

# A Prospective Study on the Contamination of Mobile Phones among Health care Workers in a Tertiary Health-care Setup

V. P. Sarasu<sup>1</sup>, K. Girija<sup>2</sup>, P. Hema Suganya<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Microbiology, Government Medical College and Hospital, Pudukkottai, Tamil Nadu, India, <sup>2</sup>Assistant Professor, Department of Microbiology, Government Thiruvavur Medical College, Thiruvavur, Tamil Nadu, India, <sup>3</sup>Tutor, Department of Microbiology, Government Medical College and Hospital, Pudukkottai, Tamil Nadu, India

## Abstract

**Background:** Mobile phones (MPs) are extensively used by health care workers (HCWs) in tertiary health-care centers for faster communication. Studies in the past have revealed that MPs were invariably contaminated with microorganisms and often go disinfected. The objective of our study was to find out the percentage of MPs of our health-care personnel contaminated with microorganisms and also to find out the microbial profile of such contaminated MPs.

**Materials and Methods:** On a random day, swabs from MPs of about 100 randomly chosen HCWs working in Government Medical College and Hospital, Pudukkottai, were collected for culture. The collected samples were cultured under strict laboratory conditions, the microorganisms grown were identified, and compilation of the microbial profile was done.

**Results:** Among 100 HCWs, MPs of 70 subjects were found to be contaminated. Out of the 70 contaminated MPs, only one had been contaminated with multiple microorganisms, while the remaining 69 MPs were contaminated with only one microorganism. The most common contamination was found to be coagulase-negative *Staphylococcus*, while the least common organisms were *Pseudomonas aeruginosa* and *Enterococcus*, with one contamination each.

**Conclusion:** Infection seen in about 70% of MPs is quite an alarming number. If proper measures to disinfect the MPs are not taken, then it might lead to increased number of infections among HCWs. Hence, we conclude that disinfection of MPs must be made mandatory both while entering and leaving a health-care setup.

**Key words:** Contamination, Health care workers, Mobile phones

## INTRODUCTION

Mobile phones (MPs) and mobile hand-held devices (MHDs) help accelerate in-hospital flow of medical information and information sharing and querying, and contribute to communications in the event of emergencies through their application and access to wireless media technology.<sup>[1,2]</sup> As technology in this area has evolved, MHDs that provide laboratory and imaging results, patient data, and photographic images are being used by

physicians during bedside rounds to engage clinicians, residents, and students. Health care workers (HCWs) access pharmaceutical knowledge and literature by MPs and MHDs, which facilitates learning and clinical performance.<sup>[3,4]</sup>

However, the MP, which we often carry in our pocket and hold with clean or dirty hands, can lead to potential risks, such as noise, distractions, loss of concentration, data safety, disturbance of patient privacy, and transfer of microorganisms possibly leading to nosocomial infections.<sup>[5,6]</sup>

The infection potential of telephones was first suggested by Aronson in 1977.<sup>[7]</sup> Then, in 1978, Cozanitis reported that telephones could pose a risk of transmitting infections within the intensive care unit.<sup>[8]</sup>

White-Raffery published study on telephones as a potential source of infection in the early 1980s.<sup>[9,10]</sup> Health care-

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**Corresponding Author:** K. Girija, Department of Microbiology, Government Thiruvavur Medical College, Thiruvavur, Tamil Nadu, India.

associated infection (HAI) is a leading cause of morbidity and mortality among patients in health-care facilities and cause significant financial burden on the state. HCWs are routinely contaminated by pathogens. MPs in the past decade and a half have emerged as a potential source of HAI.<sup>[11]</sup>

MPs are used at every possible place, home, kitchen, washroom, and market place exposing them to different types of microorganisms. They are rarely cleaned being electronic gadgets. There are reports of colonization of bacteria on cell phones exposing our patients to nosocomial infections through contact.<sup>[12]</sup>

### Aims and Objectives

The objective of our study was to find out the percentage of MPs of our health-care personnel contaminated with microorganisms and also to find out the microbial profile of such contaminated MPs.

## MATERIALS AND METHODS

This was a case cross-sectional study carried out in the Department of Microbiology, Government Medical College and Hospital, Pudukkottai, Tamil Nadu, India.

