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Doi Number: <http://dx.doi.org/10.38063/ejons.611>**INTENSIVE CARE UNIT INFECTIONS AND ANTIBIOTIC USE****Nevhiz GÜNDOĞDU¹****Betül ŞİMŞEK²****Necla BENLIER³**

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Abstract

Objective: This study was done to determine the infections and antibiotics used during hospitalization in our intensive care unit patients with chest diseases problems to raise awareness about infection control and correct antibiotic use in the daily routine of intensive care physicians

Materials and methods: The files of patients with chest diseases in the intensive care unit were reviewed retrospectively to evaluate hospital infections and antibiotic use. The effects of infections and antibiotic use on hospital stay and mortality were investigated

Results: Ventilator- Associated Pneumonia (VAP) developed in 10 patients who were intubated and the duration of VAP onset was 9.11 ± 3.14 . It was found that the mortality of patients who developed VAP increased significantly ($p < 0.05$). It was found that as the number of antibiotics and the number of days used increased, mortality increased.

Conclusion: Local microbiological data are very important in predicting resistance patterns of bacteria that may be causative, and antibiotic selection should be planned specifically for each patient

Keywords: Intensive care, hospital infection, antibiotic use

Introduction:

Nosocomial infections are still one of the important health problems experienced in the world and in our country despite the precautions. These infections are seen in patients who are hospitalized for various reasons, and if there are underlying comorbidities, septicemias are added to the cause of hospitalization, which causes an increase in treatment costs, morbidity and mortality due to the prolongation of the hospitalization period (1-3.)

Pneumonia is the most common cause of septicemia seen in hospital admissions, and nosocomial pneumonias are more mortal than community-acquired pneumonias (4,5). Therefore, infection and infection control is very important in intensive care units. Besides, the corresponding infection should be treated with the correct antibiotics and in the fastest way

possible, otherwise the problem of resistance will be encountered in intensive care units (5,7,8). In many studies, antibiotics were used in 70% of the patients hospitalized in intensive care, and it was shown that 50% of the antibiotics that were started empirically did not meet the criteria for starting antibiotics (9). This is another reason for the resistance problem.

In the Intensive Care Unit (ICU), we are faced with more and more resistant nosocomial infections day by day due to the reasons of hospital infections, treatments and mortality that are ignored in daily routines.

Therefore, we wanted to determine the infections and antibiotics used during hospitalization in our intensive care unit patients with chest diseases problems to raise awareness about infection control and correct antibiotic use in the daily routine of intensive care physicians to contribute to the literature by presenting the results of their compatibility with the culture.

Methods:

In our study, the files of 91 patients (46 women (50.5%) and 45 men (49.5%)) hospitalized in our general intensive care unit with chest diseases in 2017 were retrospectively analyzed. Patients' demographic characteristics, reasons for hospitalization, duration of stay, biochemical parameters, antibiotics they used, culture results, nosocomial infections during follow-up were recorded. Also, the effects of nosocomial infections on duration of stay and mortality were evaluated. Nosocomial infection criteria were determined according to the CDC criteria (10,11,12). The behaviors of quantitative variables are specified using centralization and variance measures: Mean \pm Sd. Anova T-test was used to show the behavioral differences of group averages when normality and equivocality assumptions were met, and nonparametric methods such as the Mann Whitney U (number of groups = 2) Test were used when not. Fisher Exact and Chi-square tests were used to determine the differences between proportions or relationships between categorical variables. Statistical significance was determined as $p=0.05$ for all cases. Statistical analysis was provided by IBM SPSS (Statistics Package for Social Sciences for Windows, Version 21.0, Armonk, NY, IBM Corp.) package program.

