

Original Article

# Microbial Flora on the White Coats of Dental staff, Karachi

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## Abstract

**Background:** Wearing a white coat is recognized as a crucial part of medical practice. The definite use of white coats and how frequently they are reformed varies significantly among individual doctors and their specialties. There has always been some worry that white coats, like nurses' uniforms and other hospital garments, may essentially play a part in spreading pathogenic bacteria. The aim of the present study was to evaluate the risk of transmission of pathogenic micro-organisms through the white coats of dental staff.

**Methodology:** This cross-sectional study was conducted at Karachi Medical and Dental College (KMDC) from 4th August to 4th October 2019. 200 white coats samples were collected and sent to the KMDC laboratory. Samples were cultured on blood agar and MacConkeys' agar. SPSS version 17.0 was used to analyze the data and chi-square and Fisher exact test were applied for significance testing.

**Results:** It was noted that most 150(75%) of the respondents washed their coats only once a week and 18(9%) had the habit of exchanging aprons. On the basis of self-grading, majority 158(79%) of the aprons were dirty, spillage was observed on 111(55.5%) aprons and 152(76%) of healthcare professionals did not remove lab coats while dining. Dental health professionals mostly kept their aprons on tables and about 53% of microorganisms were found in the upper region of aprons. The Gram-positive organisms were isolated as predominant ones from the samples obtained from the aprons.

**Conclusion:** White coats and aprons serve as an important source of cross infection. Guidelines should be formulated for their effective cleaning, washing and appropriate handling.

## Keywords

Aprons, Staphylococcus aureus, Bacillus species, Methicillin-resistant Staphylococcus aureus.



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## Introduction

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The nosocomial infections or healthcare associated infections are regarded as hazardous for patients and their families, who visit the healthcare facility<sup>1</sup>. Healthcare associated infections can be defined as, an infection taking place in a health care facility in an individual who was not infected before. It includes hospital acquired infections that become apparent after discharge. Moreover, occupational infections are also included that may occur among staff members of facility<sup>2</sup>.

In both the developing and developed countries, healthcare related infections are considered as a serious health problem. In poor resource setting, they may cause high impact. In such settings, the infection rate range is 25% to 40%<sup>3</sup>. Preceding research works have shown that nosocomial infections impart high financial strain on health care systems and patients. It results in increase in mortality, morbidity and high health care costs. According to an estimation, 1.4 million people suffer from nosocomial infections at any given time, throughout the world<sup>4</sup>.

Apron is a coat of dental as well as medical healthcare professionals which keeps their regular clothes safe from getting any kind of stains or contamination. Wearing apron is a sign of professionalism and it is a valued dress for doctors or healthcare professionals<sup>5</sup>. Wearing white coat brings credibility in medical profession and it is also used as a sign of authority and identification in medical profession. Wearing white coat have improved doctor-patient communication and build confidence to this relation<sup>6</sup>.

The color of coat is decisively selected as white because white color defines purity and cleanliness<sup>7</sup>. On the other hand, this may become contaminated with bacteria and play a role in dispersion of nosocomial infections to the patients. An important microorganism in

this regard is methicillin-resistant *Staphylococcus aureus* (MRSA) which is antibiotic resistant and increases mortality<sup>8</sup>. In September 2007 the bare below the elbow policy brought about instatement in England. Contamination with pathogenic bacteria is commonly found on Aprons<sup>6</sup>. Hospitals are always concerned about the risk of transmission of pathogenic bacteria. Finding of many studies stated that transmission of pathogenic bacteria in hospital settings may have part role of white coats of doctors', nurses' uniform and other hospital garments<sup>9</sup>. White coats were banned and a new guideline was set regarding the dress code to control nosocomial infection in British hospitals. Hospitals are always concerned about the risk of transmission of pathogenic bacteria. Patients feel ease and show confident in doctors because of the white coat. Still, wearing white coat in non-clinical (rest room, cafeteria, libraries) area have marked question on the functionality of white coat<sup>10</sup>. Many hospitals do not have changing rooms so that medical student may be seen wearing white coat while traveling to and from hospital. It can also be a reason for contamination of coat.

