

CELL PHONES AND PENS-UBIQUITOUS ACCESSORIES OF DOCTORS AND HEALTHCARE WORKERS- ARE THEY A SOURCE OF WORRY IN THE OPERATION THEATRE?

John Sajan Kurien¹, Sandeep Abraham Varghese², Sansho Elavumkal Ulahannan³, Aneesh Joseph⁴, Toney Jose⁵

¹Professor, Department of General Surgery, Government Medical College, Kottayam, Kerala.

²Assistant Professor, Department of General Surgery, Government Medical College, Kottayam, Kerala.

³Assistant Professor, Department of General Surgery, Government Medical College, Kottayam, Kerala.

⁴Senior Resident, Department of General Surgery, Government Medical College, Kottayam, Kerala.

⁵Junior Resident, Department of General Surgery, Government Medical College, Kottayam, Kerala.

ABSTRACT

BACKGROUND

Hospital-associated infections are an important cause of patient morbidity and mortality. Cell phones and pens are ubiquitous accessories of doctors and other Healthcare Workers (HCWs) in a hospital as well as outside for various purposes. But, they may serve as reservoirs of infection allowing the transportation of the contaminating bacteria to many different clinical environments.

The aim of the study is to find out the prevalence of various bacteria in mobile phones and pens of doctors and other staff working in operation theatres of Government Medical College, Kottayam, Kerala, for a period of one year.

MATERIALS AND METHODS

400 samples of microbiological swabs were collected from pens and mobile phones of medical personnel working in the operation theatres of Government Medical College, Kottayam, for one year. If growth was present in cultures, identification of organisms and sensitivity to routine antibiotics was checked by disc diffusion method according to the organism isolated.

RESULTS

About 2/3rd of mobile phones and pens carried by healthcare workers inside operation theatres contained bacteria, of which, skin commensals prevailed in number. Presence of faecal microflora and multidrug-resistant bacteria detected in some of the samples are alarming.

CONCLUSION

This study emphasises the need for creating awareness among healthcare workers regarding the role of mobile phones and pens as carriers in transmission of nosocomial infections.

KEYWORDS

Bacteria, Cell Phones, Healthcare Workers, Operation Theatres, Pen.

HOW TO CITE THIS ARTICLE: Kurien JS, Varghese SA, Ulahannan SE, et al. Cell phones and pens-ubiquitous accessories of doctors and healthcare workers- Are they a source of worry in the operation theatre?. J. Evid. Based Med. Healthc. 2017; 4(77), 4541-4544. DOI: 10.18410/jebmh/2017/906

BACKGROUND

The term 'environmental monitoring' indicates the microbiological testing of air, water, surfaces and equipments in order to detect changing trends of microbial counts and microflora.¹ Hospital-associated infections are important causes of patient morbidity and mortality. Control of infection and basic sanitation should be at the heart of good hospital management. Emergence of new pathogens and multidrug-resistant bacterial strains compel us to review

our current practices and focus on educating the healthcare workers about the importance of basics of hospital hygiene and infection prevention. Cell phones, being inexpensive and conveniently small in size, are used by doctors and other Healthcare Workers (HCWs) in a hospital for immediate communication during emergencies, ward rounds and even in operation theatres and intensive care units.^{2,3} Surgical site infection may be caused by a number of organisms including gram-positive, gram-negative or anaerobic organisms.^{4,5} Rarely, skin commensals may even cause infection especially in immunocompromised situations.⁵ The new trend of using broad-spectrum antibiotics inadvertently caused the rise of a new generation of multidrug-resistant organisms. Staphylococci and Enterococci are notorious in this sense. Mobile phones were found to carry these bacteria because count of these bacteria increases in high temperature and moisture. Our phones are ideal multiplication sites for these microbes as they are kept warm and snug in our pockets and handbags. Also, there are no guidelines for the care, cleaning and restriction of mobile phones in our healthcare

Financial or Other, Competing Interest: None.

Submission 07-08-2017, Peer Review 12-08-2017,

Acceptance 15-09-2017, Published 23-09-2017.

Corresponding Author:

Dr. Sandeep Abraham Varghese,
Villa No. 47, Skyline Palmspring Villas,
Vadavathoor P.O, Kottayam-686010,
Kerala, India.

