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Original article

Incidence and Resistance Patterns of Nosocomial Infections in Labbafi Nejad Hospital Admitted Patients during 2012-2014

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Abstract

Background: Nosocomial infections have high mortality rates because of infective organisms' specific characteristics and the type of patients identified with different comorbid diseases. The aim of this study was to determine the prevalence rate of different microorganisms and their characteristics in terms of resistance to various antibiotics.
Materials and Methods: Samples of urine, blood, abscess and wound secretion, and septum or tracheal secretions were cultured for 139 patients who were hospitalized during September 2012 to September 2014 and identified with nosocomial infection in different hospital wards. Then the type of microorganism and their antibiotic resistance were determined for each patient using culture antibiogram with disk diffusion method. Results were then analyzed using SPSS software.
Results: The incidence of nosocomial infections was observed more in men than in women. Fever and purulent discharge from the wound site were the most common symptoms, leading to patient's hospitalization. Most patients were from the transplant and urology wards. Urinary tract, skin, and soft tissue infections (SSTI) had the highest prevalence rate in patients. *Escherichia coli* was the most common infectious microorganism in patients, which was sensitive to imipenem and meropenem. *Klebsiella* as the next most common infectious microorganism was resistant to imipenem.
Conclusion: The results of this study are consistent with the previous studies. Due to infectious microorganisms' resistance to antibiotics, it is recommended to reduce the consumption of antibiotics.

Keywords: Nosocomial infection, Antimicrobial resistance, Prevalence, Infection control

1. Background

Nosocomial infections (NIs) are considered as one of the main problems in health care centers, by which 8.7% of the hospitalized patients are affected globally. In spite of increasing improvement in the treatment of human infections, the hospital-acquired infections have become a critical issue because not only its low incidence but also its importance is increasing every day. These infections cause high mortality, surgeries failure, and transplanted organs rejection, leading to longer stay in hospital and more mentally and emotionally stress (1-3). In some studies, NIs were analyzed regarding their infection site and pathogen distribution (4-6). It was shown that emerging patterns of bacteria antibiotic resistance have altered outcome of critically ill patients. Nowadays, physicians are faced with different challenges resulted from using antibiotics for their patients' effective treatment with the aim of not facing with antibiotic resistance in the future (4-6).

The main organisms causing NIs are gram negative bacilli, coagulase-negative *Staphylococci*, coagulase-positive *Staphylococci*, *Pseudomonas* spp., and *Streptococcus* (2). The common problem of NIs with which physician are faced every day is related to their treatment because of increasing antibiotic resistant organisms in hospitals. According to different studies, approximately 20% of these infections are caused by multi-drug resistant organisms (7). In many countries, one of the most frequent nosocomial infections is urinary tract infections (31%) which has a major role in medical procedure (8-9), followed by pneumonia (27%) and primary bloodstream infections (19%) as the other sources of infection (10-11).

During recent years, the rate of bacteremia associated with intravascular devices have significantly been increasing. The catheter-related infections rate among bacteremia is 19%. After patients' surgery, surgical site infections (SSI) are the most common infections, allocating 14-15% of all infections to themselves (12).

Thus, it is important to discover local and national rates of resistance for pathogens present in body sterile fluid and blood to provide data necessary for monitoring changing trend in resistance pattern and therapy (13). In several studies, it has been demonstrated that morbidity, mortality, and treatment costs of illnesses caused by nosocomial infections are increasing (14-17).

2. Objective

Because there is lake of knowledge about NIs due to missing data of epidemiological research in Iran, the purpose of this study was to determine the frequency of nosocomial infections and antibiotic susceptibility patterns in Labbafi Nejad teaching hospital (affiliated to Shahid Beheshti Medical University) to help physician in choosing suitable antibiotics for better therapy.

