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RISK FACTORS FOR MORTALITY IN INTENSIVE CARE UNIT-ACQUIRED PNEUMONIA DUE TO KLEBSIELLA PNEUMONIAE

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Abstract: **Objective**: Hospital-acquired pneumonia (HAP) developing in intensive care units (ICU) is an important problem. Gram-negative bacteria are the most important cause of HAP. Among these bacteria, *Klebsiella pneumoniae* is among the most important pathogens. The mortality rate for infections caused by carbapenem-resistant *Klebsiella pneumoniae* is high. Identifying mortality risk factors is crucial to prevent potential deaths. The aim of this study was to determine the risk factors associated with mortality in HAP due to *Klebsiella pneumoniae* in intensive care unit patients.

Material and Methods: This cross-sectional study was conducted between 01. May 2021. and 01. May 2023. in the Anesthesia and Reanimation Intensive Care Unit of Izmir Tepecik Training and Research Hospital. Patients aged 18 years who were diagnosed with hospital-acquired pneumonia due to *Klebsiella pneumoniae* were included in the study. The dependent variable of the study was 14-day mortality due to *Klebsiella pneumoniae* pneumonia. Independent variables were presence of COVID-19, bacteremia, ceftazidime/avibactam treatment, intubation, sepsis, Charlson comorbidity score, and laboratory parameters. We conducted logistic regression analysis using the backward elimination method to identify independent predictors of mortality.

Results: A total of 176 patients were included in the study. The mean age of the patients was 64.6 ± 16.2 years and 64.2% were male. The 14-day mortality rate was 29% (n:51). In the regression analysis performed to determine the risk factors for mortality; in the univariate regression analysis, day 0 leukocyte count > 10.600/mm^3 (OR: 2.31; 95% CI: 1.10-4.84), platelet value < 140.000/mm^3 (OR: 2.26; 95% CI: 1.06-4.81), AST > 50 U/L (OR: 2.40; 95% CI: 1.20-4.79) and creatinine > 1.3 mg/dL (OR: 1.96; 95% CI: 1.006-3.82) were associated with mortality. In multivariate regression analysis, a leukocyte count > 10.600/mm^3 (OR: 2.30; 95% CI: 1.03-5.14) and an AST > 50 U/L (OR: 2.23; 95% CI: 1.04-4.75) were found to be independent predictors of mortality.

Conclusion: In conclusion, leukocytosis and high AST levels were found to be independent risk factors associated with mortality in cases of *Klebsiella pneumoniae* in the intensive care unit. Taking these factors into account, in addition to other parameters and scores that determine the prognosis of patients, may be useful in reducing mortality.

Keywords: *Klebsiella pneumoniae*, mortality, pneumonia, risk factors, intensive care units.

INTRODUCTION

Hospital-acquired pneumonia (HAP) in intensive care units (ICU) is a significant problem due to its high frequency and mortality (1). Gram-negative bacteria are the most important cause of HAP developing in ICUs (2). Among these bacteria, multidrug-resistant *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae (K. pneumoniae)* are among the most important pathogens. The main resistance mechanism in these microorganisms is beta-lactamase enzyme production. Carbapenem group antibiotics are increasingly used in these units due to high extended-spectrum beta-lactamase (ESBL) rates. As a result, carbapenem resistance among these bacteria has increased significantly in recent years (3). The mortality rate for infections associated with carbapenem-resistant *K. pneumoniae* is as high as 50% (4, 5). Several new antibiotics have been introduced for the

treatment of carbapenemase-producing *K. pneumoniae* infections. Before the introduction of these agents or in countries without access to them, "second-line" antibiotics such as aminoglycosides, tigecycline, fosfomycin, and colistin are used in the treatment. Among the newer antibiotics, ceftazidime/avibactam stands out. In the treatment of infections due to carbapenemase-producing Enterobacteriaceae, mortality rates were lower with ceftazidime/avibactam treatment compared with conventional treatment regimens (6). Ceftazidime/avibactam received approval in our country in October 2019 and has been in use since April 28, 2021(7).

Several factors influence mortality in ICU-acquired pneumonia caused by gram-negative bacteria. In additon to coronary heart disease, diabetes, renal failure, shock, venous catheterization, mechanical ventilation, high Charlson comorbidity, and quick Sepsis Related Organ Failure Assessment (qSOFA) scores have all been associated with poor prognosis (8, 9).

However, there have been only a limited number of studies on pneumonia caused by *K. pneumoniae* indicating the risk factors for mortality. Identifying mortality risk factors is crucial to prevent potential deaths.

