



CAN MOBILE PHONES ACT AS VEHICLES TRANSMITTING NOSOCOMIAL INFECTIONS?

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ABSTRACT

Mobile phones are increasingly used by healthcare personnel for communication. They can harbour various potential pathogens and become an exogenous source of nosocomial infections. Aims and objectives : To study the bacteriological profile of the surfaces of mobile phones of healthcare personnel of various departments in a tertiary healthcare hospital and to compare it with the control group. Materials and Methods: A total of 100 samples from the cell phones belonging to health care personnel and 40 control samples from non health care workers were collected. Sterile swabs moistened with nutrient broth were rotated over the surfaces of mobile phones. The swabs were cultured by the routine methodology and the plates were incubated at 37°C for 24 hours. The bacterial colonies were identified and biochemical tests and antimicrobial susceptibility tests were carried out for pathogenic bacterial isolates. Results: The results showed high prevalence of pathogenic bacterial contamination of mobile phones of healthcare personnel. Coagulase negative *Staphylococcus* (CONS) followed by *Staphylococcus aureus*, *E. coli*, *Klebsiella spp.*, *Pseudomonas sp.*, and *Acinetobacter spp.* were the most prevalent bacterial agents isolated from these mobile phones. No pathogen was isolated from the control samples. Conclusion: Mobile phones may serve as vehicles of transmission of both hospital and community-acquired bacterial diseases. Strict adherence to infection control practices, such as hand washing, and other precautions must be advocated to avoid this.

KEY WORDS: Mobile phones, nosocomial infections, pathogenic bacteria



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INTRODUCTION

Cellular phones have made quite an impact on this country, but it is far from over. People enjoy the convenience and security of having a cell phone. The greatest technological advancement of this era is the mobile phone - the world at the touch of a finger. A mobile phone can solve many issues and hold most of information around the world. So, health care workers also use mobile phones in a hospital for immediate communication during emergencies, in rounds, and even in operation theatres and intensive care units¹. Global burden of healthcare associated infections (HAI) are on the rise, and contributes significantly to morbidity and

mortality of patients. The majority of HAI are inadvertently transmitted through hands of healthcare workers (HCWs)². Inanimate objects in the hospital environment are known to be contaminated with microorganisms. Mobile phones have become an extension of office practice for physicians, and may serve as a perfect substrate for microorganisms. As only very few reports about the role of mobile phones in spread of nosocomial infections are available, this study was done to assess the bacteriological profile of the mobile phones and estimate its importance in infection transmission.

MATERIALS AND METHODS

In the current study a total of 100 samples were taken from mobile phones of healthcare personnel of various categories from different departments such as orthopedics, general medicine, pediatrics, ENT, ophthalmology and general surgery in a tertiary care hospital and 40 control samples were taken from the public during the period from January 2011 to October 2011. The samples collected from the healthcare workers were categorized into doctors, nurses and technicians. The 40 control samples were taken from people who did not work in health care set up like Bank employee, students of Arts College and rickshaw drivers. A questionnaire which contained data regarding usage of phones was also filled during sample

collection. Sterile cotton swabs moistened with Nutrient broth were used for sample collection. The samples were collected by rubbing the moistened swab all over the outer surfaces of the mobile phones which were used for at least one month. They were inoculated into the culture media such as blood agar, nutrient agar and Mac Conkey agar and incubated aerobically at 37 °C for 12-18 hours. Then identification of bacteria was done by standard microbiological methods³. The pathogenic isolates were further subjected to antibiotic sensitivity testing by Kirby-Bauer disc diffusion method on Mueller-Hinton agar according to Clinical Laboratory Standards Institute antibiotic disc susceptibility testing guidelines⁴.

RESULTS

The 100 samples collected from the mobile phones of health care personnel yielded 272 bacterial isolates, out of which, 127 isolates were pathogens and the remaining 145 isolates were skin commensals (Table 1). The pathogenic bacteria isolated comprised mainly of *S. aureus* (48, 17.7%) followed by *E. coli* (27,

9.9%), *Pseudomonas species* (20, 7.4%), *Acinetobacter species* (17, 6.3%) and *Klebsiella species* (15, 5.7%). On the other hand, the 40 control samples yielded 47 bacterial isolates all of which were only skin contaminants. No bacterial pathogen was isolated from the mobile phones of non health care workers.

Table 1
Bacterial agents isolated from mobile phones

Categories of people	No. of samples	No. of bacterial agents isolated				Bacterial agents isolated							
		Commen sal Pathogens	Total	Diphtheroids	CoNS	Bacillus sp.	S.aureus	E.coli	Klebsiella sp	Pseudomonas	Acinetobacter sp.		
Health care personnel	100	145	125	272	56 20.6%	65 23.8%	26 9.6%	47 17.3%	26 9.6%	15 5.7%	20 7.4%	17 6.3%	
Non health care workers	40	47	0	47	5 10.7%	22 46.8%	20 42.5%	0	0	0	0	0	

From this study it was observed that 34% of the samples from the mobile phones of healthcare personnel yielded more than 1 pathogenic bacteria (Table 2).

