

# Microbial Contamination of White Coats, Hands and Mobile Phones of Health Care Workers

Muhammed Irfan Khan<sup>1</sup>, Mehwash Kashif<sup>2</sup>, Roohi Ehsan<sup>3</sup>, Dr. Muhammad Faizuddin<sup>1</sup>, Sana Iqbal<sup>2</sup> and Hiba Jamil<sup>4</sup>

<sup>1</sup>Pathology Department, Karachi Medical & Dental College, <sup>2</sup>Department of Oral Pathology, Karachi Medical & Dental College, <sup>3</sup>Department of Forensic Medicine, Karachi Medical & Dental College, <sup>4</sup> Karachi Medical & Dental College

## ABSTRACT

**Background:** Microbial contamination as the name suggests is the infiltration of pathogenic microbes into any living body. It increases the burden of disease and results in many fatal infections. The commonest reason behind microbial contamination in the health care system is health care workers. The risk of infections in tertiary care centers increases magnanimously despite a near-constant disinfection regimen being followed daily. Aside from the usual surfaces and equipment, infective agents are most commonly present on the hands of hospital staff, their mobile phones, and their clothing, specifically their lab coats.

**Objective:** This study was planned to evaluate the microbial contamination of white coats, hands, and mobile phones of health care workers.

**Methods:** This study, conducted in a tertiary care hospital in Karachi, estimates the percentage of microbial colonization on the white coats, mobile phones, and hands of health care workers. A total of 114 individuals were asked to obtain samples and a convenience sampling technique was used. Data were analyzed on SPSS version 17.0.

**Result:** Lab coat contaminants were found to be *Staphylococcus aureus* (70%), *Staphylococcus epidermidis* (15.71%), and *Escherichia coli* (5.71%), Methicillin-Resistant *Staphylococcus aureus* MRSA (4.2%), *Klebsiella* (2.85%), and *Pseudomonas* (1.42%). The hands of observed health care workers mostly contained MRSA (32.32%) *Staphylococcus aureus* (29.29%), *Staphylococcus epidermidis* (29.29%), and *Pseudomonas* (9.09%). Mobile phones majorly held MRSA (37%), *Staphylococcus epidermidis* (36%), *Staphylococcus aureus* (21%), and *Pseudomonas* (6%).

**Conclusion:** This cross-sectional study shows that a huge extent of health care worker's apparel and belongings were tarnished with various types of microorganisms that can bring about nosocomial contaminations.

**Keywords:** Contamination of White coats, Mobile phones, Healthcare worker, *Staphylococcus*, *Streptococcus*, *Pseudomonas*, *Klebsiella*

## Introduction

Most often, the profession of a person is reflected in the attire. The white coat is worn by most of the science people which include medical and paramedical staff. The way of dressing and cleanliness brings in respect from others in many instances.

The white coat is associated with the standard of professionalism and care and helps in gaining the trust of their patients. On the other hand, these white coats are known to be potentially contaminated with pathogenic bacteria.<sup>1</sup>

In most medical and dental schools, the same white coat is worn in both clinical and non-clinical areas. It is not uncommon to see the students wearing a white coat in nonclinical areas like canteens, libraries, and off the campus. There are research studies done on dental staff and clinical students attending patients which concluded that a white coat may act as a transmitting

### CORRESPONDENCE AUTHOR

Muhammed Irfan Khan

Pathology Department  
Karachi Medical & Dental College

agent. 2 Person to person conduction of contaminations inside medical care offices have been related to the transient holding of microbes in medical care laborers and undergraduate garments including white coats. 3 It is additionally normal to see individuals draping their white coats in their vehicles and workplaces or hauling them around outside emergency clinic regions which build chances for dealing with both pathogenic and nonpathogenic microorganisms. A portion of those bacterial strains may be safe strains, for example, Methicillin-Resistant *Staphylococcus aureus* (MRSA) which may be spread from emergency clinic to the network and the other way around. 4 Little from African nations have been distributed on the issue of medical services supplier attire and potential for sullying. 5

Unclean hands of medical care suppliers assume a significant function in spreading diseases in medical care settings. Hand cleanliness is one of the most significant preventive mediations against the spread of contaminations in medical care settings. 6