E-mail: sandeepavarghese@yahoo.com

DOI: 10.18410/jebmh/2017/906



settings. Not only mobile phones, but pens, white coats, stethoscopes and other personal articles also carry these organisms (60-94%).^{6,7,8} Taking all these factors into consideration, we believe that a proper study should be conducted in our institution to know whether our personal articles harvest harmful pathogens in quantities significant enough to cause a threat and we would like to propose strategies to minimise chances of surgical site infection from these personal articles, if these were found to be contaminated.

MATERIALS AND METHODS

Aims and objectives of the study is to find out the prevalence of various bacteria in mobile phones and pens of doctors and other staff working in operation theatres of Government Medical College, Kottayam, for a period of one year from October 2013 and to study the antibiotic sensitivity patterns of bacterial isolates. It also aims to learn the individual prevalence of organisms in different strata of healthcare workers.

Government Medical College, Kottayam, Kerala, is a tertiary care institution in Kerala. A descriptive study was conducted for a period one year starting from October 2013 to find out prevalence of bacteria in personal articles of healthcare workers. 200 samples of microbiological swabs were collected from pens and 200 samples from mobile phones of medical personnel working in the operation theatres of Government Medical College, Kottayam, using sterile saline swabs provided from the Microbiology Department. Samples were collected randomly without prior intimation about the study after taking signature in consent forms to participate in the study. The collected specimens were properly labeled with serial numbers and microbiological request forms filled with corresponding serial number, object details and date of collection. To make sure of the sterility of saline used, one saline-soaked swab was sent as control along with each group of samples collected. Collected microbiological specimens were promptly transferred to Department of Microbiology for immediate processing. Received swabs were immediately dipped in sterile glucose broth (backup broth) and aerobic bacterial cultures (5% sheep blood agar, MacConkey agar, salt agar and glucose broth) and fungal cultures (Sabouraud's Dextrose agar) were done.⁹ The plates were incubated at 37°C. Culture plates were examined for growth after 24 hours of incubation. If growth was present in cultures, Gram staining of the organism was done. After Gram staining, gram-positive and gram-negative bacteria were processed accordingly. Identification of organisms were done based on microscopy (Gram staining), cultural characteristics and metabolic characteristics (catalase test, coagulase test, methyl red test, indole production). Sensitivity to routine antibiotics was checked by Kirby-Bauer disc diffusion method, vancomycin agar dilution method and Epsilometer test (E-test).¹⁰ If there was no growth after 24 hours of incubation and glucose broth showed turbidity, subcultures were done from glucose broth. If primary plate culture and

glucose broth subculture didn't show any growth, the sample was labeled as sterile.

RESULTS

200 samples were taken from mobile phones and another 200 samples were taken from pens, out of which, 140 (70%) samples of mobile phones and 122 (61%) samples of pens showed growth (Figure 1 and 2). Mobile phones showed a significantly higher number of methicillin-resistant coagulase-negative Staphylococci (22%) compared to pens (17.5%) Klebsiella, Corynebacteria and Fungi were seen only in mobile phones, while Acinetobacter and Citrobacter spp. were seen only in pens (Figure 3 and 4).

Distribution of organism among different professional strata showed 51% of doctor's mobiles carried bacteria while 63% nurses carried bacteria in their mobiles. 68% of medical students carry bacteria in mobile phones (Figure 5 and 6).

