



CELL PHONES OF HEALTHCARE PROVIDERS AS FOMITES HARBOURING POTENTIAL PATHOGENIC MICROORGANISMS

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ABSTRACT

Background: Cell phones (CP) being used by healthcare providers are emerging as fomites capable of transmitting infections. Studies have shown presence of potentially pathogenic bacterial and fungal contamination of cell phones.

Aim: This study was conducted to detect microbial carriage of cellphones of healthcare providers

Methodology: CPs of 50 healthcare providers (HCP), comprising doctors of various specialities, nurses and technicians working at various departments/areas of hospital were screened for possible bacterial and fungal contamination.

Results: The overall rate of contamination of CPs of HCPs was 94%. Contamination with potential pathogens was found in 76% of CPs. *S. aureus* was the commonest (18/41) potential pathogen isolated and two CPs were contaminated with Methicillin Resistant *S. aureus* (MRSA). *Candida spp* was isolated from 4% of CPs. Rates of contamination with potential pathogens in CPs used by doctors was 85%, nurses 71% and technicians 69%. Rate of contamination with potential pathogens was highest in the CPs used by HCPs having access to wards (89%) followed by OPDs (88%) and OT/ICU (85%).

Conclusion: CP contamination with potential human pathogens was common in HCPs working at various areas of the hospital including sensitive areas like OTs and ICUs and also irrespective of professional cadre. Rates of contamination with multi-drug resistant organisms were low in CPs. These findings stress the need for awareness of CPs as fomites, need for strict monitoring of hand hygiene and guidelines for routine decontamination of CPs in hospitals.

Key Words: Cell phones, Hand hygiene, Fomite, *Staphylococcus aureus*

INTRODUCTION

Cell phones (CPs) have become an indispensable accessory of today's society and they are being used extensively in a hospital setting to optimize patient care and client communications. However, CPs are commonly handled (irrespective of the cleanliness of hands), rarely disinfected and could harbour pathogenic bacteria (1) Studies of healthcare workers' CPs conducted elsewhere have reported the overall contamination rate to be 40-98% (2,3,4,5). CPs are potential sources of HAIs along with medical staff, the patients' own flora. (1)

Information regarding role of CPs in spread of HAIs is limited in tropical countries like India (6). Contamination rates of CPs can vary in different hospital settings. The present study was done to assess the burden and type of contamination of CPs of health-care providers

(HCPs) in a tertiary care hospital in Chennai so that magnitude of the problem can be estimated and appropriate control and preventive methods can be suggested.

MATERIALS AND METHODS

This study was conducted in a tertiary care hospital attached to a medical college in Chennai after ethical committee approval. 50 HCPs including doctors, nurses, technicians working in outpatient departments, wards, operating rooms, ICUs etc were randomly selected for the study. No prior information about the study was given to the participants to avoid bias. After participants' informed consent their CPs were swabbed with sterile cotton swab soaked with sterile brain heart infusion broth covering both the surfaces completely. The swabs were

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immediately brought to the microbiology laboratory and inoculated on to nutrient agar, blood agar, McConkey agar and Sabouraud dextrose agar (SDA) medium. All bacterial culture media were aerobically incubated at 37° C for 48 hours and SDA which was used for growing fungi was incubated at 25° C for 1 week. Colonies obtained were identified by standard microbiological procedures and antibiogram was done for potential human pathogens.

RESULTS

Cellphones of 50 HCPs working in a private tertiary care teaching hospital in Chennai were screened for bacterial and fungal contamination. Subjects comprised of 20 doctors, 17 nurses and 13 operating theater (OT) technicians. HCPs were belonging to various specialties (Medicine, paediatrics, dermatology, general surgery, orthopaedics, ENT, etc) and many were working in more than one area of the hospital; 34 were working in OTs/ Intensive care units (ICU), 27 in wards and 17 in outpatient departments (OPD).

The overall rate of contamination of CPs of HCPs was 94% (47/50). Contamination with potential pathogens was found in 76% (38/50) of CPs. Swabs from three CPs did not yield any organisms. A total of 74 organisms were isolated out of which 41 isolates were potential human pathogens and 33 were non-pathogenic organisms. Swabs from 21 CPs yielded single organism, 25 CPs two organisms and one CP three organisms. Potential pathogens isolated (Table 1) included *Staphylococcus aureus* (18/41), *Pseudomonas spp* (7/41), Coagulase negative *Staphylococci* (6/41), *Klebsiella spp* (5/41), *Escherichia coli* (3/41) and *Candida spp* (2/41). Saprophytes isolated from the CPs included aerobic spore bearers (25/32) and *Micrococci* (7/32). *S. aureus* was the commonest (18/41) potential pathogen isolated and two CPs were contaminated with Methicillin Resistant *S. aureus* (MRSA) from a doctor and a technician both having access to OT.

