

Bacterial contamination of mobile phones, study in Babylon hospitals

التلوث البكتيري للهاتف النقال , دراسة في مستشفيات محافظة بابل

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Abstract:

this study was done by collecting (120) samples by using sterile swabs with sterile distal water were passed on the hand set and the buttons of mobile phones in Babylon maternity and children and al-hashemia hospitals in March 2011, the inoculated in nutrient, blood agar and EMB agar. growth was observed in (21) samples corresponding to (17.5%). The most frequent bacteria were Staphylococcus aureus in 10 (47.6%) followed by Staphylococcus epidermidis in 4(19%), Streptococcus pyogenes in 2(9.5%) and Micrococcus spp. and Bacillus subtilius in 1(4.7%) to each one and gram negative bacteria which represented by E.coli in 3(14.2%). the mobile phone consider as pathogenic bacterial agent of disease transmitter. The most effected antimicrobial on all bacterial isolates growth were Novobiocin and Cephalexin with complete resistant of S. aureus to oxacillin.

الخلاصة:

تم جمع 120 مسحة من مستشفى بابل للولادة والاطفال ومستشفى الهاشمية في شهر اذار 2011 وذلك من خلال استخدام مسحات معقمة مغموسة بماء مقطر معقم ثم مررت هذه المسحات على الجزء اليدوي واسفل الموبايل وقد زرعت هذه المسحات على 3 اوساطٍ وسط المرق المغذي ووسط اكار الدم ووسط الايوسين مثلين الازرق. ظهر النمو في 21 عينة اي مايعادل (17.5%). بكتريا العنقودية الذهبية كانت الاكثر انتشارا بنسبة (47.6%) تليها العنقودية البشروية بنسبة (19%) والمسبقيات القححية بنسبة (9.5%) ثم المايكروكوكس والعصيات بنسبة (4.7%) لكل منها واخيرا بكتريا الاشريشيا كولاي بنسبة (14.2%). وجد في هذه الدراسة ان الهاتف الخلوي وسيط ناقل للمسببات المرضية البكتيرية بين العاملين في المستشفيات وكذلك المرضى. وان المضاد الحيوي الاكثر الفاعلية هو النوفوبايوسين و السيفالكسين اضافة لمقاومة مطلقة للعنقودية لمضاد الاوكساسلين .

Introduction:

This study was conducted to determine bacterial contamination of mobile phones used by healthcare workers' (HCWs) and patients in Babylon's hospitals and identify the most effected antimicrobial on isolates growth.

The use of cell phones often occurs in hospitals, by patients, visitors and health care workers, and this is one environment where hospital-associated infection is most prevalent (1). Nosocomial infections caused by multi-drugresistant gram-positive organisms such as Staphylococcus aureus and enterococcal species are a growing problem in many health care institutions (2). So the use of mobile phones by medical personnel may serve as potential vehicles for the spread of nosocomial pathogens and the associated nosocomial transmission of pathogens (3). Thus, in this study, we investigated bacterial contamination of the mobile phones of the healthcare workers and patients employed in Babylon's hospitals.

Materials and methods:

Samples:

Collection of samples:

120 swabs sample were collected from healthcare workers' and patients in two hospitals in Babylon province (Babylon maternity and children and al-hashemia hospitals) in March 2011.

Methods:

A sterile swab moistened with sterile distal water was rotated over the handset and the buttons of phone.

• Diagnostic of samples:

These swabs were immediately streaked on two plates that consist of nutrient agar, blood agar supplemented with 5% sheep blood and Eosin Methylene Blue (EMB) agar. Plates were incubated aerobically at 37°C for 24 h. Plates were observed for growth and colonial morphology of the isolates. The isolates were Gram stained, and were further tested for the presence of catalase enzymes. Gram-positive catalase-positive cocci were tested for Mannitol utilization while Gram-negative rods were cultured on EMB agar.

