

Assessment of bacterial contamination and antibiotics susceptibility of
Pathogenic AL-Batool teaching hospital

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Assessment of bacterial contamination and antibiotics susceptibility of
pathogenic Bacteria in the operating theaters in AL-Batool teaching
hospital

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Abstract

Back ground: - Surgical wound pathogens is one of the most complications in every kinds of surgery. Surgical pathogens can be fatal or lead to a poorly diagnosis, causing critical trouble to both patients and doctors.

Objective:-To assess of the contamination rate and antibiotics susceptibility of pathogenic bacteria in the operating theaters in Al-Batool teaching hospital.

Materials and Methods :- This study was done in the Al-Batool teaching hospital in Diyala province for the period from one July 2015 to one February 2016 .192 swabs were taken from different sites from operating theaters included:-operative couch ,wall and floors ,air outlets ,surgical instrument ,water tape, door knob, guess . Were taken cultured on different culture media and submitted to a serial of different biochemical tests for the diagnosis of type of bacteria. and the cultures were tested for antibiotics sensitive to evaluate their activity against pathogenic bacteria isolated from operating theaters.

Results :- In this study taken 192 swabs , 160 (83.33 %) swabs show positive results for bacterial growth as single and mixed isolate, and 32(16.66 %)were negative (no growth). from 160 positive swabs were 202 single positive bacterial isolates, 116(57.42 %) gram negative

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bacteria, which include 66(56.89 %) *Escherichia coli* , 21(18.1%)*Enterobacter sp.*,12(10.34%) *klebsiella sp.*,and11(9.48%) for *pseudomonas aeruginosa* . while 86(42.57%) of bacterial isolates were gram positive include 49 (56.97 %) *Staphylococcus epidermidis* and 15 (17.44%) *Staphylococcus aureus* . The result shows high percentage of contamination with gram negative bacteria 38 (32.75 %) and26(22.41 %) during September and October while shows high percentage of contamination with gram positive bacteria 24(27.9%)and17,(19.76%)during January and December .The Cephalothin ,Cefotaxime and Rifampin are more effective against study isolates.

Conclusion:- Contamination of operating theaters was the most dangerous problem .Which was responsible for 90% of opportunistic infections in hospital ,which may be came from another person , from patients flora ,or by contamination instruments in the operating rooms ,the rate of bacterial contamination was high during September and October.

Keywords:-*Escherichie.coli* ,*Staphylococcus aureus* , Operative theaters, surgical instruments .National nosocomial infection ,Antibiotics sensitivity.

**تقييم نسبة التلوث الميكروبي والعزلات البكتيرية المقاومة للمضادات الحيوية في صالات العمليات في
مستشفى البتول التعليمي**

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الخلاصة

تعد عدوى صالات العمليات واحدة من سلسلة المضاعفات التي تصاحب أنواع العمليات الجراحية والتي قد تكون قاتلة وتسبب مشاكل صحية خطيرة للمريض والجراح وان استخدام المضادات لوقائية يمكن أن يقلل أو يمنع هذه الإصابات لحد ما. أن الهدف من الدراسة هو لتقييم مستوى التلوث الميكروبي بالعزلات البكتيرية المقاومة للمضادات الحيوية في صالات العمليات بمستشفى البتول التعليمي بمحافظة ديالى. تم جمع 192 مسحة أخذة من أماكن مختلف من صالات العمليات شملت أسرة العمليات ، الجدران والأرضيات، منافذ الهواء، الأدوات الجراحية، حنفيات المياه ومقابض الأبواب. والتي تم استنباتها على

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أوساط زرعيه وإخضاعها لسلسلة اختبارات بايو كيميائية لغرض التشخيص، كما تم تقييم مستوى المقاومة للمضادات الحيوية من خلال اختبار الحساسية لمجموعة من المضادات الحيوية . اظهرت 160 مسحة نتيجة زرع موجب في حين لم تظهر 32 مسحة اي نمو بكتيري، شكلت بكتريا نسبة (56,89)% بمجموعة البكتريا السالبة لصبغة كرام في التلوث الميكروبي لصالوات العمليات أعلى *Escherichia coli* ، (9,48) % . 10,34 ، (1 ، 18 بنسبة *Pseudomonase sp.* ، *Klebsiella* ، *Staphylococcus epidermidis* ، *Staphylococcus* ، *Enterobacter* ، *sp.* تلتها كل من (56,97,17,44 % *Staphylococcus aureus* في حين شكلت بالنسبة للبكتريا الموجبة لصبغة كرام . واطهر شهر ايلول وتشرين الأول أعلى نسبة للتلوث بالبكتريا السالبة لصبغة كرام وكانت هناك حساسية واضحة للعزلات البكتيرية تجاه مضادات السيفالوثين، السيفوتاكسيم والريفامبين .

الكلمات المفتاحية: -- بكتريا القولون ، المكورات العنقودية ، صالات العمليات ، الادوات الجراحية ، عدوى المستشفيات ، الحساسية للمضادات الحيوية .