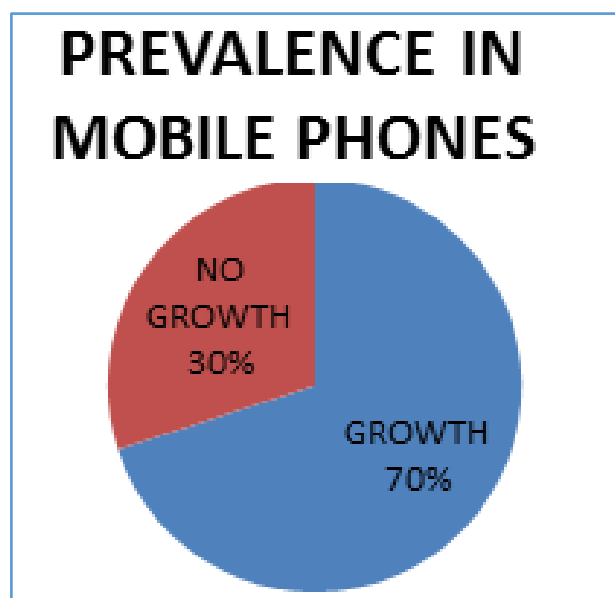


Figure 1. Prevalence of Organisms in Mobile Phones Showed 70% Growth

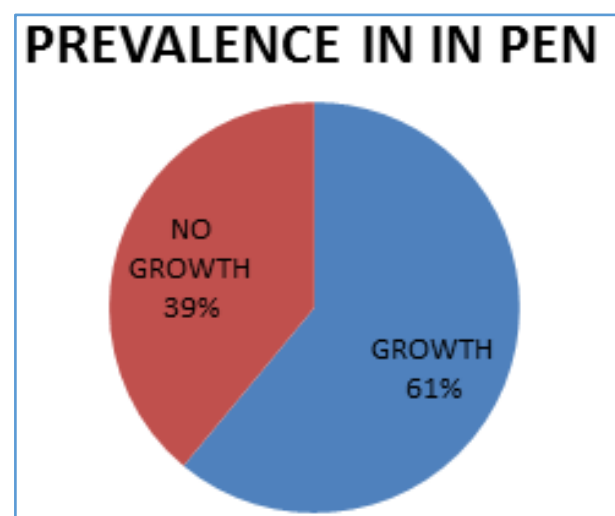


Figure 2. Prevalence of Organisms in Pens Showed 61% Growth

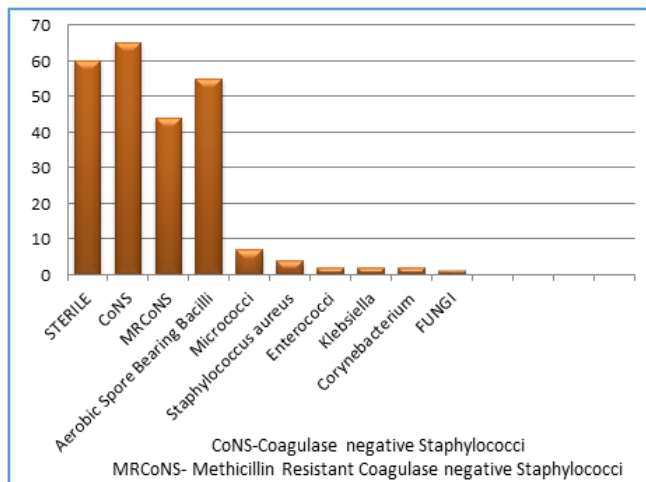


Figure 3. Organisms in Mobile Phones

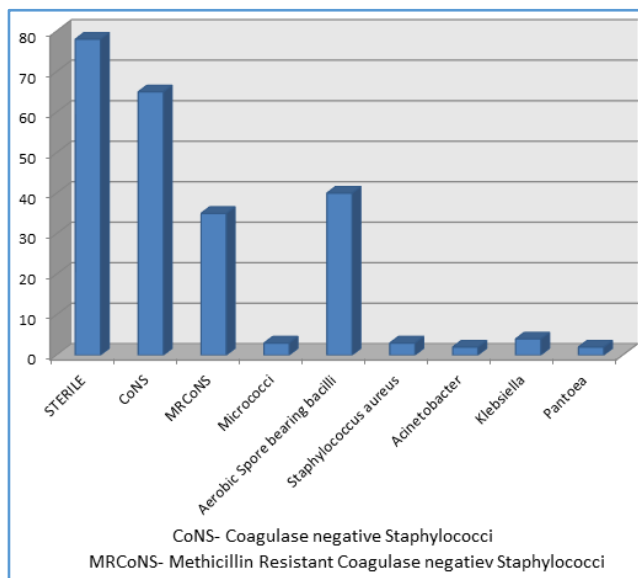


Figure 4. Organisms in Pens

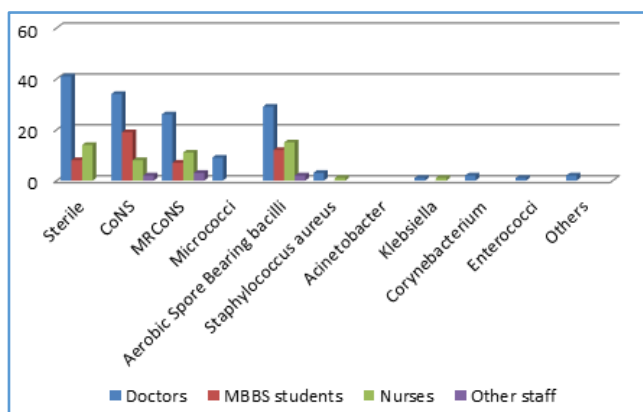


Figure 5. Distribution of Organisms According to Professional Strata in Mobile Phones

