

SCREENING OF MOBILE PHONES FOR THE PRESENCE OF MICROBES OF ORAL ORIGIN

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ABSTRACT

**Aim:** The objectives of this study are to determine the level of bacterial contamination of the mobile phones of dental personnel involved in direct patient care.

**Objective:** Mobile phones are a valuable feature of communication within hospitals, and since they are frequently handled by health-care personnel, while providing treatment for the patients, there may be a potential for contamination with various pathogens. The objective of this study was to determine the contamination of mobile phones (hospital issued and personal) carried by dental personnel.

**Background:** Transmission of microbes may happen by two ways - direct contact or indirect contact. Mobile phones come in close contact with the body and serve as a ready surface for colonization. This may cause infections in the individual as well as there might be cross-infection. The saliva also serves as the index to the microbes present in the body.

**Reason:** Mobile phones have become a basic need for everyday living. The mobile phones not only come into contact with the facial skin but also get contaminated by saliva and the touchscreen is handled multiple times a day which gives way for contamination of microbes from the hand. The health-care professionals use their mobile phones during the treatment of patients. This leads to contamination of mobile phones by the patient saliva and blood. This may pose as a severe threat for spread of infectious pathogens in the hospital environment.

**Keywords:** Mobile phones used in hospital, Mobile phone contamination, Cross infection.

INTRODUCTION

Nowadays, the use of cell phones becomes very important to devise for communication worldwide. Being luxurious and easy in handling, it is used by college students' doctors and hospital workers for emergency purpose or for fast communications. While using cell phones, there are chances of contaminations on cell phone and may be transferred from person to person. The constant handling of mobile phones by users in hospitals makes it an open breeding place for the transmission of micro-organisms, as well as health care associated infections. The health-care professionals use their mobile phones during the patient treatment, which in turn leads to accumulation of bacteria and even pathogenic viruses on the mobile phones. The mobiles may be contaminated by blood and saliva during the treatment. This same mobile phone used during the next patient treatment or phone call still may lead to spread of pathogenic diseases. Similarly, distribution of cell phones from one person to another person specially workers in hospitals make possible to spread of pathogenic organisms. Contamination may occur through direct contact by hands or spread by aerosol.

The previous studies conducted by Ramesh *et al.* have reported 45% contamination rate of mobile phones used by medical staff at Queen Elizabeth hospital, Barbados [1]. Singh *et al.* [2] reported that over 47% of immobile phones were contaminated with pathogenic microbes. Butz *et al.* [3] stated that immobile phones might carry pathogens as well; stationary phones in a daycare facility were contaminated with rotavirus Rusin *et al.* [4] documented that hand-to-mouth transfer of microbes after handling contaminated fomites during casual activities. The main aim of this study is to check the contamination of the cell phone, taking bacteria as an indicator.

METHODS

This study was conducted to check the contamination of mobile phones in health-care facility. Samples were collected with sterile swabs from

50 mobile phones of dental trainees at the Saveetha Dental College, Chennai. Each swab was the first moistened with sterile saline and was rotated over the surface of both sides of the mobile phone together with the keypad and non-touchscreen phones. They were screened for their bacterial contamination by culture. The swabs of the mobile phone were taken to microbiology lab and immediately streaked onto blood agar plates and MacConkey agar plates. The plates were then incubated for 24 hrs at 37°C aerobically. After incubation, the total colony forming units from the blood agar are counted and were tabulated to know about the bacterial load on the phones. MacConkey agar is used to differentiate and identify the lactose fermenting bacteria and the coliform bacteria.

RESULTS

In the study to check the contamination of mobile phones with pathogens, Swabs were taken from the mobile phones of the dental trainees at Saveetha Dental College and tested for bacteria. In the study group, swabs were taken randomly from the mobiles of 50 dental trainees. The results from blood agar showed a 92% contamination of the mobiles and the results from the MacConkey agar showed an 88% contamination.

The blood agar showed growth of Gram-positive bacilli such as *Staphylococcus* spp, *Streptococcus* spp, and *Bacillus*. The MacConkey Agar showed growth of coliform bacteria, *Escherichia coli*. Beta hemolytic streptococci, was seen in some of the samples.