Results:

The study included 91 patients, 46 females (50.5%) and 45 males (49.5%). The average age of the patients is 70.68 ± 14.23 . Of our inpatients, 9.9% were hospitalized due to respiratory failure due to cardiac reasons, 9.9% for pulmonary embolism, 8.8% for COPD attack, 4.4% for asthma attack, 1.1% for Amyotrophic lateral sclerosis (ALS) and 65.9% for pneumonia. Admission diagnosis of the patients did not affect mortality. Asthma is present in 11% of the patients, diabetes is present in 44%, and COPD is present in 57.1% of the patients. While 48.4% of the patients had never smoked, 13.2% quit smoking, 38.5% were still smoking. The average duration of hospital stay is 240.52 ± 175.85 hours, and the average duration of stay in intensive care is 181.2 ± 172.76 hours. Patients referring to the service were in the service in 6.31 ± 5.39 days. 36.3% of our patients are illiterate, 13.2% are literate, 34.1% are primary school graduates, 8.8% are high school graduates, 6.6% are university graduates. 73.6% of our patients who were hospitalized in intensive care were hospitalized from the emergency center, 13.2% from the ward, 7.7% through 112 emergency, 5.5% from the external center. Average APACHE

II Score is 15.27 ± 5.82 . Average pressure sore score is 17.32 ± 4.11 . Average falling score is 10.02 ± 4.79 . Average GKS is 14.45 ± 1.4 . Average nutritional score is 2.25 ± 1.75 . Our intensive care mortality is 17.6% (table 1).

As the duration of hospital stay and intensive care stay increased, mortality increased. It was found that age does not affect mortality. During our follow-up, 18 patients were intubated on an average of 6.41 ± 5.77 days of hospitalization. The duration of mechanical ventilation is 218.21 ± 260.08 hours. 48 patients used non-invasive ventilation (NIV) and 14 of these patients were intubated. The average duration of NIV use is 4.46 ± 3.2 days. 16 patients had high flow oxygen therapy and 3 patients were intubated after high flow oxygen therapy. Both high flow oxygen therapy and NIV were used alternately in 7 patients. High flow oxygen therapy (HFOT) usage time is 6.41 ± 4.15 days on average. As expected, it was found that the mortality of the patients who were intubated and received mechanical ventilation increased significantly ($p < 0.05$). While the intubation rate is 81% in mortal patients, the rate of intubation of patients who didn't die is 7%. It was determined that which day of intubation or the duration of intubation did not affect mortality. It was observed that NIV, high flow oxygen therapy and duration of mechanical ventilation did not affect mortality (table 2).

VAP developed in 10 patients who were intubated and the duration of VAP onset was 9.11 ± 3.14 days. It was found that the mortality of patients who developed VAP increased significantly ($p < 0.05$). While the VAP rate is 44% in patients who died, it is 3% in patients who didn't die. *Acinetobacter baumannii* reproduced in 9 patients and *E. coli* in 1 patient in Tracheal aspiration culture (TAC) samples taken from 10 patients who developed VAP (table 3).

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There was no reproduction in 8 patients from TAC samples that taken from all intubated patients. *Acinetobacter baumannii* reproduced in 10 patients, *E. Coli* in 1 patient and *Pseudomonas aeruginosa* in 1 patient (table 3).

10 patients with nosocomial pneumonia were identified. Nosocomial pneumonia onset duration was 6.7 ± 5.03 days. It was found that nosocomial pneumonia did not affect mortality. *Acinetobacter baumannii* was found to be reproduced in sputum culture in only 1 patient who had nosocomial pneumonia (table 3).

It was determined that there was no reproduction in sputum culture of 16 patients, *acinetobacter baumannii* reproduced in sputum culture of 2 patients, and *proteus mirabilis* was found in 1 patient (table 3). When chest X-ray of patients with VAP and nosocomial pneumonia were evaluated, new infiltrations were seen on the left in 8 patients, on the right in 4 patients, and bilaterally in 7 patients (table 4).