### Study Population

The study was conducted on December 24, 2019. A total of 100 HCWs who carry and utilize their personal MPs in the hospital premises were enrolled for the study. HCWs included doctors, staff nurses, and paramedical students from different medical specialties and units. Informed written consent was obtained from each participant before the start of the study. Subject selection was made on a random basis.

### Sampling Technique

Samples were collected aseptically with sterile swabs moistened with sterile normal saline and by rolling over the exposed surfaces of the MPs. Maximum care was taken to ensure that all the buttons of the keypad, screen, mouthpiece, earpiece, sides, and back of the mobiles were properly swabbed since these areas are the most frequent spots, in contact with the fingers. The samples were labeled and safely transported to the Microbiology Laboratory of Government Medical College, Pudukkottai, for culture, analysis, and identification of different microorganisms.

All laboratory analyses were done within 1 h of sample collection. The swabs collected were directly inoculated on blood agar and nutrient agar. The pair of inoculated media was incubated aerobically at 37°C for 24 h and then examined for bacterial growth according to standard

protocol (Cheesbrough, 2012). The isolated bacteria were identified by colony characteristics and Gram staining, and by testing for catalase, coagulase, and bile esculin hydrolysis for Gram-positive bacteria. Other biochemical tests included oxidase, indole production, citrate utilization and urease activity, triple sugar iron agar tests, and motility for Gram-negative bacteria.

## OBSERVATION AND RESULTS

As given in Table 1, we found that no microbial growth was seen in 30 samples, coagulase-negative *Staphylococcus* (CoNS) was the most common contamination accounting for 27% of contaminations. Methicillin-resistant *Staphylococcus aureus* (MRSA) was seen in two swabs, methicillin-sensitive *Staphylococcus aureus* (MSSA) was seen in seven samples. *Klebsiella pneumoniae* and *Bacillus* contaminations were found in nine MPs each. *Acinetobacter* was found in three MPs and *Micrococcus* was the second most common contamination found in 12 samples. *Pseudomonas aeruginosa* and *Enterococcus* contaminations were the least common ones with each contaminating one MP. This is depicted in Figure 1.

Table 2 shows the percentage of single and multiple contaminations. About 99% of MPs in our study were contaminated by only single microorganism, while only 1% was contaminated by multiple microorganisms. It was contaminated by both *Klebsiella pneumoniae* and CoNS. This is depicted in Figure 2.

**Table 1: Microbial profile**

S. No.	Microorganism	No. of samples in which the organism was present	Percentage
1.	Methicillin-resistant <i>Staphylococcus aureus</i>	2	2
2.	Methicillin-sensitive <i>Staphylococcus aureus</i>	7	7
3.	<i>Klebsiella pneumoniae</i>	9	9
4.	<i>Pseudomonas aeruginosa</i>	1	1
5.	<i>Acinetobacter</i>	3	3
6.	<i>Enterococcus</i>	1	1
7.	<i>Micrococcus</i>	12	12
8.	<i>Bacillus</i>	9	9
9.	Coagulase-negative <i>Staphylococcus</i>	27	27
10.	No growth	30	30

