UNIT OF AXIS JOURNALS

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Mobile phone surveillance and relationship between quantitative cultures and type of mobile device: A pilot study

Das D,[1] Khera R,[2] Sumit R[3]

Assistant Professor,[1,3] 9th Semester M.B.B.S Student[2]

[1]IQ City Medical College & Narayana Multispeciality Hospital, Durgaur. India

[2,3]University College of Medical Sciences and Guru Teg Bahadur Hospital, New Delhi

ORIGINAL RESEARCH

ABSTRACT

Aim

In this study an attempt was made to compare the mobile phone microbiota from health care workers among various departments and individuals from community not exposed to health care and correlate the quantum of bacterial load with the type of mobile phone.

Background

Inanimate object like mobile phones in the hospital environment are contaminated and are known to be considered as sources of Hospital Care Associated Infection (HCAI). It is also important to know the bacterial load on mobile phones and knowledge regarding mobile phone as source of nosocomial infection among health care workers (HCW) compared to people from community.

Material Methods

Study population and size included 100 healthcare workers from various departments of a tertiary care hospital and 50 individuals from a middle class community of East Delhi. Self structured questionnaire were distributed among the study population and quantitative culture from mobile phones were done.

Results

Total thirty six of 100 mobile hand sets of health care workers (HCW) were colonized of which 6 were polymicrobial colonisation with average bacterial load of 2709. In the community based survey, 19 (38%) of the mobile handsets were colonized having average bacterial load of 2490 CFU per handset.

Conclusion

Mobile phones used by HCWs in daily practice may be a source of nosocomial infections in hospitals. There is a threat of spreading infection by mobile phone if not disinfected properly. This is similar to the importance of hand hygiene in preventing spread of infection. If use of mobile phones is imperative, then strict mobile friendly disinfection policies need to be formulated and implemented.

Key Words

Hospital Care Associated Infection (HCAI), Colonisation, Polymicrobial

INTRODUCTION

Global burden of healthcare associated infections (HAI) is on the rise, and contributes significantly to morbidity and mortality of patients.[1] Mobile phones have become an integral and indispensable part of daily life of everyone. Multiple variations of mobile devices have been launched in the recent past and are being used in routine practice by Health Care Workers (HCW) in their respective institution widely.

If not cleaned properly mobile phones can serve as reservoir of bacteria and may act as source of nosocomial infection. They have been implicated as important sources of infection in health care settings. As mobile phones act as perfect habitat for microbes to breed, especially in high temperature and humid conditions, HCWs' mobile phones may serve as reservoirs of microorganisms that could be easily transmitted from the mobile phones to the HCWs' hands and therefore

facilitate the transmission of bacterial isolates from one patient to another in different hospital wards including critical areas like ICUs, OTs.[2]

Aims and objectives of this study were to know the quantitative load of bacteria on mobile phones used by HCWs and individuals from community and also to know awareness of presence of microbes on mobile phones and their role as nosocomial pathogens.

MATERIAL AND METHOD
This was a cross sectional pilot study. Mobile phones of 100 HCWs from a tertiary care centre of East Delhi and 50 healhty individuals from the community were investigated for the quantum of bacterial load and correlated with type of mobile phone (classical type, touch screen, slider, folding, QWERTY). The HCWs included 50 resident doctors, 10 interns, 38 nursing staff and 2 nursing orderlies.

Individuals from the community exposed to healthcare set up in the past three months and new mobile handsets ($\leq$ 15 days) were not evaluated. Separate self structured questionnaire based on survey was done of users of these mobile phones.

Partially wet sterile swabs were used to swab the complete surface of mobile device and transported immediately. Swabs were inserted in 3 ml peptone water and vortexed so as to remove the entire bacterial load in the peptone water. Immediately 10µLof this suspension was inoculated aerobically at 37º C for 24 hours on sheep blood agar and MacConkey's agar. Bacterial load was calculated by multiplying 300 to number of colonies and recorded as colony forming units (CFU) per handset.

Data analysed using SPSS 16. Assuming classical phone as reference category multivariate logistic regression for association of microbiota present on phone with type of phone was analysed adjusting for job type and department of healthcare workers.