3. Materials and Methods

This cross sectional-retrospective study was conducted from September 2012 to September 2014 in Labbafi Nejad hospital in Tehran, Iran, which is a referral and teaching hospital. Germs were examined on isolates taken from patients admitted at least 48 hours in the hospital. In the first step, a questionnaire containing questions about patients' demographic and clinical characteristics, risk factors, medical

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history, main diagnosis, type of nosocomial infection, and sort of culture was provided. The antibiotic susceptibility pattern was determined by the Kirby Bauer disk diffusion method. Then the list of patients with nosocomial infection was taken (provided by the hospital infection control nurse), and then the patients' archive files were checked thoroughly one by one. The required data were extracted and entered into the information form. Finally, the collected data were analyzed using descriptive statistics with median values in SPSS software version 19.

4. Results

During the study period, there were 139 patients suspected to nosocomial infections. About 99 (71%) patients were male, and 40 (29%) were female. The patients' median age was 47.9 ± 21.8 in men and 53.4 ± 14.7 in women. The distribution of infections regarding their major site was the most frequent in urology ward, followed by transplantation unit. The most frequent infections were urinary tract infection observed in 71 patients (51.1%) and skin and soft tissue infections (SSTI) observed in 54 patients (38.8%).

Table1. Frequency of patients in hospital wards.

Wards	Urology	Transplant	Internal Male	RCU	CCU	Internal Female	Infectious Disease	ICU	Total
Men	44	40	7	7	0	0	0	1	99
Female	18	15	0	1	1	3	1	1	40
Total	62	55	7	8	1	3	1	2	139

Table 2. Frequency of organisms taken from patients infected with nosocomial infections in Labbfi Nejad teaching hospitals of Shahid Beheshti University of Medical Sciences during 2012-2014.

Total		Others		*Enterococcus*		*E. coli*		*Klebsiella*		*Pseudomonas*		*A. baumanii*		*S. aureus*		Organisms
%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	Symptoms
0.8	1	0	0	0	0	1.9	1	0	0	0	0	0	0	0	0	Renal Mass
50.8	66	25	1	53.8	7	51.9	28	42.9	12	84.6	11	50	6	16.7	1	Fever and Chills
5.4	7	0	0	7.7	1	1.9	1	7.1	2	0	0	25	3	0	0	Dyspnea
26.2	34	50	2	23.1	3	27.8	15	32.1	9	0	0	0	0	83.3	5	Ulcer discharge
1.5	2	0	0	0	0	1.9	1	0	0	7.7	1	0	0	0	0	Dysuria
0.8	1	0	0	0	0	0	0	3.6	1	0	0	0	0	0	0	Hydronephrosis kidney transport
4.6	6	0	0	7.7	1	5.6	3	7.1	2	0	0	0	0	0	0	Pain
3.1	4	0	0	0	0	1.9	1	7.1	2	0	0	8.3	1	0	0	Weakness and malaise
1.5	2	0	0	7.7	1	1.9	1	0	0	0	0	0	0	0	0	Rising ceratinin
1.5	2	0	0	0	0	3.7	2	0	0	0	0	0	0	0	0	Nausea and vomiting
0.8	1	0	0	0	0	0	0	0	0	7.7	1	0	0	0	0	Restless
0.8	1	25	1	0	0	0	0	0	0	0	0	0	0	0	0	Coughing
1.5	2	0	0	0	0	0	0	0	0	0	0	16.7	2	0	0	Decrease caution less
0.8	1	0	0	0	0	1.9	1	0	0	0	0	0	0	0	0	Other
10	130	10	4	10	13	10	54	10	28	10	13	10	12	10	6	Total

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4.1. Antimicrobial susceptibility

The sensitivity rate of *E. coli* isolated from different specimens to different antimicrobials was varied. In this study, organisms were more sensitive to meropenem (94%) and imipenem (79%) and more resistant to piperacillin and ceftriaxone. Isolated *Acinetobacter* strains were just sensitive to gentamicin and resistant to other antibiotics such as piperacillin, ceftriaxone, and cefazolin. In *Pseudomonas* isolates, the sensitivity to ceftazidime and imipenem was higher than other antibiotics. In comparison to other antibiotics, the sensitivity to tetracycline and meropenem was the highest in *Klebsiella* isolates. *Enterococcus* isolates had sufficient sensitivity to nitrofurantoin and ampicillin; however, there was no resistance to other antibiotics.

