



Assessing the Risk of Wearing Short Sleeves in Dental Clinics

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Authors' contributions

This work was carried out in collaboration between both authors. Author PEJR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author NPM reviewed the methodology and managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

In the dental clinic, Bio-aerosols are an important consideration for infection control and occupational health. Dental clinicians are exposed to aerosols and splatters which contain infective agents such as bacteria, virus and fungal organisms. Hence, there is a definite risk of infection with transmittable agents as the position is very close from the patient's mouth. Main entry points of infection for a dentist include abrasions on the skin. This surveillance study was conducted to evaluate the risk of wearing short sleeves in dental clinics. Sterilised aluminium foil of dimension 21x28 cm was wrapped on the forearm of the 20 operating dentists and left for 30 minutes. Then it was removed, and with the help of a moistened swab the aerosol sediment from a fixed area is taken and plated on Brain Heart Infusion (BHI) agar plates. The plates were incubated and were checked for the bacterial colonies and enumerated. It was observed that, out of 20 samples collected, it was observed that, out of 20 samples collected, *Streptococcus sp.* were invariably seen. Coagulase negative *Staphylococci* were predominantly seen in 10 samples, and in the remaining 10 samples *Lactobacillus sp.* were predominantly seen. In some of the samples bacterial

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load was very high. It is the indication of the risk that the short sleeve has in dental practice. Here the demonstration of aerosol is identified by the deposition of bacterial species on the skin, and we should in mind that the aerosol may carry infectious virus also.

Keywords: *Bacterial colonies; bioaerosols; brain heart infusion agar; microbial contamination; short sleeves.*

1. INTRODUCTION

Dentists belong to a professional group who are potentially exposed to various harmful biological factors like infectious microorganisms, less frequently to allergic or toxic microorganisms [1]. The fundamental routes of spreading harmful microorganisms in a dental surgery are: blood-borne, saliva-droplet, direct contact with a patient and with infected equipment, and water-droplet infections. The greatest risk for the dentist are viruses such as Hepatitis B virus (HBV), Hepatitis C virus and Human immunodeficiency virus (HIV) that spread through blood and cause serious health and life-threatening diseases [2]. Risk factors spread via the saliva-borne route and through direct contact include a vast range of microorganisms, from prions through viruses and bacteria to fungi. Herpes simplex virus is among the important risk factors transmitted in this way [3]. The best known disease factors are spread by spraying water from dental units contaminated with microorganisms. Among the infectious microorganisms, bacteria from *Legionella* species developing inside dental unit waterlines constitute the highest risk [4,5]. Gram Negative rods producing allergens and endotoxin are important risk factors among the potentially allergenic and toxic microorganisms [6]. In the dental clinic, bioaerosols are an important consideration for infection control and occupational health, since infectious agents could be transmitted via aerosols to patients or the operator [7]. Infective agents may include bacteria, viruses, fungal organisms and possibly even prions. Viruses, such as HIV, HBV and Influenza virus could easily be contained amongst the smallest of aerosols. Similarly, prions, smaller infective particles causing diseases such as spongiform encephalopathy [8], could also be contained in such aerosols, although prion protein was not found in dental pulp from affected patients in studies conducted [9]. Dental procedures have been shown to generate bacterial aerosols, predominantly *Streptococcus sp.* and *Staphylococcus sp.* [10]. Other infective bacteria could also be generated during dental procedures and *Mycobacterium*

tuberculosis has been found in aerosol particles generated by a high-speed handpiece used during simulated dental procedures on patients with active tuberculosis. Although the oral cavity is probably the major source of bacterial contamination in dental procedures, dental unit waterlines have also been implicated as potential reservoirs of bacteria, including *Legionella pneumophila* [11] and *Mycobacterium tuberculosis*. *Staphylococcus aureus* and other gram positive, non-motile, non-spore forming cocci bacteria constituting oral flora can also be spread as splatter particles and bacterial aerosols during dental procedures [12]. Contamination by *Staphylococcus aureus* could also occur in dental clinics situated in general hospitals, which may arise from cross-contamination from the hospital environment or from the patients themselves [13]. Hence, the dentists should consider appropriate immunisations and continue to use personal protective measures, which reduce contact with bacterial aerosols and splatters in the dental clinic [14] and also the patients can be administered with herbal or chlorhexidine mouth rinses for controlling the oral pathogens before beginning the dental procedure [15,16]. The aim of the present study is to evaluate the amount of microbial contamination occurring during the dental treatment on the exposed skin due to wearing of short sleeves.

