

MOBILE PHONES AND HANDS OF HEALTHCARE AND SANITATION WORKERS: OVERLOOKED RESERVOIRS OF GRAM-POSITIVE COCCI AND A POTENTIAL SOURCE OF INFECTIONS

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Abstract

Background: Mobile phones are widely used by healthcare professionals and sanitation workers during hospital duties, often without proper disinfection. These devices may act as reservoirs for microbial pathogens, contributing to nosocomial infections through cross-contamination. **Materials and Methods:** A cross-sectional study was conducted involving 25 hospital staff members, healthcare workers and sanitation workers. Swabs were collected from the dominant hand and mobile phone surfaces of each participant and cultured using standard microbiological techniques. Isolates were identified and analyzed for frequency and species diversity. **Results:** All samples showed growth of 2–3 species of coagulase-negative staphylococci (CoNS), with *Staphylococcus epidermidis* (84%) and *S. auricularis* (64%) being most common. One case of *Staphylococcus aureus* was found on both hand and phone. No participant reported disinfecting their phones. **Conclusion:** Widespread CoNS contamination on hands and phones highlights the need for improved hand hygiene and regular device disinfection to prevent cross-contamination in healthcare settings.

Keywords: Mobile phones, Healthcare workers, Coagulase-negative staphylococci, *Staphylococcus aureus*, Nosocomial infections

INTRODUCTION

Mobile phones are widely used in healthcare settings for clinical communication and patient management. However, they have emerged as potential fomites, capable of harboring and transmitting microorganisms. This study investigated microbial contamination on the hands and mobile phones of healthcare and sanitation workers in a hospital setting. Twenty-five paired hand and mobile phone swabs were analyzed. The predominant isolates included Gram-positive cocci in clusters (GPCC), mainly coagulase-negative staphylococci (CoNS) such as *Staphylococcus epidermidis* and *Staphylococcus auricularis*. One case of *Staphylococcus aureus* was isolated from both hands and mobile phone of the same individual. These findings support the hypothesis that mobile phones may serve as "Trojan Horses" for microbial transmission, highlighting the urgent need for disinfection policies in healthcare institutions. Mobile phones are indispensable tools for communication, especially in healthcare settings, where they are often used during clinical duties. However, they have been increasingly recognized as potential fomites capable of harboring and transmitting nosocomial pathogens.^{1,2} In hospital environments, the risk of microbial contamination is compounded by high-touch surfaces and inadequate hand hygiene practices, creating favorable conditions for the colonization of potentially pathogenic microorganisms on both hands and devices.^{3,4} Previous studies have demonstrated that healthcare workers rarely disinfect their mobile phones, despite the fact that these devices are frequently used even in sterile areas such as operating theatres and intensive care units.^{5,6} The risk is not limited to pathogenic bacteria alone; even normal skin flora such as coagulase-negative staphylococci (CoNS) including *Staphylococcus epidermidis* and *Staphylococcus auricularis*, may act as opportunistic pathogens in immunocompromised or hospitalized individuals.⁷

The growing body of evidence points to mobile phones acting as reservoirs for drug-resistant organisms and viruses, thereby raising concerns about cross-contamination between patients, healthcare staff, and the hospital environment.^{8,9} In this context, the present study was undertaken to evaluate the extent of microbial contamination on the hands and mobile phones of healthcare and sanitation workers in a tertiary care hospital, aiming to assess the potential for infection transmission and the need for preventive interventions.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Microbiology Department of a tertiary care hospital in North India, aimed at assessing microbial contamination on the hands and mobile phones of healthcare and sanitation workers. Sterile cotton swabs moistened with normal saline were used to collect samples from the hands (including palms, fingertips, and interdigital spaces) and mobile phones of participants. In addition, direct fingertip cultures were performed from both the dominant and non-dominant hands by gently pressing the fingertips onto blood agar plates. All samples were collected at the end of the duty shift, prior to any hand washing or hand hygiene practices, to capture the maximum microbial load. Swabs and fingertip cultures were inoculated onto blood agar and MacConkey agar and incubated aerobically at 37°C for 24–48 hours. Isolates were identified using standard microbiological methods including Gram staining, catalase, and coagulase testing. Further identification of coagulase-negative staphylococci (CoNS) species was performed using biochemical profiles. Final confirmation and identification of isolates were done using the BD BACTEC™ FX system.

RESULTS

A total of 25 staff members participated in the study, including both healthcare workers and hospital sanitation staff. All

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participants reported regular use of their mobile phones during duty hours, with none practicing routine disinfection of their devices.

Microbiological Findings

Every hand and mobile phone sample yielded growth of 2–3 species of Gram-positive cocci in clusters (GPCC), predominantly coagulase-negative staphylococci (CoNS). Direct fingertip cultures from both dominant and non-dominant hands showed consistently higher bacterial growth in the dominant hand, both in terms of colony counts and species diversity. In addition to CoNS, occasional isolates of *Micrococcus* spp. and *Bacillus* spp. were recovered. One *Staphylococcus aureus* isolate was identified as methicillin-resistant (MRSA).

