found to be significantly higher in female cases. There was no difference between the genders in laboratory values (Table 1).

The vital values of the patients were collected from the emergency cards in the digital data archive. Of the patients whose vital values were examined; mean systolic blood pressure 122.01±26.45 (59-240) mmHg, mean diastolic blood pressure 68.19±14.63 (30-120) mmHg, heart rate mean 94.23±33.99 (44-172) beats/min, mean temperature was 37.26±3.51 °C (35-40).

The laboratory values of the cases were created by collecting the data obtained from the examinations performed during their admission to the emergency department. In the blood tests of the cases; ALT mean value 32.28±6.24 U/I, AST mean value 33.85±6.94 U/I, mean CRP value 11.53±11.44 (0-93) mg/dL, and mean WBC 13 It was measured as 0.68±9.54 (0.40-134.0)x10^3/mm^3 (Table 1).

When the age, vital values and laboratory values of the cases were compared according to the outcomes; it was observed that the mean age of the patients hospitalized in the intensive care unit (ICU) was higher, but it was not statistically significant (Table 2).

It was observed that systolic blood pressure and diastolic blood pressure averages were higher in discharged patients, and the averages decreased as they went to the service and ICU, and this was statistically significant. Likewise, it was observed that the mean heart rate in the discharged patients was lower than the patients hospitalized in the service and ICU, and it was statistically significant. We observed that the mean fever value measured was higher in patients admitted to the ICU (Table 2).

It was observed that there was no statistically significant difference in the mean CRP levels between the cases. It was observed that ALT and AST values gradually increased from discharge to the patients who were admitted to the ICU. We observed that the mean WBC values of the cases hospitalized

Table 1. Distribution of numerical data means of the cases

Parameter	Mean ± SD	Minimum	Maximum	p*
Age (year)	77.56±7.82	65	105	
Female (year)	78.73±7.99	65	105	**<0.001**
Male (year)	76.45±7.49	65	96	
Systolic blood pressure (mmHg)	122.01±26.45	59	240	
Female (mmHg)	121.77±26.25	60	240	0.729
Male (mmHg)	122.25±26.66	59	220	
Diastolic blood pressure (mmHg)	68.19±14.63	30	120	
Female (mmHg)	68.23±14.48	30	114	0.930
Male (mmHg)	68.16±14.77	45	120	
Pulse (beats/min)	94.23±53.99	44	172	
Female (beats/min)	90.75±19.41	44	172	0.578
Male (beats/min)	91.31±19.78	44	170	
Fever (°C)	37.26±3.51	35.0	40.0	
Female (°C)	37.15±0.99	35.0	40.0	0.150
Male (°C)	37.23±0.98	35.0	39.8	
ALT				
Female (U/L)	31.75±5.95	6	461	0.345
Male (U/L)	32.58±6.63	8	528	
AST				
Female (U/L)	33.85±6.94	6	610	0.412
Male (U/L)	34.12±7.42	5	601	
CRP (mg/dL)	11.53±11.44	0	93.0	
Female (mg/dL)	11.37±11.47	0	90.7	0.610
Male (mg/dL)	11.68±11.41	0.1	93.0	
WBC (x10^3/mm^3)	13.68±9.54	0.40	134.0	
Female (x10^3/mm^3)	13.53±9.04	0.40	134.0	0.527
Male (x10^3/mm^3)	13.84±10.05	0.48	126.0	

*: Independent t-test used. SD: Standard deviation, CRP: C-reactive protein, WBC: White blood cell, ALT: Alanine transaminase, AST: Aspartate transaminase

in the ICU were higher than the other cases, but this situation was not statistically significant (Table 2).

When the distributions of the patients' age, vital values and laboratory values according to the mortality status were compared, it was calculated that the mean age was statistically significantly higher in the patients with a mortal course. We observed that the mean diastolic blood pressure was statistically significantly lower in mortal cases, and the averages of CRP and WBC values were significantly higher. There was no statistically significant difference between the groups in the mean values of systolic blood pressure, pulse, fever, ALT and AST (Table 3).

