

Evaluation of Bacterial Contamination in a Clinical Environment

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How to cite the article:

Umar D, Basheer B, Husain A, Baroudi K, Ahamed F, Kumar A. Evaluation of bacterial contamination in a clinical environment. J Int Oral Health 2015;7(1):53-5.

Abstract:

Background: Although the contamination of the dental environment and personnel through aerosol contamination is a definite source of cross contamination; there is little data on the microbial involvement of the dental environment.

Materials and Methods: A total of 100 samples were taken from various inanimate surfaces in the clinical dental setting were collected aseptically by rotating sterile swabs moistened with peptone water over the surfaces of the samples and then inoculated into brain heart infusion broth and incubated at 37°C aerobically overnight. Subcultures were made on 5% sheep blood agar and MacConkey agar plates and incubated at 37°C for 24 h. Growth in the plates was observed.

Results: Out of the 100 samples screened in this study, a bacterial agent was observed in 38 samples, and 62 samples showed no growth. A higher percentage of contamination was seen on the dental chair light handles, suction tips and the pens used by the dental health care personnel's, followed by the instruments and the laboratory equipment.

Conclusion: Establishing an effective preventive strategies for well-practiced infection control is essential to prevent nosocomial infections and promote a safe environment in the dental clinics.

Key Words: Environment contamination, dental clinic, infection control

Introduction

Infection control is highly stressed in today's practice of dentistry. Research has shown that improper disinfection of the dental environment can transmit infectious diseases and prove to be a health hazard to both dental personnel,

as well as patients. This can prove to be fatal for immune deficient patients.¹ Although it is well-known that the dental environment, which includes the instruments, dental materials, and dental units, can be means for cross-contamination, there is little data on the microbial involvement.

Transmission of diseases in a dental setting can occur, (1) From the patient to the dental worker, (2) from the dental worker to the patient, (3) from one patient to the other, (4) from the dental office to the community. With the increase in transmissible diseases due to saliva or blood contamination, the dentist has an important task of minimizing these risks by following strict aseptic principles. The routine infection control which includes maintenance of hand hygiene, disinfection and contact isolation in order to prevent nosocomial infections. The colonization of the potentially pathogenic microorganisms on the various inanimate surfaces present in a clinical setup like dental chairs, mobile phones, ballpoint pens, patients' file and computer keyboards has been reported as a potential vehicle for transmission of nosocomial pathogens from dental health care personnels (DHCPs).²

Thus, in this perspective study, we have studied the bacterial colonization and contamination in an orthodontic clinical environment in a dental institution in Mangalore, India.

Materials and Methods

A total of 100 samples were taken from various inanimate surfaces in the clinical dental setting which included dental chair units, laboratory equipments, light handles, suction tips, airtors, curing units, sinktops, etc. as well as those used by the DHCP's like laptops, pens, spectacles, keys, mobile phones and cameras.

The samples were collected aseptically by rotating sterile swabs moistened with peptone water over the surfaces of the samples and then inoculated into brain heart infusion broth and incubated at 37°C aerobically overnight. Subcultures were made on 5% sheep blood agar and MacConkey agar plates; and incubated at 37°C for 24 h. The growth on the plates were differentiated and identified by morphology, gram staining, and standard biochemical reactions. Gram-positive catalase-positive organisms were tested for the mannitol utilization and coagulase production. Gram-negative cocci were identified by bile esculin agar. Gram-negative bacilli were identified by oxidase test, indole production, citrate utilization, production of urease and triple sugar ion agar.

Results

Out of the 100 samples screened in this study, a bacterial agent was observed in 38 samples, and 62 samples showed no growth. Polymicrobial growth was seen in 8 samples. Gram-negative bacteria which included *Klebsiella* species, *Pseudomonas aeruginosa*, *Escherichia coli*, *Citrobacter* species and *Enterobacter* species were mostly isolated. These results were followed by *Staphylococcus aureus* and coagulase-negative *Staphylococcus* (CONS) which constituted 6% and 5% respectively. Aerobic spore-bearing bacilli were found in 6% of the samples. Only one sample showed the presence of fungi (Table 1).

