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Bacterial Contamination Of Mobile Phones Used By Healthcare Workers In The Dental Practice

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ABSTRACT

Medical infection outbreak is a major emerging concern in many hospitals and health care centres. Mobile phones now are appropriate devices for health care staff to carry over ifections from patient to patient. Hence the main aim of the present study was to isolate, identify the different types of bacteria and their antibiotic sensitivity pattern from mobile phones of healthcare workers.

Aim: To determine the microbial contamination from mobile phones of healthcare workers (HCWs).

Objectives: To isolate, identify different types of bacteria and their antibiotic sensitivity pattern from mobile phones of healthcare workers.

Materials and Methods: All specimens were processed for isolation of organisms using different culture media like Nutrient agar, Blood agar, Mac conkey agar. Plates were incubated at 37^0 C for 24 hours and examined for growth. IMVIC test was used for specification of bacteria.

Result: In this study a total of 100 samples were examined, out of which 50 samples were from healthcare workers, 50 samples were from non-healthcare workers. 80 showed the growth of the bacterial pathogens. Hence overall contamination of the mobile phones was found to be 80%.

Conclusion: In this present study predominant isolated bacteria's were gram positive cocci. We are suggesting simple measures such as hand washing, cleaning mobile phones with 70% isopropyl alcohol to reduce incidence of healthcare associated infections in the hospital settings. It seems that emphasis on infection control practices during early dental education is essential.

Keywords: *Healthcare workers, Mobile phones, Nosocomial infection, Methicillin resistance, Staphylococcus aureus.*

1. INTRODUCTION

Due to modern diagnostic methods and treatments, hospital-acquired infections continue to be a major challenge for healthcare systems worldwide hence incidence of hospital-acquired infections is on the rise worldwide. Healthcare workers' mobile phones may harbour bacterial, fungal pathogens, posing a potential risk for contamination. Temperature of mobile phones and moisture of the operatory becomes suitable surface for growth of microorganisms [1]. Healthcare workers are using regularly their mobile phones which is carrying micro-organisms that cause hospital as well as community acquired infections. These mobile phones are essential part in both professional and social settings, yet they are often used in environments with high bacterial exposure.

The constant handling of mobile phones by different users exposes to micro-organisms and thus makes a good carrier for microbes. This is especially so with skin, due to the moisture and optimum temperature of human body especially our palms along with heat generated by mobile phones favours the colonization and multiplication of micro-organisms, so these devices can harbour various potential pathogens and serves as an exogenous source of nosocomial infection among hospitalized patients [2].

Despite the high possibility of being contaminated, mobile phones are rarely clean and are often touched during and after examination of patients and handling of specimens without proper hand washing. Currently, there are no guidelines for disinfection of mobile phones of health care workers and it seems that emphasis on infection control practices during early dental education is essential. Many researchers have studied mobile phone contamination among healthcare workers and in the community. However, limited work has been reported in our country on bacterial contamination on mobile phones used by dentists. Hence, the main objective of the present study was to isolate, identify different types of bacteria and their antibiotic sensitivity pattern from mobile phones of healthcare workers of our hospital.

2. MATERIALS AND METHOD

This cross-sectional study included 100 mobile phones belonging to dentists work in B.V. D.U. Dental College and Hospital, Sangli. A questionnaire was completed by participants, including the location and time of usage of mobile phones, methods of disinfection and material used the time interval from the last cleaning of the mobile phones and washing hands before and after using the phones. Each participant's mobile phone was swabbed aseptically by rotating cotton swabs with sterile normal saline over all exposed outer surfaces of the mobile phones.

The samples were processed for isolation of microorganism. We had used Blood agar, Mac-conkeys agar and Nutrient agar as well for isolation of bacteria and Sabouraud dextrose agar for isolation of fungi. Swabs were streaked onto blood agar, McConkey agar and Sabouraud dextrose agar, and plates were incubated at 37°C for 24 hrs. Isolated microorganisms were identified using gram stain, IMVIC test for gram negative bacteria and, catalase, coagulase tests for gram positive cocci. Antibiotic susceptibility testing was performed using disc diffusion method and interpreted according to the Clinical and Laboratory Institute Standard (CLSI) guidelines [3]. Methicillin resistance was identified using Cefoxitin disc diffusion test method in isolated staphylococcus. The antibiotics disks used for isolates were Ciprofloxacin (5 µg), Gentamicin (10 µg), Erythromycin (15 µg), Ceftriaxone (30 µg), Ceftazidime (10 µg) and Nitrofurantoin (100 µg).

Exclusive Criteria: The new mobiles and those who had used their phones less than three months were excluded from this research work.

Statistical analysis: Statistical analysis was done using SPSS (version 20). Intergroup comparisons were made using paired t-test, chi square test and descriptive statistics.

3. RESULTS

In this study a total of 100 samples were examined, out of which 50 samples were from healthcare workers, 50 samples were from non-healthcare workers.

Total 80 showed the growth of the bacterial pathogen in a significant amount. Out of these 45 from health care workers and 35 were from non- health care workers so the overall contamination of the mobile phones was found to be 80%. While the majority of phones growth was polymicrobial. Out of 80 positive samples, 27 had mixed type of bacteria were isolated.

