

Profile and Antibiotic Susceptibility Pattern of Bacterial Isolates from Mobile Phones of Healthcare Workers in a Tertiary Care Centre of Nepal

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Submitted : Jun 6, 2020

Accepted : July 26, 2020

ABSTRACT

Introduction

Nosocomial infection is a serious problem worldwide. Healthcare workers mobile phones may act as vehicle for nosocomial infections. Mobile phones are rarely cleaned and healthcare workers frequently use them thorough out their time in hospitals. The objective of this study is to determine the rate of contamination of mobile phones, prevalent microorganisms and their antibiotic sensitivity pattern.

Methods

The descriptive cross-sectional study was carried out in Clinical Microbiology laboratory from July 2019 to September 2019 after ethical approval. Samples were collected aseptically by rolling sterile swabs over the exposed surfaces of the mobile phones and inoculated on the agar plates and incubated aerobically. After incubation, plates were examined for growth. Bacteria were identified by standard microbiological procedure and antibiotic sensitivity test of isolated pathogens was done using Muller Hinton Agar by Kirby-Bauer method. Statistical analysis was done by Excel 2018.

Results

Of the 198 mobile phones sample cultures, 112 (56.6%) samples showed 7 different types of bacteria. Mixed growth was observed in 3 mobile phones and total of 115 bacterial isolates were identified. *Staphylococcus* species (74.7%) were predominant organism followed by *Acinetobacter* spp, *Klebsiella pneumoniae*, *E. coli*, *Citrobacter* and *Pseudomonas aeruginosa*. Total 37.5% of *Staphylococcus aureus* were methicillin-resistant *Staphylococcus aureus* (MRSA).

Conclusion

Mobile phones may have potential pathogenic microorganisms on their surface and can act as vector in spread of infectious agents in hospital settings. It is recommended to disinfect mobile phones regularly and to implement hand washing practices and regulations around the use of mobile phones in hospital settings.

Keywords: *Acinetobacter* species, mobile phones, MRSA, nosocomial infections, *Staphylococcus* species

INTRODUCTION

Health care-associated infections (HCAIs) or nosocomial infections are one of the commonest adverse events affecting patients while receiving health care.¹ Many studies suggest hands of healthcare workers (HCWs) play pivotal role in transmission of HCAIs.² HCWs' hands are often contaminated with pathogenic microorganisms through exogenous source of infections.³

Mobile phones which have become indispensable part of our life often provide a reservoir of exogenous source of HCAIs in hospitals. Mobile phones are often used by HCWs without restrictions and proper hand hygiene practices.⁴ HCWs take their mobile phones everywhere including operation theatre, intensive care units, wards, postoperative care units, use them while attending patients and are rarely cleaned, thus serving as a vehicle in transmission of nosocomial infections.⁵

Mobile phones are widely used in healthcare settings and may act as vector for transmission of HCIs. Microbial evaluation of such commonly used devices in healthcare settings should be done frequently. Thus, the objective of this study was to determine the degree of bacterial contamination and their resistance against commonly used antibiotics found on the HCWs mobile phones at Kathmandu Medical College.

METHODS

A hospital based descriptive cross sectional study was carried out in Clinical Microbiology Laboratory of Kathmandu Medical College and Teaching Hospital (KMCTH), Kathmandu Nepal from the month of July 2109 to September 2019. Ethical approval was received from Institutional Review Committee (Ref no. 150320195).

A total of 198 HCWs involved in patient management from intensive care unit, operation theatre, postoperative wards, different wards and laboratory were randomly selected as study participant were enrolled in the study after informed consent. Samples were collected aseptically by rolling sterile cotton swab moistened with normal saline over different surfaces of mobile phones and were transported to laboratory as soon as possible in a test tube with cotton plug. Samples were inoculated in Blood and MacConkey agar plates and incubated at 37°C for 24 hours aerobically and were examined for growth. Identification of bacteria were done by standard bacteriological technique.⁶ Antimicrobial susceptibility of all isolates was determined by the standard Kirby Bauer disk diffusion method according to norms of Clinical Laboratory Standards Institute (CLSI).⁷ Data analysis was performed using Microsoft Excel.

RESULTS

Out of 198 mobile phones, 112 (56.56%) mobile phones had bacterial colonization and no growth was seen in 86 (43.44%) mobile phones (Fig:1). Mixed growth was observed in 3 mobile phones and total of 115 bacterial isolates were identified.

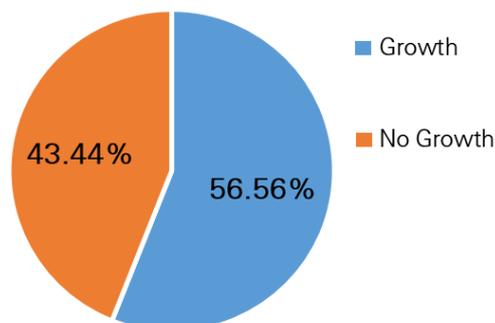


Fig 1. Bacterial contamination of HCW mobile phones

The types of bacteria isolated from mobile phones are summarized in Table 1. Coagulase-negative Staphylococcus (CoNS) were the predominant isolates [70 (60.8%)]. The rest were Staphylococcus aureus, Acinetobacter, E. coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Citrobacter.

