

## **A Survey of White Coat Hygiene among the Medical Students and Paramedical Students in a Tertiary Health Care Hospital.**

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### **Abstract:**

#### **AIMS OF THE STUDY:**

A Cross sectional study to determine the microbes present on the white coat and the factors associated with the contamination, usage, cleanliness and attitude of medical and paramedical students towards the white coat.

#### **BACKGROUND:**

Clinical white coats have very long history of being a symbol of hope and healing for medical professionals, they play an important role in doctor-patient relationship; however, there has been a concern that white coats may play a big role in transmitting infections within and outside hospital settings. In this research project, microorganisms present on white coats will be studied. Also, factors associated with contamination, reasons for wearing, usage and attitudes of medical students towards white coat, will be investigated.

#### **METHODS:**

The sterile swabs were rubbed once or twice on two predetermined areas of the white coat. After collection, the swabs were streaked onto the blood agar plates and observed for growth. Bacterial colonies were collected and subjected to staining procedures and biochemical tests for the identification of bacteria. Culture plates showing no growth after 48 hours of incubation were declared as negative.

#### **RESULTS:**

In a total of 100 white coats of medical and paramedical students, 58% were Gram positive cocci and 42% were Gram negative bacilli grown in culture which includes pathogenic bacteria like *Proteus*

species, *Klebsiella* species, and *Escherichia coli*.

## CONCLUSIONS:

This study suggests that a large proportion of medical and paramedical student's white coats may be contaminated with micro organisms, including Gram negative pathogenic organisms. White coats may be the major vector of transmitting infections from students-patients- students in tertiary health care hospitals. So, efforts should be made to discourage the usage of white coats outside the clinical areas.

## Introduction:

Profession is reflected by the attire of the person. White coat is worn by most of the science students which include medical and paramedical students. The way of dressing and cleanliness brings in respect from others in many instances. White coat is associated with standard of professionalism, care and helps in gaining the trust of their patients. In spite of following strict infection control protocols, we unknowingly carry many micro-organisms on our white coats [1]. Wearing white coats by medical professional is accepted practice, but when, where, and how we wear and wash them vary among individuals and even between different institutions. Patients-to-patients transmission of infections within health care facilities has been associated with transient harbouring of pathogens in health care workers and students clothing including white coats [2]. Clinical white coats have very long history of being a symbol of hope and healing for medical professionals, they play an important role in doctor-patient relationship; however, there has been a concern that white coats may play a big role in transmitting infections within and outside hospital settings [3]. Many medical colleges are closely attached to clinical areas and since there is no changing area in the hospital or clinical areas, students wear their white coats on the way to college and even in non-clinical and non-practical classes, library, cafeteria and resting areas around college. It is not an uncommon seen to see white coats are left on chairs or carried around [4].

White coats are known to be potentially contaminated with pathogenic bacteria and there has been always a concern about the risk of transmitting pathogenic bacteria in hospital. It is the interest of this study to find out the level and type of microbial contamination present on the medical student's white coats in order to assess the risk of transmission of pathogenic micro- organisms by this route in medical college among medical and paramedical students [5]. Student's way of handling the coat and cleaning as well as their attitude towards white coat's contamination was also investigated. The cleanliness of the coat is perceived by the student was correlated with bacteriological contamination, yet despite this is a significant proportion of students only laundered their coats occasionally. This study supports the view that the student's white coat is a potential source of cross infection on the ward [6]. Clinically trained medical and paramedical students should consider taking on the burden of maintaining freshly laundered white coats for the safety of patients. Proper handling of white coats by medical and paramedical students could minimize cross-contamination and improve patient safety by potentially reducing

