



MICROBIOLOGICAL PROFILE OF SIGNIFICANT PATHOGENIC BACTERIA PRESENT ON MOBILE PHONES OF HEALTHCARE WORKERS THAT CAUSE NOSOCOMIAL INFECTION

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ABSTRACT

Background: Mobile phones of HCWs play an important role in transmission of infection to patients and also to the health care workers, which can increase the burden of health care. We planned this study to identify the microbiological profile of significant pathogenic bacteria present on mobile phones of healthcare workers that cause nosocomial infection and also to assess the usefulness of 70% isopropyl alcohol for decontamination of mobile phones. **Methods:** 50 Healthcare workers were included in this study. 50 samples were collected before decontamination and 50 samples were collected after decontaminated with 70% isopropyl alcohol. Totally 100 samples collected. Samples were inoculated in the brain heart infusion broth and incubated at 37°C for 24-48 hours. Samples showing growth were further subcultured on Blood agar and MacConkey agar. The plates were then incubated at 37°C for 24 hours and observed for the growth. Different biochemical tests were used for further identification. Antimicrobial susceptibility test was done according to the Clinical Laboratory Standards Institute guidelines using the Kirby-Bauer disc diffusion method. **Results:** Among the 50 healthcare workers, 38 healthcare workers mobile phones were contaminated before decontamination. After decontamination, 12 healthcare workers mobile phone were contaminated.

KEYWORDS : Mobile phone, Contamination, Health care worker.

INTRODUCTION

Mobile phones are essential in everyday life and are carried everywhere and at all times. They can be vehicles for transmitting pathogens to patients. The handling of mobile communication devices with unwashed hands / and / or there seldom cleaning can aggravate potential health risks. This study highlights mobile phones as a potential threat in infection control practices and could exaggerate rate of healthcare - associated infections. Mobile phones were found to carry these bacteria because count of these bacteria increases in high temperature and our phones are ideal breeding sites for these microbes as they are kept warm and snug in our pockets and handbags. Mobile phones are challenging to disinfect without damaging the device.

Hospital acquired infections are a problem in both developed and developing countries despite overall progress. Use of the same mobile phones both inside and outside of hospitals, help to spill out notorious multidrug resistant bacteria of hospital environment in the community. Drug resistant pathogens such as *Staphylococcus aureus* which are resistant to methicillin (MRSA), and other bacteria which belong to Gram negative group like *Escherichia coli*, *Pseudomonas*, *Clostridium difficile*, Vancomycin resistant *Enterococci*, *Streptococcus* families etc, are raising important safety concerns over the use of such devices in clinical areas.

Attempting to avoid nosocomial infections, it is worth studying and identifying pathogens on mobile phones to improve the quality of healthcare. 70% isopropyl alcohol solution penetrate the cell wall more completely which permeates the entire cell, coagulates all proteins, and therefore the microorganism dies. Extra water content slows evaporation, therefore increasing surface contact time and enhancing effectiveness. To address this issue, this study will be undertaken to investigate bacterial contamination of the

mobile phones of the healthcare workers employed in a tertiary care hospital and also to assess the usefulness of simple cleaning with 70% isopropyl alcohol for their decontamination.

AIMS AND OBJECTIVES

1. To determine the incidence of bacterial colonization on the mobile phones used by Health care workers (HCWs).
2. To assess the antibiotic sensitivity pattern of the bacterial isolates from the mobile phones.
3. To assess the usefulness of simple cleaning with 70% isopropyl alcohol for their decontamination.

