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Microbiological Pattern and Antibiotic Susceptibility of Agents Isolated from Nosocomial Infections, Staff and Equipment of Surgery Section and ICU of Imam Khomaini Hospital, Ilam, Iran

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Resistant bacteria in various sections of hospital as a main issue of infection transmission is undeniable. Thereby, to achieve infection disease control on hospital, bacteria recognizing and antibiotic resistance determination is necessary. This study is aimed to determine the pattern of microbial resistant of isolates that isolated from surgery ward and ICU and compare it with osocomial infection isolates. In a descriptive and cross-sectional study, during 6 months sampling was carried out from devices and ersonnel of surgery and ICU ward. In same period Nosocomial infections from surgery and ICU wards were cultured. Bacterial on Standard criteria according to CLSI were diagnosed. Antibiotic susceptibility were done according to *Kirby-Bauer* Disk Diffusion .After culturing 130 samples were positive, the most frequency of isolated bacteria in both wards were *Staphylococcus saprophyticus*. Most frequent bacteria in ICU and Surgery ward involved; *Entrobacter* (35%) and *E.coli* (25%), in a row. In nosocomial infections, frequency of samples that cultured were positive included in; Lesion (45%), Sputum(42.5%) and Urine(12.5%). *E.coli, Klebsiella* and *Staphylococcus aureus* isolated from ICU shown high resistance to *Amplicillin, Ceftazidime*/*Cefotaxime , Ceftriaxone,* respectively. Whereas bacteria that isolated from Surgery ward shown high resistance to *Tetracycline, Amoxicillin- Tetracycline, Ceftriaxone.* Regarding to resistance pattern , there is a correlation between resistance of species that isolated from personnel and devices with nasocomial isolates. Therefore, it could be concluded that devices and personnel have main role to disseminate infection. Thereby, the proper disease control policy could be so useful to combat with issue.

Key words: Antibiotic susceptibility, Resistant Bacteria, ICU, Surgery, Hospital acquired infection.

Hospital acquired infections known as a main and significant issue of infection disease and so regards to high number of infected patients, high expense to treat, high mortality and exposure of multi resistant bacteria, there is need to study of Hospital infection[1,2]. Nosocamial infection known as an infection that occurs after 48 hours hospitalization associated with fever, mental disorder, leukopenia, oliguria, tachypnea, hypotension, tachycardia and cutaneous lesion and also is as a main cause of mortality among hospitalized patients[1,3].

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According to obtained data based on kind of infection, hospitalization period could be last 4-10 days. In developed countries less than 5% of hospitalized patients could be infected by nosocomial infection whereas in some developing countries this rate can rise up to 40%. According to results from nosocomial infection surveillance system(NISS)the prevalence of hospital-associated infections in Iran was 0.57% and it was low compared to estimates from other studies.

Revealed statistics from CDC indicate 70,000-150,000 death per years at hospital involved in hospital acquired infection that specify 20-30 billion dollar to treat4,5. The most common nosocomial infection included in; surgery wound infection, urinary infection, respiratory infection and catheters related infection and ICU devices related infection. This kind of infection has high frequency among patients whom treated by chemotherapy and ones that have background of special diseases like; diabetes, kidney-liver failure and etc[4,5]. Though, antibiotics introduction help to reduce mortality of nosocamial infection, there is not any simultaneous decline of hospital acquired infectious cases[5,6].

There were restricted studies about nosocomial infections(NIs) in Iran, which believed 8%–10% prevalence rate. The relative frequency of detected NIs through a study during March 2007 – March 2008 according to hospital ward, ICUs (26.7%) had the most NIs, followed by surgery wards (12.8%). Frequency of different types of nosocomial infections (NIs) were urinary tract infection, surgical site infection, pneumonia, bloodstream infection respectively[5]. Infection source recognize and antibiotic susceptibility determination of microbial agents which isolated from personnel and devices and comparison their resistant pattern with clinical isolated bacteria has major importance to approach with nosocamial infection[7]. Determination of microbiological and resistance pattern could be effective to prescribe appropriate antibiotics and prevent antibiotic resistance[8,9].