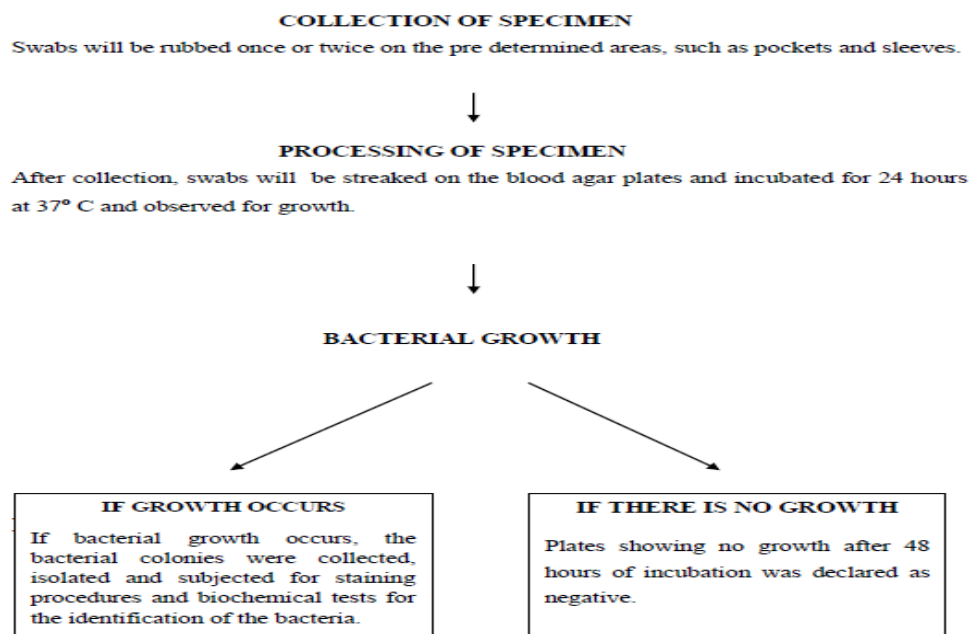
nosocomial infections [7]. Awareness on issues such as handling of white coats and ways to reduce contamination can be raised, especially research on this particular subject needs to be carried out periodically in India and also patient safety initiatives can be established to decrease nosocomial infection.

In this research project, A Cross sectional study to determine the microbes present on the white coat and the factors associated with the contamination, usage, cleanliness and attitude of medical and paramedical students towards the white coat.[8] Microorganisms are mostly present on white coats. Also factors associated with contamination, reasons for wearing, usage and attitudes of medical students towards white coat were investigated.

### **Materials and method:**

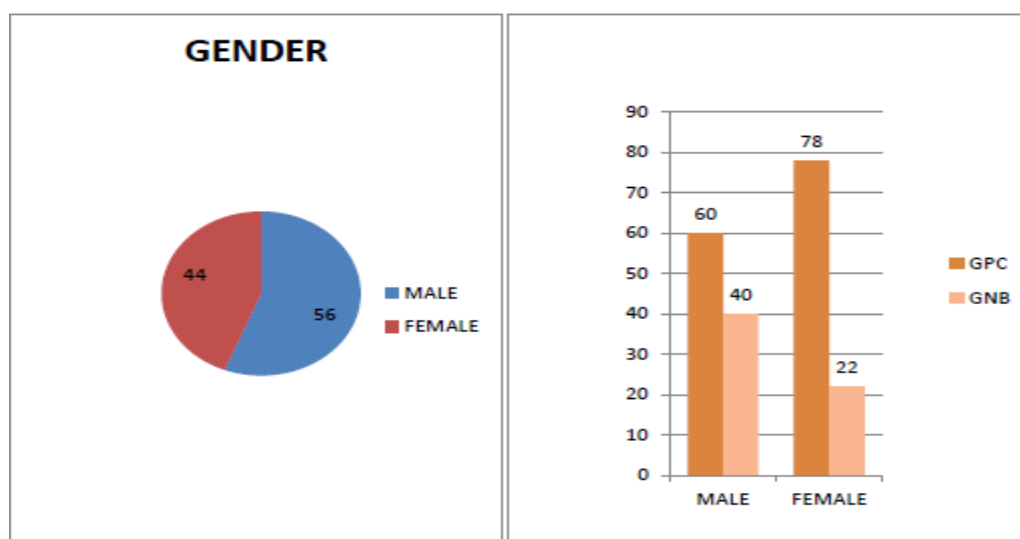
This cross sectional study was conducted in the Department of Microbiology of a tertiary care hospital which was attached to a medical college. Approval from the institutional ethical committee was duly taken for this study. [9] A total of 100 students (medical and paramedical) which includes interns, undergraduate and postgraduate students were randomly selected and they were included in this study. Among these 100 students, 16 were undergraduates, 79 were interns and 5 were postgraduate students. Inclusion Criteria: Students attending clinical postings including CRRIs (Interns). Exclusion Criteria: (a) Students with no clinical exposure (1<sup>st</sup> year), (b) Non co-operative students, (c) Newly washed coats. Sample size is calculated by formula  $n = Z^2(P)(1-P)/C^2$  Where, Z= Z value, P=Percentage picking a choice, expressed as decimal C=Confidence interval, expressed as decimal  $n = (1.96)^2(0.075)(1-0.075)/(0.05)^2$ , Number of participants=100. A brief, self-administered structured questionnaire was used to collect demographic data and information on the laundering habits, usage and their attitude towards white coats of the students. The demographic variables included gender, the subject's positions, their current postings such as Paediatrics, General Medicine, Ophthalmology etc [12] The reason for wearing the white coat with the options given as to cover clothing, to appear professional, dress code of the hospital, for the usage of pockets, to protect from pathogens or others, the frequency of washing, washing agents used such as soaps, liquid wash or disinfectants, number of white coats possessed, method of carrying the white coats like in a cover or bags or in hands or over shoulders, Usage of the white coats, the wearer's perception of whether the coat was dirty or clean and whether they believed if their white coats carried microbes and were the possible agents of the transmission of pathogens. Swabs were taken from pre determined areas of the white coat [15]. Normal saline was used to moisten the sterile swabs before collecting the sample by passing the swabs up and down twice on the desired areas and the swabs were sent immediately to the laboratory. [10]

