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High risk of bacterial contamination of Doctor's mobile phone working in Baghdad hospitals, study resistance to antibiotics

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Abstract

In this study bacteria isolated from mobile phones of male and female Doctors worked in Baghdad hospitals which include Sheikh Zayed Hospital, Ibn al-Nafis hospital, Al-Yarmouk Hospital, Al-Karama Hospital, Medical City Hospital, and Al-Nu'man Hospital. Seventy samples collected from different specialty and sex. The result of the present study shows the isolation percentage for Male was 54% and for Female was 46%. The number and types of bacteria differ with the sex and specialty. T-test show the existent of significance differences ($p<0.01$) between the number of bacterial colonies and specialty. One hundred isolates were identified, 64 were normal flora of skin which was 22 isolates of *Staphylococcus epidermidis*, formed 22% and 42 isolates of *Bacillus spp*. formed 42% from all isolated. The remaining isolated 36 were pathogenic bacteria, included seven genus *Staphylococcus aureus* 20 (20%), *Pseudomonas aeruginosa* 6 (6%), *Bacillus subtilis* 2, *Streptococcus spp*. 2, *Escherichia coli* 2, *Micrococcus lutes* 2, and *Klebsiella pneumonia* 2 Formed (2%). respectively.

The antimicrobial susceptibility test shows the most isolate were sensitive to (LEV 5, APM 10, T 30, SXT 25) and resistance to (AMC 30, CX 5, CL 30) with some exception. The susceptibility test of *Staphylococcus aureus* to Oxacillin appeared the predominant of (OSSA) which form 75% whereas the percentage of (ORSA) was 25% from all Isolates of *Staphylococcus aureus*.

Keywords: Doctor's mobile phones, Antimicrobials susceptibility test, Baghdad Hospitals

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1. Introduction

Mobile phone has become one of the essential accessories of professional and social life. The use of cell phone often occurs in hospital halls, laboratories, and intensive care units (ICU) when dealing with severe illnesses [1, 2]. A personal mobile phone is a frequently touched device in health care environments, but it is not usually included in routine cleaning schedules. It can be contaminated by resistant nosocomial pathogens and health care workers (HCWs) use it during patient examination [3, 4, 5]. Studies also demonstrate incidences of infectious diseases are greater in those people who use contaminated mobile phones [6, 7].

Although most personal objects are stored in changing rooms, mobile phones often accompany the staff into the operation room, intensive care unit and wards where calls are made or answered while attending patients [8, 9]. Mobile phones are used in the hospital without restriction and the majority of HCWs neither clean their mobile phones regularly nor wash hands after using their mobile phones [10, 11]. Further sharing of mobile phones between HCWs and non HCWs may distinctly facilitate the spread of potentially pathogenic bacteria to the community [12].
Mobile phones are potential threats in infection control practices and could exaggerate the rate of hospital acquired infections. The hygiene risk involved in using mobile phones in the hospital setting and in the community, has not yet been determined in Iraq. Thus, the purpose of this study was to determine the degree of bacterial contamination and resistance against commonly used antimicrobials found on the Doctor's mobile phones at Baghdad Hospitals.

2. Materials and Methods

2.1 Isolation & Identification of Bacteria

2.1.1Collection of samples

Seventy samples were collected from mobile phones of male and female Doctors worked in the flowing hospitals, Sheikh Zayed Hospital, Ibn al-Nafis hospital, Al-Yarmouk Hospital, Al-Karama Hospital, Medical City Hospital, and Al-Nu'man Hospital. From January 2016 to December 2016. The samples were subjected to Gram’s stain and wet mount examination and cultured on Nutrient agar, MacConkey agar, Blood agar and Mannitol salt agar (Oxoid) and incubated at 35°C for 24 h. The discrete colonies were sub-cultured and incubated at the same conditions according to [13].

2.1.2 Identification of isolates

The isolate was identified by standard biochemical tests such as oxidase test, coagulase test, Nitrate test, Citrate test, API E20 kit, API Staph kit and Vitek 2 compact system [14].

2.2 Antimicrobial susceptibility test

Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion technique on Mueller-Hinton agar [15]. Oxacillin resistant *Staphylococcus aureus* (ORSA) was detected using oxacillin (1μg) disc. Zones of inhibition were measured after 24 h incubation at 37 C to the nearest millimeter with a slide gauge **[16].**

2.3 Statistical analysis

T-test was used to compare the means of all bacteria found on mobile phones of male and female Doctors worked in different hospitals of Baghdad city. An ANOVA with Tukey's multiple comparison was used to compare the difference within the sex and specialists. An alpha level of .05 was used for all statistical tests. The statistical analysis was performed using Minitab 16 (Minitab Ltd, Coventry, UK) [17].

3. Results

The result of the present study shows the isolation percentage for Male was 54% and for Female was 46%. The number and types of bacteria differ with the sex and specialty. T-test show the existent of significance differences ($p<0.01$) between the number of bacterial colonies and specialty tables 1 and 2.

Table-1: Number and their percentages of contaminated phones for Male and Femal doctors acording to Specialist.