MATERIAL AND METHODS

This study was conducted at Imam Khomaini General Hospital of Ilam during 6 months period in 2010. Sampling from devices, personnel and nosocomial infection patients were carried out. In all steps sterile swap used to sampling then incubate in thioglycolate broth and so rapidly transferred to laboratory. After one night, samples cultured on Blood agar, Mac Conkey agar and incubate at 37°C for 16-18 h. Simultaneously clinical samples collected from both sections ICU and Surgery. Confirmed clinical isolated base on differential biochemical tests cultured on skim milk and frozen at -80 °C for following purposes. Overnight TSB culture of the isolates were marched with McFarland turbidity standard 0.5 and spread over the surface of Mueller-Hinton agar with the help of a swab stick and allowed to dry. Antibiotic discs were placed on the surface of the medium. This was incubated at 18-24 h at 37°C and the sensitivity plates interpreted by comparing the zones of inhibition according to CLSI 2010 Standards. *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853 were used as control organisms. Antibiotic discs (Oxoid) potency were as follows Gentamicin(CN) 10µg, Ceftazidime(CAZ) 30µg, Ofloxacin(OFL) 10µg, Cloxacillin (CXC) 10µg, Ceftriaxone (CRO) 30µg, Ciprofloxacin (CIP) 10µg, Amoxycillin/Clavulanate (AMC) 30µg, Tetracycline (TE) 10µg, Cotrimoxazole (COT) 10µg, Cefuroxime(CXM) 30µg. Simple percentages were used to analyze the results.

RESULTS

After culture, 130 samples including in 90 samples from personnel, devices and 30 samples from nosocomial infections, were positive. According to site sampling from personnel, hand(51.6%), nose(29.1%), and uniform(19.3) was high contamination respectively. The high frequent bacteria that isolated from personnel and devices of both wards were *Staphylococcus saprophyticus*. *Entrobacter* (35%), *Pseudomonas* (25%), *E.coli* (20%) and *Staphylococcus aureus* (5%) were most frequent isolates in ICU. While *E.coli* (25%), *Klebsiella* (20%), *Pseudomonas* (15%), *Staphylococcus aureus* (10%), *Staphylococcus saprophyticus* (10%), *Staphylococcus epidermidis* (5%) and *Proteus* (5%) were more frequent in surgery wards. The most prevalent type of infection in ICUs were pneumonia and surgical site infection, 65% , 15%

Table 1. Frequency of bacteria isolated of devices based on section

Total	*Enterococcus*	E.coli	*Staphylococcus epidermidis*	*Staphylococcus aureus*	*Klebsiella*	*Entrobacter*	*Staphylococcus saprophyticus*	Bacteria Section
30(100%)	4(13.3%)	1(3.3%)	2(6.7%)	7(23.3%)	3(10%)	2(6.7%)	11(36.7%)	ICU
28(100%)	3(10.7%)	0	2(7.1%)	7(25%)	2(7.1%)	1(3.6%)	13(46.4%)	Surgery
58(100%)	7(12.1%)	1(1.7%)	4(6.9%)	14(24.1%)	5(8.6%)	3(5.2%)	24(41.4%)	Total

Table 2. Frequency of bacteria isolated of personnel based on section

Total	*Enterococcus*	Micrococcus	*Staphylococcus epidermidis*	*Staphylococcus aureus*	*Klebsiella*	*Entrobacter*	*Staphylococcus saprophyticus*	Bacteria Section
15(100%)	2(3/13%)	1(7/6%)	2(3/13%)	1(7/6%)	2(3/13%)	1(7/6%)	6 (40%)	ICU
17(100%)	2(5/17%)	1(9/5%)	1(9/5%)	2(8/11%)	0	1(9/5%)	9 (53%)	Surgery
32(100%)	5(9/15%)	2(2/6%)	3(3/9%)	3(3/9%)	2(2/6%)	2(2/6%)	15(9/46%)	total

Table 3. Frequency of bacteria isolated of nosocomial infection based on section

Total	proteus	*E.coli*	Staphylococcus epidermidis	Staphylococcus aureus	Klebsiella	Entrobacter	Staphylococcus saprophyticus	Bacteria Section
20(100%)	0	4(20%)	0	1(5%)	3(15%)	7(35%)	0	ICU
20(100%)	1(5%)	5(25%)	1(5%)	2(10%)	4(20%)	2(10%)	2(10%)	Surgery
40(100%)	1(2.5%)	9(22.5%)	1(2.5)	3(7.5%)	7(17.5%)	9(22.5%)	2(5%)	total

Table 4. Antibiotic resistance pattern of bacteria pathogens isolated from nosocomial infections in the surgery and ICU wards at Imam Khomani Hospital, Ilam

Isolates	Ward	Percent of isolates resistance %														
		V	OX	AN	IPM	E	TIC	CRO	GM	ME	CB	SXT	CIP	RA	TE	CAZ
Staphylococcus	ICU	6	93	6	56	75	-	75	37	-	-	50	62	93	87	-
saprophyticus	Surgery	12	96	16	28	72	-	76	40	-	-	44	28	32	64	-
Enterobacter	ICU	-	-	40	40	-	-	80	80	-	-	50	50	-	70	80
	Surgery	-	-	25	10	-	-	50	50	-	-	25	0	-	50	50
Staphylococcus	ICU	2	89	-	67	88	-	100	89	40	-	89	89	11	-	-
aureus	Surgery	1	82	-	36	45	-	100	36	25	-	54	45	27	-	-
Klebsiella	ICU	-	-	37	38	-	62	75	87	-	-	50	37	15	87	100
	Surgery	-	-	28	14	-	29	43	57	-	-	71	43	10	100	86
Enterococcus	ICU	17	100	-	-	90	-	100	67	-	-	83	83	-	84	-
	Surgery	0	100			95		83	66			83	83		84	
E.coli	ICU	-	-	20	0	-	-	60	60	-	-	40	15	-	80	80
	Surgery	-	-	0	50	-	-	50	50	-	-	25	75	-	100	75
Pseudomonas	ICU	-	-	80	20	-	20	80	90	-	60	-	40	-	-	60
aeruginosa	Surgery	-	-	90	70	-	33	100	67	-	0	-	10	-	-	33
Staphylococcus	ICU	0	75	0	75	50	-	50	25	-	-	50	-	25	25	-
epidermidis	Surgery	0	75	0	20	75	-	25	0	-	-	50	0	25	75	-

