Original Article

The Most Common Bacterial Agents and Their Antibiotic Sensitivity in ICU Patients of AL-Zahra Hospital in Isfahan

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Abstract

Background: There are many reports about nosocomial infections in ICU patients, their antibiotic resistance and the necessity of combination therapy with two or more different antibiotics. This study was designed to find the predominant pathogens and their antimicrobial resistance in a University hospital intensive care unit.

Methods: We obtained samples from patients who had no signs and symptoms of infection on admission in ICU but showed infection signs at least after 48 hours. Cultures were obtained and antibiogram tests were done. Thereafter appropriate antibiotics were administered.

Results: About 40 percent of ICU patients were infected through their hospitalization. Urinary tract infection (UTI), respiratory, blood, and CNS infections were the most common infections. Gram-negative rods were including E-coli, Kelebsiella, pseudomonas and enterobacters, Gram-positive pathogens (staphylococcus epidermidis and S-aureus) were reported. Most of pathogens had resistance not only to common antibiotics but also to new generation ones. In most cases, empirical therapy had not been scaled down to definitive regimen with optimal activity, although the pathogen had been isolated and its antimicrobial sensitivities were identified.

Conclusion: Widespread use of antimicrobial agents without any precaution is responsible for antibiotic resistance. This shows the necessity of prevention of infections with use of proper antibiotics.

Keywords: ICU, Bacterial, Resistance.

Nosocomial infections appear at least in 5% of patients admitted to hospitals These infections result in increased hospitalization periods and greatly increases medical costs[1].In past decades control of gastrointestinal, oropharyngeal, and rectal flora had decreased ventilator depending respiratory infections in ICU patients[2]. Other infections like septicemia are more common seven times among ICU patients than other hospitalized patients[3]. Unfortunately, since the discovery of antimicrobial agents, antibiotic resistance has increased and become worse[4]. Widespread use of antibiotics and close relationship between patients and medical personnel increase the chance of microbial distribution and antibiotic resistant infections. These conditions result in significant morbidity and mortality[5, 6]. Careless use of antibiotics makes use of new generation antibiotics necessary[7]. In a study in Belgium, Gram-stained samples obtained from lung (57.4%), urinary tract (17.7%), abscess (7.9%), and blood (7.8%), showed high resistance against Ciprofloxacin, the third generation of cephalosporin and Extend-spectrum penicillin[8]. In a study in ICU centers of Saudi Arabia and Kuwait 106 and 101 cultures of Gram-negative germs obtained from patients. The most common pathogens were pseudomonas (20-25%), Escherichia coli (14-17%), Kelebsiella (17-20%), Entrobacters (14-17%) and Acynetobacter (3.3-3%). In both centers, 99%, 52-87% and 25-67% of pathogens were sensitive to ciprofloxacin, cefotaxime, and penicillin respectively. Poly

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antibiotic resistance to monobactams, cephalosporidine and all the three common aminoglycosides were seen[9]. Trouillet studied 135 episodes of ventilator depending pneumonia in patients of an ICU in the United State, during a 25 months study. Very high resistance bacteria were responsible in 77% of cases[10].

We tried to find the most common pathogens of nosocomial infection in ICU of Alzahra hospital and determine the proper antibiotics against them.

Materials and Methods

This study took 18 months, from Jan 2001 until June 2002. A total of 980 patients were studied in the ICU center of Al-Zahra hospital affiliated to Isfahan University of Medical Sciences (Isfahan, Iran). Cultures for colony count were obtained from patients with the following criteria:

1- Patients must had been admitted in ICU for reasons other than infection.

2- Signs of infection appeared at least 48 hours after admission.

3- Patients who had fever and signs of respiratory infections (cough, sputum) together with unclear chest X-ray (Culture from airway) .

4-Patients with pyuria as demonstrated by the urinary cultures obtained from indwelling catheters.

5-Patients with pressure sore developed in ICU.

6 - Patients with signs of bacteremia or septicemia (Blood cultures).

7-Patients with fever and ascites with abdominal tenderness (Peritoneal fluid culture).

Patients with infection at admission in ICU were excluded. Thereafter antibiogram tests was performed to determine the effective antibiotics and resistant pathogens.