MATERIALS AND METHODS

This prospective study was conducted at Madurai medical college, Government Rajaji Hospital, Madurai. Ethical committee approval was obtained. 50 healthcare workers were included in this study. 50 samples before decontamination and 50 samples after decontamination, totally 100 samples were collected. Samples were collected from mobile phones of Doctors, Nurses, Laboratory technicians, nursing assistants and hospital workers of Madurai medical college, Government Rajaji hospital. The sides, screens and back of the phones were swabbed two times for culture, before decontamination and after cleaning with 70% isopropyl alcohol. The collected samples were inoculated in brain heart infusion broth and incubated at 37°C for 24-48 hrs. Samples showing growth were further subcultured on Blood agar and MacConkey agar. The plates were then incubated at 37°C for 24 hours and observed for the growth. Primary isolation of bacteria was made based on their colony characteristics and Gram stain reaction microscopically. Different biochemical tests like catalase, oxidase, indole, citrae, urease, triple sugar iron agar, motility, methyl red, Voges-Proskauer and coagulase were used for further identification. Antimicrobial susceptibility test was

done according to the Clinical Laboratory Institute² guidelines using the Kirby-Bauer disc diffusion method.

RESULTS

In total, 50 HCWs, 10 male and 5 female totally 15 doctors, 8 male and 7 female totally 15 nurses, 5 male and 5 female totally 10 nursing assistants, 3 male and 2 female totally 5 laboratory technicians, 3 male and 2 female totally 5 sanitary workers samples were collected before decontamination and after decontamination.

TABLE 1: Distribution of contaminated mobile phones among healthcare workers before decontamination:

Health care workers	No of contaminated mobile phones		Total
	Male	Female	
Doctors N=15	8	4	12 (80%)
Nurses N=15	8	3	11 (73.3)
Nursing assistants N=10	4	3	7 (70%)
Laboratory technicians N=5	3	2	5 (100%)
Sanitary workers N=5	2	1	3 (60%)
Total	25 (86.2%)	13 (61.9%)	38 (76%)

Distribution of contaminated mobile phones among healthcare workers before decontamination

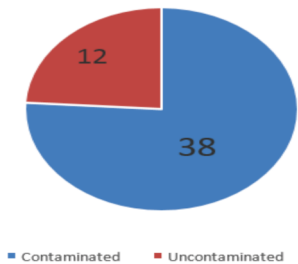


Figure 1: Distribution of contaminated mobile phones before decontamination

Table 1 and figure 1 shows, Of the total of 50 samples from mobile phones of healthcare workers before decontamination, 38 (76%) were found to be contaminated with bacteria. Among the 38 contaminated mobile phones male healthcare workers mobile phones are contaminated more 25 (86.2%), Mobile phones of laboratory technicians were contaminated 5 (100%).

TABLE 2: Types of bacteria isolated from mobile phones of Healthcare workers before decontamination:

Bacteria found in Mobile phones	Doctors N=15	Nurses N=15	Nursing assistants N=10	Laboratory technicians N=5	Sanitary workers N=5	Total
Coagulase negative Staphylococcus	8	7	4	2	1	22 (58%)
Staphylococcus aureus	1	1	1	2	0	5 (13.1%)
Klebsiella species	1	1	1	0	2	5 (13.1%)
Acinetobacter species	0	1	1	1	0	3 (7.9%)
Escherichia coli	1	1	0	0	0	2 (5.3%)

Pseudomonas aeruginosa	1	0	0	0	0	1 (2.6%)
Total	12 (31.6%)	11 (28.9%)	7 (18.4%)	5 (13.2%)	3 (7.9%)	38 (100%)

Table 2 shows most commonly isolated bacteria was Coagulase negative Staphylococcus 22 (58%), followed by Staphylococcus aureus and Klebsiella species 5 (13.1%) each.

TABLE 3: Distribution of contaminated mobile phones among healthcare workers after decontamination:

Healthcare workers	No of contaminated mobile phones		Total
	Male	Female	
Doctors N=15	3	1	4
Nurses N=15	2	1	3
Nursing assistants N=10	2	1	3
Laboratory technicians N=5		1	1
Sanitary workers N=5	1		1
Total=50	8	4	12

Distribution of contaminated mobile phones among healthcare workers after decontamination

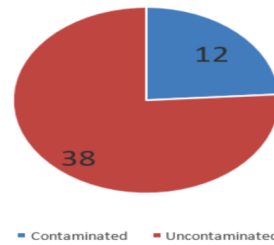


Figure 2: Distribution of contaminated mobile phones among healthcare workers after decontamination

Table 3 and figure 2 shows, of the total of 50 samples collected after decontamination with 70% isopropyl alcohol, 8 male and 4 female, totally 12 healthcare workers mobile phones were only contaminated. The contamination rate was reduced.

