Effect of some antibiotics on aerobic pathogenic bacteria in operation theaters in AL-Manathera general hospital: A comparative study

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الخلاصة

اجريت هذه الدراسة من١ حزيران ٢٠١٢ الى ١٥ اب ٢٠١٢ حيث تم جمع ١٨٠ عينة من صالات عمليات مستشفى المناذرة العام قسمت إلى ٩٠ عينة من الأرضية و٩٠ عينة من الهواء. وبعد إجراء العزل و التشخيص الأصولي للبكتريا وفحص الحساسية للمضادات الحياتية وتحليل مقارنة النتائج وجد إن بكتريا *Staphylococcus aureus* شكلت أعلى نسبة تواجد من بين العزلات البكتيرية المعزولة وبلغت ٢٩ عزلة تليها كل من*Pseudomona aeruginosa*٧عزلات و*Escherichia coli* ثلاث عزلات فقط. وأظهرت نتائج الدراسة إن المضادات الحياتيةCefatoxime, Cephalothin, Refamcin ذات فعالية تجاه العزلات البكتيرية السالبة و الموجبة لصبغة كرام في حين كانت العزلات البكتيرية مقاومة للمضادات الحياتية (**Oxacillin Amoxicillin Cloxacillin, Carbenicillin Chloramphenicol, ,Pencillin G, Tetracyclin ,Ampicillin, Lincomycin Erthromycin**).

Abstract:

The study was done between June 2012 and August 2012 where 180 specimens were obtained from operation rooms in AL-Manathera general hospital which have been divided into 90 specimens from air and 90 specimens from floor ,Isolation and Identification of the microorganisms and their Antibiotics sensitivity pattern were done and following results were obtained ***Staphylococcus aureus*** was the most common microorganisms isolated 29 then ***Pseudomonas aeruginosa*** 7 and ***E.Coli*** three specimen only, The Antibiotics sensitivity pattern showed that Cefatoxime, Cephalothin and Rifampcin were more active against gram positive and gram negative bacteria while the strains were resistant to Oxacillin ,Amoxycillin ,PencillinG, Tetracyclin ,Ampicillin, Lincomycin, Chloramphenicol**,** Carbenicillin, Cloxacillin, Erthromycin.

Introduction:

Nosocomial infection is considered to be one of the most important causes of morbidity and mortality affecting hospital admitted patients**(1,2).**

Nosocomial infection refers to the infection that is acquired after hospital admission, that is the patient does not have previously **(3).**

Due to the importance of nosocomial infection research studies are continuous about them.

The percentage of N.C infection differs from hospital to another according to the hospital, patient, treatment, and staff, in a study published by WHO in 1982 that among 90 millions patients admitted to the hospital all over the world one million died because of the nosocomial infections **(4)**, in KSA the percent of N.C infection was 2.2% in 2008, in USA was 7.8% in 2007, in China was 8.6 in 2003, in Canada was 8% in 1994, and in UK 18% in 1995 **(5)**

Despite that we cannot completely eradicate N.C infection, it is better to study the pathogenic bacteria which cause N.C infections and the factors which assist its emergence in hospital **(6).**

Materials and methods:

1. Culture media and the antibiotic disc:

Culture media were prepared according to the instruction of the manufacturing company for each medium (table 1), these media were used according to the **(7)**and **(8)**, 13 antibiotic disc were used, they are all manufactured by oxoid company.

