Original Article

Acquisition of potential reservoirs of nosocomial infection on gadgets and clothing in the dental hospital setting: An epidemiological study

Jyoti Sharma, Manjula Mehta, Sonia Bhonchal Bhardwaj, Ashish Jain[1], Jagat Bhushan[2], Swaty Jhamb[2]

Departments of Microbiology, [1]Periodontology and [2]Conservatives and Endodontics, Dr. Harvansh Singh Judge Institute of Dental Sciences and Hospital, Panjab University, Chandigarh, India

Abstract

Introduction: During dental procedures, dental professionals as well as patients are exposed to pathogens and toxic substances, which may be transmitted through direct or indirect contact. Their clothing is visibly soiled during the procedures. Their hands can serve as vectors for the transmission of pathogens. Use of mobiles, laptop, and other gadgets tend to increase the chances of microbial colonization on these surfaces. The objective of the study is to screen for the presence of microorganism the most common items pertaining to our daily personal utility which are being used in the hospital settings, to access the microbial load and their potential hazards.

Materials and Methods: In this study, 80 samples were collected from different personal utility items such as white coats, mobiles, hand towels, and laptops. These samples were evaluated for the presence of any microbial colonization on them.

Results: All the sampled surfaces showed the presence of microorganisms and all showed polymicrobial growth.

Conclusion: These identified surfaces should be cleaned and decontaminated on regular basis to prevent the transmission of pathogens in the dental hospital environment.

Keywords: Cross contamination; dental procedures; health-care workers

INTRODUCTION

In a health-care setup, there are plentiful roots and reservoirs of the infection and also the inception of the contamination inventory, which comprise of variety of microorganisms. These microbes are the part of everyday life. They are in abundance in air, soil, water, environment, in and on our bodies too. Their sources in hospital settings may be the personnel, the patients or the inanimate environment.[1] It is evident from the literature that in most of the outbreaks in hospitals or in epidemics in the health-care settings, the source of infections is mostly the infected patients, but health-care workers and visitors/patient attendant are also the potential source of infection, from where microorganisms are most of the times disseminated in to the surrounding environment in a substantial number, exceeding the minimal infective dose and cross-infect other patients, who thereafter land up in some hospital associated infections.[2] There are various means and ways by which these microbes can be transmitted from their original sources to a new host through direct or indirect contact, in the air or by vector. The most frequent route of transmission in health-care settings, however, is indirect contact and dry surfaces. During general care and/or medical treatment, the hands

Address for correspondence:
Dr. Jyoti Sharma,
Department of Microbiology, Dr. Harvansh Singh Judge Institute of Dental Sciences and Hospital, Panjab University, Chandigarh, India.
E-mail: contactjyotisharma@yahoo.co.in

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of health-care worker often come into close contact with patients. Thus, they are an important vehicle for the transmission of pathogens subsequently leading to hospital-associated infections.

Inanimate objects such as clothing and equipment as well as hand towels, gowns, mobiles, laptops, and many other personal utility items have been known to carry the potential pathogens.[3] Most of the times, the white coats or the other uniforms of the dental health-care workers are spattered by saliva, blood, and aerosols during the various activities performed while attending to the patients in dental hospitals.[4] The clothing appears to be contaminated in forts several hours of use.[5] Other personal use items such as hand towels, laptops, and mobiles have been found to have higher levels of contaminants even if they are not visibly soiled enough.[6,7]

Thus, in this study, we have evaluated bacterial colonization on the personal utility items such as gowns/white coats, towels, laptops, and mobiles.

MATERIALS AND METHODS

Settings and study participants

The study was carried out in the Department of Microbiology at Dr. Harvansh Singh Judge Institute of Dental Sciences and Hospital, Panjab University, Chandigarh, India. Health-care workers were randomly approached during routine patient care and the identified surfaces were sampled randomly during weekdays. The included study participants were faculty and postgraduate dental students who were posted in various clinical departments performing various dental procedures, whereas staff and students from nonclinical departments were excluded from the study.

Samples

A total 80 samples, twenty samples from each group were obtained from gowns/white coats, hand towels, mobiles, and laptops were included in the study for the assessment of microbial contamination.

For mobiles and laptops

The samples were collected aseptically by rotating sterile swab moistened with brain–heart infusion broth over the surface of the identified item. The swabs were replaced in the tube and sent to microbiology laboratory for further investigations.

For gowns/white coats and hand towels

These were sampled by aseptic manner by swabbing a sterile surgical glove along the surface and then placing the glove onto a blood agar plate.