### The illustrated representation of the collection and processing of samples:



### Results:

#### CHART: 1 GENDER RATIO WITH BACTERIAL CONTAMINATION ON WHITE COATS.

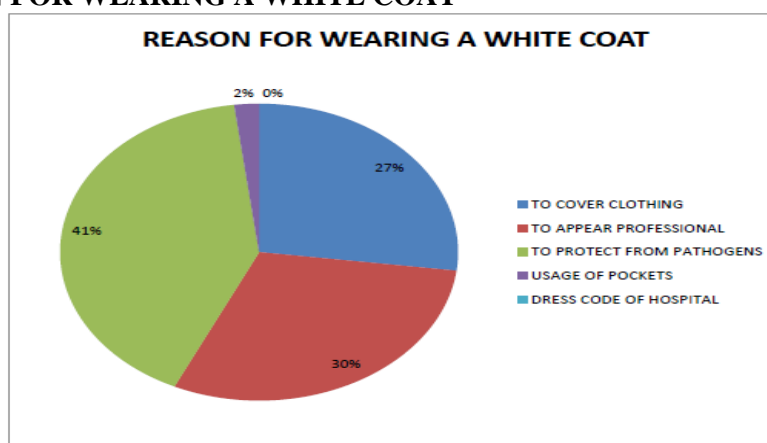


As of our study, totally 100 medical and paramedical students were included. Out of 100 students, 56 males and 44 females were participated. Out of 56 male coats, 60% of coats were contaminated with gram positive cocci and 40% of coats were contaminated with gram negative bacilli. Out of 44 female coats, 22% of coats were contaminated with gram negative bacilli and 78% of coats were contaminated with gram positive cocci. . Male coats are highly contaminated with gram negative bacteria comparing to femalecoats.

#### USAGE AND MAINTENANCE OF WHITE COATS

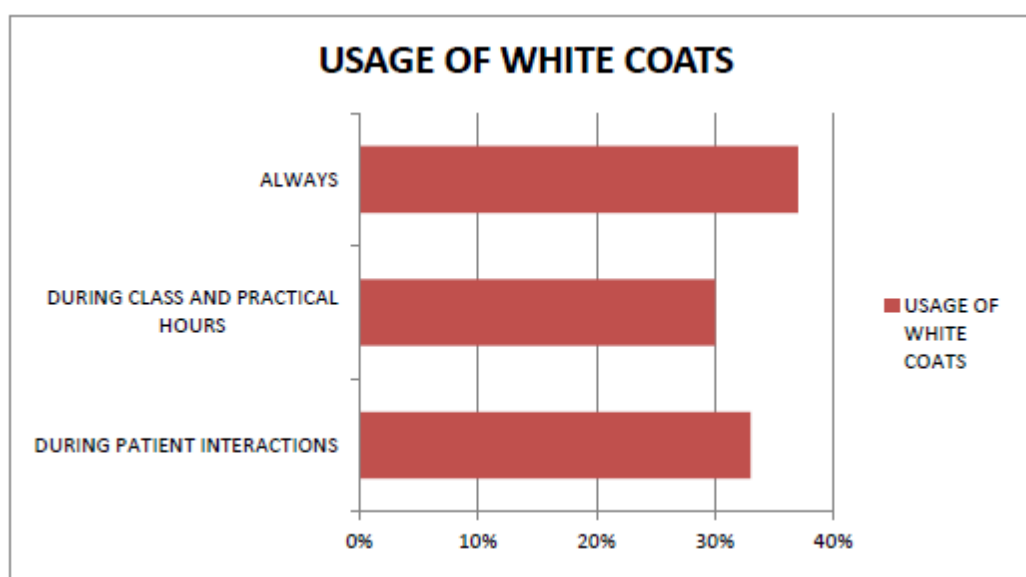
The attitude of the students towards the white coat is interpreted via some questions regarding the white coat usage and maintenance, and their answers to the questionnaire results will follows.

