Original Article

Microbial Contamination of White Coats and Dental Chair Among Clinical Dental Students – A Cross Sectional Study

Kalaiselvi Santhosh[1*] , Karthikeyan G R[2], K.Balan[3], Indrapriyadharshini.K[4], Anu Sushanth. A[5]
[1*]Reader of Oral Medicine And Radiology, [2]Professor Of Oral And Maxillo-Facial Surgery, [3]Professor Of Clinical Microbiology, [4]Senior Lecturer Of Public Health Dentistry, [5]Reader Of Oral Medicine And Radiology
[1,2,4]Karpaga Vinayaga Institute Of Dental Sciences, [3]Karpaga Vinayaga Institute Of Medical Sciences And Research Centre,Chinnakolambakam,Palayanur (Po), Chengalpattu (District), 603308 Tamil Nadu, India.
[5]Educare Institute Of Dental Sciences,Malappuram, Kerala, India.

***Corresponding Author: -** Kalaiselvi Santhosh

[*]Mail ID: dr.sks13@gmail.com
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Abstract

Introduction: Oral surgical procedures gives rise to aerosols which include saliva, nasopharyngeal secretion, organic particles and blood. The aerosols act as a carrier for various bacteria and hence become a potent source for infection. Oral surgical procedures are highly prone to create contamination of aerosols and pathogens which arise from the blood. White coats worn by dentists and the dental chair are highly potent to be contaminated with bacteria and has been an important risk factor in the transmission of infection in the hospital. There is very little evidence available in the current literature regarding contamination of white coats worn by dentists and contamination present in the dental chair. With this background this study was designed to determine the level and type of bacterial contamination on the white coat and the dental chair in the department of oral and maxillofacial surgery at Karpaga Vinayaga Institute of Dental Sciences, Madhuranthagam, Chengalpet.

Materials and method: All the participants were subjected to pre-tested self-administered questionnaire to assess their perception on contamination of white coat and the frequency of washing. Samples for the study were taken from the white coats of undergraduate final year students, interns and various sites of dental chair. Sampling was carried out by an inert vector and the microorganisms were recovered later for analysis. Sterile cotton swab, and Stuart's transport media with proper microbiological quality control check which were Approved by Clinical Laboratory Standards Institute were used.

Result: Among 200 students, participants more than half of the students (60%) stated that the number of white coats used in a week was one, of which 75% were final year students and 45% were interns. It was found to be statistically significant (P=0.032*). Majority of the final year students (70%) reported that their white coat was last washed a week ago and there was a statistically significant difference found between final year and interns (P = 0.021*). Almost 50% of interns got their white coats washed twice a week and 70% of final years once a week. There was a statistically significant difference found between final year and interns (P = 0.024. More than half (55%) of the study participants wear their white coats before entering the respective department or laboratory, of which (87%)were final years and (23%) were interns and it was found to be statistically significant (P=0.036*). Interestingly, a greater number of students (90%) agreed that they never had the practice of exchanging their white coat with their colleagues some or the other time, of which 88% were final years and 92% were interns.

Conclusion: White coats have been shown to harbor potential contaminants and may have a role in cross infection of pathogenic microorganisms. Thus current study highlight's the situation of dental cross infection in the form of Students perception, attitude and practice of having more than one white coat, periodic washing of white coats.

Key words: dental students, microbial contamination, preclinical, white coats

INTRODUCTION

Infection from dental procedure is through direct and indirect transmission. Direct includes transmission through aerosol (oral fluids, nasopharyngeal secretion and blood), indirect transmission through indirect mode (equipment and surfaces contamination) and airborne pathogens by inhalation[1,2] Aerosol are a very potent source of bacterial infection and can cause cross infection [3,4]

The white coat worn by dental students, serve as a medium of protection from contamination. Even with awareness of individual protection, it is observed very often students wear their white coat in dining rooms, canteen, and other shopping areas, making the environment prone for cross contamination [5.6]

With this context, the goal of the current study was to identify the level of bacterial contamination in dental students' white coats and dental chairs and to evaluate the risk of infection transmission through such contact in the department of oral and maxillofacial surgery. [7]

MATERIALS AND METHODS

Students from the Karpaga Vinayaga Institute of Dental Sciences in Chengalpattu, Tamil Nadu, India were chosen to participate in the study from May to October 2021. This research is cross-sectional. After explaining the study in detail to the students, their written consent was obtained.

Using G power software, the sample size was computed with 80% statistical power, = 0.05, 95% confidence interval, and 10% margin of error (E). 200 people took part in the study, including interns and students in their final years who were assigned to the Department of Oral and Maxillo-Facial Surgery. Prior to the start of the investigation, institutional ethical committee issued order IEC/KIDS/004/2021 obtaining ethical permission.