Table (1): Culture media and the antibiotic disc

Culture medium	Manufacturing company	antibiotic
Blood agar	**Biolife , Italy**	**Cephatoxime (30mg) CTX**
MacConkey agar	**Mast , U.K**	**Cephalothin (30mg) KF**
Mannitol salt agar	**Oxoid , U.K**	**Revamping (30mg) RD**
Nutrient agar	**Biolife , Italy**	**Erthromycin (15mg) E**
Nutrient broth	**Biolife , Italy**	**Lincomycin MY (2mg)**
Muller-Hinton agar	**Oxoid , U.K**	**Tetracyclin TE (30mg)**
Piocianosel agar	**Mast , U.K**	**Oxacillin OX (1mg)**
Pepton water	**Biolife , Italy**	**Pencillin G P (10IU)**
Methylred-Voges proskauer	**Oxoid , U.K**	**Chloramphenicol C (30mg)**
Kligler-Iron agar	**Difco , U.S.A**	**Carbenicillin (100mg) CAR**
Simmon citrate agar	**Biolife , Italy**	**Cloxacillin OB(5mg)**
Sugar fermention test	**Difco , U.S.A**	**Ampicillin (25mg) AMP**
		Amoxicillin (30mg) AML

2. **Diagnosis of isolated pathogenic bacteria:**

It was done according to Cowan, Collee, Macfaddin **(7,8,9)**

The diagnosis depends on microbiological properties, biochemical tests which include:

A. Oxidase test
B. Catalase test
C. Coaglase test
D. Indol production test
E. Red methyl test
F. Sugar fermentation test
G. Test of growth on mannitol salt agar
H. Growth on Piocianosel agar.
I. Simmons citrate and others.

2.Sensitivity test: According to Bauer **(10)**.

Table 2: Species of bacteria according to biochemical tests:

الاختبار / اسم البكتريا المرضية	Gram stain	Oxidase	Catalase	Indol	Methyle- red	Voges-proskauer	Simmons citrate	K.I.A	H2S	Coagulase (slide)	Grow on mannitol salt	hemolysis	Pyocyanin pigment	glucose	lactose	maltose	mannitol
Staphylococcus aureus	+	-	+			+			-	+	+	**B**	-	+			+
Escherichia coli	-	-	+	+	+	-	-	**A/ A**	-	-	-		-	+	+	+	+
Pseudomonas aeruginosa	-	+	+	-	-	-	-	**k/k**	-	-	-	**B**	+	+	-	-	-

Statistical analysis:

By chi square (X2) test and correlation coefficient, P-value less than 0.05 level of significance was considered to be statistically significant.

Results:

Positive and negative numbers of bacterial isolates and their percentages:

There was only 22 positive bacterial isolates from 90 isolates from the floor of the operation theaters (40.4%), while the negative isolates were 68 (75.6%).

From 90 bacterial isolates from the air of the operation theater there was only 17 positive(18.8%), and 83 negative isolates (81.2%) (table 3).

The study revealed that there was 12 isolates of *staphylococcus aureus* (54.5%), 7 isolates of *pseudomonas aeroginosa* (31.8%), and only 3 isolates of ***Escherichia coli*** (13.7%) from the floor of the operation theaters, while from the air of the operation theaters there was 17 bacterial isolates of S.Aureus only(100%) without other types of bacteria, table 4.

Table 3: Number of positive and negative bacterial isolates from their sources and their percentages

Source of the isolate	Total number	Positive number	percentage	Negative number	percentage
Floor	**90**	**22**	**24.4**	**68**	**75.6**
Air	**90**	**17**	**18.8**	**73**	**81.2**

Table 4: Distribution and percentages of bacterial isolates according to their sources

Source of the isolate	Total number of isolate	Positive number	S.Aurues	P.Aeroginosa	E.coli
Floor	**90**	**22**	**12(54.5)%**	**7(31.8)%**	**3(13.7)%**
Air	**90**	**17**	**17(100)%**	**0**	**0**
Total	**180**	**39**	**29**	**7**	**3**

X2= 1.61 : Df =3 : P= 0.05

Resistance of bacterial isolates to the effect of antibiotics:

The result of this study revealed that cefatoxime, cephalothin, and rifampcin are effective against Gram positive and negative bacteria that leads to growth inhibition(table5).