Biochemical tests:

To diagnose gram positive bacteria:

- Catalase test: this test was done by transferring a small quantity of the bacterial colony from 24hrs. culture medium into a clean slide and adding one drop of (3% H₂O₂). The result was positive when the gas bubbles appear (4).
- Growth on Mannitol salt agar: this medium was streaked by tested bacteria and incubated at 37°C for 24hrs. if the medium color change in to yellow color the test is positive and the tested organisms is *S.aureus* (5).

To confirm gram negative rods bacteria by: Indole, Methyl Red, Voges Proskauer, Citrate, Urease tests and growth on Triple Sugar Iron agar were done.

- Antibiotics susceptibility test (Disc diffusion method):

This was performed on Mueller Hinton agar with the following antibiotics discs (table1) according to Kirby- Bauer disc diffusion method (6). Sensitivity was read after incubation for 24 hrs. at 35°C. oxacillin antibiotic was tested for *S. aureus* only. isolates were regarded as sensitive or resistant according to CLSI criteria (7).

Table1: Antibiotics disc with standard zone diameter (CLSI, 2011)

Antibiotics disc	Symbol	Potency	Zone diameter nearest whole mm	
			S	R
Novobiocin	NV	30 µg	>22	<17
Cephalexin	CL	30 µg	>18	<14
Gentamicin	CN	30 µg	>15	<12
Tetracycline	TE	30 µg	>19	<14
Oxacillin	OX	1µg	>13	<10

Statistical analysis:

Statistical analysis done by T test with mean, Std. deviation and Std. error mean to bacterial isolates only

Results and discussion:

The HCWs aged from 19- 50 with the mean age of 30. About 66% of them were women. A total of 120 samples, 21 (17.5%) samples were positive and 99 (82.5%) samples were negative that's may be due to that is non bacterial cause contamination or that may be due to use regular disinfection in hospital. This result agree with Nigerian study which revealed that rate of bacterial contamination in mobile phone of individuals working in a hospital environment in (15.3%) were lowest than other environment like among marketers and food vendors in (92.3%) (1). Isolated bacteria were showed at table (2).

Table (2) bacterial isolated from mobile phones:

Bacterial isolates	No. (%)
Staphylococcus aureus	10(47.6)
Staphylococcus epidermidis	4(19)
Streptococcus pyogenes	2(9.5)
Micrococcus spp.	1(4.7)
Bacillus subtilis	1(4.7)
E.coli	3(14.2)
Total	21(100)

This study revealed that Staphylococcus aureus was the highest among bacterial isolates in (47.6%) that is agree with Nigerian study which found that Staphylococcus aureus was the highest among bacterial isolates from health workers in (36.8%) (1). Also in Indian study found this bacteria was defined as significant isolates (8). Staphylococcus aureus commonly associated with nosocomial infections (9). While Staphylococcus epidermidis in (19%) and Micrococcus spp. in (4.7%)

Brady et al. had shown that the combination of constant handling and heat generated by the phones creates a prime breeding ground for microorganisms that are normally found in our skin. This may be because these types of bacteria increase in optimum temperature and phones are perfect for breeding these germs as they are kept warm and easy to handle in pockets, handbags and brief-cases (10).

Micrococcus spp. was found as normal inhabitants of human skin and mucous membranes and was usually regarded as contaminants in clinical isolates (11).

Streptococcus pyogenes found in (9.5%). Other studies that findings indicate that Staphylococcus aureus and Streptococcus species are the main bacterial isolates frequently associated with personal and public mobile phones (12). These organisms may probably have their entry to the phone through the skin and hand to hand mechanism. This is because the isolated bacteria are subset of the normal microbiota of the skin as advanced by earlier researchers (13).

E.coli found in (14.2%). E.coli and Staphylococcus aureus it is a well-established fact that these bacteria are agents of nosocomial infections. Rusin et al. had documented both gram-positive and gram-negative bacteria in the hand-to-mouth transfer during casual activities (14). T test reveal significant difference among bacterial isolates from mobile phone at (P 0.05). The present findings imply that mobile phones may serve as vehicles of transmission of diseases such as diarrhea, pneumonia, boils, and abscesses.