RESEARCH TOOL:

All the participants were subjected to pre-tested self-administered questionnaire to assess their perception on contamination of white coat and the frequency of washing. There were total of 15 questions with multiple-choice answers under four domains. The questions were to assess the demographic data like age of the participants, gender and the academic year . Questionnaire was in English and “test-retest” method was used to assess the reliability during pilot study. The pilot study obtained $\kappa = 0.96$. The internal consistency of the questionnaire was 0.89 by Cronbach’s alpha method. The questionnaire was answered by the participating students at their respective work area.

DATA COLLECTION:

An effective technique for removing microorganism from the sampling site was necessary for the study. An inert vector was used for sampling, and the microbe was later retrieved for examination. The Clinical Laboratory Standards Institute-approved Stuart's transport media and sterile cotton swabs with sufficient microbiological quality control checks were utilized. Samples for the investigation were collected from interns' and final-year undergraduate students' white coats. Samples from several dental chair locations (chair switch, LED light handle, material tray handle) at the oral and maxillofacial surgery department were also collected.

After the sampling was done from the coat and dental chair the swabs were transported in the Stuart’s media to the microbiology laboratory. They were incubated for 2 h at 37°C subsequently the sub culture were transferred to the Mac Conkey and blood agar plates. This was followed by incubation 37°C for 24 h. The culture plates were analyzed for colony morphology. Gram staining was performed in plates having no growth after 48 hrs were reported as negative.

DATA ANALYSIS:

Statistical Package for Social Sciences software was used to methodically evaluate the data that were gathered (SPSS version 20, USA). Demographic variables were subjected to descriptive statistics. Chi square analysis was used to compare qualitative data across groups. Any value that was equal to or less than the P value of 0.05—which was established at that value—was considered significant

Results:

The goal of the current study was to evaluate the microbial contamination of dental chairs and white coats among clinical dental students at Chengalpattu's Karpaga Vinayaka Institute of Dental Sciences. 200 students, including 100 each from the final year and interns, made up the study group. They had an average age of 22.18 2.85. Of our participants, 57% were male and the remaining 53% were female. The questionnaire received a 100% response rate.

More than half of the participants in the survey (60%) said they used one white coat every week, with 75% of them being final-year students and 45% being interns. The statistical significance was established (P=0.032*). A statistically significant difference between final year students and interns was discovered (P = 0.021*), with the majority of final year students (70%) reporting that their white coat was last washed one week ago. 70% of final year students had their white coats washed once a week, compared to over 50% of interns. Final year students and interns showed a statistically significant difference (P = 0.024*). When questioned about the type of cleaning, the majority of students (71%)—of whom 66% were final year students and 76% were interns—said that home wash was appropriate for cleaning. Between final year students and interns, there was no statistically significant difference (P=0.210). It was discovered to be statistically significant (P=0.036*) that more than half (55%) of the study participants wore their white coats before entering the corresponding department or laboratory, of which (87%) were final year students and (23%) were interns. Interestingly, a greater number of students (90%) agreed that they never had the practice of exchanging their white coat with their colleagues some or the other time, , of which 88% were final years and 92% were interns [Table 1].

Table 1: Frequency Distribution of The Study Subject According To Their Responses

Responses	Final year BDS (n=100)	Interns (n=100)	P
Number Of White Coats One A Week Two A Week Three A Week	 75% 17% 8 %	 45% 50% 5%	 **0.032**
When Was Your White Coat Last washed? Two Days Back Three Days Back A Week Back	 18 % 12% 70%	 51% 4% 45%	 **0.021**
Frequency of washing Once A Week Twice A Week Thrice A Week	 70% 18% 12%	 45% 50% 4%	 **0.024**
Type of cleaning Laundry Home Wash	 34% 66%	 24% 76%	 0.210
How Do U Carry Ur White coat? Cover Shoulder Bags	 12% 22% 66%	 22% 14% 78%	 0.189
When Or Where Do You Wear White Coat? • After coming to the college • Before entering the department or Lab • Before starting the work	 87% 13% 0	 23% 77% 0	 **0.036** **0.012**
Exchange Of Coats Yes No	 12% 88%	 8% 92%	

Students perception regarding white coat contamination, about 37% of the study participants were not able to perceive the cleanliness of white coat of which 23% were final year and 50% were interns and it was found to be statistically significant (P=0.032).More than 65% study participants agree that white coat is a potential transmitting agent. About 50% were final years and 83% of interns and it was found to be statistically significant(P=0.012). More than 30% of the study participants considered white coat carried germs, among which final year were 43% and interns were 21%. There was no statistical significance regarding spill on white coat.