A higher percentage of contamination was seen on the dental chair light handles, suction tips and the pens used by the DHCP's, followed by the instruments and the laboratory equipments. Samples including laptops, dental chair units, light handles, mobile phones, sink tap, etc. showed equal frequency of bacterial contamination.

This study shows that nearly 40% of the samples were contaminated due to bacterial colonization. Contamination by nosocomial species (*S. aureus*, *Klebsiella pneumonia*, *Enterococcus* species) was seen in 17 out of 100 samples (Figure 1).

Discussion

The maintenance of hygiene principles is mandatory for healthy living conditions. However, deviation from the traditional hygiene practices is often seen in both developing and the developed countries. The present generation inclusive of the students and the DHCPs use their mobile phones in their daily routine, which makes cellular phones the most common object of contamination by nosocomial pathogens. The threat of contamination with potential pathogens is a valid concern.

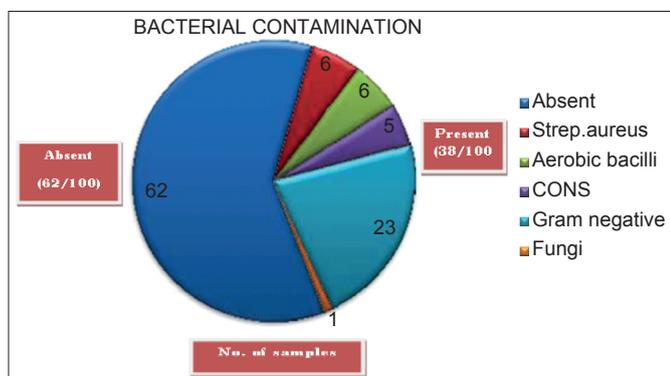


Figure 1: The distribution of the microbial contaminants

Nosocomial infections caused by multi-drug resistant Gram-positive organisms such as *S. aureus* and *Enterococcal* species are a growing problem in many health care institutions. Hands and instruments used by health care workers serve as vectors for the nosocomial transmission of microorganisms. The use of mobile phones by medical personnel may serve as potential vehicles for the spread of nosocomial pathogens and the associated nosocomial infections. Several reports have documented the contamination of mobile phones among healthcare workers.³⁻⁸ The results of this study showed microbial contamination of the dental environment out of which some of the contaminated microorganisms (such as *S. aureus*) were epidemiologically important nosocomial pathogens.

Control measures are quite simple and can include engineering modifications, such as the use of hands-free devices for calling, cleaning and disinfecting appropriate surfaces of the equipments, and hand washing with or without gloving of pertinent personnel. A routine pre-rinsing with any antimicrobial mouth rinse like chlorhexidine will be useful in-office use as a part of infection control regimen.⁹ Measures like regular use of hand sanitizers after every examination and frequent cleansing of the mobile phones, laptops and other surfaces with alcohol disinfectant wipes may help reduce the risk of cross contamination. Since there are many different diseases that are contagious and have the potential for infection, we have to follow guidelines known as universal precautions. Universal precaution means that we treat all patients as though they may be potentially infectious. This allows us to eliminate the occurrence of nosocomial infection.^{10,11} Precautions are also taken to reduce the possibility of cross contamination such as:¹²

- Use of disposable armamentarium wherever possible
- Thorough sterilization and disinfection of all instruments and contaminated surfaces
- Selection of equipment designed to prevent cross contamination
- Care and maintenance of dental units
- Vaccination of dental workers
- Hand washing to curtail bacteria in grooves of skin
- Use of protective barriers like gloves, facemasks and protective eyewear
- Disposal of contaminated wastes in appropriate way.

Conclusion

Establishing effective preventive strategies for well-practiced infection control is essential to prevent nosocomial infections and promote a safe environment in the dental clinics.

Table 1: Distribution of the pathogens present.

Bacterial contamination	Present (38/100)					Absent
	<i>S. aureus</i>	Aerobic species	CONS	Gram-negative bacilli	Fungi	
Number of samples	6	6	5	23	1	62/100

S. aureus: *Streptococcus aureus*, CONS: Coagulase negative *Staphylococcus*

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