Cell phones have gotten a crucial extra of the present society, and they are being utilized broadly in medical clinic settings. They are normally taken care of independent of the neatness of hands and once in a while sanitized, consequently may hold pathogenic microorganisms. 7 The discussion on the limitation of cell phone use in clinical settings because of electromagnetic obstruction that may influence clinical hardware has arrived at an end, yet the possible function of cell phones in sending disease stays under extreme discussion. A few investigations have portrayed the sullying of clinicians' cell phones in medical services settings and announced a degree of pollution and kind of microorganisms that rely upon the clinical and topographical setting. 8

Patients in serious consideration units i.e. ICUs are especially vulnerable to HAIs as a result of their unexpected weakness status notwithstanding the utilization of intrusive hardware like catheters and cannula. So also, babies in neonatal consideration units (NICUs) have a higher danger of clinic procured contaminations (HAIs) due to their juvenile insusceptible frameworks, their skin doesn't give a solid obstruction against creatures in nature and countless these newborn children are untimely and regularly require intrusive techniques to support their life, for example, mechanical ventilation and complete parenteral sustenance. 9 Wearing white coats by a clinical expert is acknowledged practice, however when, where, and how we wear and wash them fluctuate among people and even between various

establishments. 10-12 Very few local studies were found on the topic therefore, this study was conducted with the rationale to evaluate the microbial contamination of white coats, hands, and mobile phones among health care professionals.

## Methods

A cross-sectional study was conducted in different departments of Abbasi Shaheed Hospital, Karachi, and Karachi Medical and Dental College. The samples were collected randomly from different cell phones, white coats, and hands of health care workers. The duration of the study was 6 months from July 2018 – December 2018. The participants were asked for verbal informed consent for sample collection and part of the study. A brief self-administered, structured questionnaire was used to collect demographic data and other information regarding laundry habits of lab coats washing, time of wearing coats, hand hygiene habit, and ways of cleaning mobile phones if any. A total of 114 samples were randomly collected from which includes 52 lab coats, 36 hands, and 26 mobile phones of the health care workers. Samples were collected in an aseptic fashion. Samples were collected from sterilized swabs from three different areas of lab coats, hands, and mobile phones. The researcher washed his hands with antiseptic soap, use hand sanitizer, and collected the samples. Applicators were placed carefully in their containers and transported to the laboratory within 24 hours of sample collection. The samples were inoculated in Blood agar and MacConkey agar which then incubated at 37-degree centigrade overnight. The bacteria experienced diverse biochemical tests to isolate the particular organism. Besides Gram staining, the biochemical tests used to isolate microorganisms were sugar media test, citrate test, urease test, and other selective biochemical tests. Data was analyzed on SPSS version 17.00.

## Results

Table- I showed the frequency of different items and their gender-wise distribution. It revealed that females have reported majority contamination among all three items. (Table-I)

The percentages of the organism that colonize on all three parts to identify the diseases they would cause eventually are found to be, Lab coat contaminants were *Staphylococcus aureus* (70%), *Staphylococcus epidermidis* (15.71%), *Escherichia coli*(5.71%), Methicillin-Resistant *Staphylococcus aureus* MRSA (4.2%), *Klebsiella* (2.85%) and *Pseudomonas*(1.42%). The palms of observed health care workers mostly

contained MRSA (32.32%) Staphylococcus aureus (29.29%), Staphylococcus epidermidis (29.29%), and Pseudomonas (9.09%). Mobile phones majorly held MRSA (37%), Staphylococcus epidermidis (36),

Staphylococcus aureus (21%), and Pseudomonas (6%). (Table- II)

**Table- I displaying occurrence of items according to gender**

Objects	Frequency n(%)	Females n (%)	Males n(%)
Laboratory coats	52 (45.6)	35 (67.3)	17 (32.6)
Hands	36(31.57)	24( 66.6)	12 (33.3)
Cellular phones	26( 22.80)	23 (88.4)	03 (11.53)

**Table-I: Relative exploration of diverse microorganisms on diverse items**

	Staphylococcus aureus %	Staphylococcus epidermidis %	Escherichia coli%	Methicillin Resistant Staph. Aureus %	Pseudomonas aeruginosa %	Klebsiella pneumoniae. %
White coats (52)	70	15.71	5.71	4.2	1.42	2.85
Hands (36)	29.29	29.29	-	32.32	9.09	-
Mobile phones (26)	21.0	36	-	37	6	-

### Discussion

The white coat has been designed to bring dignity to the medical profession.<sup>13</sup> From undergraduate students to postgraduate doctors, every individual wore it to be presented as professional. On contrary, it does bring a lot of infections as the professionals wore it for hours in hospital premises that can cause any nosocomial infection as the doctor is in continuous contact with the patient and also to the hospital environment.<sup>14</sup> They not only get in contact with the hospital environment but also the outside environment as doctors also wear white coats get contaminated with other microbial organisms too, in which Gram-positive cocci are the predominant bacteria. 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. <sup>16</sup> We have conducted our research in a government hospital which poses more risk of infections as the majority of patients coming there were from a low class. Due to their poor hygiene and sanitary conditions, they could be the carrier of many diseases which they can spread to medical students and doctors.

