

Bacteriological Profile from Cell Phones Amongst Laboratory Personnel at Tertiary Care Hospital, Jaipur

Snigdha Purohit*, **Aruna Vyas****, **Rajni Sharma****

ABSTRACT

Introduction : Cell phones are commonly used in healthcare settings for rapid communication within hospitals. One of the most common concerns regarding heavy use of devices is that they can be vehicles for transmitting pathogens. People rarely disinfect phones and as a result devices have potential for contamination with various bacterial agents. So the present study was aimed to determine the bacterial contamination on cell phones that are frequently used by lab personnel.

Aim & Objectives : To isolate bacterial flora contaminating the surfaces of cell phones that are frequently used by laboratory personnel.

Methods : All cell phones which were taken into study were disinfected with 70% Isopropyl Alcohol before entering the laboratory. At the time of leaving the laboratory, swabs from 40 phones were collected and inoculated on Blood agar, MacConkey agar and Thioglycollate Broth. Isolated organisms were processed according to standard protocol.

Results : Swabs of cell phones of 40 lab personnel were analysed for presence of microorganisms. Out of 40 samples, all 40 (100%) were contaminated with microorganisms. 40 organisms were isolated from 40 phones. Out of 40, 27 (67.5%) cell phones were contaminated with aerobic Gram Positive Bacilli, 3 (7.5%) were

contaminated with Micrococci, 2 (5%) with E.coli, 2 (5%) with Enterobacter aerogenes, 2 (5%) with Coagulase Positive Staphylococcus species, 1 (2.5%) with Acinetobacter baumannii and 1 (2.5%) with Pseudomonas aeruginosa species. There were 2 (5%) samples which were contaminated with both Micrococci and Gram Positive Bacilli.

Conclusion : Restriction of cell phones is recommended in laboratory. Hand hygiene must be followed before and after handling of phones.

Keywords : cell phones, contamination, laboratory personnel.

INTRODUCTION

Cell phones have become one of the most indispensable accessories of professional and social life¹. They have become one of the essential devices used for communication in daily life, and are commonly used almost everywhere. Healthcare workers use these phones for rapid communication within hospital settings. However, one of the most common concerns regarding heavy use of mobile devices is that they can act as a vehicle for transmitting pathogenic bacteria and other microorganisms². Contamination can spread from outside surfaces to >80% of exposed hands³.

The constant handling of cell phones by laboratory personnel poses a severe threat to spread of infectious pathogens which could be multi drug

*Resident Doctor, **Senior Professor
Department of Microbiology, SMS Medical College, Jaipur

Corresponding Author :

Dr. Snigdha Purohit
111, Mahaveer Nagar 1st, Near Sony Centre Showroom,
Tonk Road-Jaipur (Rajasthan)
Email : snigidoc@gmail.com

resistant also; both inside the facility and to the community outside. This is especially so because the skin of our palms provide moisture and optimum temperature of human body for these bacteria to proliferate⁴. These factors and the heat generated by cell phones contribute to harbouring bacteria on the device at alarming levels. When we consider a phone's daily contact with the face, mouth, ears, and hands, the dire health risks of using germ-infested mobile devices are obvious⁵.

We rarely make an effort to disinfect our phones as it is cumbersome process because excess moisture could damage them. Contaminated hands and cell phones of health professionals can play a great role in spreading infections to self, family member, and others outside the hospital⁶⁻⁸.

There are some reports which indicate that giving low emphasis on regular disinfection of hands and poor hand washing practices by health professional predispose their and other individuals' cell phones to the colonization of bacteria^{9,10}.

Many researchers have studied cell phone contamination among healthcare workers however little work has been done in the laboratory setup. So the present study was aimed to determine the bacterial contamination on cell phones that are frequently used by lab personnel.

MATERIALS & METHODS

SAMPLE COLLECTION & PROCESSING

This cross sectional study was performed for 1 month in May 2018, at Department of Microbiology, SMS Hospital Jaipur, Rajasthan. A total of 40 samples were collected from the cell phones of laboratory personnel working in bacteriology lab. Oral consent was obtained from all the individuals whose cell phones were included in the study.

