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Nosocomial infectious prevalence study in Al-Yarmouk hospital

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Abstract : Nosocomial infections are those infections acquired as a result of treatment in a hospital or health care service providing center. These infections usually appear 48 hours or more after hospital admission or within 30 days after discharge. In this study, a total of 730 samples including (90 swabs from patient and 640 environmental swabs sample) were collected from AL-Yarmouk hospital Educational in Baghdad from the period between June and August 2016. By morphological and biochemical reactions, *Acinetobacter boumanii*, *Escherichia coli*, *Enterobacter*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Proteus Vulgaris*, *Pseudomonas aeruginosa*, *Serratia fiacria*, *Staph. aureus*, *Strep. Pneumonia*, *Strep. Pyogens* and *Fungus* were isolated, identified and tested for their antibiotic sensitivities using agar disc diffusion assay against (Amikacin, Cefixime, Ceftriaxone, Chloramphenicol, Ciprofloxacin, Clindamycin, Gentamycin, Imipenem, Tetracycline and Ticarcillin). The antimicrobial susceptibility was performed that all microorganisms were sensitive to Imipenem and resist to Ticarcillin. *P. aeruginosa* was more resistant to all used antibiotic except Ciprofloxacin, while *E. coli* was more Sensitive to all used antibiotic except Ticarcillin.
The clinical specimens showed that *P. aeruginosa* was the commonest isolate (9 and 3 isolates in Ear and wound swabs respectively 12 (24.49 %) followed by *E. coli* (2 and 6 isolates in Ear and wound swabs respectively 8 (16.33 %) and *Staph. aureus* (3, 3 and 2 in Ear, Nasal and wound swabs respectively 8 (16.33 %) with significant differences ($P \leq 0.05$). While the environment isolates showed that the general operation room was the highest contamination with microorganisms followed by Burn unit and urological operation room with significant differences ($P \leq 0.05$). *Staph. aureus, E. coli* and *P. aeruginosa* were the commonest isolate reached to 50 (26.74 %), 45 (24.06 %) and 32 (17.11 %) respectively.
Key words : Nosocomial infections, antibiotic resistance, pathogenic microorganisms.

Introduction

Nosocomial infections have been a major problem to health care delivery. These often result in prolonged recovery of patients and even death when not treated early. Different types of bacteria, fungi and viruses have been implicated in the development of nosocomial infections[1]. Several species of microorganisms have been isolated from different hospitals across the world[2]. Even though some of these organisms were not known for causing recalcitrant nosocomial infections, they are opportunistic pathogens and hence pose a challenge to patients especially those with immunocompromised conditions. Nosocomial infections usually encountered include urinary tract infection, pneumonia, tuberculosis, gastroenteritis, legionnaire's disease and Vancomycin-resistant Enterococci infections[3].

Microorganisms usually implicated in these infections include among others *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella* species, *Mycobacterium tuberculosis*, and *Clostridium difficile*, which are rapidly gaining resistance because of the broad spectrum antibiotics used in an attempt to control them. Most of these organisms are usually contaminants on the surfaces of most materials such as doors, beds, instruments and on care providers. They are therefore easily transmitted to patients when adequate hygienic practices are not followed regularly. Patients at the intensive care unit are the most at risk of these hospital-acquired infections[4]. The aim of this study to Isolation and identification of common microorganisms which are expected to be associated with hospital acquired infections from different hospital environments and from patients admitted in AL-Yarmouk hospital in Baghdad.

Materials and Methods

Bacterial isolates

A total of ninety clinical swabs were collected from wounds, Nasal, Throat, Ear and Tung patients that admitted in a governmental hospital in Baghdad at AL-Yarmouk Educational, Iraq from both gender with age ranged (4–75 year). Furthermore, six hundred forty environmental swabs sample, were taken from different site of hospital during the June - August 2016. Bacterial isolation and identification were performed using standard laboratory methods [5, 6, 7, 8].

Antibiotics susceptibility test

Antibiotic susceptibility of isolates was performed by agar disc diffusion method, according to manufacture instructions and clinical and Laboratory Standards Institute (CLSI) guidelines[9].

Statistical analysis

The Statistical Analysis System program was used to effect of difference factors in study parameters. Chi-square test was used to significant compare between percentages in this study[10].