DISCUSSION

In our study, 92% of the mobile phones of the health-care workers were found to be contaminated with micro-organisms known to be acquired from patients. The most common users were between the age groups of 20-30 years who was actively involved in the institution of health-care activities. The mean bacterial load on

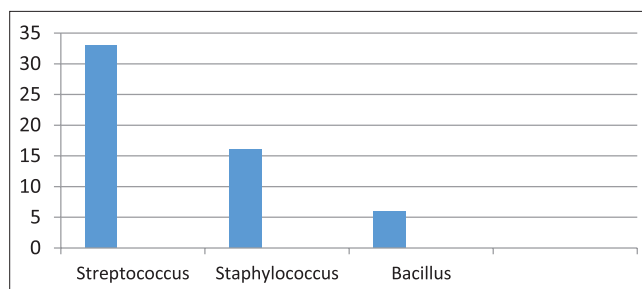


Fig. 1: Number of colonies

Table 1: Results

Number of mobile phones screened	Culture positive	Bacterial load (mean CFU)
50	46	53.1

CFU: Colony forming units

blood agar was 53.1. Out of 50 plates, 33 were found to have alpha hemolytic *Streptococcus* present in the patient saliva. 16 were found with coagulase negative *Staphylococcus* probably derived from the patient saliva and from the skin flora and 6 contained *Bacillus* species which is ubiquitous in nature.

These results suggested that close contact objects that were contaminated could serve as reservoirs of bacteria where could be easily transmitted from the mobile phone to the dental trainees hands. This leads to cross contamination and produce iatrogenic infections. Although in this study, the level of contamination on the cell phones was identified by demonstrating bacteria present in them. There is always an equal risk of virus being transmitted through the same route. During every phone call, the mobile phones come into close contact with strongly contaminated human body areas with hands to hands and hands to other areas (mouth, nose, and ears) [5]. Thus, mobile phone contamination can act as a source of infection outside the clinical setup also. Whoever handles this mobile phone are at risk of acquiring infection through contact with the phone. The problem of transmission of infection is less when fixed landline phones are used in the clinics.

*Streptococcus* can spread through airborne droplets when someone with the infection coughs or sneezes and can live on mobiles or other inanimate objects. You can also pick up the bacteria from a mobile or other surface and transfer them to your nose, mouth or eyes [6].

*Streptococcus* can be classified as alpha and beta haemolytic. In this study, many alpha haemolytic streptococci were isolated.

Most *Staphylococcus* can be transmitted from person to person. They can live on inanimate objects, hence making mobile phones a suitable place. The most common *Staphylococcus* is *Staphylococcus aureus*. *S. aureus* is carried by healthy people on the skin and nose. It can cause mild to serious infections if it enters the body through cuts, wounds, etc. It is a pathogen known to cause hospital-acquired infections [7]. The *Escherichia* seen in this study was *E. coli*. Some strains of *E. coli* can cause gastrointestinal infection.

Increased atmospheric bacterial contamination during routine dental activity has been assumed and scientifically established for some time and recent attempts to quantify this environmental hazard have shown the seriousness of this potential cross-contamination [8]. When suspended in an aqueous medium, bacteria rapidly associate with any available surface like mobile phones.

A contamination rate of 94.5% was reported by Ulger *et al.* in a study in Turkey [9]. In a Sri Lankan study, Gunasekhara has reported a contamination rate of 70% of mobile phones of anesthetists working

in the operation theaters [10]. Other studies in India have reported the presence of organisms in 72% and 95% of the mobile phones by Datta *et al.* [11] and Tambekar *et al.* [12], respectively.

The reason for contamination of mobile phones is mainly because the dental students used with their gloved hands, or using the mobile phones immediately after patient treatment without washing hands. Poor hygiene like not washing hands after fecal discharge and wound scratch leads to incorporation of these bacteria onto hands and nails and subsequent spread via mobile phones [13].

Developing active preventive strategies like routine decontamination of mobile phones with ethyl alcohol containing disinfectant materials might reduce cross-infection. Another way of reducing bacterial contaminations on mobile phones might be the use of antimicrobial additive materials [14]. We could easily avoid spreading bacterial infections just using regular cleansing agents and rearranging our environment. In the future, mobile phones could be produced using protective material against the bacterial contamination.