Table 2
Different combinations of organisms on the surface of mobile phones

	Organism	No. of isolates	% of isolates
One pathogen+ commensals	<i>Staphylococcus aureus</i>	18	21.4
	<i>Escherichia coli</i>	9	10.7
	<i>Klebsiella species</i>	6	7.1
	<i>Pseudomonas species</i>	8	9.5
	<i>Acinetobacter species</i>	9	10.7
Two pathogens+ commensals	<i>Staphylococcus aureus</i> + <i>Escherichia coli</i>	6	7.1
	<i>Staphylococcus aureus</i> + <i>Klebsiella species</i>	8	9.5
	<i>Staphylococcus aureus</i> + <i>Pseudomonas species</i>	5	5.9
Three pathogens+ commensals	<i>Staphylococcus aureus</i> + <i>Escherichia coli</i> + <i>Pseudomonas species</i>	4	4.7
	<i>Staphylococcus aureus</i> + <i>Escherichia coli</i> + <i>Acinetobacter species</i>	2	2.4
	<i>Staphylococcus aureus</i> + <i>Klebsiella species</i> + <i>Acinetobacter species</i>	1	1.2

Antimicrobial susceptibility tests revealed that almost all the strains were sensitive to cefipime and piperacillin-tazobactam. Drug resistance was commonly seen among the aminoglycosides, first and second generation cephalosporins (Figure 1). Among the *Staphylococcus aureus* strains (47) isolated it was found that all the Methicillin resistant *Staphylococcus aureus* (MRSA) (17, 36 %) were quinolone resistant strongly suggesting that they could be sources of HAIs (Figure 2).

Figure 1

Comparison of resistance pattern of various Gram negative bacilli isolated in the study

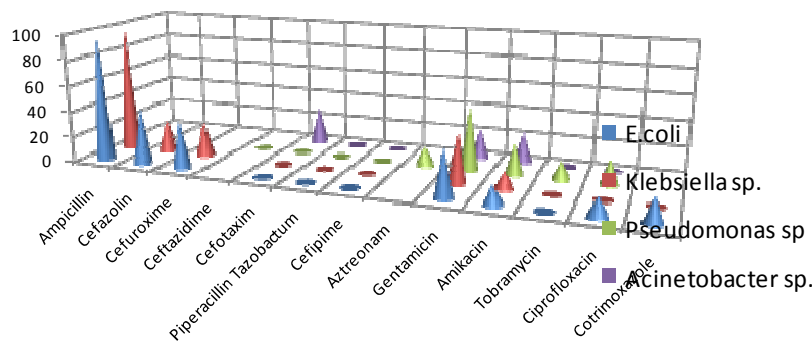
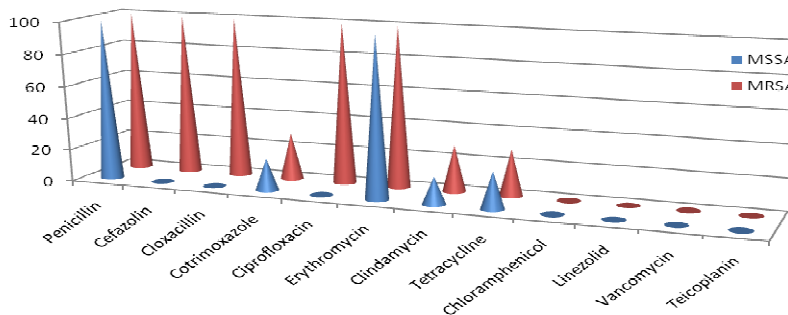


Figure 2

Comparison of resistance pattern of MSSA & MRSA isolated



DISCUSSION

As already mentioned, mobile phones of health care workers showed 100% contamination with pathogenic bacteria. Isolation of bacterial agents from electronic devices such as handheld computers and personal digital assistants has shown these devices to be possible modes of transmission of nosocomial pathogens⁵. In a study conducted in Queen Elizabeth hospital in Barbados, West Indies, over 40% of mobile phones of 266 medical staff and students were culture positive for pathogenic bacteria⁶. Ulger et al (2009)⁷ reported that 94.5% of 200 health care workers and their mobile phones were contaminated with various microorganisms, including nosocomial pathogens, in a study conducted in New York and Israel. The present study

concur 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. Coagulase negative *Staphylococcus* (CoNS) was the most prevalent bacterial agent isolated from 65 (23.8%) mobile phones in this study. This result corroborates the findings of Karabay et al (2007)⁸, in which it was 68.4%. Brady et al (2006)⁹ 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. In this study, the pathogens isolated include *S. aureus*,

Pseudomonas species, *Klebsiella species*, *E. coli*, and *Acinetobacter species*. It is a well-established fact that these bacteria are agents of nosocomial infections. Rusin et al (2002)¹⁰ had documented both gram-positive and gram-negative bacteria in the hand-to-mouth transfer during casual activities. The present findings imply that mobile phones may serve as vehicles of transmission of diseases such as diarrhoea, pneumonia, boils, and abscesses.

CONCLUSION

According to these results it is obvious that, the training of healthcare personnel about strict infection control procedure, hand hygiene, environmental disinfection, and eventually, optimum disinfection methods for mobile phones are of great importance. Active

Also, *P. aeruginosa* has been reported in the United States by the Centre for Disease Control and Prevention to be the most isolated nosocomial pathogen accounting for 10.1% of all hospital-acquired infections, and has been implicated in gastrointestinal infection, primarily in immunocompromised individuals¹¹. MRSA is another very important nosocomial pathogen and in this study 17 (6%) isolates were MRSA which is a cause of concern¹².

preventive strategies like routine decontamination of mobile phones with alcohol containing disinfectant materials should be developed. Another way of reducing bacterial contaminations on mobile phones might be the use of antimicrobial additive materials.

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