Table 1. Distribution of microbial isolates

Organism	Number of participants	Percentage (%)
<i>Staphylococcus epidermidis</i>	21	84%
<i>Staphylococcus auricularis</i>	16	64%
<i>Staphylococcus haemolyticus</i>	13	52%
<i>Staphylococcus hominis</i>	10	40%
<i>Staphylococcus capitis</i>	7	28%
<i>Staphylococcus warneri</i>	5	20%
<i>Staphylococcus saprophyticus</i>	3	12%
<i>Staphylococcus aureus</i> (MRSA)	1 (on both hand and phone)	4%
<i>Micrococcus</i> spp.	4	16%
<i>Bacillus</i> spp.	2	8%

- All participants had at least 2–3 species of GPCC/CoNS isolated from both hand and mobile phone samples.
- The same bacterial flora on hands and mobile surfaces suggests probable cross-contamination.
- The dominant hand consistently harbored a higher microbial load compared to the non-dominant hand.

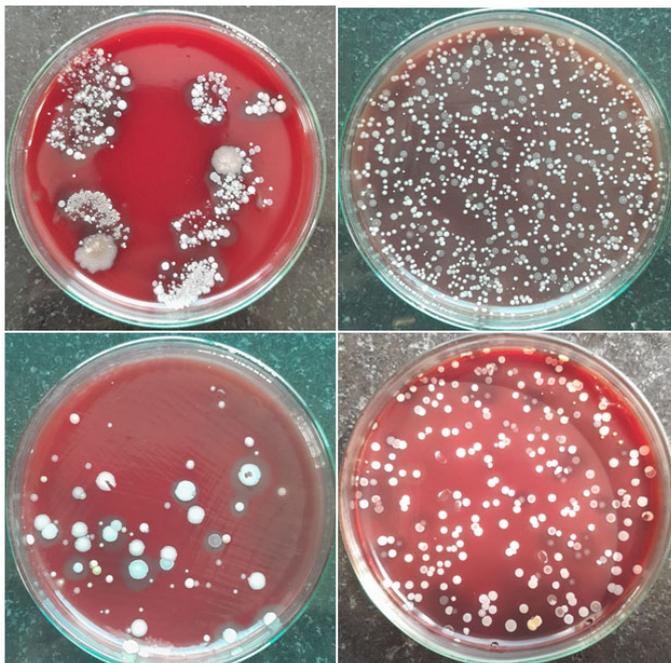


Figure 1. Culture plate showing different type of colonies on agar plate

DISCUSSION

The findings of our study corroborate previous literature that mobile phones and hands of healthcare workers are frequently colonized by various microorganisms.^{1,3} Coagulase-negative staphylococci (CoNS), particularly *Staphylococcus epidermidis* and *Staphylococcus auricularis*, were the most frequently isolated organisms in our study, consistent with earlier reports highlighting their prevalence in both community and hospital environments.^{4,7} Importantly, *Staphylococcus aureus*, a known pathogen associated with nosocomial infections, was isolated from both the hands and phone of one healthcare worker, raising concern for potential transmission to patients, especially those in high-risk units.^{2,6} Similar findings have been observed by Ulger et al. and Brady et al., who documented the presence of *S. aureus* and other nosocomial organisms on mobile phones used in healthcare settings.^{2,5} The absence of routine disinfection practices among participants emphasizes a critical gap in infection control measures. Several studies recommend regular disinfection of mobile devices and proper hand hygiene to minimize the risk of cross-contamination.^{6,8,9} Moreover, the presence of similar organisms on both hands and phones supports the hypothesis that mobile phones can act as intermediaries in the chain of infection, facilitating microbial transfer within clinical areas.^{1,3,6} These findings underscore the urgent need to incorporate mobile phone hygiene into routine infection prevention protocols. Educational interventions, regular audits, and provision of alcohol-based wipes or UV sanitation devices could significantly reduce microbial load on these devices.⁹ Further studies with larger sample sizes and molecular typing can offer deeper insights into the exact transmission dynamics and clonal relationships between isolates from hands, phones, and patients.

Conclusion

Mobile phones and hands of healthcare and sanitation workers were significantly contaminated with Gram-positive cocci, predominantly CoNS species such as *Staphylococcus epidermidis* and *Staphylococcus auricularis*. In one case, *Staphylococcus aureus* was recovered from both phone and hands, suggesting a direct transmission risk. These findings support the growing consensus that mobile phones are neglected fomites and potential contributors to nosocomial infections. The routine disinfection of mobile phones and the development of hospital-wide mobile device hygiene protocols are urgently needed to mitigate the risk of healthcare-associated infections.

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