Aim: The aim of this study was to determine the risk factors associated with mortality in HAP due to *K. pneumoniae* infection in intensive care patients.

MATERIAL AND METHODS

This cross-sectional study was conducted between 01. May 2021. and 01. May 2023. in the Anesthesia and Reanimation Intensive Care Unit of Izmir Tepecik Training and Research Hospital. Patients aged 18 years who were diagnosed with hospital-acquired pneumonia due to *K.pneumoniae* were included in the study. The diagnosis of pneumonia was made according to the Infectious Diseases Society of America (IDSA) guideline criteria (10).

Electronic medical records were used to collect data. The study was approved by the Ethics Committee of the Tepecik Training and Research Hospital on September 15, 2022, under the number 2022/09-13.

The study's dependent variable was 14-day mortality due to *K.pneumoniae* pneumonia. Independent variables included demographic characteristics of the patients, the presence of COVID-19, bacteremia, ceftazidime/avibactam treatment, comorbidity, intubation, sepsis, Charlson comorbidity score, as well as levels of leukocytes, platelets, hemoglobin, C-reactive protein, procalcitonin, creatinine, albumin, AST, and ALT. Laboratory results were categorized using either the upper/lower limits of normal values or the median/intermediate values in the study database.

Descriptive statistics are presented as a number and percentage for categorical variables, the mean and standard deviation for continuous variables that fit the normal distribution, and median and 25%-75% interquartile range for those that do not. We used Pearson's chi-square or Fisher's exact test to compare categorical data, the t-test to compare continuous variables that followed a normal distribution, and the Mann–Whitney U test for those that did not.

Logistic regression analysis with the backward elimination method was performed to determine the independent predictors of mortality. To select the variables to be included in the model, a univariate regression analysis was first performed with the variables that were statistically significant in the univariate analysis or had a relationship found in the literature and with biological probability, and a crude odds ratio (OR) was calculated. The adjusted OR was calculated by multivariate regression analysis, and predictors were determined. Analyses were performed with SPSS 22.0 (IBM Corporation, Armonk, New York, United States) and a two-way p value < 0.05 was considered statistically significant.

RESULTS

A total of 176 patients were included in the study. The mean age of the patients was 64.6 ± 16.2 years and 64.2% were male. The 14-day mortality rate was 29% (n:51). *K. pneumoniae* growth in blood culture was found in 21.6% (n:37), sepsis in 64.1% (n:107), and COVID-19 in 41.5% (n:73) of the patients. 94.5% of COVID-19 cases and 84.5% of other cases were intubated. The demographic and clinical characteristics, laboratory findings, and treatment results of the patients are shown in Table 1.

Table 1. *Demographic and clinical characteristics, laboratory findings, and treatment results of the patients*

Demographic and clinical characteristics	n (%)
Age (mean ± SD)	64.6 ± 16.2
Gender (n:176)	
Female	63 (35.8)
Male	113 (64.2)
Co-morbidity (n:176)	
Yes	147 (83.5)
No	29 (16.5)
COVID-19 (n:176)	
Yes	73 (41.5)
No	103 (58.5)
Sepsis (n:167)	
Yes	107 (64.1)
No	60 (35.9)
Bacteremia (n:171)	
Yes	37 (21.6)
No	134 (78.4)
Invasive mechanical ventilation (n:175)	
Yes	156 (89.1)
No	19 (10.9)

Charlson score (n:176) [median (IQR)]	3 (2-5)
Length of stay (n:176) [median (IQR)]/days	31 (16-51)
Laboratory	
Day 0 WBC/mm^3 [median (IQR)]	12.400 (9.000-18.500)
Day 7 WBC/mm^3 [median (IQR)]	11.100 (8.100-15.300)
Day 0 CRP/mg/L [median (IQR)]	139.5 (78.5-219.8)
Day 7 CRP/mg/L [median (IQR)]	125.5 (81.3-191.5)
Day 0 Procalcitonin mcg/L [median (IQR)]	0.6 (0.17-3.6)
Day 7 Procalcitonin mcg/L [median (IQR)]	0.36 (0.12-1.5)
Day 0 Haemoglobin g/dL (mean ± SD)	9.7 ± 2.2
Day 0 Trombocyte/mm^3 [median (IQR)]	231.000 (156.000-310.000)
Day 0 Albumin g/dL (mean ± SD)	2.3 ± 0.5
Day 0 ALT U/L [median (IQR)]	28 (17-61)
Day 0 AST U/L [median (IQR)]	29.5 (18-58.8)
Day 0 Creatinin mg/dL [median (IQR)]	1.1 (0.7-1.8)
Treatment	
Ceftazidime/avibactam (n:176)	
Yes	26 (14.8)
No	150 (85.2)
Mortality	
14-day mortality (n:176)	
Yes	51 (29)
No	125 (71)