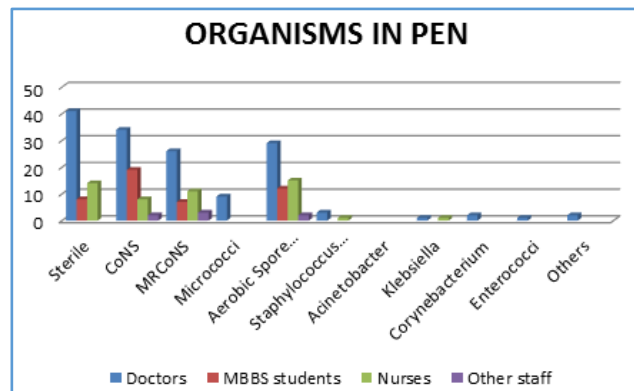


Figure 6. Distribution of Organisms According to Professional Strata in Pens

DISCUSSION

Present study revealed 70% of mobile phones contained some sort of bacteria (Figure 1). A study conducted by Dr. Dutta and Dr. Chander shows a prevalence of 72% bacteria in mobile phones, which is equivalent to present study,⁶ while a study by Dr. Pandey et al showed prevalence of 47.6% bacteria in mobile phones.⁷ A third study conducted by Pal S et al showed a 94.5% of prevalence.⁸ Another study by Boonderowa et al showed 91.67% growth in mobile phones.⁹ Ustun C et al also demonstrated 97.8% growth in mobile phones.¹¹ Another study by Fatma Ulgel et al showed a total growth of 94.5%.^{12,13} Prevalence of organisms was found out to be slightly lesser in the present study. On studying the prevalence of individual organisms in mobile phones, commonest isolate were coagulase-negative Staphylococci (31.5%) followed by aerobic spore bearing bacilli (27.5%). Methicillin-resistant Coagulase-negative Staphylococci were present in 22% of samples. Micrococci (4%), Staphylococcus aureus (2%), Enterococci, Corynebacteria and Klebsiella (1% each) were also present (Figure 3). On comparing with other studies, Dutta and Rani Chander study showed presence of aerobic spore bearing Bacilli (47%) followed by methicillin-sensitive Staphylococcus aureus (46%), then methicillin-resistant Staphylococci (MRSA) (26%) and coagulase-negative Staphylococci (19%) as major isolates. Micrococci (2%) and viridans streptococci (1%) were also present.⁶ Study of Anitha Pandey et al showed coagulase-negative Staphylococci (20%) as the predominant organism followed by Acinetobacter (14%),⁷ Staphylococcus aureus (7.9%), E. coli (4.7%), Pseudomonas (2%) and Klebsiella (2%). A third study conducted by Pal S et al showed Staphylococci as the main pathogen (87%) of which 29% was MRSA. Micrococci (22%), Enterococci and Viridans Streptococci together formed 13%.⁸ Another study by Boonderowa et al showed coagulase-negative Staphylococci as predominant isolate (69.3%) like the present study.⁹ Micrococci were found in 57.8% samples. Rest of the samples contained Klebsiella (1.5%) and pseudomonas (1%). Unlike other studies E. coli, Pseudomonas and MRSA were not seen in present study samples.

Prevalence of bacteria in pens during the present study is 61% (Figure 2). Anitha Pandey et al showed 66% pens were hosting bacteria. Both results are comparable.⁷ Analysis of individual organisms of pens showed coagulase-negative Staphylococcus as predominant organism (31.5%) followed by aerobic spore bearing bacilli (21%). Methicillin-resistant coagulase-negative Staphylococcus (18%) a few numbers of streptococci (2%) and other bacteria were present (Figure 4). Study by Anitha Pandey et al showed coagulase-negative Staphylococci (26%) as predominant isolate just as the present study.⁷ Staphylococcus and *E. coli* were present in (14%) of samples followed by (6%) *Pseudomonas*, (4%) *Klebsiella* and (2%) *Acinetobacter*.