#### CHART2: REASON FOR WEARING A WHITE COAT

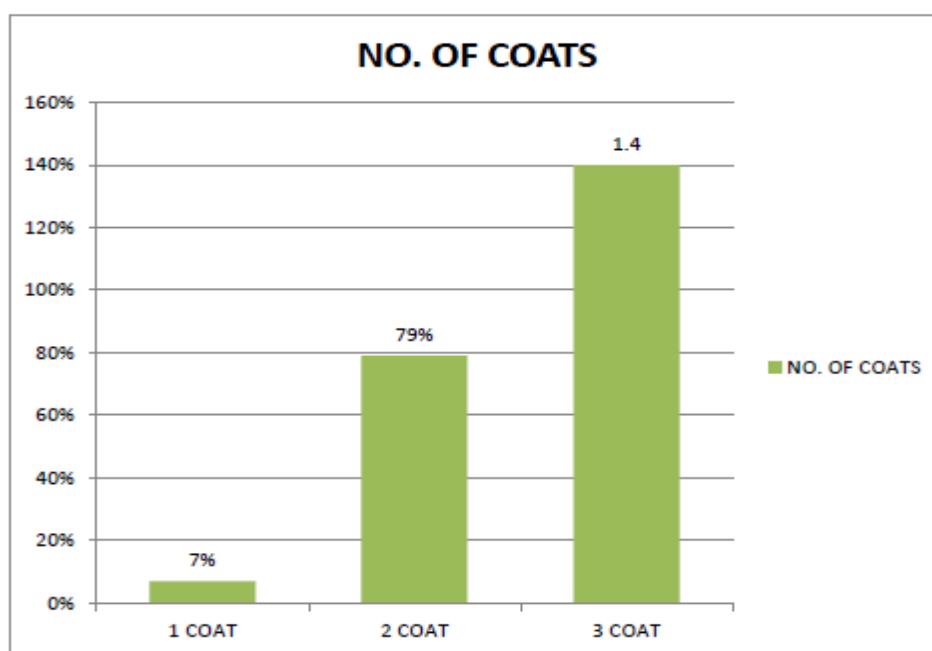


Students were asked for the reason of wearing the white coat in a total of 100 students, 27 students wearing to cover their clothing, 30 students wearing to appear professional, 41 students wearing to protect from pathogens and 2 students wearing for the usage of pockets in the white coat. The ultimate reason should be to protect from pathogens and only 41% of students thinking that way.

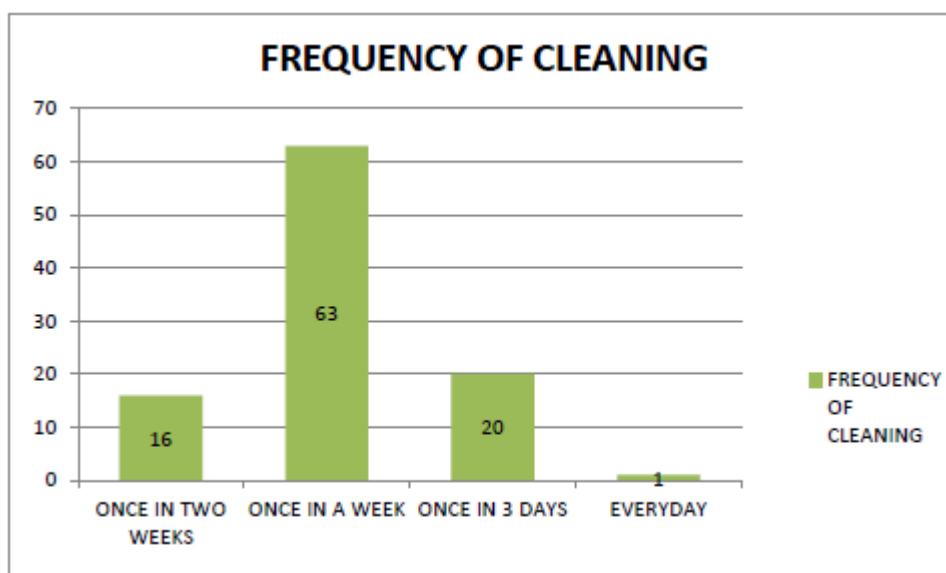
#### CHART: 3 USAGES OF WHITE COATS.