Table 1. Type of bacteria isolated from HCW's mobile phones (n=115)

Bacteria isolated	Number (%)
Coagulase-negative Staphylococcus	70 (60.8 %)
Staph. aureus	16 (13.9%)
Acinetobacter	14 (12.3%)
E. coli	5 (4.3%)
Klebsiella pneumonia	6 (5.3%)
Citrobacter	2 (1.7%)
Pseudomonas aeruginosa	2 (1.7%)

Table 2. Antibiotic sensitivity pattern of Gram positive cocci isolated from HCW's mobile phones (n=86)

Antibiotics	CoNS (n=70)	Staph. aureus (n=16)
	Sensitive no. (%)	Sensitive no. (%)
Cefoxitin	70 (100%)	10 (62.50%)
Ciprofloxacin	18 (25.71%)	6 (37.50%)
Cotrimoxazole	61 (87.14%)	12 (75.00%)
Amikacin	70 (100%)	14 (87.50%)
Erythromycin	23 (32.86%)	0 (0%)
Clindamycin	22 (31.43%)	7 (43.75%)
Linezolid	70 (100%)	16 (100%)

Table 3. Antibiotic sensitivity pattern of Gram negative bacilli isolated from HCW's mobile phones (n=86)

Antibiotics	Acinetobacter (n=14)	K. pneumoniae (n=6)	E.coli (n=5)	Citrobacter (n=2)	P. aeruginosa (n=2)
	Sensitive no. (%)	Sensitive no. (%)	Sensitive no. (%)	Sensitive no. (%)	Sensitive no. (%)
Amikacin	11 (78.6%)	5 (83.3%)	5 (100%)	2 (100%)	2 (100%)
Ampicillin	0 (0%)	1 (16.7%)	0(0%)	0 (0%)	0 (0%)
Ciprofloxacin	6 (42.9%)	5 (83.3%)	5 (100%)	2 (100%)	2 (100%)
Ceftriaxone	3 (21.4%)	4 (66.7%)	2 (40%)	1 (50%)	0 (0%)
Cefixime	3 (21.4%)	2 (33.3%)	1 (20%)	1 (50%)	0 (0%)
Imipenem	6 (42.9%)	5 (83.3%)	5 (100%)	2 (100%)	2 (100%)
Piperacillin- Tazobactam	7 (50.0%)	5 (83.3%)	4 (80%)	2 (100%)	2 (100%)
Tegecycline	4 (100%)	6 (100%)	5 (100%)	2 (100%)	2 (100%)

The antibiogram of Gram positive cocci is shown in table 2. Total 37.5% Staph. aureus were methicillin-resistant Staphylococcus aureus (MRSA). Both CoNS and Staph. aureus were 100% susceptible to linezolid.

Antibiotic susceptibility pattern of gram negative bacilli is shown in Table 3. All gram negative bacilli are 100% sensitive to antibiotic tigecycline. Similarly, amikacin, ciprofloxacin and piperacillin-tazobactam is effective in E. coli, Citrobacter and P. aeruginosa. Acinetobacter and K. pneumoniae have variable sensitivity patterns.

DISCUSSION

HCWs plays important role in transmission of nosocomial infections.⁸ Microorganisms are transmitted from person to person or through fomites like stethoscope, elevator buttons, table surfaces, mobile phones, thermometer. Hand washing has been repeatedly shown to reduce the risk of HCAI.^{9,10}

The result of our study shows that mobile phones which are often used by HCWs in healthcare settings carry potentially pathogenic microorganisms. The frequency of contamination of mobile phones observed in this study was 56.56 %. Similar rate of contamination was found by Kokate et al and Mark et al.^{11,12} Whereas many other studies has shown higher rate of contamination of HCW's mobile phones. Overall, studies done across the world on mobile phones contamination has varied prevalence of 24% to 94.5%.¹³⁻¹⁹ This variation in rate of contamination might be due to difference in adherence to infection control practices or frequency of disinfection of mobile phones and hand washing practices.

Out of 115 bacteria isolated in the study, Staphylococcus species (74.7%) were predominant bacteria grown from HCWs mobile phones. Similar pattern has been observed and reported by various studies done in contamination of mobile phones.¹³

Balapriya P et al in her study of nosocomial pathogens in mobile phones showed that CoNS were mostly susceptible to Penicillin which is similar to our study.¹⁴ Normal skin flora primarily consist of gram positive cocci especially CoNS, this might be reason of their high rate and growth of fewer gram negative bacteria from mobile phones in present and other studies. It is also well known fact that organisms like S.aureus and CoNS resist dryness and thus can survive and multiply in warm environments like mobile phones.¹⁷

The second common bacteria isolated from HCWs mobile phones was Acinetobacter species (12.3%). It is a gram negative cocco-bacillus. Isolation of Acinetobacter species from mobile phones is not unexpected given its ubiquitous nature and ability to persist in hospital environment for long period of time.

Isolation of multidrug resistant organisms like MRSA and Acinetobacter species from HCWs' mobile phone is a worrisome finding. The isolation of antibiotic-resistant bacteria from mobile phone is a serious issue with important implications for hospital infection prevention and control program.

CONCLUSION

Our study showed mobile phones used by HCWs were contaminated with potentially pathogenic bacteria. These microorganisms could be transmitted to patients through hands of HCWs. Some measures to prevent cross contamination through mobile phones like limited use of mobile phones in hospital settings, regular disinfection of mobile phones and hand washing is recommended.

CONFLICT OF INTEREST

None declared.

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