Antimicrobial susceptibility testing:

In the present study, CoNs were susceptible to ceftriaxone, ciprofloxacin and gentamicin while it was resistant to trimethoprim-sulfamethoxazole and ampicillin. Acinetobacter and pseudomonas aeruginosa showed the highest level of resistance, where all isolates were resistant to ampicillin, trimethoprim-sulfamethoxazole, erythromycin and amoxicillin-clavulanate.

DISCUSSION:

Total number of healthcare workers in this study were 50. Before decontamination, number of mobile phones contaminated were 76%. Contamination rate was less than that of the studies by Bhat SS et al (99%)³ In this study, Males were 58% and females were 42%. Mobile phones of male healthcare workers were more contaminated (86.2%) than females (61.9%). In the study by Kokate et al¹, contamination of mobile phones of male healthcare workers was more than females.

Results from this study showed 100% of the mobile phones belonging to laboratory technicians were contaminated whereas only 80% of doctors possessed contaminated mobile phones. Same result was observed by Tambe N.N et al⁴. Direct exposure to body fluids, tissues etc, consisting of different pathogenic organisms might be the reasons of higher contamination rate in laboratory technicians.

In the present study, Coagulase negative staphylococcus was the main organism isolated (58%). In contrast, studies

conducted by Datta P et al⁵ revealed that *Staphylococcus aureus* was the predominant organism. Though, CoNs is a component of normal skin flora but in hospital set up it could emerge as a pathogen, increasing number of microorganisms causing nosocomial infections.

In this study, 13.1% of *Staphylococcus aureus* was isolated. Studies conducted by Pal K et al⁶ revealed 14.07%. In the current study, *Klebsiella* species isolation rate was 13.1%. In this study, isolation of *Acinetobacter* species was (7.9%). But *Acinetobacter* species were the most frequently isolated 33.3% from healthcare workers mobile phones (Sue Elizabeth Shajan et al⁷)

In my study, isolation of *Escherichia coli* was (5.3%). The presence of *Escherichia coli* indicates a low level of hand and mobile phone hygienic practice, as the organism is part of the intestinal flora and amongst the leading causes of hospital-acquired infection.

In the current study, *Pseudomonas aeruginosa* was isolated (2.6%). *Staphylococcus aureus*, *Klebsiella* species, *Acinetobacter* species, *Escherichia coli* and *Pseudomonas aeruginosa* were established pathogens for hospital associated infections. After decontamination with 70% isopropyl alcohol, 8 male and 4 female, totally 12 healthcare workers mobile phones only contaminated. The contamination rate was reduced.

In the present study, CoNs were susceptible to ceftriaxone, ciprofloxacin and gentamicin while it was resistant to trimethoprim-sulfamethoxazole and ampicillin. *Acinetobacter* and *Pseudomonas aeruginosa* showed the highest level of resistance, where all isolates were resistant to ampicillin, trimethoprim-sulfamethoxazole, erythromycin and amoxicillin-clavulanate.

All the healthcare workers do wash their hands after receiving phone calls and before touching patients. Proper decontamination with 70% isopropyl alcohol reduce the contamination rate of mobile phones.

CONCLUSION

In today's world mobile phone usage transmits infections. The present study will highlight the mobile phones as a potential threat in infection and hence control practices should be implemented better. This study will emphasize the need for developing effective preventive strategies such as regular decontamination of mobile phones with alcohol disinfectant wipes to reduce bio burden and will also insist the health care workers to adhere on simple practice like hand hygiene which will help to prevent cross infections and other nosocomial infections.

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