

MOBILE PHONES OF HEALTH CARE PROFESSIONALS: A POTENTIAL THREAT TO INFECTION CONTROL IN A TERTIARY CARE HOSPITAL

Karthik Manikandan, Jeya M, Sasikala S

Dept. of Microbiology, Rajah Muthiah Medical College, Annamalai University, Annamalai Nagar, Chidambaram, Tamilnadu, India.

ABSTRACT

Back Ground: Nosocomial infections are a major problem in both developed and developing countries. Among various reasons for the increase in the rate of nosocomial infections, the role of mobile phones used by Health Care Professionals (HCPs), is analyzed in this study. **Aims and Objectives:** To screen the surfaces of mobile phones of HCPs for pathogenic and nonpathogenic bacteria and to compare it with the control group. To study the significance of mobile phones of HCPs acting as vehicles for transmitting nosocomial infections. **Materials and Methods:** 200 HCPs (Doctors, nurses, medical students, and technicians) 50 other than HCPs mobile phone surfaces are swabbed with sterile swabs soaked in sterile saline and inoculated onto Blood agar and Mac Conkey agar and incubated for 48 hours. The organisms are identified by the colony morphology and characteristic biochemical reactions. Control group (50) comprised of general public and arts and science students. A questionnaire related to their habit of using the cell phones was also filled up by both the test group and the control group. **Results:** The pathogenic bacteria isolated from study group are *Staphylococcus aureus*, which is predominant, followed by *E. coli*, *Klebsiella*, *Pseudomonas aeruginosa* and *Proteus mirabilis*. The non- pathogenic bacteria isolated are *Micrococci*, *Coagulase Negative Staphylococci*, *Diphtheroids*, *Neisseria catarrhalis*, *Aerobic spore bearers*, and *Candida albicans*. The prevalence of Pathogenic bacteria and Non Pathogenic bacteria are higher in HCPs samples when compared with the control group.

KEY WORDS: Nosocomial infections, Mobile phones, Health care professionals.

INTRODUCTION

Nosocomial infections, despite of all the progress in the hygienic level and medical development, is a major problem in both developed and developing countries. It is estimated that about 5-10% of patients in hospitals suffer from nosocomial infections [1]. Now this figure rises still higher due to various reasons in which the mobile phones of the health care professionals play a major role [2].

Mobile phones have become an inevitable part of our life. Today mobile phones are being used increasingly by the health care professionals in all places including the sterile areas like Intensive Care Units (ICU) and Operation Theatres (OT) [3]. The mobile phones of health care professionals may get contaminated, when he or she examines the patients, dresses the wounds and processes the samples and then directly uses the mobile phones without washing the hands or with gloved

hands [4]. During every usage of phones, it comes in contact with the contaminated parts of the body like hands, nose, ear and mouth. Mobile phones act as a perfect habitat for microbes to breed, especially in high temperatures and humid conditions [5]. If the doctor uses a contaminated mobile phone and then examines other patients, the infection is transferred to the new patient. Also when the Health care workers share their phones with the non-health care workers then the infection is transferred to the community thus posing a major potential threat.

The risk of infection involved in using mobile phones in the ICUs and OTs has not yet been determined as there are no cleaning guidelines available that meet the hospital standards [4]. Hence there is need of defining their role in spreading infections, so that we can take some preventive measures against it.

MATERIALS AND METHODS

Study design: Case – control analytical study

Ethics approval: After getting ethical clearance for the study from the institution and written informed consent was obtained

Locus of study and period: This study was conducted in a Rajah Muthiah Medical College, a tertiary care teaching hospital for a period of 6 months.

Sample size: Two hundred and fifty



DOI: 10.5455/ijcbr.2017.33.07

eISSN: 2395-0471
pISSN: 2521-0394

Correspondence: Jeya M, Dept. of Microbiology, Rajah Muthiah Medical College, Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu, India. **Email:** drmjeya@gmail.com

Inclusion criteria: A total number of 200 samples were collected from the mobile phones of different category of Health care professionals, (doctor’s 50 + staff nurses 50 + medical students 50 + technicians 50) in the hospital and 50 control samples (other than HCPS, outside from institute) were collected from control group. The control group comprised of professors and students of Arts and Science College and general public.

