

Effect of white coats on spread of nosocomial infection

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ABSTRACT

White coats are known to be potential transmitting agents of multi-drug resistant organisms. This study was conducted to determine the level and type of microbial contamination present on the white coats of medical students in order to assess the risk of transmission of pathogenic micro-organisms by this route in a hospital setting. A cross sectional survey of the bacterial contamination of white coats in a tertiary care hospital. 50 medical students working in various specialties were included in the study. Swabs were taken from 4 different areas of the white coat – collar, pocket, side and lapel and processed in the Microbiology department according to standard procedures. Although most of the white coats had been washed within the past 2 weeks, the sides of the coats were the most highly contaminated areas followed closely by the collar and pockets. *Staphylococcus aureus* was the most common isolate followed by coagulase negative *Staphylococci* and Gram negative non fermenters. Most of the Gram positive cocci were resistant to Penicillin, Erythromycin and Clindamycin. White coats have been shown to harbor potential contaminants and may have a role in the nosocomial transmission of pathogenic microorganisms. Thus, a yearly purchase of white coats and the possession of two or more white coats at any point in time should be made compulsory. There is pressing need to promote scrupulous hand washing before and after attending patients and alternatives to white coats, including universal use of protective gowns, should be considered.

Keywords: White coat, Bacterial contamination, Nosocomial infection

INTRODUCTION

White coats are worn primarily for identification, but there has always been some concern that white coats, like nurses' uniforms and other hospital garments, may play a part in transmitting pathogenic bacteria in a hospital setting, as white coats are known to be potentially contaminated with pathogenic drug resistant bacteria [1]. Since many medical colleges are closely attached to hospital environments and as there is no changing area in the hospitals, students wear their white coats on the way to their colleges and even in the non-clinical and non-practical classes, library, cafeteria and in the resting areas around their colleges. It is not uncommon to see white coats being left on chairs or being carried around outside the hospital premises [2].

It was the interest of this study to find out the level and the type of microbial contamination which was present on the medical student's white coats in college, in order to assess the risk of transmission of the pathogenic organisms by this route in our hospital. The student's way of handling the coats and cleaning them, as well their perception towards white coat contamination also were investigated.

MATERIALS AND METHODS

50 undergraduate and postgraduate medical students and interns were randomly selected and they were included in this study, of which 65% were males and 35% were females. Of the 50, 83% were undergraduate students, 10% were interns and 7% were postgraduate students. All the students were working in the outpatient and the inpatient wards of our hospital. All the invited students were asked to read the questionnaire and to sign the consent forms.

A brief, self-administered, structured questionnaire was used to collect demographic data and information on the white coat laundering habits of the participants. The demographic variables included gender, place of staying, the subject's positions (student, intern or post-graduate), their current work locations (paediatrics, medicine, ophthalmology, ENT, skin and STD, microbiology, surgery, public health and obstetrics and gynaecology), the reason for wearing the white coat (to cover clothing, to appear professional, dress code of the hospital, for the usage of pockets or other), length of the usage of the coat (<1 year, 1-2 years, 2-3 years or > 3 years), when the coat was last washed (<3 days, 1 wk, 2-4 weeks or >1 month), the frequency of washing (<3 days, 1 week, 2-4 weeks or > 1 month), type of cleaning (home or laundry), washing agents used (soaps, liquid wash or disinfectants), number of white coats possessed (1, 2, 3 or >3), method of carrying the white coat (cover, bags, hands or shoulder), location of the use of the white coat (hospital only or hospital and college), 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 four different areas of the white coat (collar, pocket, sides and lapels). The swabs which were used were plain, cotton-tipped and sterilized swabs. Normal saline was used to moisten the 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. The swabs which were received by the Department of Microbiology were immediately streaked onto blood agar and McConkey's agar and the plates were incubated overnight at 37°C. The colonies which were obtained were identified by using standard techniques [3]. Antibiotic sensitivity testing was done by using Kirby Bauer's disc diffusion method as has been described in the CLSI guidelines 2011 [4].

RESULTS AND DISCUSSION

Traditionally, the white coat is thought to bring credibility and dignity to the medical profession [2]. However, white coats have been shown to harbour potential contaminants [1,2,5,6] and so these may have a role in the nosocomial transmission of pathogenic microorganisms. The high rates of the bacterial contamination of white coats may be associated with the following 2 facts: Firstly, patients continuously shed infectious microorganisms in the hospital environment, and the health care providers are in constant contact with these patients. Secondly, it has been demonstrated that microorganisms can survive between 10 and 98 days on fabrics which are used to make white coats, which include cotton, cotton and polyester, or polyester materials [7,8].

All the medical students worked in the clinical wards from the 2nd phase and examined patients. These students indiscriminately used the white coats even outside the hospital premises. Since white coats are implicated as major fomites in the transmission of nosocomial infections, we studied 50 medical students who were working in various specialties. Most of them i.e., 40 were undergraduates, 6 were interns and the remaining 4 were postgraduate students. Of the 32 white coats which belonged to the male subjects, 20(62.5%) were contaminated, while of the 18 white coats which belonged to the female subjects, 13(72.2%) were contaminated. This was the same as the findings of a study which was conducted by Muhadi et al., [2] who found in their study, that the coats of females tended to be more contaminated.