**Table 2: Single and multiple contaminations**

S. No.	Contamination	Number of mobile phones	Percentage
1.	Single contamination	99	99
2.	Multiple contaminations	1	1

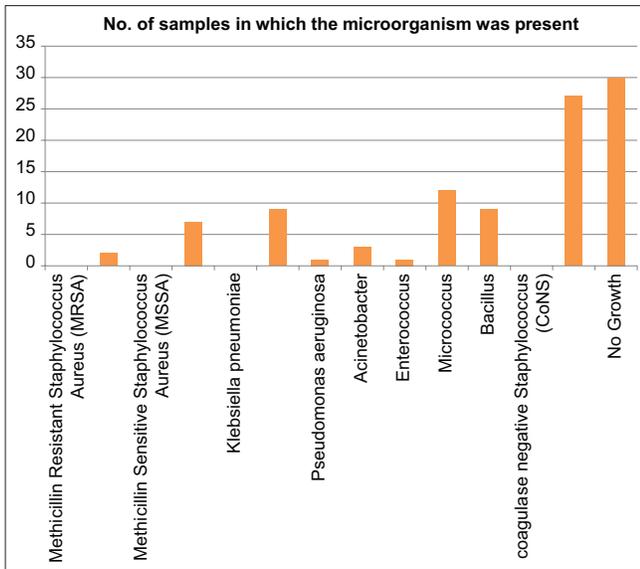


Figure 1: Microbial profile

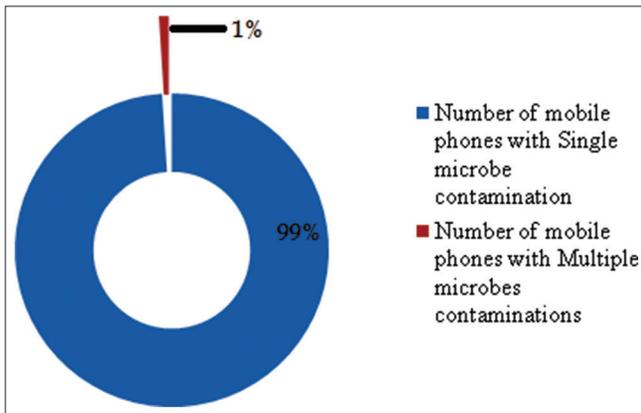


Figure 2: Single and multiple contaminations

## DISCUSSION

In this modern world of technology, MP is a part of our day-to-day life. It has become practically impossible to live without this device. We tend to carry the MPs to almost everywhere in a health-care set up barring a few places such as operation theatres. Hence, the risk of contamination and transmission of pathogens are tremendous. Therefore, we decided to carry out this study to find out the percentage of MPs of HCWs contaminated with microbes and also to find out the microbial profile of such contaminations.

Out of the 100 samples collected from MPs of 100 HCWs, about 70% of samples were found to be contaminated with microbes. This percentage was less when compared to a study done by Siddiqui *et al.* whose study revealed that 92% of samples were contaminated.<sup>[13]</sup>

Among the microbes to contaminate the MPs in our study, CoNS accounted for the most common contamination with

27%. Our results are in accordance with the study done by Brady *et al.* which revealed CoNS to be the most common microorganism isolated from MP swabs.<sup>[6]</sup>

MRSA was seen in 2% of swabs which is comparable to the results of study by Brady *et al.*<sup>[6]</sup> which revealed a 2–10% contamination by MRSA.

MSSA was seen in seven out of 100 samples. A study by Morubagal *et al.* revealed that MSSA was seen in 16.64% of samples,<sup>[14]</sup> while in our study, it was less and found to be only 7%.

Acinetobacter was found in swabs collected from three MPs accounting for 3%. This is similar to review by Brady *et al.*<sup>[6]</sup> who quoted 1–12%. Pal *et al.*<sup>[15]</sup> have found Acinetobacter to be occurring at 5.93% which is slightly higher than our findings.

In our study, we isolated microorganisms such as *P. aeruginosa* and *Klebsiella pneumoniae*, and *Enterococcus faecalis*. This is similar to a study done by Akinyemi *et al.*<sup>[5]</sup> In our study, *P. aeruginosa* and *Enterococcus* contaminations were the least common ones with each contaminating one MP accounting for 1% each. *P. aeruginosa* was found in only 1% of our samples, this is contrary to results of study by Pal *et al.*<sup>[15]</sup> which revealed *P. aeruginosa* to be present in 6.67% swabs which is higher than that of our findings. *Klebsiella pneumoniae* contamination was found in nine MPs accounting for 9%, this is higher than the 4% found in the study done by Ramesh *et al.*<sup>[2]</sup> In our study, we found out that *Bacillus* contamination was also found in 9% of MPs.

Micrococcus was the second most common microorganism in our study, contaminating about 12% of MPs, this is higher than the findings from a study done by Siddiqui *et al.* which showed that combined contaminations including aerobic spore-bearing Gram-positive rods, *Moraxella* species, and micrococci accounted for only 2.5%.<sup>[13]</sup>

## CONCLUSION

Contamination of MPs has reached alarming levels. We recommend all HCWs to disinfect their MPs both while entering the health-care facility and also while leaving the facility. Our study has a small sample size, nonetheless, it throws light on the fact that enormous number of mobiles phones used by HCWs is contaminated. Studies involving larger samples would give us further insight into the problem.

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