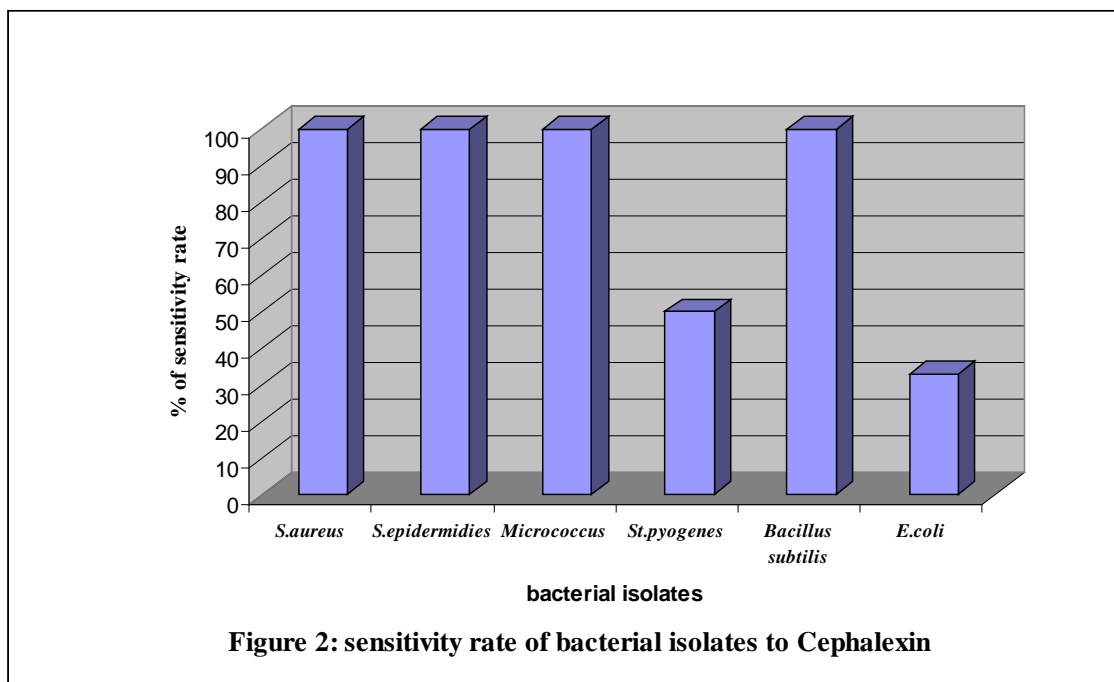
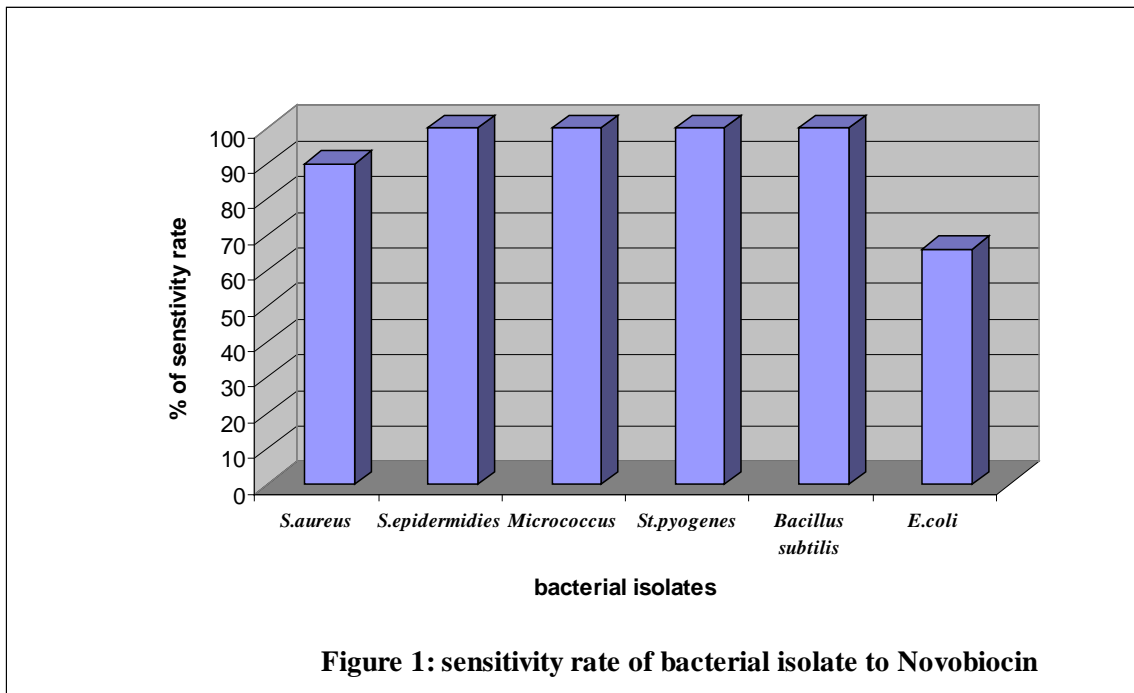
Mobile phones were found to carry these bacteria because count of these bacteria increases in high temperature and our phones are ideal breeding sites for these microbes as they are kept warm