CRP: C-reactive protein; WBC: White blood cell count

Ceftazidime/avibactam (88.2%) was the most susceptible antibiotic for *K.pneumoniae* isolates from respiratory samples of the patients, followed by fosfomycin (41.7%) and trimethoprim-sulfamethoxazole (41.7%). Resistance to carbapenems was over 80%, whereas resistance to colistin was 95.9%. The antimicrobial susceptibility profiles of the isolates are shown in Table 2.

Ceftazidime/avibactam was used in 14.8% (n:26) of patients. In other patients, various combination regimens were employed according to antibiotic susceptibility results. Although the mortality rate was lower in patients treated with ceftazidime/avibactam than in those not treated with ceftazidime/avibactam, the difference was not statistically significant (23.1% vs 30%; p:0.47). In bacteremic cases (n:37), the mortality rate was 9.1% in those treated with ceftazidime/avibactam (n:11) and 30.8% in those treated with other antibiotics (n:26), but the difference was not statistically significant (p:0.22). Although the mortality rate was higher in COVID-19 cases than in non-COVID-19 cases, the difference was not statistically significant (34.2% vs. 25.2%; p:0.19).

Mortality rates of patients were compared in terms of various variables. The mortality rate was found to be statistically significantly higher in the presence of sepsis (34% vs 20%), leukocyte count > 10,600/mm^3 (34.8% vs 18.8%), platelet value < 140,000/mm^3 (43.2% vs 25.2%), AST value > 50 U/L (42.3% vs 23.4%), and creatinine value > 1.3 mg/dL (38.1% vs 23.9%) ($p < 0.05$).

A comparison of the mortality rates of the patients in terms of clinical and laboratory findings is presented in Table 3.

Table 2. *The antimicrobial susceptibility of K.pneumoniae isolates*

Antibiotic	Susceptible n (%)	Susceptible, increased exposure n (%)	Resistant n (%)	Total n (%)
Ceftazidime/avibactam	75 (88.2)		10 (11.8)	85 (100)
Meropenem	28 (16.9)		138 (83.1)	166 (100)
Imipenem	30 (18.9)	1 (0.6)	128 (80.5)	159 (100)
Ertapenem	13 (8.3)		144 (91.7)	157 (100)
Fosfomycin	10 (41.7)		14 (58.3)	24 (100)
Colistin	2 (4.1)		47 (95.9)	49 (100)
Tigecycline	-	-	5 (100)	5 (100)
Amikacin	30 (18.9)	1 (0.6)	128 (80.5)	159 (100)
Gentamicin	13 (8.3)		144 (91.7)	157 (100)
Trimethoprim-Sulfamethoxazole	10 (41.7)		14 (58.3)	24 (100)
Ciprofloxacin	19 (11)		154 (89)	173 (100)
Levofloxacin	9 (5.6)		152 (94.4)	161 (100)
Piperacillin/tazobactam	17 (10)		153 (90)	170 (100)
Ceftriaxone	18 (10.4)		155 (89.6)	173 (100)
Ceftazidime	15 (8.9)		154 (91.1)	169 (100)
Cefuroxime	12 (7.3)		152 (92.7)	164 (100)

Table 3. *Comparison of mortality rates according to demographic, clinical, and laboratory findings of patients*