Samples were obtained from cell phones of all participants using sterile cotton swabs. Before taking

a swab, both hands of laboratory personnel were cleaned using an alcohol-based instant hand sanitizer, and powder-free disposable gloves were worn per sample throughout the work to prevent cross-contamination. Sterilized cotton swab moistened by sterile normal saline was rotated to swipe from overall (screen, keypad, sides, and back) area of the mobile phone. All swabs were immediately streaked over the surface of blood and MacConkey's agar plates. The cotton ends of these swabs were cut off and soaked in 10 ml thioglycolate broth. Blood and MacConkey's agar plates along with thioglycollate broth were incubated aerobically at 37°C for 24 hours.

IDENTIFICATION OF ISOLATES

Isolated bacterial agents were identified according to the standard microbiological methods. Primary isolation of bacteria was made based on their colony characteristics and Gram stain reaction microscopically. Different biochemical tests like triple sugar iron agar, indole, citrate, oxidase, urease, motility, mannitol, catalase, and coagulase were used for further identification.

RESULTS

There were 40 participants whose cell phones were analysed for the presence of microorganisms. Swabs from 40 lab personnel were taken into study. Out of 40 samples, all 40 (100%) were contaminated with microorganisms. 40 organisms were isolated from 40 phones. Out of 40, 27 (67.5%) cell phones were contaminated with aerobic spore bearing Gram Positive Bacilli, 3(7.5%) were contaminated with Micrococci, 2(5%) with E.coli, 2(5%) with Enterobacter aerogenes, 2(5%) with Coagulase Positive Staphylococcus species, 1(2.5%) with Acinetobacter baumannii and 1(2.5%) with Pseudomonas aeruginosa species. There were 2(5%) samples which were contaminated with both Micrococci and Gram Positive Bacilli.

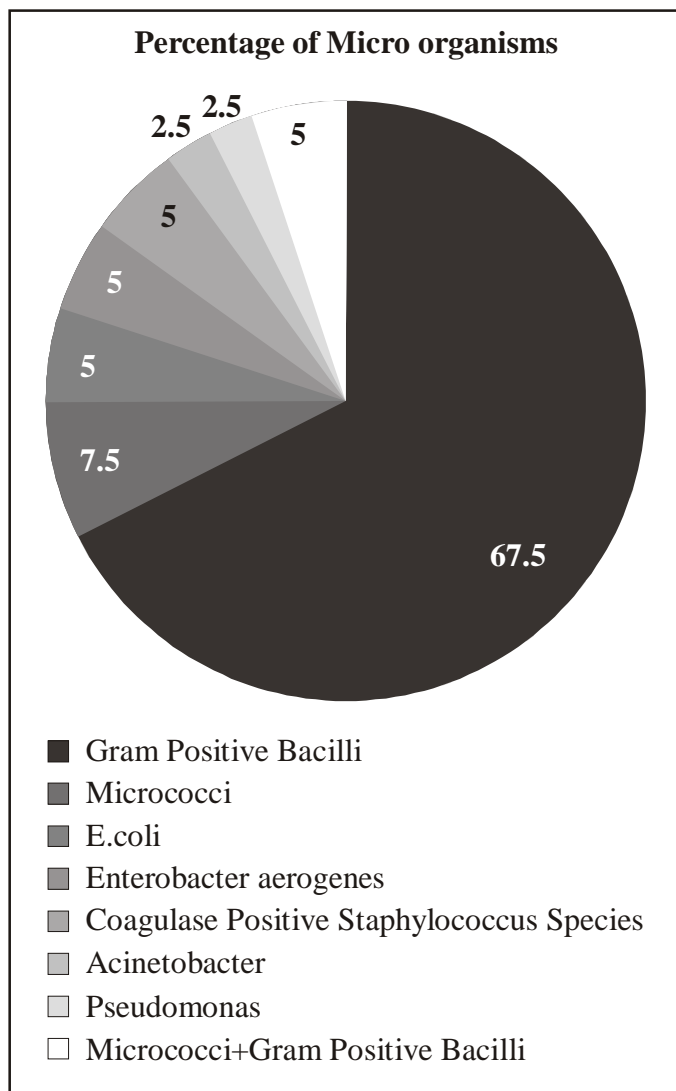


Figure : 1 Pie chart showing percentage of different bacteria grown on cell phones.

DISCUSSION

In this study our main aim was to isolate the bacteria which contaminate the cell phones of laboratory personnel as they are the ones who come in maximum contact of patient’s sample while processing them. This poses a potential health risk to them. Also it results in contamination of those zones in laboratory which are already sterile. The surface spread method is an easy and useful tool for detection of bacterial contamination of mobile phones.