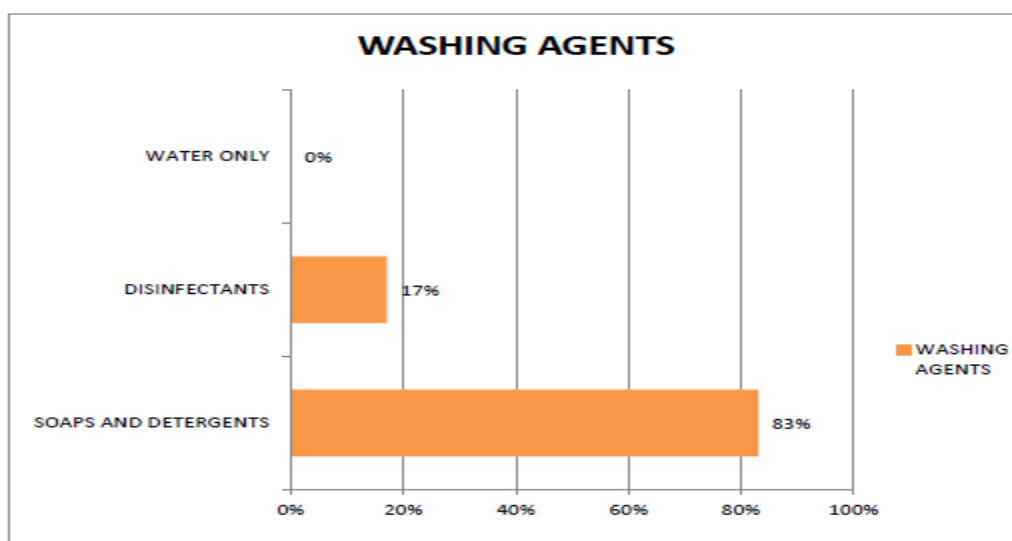
Every single students included in the study were from clinical areas, and out of them 33 students using during patients interactions, 30 students using during both class hours and practical's hours and 37 students using it always, whenever they are in their department and also outside the department. Students who use their white coats always (class, practical and during patient interaction), were more contaminated comparing to others.

**CHART: 4 NUMBER OF COATS**

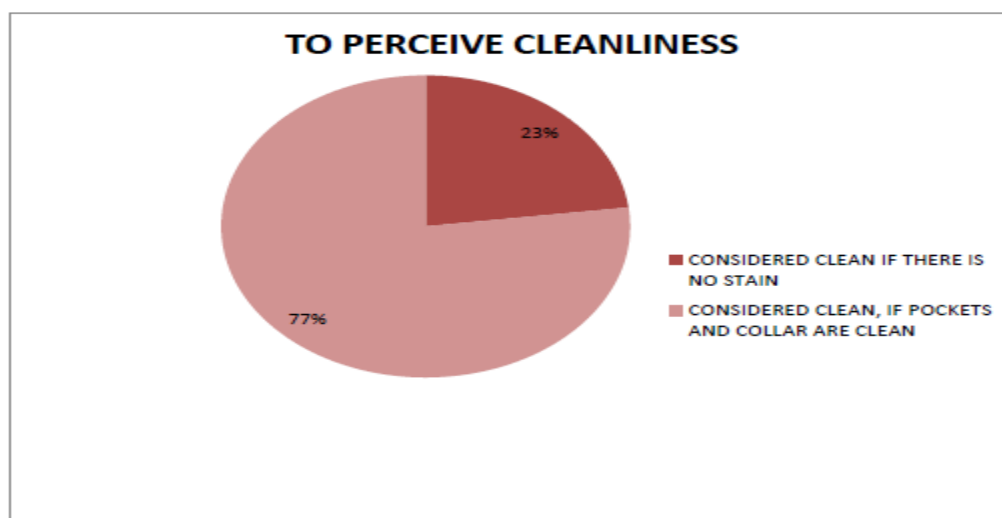
Out of 100 students 7% of students having only one coat, 79% of students having 2 coats and 14 of students having 3 coats. The ideal number of coats an medical or paramedical students can possess is 3 coats.

**CHART: 5 FREQUENCY OF CLEANING**

Students are asked about the frequency of cleaning of their white coats, and 16% of students answered that they clean their white coats only once in two weeks, 63% of students clean their coats once in a week, 20% of students clean once in 3 days and only 1% of students clean their coats every day.