	Mortality		P value
	Yes n (%)	No n (%)	
Gender Female Male	 15 (23.8) 36 (31.9)	 48 (76.2) 77 (68.1)	0.26
Co-morbidity Yes No	 44 (29.9) 7 (24.1)	 103 (70.1) 22 (75.9)	0.53
COVID-19 Yes No	 25 (34.2) 26 (25.2)	 48 (65.8) 77 (74.8)	0.19
Sepsis Yes No	 37 (34.6) 12 (20)	 70 (65.4) 48 (80)	0.04
Bacteremia Yes No	 9 (24.3) 40 (29.9)	 28 (75.7) 94 (70.1)	0.5
Invasive mechanical ventilation Yes No	 49 (31.4) 2 (10.5)	 107 (68.6) 17 (89.5)	0.06
Ceftazidime/avibactam Yes No	 6 (23.1) 45 (30)	 20 (76.9) 105 (70)	0.47
Day 0 WBC/mm^3 4.200–10.600 > 10.600	 12 (18.8) 39 (34.8)	 52 (81.3) 73 (65.2)	0.02
Day 7 WBC/mm^3 4.200–10.600 > 10.600	 10 (15.2) 9 (12.3)	 56 (84.8) 64 (87.7)	0.63
Day 0 CRP mg/L 5-100 100-200 > 200	 15 (25.4) 16 (25.8) 20 (36.4)	 44 (74.6) 46 (74.2) 35 (63.6)	0.34
Day 7 CRP mg/L 5-100 100-200 > 200	 6 (11.8) 9 (15.3) 4 (13.3)	 45 (88.2) 50 (84.7) 26 (86.7)	0.86
Day 0 Procalcitonin mcg/L < 0.25 0.25–1.5 > 1.5	 12 (20.3) 20 (35.1) 19 (31.7)	 47 (79.7) 37 (64.9) 41 (68.3)	0.18
Day 7 Procalcitonin mcg/L < 0.25 0.25–1.5 > 1.5	 4 (7.4) 10 (19.6) 5 (14.7)	 50 (92.6) 41 (80.4) 29 (85.3)	0.18
Haemoglobin g/dL > 9 < 9	 26 (27.7) 25 (30.5)	 68 (72.3) 57 (69.5)	0.68

Thrombocyte/mm^3 < 140.000 > 140.000	 16 (43.2) 35 (25.2)	 21 (56.8) 104 (74.8)	 0.03
Albumin (< 3.5 g/dL) Yes No	 51 (30.4) 0 (0)	 117 (69.6) 7 (100)	 0.10
ALT U/L < 50 > 50	 32 (25.2) 19 (38.8)	 95 (74.8) 30 (61.2)	 0.07
AST U/L < 50 > 50	 29 (23.4) 22 (42.3)	 95 (76.6) 30 (57.7)	 0.01
Creatinine mg/dL < 1.3 > 1.3	 27 (23.9) 24 (38.1)	 86 (76.1) 39 (61.9)	 0.04
Age (mean ± SD)	67.6 ± 16.8	63.4 ± 15.8	0.12
Charlson comorbidity index [median (IQR)]	4 (2-5)	3 (2-4)	0.15

Table 4. *Risk factors for mortality determined by univariate and multivariate logistic regression analyzes*

	Univariate Crude OR 95% CIp value			Multivariate* Adjusted OR 95% CIpvalue		
Age	1.01	(0.99-1.04)	0.12			
Gender Female Male	 1 0.66	 (0.33-1.35)	 0.26			
Sepsis	2.11	(1.001-4.46)	0.05			
Day 0 WBC/mm^3 4200–10600 > 10600	 1 2.31	 (1.10-4.84)	 **0.02**	 1 2.30	 (1.03-5.14)	 **0.04**
Thrombocyte/mm^3 > 140000 < 140000	 1 2.26	 (1.06-4.81)	 **0.03**			
AST U/L < 50 > 50	 1 2.40	 (1.20-4.79)	 0.01	 1 2.23	 (1.04-4.75)	 **0.03**
Creatinin mg/dL < 1.3 > 1.3	 1 1.96	 (1.006-3.82)	 **0.04**			

OR: odds ratio; CI: Confidence Interval
*Only statistically significant variables are shown.

In the regression analysis performed to determine the risk factors for mortality; in the univariate regression analysis, day 0 leukocyte count >10.600/mm^3 (OR: 2.31; 95% CI: 1.10-4.84), platelet value < 140.000/mm^3 (OR: 2.26; 95% CI: 1.06-4.81), AST > 50 U/L (OR: 2.40; 95% CI: 1.20-4.79) and creatinine > 1.3 mg/dL (OR: 1.96; 95% CI: 1.006-3.82) were associated with mortality. In multivariate regression analysis, a leukocyte count > 10.600/mm^3 (OR: 2.30; 95% CI: 1.03-5.14) and an AST > 50 U/L (OR: 2.23; 95% CI: 1.04-4.75) were found to be independent predictors of mortality (Table 4).

DISCUSSION

In our study, the mortality rate was found to be 29% in patients who were followed up in the ICU with a diagnosis of HAP due to *K. pneumoniae*, and leukocytosis and AST elevation were found to be independent risk factors associated with mortality. However, the presence of sepsis, comorbidities, COVID-19 infection, bacteremia, and antibiotic treatment regimens were not associated with mortality.