Chronic diseases of the cases were determined and collected from the automation system. The data obtained were analyzed and in our study, it was observed that 87% of the cases had at least one chronic disease; 54.4% had hypertension (HT), 49% had diabetes mellitus (DM), 20.2% had malignancy, 15.7% had congestive heart failure, 12.5% had chronic renal failure (CRF) and 39.1% had another chronic disease. Additionally, it was found statistically significant that mortality was higher in cases with malignancy and in those with another chronic disease.

In our study, the effects of chronic disease conditions on mortality were evaluated. In the cox regression analysis, it was observed that the presence of malignancy and a history of CRF in case of infection pose a statistical risk in terms of mortality in patients (p=0.001, p=0.014).

When the application complaints of the cases are examined; the most common complaint at presentation was general condition disorder (18.1%; n=272), the second most frequent were abdominal pain (13.5%; n=203) and the third most frequent were shortness of breath (12.2%; n=183). The relationship between admission complaints and mortality was examined, and it was seen that the highest mortality rate was in the patients who presented with headache, and this situation was statistically significant (Table 4).

When the infection foci detected because of the evaluation of the cases were examined; in the cases, pneumonia was the most common (38.5%; n=579), urinary system infection (23.7%; n=356) and biliary tract diseases (13.2%; n=198) were the third most frequent infections. appeared to be the focus. The distribution of other foci of infection is shown in Table 5. In the relationship between the foci of infection of the cases

Table 2. Age, vital values and laboratory values of the cases by outcome comparison

Parameter	Discharge Mean ± SD	Service admission Mean ± SD	ICU admission Mean ± SD	p*
Age (year)	77.51±7.08	77.30±7.92	78.39±7.45	0.063
Systolic blood pressure (mmHg)	129.64±17.44	123.69±26.49	117.55±28.27	**<0.001**
Diastolic blood pressure (mmHg)	71.41±11.43	69.08±14.12	64.32±16.36	**<0.001**
Pulse (beats/min)	89.65±16.27	94.34±62.71	95.44±24.67	**0.008**
Fever (°C)	37.25±0.89	37.02±2.02	38.03±6.44	**<0.001**
Lower (U/L)	26.14±7.25	30.14±7.12	39.14±10.64	**0.038**
AST (U/L)	28.36±6.28	28.24±7.54	36.71±8.98	**0.021**
CRP (mg/dL)	11.79±11.11	11.24±11.22	12.36±12.17	0.451

*: Independent t-test used. ICU: Intensive care unit, SD: Standard deviation, AST: Aspartate transaminase, CRP: C-reactive protein

Table 3. Comparison of age, vital values and laboratory values of the cases by mortality status

	Mortality		p*
Parameter	Survive Mean ± SD	Ex Mean ± SD	
Age (year)	77.29±7.79	80.74±7.52	**<0.001**
Systolic blood pressure (mmHg)	122.23±26.27	119.44±28.51	0.274
Diastolic blood pressure (mmHg)	68.42±14.52	65.48±15.62	**0.037**
Pulse (beats/min)	93.88±55.77	98.42±24.16	0.383
Fever (°C)	37.26±3.65	37.29 ±1.02	0.940
Lower (U/L)	32.88±8.24	33.12±7.78	0.785
AST (U/L)	33.25±6.78	33.81±7.25	0.540
CRP (mg/dL)	11.34±11.19	13.71±13.91	**0.032**
WBC (x10^3/mm^3)	12.85±7.75	23.58±18.85	**<0.001**

*: Independent t-test used. SD: Standard deviation, AST: Aspartate transaminase, CRP: C-reactive protein, WBC: White blood cell

and mortality: We observed that the most deaths were from pneumonia, followed by urinary system infections and biliary tract diseases. While mortality was observed in 7.8% (n=117) of the cases, no mortality was observed in 92.2% (n=1386) (Table 5).