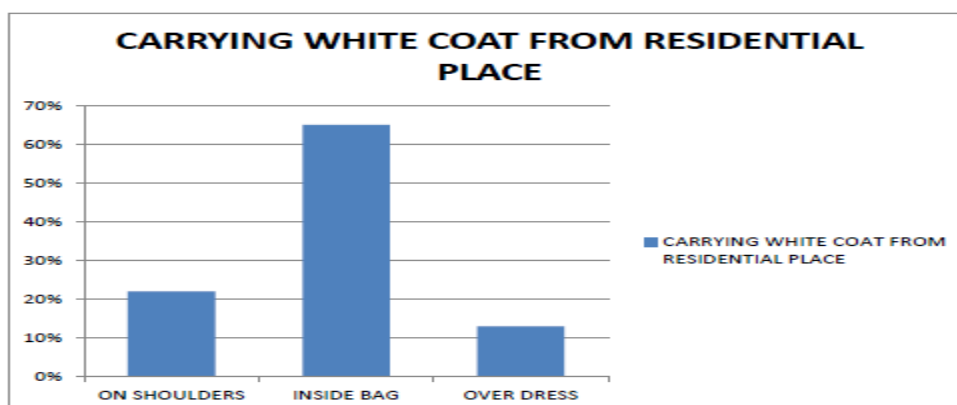
**CHART: 6 WASHING AGENTS**

Out of 100 students, 83 students were using soaps and detergents as their washing liquid and 17 students using disinfectants as their washing liquid and none of them using only water to clean their white coats which are quite considerable. But to be cleaned from both stain and micro organisms, every coat should be cleaned with both detergents and disinfectants. And no coats should be washed with general clothings, to prevent cross contaminations. 82 students using soaps and detergents to wash their white coats, 17 students using disinfectants as their washing agents and only one student using both as washing agents, which is quite considerable way of washing but not practiced by many.

**CHART: 7 PERCEIVING CLEANLINESS**

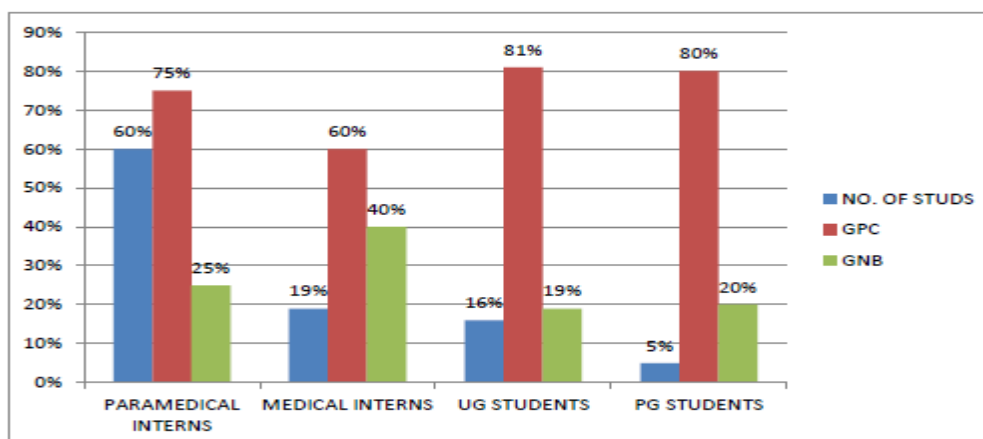
23% of students considered their coats are quite clean if there in no stain on it and 77% of students considered their coats are clean if only their pockets and collars are cleaned. Both are quite good ways to perceive the cleanliness of the coats but still treating with disinfectant makes it much better.

**CHART: 8 DIFFERENT WAYS OF CARRYING WHITE COATS FROM RESIDENTIAL**

**PLACE.**

Carrying white coats from their residential place plays an important role in the contamination of white coats. In our study 22% of students carrying their white coats on their shoulders and 65% of students wearing it over their dress and 13% of students keeping their coats inside their bags and this is quite considerable and hygienic way of carrying white coats from the residential place. Students who carry coats on their shoulders, which is considered highly contaminated comparing to the others. Growth of micro organism can be shown by using blood agar plate. Bacterial growth in the blood agar plates showing the white opaque colonies and geryish white colonies indicate the presence of contaminated white coats. Bacteria can be identified by using some biochemical method. Such as IMViC method (Indole test, methyl red test, Vogesproskauer test and citrate utilization test) were used to identify the enterobacteriaceae and related member.