In a study conducted in China with *K. pneumoniae*-related pneumonia cases developing in intensive

care units, the mortality rate was found to be 18%, and the risk factors associated with mortality were low Glasgow Coma Scale, low platelet count, low albumin concentration, high lactate levels, and inappropriate antibiotic treatment (1). In another study conducted in hospital-acquired pneumonia cases with bacteremia, the 28-day mortality rate was found to be 60.2%. High severe organ failure assessment score (SOFA) and inappropriate antibiotherapy were found to be factors associated with mortality (11). Jiao et al. found that the presence of ventilator-associated pneumonia, pressure ulcers, and several comorbidities were associated with high mortality in patients with hospital-acquired pneumonia (12). In our study, the mortality rate was found to be higher in intubated patients, but the difference was not statistically significant. No difference was found between the Charlson comorbidity index and mortality.

Our patients in the study were elderly, intubated, and generally in poor clinical condition with sepsis. Approximately one-fifth of the patients had simultaneous *K. pneumoniae* growth in blood culture. The presence of bacteremia in cases of pneumonia worsens the disease course and leads to increased mortality (13). Similarly, in a study conducted in Japan in 2015, the mortality rate was found to be significantly higher (34.8% vs. 11.3%) in patients with bacteremia (14). However, there was no difference in the mortality rate between patients with and without bacteremia in our study. These results should be evaluated with caution because the number of patients with blood culture growth was low in our study. Further studies are needed with a larger number of patients to investigate mortality in cases of bacteraemic pneumonia caused by *K. pneumoniae*.

In previous studies, conflicting data have been presented in research examining the effect of the appropriateness of antibiotic treatment on mortality. In addition to studies reporting that mortality decreased with appropriate treatment, there are also studies reporting that it did not affect mortality (1, 14, 15). In our study, very high resistance rates, including carbapenems and colistin, were found in *K. pneumoniae* isolates. Ceftazidime/avibactam exhibited the highest susceptibility rate (88.2%). In a study conducted in critically ill patients, ceftazidime/avibactam treatment was found to be associated with higher survival (16). Similarly, in our study, a lower mortality rate was observed in the group receiving ceftazidime/avibactam treatment compared with the group receiving other combination regimens, but the difference was not statistically significant. In the study by Rivera-Espinar et al., 30-day mortality in ventilator-associated pneumonia due to *K. pneumoniae* was higher in the presence of carbapenem resistance due to KPC than in susceptible isolates. However, even in cases of VIP caused by resistant isolates, a similar prognosis has been observed with appropriate antibiotic treatment (15). Ceftazidime/avibactam is indicated according to the specific rules in our country. It can only be used for infections in vitro resistant to carbapenems, aminoglycosides, and third-generation cephalosporins and susceptible to ceftazidime/avibactam. Ceftazidime/avibactam was used in only 14.8% of cases. Therefore, randomized trials with larger numbers of patients should be conducted.

Garcia-Vidal et al. found that the presence of community or hospital-acquired superinfection was associated with a worse prognosis in patients with COVID-19 infection (17). In a meta-analysis study, it was found that co-infection or superinfection increased mortality in those infected with COVID-19 (18). In our study, although the mortality rate was higher in COVID-19 cases, there was no statistically significant difference. This was considered to be because the patient population in the study was elderly, intubated, and sepsis patients. Standard treatment and care protocols applied to critically ill patients may have caused similar mortality rates.

In our study, leukocytosis, thrombocytopenia, elevated creatinine levels, and elevated AST levels were significantly associated with mortality in univariate analysis. However, only leukocytosis and high AST levels remained significant in multivariate analysis. In a study conducted in hospitalized patients with community-acquired pneumonia, age, leukocytosis, high urea level, and hypotension were found to be associated with mortality (19). In the study by Sönmez et al. examining mortality predictors for COVID-19, high AST levels and leukocytosis were found to be independent risk factors (20). This may be compatible with the fact that the presence of sepsis and organ dysfunction in patients is associated with mortality.

In order to prevent mortality due to nosocomial infections, it is essential to maintain infection control measures, personnel training, early diagnosis, and appropriate treatment of developing infections (21).

Our study has several limitations. The study was conducted in a single center with a relatively small number of patients. Treatment regimens could not be adequately compared because antibiotic treatments included different combinations and the number of patients receiving ceftazidime/avibactam was low.