Contamination rates with potential pathogens of CPs used by doctors were 85% (17/20), nurses 71% (12/17) and technicians 69% (9/13) (Figure 1). Rate of contamination with potential pathogens was highest in the CPs used by HCPs having access to wards (89%, 24/27) followed by OPDs (88%, 15/17) and OT/ICU (85%, 29/34) (Figure 2).

DISCUSSION

Fomites play an important role in spread of hospital-acquired infections. A variety of surfaces, equipments and devices have been found to harbour pathogenic microorganisms, including drug resistant ones like MRSA and

Table 1: Potential human pathogenic organisms isolated from CPs of HCPs

Potential pathogen	Potential pathogens isolated from CPs of*			Total (n=50)
	Doctors (n=20)	Nurses (n=17)	Technicians (n=13)	
S.aureus	10 (50%)	6 (35%)	2 (15%)	18
Coagulase Negative Staphylococci	2 (10%)	3 (18%)	1 (8%)	6
Pseudomonas spp.	3 (15%)	2 (12%)	2 (15%)	7
Klebsiella spp.	2 (10%)	1 (6%)	2 (15%)	5
E.coli	1 (5%)	0	2 (15%)	3
Candida spp.	1 (5%)	0	1 (8%)	2
Total	19	12	10	41

*Sometimes more than one organism isolated from a mobile

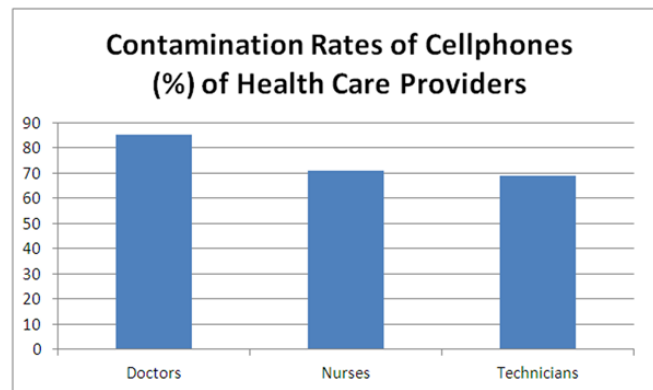


Figure 1: Contamination rates of cellphones of health care providers

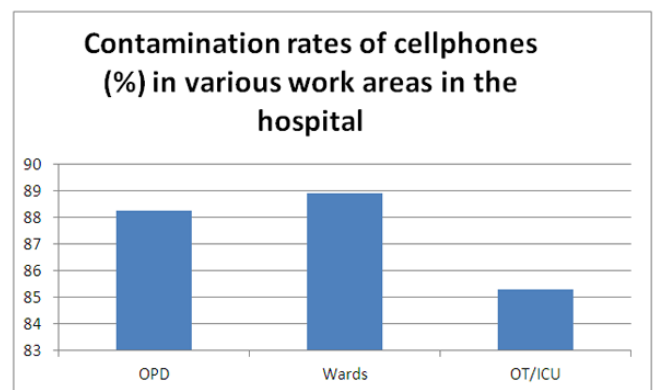


Figure 2: Conamination rates in various work areas in the hospital

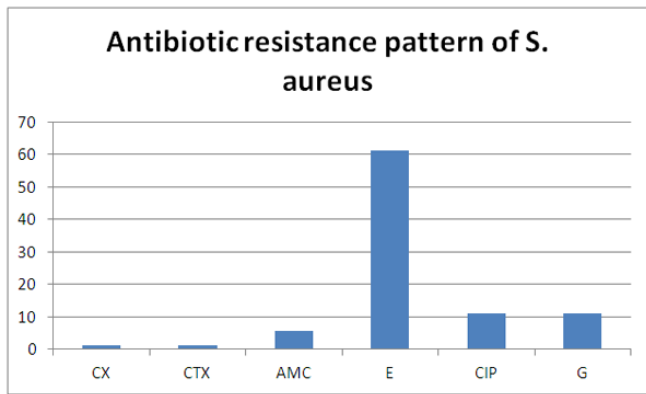


Figure 3: Antibiotic Resistance pattern of *S. aureus*

(CX-Cefoxitin, CTX – Cephotaxime, AMC – Amoxycillin-Clavulanate, E-Erythromycin, CIP- Ciprofloxacin, G- Gentamicin)

VRE, in hospital settings. (2,7,8) Microbes can be transferred from person-to-person or from inanimate objects commonly used in hospitals (stethoscopes, pens, charts, fixed and mobile phones) to hands and vice versa. (3) Clean hands can become colonized after contact with contaminated surface or fomite while caring for patients and organisms can cause infection if they come in contact with susceptible hosts (3,8,9). Hand-to-mouth transfer of microbes after handling contaminated fomites during casual activities has also been documented (2).