Results

During the study , which took a year and half, about 1200 patients were admitted in ICU, 380 of these patients (32%) developed nosocomial infections. Predisposing factors in these patients in order of importance and prevalence were: Diabetes Mellitus, trauma, surgery, malignancy, cardiopulmonary disease, immunodeficiency disease, corticosteroids use, and old age. Infectious signs appeared within 48 hours to 14 days. Twenty percent of patients were infected in the first five days after admission and 75% in the first week. Other patients showed infections during the second and third weeks after admission.

Urinary tract infection with a prevalence of 29% was the most common infection. Other common infections were pneumonia, septicemia, wound infection and meningitis. These results are shown in table 1. Antibiogram tests results showed that most of infections were resistant not only to common antibiotics but also to new generation antibiotics. Many pathogens resisted to Quinolons, the third generation cephalosporins, vancomycin, and clindamycin. Antimicrobial sensitivity and resistance are shown in table 2.

Table 1. Prevalence of infections in ICU patients in this study.

Sample	Number	Percentage
Urine	140	29
Sputum	123	18.5
Blood	50	10.5
Wound	40	7.4
CSF	17	3.5
Peritoneal fluid	10	1.6
Total	380	100

Discussion

Careless and widespread use of antimicrobial agents increases the risk of antibiotic resistant and leads to the spread of infections[11, 12]. There is also close relation between resistance against β-lactams and prior use of third generation cephalosporin[12, 13]. Nosocomial infections emerge in 5% of admitted patients in hospitals. In ICU patients, this statistic is about 2 to 5 percent[14-16]. In our study nosocomial infections appeared in 32% of patients. The majority of infections in the present study were originated from non-surgical patients. Therefore, it is possible that underlying diseases in these patients, like diabetes mellitus, the immune deficiency, COPD, and cardio pulmonary disease, increase the chance of infection. Indwelling catheter is a predisposing factor to nosocomial urinary tract infections and all ICU patients necessarily had at least one indwelling bladder catheter. Therefore, it is expected that UTI will be very common. In our study, UTI was also the most common infection. The rate of pressure sore has been reported as 7.5% in Nichol study [17]. We studied common antibiotics like Aminopenicilins (ampicilin-amoxicillin), penicillin, erythromycin,

Table 2. Sensitivity of pathogens in different organs to antibiotics in this study. Data are percentage frequency.

		A	B	C	D	E	F	G
Urinary Tract	S	3	5	33	15	5	30	15
	R	57	55	34	10	15	20	10
	I	40	40	33	75	80	5	75
Pulmonary	S	4	6	50	30	10	30	15
	R	60	54	25	25	5	40	35
	I	36	40	25	45	85	30	50
Septicemia	S	5	25	35	15	10	50	15
	R	30	5	10	10	15	30	10
	I	65	70	55	75	50	20	75
Wound	S	10	5	15	10	10	10	55
	R	25	20	10	15	25	25	10
	I	65	75	75	75	65	65	35

A=Ampicilline, B=Co-Trimoxazol, C=Ciprofloxacin, D=Gentamycin, E=Cephalothin , F=Ceftriaxon, G=Vancomycin S=Sensitive, R=Resistant, I=Intermediate

first generation cephalosporin (cephalothin-cefazolin), third generation cephalo- sporin (ceftriaxone), quinolons (ciprofloxacin), sulfonamides (co-trimoxazole), urinary antiseptics (nitrofurantoin), and some special antibiotics like vancomycin by antibiogram. Pathogens were resistant not only to common antibiotics but also to new antibiotics like new quinolons, third generation cephalosporins, vancomycin, and clindamycin.

In conclusion, to control infections and to prevent antibiotic resistance we suggest the following:

1- The committees for controlling infections become more active and do more supervision on the use of antibiotics.

2- New antimicrobials should be used with more caution and widespread use of them should be stopped.

3- Antibiotics must be applied as prophylaxis only when indicated.

4- Serial studies like obtaining cultures and antibiogram tests must be done for ICU personnel and different parts of ICU.

5- ICU stuffs must have courses about new infections and antibiotics resistance. Stuffs must be familiar with the newest information about infections and ways of struggling them.

6- Hospital laboratories must apply new methods in preparing cultures and antibiogram tests in a way that pathogens will be diagnosed as soon as possible to prevent empirical antibiotic administration.

7- Long-term uses of antibiotics should be discouraged whenever possible.

8- A committee of physicians, infections disease specialist, and pharmacologists must decide about the kind of antibiotic, its dose, and treatment period.

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