Grouping:

Groups I: Control group

Group II: Health care professionals (HCPs)

Sample collection: The mobile phones that are used for at least 6 months by the Health Care Professionals group and the control group are included for this study.

Methodology: The samples were collected by using sterile cotton swabs moistened with sterile normal saline. These swabs were rubbed over the outer surface of the mobile phones [4,6]. The swabs were placed in sterile test tubes and were sent to the Laboratory.

Processing of samples: The swabs were inoculated into the Mac Conkey agar and blood agar and were incubated at 37°C for 48 hours. Gram staining was carried out from different bacterial colonies. Identification of bacteria was carried out by the colony morphology and appropriate biochemical tests [6]. The pathogenic bacteria were subjected for antibiotic sensitivity test by Kirby-Bayer disc diffusion method on Muller-Hinton agar following CLSI guidelines [7]. The results were compared with the control group. The antibiotic susceptibility pattern of pathogenic bacteria isolated from the mobile phones were compared with that of the clinical isolates [7].

RESULTS

200 samples were collected from the mobile phones of Health Care Professionals (Table 1) and 50 samples were collected from the mobile phones of the Control group.

Table 1. Age distribution of the participants

AGE	Health care professionals				Control Group
	Doctors	Nurses	Medical students	Technicians	
18-30	34	7	50	0	28
30-40	12	17	0	15	14
40-50	4	16	0	20	6
50-60	0	10	0	15	2
TOTAL	50	50	50	50	50

Sex distribution of the participants: In Doctors category male were 20 and female were 30 in number. All staff nurses (50) were female. Among medical students category male were 30 and female 20 in number. In the technician category male were 30 and female 20 in number.

Persons sharing their mobile phones with others: Sharing of mobile phones is mostly seen among nurses (82%) followed by medical students (80%), doctors and technicians (60%) respectively.

Habit of keeping the mobile phone over patients’ bed: Greater proportion of Doctors (70%) has the habit of keeping the mobile phone over patients’ bed followed by nurses (46%) and medical students (20%).

Awareness about the transmission of microbes through mobile phone: The proportion of HCPs who are aware of transmission of microbes through their mobile phones are Doctors (72%), students (76%), technicians (60%) and nurses (48%). They are not having the habit of cleaning their mobile phones regularly. In nurses category 28% has habit of cleaning their mobile phones using sterile swabs, while other categories such as Doctors, medical students, and lab technicians are not having the habit of cleaning their mobile phones.

Assessment based on Microbiological examination: About 83.3% of mobile phones of HCPs were contaminated, while only 40% of mobile phones of the control group were contaminated. Nurses’ phones showed high rate of contamination (86%) followed by doctors and medical students (84%) each and technicians (80%).

Micrococci are predominant non pathogenic bacteria isolated from the mobile phones of Doctors, nurses and students while Aerobic spore bearers are predominant in Technicians. *Diphtheroids* are predominant in control group. *Candida albicans* was isolated only from the Doctors group.

Staphylococcus aureus (24%) is the predominant pathogenic bacteria isolated among HCPs while *E.coli*(6%) is predominant in control group. Very few isolates of *Proteus mirabilis* (2.5%) is isolated from the study group.

Antibiotic susceptibility pattern of pathogenic bacteria: Of the total isolate of *S.aureus* (48) 14.5% (7) were MRSA. Chloramphenicol (85%) is the most sensitive antibiotic for the obtained isolates, followed by Linezolid (80%), Vancomycin (80%), Ciprofloxacin (75%), Clindamycin (65%), Gentamycin (54%), Erythromycin (25%), and tetracycline (20%). Co-trimoxazole (15%) is least susceptible. Gentamicin (85%) is the most sensitive antibiotic for the *E.coli* isolates, followed by Amikacin (75%), Imipenam (72%), Ciprofloxacin (62%), Cefazolin (52%), Cefotaxime (50%), and Ampicillin (42%) and Tetracycline (24%).