Specialist Doctor	Male			Femle			Total No. of CM	%
	No.of Mobile	No.of conta. Mobile	%	No.of Mobile	No.of conta. Mobile	%		
General Surgery	5	3	5	5	2	4	5	7
Gastroenterology	5	4	7	5	3	5	7	10
Dermatology	5	5	9	5	3	5	8	11.5
*** (OB/GYN)**	5	5	9	5	5	9	10	14
**** (ENT)**	5	5	9	5	5	9	10	14
Dentistry	5	5	9	5	4	7	9	14
General Medicin	5	4	7	5	4	7	8	11.5
Total	35	31	54	35	26	46	57	100

* **Obstetrics and gynecology**, ** **Ear-Nose-Throat**, conta=contamineted,CM=Contamineted Mobile.

Table-2: Number and their percentages of bacterial colonies isolated from Doctor's Mobile Phones works in Baghdad Hospitals.

Specialist Doctor	Male		Femal		Total	
	No.	%	No.	%	No.	%
General Surgery	146	5	100	4	246	9
Gastroenterology	200	8	155	5	355	13
Dermatology	199	7	150	6	349	13
***(OB/GYN)**	250	9	231	9	481	18
**** (ENT)**	220	9	200	7	420	16
Dentistry	215	8	200	8	415	16
General Medicin	211	8	188	7	399	15
Total	1441	54	1224	46	2665 100	

* **Obstetrics and gynecology**, ** **Ear-Nose-Throat**.

Table (3) shows, the number of isolated bacteria was one hundred isolates were identified, 64 were normal flora of skin which was 22 isolates of Staphylococcus epidermidis, formed 22% and 42 isolates of Bacillus spp. formed 42% from all isolated. The remaining isolated 36 were pathogenic bacteria, included seven genus Staphylococcus aureus 20 (20%), Pseudomonas aeruginosa 6 (6%), Bacillus subtilis 2, Streptococcus spp. 2, Escherichia coli 2, Micrococcus lutes 2, and Klebsiella pneumonia 2 Formed (2%). respectively.

Table-3: Type, number and their percentages of bacteria isolated from Doctor's Mobile Phones works in Baghdad Hospitals.

Isolates	Male		Femal		Total	
	No.	%	No.	%	No.	%
Bacillus subtilis	1	1	1	1	2	2
Bacillus spp	22	22	20	20	42	42
Escherichia coli	1	1	1	1	2	2
Klebsiella pneumonia	1	1	1	1	2	2
Micrococcus luteus	1	1	1	1	2	2
Pseudomonas aeruginosa	3	3	3	3	6	6
Staphylococcus aureus	11	11	9	9	20	20
Staphylococcus epidermidis	13	13	9	9	22	22
Streptococcus spp.	1	1	1	1	2	2
Total	54	54	46	46	100	100

The antimicrobial susceptibility test shows the most isolate were sensitive to (LEV 5, APM 10, T 30, SXT 25) and resistance to (AMC 30, CX 5, CL 30) with some exception table 4.

Table-4: Antibiotic resistance pattern of pathogenic bacteria isolates from Doctor's Mobile Phones works in Baghdad Hospitals.

Isolates	Resistance in percentage Antibiotic (µg/disc)						
	AMC	AMP	CL	CX	LEV	SXT	T
Bacillus subtilis	100	0	50	100	0	0	0
Escherichia coli	100	0	100	100	0	0	50
Klebsiella pneumonia	100	0	50	100	0	0	0
Micrococcus luteus	100	0	50	100	0	0	0
Pseudomonas aeruginosa	100	17	83	100	33	17	100
Streptococcus spp	100	0	100	100	50	0	100

AMC= Amoxicillin/Ciavulanic Acid, AMP= Ampicillin, CL= Cephalexin, CX= Cloxacillin, LEV= Levofloxacin, SXT= Trimethoprim, T= Tetracycline.

The susceptibility test of *Staphylococcus aureus* to Oxacillin appeared the predominant of (OSSA) which form 75% whereas the percentage of (ORSA) was 25% from all Isolates of *Staphylococcus aureus* table 5.

Table-5: Frequency of ORSA and OSSA in *Staphylococcus aureus* isolated from Doctor's Mobile Phones works in Baghdad Hospitals.

Isolates	Oxacillin Antibiotics(1µg/disc)				Total	
	ORSA		**OSSA**			
	No.	%	No.	%	No.	%
Staphylococcus aureus	5	25	15	75	20	100

ORSA= Oxacillin Resistance *Staphylococcus aureus*, **OSSA**= Oxacillin Sensitive *Staphylococcus aureus*.