in our pockets and handbags. Hence, in a country like ours, mobile phones of HCWs play an important role in transmission of infection to patients, which can increase the burden of health care.

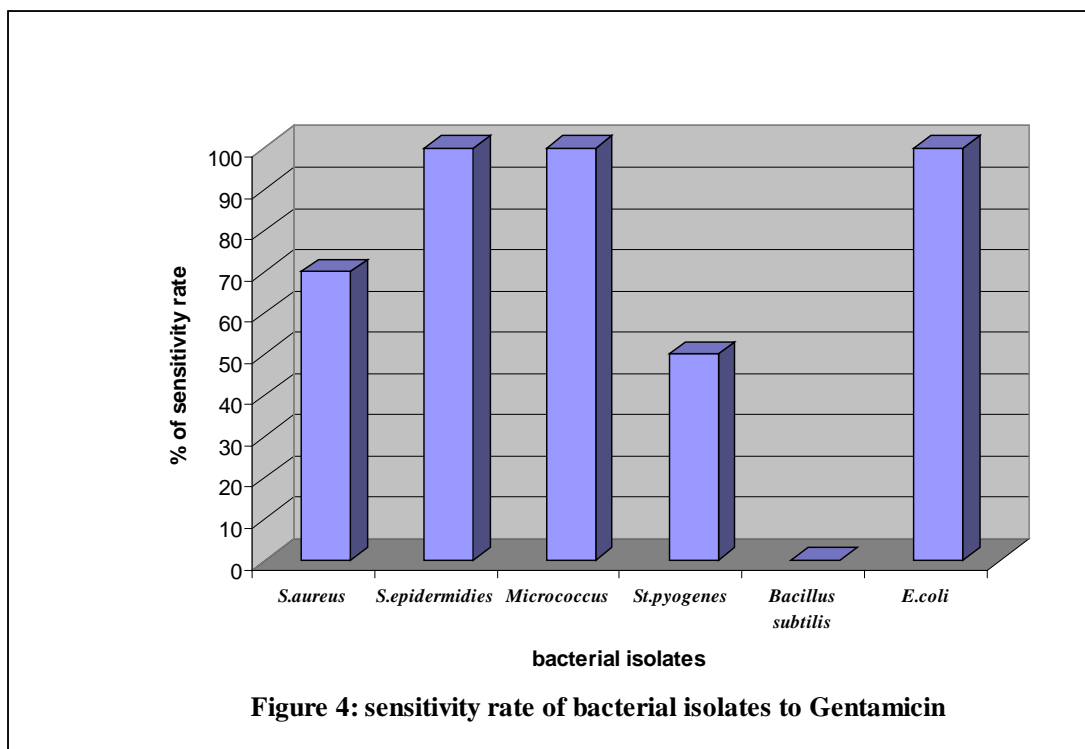
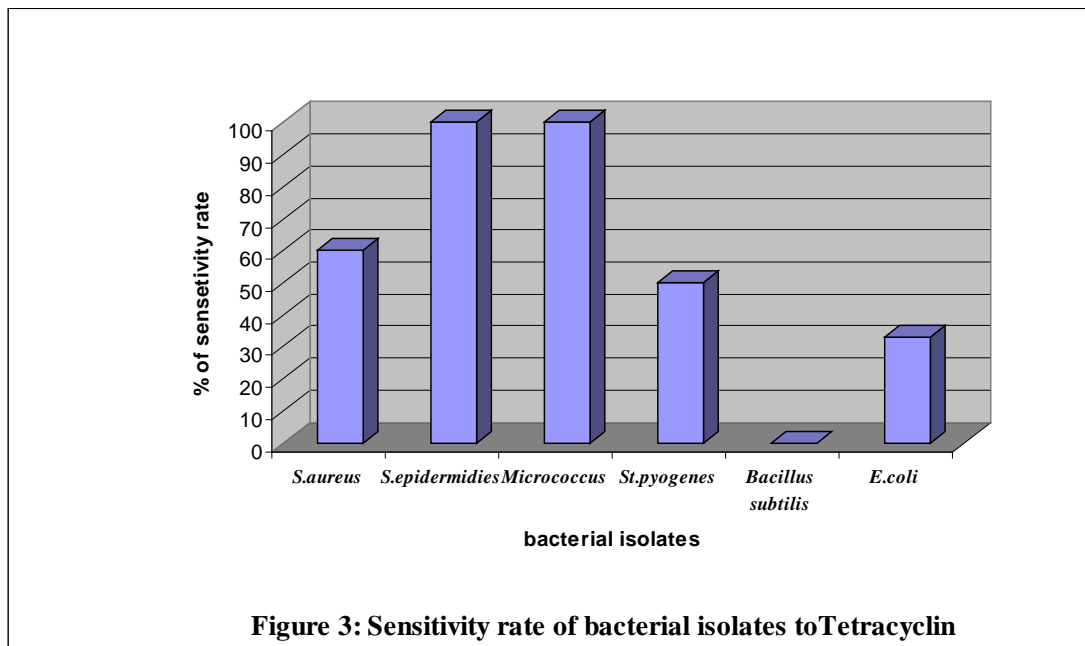
Antibiotics sensitivity test:

Antimicrobial sensitivity testing revealed that Novobiocin and Cephalexin were more effective on bacterial isolates than other antibiotics as shown in figures (1 and 2).

Other Nigeria study had shown that third-generation cephalosporin is effective against a wide range of bacteria (15) than other antibiotics.



While sensitivity rate of bacterial isolates to Tetracycline and Gentamicin was as shown in figures (3 and 4).



On the other hand *S. aureus* revealed complete resistant rate to oxacillin that mean all *S. aureus* isolates were Methicillin resistance (MRSA). In Indian study found that MRSA is one of the most frequently isolated bacteria from mobile phone in hospital infections and is a cause for concern (16).

Conclusion:

The present study concurs with their findings; thus contaminated, close-contact objects could serve as reservoirs of bacterial agents which could be easily transmitted from the mobile phones to the hands, and then from the hands to other areas of the body such as mouth, nose and ears. Also it consider pathogenic agent of disease transmission and if care is not taken it could be vehicle for the transmission of biological weapon of mass destruction among hospitals staff and patients. The most effected antimicrobial on isolates growth were Novobiocin and Cephalexin follow by Tetracycline and Gentamicin.

Recommendation:

- Decontamination of mobile phones with alcohol containing disinfectant might reduce transmission of infection.
- Hand washing and good hygienic practice among the users of mobile phones is advocated, to prevent the possibility of phones as vehicles of transmission of both hospital and community-acquired bacterial diseases.
- Further investigations are needed to substantiate the role of mobile phones in the transmission of nosocomial infection to outside hospital.

Statistical analysis:

T-test

	N	Mean	Std. deviation	Std. error mean
VAR00001	7	6.0000	7.30297	2.76026

One sample test

	Test value=0					
	T	df	Sig.(2tailed)	Mean difference	95%confidence interval of the difference	
					lower	Upper
VAR00001	2.174	6	0.073	6.00000	0.7541	12.7541

VARIABLES= VAR00001

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