5. Discussion

Nosocomial infections are considered as one of the global health problems in every hospital around the world, differing from one country to another. It causes a high rate of morbidity of patients (12) in addition the health care workers (HCWs) sometimes as well as causes an extra health care expense which can cause an vital role in NIs transmitting from patients to other patients and to HCWs. Knowledge about the epidemiology of these infections help the resources to be dedicated to infections control (18-19).

The average age of patients in the present study was 49 years. In Davoudi's study, the patients' average age was 52.2 years, which was similar to the present study (20). This range of avrage age (over 50 years old) indicates that older people are more at risk of infections and most resistant to antibiotics (21-22). In the current study, *E.coli* isolated from 54 patients was the most common cause of fever and chills, followed by *Klebsiella* isolated from 28 patients as the second cause. However, in many studies conducted on nosocomial infections, *E. coli* was identified as the main cause of UTI, *P. aeruginosa* and *Acinetobacter* are the most common cause of nosocomial infections which are widly resistance to antibiotics (23).

In this study, the highest rate of nosocomial infections was observed in the urology and transplant units, and the most common type of NIs was wound secretion infection, consistent with the previous studies (24-26).

Among gram negative organisms, *Acinetobacter* is the most common cause of nosocomial infections. Kazemi studied antimicrobial susceptibility patterns among *A. baumannii* in Khatam ol Anbia hospital. In this study, they confirmed increasing rate of antibiotic resistance in patients (13). In another study conducted in Mashhad, burn ward had the highest frequency of infection, and *Acinetobacter* spp. was identified as the most frequent pathogen, which is different from our result (27). In their study, *Acinetobacter* spp. isolated from different clinical samples were multi-drug resistant. Based on different studies, the prevalence rate of multi-drug resistant *Acinetobacter* spp. in Atlantic region countries is around 29.3% (28). Unfortunately, the treatment of infections caused by *Acinetobacter* spp. is difficult since the prevalence rate of multi-drug resistant strains are increasing (28-29).

In the current study, *Entrobacteriaceae* species had high prevalence rate and were antibiotic resistant. *E. coli* in 54 patients and *Klebsiella* in 28 patients had high frequency. In a study by Bean et al., the rate of resistance to gentamycin, ampicillin, and cotrimaxazole was lower than that of our study (29). In their study, *S. aureus* antibiotic resistance was high. In Molaabbaszadeh et al. study, the rate of resistance of *S. aureus* to ciprofloxacin, clindamycin, and cotrimoxazole was low (30). In the current study, all samples seemed to be resistant to methicillin, penicillin, and streptomycin.

For a nosocomial infection selecting an empiric treatment, the prevalent resistance patterns should be consider. For the treatment of nosocomial infections should use effective antimicrobials against pathogens which are likely resistant and should not further promote the resistance rate. Recent data suggest that because of ESBLs and high-level amp C β-lactamase resistances, the use of third-generation cephalosporins may be ineffective in the treatment of many patients with nosocomial infections. In addition, the use of these agents may allow overgrowth of inherently resistant *Enterococci.*

6. Conclusions

In conclusion, since we are faced with increasing nosocomial infections in our region, particularly in Iran, it seems necessary to make a precise report and enhance infection control procedures in hospitals.

Conflict of Interest

There is no conflict of interest regarding the publication of this paper.

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Authors' Contributions

Study concept and design: Dr. Simindokht Shoaei and Dr. Shahnaz Sali; acquisition of data, analysis and interpretation of data: Dr. Meisam Yousefi; study supervision: Dr. Simindokht Shoaei.

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