Most of the times students kept wearing their aprons while eating their meals at canteen, library and also at nonclinical<sup>11</sup>. Also, sometimes healthcare professionals left their aprons on chairs or tables. In case of dental healthcare professionals, there is important risk factor for infection with various organisms due to the various contaminations found while doing dental care like splashes of blood, saliva and aerosols<sup>1</sup>. Previous research works have associated different factors with contamination of white coats such as gender, work location, departments, personal carriage, personal hygiene, and handling<sup>12</sup>. According to a study, cuffs are the most contaminated regions as they come in contact with patients frequently. On the basis of gender, female's coats are found to be more contaminated<sup>2</sup>. However, research work of Banu et al., has

claimed that males have more contaminated white coats<sup>7</sup>. Some studies have found that staffs of medical department have more contaminated coats, while other studies have denied this fact<sup>9</sup> similarly, some research works have associated contamination with handling and washing of white coats while others have explained it on the basis of plateau effect<sup>3</sup>.

This study will elaborate the type of microorganisms carried by white coats and their role in spreading infection in hospital. Such an approach is important to envisage and implement adequate policies<sup>11</sup>. It will also help in creating awareness on issues of washing and handling white coats in order to overcome contamination. This area of research is highly important in country like Pakistan, where nosocomial infections are high<sup>2</sup>. It will help in developing patient safety initiatives to control nosocomial infections. However, the implementation of policies is controversial as studies have different views regarding role of healthcare workers uniform. Consequently, ban on white coat has not been advocated by The American Medical Association, instead further research has been recommended<sup>5</sup>. Thus, the aim of this study to assess microbial flora on aprons of dental healthcare professionals.

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## Methodology

This cross-sectional study was conducted from 4th August to 4th October 2019 at Karachi Medical and Dental College (KMDC), Pakistan. All the participants were briefed about the study protocol and informed consent was taken prior to inclusion in the study. Total 200 dental healthcare professionals including interns, post-graduate (PG) students, undergraduate (UG) students and the dental faculties were included in the study. All the aprons were made up of cotton material with half sleeve structure. Participants were given a questionnaire inquiring the washing and exchange habits of aprons

including the frequency of washing, exchanging, cleanliness, spillage and handling. Samples were taken from the three pre-determined areas i.e. chest area, upper part of pocket and sleeves of aprons by using sterile saline moistened cotton swabs. Samples were sent to the KMDC laboratory for assessment.

Samples, swabs were cultured on blood agar and MacConkeys' agar, the plates were then incubated at 37°C for 24 hours. The culture plates were examined for growth on next day and were identified by standard laboratory methods. Methicillin resistance in Staphylococcus species were tested with the help of Cefoxitin and Oxacillin disk on Mueller Hinton agar by using Clinical & Laboratory Standards Institute (CLSI) guidelines. For statistical analysis, SPSS version 17.0 was used, all categorical variables like presence of microorganisms, factors relevant to cleanliness etc. were represented through frequencies and percentages. The presence of microbes and factors of cleanliness of apron were associated through chi-square test where p value < 0.05 was considered significant.

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## Results

Table I shows demographic data of the study participants. It was noted that 150(75%) healthcare professionals washed their coats only once a week and 18(9%) had habits of exchanging aprons. On the basis of self-grading, 158(79%) of the aprons were dirty and spillage was observed on 111(55.5%) aprons. Aprons were used by 152(76%) health professionals while dining and 98(49%) had the habit of leaving their aprons on tables. No statistically significant association was found between microbial flora presence and factors such as place of keeping aprons (p=0.213), practice of exchanging (p=0.221), spillage (p=0.232), gender (p=0.112), frequency of washing (p=0.212) and use while eating (p=0.253).

Table I: Demographic details of the study population

Variables		n(%)	p value
Gender	Male	100(50)	0.112
	Female	100(50)	
Frequency of washing	Once in a week	150(75)	0.212
	Twice in a week	30(15)	
	Thrice in a week	20(10)	
Practice of exchange	Yes	18(9)	0.221
	No	182(91)	
Cleanliness	Dirty	158(79)	0.321
	Moderately clean	122(61)	
	Clean	20(10)	
Spillage	Yes	111(55.5)	0.232
	No	89(44.5)	
Use of apron while eating	Yes	152(76)	0.253
	No	48(24)	
Place of keeping apron	Table	98(49)	0.213
	Chair	84(42)	
	Cupboard	18(9)	

The microbial distribution for aprons is shown in the Table 2. About 53% of microorganisms were present on the chest region of aprons. The Gram-positive organisms were isolated as predominant ones from the aprons.

Table 2: Microbial distribution as per the samples obtained from white coats.