Introduction

Surgical site infection is one of the most serious complications in any kind of surgery [1]. Patient associated factors include old age and increased prevalence in coexistence of metabolic diseases which decrease host immunity. The advent of antibiotics made the recalcitrant surgical site infection as an amenable complication. [2]. The most consequential factors for surgical site infection is bacterial contamination which overwhelms the host immunity. Here in, the control of bacterial contamination and appropriate reduction of the soiled bacteria would be the most effective method to prevent a surgical site infection and the use of antibiotics could be minimized, so to retard the advent of resistant strains [3,4]. An epidemiologic study of the routes and sources of contamination should be conducted to determine preventive measures. The presumptive source of contamination is the direct surgical participants, include the surgeon and scrub nurse. In addition, the traffic in the operation theater and the ventilation system can influence contamination. These factors would be related with the surgical time. The quantitative analysis [5,6] . Surgical site infection can be fatal or lead to a poor prognosis, causing critical damage to both patients and surgeons. [7]. Prophylactic use of antibiotics has been accepted as a mainstay to prevent surgical site infection for more than 30 years [8]. Indicated that over use

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of antibiotics increased infection by MRSA and G(-) bacteria. There are patient factors, surgical factors and environmental factors that contribute to the development of surgical site infection. Patient factors, such as older age, and surgical factors, such as the expansion of complexity and magnitude of a surgery, create a higher risk of infections [9]. The largest source of bacterial contamination of surgical pathogens is the bacteria of the patient's own skin, followed by the participants in a surgery [10]. Noted that 38% of post-surgical patient deaths are the direct consequences of surgical site infection. In orthopedic surgeries, the infection rate of total hip arthroplasty was 7%. [11]. The more bacteria contaminate the surgical field. It was already proved by several researchers that longer surgical times lead to higher infection rates [12,13]. The objective from this study to assess of the contamination rate and antibiotics susceptibility of pathogenic bacteria in the operating theaters in Al-Batool teaching hospital.

Materials and Methods

This study was done in the Al-Batool teaching hospital in Diyala province for the period from one July 2015 to one February 2016. 192 swabs were taken from different sites of operating theaters included: -Surgical bed, wall and floors, air outlets, surgical instrument, water tap, door knob, gress, TM fluids. Swabs were taken cultured on different culture media and submitted to a serial of different biochemical tests for the diagnosis of type of bacteria [14,15]. and the cultures were tested for antibiotics sensitive Penicillin G, Oxacillin, Chloramphenicol, Tetracycline, Erythromycin, Cephalothin, Cefatoxime, Rifampin by using Kirby-Bauer disk method to evaluate their activity [16].

Results

In this study taken 192 swabs was taken from different sites of operating theaters, 160 (83.33%) swabs show positive results for bacterial growth as single and mixed isolate, and 32 (16.66%) were negative (no growth). From 160 positive swabs were 202 positive bacterial isolates, 116 (57.42%) gram negative bacteria, which include 66 (56.89%) *Escherichia coli*, 21 (18.1%) *Enterobacter sp.*, 12 (10.34%) *klebsiella sp.*, and 11 (9.48%) for *pseudomonas aeruginosa*, and 1 (0.89%) For each *proteus mirabilis* and *proteus vulgaris*, and 4 (3.44%) for

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Serratia marsecense . while 86(42.57%) of bacterial isolates were gram positive include 49 (56.97 %) *Staphylococcus epidermidis* and 15 (17.44%) *Staphylococcus aureus* and 22(25.58%) *Bacillus sp* .The result shows high percentage of contamination with gram negative bacteria as table-2 38 (32.75 %) and 26(22.41 %) during September and October, while shows high percentage of contamination with gram positive bacteria 24(27.9%)and 17(19.76%) during January and December. showed that Cephalothin, Cefotaxime and Rifampin are more effective against gram negative and positive bacteria.

Table (1): Number gram positive and negative bacteria in operating theaters and the percentage

Gram negative	N.	%	Gram positive	N	%
<i>E.coli</i>	66	56.89	<i>Staphylococcus aureus</i>	15	17.44
<i>Enterobacter SP.</i>	21	18.1	<i>Staphylococcus epidermidis</i>	49	56.97
<i>Klebsilla SP.</i>	12	10.34	<i>Bacillus cereus</i>	6	6.97
<i>Pseudomonas areuginosa</i>	11	9.48	<i>Bacillus subtilis</i>	16	18.6
<i>Proteus mirabilis</i>	1	0.86			
<i>Proteus vulgaris</i>	1	0.86			
<i>Serratia marsecense</i>	4	3.44			
Total	116	57.42		86	42.57

Table (2):- The percentage of distribution gram negative and positive bacteria during the months study

Months	Gram negative bacteria	%	Gram positive bacteria	%	Total
July	11	9.48	4	4.65	15
August	16	13.79	9	10.46	25
September	38	32.75	12	13.95	50
October	26	22.41	11	12.79	37
November	7	6.03	9	10.46	16
December	9	7.75	17	19.76	26
January	9	7.75	24	27.9	33
Total	116		86		202