Table- I showed the frequency of different items and their gender wise distribution. Results reported that females have major contamination over all three items.

This could be due to the enrolment of more female’s students in medical and dental degree programs. Approximately 70% of the organisms found from the white coats were Staphylococcus aureus. It can cause many diseases like insignificant contagions for example blemishes, impetigo, carbuncles, and facial space infections to serious illnesses like pneumonia, meningitis, bacteremia, and sepsis. Staphylococcus epidermidis, the second frequently found organism with 15.71% can cause infection in prosthetic joints, catheters, and large wounds. These discoveries were practically simply like another research in Columbia of 75% bacterial defilement and not quite the same as another investigation in Nigeria where defilement was 91.30% <sup>14, 15,17</sup>. The higher predominance in Nigeria is consistent with our investigation may be clarified by the way that our examination was led at a tertiary care hospital same as in the Nigerian study which was directed in the local medical clinic. S. aureus was the significant microbe confined (46.20%) in their investigation.<sup>18</sup>

Hand contamination of health care workers is a major problem. The rate is high as they are the source of spread everywhere, whether cell phones or white coats. The organisms obtained from the hands are MRSA, staphylococcus aureus, Staphylococcus epidermidis, and Pseudomonas with MRSA affecting a great percentage of individuals. MRSA (Methicillin-resistant Staphylococcus aureus) is a tough bacteria as

it is resistant to many antibiotics. It mainly causes skin infections by direct contact or by droplets causing pneumonia. Staphylococcus aureus and epidermidis are also among the highest infectious agent in our research.<sup>20</sup> It is noteworthy that in our study, hand samples were obtained during routine healthcare practices under non-standardized conditions. This allows us to get a clear cut picture of bacterial load on hands. By following proper hygiene practices and using disinfectants in clinical practices can help cope up with the risks of microbial contamination. Mobile phones were found to be contaminated with MRSA (Methicillin-resistant Staphylococcus Aureus) and S. Epidermidis. MRSA can cause skin infections, rashes, sores, boils, and some serious infections like surgical wounds, bloodstream, lungs, or urinary tract infections. S. Epidermidis can cause nosocomial infections which are the reason why it has gained so much attention.

Past examinations have exhibited that the microbiological profile of the clinicians' cell phones corresponds with the microorganisms disengaged from the clinicians' hands, which may show that cell phone sullyng may be an indicator of hand defilement.<sup>21</sup>

Cross-sectional plan and diminutive specimen size are the constraints of the study. It is suggested that further investigations will be led with a bigger specimen size to make it more generalizable. Additional examination is expected to assess procedures to limit the danger of patient-to-persistent transmission of microbes from other despoiled things. Awareness programs must be arranged so the clinicians and staff are invigorated with the standards of cross-contamination control and cleansing strategies.

## Conclusion

This cross-sectional study shows that a huge extent of health care worker's apparel and belongings were tarnished with various types of microorganisms that can bring about nosocomial contaminations.

**Conflicts of Interest:** The authors declared no conflicts of interest.

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## References

1. Saj T, Murali P, Bohra S, Shenoy S, Krishnanayak U. Microbial flora on the white coats of dental health care professionals. *Indian J Oral Sci.* 2016 ;1;7(2):107-.