Results and Discussion

Culture of Patient Specimen (Clinical isolated)

Ninety clinical swabs that obtained from wounds, Nasal, Throat, Ear and Tung patients admitted to the hospital, forty-nine swabs were contamination. All swab cultured on MacConkey and blood agar.

The result demonstrated that *P. aeruginosa* was the commonest isolate (9 and 3 isolates in Ear and wound swabs respectively, 24.49%) followed by *E. coli* (2 and 6 isolates in Ear and wound swabs respectively, 16.33%) and *Staph. aureus* (3, 3 and 2 in Ear, Nasal and wound swabs respectively) in percentage (16.33%) with significant differences ($P \leq 0.05$). while non-significant differences contamination with *Serratia fiacria*, *Strep pneumonia and Enterobacter aerogenes* (2.04%), as shown in (Table 1).

According to surveillance data, *P. aeruginosa* was the third and fifth most common cause of hospital acquired urinary tract infections in the USA and in Europe [11]. Another study by [12] found that the most predominant bacterial isolate was *P. aeruginosa* followed by *Staph. aureus* and *E.coli*.

Table (1): Clinical isolated swab from patients

Microorganisms	Specimens					
	Ear swab	Nasal swab	Throat swab	Wound swab	Tung swab	Total
Acinetobacter baumannii	1	0	0	2	0	3 (6.12%)
E. coli	2	0	0	6	0	8 (16.33%)
Enterobacter aerogenes	0	0	0	1	0	1 (2.04%)
Fungus	3	0	0	0	0	3 (6.12%)
K. pneumonia	0	0	0	2	0	2 (4.08%)
Proteus mirabilis	2	0	0	3	1	6 (12.24%)
Proteus vulgaris	0	0	0	1	1	2 (4.08%)
P. aeruginosa	9	0	0	3	0	12 (24.49%)
Serratia fiacria	1	0	0	0	0	1 (2.04%)
Staph. aureus	3	3	0	2	0	8 (16.33%)
Strep. pneumonia	0	1	0	0	0	1 (2.04%)
Strep. pyogens	0	0	2	0	0	2 (4.08%)
Total	21	4	2	20	2	49
Chi-square (χ^2)	5.02 *	2.45 NS	0.973 NS	4.21 *	0.73 NS	7.42 *

*** (P<0.05) NS: Non-significant.**

Culture from Environmental Swabs

Six hundred forty swabs were taken from different site of units and operation room hospital. One hundred eighty-seven swabs were contamination.

Table (2) shows that the general operation room was the highest contamination with microorganisms followed by Burn Unit and urological operation room with significant differences ($P \leq 0.05$). *Staph. aureus*, *E. coli* and *P. aeruginosa* were the commonest isolate reached to 50 (26.74%), 45 (24.06%) and 32 (17.11%) respectively. While the less rate 3 (1.60%) of *Proteus vulgaris*, 3 (1.60%) of *Micrococcus* and 6 (3.21%) of *Proteus mirabilis* with non-significant differences in other units. [13]reported that the hands of staff members can become transiently contaminated and transfer infection among patients that play important role in increase chance of spreading these microorganisms.

P. aeruginosa and *A. baumannii* are an opportunistic pathogen have been found contaminate the floors, bed rails and sinks of hospitals, and have been also cultured from the hands of nurses, these species are important cause of nosocomial infections, include pneumonia, meningitis, bloodstream, urinary tract, surgical wounds, and soft tissue infections [14, 15].

According to data from the national nosocomial infection surveillance system, the distribution of pathogens isolated from surgical site infections (SSIs) has not changed markedly during the last decade where *S. aureus*, *Enterococcus spp.* and *E. coli* remain the most frequently isolated pathogens [16]. Furthermore, (SSIs) which account 17% of all health care-associated infections (HCAIs) are the second most common next to urinary tract infections. They occur after approximately 3% of all operations and result in greater lengths of stay and additional costs [17].

[18] reported that nosocomial infections are found mainly in intensive care units compared other units of the hospital. They account for about 5 – 10 % of the cases admitted to hospitals for emergency care in the

developed countries. It is the result of a chain of events influenced by the microbe involved, the transmission method, and patient's adherence to physician's instructions.