RESULT
36 mobile handsets of HCWs were colonized of which 6 were polymicrobial colonisation. Only Gram positive isolates including *Staphylococcus aureus* and Coagulase negative Staphylococcus (CONS) were isolated.

Among 54 classical phones, 20(37%) were colonized with an average bacterial load of 3786 CFU per handset. Of 22 touch screen and 15 QWERTY mobile sets 9(41%) and 5(33%) were colonized with average bacterial loads of 2190 and 3660 CFU per handset respectively. For slider phones average bacterial load was 1200 CFU.Table-1
Of the total 36 colonised mobile phones, 19 isolates were *Methicillin resistant Staphylococci* (MRSA and MRCONS).

Analysis of questionnaire showed that, among HCW 81% were aware about role of cell phone as reservoir of microbes and 51% felt the need to disinfect their mobile phones on regular basis. 15 out of 36 HCW predicted before culture that there mobile harbor nosocomial pathogens.

14 out of 22 HCW who were using touch screen mobile phone felt that application of disinfectant will spoil their phone.

76% of health care workers considered hands to be the most common sources of nosocomial infections as compared to mobile phones (12%), BP instruments (8%) and Stethoscope (4%).

65% health care workers used their phone while eating food. 39% health care workers had forbidden patients to use their cell phones in wards while 27% HCW in OPD. The reasons they mentioned were disturbance (27%) and increased infection chances (22%). Remaining did not respond.

54 of 89 HCW carried their phones while eating food and 43 of 89 HCW did not wash their hands between the procedures after using their phones.

In the community based survey, 19 (38%) of the 50 mobile handsets were colonized having an average bacterial load of 2490 CFU per handset. Except for a single *E.coli* isolate remaining 18 isolates, were CONS among which 11 were MRCONS.

Questionnaire based analysis showed 32 of 50 (64%) people from the community were aware of cell phones as a reservoir of microbes. Only 30% wanted to disinfect their phone daily. 38% people felt that application of disinfectant will spoil their phone. 84% of people from community use their phone while eating food. (Table 1)

In our study we observed that colonisation was highest among classical handsets followed by QWERTY handsets. The touch screen mobile had lowest number of bacterial load. Average bacterial colonization was higher in HCW. (Table 2)

DISCUSSION
Although few reports have documented the contamination of mobile phones so far no study has reported the bacterial load on mobile phones.[3,4,5] This study also ascertained contamination of mobile phones with microorganisms among general public external to the hospital environment.

Whereas strict attention is paid to changing clothes, removing jewellery, covering hair, undertaking hand hygiene measures, storing personal objects in changing rooms to reduce the transfer of microorganisms from the external clinical environment into the operating

environment, most expensive mobile phones often accompany staff into the operating environment as currently no local policy restricting the use of mobile phones in clinically sensitive areas is in place.[3] So it is important to know the bacterial load on mobile phone used by HCW within hospital including critical areas like ICUs, OTs .

In our study we observed 36% of mobile phones used by the HCW were contaminated by bacteria. But Brady et al showed that 89.7% mobile phones were contaminated by bacteria.[3]

Ulger et al. also stated high percentage (94.5%) of phones showed evidence of bacterial contamination and the isolated microorganisms were similar to hand isolates. [4] Similarly Elkholy and Ewees stated that the rate of mobile phone contamination was 96.5%.[5] Tambekar et al. stated that 95% of mobile phone showed bacterial contamination and among *S. aureus* isolates 83% were methicillin resistant.[6]

In concordance with our study lower rates were observed by Ramesh et al.[7] who stated that 45% of mobile phones which were swabbed grew micro-organisms.[7] Similarly, Ali et al.[8] found that 43.6% of HCWs carried infective microorganisms on their cell phones and they recommended that cell phones should be cleaned regularly.[8]

Table 3: Comparison of various studies about percentage of mobile phone colonisation among health care workers

Our study	Studies with high percentage of bacterial colonisation of mobile phone (Contrast to our study)	Studies with low percentage of bacterial colonisation of mobile phone (Similar to our study)
36% of mobile phones among HCW were colonised with bacteria	Padma Srikanth et al 2009 (94%)	Ali et al 2010(43.6%)
	Fatma Ulger et al 2009(94.5%)	Ramesh et al 2008(45%)
	Elkholy and Ewees et al 2010(96.5%)	
	Tambekar et al 2008(95%)	

Padma Srikanth et al[9] documented among 79 bacterial isolates from corporate personnel, 43(54%) were pathogen. Polymicrobial growth was detected in 28 (78%) mobile phone of office users.