Microbiological analysis

The brain–heart infusion tubes were incubated at 37°C for 24 h and then blood agar and MacConkey agar plates were streaked and then incubated at 37°C for 24–48 h. Similarly, blood agar plates with clothing samples were incubated under similar conditions. The growth was further subjected to Gram staining and biochemical testing. All the isolates were identified on the basis of Gram stain, colony morphology, and conventional biochemical testing.[8]

RESULTS

Out of total 80 samples screened in the study, all the samples harbored microorganisms on their surface. The details are provided in Table 1. Polymicrobial growth was obtained from all the samples. Potentially clinical relevant isolates found in the study were *S. aureus*, *S. epidermidis,* and Gram-negative rods. Clinically irrelevant bacteria such as *Micrococci* and *Bacillus* were also isolated from these surfaces.

White coats

From 20 white coat samples, 3 harbored *S. aureus*, two harbored *S. epidermidis,* and four showed presence of Gram-negative bacilli. *Micrococci* and *Bacillus* was found on 19 and 17 white coat samples.

Hand towels

From 20 hand-towel samples, *S. aureus* and *S. epidermidis* were found on one sample each. GNB grew on five samples drawn from hand towels. *Micrococci* and *Bacillus* were found on 19 and 17 hand towel samples.

Mobiles

Out of 20 mobiles screened growth of *S. aureus* and *S. epidermidis* was found on two samples each. The mobiles also harbored Gram-negative bacilli. *Micrococci* and *Bacillus* was found on majority of the mobile, 19 and 17, respectively.

Laptops

Out of 20 mobiles screened growth of *S. aureus* and *S. epidermidis* was found on two samples each and GNB grew

Table 1: Frequency of isolation (%) of different microorganisms from various articles of personal use

Articles	*Staphylococcus aureus*	*Staphylococcus epidermidis*	*Micrococci*	*Bacillus*	Gram negative bacilli
White coats	15	10	95	85	20
Hand towels	5	5	95	85	15
Mobiles	10	10	95	85	15
Laptops	10	10	90	90	20

on four samples drawn from laptops. The nonpathogenic bacteria *Micrococci* and *Bacillus* were found on 18 laptops.

DISCUSSION

The work space in the dental hospital setup is exposed to and contaminated with heterogeneity of pathogenic and nonpathogenic microorganisms. The dental professional and patients are apparently exposed to the number of infectious agents and other harmful toxic materials which are transported by aerosols and droplets produced during/in the due course of dental operative procedures[9] stimulating a heightened risk of cross infection.[10,11] Hegde *et al.* highlighted the need of complete structural change to prevent cross-infections among patients and dentists.[12] Hands of health-care workers act as the vectors for the dissemination of nosocomial pathogens, so the risk of contamination with probable pathogen is a persuasive consideration.

Through this study, we want to highlight and display the alarming number of potentially clinical relevant bacteria which are colonizing different surfaces of articles commonly used by the health care staff, which ultimately may serve as the source of infection outbreak. In addition, it is important to note the role of personal utility items of the health-care workers in the transmission and spread of infections since they act as microbial reservoirs.[13] Bacterial contamination of mobile phones by health-care workers has been well documented.[7,14,15] Palaniswamy *et al.* suggested the use of titanium dioxide nanoparticle spray to disinfect mobiles to reduce microbial contamination.[16] A study by Shakeel Anjumn *et al.* on contamination of laptops has shown the presence of several organisms colonizing on these surfaces.[17] Sheth *et al.* compared different techniques of sterilization revisiting ultraviolet radiation for surface disinfection,[18] while Shekhar *et al.* compared the disinfecting efficacy of different herbal disinfectants against *Enterococcus faecalis*.[19] The most effective way of reduce the cross-infections originating because of these personal utility devices is regular cleaning and disinfection.

CONCLUSION

This study raises the concern that contact with the contaminated personal items such as mobiles, laptops, white coats, and towels serve as the mechanism of transmission of pathogens. It is very important that health-care workers must perform hand hygiene after contact with these items and cleaning and decontamination of these items should be done on regular basis.

Limitations of the study

Though this study has analyzed the type of bacterial contaminations and their morphotypes as well, but it is a qualitative study and exact microbial load can be assessed with the help of quantitative analysis to check if it exceeds certain permissive grid values. Antibacterial susceptibility profile of these isolates would be helpful in tracking the resistance transmission.

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Conflicts of interest

There are no conflicts of interest.

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