Gentamicin (86%) is the most sensitive antibiotic for the *Klebsiella* isolates, followed by Amikacin (71%), ciprofloxacin (43%) and, cefoperazone (14%). Ampicillin is (100%) resistant.

Antibiotic susceptibility pattern of *P. aeruginosa* isolates is as follows. Amikacin (100%) is the most sensitive antibiotic, followed by Piperacillin Tazobactam (85%), Ceftazidime (74%), ofloxacin (57%), ciprofloxacin (43%), ampicillin (14%), and gentamicin (7%).

The susceptibility pattern of pathogenic bacteria isolated from mobile phones was compared with that of the clinical isolates from patients’ samples. It is found that there is a (65%) correlation in their susceptibility pattern. This is one of the evidence to suspect that some strains of the bacteria causing clinical infection could have been transmitted through mobile phones.

Table 2. Nonpathogenic bacteria isolated from different groups.

Organism	Control group (N=50) % (n)	HCPS group (N= 200) % (n)	HCPs group individual data (n=50 in each group)			
			Doctors % (n)	Nurses % (n)	Students % (n)	Technicians % (n)
<i>Micrococci</i>	6 (3)	20 (40)	24 (12)	14 (7)	32 (16)	10 (5)
<i>CoNS</i>	8 (4)	8.5 (17)	6 (3)	10 (5)	8 (4)	10 (5)
<i>Diphtheroids</i>	16 (8)	7 (14)	10 (5)	4 (2)	6 (3)	8 (4)
<i>Neisseria catarrhalis</i>	0	1.5 (3)	0	0	6 (3)	0
<i>Aerobic spore bearers</i>	0	14.5 (29)	18 (9)	8 (4)	20 (10)	12 (6)
<i>Candida albicans</i>	0	2.5 (5)	10 (5)	0	0	0
Total	30 (15)	54 (108)	68 (34)	36(18)	72 (36)	40 (20)

Table 3. Pathogenic bacteria isolated

Organism	Control group (50) % (N=50)	HCPS group (n=200) % (n)	HCPs group individual data (n=50 in each group)			
			Doctors % (no)	Nurses % (no)	Students % (n)	Technicians % (n)
<i>Staphylococcus aureus</i>	4 (2)	24 (48)	24 (12)	40 (20)	12 (6)	20 (10)
<i>Escherichia coli</i>	6 (3)	6.5 (13)	12 (6)	4 (2)	4 (2)	6 (3)
<i>Klebsiella pneumoniae</i>	0	5 (10)	10 (5)	2 (1)	4 (2)	4 (2)
<i>Pseudomonas aeruginosa</i>	0	4 (8)	4 (2)	2 (1)	2 (1)	8 (4)
<i>Proteus mirabilis</i>	0	2.5 (5)	4 (2)	0	4 (2)	2 (1)
Total	10 (5)	42 (84)	54 (27)	48 (24)	26 (13)	40 (20)

DISCUSSION

In our study the percentage of contamination of mobile phones among healthcare professional is 83.3%. This result closely correlates with the result obtained by Shekhar Pal et al., (81.8%), Brady et al, (89.7%), Jayalakshmi et al, (91.6%) and Swarajya Lakshmi (91.8%) [8-11]. But very high contamination rate was reported by Yazhini Jagadeeshan (98%) [12] and low rate of contamination was found by Sandeep B. Kokate et al (60%) [13] Hayder HamazhAltee (17.5%) [14]. Only 40% of the control group showed bacterial contamination. This correlates with the results of Radhika et.al (33.3%) [15] and varies with the results of Girma Mulisa Misgana et al where it was 56% [16].