In our study in the community based survey, 19 (38%) of the 50 mobile handsets were colonized having an average bacterial load of 2490 CFU per handset. Except for a single *E.coli* isolate remaining 18 isolates were CONS among which 11 were MRCONS. Polymicrobial colonization was not documented in our study from community based survey as compared to study by Padma Srikanth et al.[9]

In the study by Padma Srikanth et al.[9] analysis of the questionnaire showed that 38 (75%) HCWs and 11 (37%) of

corporate users were aware that mobile phones harbour microorganisms and transmit infectious agents. In our study HCW (81%) were aware about role of cell phone as reservoir of microbes and 51% felt the need to disinfect their mobile phones on regular basis. In our study questionnaire based analysis showed 32 of 50 (64%) people from the community were aware of cell phones as a reservoir of microbes. Only 30% wanted to disinfect their phone daily. 38% people feel that application of disinfectant will spoil their phone.

Few studies have documented high rate of pathogenic bacteria including isolation of Gram negative bacteria.[9,10] But in our study isolation of commensal flora was more and we isolated only 1 *E. coli* that to from the community based study.
In our study of the total 36 colonised mobile phones among HCW, 19 were *Methicillin resistant Staphylococci* (MRSA and MRCONS).
There was no significant difference in colonization percentage among the HCW and community individuals. (p value >0.05)

CONCLUSION

Although in our study there was no significant difference in colonization percentage among HCW (36%) and community individuals (38%), but average bacterial load on mobile phone was found to be high. In high temperature and humid conditions mobile phones can serve as reservoirs of microorganisms that could be transmitted to HCWs' hands or vice versa and may act as source of nosocomial infection.

Now a day's most of the hospitals in developing country like India give emphasis in good hand hygiene practice but no policies are available regarding use and disinfection of mobile phones.

Strict guidelines need to be implemented on restricted /no use of mobile phones in hospital particularly critical areas like ICUs and OTs. If their use is imperative, then strict mobile friendly disinfection policies need to be formulated and implemented.

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CORRESPONDENCE ADDRESS

Dr. Dip Mala Das
Assistant Professor
Department of Microbiology
IQ City Medical College & Narayana Multispeciality Hospital, Durgaur. India
Email: dipmala_das@yahoo.com

Please cite this paper as: Das D, Khera R, Sumit R. Mobile phone surveillance and relationship between quantitative cultures and type of mobile device: A pilot study. Inter J Medical Sci Res Prac 2014; 1 (3): 71-74.

ACKNOWLEDGEMENTS

PEER REVIEW

Double Blinded externally peer reviewed.

CONFLICTS OF INTEREST

Nil

FUNDING

Table 1: Comparison of CFU/phone and % of colonization of different types of mobile phones

Type of mobile phone	CLASSICAL		TOUCH		SLIDER		FOLDING		QWERTY	
Study population	CFU/phone	% colonisation	CFU/phone	% colonisation	CFU/phone	%	CFU/phone	% colonisation	CFU/phone	% colonisation
HCW	3786	37%	2190	41 %	1200	25 %	-	-	3660	33 %
	n=54		n=22		n=8		n=0		n=16	
Community	3900	36.3%	4050	28%	-	-	-	-	2250	71.4%
	n=33		n=7		n=3		n=0		n=7	

Table 2: Multivariate logistic regression for association of microbiota present on phone with type of phone (adjusting for job type and department of healthcare workers)

Microbial presence	Type of phone* OR (95%C.I.)	
Touch	Sliding/Folding	QWERTY
1.489(0.48-4.62)	0.243 (0.03-2.13)	1.342 (0.39-0.54)