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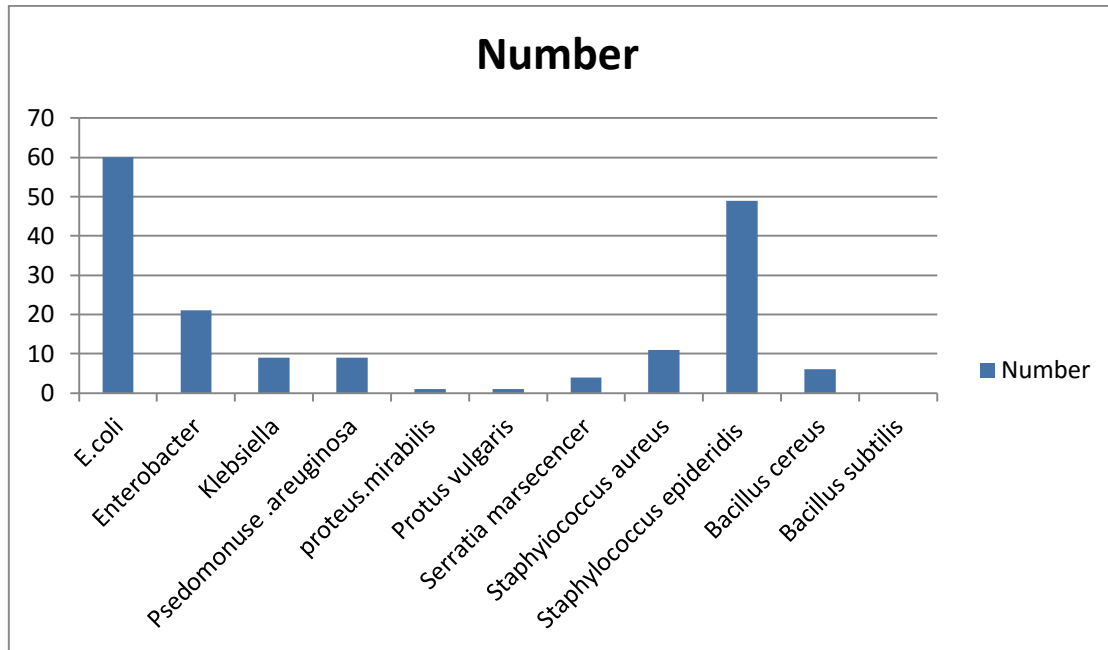


Figure (1):-Distribution and percentage of gram negative and positive bacterial isolate

Table (3):-Antibiotics susceptibility of bacterial isolates to different antibiotics.

Antibiotics	Concentration µg/ml	<i>E . coli</i>	<i>Klebsiella sp.</i>	<i>Enterobacter sp.</i>	<i>Pseudomonase aeruginosa</i>	<i>S. aureus</i>
PenicillinG	10U	R	R	R	R	R
Oxacillin	30	R	R	R	R	R
Chloramphenicol	30	R	R	R	R	R
Tetracyclin	30	R	R	R	R	R
Erythromycin	15	R	R	R	R	R
Cephalothin	30	S	S	S	S	S
Cefatoxime	30	S	S	S	S	S
Rifampin	30	S	S	S	S	S

R=Resistant S=Sensitive

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Discussion

The result of revealed that *Escherichiacoli* , *Enterobacter sp.* ,*Staphylococcus* ,*Klebsiella sp.* and *pseudomonas aeruginosa* were the most important bacterial contamination of operating theaters and causing of nosocomial infection due to their resistance to anti septics and antibiotics (17,18,19,20 ,21,22).In this study the contamination may be due to contamination by nurse and staff clothes , operating coats , or diluted material of sterilization . In most studies done all over the world, most bacteria in the operating theaters and emergency department during all seasons were *Staphylococcus aureus*, which was corcoordinate with in the results of the our study(24). Regarding the gram positive swabs the *staphylococcus epidermidis* was the common cause and the reason may be due to surgeons and nurse staff origin, poor sterilization of the wound area, using expired sterilization material and wrong methods of sterilization. In hospitals/clinic air of Silesian and Hamedan (Iran)hospitals the *Staphylococcus/Micrococcus* group was the dominant contaminate(24,25,26)Furthermore, Micrococcus, Staphylococcus, *B. subtilis*, *Mycobacterium*, *Diphtheroid*, *Streptococcus pyogenes* , *Pseudomonas aeruginosa*, *Nocardia spp* . Although the total number of bio-aerosols detected during summer was more than other seasons in the current study. A study conducted in high-rise apartment buildings in Korea reported more bio-aerosols during summer than winter (27). Due to the fact that the micro organisms' existence in the atmosphere of operating theaters stretches the healing time of wounds and infections.

Conclusion

Contamination of operative theaters was the most dangerous problem .Which was responsible for 90% of opportunistic infections in hospital ,which may be came from another person , from patients flora ,or by contamination instruments in the operating rooms ,the rate of bacterial contamination was high during September ,October ,January.

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