Microorganisms	White Coats n(%)		
	Chest	Pocket	Sleeves
Methicillin Resistant Staphylococcus Aureus (MRSA)	12(6)	5(2.5)	3(1.5)
Staphylococcus Aureus	28(14)	8(4)	4(2)
Coagulase Negative Staphylococci	31(15.5)	10(5)	25(12.5)
Diphtheroides	11(5.5)	10(5)	10(5)
Bacillus Species	10(5)	12(6)	8(4)
Pseudomonas Stutzeri	12(6)	6(3)	10(5)
Serratia	2(1)	1(0.5)	1(0.5)

## Discussion

White coat affiliates professionalism, credibility and purity with the health care professionals. However, they had been found to carry microorganisms that transmit infections<sup>13</sup>. This study was carried out to

determine microbial flora on aprons of dental health care professionals in a dental college and hospital. Moreover, the factors related with contamination were aimed to be investigated along with usage and attitudes of doctors towards white aprons.

The findings of present study show that white coats carry microorganisms because majority of the screened coats were contaminated. In one report contamination associated with white coats range from 28.46% to 95%<sup>14</sup>. This scenario imposes the question of place of white apron in the medical profession. Two reasons are responsible for this high bacterial load of white coats. One reason is that the doctors interact with patients, who shed microorganisms. Secondly, microorganisms can survive for 10 to 98 days on fabric material of white coats<sup>15</sup>.

The most common type of organisms found on aprons was *Staphylococcus aureus* (30%) these results are similar to what has been reported<sup>7</sup>. *Bacillus* species was the second most common organism found. Some forms of microbes including gram negative bacilli were regarded as environmental microorganisms having no clinical importance. MRSA was predominantly isolated *S. aureus*. MRSA is responsible for more than 60% hospital infections. Despite this fact, the dental health care professionals may carry them on aprons due to frequent dental contact<sup>16</sup>.

A study conducted by Srinivasan et al.,<sup>10</sup> found that 95% of white coats of doctors and students were contaminated with Gram negative bacilli and aerobic spore bearers. Gram positive cocci and gram-negative bacilli were found to contaminate the white coats of 92% dental students in another study<sup>1</sup>. The study of Uneke et al.,<sup>2</sup> indicated that 91.3% white coats of doctors were contaminated with diphtheroid, whereas, Banu et al.,<sup>7</sup> reported that *Staphylococcus aureus* is the major contaminant for 69% of white coats of medical students. *Escherichia coli* was found to be important contaminant for 28.46% of white coats of physicians in the study of

Pandey et al.,<sup>15</sup>. On the other hand, skin commensals including *Staphylococcus* and diphtheroid were found mainly in study of Wong et al. In the study of Muhadi et al., *Bacillus* and *Staphylococcus aureus* were found as main isolated on sleeves of white coats worn by medical students<sup>4</sup>.

In the present study, an important isolated microorganism was diphtherias. These microorganisms are usually present as skin commensals, however; they result in nosocomial infections in immunocompromised individuals. Many other studies have reported diphtherias as an important isolate of white coats<sup>12</sup>. It was found that white coats of female doctors are more contaminated as compared to the male ones. However, there is no association between contamination and number of white coats possessed. This is because the frequency of washing a white coat is linked with contamination. In accordance with plateau effect, the maximum steady state is reached by contamination in first week and it does not alter in the following weeks. This is true as coats washed after a week were equally contaminated. To decrease contamination, white coats should be washed within a week with disinfectants<sup>8</sup>.

Future research works should be conducted by using unworn white coats as controls for comparison. Due to variation in predominant isolates in different studies, hospitals should attempt to find out predominant organism in their locality for comparison of nosocomial data. For pathogenic isolates, antibiotic sensitivity analysis should be conducted. The short sleeved white coats should be specially considered for evaluation in future studies. Moreover, association of doctor attire and

patient preference should also be explored in Pakistan.

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## Conclusion

The findings of present study imply that white coat of doctors carry microorganisms, which can become means of spreading nosocomial infections and diseases. Thus, it is important to overcome contamination associated with white coats. This can be accomplished through regular hand wash before and after interaction with patients. Regular washing of aprons with disinfectants is also mandatory. To overcome bacterial contamination through coats, ban should be implemented on their use in non-clinical areas. Moreover, guidelines should also be formulated for better handling and washing of aprons.

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## Conflicts of Interest

None.

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