While 7.5% (n=113) of the cases were discharged, 70.1% (n=1054) were followed up in the ward, and 22.4% (n=336) were hospitalized and treated in the ICU. Among the cases, the cases admitted to the ICU were mostly hospitalized with the diagnosis of pneumonia; it was observed that 91.4% of the cases with biliary tract diseases were hospitalized and more than half of the cases with upper respiratory tract infection were treated as outpatients (Table 6).

Only the patients who underwent blood culture analysis were included in our study and the results of the blood cultures were approved by a microbiology specialist. Because of the

Table 4. The relationship between admission complaints and mortality

	Mortality status		p
Application complaint	**Surviving cases n (%)**	**Exitus cases n (%)**	
General condition disorder	255 (93.8)	17 (6.2)	0.003
Stomach ache	186 (91.6)	17 (8.4)	0.003
Dyspnea	160 (87.4)	23 (12.6)	0.003
Fire	168 (92.3)	14 (7.7)	0.003
Blurring of consciousness	162 (90.0)	18 (10.0)	0.003
Cough	167 (93.3)	12 (6.7)	0.003
Nausea vomiting	65 (97.0)	2 (3.0)	0.003
Oral intake disorder	61 (98.4)	1 (1.6)	0.003
Dysuria	43 (95.6)	2 (4.4)	0.003
Weakness	31 (96.9)	1 (3.1)	0.003
Ileus	29 (96.7)	1 (3.3)	0.003
Diarrhea	23 (91.7)	2 (8.3)	0.003
Knee pain	23 (100.0)	0 (0,0)	0.003
Headache	11 (64.7)	6 (35.3)	0.003
Chest	2 (66.7)	1 (33.3)	0.003

Table 5. Foci of infection detected in the cases

	Mortality status		p
Infection focus	**n (%)**	**n (%)**	
Pneumonia	519 (89.6)	60 (10.4)	0.001
Urinary system infection	342 (96.1)	14 (3.9)	0.001
Bile tract diseases	185 (93.4)	13 (6.6)	0.001
Soft tissue infection	76 (93.8)	5 (6.2)	0.001
Intra-abdominal infection	34 (94.4)	2 (5.6)	0.001
Gastroenteritis	31 (100.0)	0 (0.0)	0.001
URTI	18 (100.0)	0 (0,0)	0.001
Central nervous system infection	8 (80.0)	2 (20.0)	0.001
Septic arthritis	9 (100.0)	0 (0.0)	0.001
Infective endocarditis	6 (100.0)	0 (0.0)	0.001
Catheter infection	6 (100.0)	0 (0.0)	0.001
Enterorectal fistula	2 (66.7)	1 (33.3)	0.001
Spontaneous bacterial peritonitis	2 (100.0)	0 (0.0)	0.001
Unknown	148 (88.1)	20 (11.9)	0.001
Total	1386 (92.2)	117 (7.8)	0.001

URTI: Upper respiratory tract infection

blood culture of the patients, the infectious agent was detected and in the results obtained; it was observed that there was no growth in 48.9% (n=736) of the cases, the result was considered contamination in 9.6% (n=144) and *Escherichia coli* in 8.2% (n=124) (n=122) *Streptococcus pneumoniae* was identified as the causative agent. Other infectious agents are given in Table 7.

Infectious agents detected because of culture and the mortality status of the cases were compared and the results are given in Table 7. When *Pseudomonas auroginosa* and *Acinetobacter baumannii* were detected among these factors, the mortality rate was found to be statistically significantly higher compared with other factors (p<0.001) (Table 7).

Discussion

As in the world, the elderly population and the dependency ratios of the elderly population are increasing in our country. Additionally, the proportion of the elderly population in admissions to the emergency department is increasing. Additionally, these patients apply to the emergency department with serious illnesses [8,9]. These patients have many comorbid diseases with atypical signs and symptoms that complicate the diagnosis and treatment. It often carries an increased risk of recurrent emergency admissions, hospitalization, and mortality [10]. Additionally, the outcome of these patients is associated with many conditions, such as functional status, comorbidity score, age, social support, multiple drug use, and cognitive impairment [11,12].