Predominant isolated bacteria were gram positive cocci. They were coagulase-negative *staphylococci* (60%) and *Staphylococcus aureus* (25%). Other isolates were *Escherichia coli*, *Pseudomonas spp.*, *Klebsiella pneumonae* and *Klebsiella pneumonae* (ESBL). Most isolates were susceptible to Ciprofloxacine and Gentamicin. Methicillin resistance was detected in 20% and 18% of *S. aureus* and coagulase-negative staphylococci isolates, respectively. No significant association was found between mobile phone contamination with age group and gender also.

4. DISCUSSION

Mobile phones enhance communication and connectivity within healthcare institutions, improving the effectiveness of

healthcare program. Mobile phones provide access to laboratory and imaging results and medical images, enabling physicians to engage clinicians, residents, and students during bedside rounds. Infection issue and controlling it is one of the basic challenges of dentistry profession, it is important risk factor for both the patient and dentist [4]. Now a day, mobile phones have become one of the most indispensable accessories of professional and social life. Although they are usually stored in bags or pockets, mobile phones are handled frequently and held close to the face [5]. In general researches have shown that the dentists are exposed to high risk of infections such as *Mycobacterium tuberculosis, Hepatitis B, Staphylococci, Streptococci* and *Human Immunodeficiency Virus* [6].

Preventing cross infection in dentistry is a basic issue in dentistry profession, because the dentistry environment is an environment in which the transmission of infectious diseases occurs easily [7]. The human skin constantly remains in the contact with the microorganisms and it highly susceptible to microbial infections [8].As a consequence, the incidence of certain infectious disease is higher among dental professionals than observed for the general population and even other medical staff [9,10].

Our findings provide an essential informative baseline on *S. aureus, E. coli* and MRSA present on mobile phones used by healthcare workers in hospitals. Some previous studies suggested that the possibility of pathogens transmissions not only by mobile phones, but also other electronic devices such as personal digital assistants, handheld computers, stethoscopes, including epidemiologically significant drug resistant pathogens. The study conducted by Arora U et al [11] and Elmanama A et al [12] *Jayalakshmi J, et al [13]* Neha sharma et al [14] had reported microbial contamination with different bacteria as 91.60% ,90.9%, 91.6% and 94%. This is more than our study it is (80%). Whenever a phone call is made, the mobile comes into direct contact with the hand. Thus, these results suggest that microbial contamination of mobile phones can serve as a source of pathogens, which may quickly spread to the hands of healthcare workers and be transmitted to patients.

The microorganisms that are settled onto phone surfaces are the same as the bacteria that are found on the surface of the tooth and saliva also. So the source of mobile contamination in dental clinic is not only hands of mobile users, but its origin is also the atmospheric pollution. Dental gloves are used to protect from contamination while being in contact with blood, saliva and mucous membranes. They also protect patients from being infected with clinician's pathogens. The use of gloves does not eliminate the need for hand washing, because gloves may be infected due to rupture or contaminated hands after removing gloves. Hand-washing is the most important single factor to prevent transmission of bacteria and viruses [15].

Predominant isolate *Staphylococcus* Species was observed in this study. It is may be due to improper hand hygiene practices and infrequent sanitization of mobile phones by healthcare workers. The risk of mobile contamination increases when healthcare workers come into contact with colonized patients, surfaces, and objects within the hospital environment, this is in accordance with Katsuse-Kanayama et al. [16] and reinforces the need for proper hand hygiene practice by healthcare workers prior to patient contact as a critical way of avoiding health care associated infections. Though the rate of *E. coli* (35%) contamination was high in our study, it is higher than the rate reported by Selim and Abaza(13%) [17].

Contamination with *E. coli* means that other faecal coliforms and pathogens from healthcare workers´ mobile phones could be transmitted onto their hands and subsequently to the patients they serve or other common contact surfaces in the hospitals. The presence of faeces on mobiles phones may be due to lack of cleanliness and low hygiene standards.

The MRSA isolation rate found in this study (28%) is less than similar researches carried out. However, other researchers reported higher isolation rates such as 53% by Selim and Abaza [17] 53.3% by Angadi et al. [18] in India. Our result of isolates correlates with study of Singh et al [19]. He observed the bacterial contamination on mobile phones of dentists at a dental college hospital in India. Their study showed that coagulase-negative *Staphylococcus* spp. and *Staphylococcus aureus* were the most commonly found bacteria on mobile phones. It is alarming to find that an isolate were resistant to various antibiotics. This may lead to a heightened economic burden for financially disadvantaged individuals.

Table No. 1 Organisms isolated from Health care workers and Non- health care workers

Name of isolated bacteria	**Health care workers (N=45)**	**Non- health care workers (N=35)**
Staphylococcus aureus (MRSA)	08	03
Staphylococcus aureus	09	08
Coagulase Negative Staphylococci	15	13

Pseudomonas spps	02	01
Klebsiella peumoniae	01	01
Klebsiella peumoniae (ESBL)	01	-
E.Coli	09	09

Hand hygiene is one of the most essential preventive interventions against the spread of infections in healthcare settings [20].

5. CONCLUSION

Mobile phones have become an integral part of a person's lifestyle. It is not only capable to transfer message but also pathogens. We are suggesting simple measures like hand washing, cleaning mobile phones with 70% isopropyl alcohol, implementing a well-regulated infection control plan and providing regular training for healthcare personnel to reduce incidence of healthcare associated infections in the hospital settings. Currently, there are no guidelines for disinfection of mobile phones of health care workers and it seems that emphasis on infection control practices during early dental education is essential.

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