In our study, the prevalence of nonpathogenic bacterial isolates in descending order was *Micrococci*, *Aerobic Spore Bearers*, *Coagulase Negative Staphylococci*, *Diphtheroids*, *Candida albicans* and *Neisseria catarrhalis*. This was similar to the result obtained by Padma Srikanth where the isolates were *Coagulase Negative*

Staphylococci, *Micrococci*, *Aerobic spore bearers* and Swarajya Lakshmi reported *Diphtheroids*, *Coagulase Negative Staphylococci*, *Micrococci*, and *Candida species* [5,11]. *Aspergillus niger* was isolated in another study [6]. *Aspergillus species*, *Mucor*, *Penicillium species* and *Candida species* were documented in the study by Gosa Girma [17]. The pathogenic bacteria isolated from HCPs is 42% in our study but it was 20%, and 16.7% in other study [17].

In our study the pathogenic bacteria isolated from the study group were in the descending order of *S.aureus*, *E.coli*, *Klebsiella*, *Pseudomonas aeruginosa*, and *Proteus*. *Staphylococcus aureus* (24%) was the predominant pathogenic bacteria in our study and this correlates with Rawia Ibrahim Badr etal [6] and it was 52% in the study by Fatmaulger et al [18]. Among that 14% were MRSA in our study which was 18% in a study by Datta P et al., [19] and higher (39%) in other studies [20]. The percentage of Gram Negative bacilli isolated from HCPs' in our study is 18% and is similar to the results of Ramesh J etal [21], (15%).The predominant pathogenic bacteria isolated

from HCWs' by Shekhar Pal et al.,[8] were *Staphylococcus species*, *Acinetobacter species*, *E.coli* and *Klebsiella species* respectively. This result is correlating with our results, except for *Acinetobacter species*. Some researchers (Dr.Harish Trivedi) have also isolated *Acinetobacter* and *Enterococci*, Sham S Bhat et al- *Acinetobacter*, *Enterococcus*, *Enterobacter* which were not obtained in our study [2,4,10].

Some authors have stated that mobile phones of HCPs' were also contaminated with nosocomial pathogens [16]. In our study also bacteria causing nosocomial infections, such as *Staphylococcus aureus*, *Klebsiella* and *Pseudomonas aeruginosa* were reported. In the control group 10% of samples pathogenic bacteria were isolated in our study. But in another study, from none of the control group samples pathogenic bacteria was isolated [8].

In our study it is found that about 70% of Doctors have the habit of keeping their phone on the patient's bed. But none of the technicians have this habit; this may be due to their limited ward side work habits. It is also found that only 72% of doctors and 48% of nurses have the awareness about the role of mobile phone in causing nosocomial infection. Only 24% of the doctors have the habit of regular cleaning of their phones. It is looking alarming.

CONCLUSION

This study can create awareness among Health Care Professionals about the bacterial contamination of their mobile phones can occur even with pathogenic bacteria. Health Care Professionals can be advised to do routine decontamination of their mobile phones using alcohol swabs and frequent hand washing to avoid spreading of nosocomial infections. Strict infection control measures are essential in a tertiary care hospital to reduce the hospital acquired infections.

Financial Support : None

Conflicts of Interest: There are no conflicts of interest.

REFERENCES

1. Oguz Karabay, Esra Koçoglu, and Mustafa Tahtaci. The role of mobile phones in the spread of bacteria associated with nosocomial infections J Infect Developing Countries. 2007; 1(1):72-73.
2. Harish R Trivedi, Kairavi J Desai, Lopa P Trivedi, et al. Role of Mobile Phone in Spreading Hospital Acquired Infection: A Study in Different Group of Health Care Workers. Natl J Integ Res med. 2011; 2(3): 61-65.
3. Kabir OA, Audu DA, Olabisi OA, Coker OA. The potential role of mobile phones in the spread of bacterial infections. J Infect Dev Ctries. 2009; 3(8):628-632.
4. Bhat SS, Hegde SK, Shailaja Salian. Potential of Mobile Phones to Serve as a Reservoir in Spread of Nosocomial Pathogens. Online Journal of Health and Allied Science.