Table : 1 Table showing number of bacteria and their percentage isolated from cell phones of laboratory personnel

TYPE OF ORGANISM	NUMBER (n=40)	PERCENTAGE (%)
Gram Positive Bacilli	27	67.5
Micrococci	3	7.5
E.coli	2	5
Enterobacter aerogenes	2	5
Coagulase Positive Staphylococcus species	2	5
Acinetobacter	1	2.5
Pseudomonas	1	2.5
Micrococci + Positive Bacilli	2	5

In our study 40 individuals participated and swab samples were taken from their cell phones after their verbal consent. All cell phones were contaminated with either single or mixed bacterial agents. However maximum number of isolates detected was aerobic Gram Positive Bacilli which account to 67.5% of the total samples. These bacilli are ubiquitous in nature, present in soil, dust, water and air and are also frequently isolated as contaminants in bacteriological culture media. Micrococcus which accounts for 7.5% are skin commensals usually not associated with human infections. E.coli(5%), S.aureus(5%),P. aeruginosa (2.5%) and Acinetobacter baumannii(2.5%)all form a part of ESKAPE pathogens which cause hospital acquired infections and are difficult to treat because of their multi drug resistance property. E. aerogenes(5%) has also gained increasing attention as a nosocomial pathogen during last 2 decades. They are commensals in skin, oral cavity and intestine. The carriage rate is much higher among hospital staff than community. Unhygienic practices and warm hospital environment (summers) promote colonization.

In a study done by Salim et al¹¹ Swab samples were collected from 40 mobile phones of patients and health care workers at the Alexandria University Students' Hospital. They were tested for their bacterial contamination. All of the tested mobile phones (100%) were contaminated with either single or mixed bacterial agents. The most prevalent bacterial contaminants were methicillin-resistant *S. aureus* and coagulase-negative staphylococci representing 53% and 50%, respectively. Similar results were reported by Tagoe et al.

A cross-sectional study was done by Shadi Zakai et al¹¹ in which they identified both pathogenic and non pathogenic bacteria on cell phones of 105 medical students at King Abdulaziz University, Jeddah, Saudi Arabia, using standard microbiological methods. Out of 105 cell phones screened, 101 (96.2%) were contaminated with bacteria. Coagulase-negative staphylococci were the most abundant isolates (68%). Seventeen (16.2%) cell phones were found to harbor *Staphylococcus aureus*. Gram-positive bacilli were isolated from 20 (19%) samples.

Badr et al⁷ conducted a cross-sectional study from February to March 2018 on 226 health professionals' mobile phones which were selected by a simple random sampling technique. The overall prevalence of mobile phone contamination with one or more bacteria was 94.2%. Coagulase-negative staphylococci (CoNS; 58.8%), *Staphylococcus aureus* (14.4%), and *Klebsiella* species (6.9%) were the most predominant bacterial isolates. They also put antimicrobial susceptibility tests and found the overall prevalence of multidrug-resistant bacteria as 69.9%. About half of Gram-positive and Gram-negative bacteria were resistant to ampicillin and trimethoprim-sulfamethoxazole. Male sex (adjusted odds ratio (AOR) 4.1, 95% confidence interval (CI) 1.1, 15.8) and the absence of regular phone cleaning/disinfecting were found to be the most significant factors (AOR 4.1, 95% CI 1.2, 13.5) associated with health care professionals' mobile

phone bacterial contamination in their study.

Chang CH et al⁹ conducted an observational cohort study on medical staffs working in the operating room who were asked to take bacterial cultures from their cell phones, anterior nares, and dominant hands. They identified the relation between cell phone contamination and bacterial colonization of the medical staff, genotyping of *Staphylococcus aureus* (SA) was done via *Staphylococcus* protein A gene (*spa*) typing and pulsed-field gel electrophoresis (PFGE). A total of 216 swab samples taken from 72 medical-staff members were analyzed. The culture-positive rate was 98.1% (212/216). In 59 (27.3%) samples, the bacteria were possible clinical pathogens. The anterior nares were the most common site of colonization by clinical pathogens (58.3%, 42/72), followed by cell phones (13.9%, 10/72) and the dominant hand (9.7%, 7/72). SA was the most commonly isolated clinical pathogen and was found in 43 (19.9%) samples. In 66 (94.3%) of the 70 staff members for whom bacteria were detected on their cell phones, the same bacteria were detected in nares or hand. Among 31 medical staff who were carriers of SA in the anterior nares or dominant hand, 8 (25.8%) were found to have SA on their cell phones, and genotyping confirmed the same SA strain in 7 (87.5%) of them.