CONCLUSION

In conclusion, leukocytosis and high AST levels were found to be independent risk factors associated with mortality in cases of *K. pneumoniae* in the intensive care unit. Taking these factors into account, in addition to other parameters and scores that determine the prognosis of patients, may be useful in reducing mortality.

Abbreviations

HAP — Hospital-acquired pneumonia
IDSA — Infectious Diseases Society of America
qSOFA — quick Sequential Organ FailureAssessment
WBC — White blood cell count
CRP — C-reactive protein
AST — Aspartat aminotransferase
ALT — Alanine aminotransferase
OR — odds ratio
CI — Confidence Interval
IQR — Inter QuantileRange
COVID-19 — Coronavirus Disease 2019
ICU — Intensive care unit

Authors contributions:

US: Study design, data collection, writing the manuscript, analyzing data

DÇ: Analyzing data, writing the manuscript, data collection

SS: Data collection, writing the manuscript

GE: Analyzing data, data collection

SA: Study design, writing the manuscript, analyzing data

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Sažetak

FAKTORI RIZIKA ZA SMRTNOST U SLUČAJEVIMA PNEUMONIJE IZAZVANE KLEBSIELOM U JEDINICI INTENZIVNE NEGE

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Uvod: Bolnički stečena pneumonija (BSP) koja se razvija u jedinicama intenzivne nege (JIN) predstavlja značajan problem. Gram-negativne bakterije su najvažniji uzrok BSP. Među ovim bakterijama, Klebsiella pneumoniae je jedna od najvažnijih patogena. Stopa smrtnosti od infekcija izazvanih Klebsiella-om pneumoniae otpornom na karbapeneme je visoka. Identifikacija faktora rizika za smrtnost je od suštinskog značaja kako bi se sprečile potencijalne smrti. Cilj ovog istraživanja bio je utvrditi faktore rizika povezane sa smrtnošću kod BSP izazvane infekcijom Klebsiella-om pneumoniae kod pacijenata u jedinicama intenzivne nege.

Materijal i Metode: Ova studija preseka sprovedena je između 01. maja 2021. i 01. maja 2023. godine u Jedinici intenzivne nege za anesteziju i reanimaciju u Bolnici za obuku i istraživanje Izmir Tepecik. U istraživanju su učestvovali pacijenti stariji od 18 godina kod kojih je dijagnostifikovana bolnički stečena pneumonija uzrokovana Klebsiella-om pneumoniae. Zavisna varijabla istraživanja bila je smrtnost u roku od 14 dana usled pneumonije uzrokovane Klebsiella-om pneumoniae. Nezavisne varijable obuhvatile su prisustvo COVID-19, bakterijemiju, tretman sa ceftazidime/avibactam, intubaciju, sepsu, Charlson komorbiditet skor, i laboratorijske parametre. Sproveli smo analizu logističke regresije koristeći metod obrnutog isključivanja kako bismo identifikovali nezavisne prediktore smrtnosti.

Rezultati: U studiju je uključeno ukupno 176 pacijenata. Prosečna starost pacijenata iznosila je 64,6 ± 16,2 godine, a 64,2% su bili muškarci. Stopa smrtnosti u roku od 14 dana iznosila je 29% (n:51). U analizi regresije sprovedenoj kako bi se utvrdili faktori rizika za smrtnost, u univarijatnoj regresiji, leukociti prvog dana > 10.600/mm^3 (OR: 2,31; 95% CI: 1,10-4,84), vrednost trombocita < 140.000/mm^3 (OR: 2,26; 95% CI: 1,06-4,81), AST > 50 U/L (OR: 2,40; 95% CI: 1,20-4,79) i kreatinin > 1,3 mg/dL (OR: 1,96; 95% CI: 1,006-3,82) bili su povezani sa smrtnošću. U multivarijatnoj regresijskoj analizi, leukociti > 10.600/mm^3 (OR: 2,30; 95% CI: 1,03-5,14) i AST > 50 U/L (OR: 2,23; 95% CI: 1,04-4,75) su pronađeni kao nezavisni prediktori smrtnosti.

Zaključak: Ukratko, leukocitoza i visoki nivoi AST su identifikovani kao nezavisni faktori rizika povezani sa smrtnošću u slučajevima Klebsiella pneumoniae u jedinici intenzivne nege. Razmatranje ovih faktora, zajedno sa ostalim parametrima i skorovima koji utiču na prognozu pacijenata, može biti korisno u smanjenju smrtnosti.

Ključne reči: Klebsiella pneumoniae, smrtnost, pneumonija, faktori rizika, jedinice intenzivne nege.

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