

## STUDY ON MICROBIAL CONTAMINATION OF MOBILE PHONES AND THEIR ROLE IN NOSOCOMIAL INFECTIONS IN A TERTIARY HOSPITAL OF SOUTH INDIA

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### ABSTRACT

**Introduction:** Mobile phones have become an essential accessory of our life in today's world. The study revealed the potential role of mobile phones in nosocomial infections.

**Objectives:** To screen the mobile phones of health-care personnel for microbial contamination in hospital.

**Methods:** A total of 100 swabs were collected from mobile phones of 40 resident doctors and 10 health-care personnel before and after use of disinfectant. Samples were processed, and identification was done as per standard laboratory procedures.

**Results:** Results revealed 92% bacterial contamination with monomicrobial or polymicrobial growth. Coagulase negative *Staphylococci* (29.59%) was the most predominant organism followed by Diphtheroids (22.44%). Other bacteria which were isolated *Staphylococcus aureus*, *Micrococci*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Citrobacter* spp. fungal growth included *Aspergillus niger* and *Candida albicans*. On the other hand, after using disinfectant, the contamination rate was reduced.

**Conclusion:** Mobile phones act as a carrier for transmission of both community acquired as well as hospital acquired infections. However, with the proper use of disinfectants, and proper hand hygiene practices it can be reduced.

**Keywords:** CONS (Coagulase-negative Staphylococci), S.aureus (*Staphylococcus aureus*), K.pneumoniae (*Klebsiella pneumoniae*).

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### INTRODUCTION

Nosocomial infections have increased rapidly with the rapidly growing era. Nowadays, mobile phones have become an indispensable accessory of everyone's life. These mobile phones could act as a reservoir of infection which may facilitate patient to patient transmission of microorganisms in hospital settings [1]. Extensively, the mobile phones are being used in hospital halls, laboratories, outpatient department, operation theatres, and various areas in the hospital. Hospital acquired infections are increasing as these may be spread through the hands of health-care personnel, use of stethoscope, and other daily instruments used by health-care personnel.

The widespread and careless use of mobile phones in the hospitals is a subject of controversy because though they might be very helpful in some cases to seek information; they act as a perfect habitat for microbes to breed and spread nosocomial infections. They have been described as "Technological Petri dishes" [2]. The use of mobile phones should be weighed against the risk of contamination and transmission of infections. The need of identifying their role in spreading infection is hence crucial so that preventive measures can be taken [3].

### Aim

The study was conducted with the aim to screen the mobile phones of health-care personnel for various bacteria and fungi with special reference to methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum beta lactamases (ESBL).

### METHODS

The cross-sectional study was carried out by sampling the mobile phones of 50 health-care personnel categorized into doctors (n=40), nurses (n=10) in a tertiary care hospital of South India. After getting ethical approval from the institute and informed consent of the health-

care workers, sterile swabs moistened with sterile saline were used to swab various surfaces over the mobile phones. The mobile phones of 50 doctors and health-care workers were taken. Sterile swabs moistened with sterile saline were used to collect the specimen. One of the swabs was used for carrying out aerobic culture on 5% sheep blood agar, MacConkey agar, and chocolate agar and incubated at 37°C for 48 hrs. The second swab was used for fungal culture and inoculated onto Sabourauds dextrose agar with chloramphenicol and incubated at 37°C. The mobile phones were disinfected with disinfectant phone wipes (active ingredient-sodium hypochlorite), and swabs were taken again to make a comparative study on the microbial contamination before and after disinfection of the phone. Organisms isolated were identified using standard laboratory procedures [3,4,5].

Antibiotic sensitivity testing was performed on Mueller-Hinton agar according to the Clinical and Laboratory Standards Institute guidelines. MRSA was detected using cefoxitin (30 µg) disc. Moreover, ESBL production in Gram-negative bacteria was detected using potentiated disc diffusion test [6].