## CONCLUSION

Mobiles phones are an indispensable accessory for everyone, especially the health-care professionals where communication is made easy and fast. However, the fact that they can play a potential role in the spread of pathogens also needs to be kept in mind.

To prevent the spread of infections through mobile phones proper hygienic and sanitary methods of handling of mobile phones should be followed. Decontaminating the mobile phones is also important to prevent the spread of infectious diseases.

The use of mobile phones in the clinics can be restricted and alternatively fixed landline phones can be provided in all the clinics. This will definitely prevent the transfer of pathogens from the clinics to other places. This can help in preventing dissemination of hospital strains into the community.

## REFERENCES

1. Ramesh J, Carter AO, Campbell MH, Gibbons N, Powlett C, Moseley H Sr, *et al.* Use of mobile phones by medical staff at Queen Elizabeth hospital, Barbados: Evidence for both benefit and harm. *J Hosp Infect* 2008;70(2):160-5.
2. Singh S, Acharya S, Bhat M, Rao SK, Pentapati KC. Mobile phone hygiene: Potential risks posed by use in the clinics of an Indian dental school. *J Dent Educ* 2010;74:1153-8.
3. Butz AM, Fosarelli P, Dick J, Cusack T, Yolken R. Prevalence of rotavirus on high-risk fomites in day-care facilities. *Pediatrics* 1993;92(2):202-5.
4. Rusin P, Maxwell S, Gerba C. Comparative surface-to-hand and fingertip-to-mouth transfer efficiency of gram-positive bacteria, gram-negative bacteria, and phage. *J Appl Microbiol* 2002;93(4):585-92.
5. Brady RR, Fraser SF, Dunlop MG, Paterson-Brown S, Gibb AP. Bacterial contamination of mobile communication devices in the operative environment. *J Hosp Infect* 2007;66(4):397-8.
6. Elsevier Health Sciences. Dangerous Bacteria Found on Cell Phones of Hospital Patients. *Science Daily*; 2011. Available from: <http://www.sciencedaily.com/releases/2011/05/110531115416.htm>. [Last cited on 2014 Mar 22].
7. Venkatesh MP, Placencia F, Weisman LE. Coagulase-negative staphylococcal infections in the neonate and child: An update. In: *Seminars in Pediatric Infectious Diseases*. Oxford: Elsevier; p. 120-7.
8. Gashaw M, Abteu D, Addis Z. Prevalence and antimicrobial susceptibility pattern of bacteria isolated from mobile phones of health care professionals working in gondar town health centers. *ISRN Public Health* 2014;6:05074. Available from: <http://www.dx.doi.org/10.1155/2014/205074>.
9. Ulger F, Esen S, Dilek A, Yanik K, Gunaydin M, Leblebicioglu H. Are we aware how contaminated our mobile phones with nosocomial pathogens? *Ann Clin Microbiol Antimicrob* 2009;8:7.

10. Gunasekara TD, Kudavidanage BP, Peelawattage MK, Meedin F, Guruge LD, Nanayakkara G, *et al.* Bacterial contamination of anaesthetist hands, personal mobile phones and wrist watches used during theatre sessions. *Sri Lanka J Anaesthesiol* 2009;17(1):11-5.
11. Datta P, Rani H, Chander J, Gupta V. Bacterial contamination of mobile phones of health care workers. *Indian J Med Microbiol* 2009;27(3):279-81.
12. Tambekar DH, Gulhane PB, Dahikar SG, Dudhane MN. Nosocomial hazards of doctors mobile phones in hospitals *J Med Sci* 2008;8:73-6.
13. Tagoe DN, Gyande VK, Anshah EO. Bacterial contamination of mobile phones: When your mobile phone could transmit more than just a call. *Webmed Central Microbiol* 2011;2(10):WMC002294.
14. Jayalakshmi J, Appalaraju B, Usha S. Cellphones as reservoirs of nosocomial pathogens. *J Assoc Physicians India* 2008;56:388-9.