Elderly patients are often brought to emergency rooms by ambulance. These patients present to the emergency department with serious and more complex problems. Therefore, more radiological examinations and laboratory tests are performed on these patients. However, older patients stay in the emergency room for longer time [8,9,13]. These patients need 2.5-4.6 times hospitalization and 5 times intensive care hospitalization [10,14]. However, due to the high incidence of misdiagnosis in elderly patients, some of these patients are often discharged from the emergency room without being diagnosed or treated [10].

There is no specific training, such as approaching the geriatric patient in emergency residency training. For this reason, there are difficulties in the diagnosis and treatment of elderly patients [15,16]. However, the applications of these patients to the emergency department is increasing day by day. In our study, we analyzed the infectious agents in the blood culture results of elderly patients who applied to the emergency department with any suspicion of infection and to bring the information obtained to the literature.

In the literature, the rate of the elderly population in emergency service admissions varies between 12% and 50%. In a study by Satar et al. [17] in Turkey, this rate was found to be 12.3%. In the study by Ünsal et al. [18], this rate was found to be 12%. In our study, this rate was found to be 11.8% and it was evaluated as compatible with the literature. The difference in the rate of admission to the emergency service of elderly patients may vary according to the country, city, region and the elderly population in that region.

Table 6. Distribution of outcome status of the cases by infecti

	ICU	Ward	Discharge	p
	Outcome			
Infection focal	**n (%)**	**n (%)**	**n (%)**	
Pneumonia	176 (30.4)	371 (64.1)	32 (5.5)	<0.001
Urinary system infection	66 (18.5)	244 (68.5)	46 (12.9)	<0.001
Bile tract diseases	17 (8.6)	181 (91.4)	0 (0.0)	<0.001
Soft tissue infection	18 (22.2)	57 (70.4)	6 (7.4)	<0.001
Intra-abdominal infection	8 (22.2)	28 (77.8)	0 (0.0)	<0.001
Gastroenteritis	6 (19.4)	21 (67.7)	4 (12.9)	<0.001
URTI	0 (0.0)	8 (44.4)	10 (55.6)	<0.001
Central nervous system infection	3 (30.0)	7 (70.0)	0 (0.0)	<0.001
Septic arthritis	-	5 (55.6)	4 (44.4)	<0.001
Infective endocarditis	3 (50.0)	3 (50.09)	0 (0.0)	<0.001
Catheter infection	3 (50.0)	3 (50.09)	0 (0.0)	<0.001
Enterorectal fistula	3 (100.0)	0 (0.0)	0 (0.0)	<0.001
Spontaneous bacterial peritonitis	0 (0.0)	2 (100.0)	0 (0.0)	<0.001
Unknown	33 (19.6)	124 (73.89)	11 (6.5)	<0.001

Biliary tract diseases: Includes acute cholangitis, acute pancreatitis and acute cholecystitis. URTI: Upper respiratory tract infection, ICU: Intensive care unit

In the literature, it has been determined that women aged 65 and over apply to the emergency service at a higher rate [18-20]. In the study of Lim and Yap [21], it was reported that 56% of patients aged 65 and over who applied to the emergency department were male. In our study, similar to the findings of Lim and Yap [21], 51.2% of male patients aged 65 and over applied more frequently. It was thought that this rate, which was determined differently from the literature, may be due to the characteristics of the region and because men are given more value due to the patriarchal family structure in our country. It is also effective for men to apply to the emergency room for even the smallest thing. In women, we thought that it might be due to more hesitation in going to the hospital or the emergency room.