Table (2): Environmental swab isolated from hospital units

Microorganisms	urological operation room	general operation room	Burn Unit	Orthopedic operation room	Obstetrics operation room	CCU Unit	RCU Unit	ENT Unit	Dialysis Unit	Neonate room	Kitchen Unit	Total
E. coli	9	7	7	1	3	2	2	1	5	2	6	45 (24.06%)
Enterobacter aerogenes	4	1	2	0	0	0	0	0	0	0	1	8 (4.28%)
Fungus	0	0	3	0	0	1	0	2	2	1	2	11 (5.88%)
K. pneumonia	5	2	0	0	2	0	1	1	1	0	2	14 (7.49%)
Micrococcus	0	0	2	0	0	0	0	1	0	0	0	3 (1.60%)
P. aeruginosa	3	8	10	3	1	2	2	0	3	0	0	32 (17.11%)
Proteus mirabilis	2	2	0	0	1	0	0	1	0	0	0	6 (3.21%)
Proteus Vulgaris	1	2	0	0	0	0	0	0	0	0	0	3 (1.60%)
Staph. aureus	3	8	4	5	4	5	7	5	6	2	1	50 (26.74%)
Staph. epidermidis	2	3	1	1	1	3	1	1	1	1	1	16 (8.55%)
Total	29	33	29	10	12	13	13	11	18	6	13	187
Chi-square (χ^2)	**4.58***	**4.72***	**5.19***	**2.26 NS**	**1.75 NS**	**1.86 NS**	**2.48 NS**	**1.26 NS**	**2.07 NS**	**0.77 NS**	**2.15 NS**	**11.63****

CCU: cardio care unit, RCU: Respiratory care unit, ENT: Ear nose throat, * (P<0.05), ** (P<0.01), NS: Non-significant.

Antibiotic susceptibility test

Antimicrobial Susceptibility was performed on 11 different type of bacterial isolated to 10 Antibiotic 6 of them was Extend Spectrum beta-lactamases (ESBLs) represent by Ceftriaxone, Ticarcillin, Tetracycline, Imipenem, Clindamycin, and Cefixime and for 4 antibiotics were non (ESBLs) represent by amino glycoside (Amikacin and Gentamycin), Chloramphenicol and Ciprofloxacin (Fluoroquinolone).

The antibiotic for studied isolates was revealed that all microorganisms were Sensitive to Imipenem and Resist to Ticarcillin as shown in (Table 3). *P. aeruginosa* was more resistant to all used antibiotic except Ciprofloxacin, while *E. coli* was more Sensitive to all used antibiotic except Ticarcillin.

Ciprofloxacin has been reported as the second most effective drug against *P. aeruginosa* this well agreed with study done by [19]. This result was agreeing with some previous studies that had shown sensitivity of *P. aeruginosa* against Imipenem as mentioned by [20]. *P. aeruginosa* is become more resistant to commonly used antibiotic and more resistance to new antibiotic [21, 22].

A study by [23] which isolated different types of bacteria from patient and units of some hospital in Baghdad, which had shown that *P. aeruginosa* isolates appeared complete resistance to Ceftriaxone and high resistance to Gentamicin.

As reported by [24] nosocomial infection has the highest percentage in South-East Asia, and the Eastern Mediterranean and one of the main reasons for this has been the inadvertent misuse of antibiotics leading to widespread resistance [25].

Table (3): Antibiotic sensitive test

Microorganism	Antibiotic																													
	Imipenem			Gentamycin			Amikacin			Tetracycline			Ciprofloxacin			Chloramphenicol			Ticarcillin			Ceftriaxone			Clindamycin			Cefixime		
AST	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R
Acinetobacter boumanii	S			S			S				I		S					R			R		I				R			R
E. Coli	S			S			S				I		S			S					R	S			S			S		
Enterobacter	S				I		S				I		S			S					R		I			I			I	
Klebsiellia pneumonia	S			S			S					R	S			S					R			R			R			R
Proteus mirabilis	S				I		S					R		I		S					R	S					R		I	
Proteus Vulgaris	S			S			S					R	S			S					R		I				R			R
Pseudomonas aeruginosa	S					R			R			R	S					R			R			R			R			R
Serratia fiacria	S			S			S			S				I			I			I			R		I				R
Staph. aurous	*	*	*	S					R	S				I		S					R			R			R		I	
Strep. pneumonia	*	*	*			R			R		I				R			R			R			R		I				R
Strep. pyogens	*	*	*	S					R			R		I		S					R	S					R			R

AST = Antibiotic sensitive test S= Sensitive R=Resistant * = Not used antibiotics

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