- 2011; 10(2):14.
5. Padma Srikanth, Ezhilarasan Rajaram, Suchithra Sudharsanam, Anandhi Lakshmanan, SSM. Umamaheswari, Kalyani J. Mobile Phones: Emerging Threat for Infection Control. J Infection Prevention.2010; 11:87-90.
6. Rawia Ibrahim Badr, HatemIbrahim Badr, Nabil Mansour Ali. Mobile phones and nosocomial infections. Int J Infect Control 2012; 8: 1-5.
7. CLSI Guidelines, 2014: M100-S24 Performance standards for antimicrobial susceptibility testing. Twenty fourth informational supplement.
8. Shekar Pal S, Juyal D, Adekhandi S. Mobile phones: Reservoirs for the transmission of nosocomial pathogens. Adv Biomed Res. 2015; 4: 144 – 150.
9. Brady RR, Wasson A, Stirling I, McAllister C, Damani NN. Is your phone bugged?. The incidence of bacteria known to cause nosocomial infection in healthcare workers mobile phones. J Hosp Infect. 2006; 62: 123-125.
10. Jaya Lakshmi, Appalaraju. Cellphones as Reservoirs of Nosocomial Pathogens. JAPI. 2008;56:388 – 389
11. Swarajyalakshmi M, Lakshmi B. Mobile phones: Potential Threat in Infection Control. Indian Journal of Basic and Applied Medical Research. 2014: 3:496-500.
12. Yazhini Jagadeesam, Deepa M, Kannagi M. Mobile Phones as fomites in Microbial Dissemination. Int J Curr Sci. 2013; 5: 6-14.
13. Sandeep B. Kokate, Sanjay Kumar R.More, VivekGujar, SmitaMundhe, Quazi Syed Zahirudin. Microbiological flora of mobile phones of resident doctors. J Biomedical Science and Engineering. 2012; 5: 696-698.
14. Hayder Hamzah, Altaee, Shaimaa O. Hasson, Shrooq F. Hassan. Bacterial contamination of mobile phones,study in Babylon hospitals. Journal of Kerbala University. 2013;11: 228-234.
15. RadhikaRana, Sunanda Joshi , Sucheta Lakhani , Mandeep Kaur , Pragnesh Patel. Cell Phones – Homes for Microbes. Int J Biol Med Res. 2013; 4(3):3403- 3406.
16. Girma Mulisa Misgan, Ketema Abdissa, Gameda Abebe. Bacterial contamination of mobile phones of healthcare workers at Jimma University Specialized Hospital, Jimma, South West Ethiopia. International Journal of Infection Control. 2014; 11: 1-8.
17. Gosa Girma. Potential Health Risks with Microbial Contamination of Mobile phones. Global Research Journal of Education.2015; 3 (1): 246-254.
18. Fatmaulger, Sabari Esen, AhmetDilek. Are we aware How Contaminated our Mobile Phones with Nosocomial Pathogens?. Annals of Clinical Microbiology and Antimicrobials. 2009; 8: 9 -13.
19. Datta P, Rani H, Chander J, Gupta V. Bacterial contamination of mobile phones of health care workers. Indian J Med Microbiol. 2009;27:279-281.
20. Goldblatt JG, Krief I, Klonsky T, Haller D, Milloul V, Sixsmith DM et al. Use of cellular telephones and transmission of pathogens by medical staff in New York and Israel. Infect Control Hosp Epidemiology. 2007; 28:500-503.
21. Ramesh J, Carter AO, Campbell MH, Gibbons N, Powlett C, Moseley H. S, Levis D, Carter T. Use of mobile phones by medical staff at Queen Elizabeth Hospital Barbados: evidence for both benefit and harm. J Hospt Infect . 2008; 70: 160-165.

How to Cite this article: Karthik Manikandan, Jeya M, Sasikala S. Mobile Phones Of Health Care Professionals: A Potential Threat To Infection Control In A Tertiary Care Hospital. *Int. j. clin. biomed. res.* 2017;3(3): 22-25.