With increasing age, some diseases may occur because of naturally occurring physiological changes. Therefore, the prevalence of chronic disease in elderly patients is higher than in younger patients. Özdemir et al. [22] reported that patients over 65 years of age with at least one chronic disease constitute 79% of all patients over 65 years of age. In a study by Fadıloğlu and Tokem [23] in our country; it was reported that 90% of patients aged 65 and have a chronic disease, 35% have two chronic diseases and 23% have three chronic diseases. In our study, it was observed that 87% of the cases had at least one chronic disease; it was determined that HT was the most common with a rate of 54.4%, and DM was the second most common with a rate of 49%. Additionally, the presence of these diseases has a positive effect on mortality. In the cox regression analysis performed in our study, it was observed that malignancy and CRF increased mortality statistically significantly.

Complaints on admission to hospital in elderly patients are often atypical complaints [4,5]. In the literature, it has been reported that non-specific findings such as falling, mental status changes, delirium, urinary incontinence and fatigue are common causes of presentation in elderly patients [24,25]. In their study, Norman and Toledo [26] stated that one of the important reasons for their atypical presentations is underlying chronic diseases. In the study of Temel and Akçam [2], it was reported that they are most frequently applied due to fever, cough, sputum, and confusion. In our study, it was observed that the most frequent complaints were general condition disorder, abdominal pain and shortness of breath, respectively. We think that these differences in the frequency of admission

Table 7. Comparison of the effects of infectious factors on mortality in the cases

	Mortality atatus		p*
Culture factor result	**No n (%)**	**Yes n (%)**	
No reproduction	704 (95.7)	32 (4.3)	<0.001
Contamination	129 (89.6)	15 (10.4)	<0.001
Escherichia coli	118 (95.1)	6 (4.9)	<0.001
Streptococcus pneumoniae	110 (90.2)	12 (9.8)	<0.001
MRSA	90 (87.4)	13 (12.6)	<0.001
Staphylococcus aureus	84 (93.3)	6 (6.7)	<0.001
Klebsiella pneumoniae	41 (87.2)	6 (12.8)	<0.001
Enterococcus faecalis	42 (89.4)	5 (10.6)	<0.001
Acinetobacter baumannii	26 (74.3)	9 (25.7)	<0.001
Pseudomonas aeruginosa	7 (58.3)	5 (41.7)	<0.001
Staphylococcus haemolyticus	9 (75.0)	3 (25.0)	<0.001
Staphylococcus epidermidis	8 (100.0)	0 (0.0)	<0.001
Aerococcus species	5 (83.3)	1 (16.7)	<0.001
Candida albicans	5 (83.3)	1 (16.7)	<0.001
Candida glabrata	5 (83.3)	1 (16.7)	<0.001
Staphylococcus lugdunensis	6 (100.0)	0 (0.0)	<0.001
Enterococcus raffinosus	5 (83.3)	1 (16.7)	<0.001
Gram (+) basil	5 (83.3)	1 (16.7)	<0.001
Streptococcus spp.	6 (100.0)	0 (0.0)	<0.001
Streptococcus pyogenes	6 (100.0)	0 (0.0)	<0.001
Yeast mushroom	5 (83.3)	1 (16.7)	<0.001

*: Fisher's Exact test used, MRSA: Methicillin-resistant *Staphylococcus aureus*

complaints in the literature are due to the differences in sociocultural levels, socioeconomic levels and existing chronic diseases in the regions where the hospitals are located.

Although there are serious bacterial infections in the elderly, there may still be applications with normal body temperature. The reason for this is the functional disorders seen due to aging. Although the presence of fever suggests infection, its absence does not exclude it [27,28]. This may cause delays in diagnosis in some infective diseases. As a result, mortality and morbidity in patients increase [29-31]. In the study of Gleckman and Hibert [32], fever was reported in only 13% of patients with bacteremia. Similarly, in the study of Castle et al. [33], fever was found in only one-third of the elderly patients with infection. In our study, fever was observed in 32.4% of the cases, and it was found to be compatible with the literature.