The medical students who were residing at home tended to have white coats that were more contaminated (72.9%), whereas those who were residing in the hostel had less contaminated coats (63.1%), which was a worrying prospect, as the hospital organisms were likely to spread in the community. Most of the students were of the opinion that white coats were worn to appear professional (67%) and because it was the dress code of the hospital (45%). However, 32 of the subjects used their white coats only in the hospital premises, while the other 18 used it outside the hospital premises too. Although both the clinical and the non-clinical students had a high level of awareness regarding the contamination of the white coats, they still wore it in different areas of the college such as the library, reading rooms, canteen, classes and even outside the hospital premises when it was not necessary. Providing

students with changing areas in at the hospital site may reduce their frequency of using the white coats in the college and in the non-clinical areas [2].

Even though the subjects perceived their white coats to be clean, even without stains, 41 were aware that the coats could act as a mode of transmission of the hospital's pathogenic organisms. The data from the washing practices of the students revealed that most of the students had washed their white coats within the past 1 week (71%). In spite of this, the contamination was high (62%-78%), irrespective of the time gap since the last wash. This was similar to the findings of a study which was done by Wong et al., [1], who found that the microbial counts did not vary with the time in the use of the white coats. A steady state of maximal microbial contamination was attained within the first week of use of the coats and this did not change significantly thereafter. 49 of the white coats were washed at home, whereas 11 were washed in a laundry. The degree of contamination was similar in both the sets.

In the present study, *Staphylococcus aureus* was the major pathogen which was isolated (64.7%), which is similar to that which was found in the studies of Muhadi et al., [2], Treacle et al., [9] and Wong et al., [1] and different from the findings of a study which was done by Uneke et al., [7], in which diphtheroids were the most common organisms which were isolated. The antimicrobial susceptibility pattern of the gram positive cocci revealed that most of them were resistant to Penicillin (81.6%), Erythromycin (70.6%) and Clindamycin (58.7%). This is consistent with the susceptibility pattern of similar organisms which were isolated from suspected nosocomial infections in our hospital and this indicated a possible link between the contamination of the white coats and the transmission of infections to the susceptible patients. In our study, MRSA was isolated from 4 white coats, which was significantly lower than that which was reported Uneke et al., [7] but similar to the findings of a study which was done by Treacle et al., [9], who reported no MRSA isolation from the white coats.

Coagulase negative *Staphylococci* were also isolated (10.3%), which are skin commensals and these can be potentially infectious to the patients who are admitted in the hospital. Gram negative bacilli were isolated from the white coats, but these were also significantly lesser in number but were also potentially infectious, as was reported by Zachary, 2001 and Grabsch 2006 [2,5,10,11].

The following suggestions may be made on the basis of the findings of this investigation. Firstly, a yearly purchase of white coats and the possession of 2 or more white coats at any point of time should be made compulsory. The wearers of the white coats should be encouraged to wash their white coats weekly. This study provides microbiological evidence to support the exclusion of white coats from the nonclinical areas of the hospital such as the libraries and the dining rooms. A number of earlier studies had demonstrated that the compliance with the hand-hygiene protocols among all the healthcare workers, including the physicians, was poor [7]. A lack of hand hygiene undoubtedly enhances the contamination of the white coats, since they are often touched by the physicians in the course of their work. As a result, there is a pressing need to promote a scrupulous hand washing among the physicians before and after they attended to patients and also to promote alternatives to the white coats, which includes the universal use of protective gowns.

REFERENCES

- [1] Wong D; Nye K; Hollis P; *British Medical Journal*, **1991**,303 21–28.
- [2] Muhadi SA; Aznamshah NA; Jahanfar S; *Malayasian Journal of Microbiology*. **2007**, 3(1) 35–38.
- [3] Mackie; Mc Cartney In: *Practical Medical Microbiology*. 14th. Collee JG, Fraser AG, Marmion BP, Siminons A, editors. New York: Churchill Livingstone; **1996**.
- [4] CLSI. Performance standards for Antimicrobial Susceptibility testing; Twenty First Informational Supplement. CLSI document M100-S21. Wayne, PA: Clinical and Laboratory Standards Institute; **2011**.
- [5] Varghese D; Patel H; *British Medical Journal*. **1999** 519.
- [6] Neely AN; *Journal of Burn Care and Rehabilitation*. **2000** 21 523–27.
- [7] Uneke CJ; Ijeoma PA; *World Health and Population*. **2010** 11(3) 44–54.
- [8] Chacko L, Jose S, Issac A, Bhat KG. *Indian Journal of Medical Microbiology*. **2003** 21(4) 291.
- [9] Treacle AM; Thom KA; Furuno JP; Strauss SM; Harris AD; Perencevich EN. *Am J Infect Control*. **2009** 37(2):101–05.
- [10] Zachary KC; Bayne PS; Morrison VJ; Ford DS; Silver LC; Hooper DC; *Infection Control and Hospital Epidemiology*. **2001** 22(9) 560–64.

[11] Grabsch EA; Burrell LJ; O’Keeffe JM; Ballard S; Grayson L; *Infection Control and Hospital Epidemiology*. **2006** 27 287–93.