Urinary tract infection was observed in 21 patients. Urinary tract infection onset time is 5.5 ± 3.94 days. It was found that the mortality of patients with urinary tract infections increased significantly ($p < 0.05$). While the mortality rate is 44% for those with urinary tract infection, it is 19% for those without urinary tract infection (table 2). It was observed that there was no reproduction in the 13 urine cultures sent, 2 patients had *candida albicans*, 1 patient had *E. Coli*, and 1 patient had *Providencia retgeri* (table 3). It was observed that the antibiotic initiated in

only 1 of these patients was compatible with the culture, and antibiotic changes were performed in the other 3 patients because it was not compatible with the culture obtained (table 3).

It was observed that there are total of 14 patients with central venous catheters and only 1 of these patients had catheter infection, *Staph epidermidis* reproduction (table 3). It was found that mortality increased in patients with catheters and 50% of patients died had a catheter (table 2).

While nosocomial pneumonia and the first day of hospitalization of VAP did not change the mortality, it was observed that the later the urinary tract infection started, the higher the mortality (table 2).

It was determined that 18.7% of the patients who were started empirical antibiotics did not have reproduction in the culture, 5.5% were compatible with the culture (table 3), 14.3% were not compatible with the culture and the culture was not taken from 61.5% of the patients. The first antibiotic was started after 2.06 ± 2.61 days and the antibiotic was continued for 5.43 ± 4.52 days. 3 people did not take antibiotics. An average of 2.31 ± 1.44 antibiotics were started for the patients. Triple antibiotics were started for 6 patients. It was observed that the first antibiotics were meropenem and piperacillin tazobactam with antipseudomonal activity, the second antibiotics were levofloxacin and clarithromycin with atypical activity. Doublet antibiotics were started for 16 patients. Levofloxacin, clarithromycin, moxifloxacin and ciprofloxacin, which have atypical activities, were used in 15 patients. Antibiotic changes were made in 28 patients.

The second antibiotic was started after 2.73 ± 2.83 days and continued for 5.1 ± 3.89 days. The third antibiotic was started after 5.31 ± 4.14 days and continued for 6.22 ± 4.27 days. The fourth antibiotic was started after 8.44 ± 5.45 days and continued for 8.25 ± 4.14 days. The fifth antibiotic was started after 14.78 ± 9.36 days and continued for 6.89 ± 4.51 days. The day the antibiotic was started on the day of hospitalization did not affect the mortality. It was found that as the number of antibiotics and the number of days used increased, mortality increased (table 2).

Discussion

Invasive procedures and hospital infections due to these procedures are seen in intensive care hospitalizations. 91 patients were hospitalized to our intensive care unit in 2017, and we had a total of 21 urinary tract infections, 10 ventilator-associated pneumonia, 10 nosocomial pneumonia and 1 catheter infection, and our mortality was found as 17.6%.

In the studies conducted, the five most commonly prerduced agents for Ventilator- Associated Pneumonia (VAP) and Nosocomial Pneumonia (NP) were stated as *Staphylococcus aureus*, *Pseudomonas aeruginosa* species (especially *Pseudomonas aeruginosa aeruginosa*), *Acinetobacter baumannii* species, *Escherichia coli*, and *Klebsiella* species (4). In our study, it was observed that 18 patients were intubated and VAP developed in 10 of these patients. It was found that the infectious agent was grown in all patients with VAP, resistant *Acinetobacter baumannii* was grown in 9 patients and *E. Coli* was grown in 1 patient. VAP rate has been shown as 5-50% in many publications, and this rate was observed to be higher in our study

(7,13,14). In studies conducted, if there is an infection with acinetobacter infection that is resistant to many drugs, mortality was reported as 52-66%, and similar results were found with our study (15). *Acinetobacter baumannii* infections are infections with high antibiotic resistance and increase hospital stay and mortality (16). In our study, while mortality was 44% in patients with VAP, our mortality was 3% in patients without VAP. We think that one of the most important reasons for this is that the infectious agent is resistant *Acinetobacter baumannii* and also the correct empirical treatment is not applied. Many studies have also shown that correct empirical treatment reduces mortality rates when initiated early (17,18,19). It was found that piperacillin + tazobactam was started in 9 of 10 patients who developed VAP, and meropenem was started in 1, and microorganisms that grew later in these patients were resistant to these antibiotics. As can be seen from this result, another reason for the high mortality is that the empirical antibiotic was not started correctly. Therefore, intensive care units should know their own flora and should start empirical antibiotics correctly. Because multi-drug resistant microorganisms are increasing (5)