However in our study most common contaminant was Gram Positive Bacteria as compared to other studies. It could be because of small sample size that the organisms we found were not variable. But we could definitely hypothesize that cell phones play a role in the spread of infectious agents among the laboratory personnel and thereby in the community.

CONCLUSION

- Restriction of cell phones is recommended in laboratory. When required, base phones can be used. Reasons for restriction are:
- I. Slightest distraction can lead to communication of wrong results to the patients.

- II. Potential carrier of harmful bacteria and can result in contamination in sterile zones in microbiological laboratories.
- III. Danger of fire or explosion in laboratory which may prove disastrous.
- IV. As the camera feature can be used to take pictures of sensitive documents or facilities and convey them to outside interested parties, security of laboratory data is must.

Due care should be taken when using phones especially during working hours. If needed, individual should keep the phone on their person, under their lab coat and only make or attend calls in emergency after removing gloves.

Hand hygiene must be followed before and after handling of phones to reduce risk of nosocomial infection. Adequate decontamination of phones by cleaning it with 70% Isopropyl Alcohol is one such process which could reduce the risk of cross contamination of bacteria and may prove beneficial in curtailing any potential disease transmission.

Lockers should be provided for safe custody of mobile phones along with other valuables for lab personnel.

REFERENCES

- 1. Selim HS, Abaza AF. Microbial contamination of mobile phones in a health care setting in Alexandria, Egypt. *GMS Hyg Infect Control*.2015;10:doc03:1-9 doi:10.3205/dgkh000246
- 2. S. Ettelt, E. Nolte, M. McKee, O.A. Haugen, I. Karlberg, N. Klazinga, et al.Evidence-based policy? The use of mobile phones in hospital. *J Pub Health*. 2006 ; 28(4):299-303.

- 3. K.A. Reynolds, P.M. Watt, S.A. Boone, C.P. Gerba Occurrence of bacteria and biochemical markers on public surfaces *Int J Environ Health Res*. 2005 ;15(3):225-34.
- 4. Tagoe DN, Gyande VK, Ansah EO. Bacterial Contamination of Mobile Phones: When Your Mobile Phone Could Transmit More Than Just a Call. *Webmed Central MICROBIOLOGY* 2011;2(10):WMC002294 doi:10.9754/journal.wmc.2011.002294
- 5. Singh A, Purohit B.Mobile phones in hospital settings: a serious threat to infection. *Occup Health Saf*. 2012 ; 81(3):42-4.
- 6. Angadi KM, Misra R, Gupta U, Jadhav S, Sardar M. Study of the role of mobile phones in the transmission of hospital acquired infections. *Medical Journal of Dr DY Patil University*. 2014;7(4):435.
- 7. Badr RI, Ibrahim Badr H, Ali NM. Mobile phones and nosocomial infections. *International Journal of Infection Control*. 2012;8(2):295.
- 8. Nwankwo EO, Ekwunife N, Mofolorunsho KC. Nosocomial pathogens associated with the mobile phones of healthcare workers in a hospital in Anyigba, Kogi state, Nigeria. *JEpidemiol Glob Health*. 2014;4(2):135–40.
- 9. Chang CH, Chen SY, Lu JJ, Chang CJ, Chang Y, Hsieh PH. Nasal colonization and bacterial contamination of mobile phones carried by medical staff in the operating room. *PLoS One*. 2017;12(5): e0175811 . <https://doi.org/10.1371/journal.pone.0175811>
- 10. Sepehri G, Talebizadeh N, Mirzazadeh A, Mir-shekari T-R, Sepehri E. Bacterial contamination and resistance to commonly used antimicrobials of healthcare workers' mobile phones in teaching hospitals, Kerman, Iran. *Am J Appl Sci*. 2009;6(5):806.
- 11. Zakai S, Mashat A, Abumohssin A, Samarkandi A, Almaghrabi B, Barradah H,et al. Bacterial contamination of cell phones of medical students at King Abdulaziz University, Jeddah, Saudi Arabia. *J Microsc Ultrastruct*. 2016;4:143-6. <http://www.jmau.org/text.asp?> 2016/4/3/143/224860.