2. MATERIALS AND METHODS

Aluminium foil of dimension 21x28 cm was sterilised in a hot air oven at 160°C for 60 minutes. The sterilised aluminum foil was then wrapped around on the forearm of the 20 operating dentists and left for 30 minutes for aerosol sedimentation.

The foil is then removed with minimal contact, and by using a moistened swab the aerosol sediment from a fixed area is removed and plated on Brain Heart Infusion (BHI) agar plates. The plates were incubated for 24 hours and were checked for the bacterial colonies and enumerated.

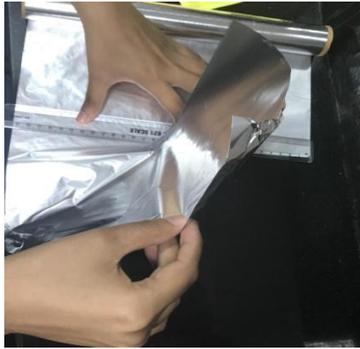


Fig. 1. Image showing the aluminium foil being cut in 21x28 cm dimension



Fig. 2. Image showing the aluminium foil being folded and wrapped before sterilization



Fig. 3. Image showing the aluminium foil being wrapped around on the forearm of the operating dentist

3. RESULTS AND DISCUSSION

The Incubated agar plates were checked for the bacterial colonies and enumerated. The following

Table shows (Table 1) the total number of colonies in the BHI agar plates.

It was observed that, out of 20 samples collected, *Streptococcus sp.* were invariably seen in all the samples. Coagulase negative *Staphylococci* were predominantly seen in 10 samples, and in the remaining 10 samples *Lactobacillus sp.* were predominantly seen. All the organisms demonstrated in these samples were of oral origin. In some of the samples bacterial load was very high. It is the indication of the risk that the short sleeve has in dental practice. Since the position of the operator is very close from the mouth of the patient, the chance of transmission is very high.



Fig. 4. Image showing 20 colonies



Fig. 5. Image showing confluent growth



Fig. 6. Image showing 125 colonies

Table 1. Total number of bacterial colonies from the samples collected

S. No	Number of colonies	S. No	Number of colonies
01	20	11	21
02	03	12	12
03	Confluent	13	03
04	Confluent	14	Confluent
05	125	15	03
06	88	16	20
07	Confluent	17	82
08	Confluent	18	07
09	37	19	46
10	09	20	23



Fig. 7. Image showing 3 colonies

A similar study was conducted by evaluating the microbial contamination in white coats of the operating dentists, wherein it was found that the sleeve and the pocket of the white coat were the sites that were most highly contaminated with *Staphylococcus sp.*, *Acinetobacter sp.*, and diphtheroids [17].

Gram negative bacilli and other forms of microbes which are considered environmental microorganisms with no clinical significance and skin commensals such as coagulase negative staphylococci were found in previous studies also [18,19]. It was found in a recent study that contact with HBV from the bioaerosols led to its entry through abrasions in the operator's skin [20].

In September 1978, two cases with HBV treated by the same dentist led to investigation of a dental practice in Baltimore, Maryland. The dentist had an acute Hepatitis B and had remained positive for Hepatitis B surface antigen and Hepatitis B e antigen over the ensuing 6 months. He had continued to work while infected, wearing surgical gloves to minimize the risk of transmitting infection. Serologic follow-up of 764 patients showed that a total of six patients, three of whom were symptomatic, had developed

Hepatitis B infection after dental treatment. All six were among a group of 395 patients treated before the dentist began wearing gloves [21]. In February 2012, two dental students in north india developed bilateral swelling of the parotid glands, and the possible source was determined to be an infected patient [22]. *Mycobacterium abscessus* associated odontogenic infections occurred in a group of children after they underwent a surgery. This can spread to the clinician if he or she is susceptible to the infection [23]. Hence, it is important to use Personal Protective Equipment and clean white coats in order to protect patients and dental practitioners [24].

4. CONCLUSION

Results of this study showed that dental procedures like scaling and air turbine usage lead to considerable microbial aerosol contamination in the immediate vicinity of the patient's mouth and subsequent contamination of the dentists' barrier clothing and skin in case the operator wears short sleeves. The demonstration of aerosol is identified by the deposition of only bacterial species on the skin, but we should mind that the aerosol may carry infectious virus also.

This has a potential to spread infection to dental practitioners and patients in the dental clinic and hence, a safe environment and protective suits are an important consideration in the dental clinics.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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