In a study where intensive care patients were followed prospectively in 159 patients, Amoxicillin with clavulanate and azithromycin was the most common first choice of antibiotic used (46.5%). In this study, the first choice antibiotic was determined to be levofloxacin or piperacillin tazobactam. Sputum culture was sent from 58 of 159 patients and it was determined that 74% of these patients did not have reproduction and the sample taken was not proper in 19%. *Klebsiella pneumoniae* was found in 2 of the remaining 4 samples, *Pseudomonas aeruginosa* in 1, and *Morganella morganii* in 1. In our study, it was observed that there was no reproduction in sputum culture sent from 16 patients, and *acinetobacter baumannii* reproduced in sputum culture in 2 patients and *proteus mirabilis* in 1 patient. In this study conducted on 159 patients, the pathogen was detected in only 20 (12.6%) patients. In our study, sputum culture was sent in 19 patients, and pathogen was detected in 3 patients in sputum culture, while reproduction was observed in 12 of the tracheal aspirate culture taken from 18 patients who were intubated (20).

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In studies conducted, unnecessary, incorrect or inappropriate doses of antibiotics are used in 30-60% of patients (18). In our study, antibiotics were not used in only 3 patients, and it was found that antibiotics were not suitable in most of the patients who were used antibiotics due to the resistance problem.

In studies conducted, it was observed that mortality increased as the onset of antibiotic use was delayed (8). In our study, antibiotics were initiated 2.06 ± 2.61 days later, and continued for 5.43 ± 4.52 days. It was observed that as the number of antibiotics and the number of days used increased, the mortality increased and also that the antibiotic was started on the day of hospitalization did not affect the mortality. From these findings, we can think that the timing of antibiotic initiation in our clinic is correct, but mortality has increased since we cannot provide infection control. It was determined that 18.7% of the patients who were started empirical antibiotics did not have reproduction in the culture, 5.5% were compatible with the culture, 14.3% were not compatible with the culture and the culture was not sent from 61.5% of the patients. As can be understood from these results, it can be said that culture should be taken from all patients regularly.

In our study, it was found that 8 of 11 patients who had acinetobacter reproduction in their cultures were found to be died. Mortality was reported as 50% in acinetobacter baumannii infections in which 177 patients were prospectively screened. However, in our study, appropriate empirical treatment was not initiated correctly, and in the other study, correct empirical treatment was started at a rate of 39% (21). Again, this shows that correct empirical treatment and early treatment are very important in preventing mortality. In one study, acinetobacter baumannii was resistant to 73.6% quinolones, 71.3% sulfonamides, 50-70% cephalosporins, β -lactam/ β -lactamase inhibitor combinations, and carbapenems, and no resistance was found against colistin (22). Since we used quinolone, carbapenem and β -lactam/ β -lactamase inhibitor combinations as empirical treatment, it was observed that our empirical treatment approaches were not successful. In our study, it was observed that our own flora was not adequately evaluated.

A treatment algorithm has not been established against *A. baumannii*, and there are not enough studies on this subject. Combinations containing imipenem or β -lactam have been reported to be beneficial, and binary combinations including colistin have also been reported to be beneficial. (22)

According to the VAP guidelines, the flora characteristics of the hospital are decided whether the causative pathogen is a resistant subject or not, and the appropriate empirical antibiotic is arranged by considering the hospital's local resistance algorithm and patient characteristics (23).

As a result, every intensive care unit should know its own flora and antibiotic resistance and should form an empirical treatment algorithm for hospital-acquired infection in the city.