Clinically significant microorganisms like *S. aureus*, gram negative bacilli, *Candida* spp have been shown to persist on inanimate objects for weeks to months (8). High inoculums of the microbe, low temperature with relatively high humid environmental conditions provide best chances for long persistence of organisms (9). The longer a nosocomial pathogen persists on a surface, the longer it may be a source of transmission and thus endanger a susceptible patient or HCP (9).

CPs are widely used and in close contact with the body. They are used for communication by HCPs in almost every location in a hospital including OTs and ICUs. (2,5). CPs allow for easy accessibility of the clinician so can help in providing timely patient care. The mobile phone technology not only allows for rapid communication but also enables storage of formulary data, clinical and diagnostic protocols that can be made available to a busy clinician at his finger tips (7,6). People frequently handle CPs and that too irrespective of the cleanliness of their hands (1). The use of CPs by HCPs in the ICU, burns wards and OTs may have more serious hygiene consequences, especially since they are used close to patients (3). The rates and composition of contamination of CPs in hospitals could be risky to general public in community if carried outside (2). More studies are required to estimate the burden of contamination of CPs of HCPs, spectrum of organisms so

that appropriate preventive and control measures can be followed.

In this study overall rate of contamination of CPs used by HCPs was 94% and that by potential human pathogens was 76%. The contamination rates were found high in our study and are comparable to findings of Bhat S et al and Padma K et al with overall contamination rates of 98% and 94% respectively (6, 5). *S. aureus* was the commonest pathogen found contaminating CPs (36%) and 4% CPs harboured MRSA. Majority of isolated *S. aureus* strains were sensitive to antibacterials tested (Fig). Though the MRSA were found in relatively less number of CPs both were found in CPs of HCPs having access to sensitive areas like OTs and ICU. Many previous studies also have found *S. aureus* as the commonest organism on HCPs' CPs (12-56%) and MRSA was found in 1.9-18% CPs. Previous studies also have shown lesser rates of contamination with gram negative bacilli than gram positive cocci (2, 3, 6, 4, 5). Very few studies have looked for fungal contamination of CPs, in our study only 4% CPs were found to harbour fungi, both *Candida* spp.

CPs of doctors harboured more pathogens (85%) compared to nurses (71%) and technicians (69%). Higher contamination of CPs of doctors than nurses was observed in other studies also (1,6). The reasons for the differences were not specifically studied. Contamination of CPs of HCPs was found to be high irrespective of the area of work in the hospital – wards (89%), OPDs (88%) or OTs/ICU (85%). A study comparing CPs of hospital and non-hospital settings showed spectrum of organisms isolated to be similar in both the groups but resistant organisms like MRSA were found only in the hospital setting (6).

Today CPs, due to their various benefits, have become indispensable devices for HCPs and hence their complete restriction inside the hospitals is not practical. As the present study and the previous similar studies suggest, the problem of CPs as fomites carrying harmful microbes needs to be addressed. There is limited information available on CP disinfection methods that are both effective and do not damage the CPs.(1) Use of 70% isopropyl alcohol wipes, which is simple and can be routinely used, has been suggested to disinfect CPs by a few studies. (1,10) Sensitizing and training of HCPs about strict infection control procedures, hand hygiene, environmental disinfection methods are essential. (2,6) Engineering modifications such as use of hands-free mobile devices, use of surfaces that are easy to clean and disinfect, use of antimicrobial additive materials in CPs have been proposed as solutions (2,3). The Center for Disease Control (CDC) and Healthcare Infection Control Practices Advisory Committee (HICPAC) have recommendations for routine decontamination of all hospital equipments (8). Similar guidelines extending to CPs are the need of

the hour. A study done by Obasi C *et al* showed a self-cleaning unit to decontaminate small reusable objects, including electronic equipments like wall-phones, key-boards, in a hospital to be effective in a single cycle (8). Applicability of similar techniques to decontaminate CPs needs to be studied.

CONCLUSION

In conclusion, this study highlights the high rates of contamination of CPs used by HCPs in a hospital setting. CP contamination with potential human pathogens was common in HCPs working at various areas of the hospital including sensitive areas like OTs and ICUs and also irrespective of professional cadre. Carriage rates of resistant organisms (MRSA) were low. These findings stress the need for awareness of CPs as fomites, need for strict monitoring of hand hygiene and guidelines for routine decontamination of CPs in hospitals.

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