Table 2: Perception Score of Study Participants Regarding White Coat Contamination

Responses	Final year BDS	Interns	P
How Do You Perceive Cleanliness of your white Coat? •Can't Perceive •Consider clean If There Is No Stain •Consider Clean if Collar and pocket are Clean	 23% 33% 44%	 50% 19% 31%	**0.004**
Does Your White Coat Is A Potential Transmitting agent? Strongly Disagree Disagree Can't Say Agree	 13% 17% 20% 50%	 0 4% 13% 83%	**0.012**
Do you think white coat carries germs? Strongly Diaagree Disagree Cant Say Agree	 17% 15% 25% 43%	 02% 11% 31% 21%	**0.008**
Spill On the White Coat Blood Saliva Others	 35% 44% 21%	 25% 57% 18%	
Self-Grading of the White coat by Subject Clean Moderate Dirty	 54% 38% 8%	 58% 34% 8%	

Table 3: Frequency Distribution of The White Coats Showing Growth Of Microorganisms

Microbes	Final year BDS (n=100)	Interns (n=100)	P
Chest :			
Gram Positive Cocci	49%	52%	1.02
Gram Negative Cocci	13%	9%	1.12
Gram Positive Bacillus	13%	11%	1.36
Gram negative Bacillus	27%	22%	0.923
Pocket:			
Gram Positive Cocci	41%	39%	1.16
Gram Negative Cocci	7%	5%	1.03
Gram Positive Bacillus	11%	7%	1.02
Gram negative Bacillus	24%	19%	0.081

Chi-square test, *statistically significant.

Frequency distribution of microorganism growth of two different areas of white coat, the chest and pocket. There was no statistical significance in microorganism distribution seen among the white coat of the study participants. Chest area shows more prevalence of gram positive cocci, 49% in final year and 52% in interns, which was followed by gram negative bacillus, 27% in final year and 22% in interns and less frequency of gram-negative cocci and gram positive bacillus. Pocket area showed gram positive cocci of 41% in final year and 39% in interns followed by gram negative bacillus 24%in final year and 19% in interns and less frequent of gram negative cocci and gram positive bacillus.

Table 4: Frequency Distribution of Bacterial Contamination Levels Of The Surfaces Of The Three Parts Of The Dental Unit Chair

Dental chair parts (n=200)	Gram Positive Cocci	Gram Negative Bacillus	Gram Positive Bacillus	Gram Negative Cocci
Chair Switch	31%	13%	7%	13%
Handle of the LED Light	32%	13%	3%	6%
Handle of the Material Tray	44%	18%	5%	9%
Total	35%	14%	5%	9%

Gram positive bacteria outnumbered gram-negative bacteria in quantity, according to the results of the identification of the bacterial contamination level of three components of the dental unit chair. Gram negative bacillus made up 14% of the total, gram positive bacillus 5%, gram negative cocci 9%, and gram positive bacillus 35% of the total.

DISCUSSION

The results showed, more than half of the students (60%) wore a single white coat per week. This was similar with study conducted by Acharya et al[8]. Regarding frequency of changing and washing, about 50% reported to change and wash once a week which is similar with Aljohani, et al [9] and 71% preferred home wash which was similar with Asima Banu et al and better as compared to the findings obtained by Muhadi et al[10] and Acharya etal. [8]

Before entering the corresponding department or laboratory, more than half (55%) of the study's participants don their white coats. It's interesting to note that while just 28% of students claimed they had ever exchanged white coats with colleagues Pydi, et al. [11], a majority of students (90%) said they had never done so.

Students' perception regarding white coat contamination, about 37% of the study participants were not able to perceive the cleanliness of white coat. More than 65% study participants agreed that white coat is a potential transmitting agent of which 50% were final years and 83% of interns and it was found to be statistically significant(P=0.012).[10] About more than 30% of the study participants considered white coat carries germs among which final year were 43% and interns were 21% and was statistically significant of about(0.008). This was similar to the finding by Pydi, et al. [11]

The study by Acharya et al. revealed more gram-positive cocci grew in two different places of the white coat chest and pocket with a frequency distribution of 45%, while gram negative organisms in the two areas were comparably less frequent. Gram-positive cocci were found to be isolated in large quantities in this study (50 percent of the total cultures collected), which is consistent with previous research by Malini et al [12,13]

The identification results of the bacterial contamination level on three parts of the dental unit showed gram positive bacteria exceeded the gram-negative ones in quantity. In total, gram positive cocci were was 35% , gram negative bacillus was 14%, gram positive bacillus was 5% and gram negatve cocci was 9% which was similar with study conducted by Ga-Young et al[14] and Treakle et al.[15] Wilson et al[16]

CONCLUSION

Present study explains that white coats are highly contaminated and are capable of causing infection. Students perception, attitude and practice of having more than one white coat, periodic washing of white coats after use, avoidance of using a particular white coat for a long period of time and frequent laundering of their coats should be encouraged. Study authenticates that certain precautions have to be taken in order to reduce the degree of contamination in health care settings. Preventing cross contamination between patient and dentist can be done by regular use of disposal PPE and drapes. Further continuous monitoring and analysis and proper implementation are needed to ensure proper disinfection of clinical surfaces.

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ETHICAL CONSENT

Patient included in the study had provided informed consent.

FUNDING

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CONFLICT OF INTEREST

The author declare that was no conflict of interest

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