On analysing the sensitivity patterns to routine antibiotics, most of the gram-positive organisms present in day-to-day objects were resistant to conventional penicillin group of antibiotics except for cloxacillin. But, they show good sensitivity to first generation cephalosporins and tetracyclines. None of the isolates from mobile phones and pens were vancomycin resistant. There is not much difference in sensitivity patterns between organisms in mobile phones and in pens.

Distribution of organisms among different professional strata were also analysed (Figure 5 and 6). All of the samples (100%) collected from the cleaning staff contained organisms. 51% of doctors' mobiles carried bacteria, while 63% nurses carried bacteria in their mobiles. 68% of medical students carry bacteria in mobile phones. Only personal articles of doctors and nurses showed growth of faecal flora like *Klebsiella* and *Enterococci*. This maybe because doctors and nurses keep more proximity to patients than other study groups.¹⁴ However, the presence of fecal microflora in some of the samples should raise an alarm.¹⁵

CONCLUSION

This study was initiated with an intention of creating awareness among healthcare workers regarding the role of mobile phones and pen as carriers in transmission of nosocomial infections. This study should remind us of the importance of hand washing once again and the importance of cleaning our personal articles at regular intervals. Also, use of mobile phones in operation theatres should be restricted to emergencies only and use of disposable pens in the theatres should be encouraged.

REFERENCES

- [1] Environmental monitoring of clean rooms in vaccine manufacturing facilities. Geneva: WHO 2012:2-3.
- [2] Kokate S, More, S, Gujar V, et al. Microbiological flora of mobile phones of resident doctors. *J of Biomedical Science Engineering* 2012;5:696-698.
- [3] Rafferty KM, Pancoast SJ. Bacteriological sampling of telephones and other hospital staff hand-contact objects. *Infect Control* 1984;5(11):533-535.
- [4] Pathak A, Saliba EA, Sharma S, et al. Incidence and factors associated with surgical site infections in a teaching hospital in Ujjain, India. *Am J Infect Control* 2014;42(1):11-15.
- [5] Manian FA, Meyer L. Surgical-site infection rates in patients who undergo elective surgery on the same day as their hospital admission. *Infect Control Hosp Epidemiol* 1998;19(1):17-22.
- [6] Datta P, Rani H, Chander J, et al. Bacterial contamination of mobile phones of health care workers. *Indian J Med Microbiol* 2009;27(3):279-281.
- [7] Pandey A, Asthana AK, Tiwari R, et al. Physician accessories: doctor, what you carry is every patient's worry? *Indian J Pathol Microbiol* 2010;53(4):711-713.
- [8] Pal S, Juyal D, Adekhandi S, et al. Mobile phones: Reservoirs for the transmission of nosocomial pathogens. *Adv Biomed Res* 2015;4:144.
- [9] Bhoonderowa A, Gookool S, Biranjia-Hurdoyal SD. The importance of mobile phones in the possible transmission of bacterial infections in the community. *J Community Health* 2014;39(5):965-967.
- [10] Hombach M, Ochoa C, Maurer FP, et al. Relative contribution of biological variation and technical variables to zone diameter variations of disc diffusion susceptibility testing. *J Antimicrob Chemother* 2016;71(1):141-151.
- [11] Ustun C, Cihangiroglu M. Health care workers' mobile phones: a potential cause of microbial cross-contamination between hospitals and community. *J Occup Environ Hyg* 2012;9(9):538-542.
- [12] Ulger F, Esen S, Dilek A, et al. Are we aware how contaminated our mobile phones with nosocomial pathogens? *Ann Clin Microbiol Antimicrob* 2009;8:7.
- [13] Jeske HC, Tiefenthaler W, Hohlrieder M, et al. Bacterial contamination of anaesthetist's hands by personal mobile phone and fixed phone use in the operating theatre. *Anaesthesia* 2007;62(9):904-906.
- [14] Bukharie HA, Al-Zahrani H, Rubaish AM, et al. Bacterial contamination of stethoscopes. *J Family Community Med* 2004;11(1):31-33.
- [15] Hoy YE, Bik EM, Lawley TD, et al. Variation in taxonomic composition of the fecal microbiota in an inbred mouse strain across individuals and time. *PLoS One* 2015;10(11):1-17.