The arrival vital values of the cases were evaluated and when the obtained results were examined; it was observed that when the severity of the patients increased (from discharge to intensive care), there was an increase in the mean pulse rate and a decrease in systolic and diastolic blood pressure values. This explains the emergence of sepsis and septic shock findings in patients with intense infection. A comparison could not be made due to the absence of similar studies in the literature.

In the diagnosis of infection in elderly patients, tests such as leukocytes and CRP are studied. Laboratory findings of elderly patients may differ from those of younger patients. The leukocyte increase in the complete blood count may have been lower than expected. Studies have shown that there is no increase in white blood cells a serious infection in geriatric patients with a frequency of 32%-49% [1]. In the study of Bentley et al. [34], they associated the higher leukocyte count in geriatric patients with the presence of a bacterial infection. In our study, CRP and leukocyte values were found to be statistically significantly higher in cases with mortality. Additionally, in the cox regression analysis performed, it was observed that statistically significant mortality was also high in cases with increased leukocyte levels, but no such relationship was found between CRP and mortality.

In our study, the most common focus of infection was pneumonia, the second most common urinary tract infections, and the third most common biliary tract diseases. Uluğ et al. [35] evaluated community-acquired infections in elderly patients and found that pneumonia and acute gastroenteritis were the most common causes, respectively. Avkan-Oğuz et al. [36] reported that urinary system infections, acute gastroenteritis and pneumonia were the most common foci of infection in elderly patients, respectively. As in these studies, urinary tract infections and pneumonia are the most common focus of infection in geriatric patients, and our study was found to be compatible with the literature. We think that this situation arises due to the need for care of elderly patients and the inability to perform self-hygiene.

The causative microorganisms in infectious diseases differ among young populations depending on the place where the infection is acquired (community origin, nursing home) and accompanying diseases [35]. In the study of Temel and Akçam [2], the most common agents in elderly patients were *E. coli* (36%), *Brucella* spp. (3%) and *Acinetobacter* spp. (3%) was found [24].

In our study, blood culture samples were taken from 1503 patients and no growth was observed in 48.9% (n=736) of these samples; *E. coli* (8.2%) was the most common infectious agent, *S. pneumoniae* (8.1%) was the second most common and methicillin-resistant *Staphylococcus aureus* (MRSA) was the third (6.7%). In addition, it should be considered that resistant agents such as MRSA (6.7%), *Acinetobacter* (2.3%), *P. aeroginosa* (0.8%) are more common in the elderly. Our study was found to be similar to the literature. The reason for the high number of cases with no growth in culture; it was thought that viral infections could be seen frequently or inappropriate culture cultivation.

The effect of the infectious agents detected in the cases on mortality was examined and it was observed that resistant infectious agents such as *P. aeroginosa* (41.7%) and *A. baumannii* (25.7%) caused the highest mortality. This situation shows us that if resistant infectious agents are detected in elderly patients, treatment should be started quickly and close follow-up should be done.

Conclusion

In our study, it should be kept in mind that elderly patients presenting with signs of infection may have a resistant infection, early blood culture should be taken, treatment should be started quickly, and close follow-up should be performed. It should be kept in mind that especially patients with a history of malignancy and CRF are at risk of mortality. We have seen that the most common focus of infection is pneumonia and urinary system infection, and therefore we think that social education and hygiene measures will reduce both the mortality in geriatric patients with infectious diseases and the losses in our country's economy.

Ethics

Ethics Committee Approval: Izmir Katip Celebi University Local Ethics Committee of the hospital (decision no: 524, date: 09.01.2020).

Informed Consent: A signed voluntary consent form was obtained from all patients included in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.D., U.P., S.B., Concept: A.K., M.G.E., S.B., Design: U.P., A.K., M.G.E., S.B., Data Collection or Processing: E.D., M.G.E., S.B., Analysis or Interpretation: E.D., U.P., A.K., Literature Search: E.D., U.P., A.K., S.B., Writing: E.D., U.P., M.G.E.

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