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In one study, 70.9% of 141 patients whose urinalysis were performed had previously used antibiotics for at least 24 hours in the ICU. *Klebsiella pneumoniae* (46.7%), *Escherichia coli* (20.0%), *Pseudomonas aeruginosa* aeruginosa (13.3%), *Acinetobacter baumannii* baumannii (13.3%) and *Enterococcus* sp (6.7%) were detected as CAUTI etiological agents. All multi-resistant microorganisms detected in urinalysis were associated with CAUTI: *K. pneumoniae* (44.5%), *E. coli* (22.2%), *P. aeruginosa* (11.1%), *A. baumannii* (11.1%) and *Enterococcus* sp (11.1%) (24).

Approximately 80% of health-related UTIs are associated with the use of a urinary catheter (UC). The risk of developing a catheter-associated UTI (CAUTI) increases with catheterization time and can reach 5% per day of use. Therefore, after 28 days of catheterization, this risk is estimated to increase to 100%, which increases the transition from secondary sepsis to infection and the estimated mortality rate up to 30% in approximately 4% of patients (24).

The average incidence of catheter-associated urinary tract infection was 13.79 per 1000 catheter days, with a prevalence rate of 9.33% (25). In our study, urinary tract infection developed in 21 patients and our incidence is higher. It was observed that there was no reproduction in the 13 urine cultures sent, 2 patients had candida albicans, 1 patient had *E. Coli*, and 1 patient had *Providencia retgeri*.

In another study, a total of 148 patients (66 men, 82 women; age range: 1-94 years, mean age: 58.7 ± 21.8 years), 67 (45.3%) 109 central venous catheters applied to 148 patients from neurosurgery ICUs were evaluated. 109 central venous catheters applied to 148 patients were evaluated. Average catheterization duration was 8.5 ± 5.2 days. In a total of 148 patients (19.6%), 32 CR-BSI episodes (16%) were detected from 199 catheterizations in 29 patients. The most frequently isolated microorganisms are methicillin-resistant coagulase-negative staphylococci (8/32; 25%), penicillin-resistant *Enterococcus* spp (8/32; 25%) and *Candida albicans* (4/32; 12.5%) (26). In our study, 14 patients had a catheter, and catheter-related infection was detected in only 1 patient, and the growing agent is *staph. epidermidis*.

In conclusion, the possibility of infection development is high in patients in Intensive Care Units. The treatment of infections in serious patients can be difficult due to the delay in diagnosis, difficulties in identifying causative microorganisms, and the high prevalence of antibiotic-resistant strains. The rapid spread of antibiotic-resistant bacteria in intensive care units makes it difficult to choose the appropriate antibiotic all over the world. Delay in antibiotic treatment in intensive care infections may increase mortality. Therefore, it is desirable that initial treatments be wide enough to grasp all possible pathogens. Local microbiological data and previous antibiotic use are very important in predicting resistance patterns of bacteria that may be causative, and antibiotic selection should be planned specifically for each patient. In critically ill patients, antibiotic pharmacodynamic and pharmacodynamic properties, distribution volume and excretion may change, affecting dosage regimens.

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Table 1: Demographic and Clinical Data

Gender: F/M 46/45
Age: 70.68±14.23 years
Glaskow Coma Scale : 14.45 ± 1.4 15 (8 - 15)
Duration of Hospital Stay: 240.52 ± 175.85 208 (28 - 980) days
Nutrition score: 2.25 ± 1.75 2 (0 - 7) days
Duration of ICU Stay: 181.2 ± 172.76 126 (15 - 960) days
Referring to the Service: 6.31 ± 5.39 5 (1 - 34) days
APACHE II Score: 15.27 ± 5.82 15 (3 - 42)
Falling score in ICU: 10.02 ± 4.79 9 (1 - 27)
Smoking status
None: 12 (13.2%)
Quit: 35 (38.5%)
Current smoker: 44 (48.4%)
Patient admission from:
Emergency Room: 67 (73.6%)
112 Emergency: 7 (7.7%)
Wards: 12 (13.2%)
Other Hospitals: 5 (5.5%)
Admission diagnosis
Cardiac problems: 9.9%
Pulmonary embolism: 9.9%
COPD attack: 8.8%
Asthma Attack: 4.4%
Amyotrophic lateral sclerosis (ALS): 1.1%
Pneumonia: 65.9%
Comorbidity
Asthma: 11%
Diabetes mellitus: 44%
COPD: 57.1 %
Mortality: 17.6%
Which Day of Hospital Origin Pneumonia: 6.7 ± 5.03 5.5 (3 - 20)
Which Day of Intubation: 6.41 ± 5.77 5 (1 - 17)
Antibiotics Numbers: 2.31 ± 1.44 2 (0 - 7)
Which Day of UTI: 5.5 ± 3.94 4 (2 - 14)
MV Duration: 218.21 ± 260.08 83 (9 - 920) hours
Which Day of VAP: 9.11 ± 3.14 11 (4 - 13)
Duration of HFOT: 6.41 ± 4.15 6 (0 - 16) days