2. Janani K, Kumar MP. Microbial contamination of dental care clothing-a quantitative study. *Drug Inven. Today.* 2018 ; 1;10(4).
3. Pydi S, Pachava S, Sanikommu S. Microbial contamination of the white coats among preclinical and clinical dental students: A comparative cross-sectional study. *J Indian Assoc Public Health Dent.*2015; 13(2):193-196.
4. Thaore S, Desai N, Srinidhi SR, Surwade P. Microbial contamination of lab coats while performing endodontic treatment. *The IIOAB journal.* 2011;7(6):1-6.
5. Kashif M, Kamran MA, Ayub T, Hussain SS, Khan MI. Are we clean enough? A cross sectional study conducted among general dental practitioners and consultants of Karachi. *J Liaquat Uni Med Health Sci.* 2020; 19(2): 128-32.
6. Ferdous T, Shuchi S, Begum A, Hossen MS, Hossain MN. Mobile phone using pattern and the perception amongst university students in Dhaka city. *Bioresearch Communications-(BRC).* 2020; 1;6(1):872-81.
7. Rai R, Kumar PN, Prashant GM, Hirekalmath SV, Imranulla M, Mohammadi SN, Basha S. Perception and attitude towards wearing white coats in public places among dental undergraduates and postgraduates of Davangere City, India. *J. Adv. Med and Med Res.* 2016:1-0.
8. Brady RR, Verran J, Damani NN, Gibb AP. Review of mobile communication devices as potential reservoirs of nosocomial pathogens. *J Hospital Inf.* 2009 1;71(4):295-300.
9. Newby J. Nosocomial infection in neonates: inevitable or preventable?. *J perinatal & neonatal nursing.* 2008 : 1;22(3):221-7.
10. Gouda NS, Sultan AM, Eldeglia H, Seliem WA. Bacterial contamination of white coats and hands of healthcare workers at mansoura university children's hospital, Mansoura-Egypt. *African J Clinical and Experimental Microb.* 2018;19(1):18-23.
11. Iqbal S, Ahmed S, Aslam A, Kashif M, Khan I, Khan N. Microbial Flora on the White Coats of Dental Staff, Karachi. *IJEHSR [Internet].* 1Mar.2020 [cited 2Dec.2020];8(1):21-7.
12. Pandey A, Asthana AK, Tiwari R, Kumar L, Das A, Madan M. Physician accessories: doctor, what you carry is every patient's worry?. *Indian J Pathol and Microb.* 2010 Oct 1;53(4):711.
13. Kashif M, Khan MI, Iqbal N, Mazhar L, Mahrukh S, Arshad M et al. Effectiveness of sterilization and disinfection of extracted human teeth for institutional use: A case control study conducted at a tertiary care hospital. *Med forum* 2013;26(12): 7-10.
14. MBU OS. Association between Medical Doctors' White Coats and Bacteria Dissemination in a Tertiary Hospital in Nigeria. *Journal of Applied and Basic Science (JABS).* 2017;n;10(1):19.

15. World Health Organization. Prevention of hospital-acquired infections: a practical guide. Geneva, Switzerland: World Health Organization; 2002.
16. Ahmed S, Kashif M, Butt AI, Faisal SS. Pattern of Bacteraemia After Non-Surgical Extraction of Tooth. *Annals ASH & KMDC*. 2015 Jun 1;20(1).
17. Cataño JC, Echeverri LM, Szela C. Bacterial contamination of clothes and environmental items in a third-level hospital in Colombia. *J Interdisciplinary perspect on infectious dis*. 2012 Jan 1;2012.
18. Qaday J, Sariko M, Mwakyoma A, Kifaro E, Mosha D, Tarimo R, Nyombi B, Shao E. Bacterial contamination of medical doctors and students white coats at Kilimanjaro Christian Medical Centre, Moshi, Tanzania. *Int J bacteriol*. 2015;2015.
19. Mwamungule S, Chimana HM, Malama S, Mainda G, Kwenda G, Muma JB. Contamination of health care workers' coats at the University Teaching Hospital in Lusaka, Zambia: the nosocomial risk. *J Occupational Med Toxicol*. 2015; 1;10(1):34.
20. Ulger F, Dilek A, Esen S, Sunbul M, Leblebicioglu H. Are healthcare workers' mobile phones a potential source of nosocomial infections? Review of the literature. *J infect develop countries*. 2015; 29;9(10):1046-53.
21. Murgier J, Coste JF, Cavaignac E, Bayle-Iniguez X, Chiron P, Bonneville P, Laffosse JM. Microbial flora on cell-phones in an orthopedic surgery room before and after decontamination. *J Orthopaed & Traumatol: Surg. & Res*. 2016 1;102(8):1093-6..

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<b>CONTRIBUTION OF AUTHORS</b>	
<b>Author</b>	<b>Contribution</b>
Dr. M. Irfan	A,B,C
Dr. Mehwash Kashif	A, B,C
Dr. Roohi Ehsan	A,B
Dr. M. Faiz Uddin	B,C
Dr. Sana Iqbal	A,B
Hiba Jamil	B,C