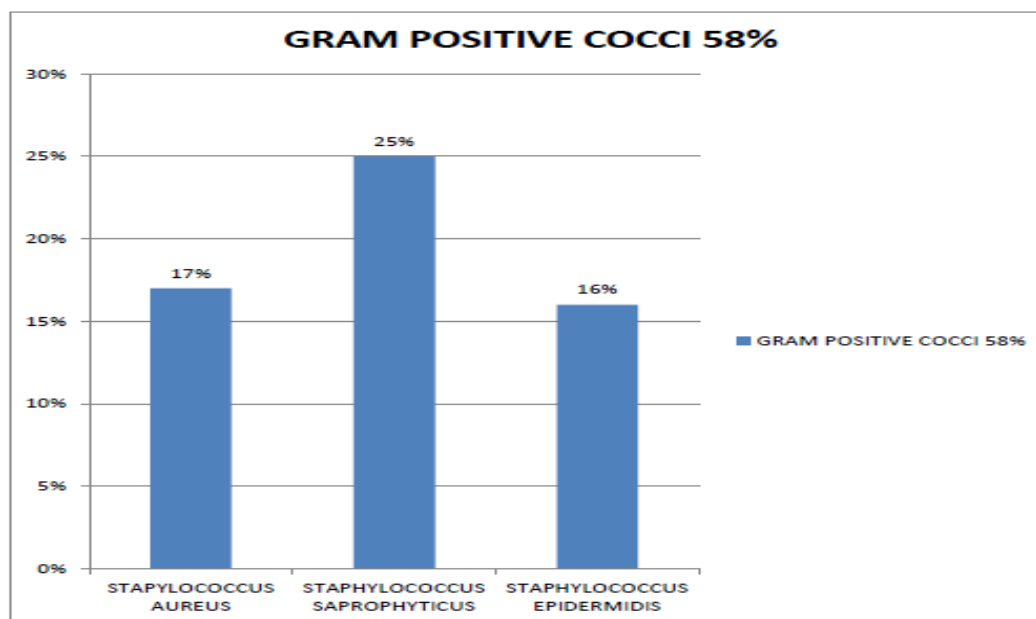
**CHART:9 COMPARISON OF BACTERIAL CONTAMINATION OF MEDICAL AND PARAMEDICAL STUDENT'S WHITE COATS.**



Out of 60 paramedical interns, 25% of coats were contaminated with gram negative bacilli and 75% of coats were contaminated with gram positive cocci. Out of 19 medical interns, 40% were contaminated with gram negative bacilli and 60% of coats were contaminated with gram positive cocci. Out of 16 under graduate students, 19% of coats were contaminated with gram negative bacilli and 81% of coats

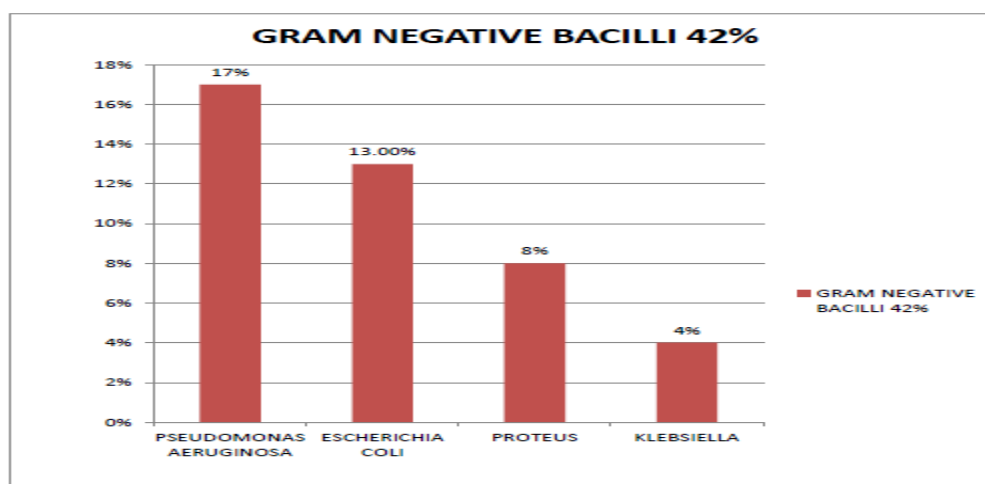
were contaminated with Gram positive cocci. 5 post graduate students were participated in the study, out of them, 20% of coats were contaminated with gram negative bacilli and 80% of coats were contaminated with gram positive cocci. Medical interns coats were more contaminated with Gram Negative Bacilli comparing to the other students.

**CHART NO 10: PERCENTAGE OF GRAM POSITIVE COCCI**



58% of gram positive cocci were isolated and identified including Staphylococcus aureus (17%), Staphylococcus saprophyticus (25%) and Staphylococcus epidermidis (16%).