ICU: Intensive care unit

COPD: Chronic obstructive pulmonary disease

UTI: Urinary Tract Infections

MV: Mechanical Ventilation

VAP: Ventilator- Associated Pneumonia

HFOT:High Flow Nasal Oxygen Therapy

Table 2: Relations Between Clinical Features and Mortality

<i>Mortality</i>	<i>Yes</i>	<i>No</i>	<i>p</i> *
Patient admission from			
Emergency Service	11 (69.0%)	56 (75.0%)	0.287**
Other Hospitals	1 (6.0%)	4 (5.0%)	
Wards	3 (19.0%)	9 (12.0%)	
112 Emergency	1 (6.0%)	6 (8.0%)	
Antibiotic 1 (starting day)	2.94 ± 4.68	1.86 ± 1.86	0.941(m)
	1 (1 - 18)	1 (1 - 10)	
Antibiotic 2 (usage days)	6.2 ± 4.38	4.74 ± 3.7	0.197(m)
	5 (1 - 15)	4 (1 - 14)	
Antibiotic 2 (starting day)	4.2 ± 4.54	2.24 ± 1.8	0.058(m)
	2 (1 - 18)	1 (1 - 7)	
Antibiotic 3 (usage days)	7.75 ± 4.11	5.3 ± 4.19	0.045(m)
	7.5 (1 - 15)	4.5 (1 - 17)	
Antibiotic 3 (starting day)	7.75 ± 3.91	3.85 ± 3.62	0.002(m)
	8 (3 - 16)	3 (1 - 13)	
Antibiotic 4 (usage days)	8.0 ± 3.35	8.57 ± 5.26	1(m)
	7 (4 - 13)	6 (4 - 17)	
Antibiotic 4 (starting day)	10.0 ± 5.34	6.43 ± 5.29	0.1(m)
	9 (4 - 20)	4 (2 - 15)	

Antibiotic 5 (usage days)	6.0 ± 4.2	8.67 ± 5.51	0.3(m)
	4.5 (2 - 13)	6 (5 - 15)	
Antibiotic 5 (starting day)	13.33 ± 7.23	17.67 ± 14.19	0.549(a)
	10 (7 - 23)	15 (5 - 33)	
Education			
Primary school	4 (25.0%)	27 (36.0%)	0.661**
High school	1 (6.0%)	7 (9.0%)	
Illiterate	6 (38.0%)	27 (36.0%)	
Literate	3 (19.0%)	9 (12.0%)	
University	2 (12.0%)	4 (5.0%)	
Gender			
Male	8 (50.0%)	37 (49.0%)	1*
Female	8 (50.0%)	38 (51.0%)	
Age	73.25 ± 16.79	70.13 ± 13.69	0.307(m)
	77 (25 - 94)	73 (19 - 89)	
Smoking			
Quit	4 (25.0%)	8 (11.0%)	0.174**
Smoker	7 (44.0%)	28 (37.0%)	
Non-smoker	5 (31.0%)	39 (52.0%)	
Intubation			
Yes	13 (81.0%)	5 (7.0%)	<0.001**
No	3 (19.0%)	70 (93.0%)	
MV			
Yes	14 (88.0%)	5 (7.0%)	<0.001**
No	2 (12.0%)	70 (93.0%)	
NIV			