Table 5: Sensitivity pattern against bacterial isolate

Antibiotic	*Staphylococcus aureus*	*Pseudomonas aeroginosa*	*E. coli*
Rifampcin	**S**	**S**	**S**
Cefatoxime	**S**	**S**	**S**
Cephalothin	**S**	**S**	**S**
Erythromycin	**R**	**R**	**R**
Lincomycin	**R**	**R**	**R**
Tetracyclin	**R**	**R**	**R**
Oxacillin	**R**	**R**	**R**
Penicillin G	**R**	**R**	**R**
Chloramphenicol	**R**	**R**	**R**
Carbenicillin	**R**	**R**	**R**
Cloxacillin	**R**	**R**	**R**
Ampicillin	**R**	**R**	**R**
Amoxicillin	**R**	**R**	**R**

S:Sensitive **R:Resistant**

Discussion:

Staphyllococcus aureus have ability to resist dehydration and ability for easy transmission to the patients by contaminated air or hands **(11)** and considered to be one of the most important causes of nosocomial infections **(12)**.

Gorden found that it is the most important cause of nosocomial infection, due to its ability to resist dehydration, easy transmission, resistance to antiseptics and antibiotics**(13)**.

Pseudomonas aeroginosa is the second common cause of nosocomial infections since it have intrinsic resistant**(14, 15)**.

Researches are continuous to find the most effective antibiotic against P.aeroginosa**(16)**.

This bacteria can live in antiseptics, detergents, and can live for long periods in humid environments especially in hospitals, It is considered to be the second important cause of nosocomial infections(10%) after S.aureus **(17)**.

E.coli is the third cause of hospital acquired infections, this agree with Chakraborty, 1996 **(3)**. E.coli can also be available widely in hospitals since it have K-Antigen in addition to its ability to adhere to surfaces and to resist antiseptics and antibiotics but to less extent than S.aurues and P. aeroginosa.

Resistance of bacterial isolates to the effect of antibiotics:

The result of this study revealed that cefatoxime, cephalothin, and rifampcin are effective against Gram positive and negative bacteria that leads to growth inhibition(table5), this agree with Edmistion et al, 2001**(18)**, that is first generation cephalosporins like cephalothin are effective against Gram positive bacteria especially S.aureus, while third generation cephalosporins (cefatoxime) is highly effective against Gram negative bacteria, these two antibiotics are highly concentrated in the serum.

Restriction of Refampcin use in treatment of tuberculosis in the last years increase its activity against other species of bacteria like P.aeroginosa and E.coli **(19)**.

According to this study the Gram positive and negative bacteria were resistant to Ampicillin,Oxacillin, Amoxicillin, PencillinG, Erthromycin, Lincomycin,Tetracyclin, Chloramphenicol**,** , Carbenicillin, and Cloxacillin.

This related to that pencillins are of excessive use in the treatment of bacterial infections that leads to appearance of resistant strains.

S. aureus considered to be one of the most resistant strains to pencillins and cephalosporins since it have beta-lactamase enzyme which opens beta lactam ring renders antibiotic ineffective, this enzyme under the control of transducible plasmide, and R-factor in P.aeroginosa **(20)**, in addition to that phosphotransferase enzyme and adenyltransferase enzyme which act against Aminoglycosides have been notably increased by Gram negative bacteria in hospitals especially P.Aeroginosa **(21)**.

E.coli can resist multiple antibiotics by the mechanism of transmissible plasmide, therefore many antibiotics will fail in the treatment of hospital admitted patients **(22)**, this in agreement with AL-Kaby, 2004, that there is high percentages of Gram+and Gram-bacteria are highly resistant to the antibiotic effect and are present in hospitals**(23)**.

Levien et al, 2006, Ellner et al, 2002 found that bacteria which cause hospital infections are more resistant to the effect of antibiotics than the bacteria which cause community acquired infections **(24,25)**, this may be due to that the hospital environment is highly crowded in addition to low hygiene **(26)**, in addition to other factors like improper antibiotic use and prescription of broad spectrum antibiotics for long duration especially when the patient stay in hospital for long period of time **(27)**.

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