CRO: Ceftriaxone 30µg; CXT: Cotrimoxazole 25µg; OX: Oxacillin 10µg; CM: Gentamicin 10µg; CAZ: Ceftazidime 30µg; CXM: Cefuroxime 30µg; CIP: ciprofloxacin 10µg; TE: Tetracycline 25µg; V : vancomycin ; AN: Amikacin ; IPM :Imipenem; E: Erythromycin, TIC: Ticarcillin, ME:Meticillin, CB: Carbinicillin; RA: Rifampin ;TE: tetracycline; CAZ: ceftazidim, for some antibiotics data not showed

respectively, and in surgery ward was surgical site infection and urinary tract infection,70% ,20% respectively(Table-1,Table-2). *E.coli, Klebsiella* and *Staphylococcus aureus* isolated from ICU shown high resistance to *Amplicillin, Ceftazidime/ Cefotaxime, Ceftriaxone,* respectively. Whereas bacteria that isolated from Surgery section shown high resistance to *Tetracycline, Amoxicillin, Tetracycline, and Ceftriaxone*(Table-4). Funding of relative and absolute frequency of isolated bacteria from personnel rely on section shown in table-1. As Could be fund it on table, *Staphylococcus saprophyticus* were most frequent isolates in both wards. P value for all of isolates shown common source of infection between nosocomial infections isolates with bacteria that isolated from devices and personnel. But $P<0.003$ for isolated *E. coli* from devices, personnel and clinical samples indicates certain difference and also there is different resistant pattern for clinical isolate of *Entrobacter* and bacterial isolated from devices by $P<0.0001$.

DISCUSSION

This study confirmed that objects and personnel in the surgery and ICU wards were variously contaminated with known bacterial pathogens. Correlation between bacterial isolated from personnel and devices with nosocomial infection was investigated in this study. Researchers about role inanimate environment in spread of infection have disagreement, some in their study concluded that the common nosocomial pathogens may well survive or persist on surfaces for months and can thereby be a continuous source of transmission[7], another remarked that the inanimate environment has little relevance to the spread of infection, other workers noted that the devices are involved in the transmission of pathogens in health care environments[10,11] Most of common studies around the world shown that microbial agent of hospital infection is specific to hospital which isolated from. Also, the frequency and resistant pattern of isolates are various from one hospital to another, therefore, there is need to monitor antibiotic susceptibility of bacteria[8]. Loftus et al indicated, the contaminated hands of anesthesia providers serve as a significant source of patient environmental and stopcock set contamination in the operating room[12]. Naser and his colleges isolated 35.29% gram positive bacteria, and 44(64.71%) gram negative bacteria from ICU, the highest rates (19.11%) of bacterial contamination had been found on the walls and the floor of ICU[5]. Our funding indicates in both wards *E.coli* is more dominant pathogen in urine cultures, *Klebsiella* and *Pseudomonas* in surgery wounds, *Entrobacter* in sputum samples. In proportion to drug resistance pattern among bacteria isolated from nosocomial infection, personnel and devices, there is same sources for *Staphylococcus aureus, Staphylococcus saprophyticus, Entrobacter, Klebsiella* that isolated from devices and clinical isolates of ICU which suggest the role of same source to disseminate infection to patients ($p<0.05$). *Klebsiella* isolated from devices and clinical isolates were same and *Entrobacter* isolated from personnel and clinical isolates were too ($p<0.05$). *S.aureus* and *S.saprophyticus* have same sources among personnel, devices and clinical isolates ($p<0.05$).

CONCLUSION

Our funding indicate the same sources between devices and personnel isolates and clinical isolates exactly for *S.aureus* and *S.saprophyticus* that strongly provide conditions to make this idea that personnel and devices play a main role to disseminate infection through hospital and transfer it to hospitalized patients. To achieve control of nosocomial infection need to administrate special programs such as more surveillance to devices and room sterilization specially before and after surgery, have special instrument to wash and sterilize personnel's uniforms, isolate infected patients and prescribe antibiotic base on susceptibility and treatment priority.

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