Yes	11 (69.0%)	36 (48.0%)	0.131**
No	4 (25.0%)	39 (52.0%)	
HFOT			
Yes	3 (19.0%)	13 (17.0%)	1**
No	13 (81.0%)	62 (83.0%)	
Arterial Cannulation			
Yes	14 (88.0%)	56 (75.0%)	0.344**
No	2 (12.0%)	19 (25.0%)	
UTI			
Yes	7 (44.0%)	14 (19.0%)	0.047**
No	9 (56.0%)	61 (81.0%)	
VAP			
Yes	7 (44.0%)	2 (3.0%)	<0.001**
No	8 (50.0%)	73 (97.0%)	
Hospital Origin Pneumonia			
Yes	2 (13.0%)	8 (11.0%)	0.671**
No	13 (87.0%)	67 (89.0%)	
COPD			
Yes	11 (69.0%)	41 (55.0%)	0.45*
No	5 (31.0%)	34 (45.0%)	
Asthma			
Yes	1 (6.0%)	9 (12.0%)	0.685**
No	15 (94.0%)	66 (88.0%)	
Diabetes mellitus			
Yes	8 (50.0%)	32 (43.0%)	0.796*
No	8 (50.0%)	43 (57.0%)	

Duration of MV	166.57 ± 165.96 92.5 (9 – 495)	362.8 ± 423.56 80 (40 - 920)	0.3658
Duration of NIV	4.17 ± 3.74 2 (1 - 13)	4.56 ± 3.05 4 (1 - 14)	0.391
Duration of HFOT	7.75 ± 6.85 7.5 (0 - 16)	6.0 ± 3.24 6 (2 - 13)	0.479
Duration of Hospital Stay	363.19 ± 182.28 355 (55 - 670)	214.35 ± 164.09 192 (28 - 980)	0.001
Duration of ICU Stay	342.5 ± 179.47 355 (55 - 640)	146.79 ± 151.47 94 (15 - 960)	<0.001(m)
Which Day of Hospital Origin Pneumonia	12.0 ± 11.31 12 (4 - 20)	5.38 ± 2.07 5.5 (3 - 9)	0.559
APACHE-II Score	17.14 ± 3.24 18 (13 - 21)	15.12 ± 5.97 14 (3 - 42)	0.102(m)

ICU: Intensive care unit

COPD: Chronic obstructive pulmonary disease

UTI: Urinary Tract Infections

MV: Mechanical Ventilation

NIV: Non-Invasive Ventilation

VAP: Ventilator- Associated Pneumonia

HFOT: High Flow Nasal Oxygen Therapy

p* Pearson Chi-Squared Test, p** Fisher Exact Test

p<0.005 Statistical significance

table 3: Cultures and Antibiotics

Tracheal Aspiration Culture of VAP (10 patients)
Acinetobacter baumannii: 9 patients
E. Coli: 1 patient
Sputum Culture of Nosocomial Pneumonia (10 patients)
Acinetobacter baumannii: 1 patient
Urine culture of UTI (21 patients)
Candida albicans: 2 patients
E. Coli: 1 patient
Providencia retgeri: 1 patient
Central Venous Catheters Infection (1 patient): Staph epidermidis
Empirical Antibiotics and Compatibility with Cultures and Antibigram
No reproduction in the culture: 18.7%
Compatible with the culture: 5.5%
Not compatible with the culture: 14.3%
Not taken specimen for culture: 61.5%

Table 4: X-ray Evaluation of VAP and Nosocomial Pneumonia

Changes of Chest X-ray of Patients with VAP and Nosocomial Pneumonia
New infiltrations on the left side: 8 patients
New infiltrations on the right side: 4 patients
New infiltrations on the bilateral sides: 7 patients