4. Discussion

The result of the present study shows the isolation percentage for Male was 54% and for Female was 46%. The interpretation of these results to the contamination of

male doctor's mobile phones was more than female doctor's mobile phones, it might be due to the reason that females keep their mobiles in purses and use less frequently during their duties. On the other hand, male doctors keep their mobiles in their pockets and use frequently anywhere, anytime whenever it is needed and thus contaminated and played an important role in transmission of pathogens [18. 19]. The number and types of bacteria differ with the sex and specialty. T-test show the existent of significance differences ($p<0.01$) between the number of bacterial colonies and specialty tables 1 and 2. **These results are agreement with the results of several studies [20, 21. 22].**

The result of the present study shows **the number of isolated bacteria was one hundred isolates were identified, 64 were normal flora of skin which was 22 isolates of Staphylococcus epidermidis, formed 22% and 42 isolates of Bacillus spp. formed 42% from all isolated. The remaining isolated 36 were pathogenic bacteria, included seven genus Staphylococcus aureus 20 (20%), Pseudomonas aeruginosa 6 (6%), Bacillus subtilis 2, Streptococcus spp. 2, Escherichia coli 2, Micrococcus lutes 2, and Klebsiella pneumonia 2 Formed (2%) respectively Table 3. These results are agreement with the results of several studies [23, 24. 25].**

The antimicrobial susceptibility test shows the most isolate were sensitive to (LEV 5, APM 10, T 30, SXT 25) and resistance to (AMC 30, CX 5, CL 30) with some exception table 4. The interpretation of these results to **bad use of antibiotics by patients without referral to the doctor, which increases the natural selection of the emergence of isolates resistant to antibiotics [26, 27].**

The susceptibility test of Staphylococcus aureus to Oxacillin appeared the predominant of (OSSA) which form 75% whereas the percentage of (ORSA) was 25% from all Isolates of Staphylococcus aureus table 5. The interpretation of these results to the less use of oxacillin antibiotic to treatment of Staphylococcus aureus infection in Baghdad hospitals, which reduces the chance of resistant isolates to oxacillin antibiotic. **These results are agreement with the results of several studies [28, 29, 30].**

5. Conclusions

The study found that the mobile phone of doctors is a means of transporting bacteria from the hospital to the environment, especially that the mobile phone is introduced in all the corridors of the hospital, including the lobby of major and minor operations and mobile phone is not subject to routine sterilization, which is subject to the rest of the medical devices used by doctors to treat patients. Hence regular surveillance and development of effective preventive strategies such as regular decontamination of mobile phones with alcohol disinfectant to reduce the burden and use of antimicrobial additive materials are required.

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ارتفاع مخاطر التلوث الجرثومي للهاتف المحمول للأطباء العاملين في مستشفيات بغداد ، دراسة المقاومة للمضادات الحياتية

عصام جاسم الخليفاوي

قسم علوم الحياة / كلية التربية للعلوم الصرفة- ابن الهيثم/ جامعة بغداد، بغداد، العراق

الخلاصة

تم خلال هذه الدراسة عزل االجراثيم الملوثة للهاتف المحمول الخاص بالأطباء والطبيبات العاملين في مستشفيات بغداد والتي شملت مستشفى شيخ زايد، مستشفى ابن النفيس، مستشفى اليرموك، مستشفى الكرامة، مستشفى مدينة الطب، ومستشفى النعمان. تم جمع سبعون عينة من مختلف التخصصات ومن كلا الجنسين.

أظهرت انتائج الدراسة الحالية أن نسبة العزل من الذكور ٥٤% ومن الإناث ٤٦%. أظهرت نتائج اختبار تي وجود فروق معنوية ($P<0.01$) بين عدد المستعمرات المعزولة من الاختصاصات المختلفة.

تم في هذه الدراسة تشخيص ١٠٠ عزلة جرثومية، ٦٤ منها كانت فلورة طبيعية على الجلد وهي ٢٢ عزلة *Staphylococcus epidermidis*شكلت نسبة(٢٢%) و ٤٢ عزلة .*Bacillus spp* شكلت نسبة (٤٢%) من مجموع العزلات الجرثومية. ٣٦ عزلة جرثومية ممرضة تعود إلى سبع أجناس وهي ٢٠ عزلة *Staphylococcus aureus* شكلت نسبة (٢٠%) ٦ عزلات *Pseudomonas aeruginosa* شكلت نسبة (٦%)، عزلتان من الجرثومة *Bacillus subtilis* و عزلتان من جرثومة .*Streptococcus spp* وعزلتان من جرثومة *Escherichia coli* وعزلتان من جرثومة *Micrococcus lutes* وعزلتان من جرثومة *Klebsiella pneumonia* شكلت نسبة (٢%) على التوالي.

بين اختبار الحساسية للمضادات الحيوية أن معظم العزلات حساسة للمضادات الحيوية(Ampicillin، Levofloxacin، Tetracycline و Trimethoprim.) ومقاومة للمضادات الحيوية (Cephalexin ، Amoxicillin/Ciavulanic Acidو Cloxacillin) مع وجود بعض الاستثناء.

اظهر اختبار الحساسية لجراثيم *Staphylococcus aureus* تجاه المضاد الحيوي الأوكزاسيلين Oxacillin سيادة المكورات العنقودية الذهبية الحساسة للأوكزاسيلين (OSSA) حيث بلغت نسبتها ٧٥% في حين بلغت المكورات العنقودية الذهبية المقاومة للأوكزاسيلين (ORSA)٢٥ % من مجموع المكو ا رت العنقودية الذهبية المعزولة.

الكلمات المفتاحية: الهاتف المحمول للأطباء، الفعالية المضادة للجراثيم، مستشفيات بغداد