### RESULTS

Out of the 50 samples collected, 46 (92%) showed bacterial growth with one or more colonies. Following disinfection, no growth was detected in 83% of the samples, indicating that using proper disinfection methods, the transmission of infection via mobile phone contamination can be reduced significantly. Out of 100 isolates, 95 isolates showed bacterial growth and 3 isolates showed fungal growth. Out of these 95 bacterial growths, 12 were monobacterial, 29 showed the presence of two bacteria, and 7 showed polybacterial growth.

Fungal isolates showed growth of one organism only. Out of 3 fungal isolates, 2 (2.04%) showed growth of *Aspergillus niger* and 1 (1.02%) isolate showed *Candida albicans* as shown in Table 1.

**Table 1: Total number of bacterial and fungal isolates**

Bacterial and fungal isolates	Number (%)
Coagulase negative <i>Staphylococci</i>	29 (30.5)
<i>Diphtheroids</i>	22 (23.5)
<i>S. aureus</i>	17 (17.8)
<i>Micrococci</i>	13 (13.6)
<i>E. coli</i>	6 (6.3)
<i>K. pneumoniae</i>	3 (3.1)
<i>P. aeruginosa</i>	3 (3.1)
<i>Citrobacter spp.</i>	2 (2.1)
<i>A. niger</i>	2 (2.1)
<i>C. albicans</i>	1 (1.1)

*S. aureus*: *Staphylococcus aureus*, *E. coli*: *Escherichia coli*, *K. pneumoniae*: *Klebsiella pneumoniae*, *P. aeruginosa*: *Pseudomonas aeruginosa*, *A. niger*: *Aspergillus niger*, *C. albicans*: *Candida albicans*

Further antibiotic susceptibility testing showed that out of 17 isolates of *S. aureus*, 5 (29.4%) isolates were MRSA and out of 11 isolates of *Enterobacteriaceae*, 1 (9.1%) was ESBL producer.

### DISCUSSION

The results show that the mobile phones harbor a number of pathogenic bacteria including MRSA and are hence a potential threat in spreading nosocomial infections. Our study revealed that the contamination rate carried by the mobile phone devices is too high by the health personnel in hospitals. This study showed 92% rate of contamination in the mobile phones of health personnel as compared to other studies Brady *et al.* [7] 89.7%, Ulger *et al.* [8] 94.5%, Elkholy and Ewees [3] 96.5% showed contamination by bacteria.

In this study, it was reported that the majority of health personnel showed polymicrobial growth, i.e., 12.6% were monomicrobial, 30.5% showed growth of two bacteria and 7.36% had growth of three or more bacteria on their mobile phones which were correlated with the study of Chawla *et al.* which stated 40% mobile phones with two types of organisms, 27.5% showed the presence of three or more types of organisms and 25% were monomicrobial [9].

The most common bacteria isolated was coagulase negative *Staphylococcus* (30.5%) and diphtheroids (23.5%) being the second common which was correlated with other studies like Ulger *et al.* [8] 68.4%, Karabay and Kocoglu [10] 60% and Killiac *et al.* [11] 58.96%, which showed coagulase negative *Staphylococci* as the predominant bacteria isolated from the mobile phones.

MRSA was isolated from (29.4%) cases in this study which was correlating with the study of Badr *et al.* [12] where 31% cases were MRSA and Pal *et al.* [13] where 21.05% were MRSA.

ESBL was isolated from 9.1% cases in this study.

### CONCLUSION

Since restrictions on the use of mobile phones by health personnel in hospitals are not a practical solution, we suggest that health-care personnel should practice increased adherence to infection control precautions such as hand hygiene. Hand washing after or before attending a call is to be recommended strictly. The use of headset or earset during hospital hours might be a good alternative using handset. In addition, it should be informed that these devices may be a source for transmission of hospital-acquired infections. Further studies for the possible methods of decontamination of mobile phones, such as using alcohol and/or disinfection tissues, should be conducted in hospitals with more intensive care units and larger bed capacities.

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