**CHART NO: 11 PERCENTAGES OF GRAM NEGATIVE BACILLI**



42% of gram negative bacilli were isolated and identified including Pseudomonas Aeruginosa (17%),

*Escherichia Coli*(13%), *Proteus*(08%) And *Klebsiella*(04%).

### Discussion:

In this study, 56 males and 44 females were included. Out of 56 male coats, 60% of coats were contaminated with gram positive cocci and 40% of coats were contaminated with gram negative bacilli. out of 44 female coats, 22% of coats were contaminated with gram negative bacilli and 78% of coats were contaminated with gram positive cocci.[12] In muhadi et al study about the gender and the polluted sites, they concluded that male coats were more contaminated compared to female coats, which is quite similar to our study. [13]Students and Interns can be easily classified under their course and their year of study. Out of 60 paramedical interns, 25% of coats were contaminated with gram negative bacilli in which *Pseudomonas* species were predominantly seen and 75% of coats were contaminated with gram positive cocci in which *Staphylococcus Saprophyticus* were mostly identified. Out of 19 medical interns, 40% were contaminated with gram negative bacilli in which *Proteus species* were highly isolated and 60% of coats were contaminated with gram positive cocci in which *Staphylococcus* species are highly seen. Usage of the white coats plays the important role in contamination of white coats. In which, 35% of white coats were contaminated with gram negative bacilli and 75% of white coats were contaminated with gram positive cocci who use their white coats only during the patients interactions. Students who use their coats during class and practical hours are less contaminated with gram negative bacilli comparing to others. 33% of gram negative bacilli and 67% of gram positive cocci were found on their white coats. Students who use their white coats always (class, practical and during patient interaction), were more contaminated comparing to others. 52% of coats were contaminated with gram negative bacilli and 48% of coats were contaminated with gram positive cocci. Out of 100 students 7% of students having only one coat, 79% of students having 2 coats and 14 of students having 3 coats. It shows that the contamination rate is high for the students who have only one white coat. The ideal number of coats an medical or paramedical students can possess is 3 coats. Considering their workload in their departments and the frequency of cleaning, 3 coats per student is required to protect themselves and the patients from the pathogen.

Frequency of washing and washing agents using for washing is questioned to the students in the questionnaire. 82 students using soaps and detergents to wash their white coats, 17 students using disinfectants as their washing agents and only one student using both as washing agents, which is quite considerable way of washing but not practiced by many. In this, students who use only soaps and detergents are considered more contaminated with 33% of gram negative bacilli and 67% of gram positive cocci. Students are asked about how they carry their white coats from their residential place. As a result, 22 students carry their coats on the shoulders, 65 students wear it over their dress from their residential place and 13 students carry by keeping inside the bags, which is a safe and correct way to carry the white coat. 46% of gram negative bacilli and 54% of gram positive cocci were found on the coats of students who

carry coats on their shoulders, which is considered highly contaminated with gram negative bacilli comparing to the others. Muhadi et al in their study stated that by comparing genders in terms of polluted sites, micro organisms were more likely to be isolated from male collars and female pockets [14] but there were no significant difference between genders for two other sites, side or sleeves (in cases with long sleeves). In their study, SiyaPydi et al discussed about white coats which have been shown to act as fomites and harbor potential contaminants. Results of the current study confirmed previous findings, in which Gram-positive cocci are the predominant bacteria [15]. Gram-positive cocci are most commonly present as commensals on the skin. Coagulase-negative staphylococci are seen in the present study, whereas the study done in medical students observed the presence of *Staphylococcus aureus*, where they are known to cause nosocomial infections.

### Conclusion:

This study suggests that a large proportion of medical and paramedical student's white coats are contaminated with micro organisms, including gram negative pathogenic organisms.

Here, white coats become the major source of transmitting infections from students-patients- students in tertiary health care hospitals. This is due to the usage of white coats outside the clinical areas and improper hygiene practice as we discussed in this study earlier. To prevent this contamination and transmission of infection from students to patients, students should be educated with the knowledge about purpose and importance of white coats and also they should prevent using it outside the clinical areas and the proper usage of whitecoats. This study shows that several pathogenic microorganisms are harboured by the white coat and it plays a significant role in transmission of infections in a hospital setting. It is important, as once these aspects are understood then appropriate policies could be implemented. Proper handling of white coats by medical and paramedical students and other healthcare workers could minimize cross-contamination and improve patient safety by potentially reducing nosocomial infections.

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