

Biometric Identification System as a Potential Source of Nosocomial Infection among Medical Students

Abdu Samad, Syed Mohammed Miqdad, A. Hashim¹, Reuben Abraham Jacob

Department of Oral Pathology and Microbiology and ¹Forensic Medicine and Toxicology, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore, Karnataka, India

Abstract

In the current situation, biometric devices, electronic devices, and medical apparatus usage cannot be restricted in hospitals and offices. These devices will act as a vehicle for the transmission of bacterial agents. Our study observed that a biometric device is acting as a vehicle/source of spreading bacterial agents. It will be more in the hospital environment. The only way to protect from infections is strict adherence to infection control and good hygienic practices. We also observed fewer samples containing yielding of bacteria, indicating that either student is not interacting with biometric devices or is more aware of infection spread and followed the hand hygiene practice with alcohol.

Keywords: Biometrics, hand hygiene, healthcare worker, medical students, nosocomial infection

INTRODUCTION

A biometric identification system, which involves fingerprint capture, has become a popular technique used in the registration of Aadhar, visa applications, and even to mark attendance at various offices, hospitals, and institutions. The device recognizes the person by the physical contact between the fingertip's skin and the screen's layer. Hospital-acquired infections (HAIs), also known as nosocomial infections, are newly acquired infections from the hospital environment. HAI increases day by day, causing a significant rate of mortality and morbidity.^[1] There are several ways to spread infection, like through the hands of health-care workers, blood pressure apparatus, thermometer, stethoscope, and toys in pediatric. The department devices used in these premises will act as vehicles for transferring pathogens from one person to another.^[2] It can become a potential source and reservoir of bacteria and germs. This activity in the hospital environment will increase the risk of transmission of infection, and the device becomes a carrier source of bacteria.^[3] Many studies have been carried out on objects such as the thermometer, stethoscopes, keyboard, toys, and biometrics.^[4,5] This study was performed to determine the presence of pathogens on the surface of the biometric

fingerprinting device in the hospital environment, thereby assessing the risk of transmission of pathogenic bacteria from the device, which can be a potential source of nosocomial infection among medical students.

MATERIALS AND METHODS

A cross-sectional study was conducted after obtaining ethical clearance from the Ethics Committee of Yenepoya Deemed to be University. Participants consist of 50 medical students who were posted either in the department of medicine or surgery. The concept of the study was explained, and consent was obtained from each participant. Once the postings end in the department, the participants were asked to perform hand hygiene in their preregistered fingers using an alcohol-based hand rub (chlorhexidine gluconate and 70% ethyl alcohol antiseptic solution-CUTARUS-CHC) for 20 s. A swab was performed from the finger aseptically using damp cotton swabs by rotating on the finger. Once the swab was collected, participants were asked to perform a biometric punch with the

Address for correspondence: Dr. Syed Mohammed Miqdad, Department of Oral Pathology and Microbiology, Yenepoya Dental College, Yenepoya (Deemed to be University), Mangalore, Karnataka, India. E-mail: sayyaduna@gmail.com

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registered finger. The swab collection was repeated. Samples were submitted to the processing team in the microbiology laboratory within 30 min of sample collection. Samples were inoculated onto blood agar/MacConkey's agar plates and incubated at 37°C for 24 h. Plates were examined for growth and identification. Identification was made based on colony morphology. The study was conducted after obtaining Ethical clearance from Yenepoya Ethics Committee having approval no. 2019/127 dated on 29/06/2019. We ensured that the potential subject has understood the information and obtained the potential subject's freely-given written informed consent.

RESULTS

Among the 50 swabs collected before the biometric registration, 6 (12%) yielded growth, of which 5 (90%) were coagulase-negative staphylococci (CoNS) and 1 (10%) was *Staphylococcus aureus* [Table 1].

Among 50 swabs collected after the biometric registration, 6 (12%) yielded growth, all of which were CoNS [Table 2].

DISCUSSION

The biometric fingerprinting device is more commonly used in private and public sectors for attendance records and personal identification. The physical contact between the skin and the device's surface (screen) is involved in this system, and it may be having some microorganisms.^[1] The system used in hospital premises would be contaminated with microorganisms which will lead to a nosocomial pathogen. *S. aureus*, *Acinetobacter*, *Escherichia coli*, and *Pseudomonas* species were recovered from elevator buttons, biometric attendance devices, and door handles.^[5] When a healthy individual used the machine to perform his/her attendance, there is a high chance of indirectly transmitting the microorganisms from the device to the person.^[3] Many studies have been conducted on health-care worker's aspects, as they are more at risk of transferring the pathogenic organisms.^[6,7]

A total of 100 swabs were collected from the medical students' registered finger, out of which 50 swabs were collected after

alcohol rub, and the remaining 50 swabs were collected once the biometric registration was done [Figure 1]. In medical students, the bacterial agents isolated were CoNS and *S. aureus*. A study was done at a hospital, medical college, and administrative block biometric fingerprinting device came positive for *S. aureus*, CoNS, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*.^[8] It was surprising that the microorganism was present even after alcohol rub (12%) in our study [Table 1]. Isolation of few microorganisms from the fingertip compared to other studies could be due to the improper usage of antiseptics, and this could be corrected by doing a proper hand rub. A study found a significant increase in the colonization of *S. aureus* among medical students during their hospital practices.^[9]

Among 50 swabs collected after the biometric registration [Figure 2], 6 samples (12%) yielded growth, of which 6 (100%) were CoNS [Table 2]. In a study, samples collected from the biometric fingerprinting devices' surface, 46% of samples were culture positive. Among the culture positives, the coagulase-negative *Staphylococcus* species was the most common organism to be isolated (49%), followed by Gram-positive bacilli (44%) and Gram-negative bacilli (7%).^[10] Similarly, a study showed the growth of *S. aureus* on the biometric system.^[11] The isolates identified in keyboards were used in the hospital by Bures *et al.*, and our study showed almost the same result (CoNS).^[12] Another study shows that mobile phones can spread bacterial infections.^[4,13] Blomeke *et al.* studied the survivability and transferability of these organisms from biometric devices and reported that most organisms are transferred in the first 10 min after they

Table 1: Swab before the biometric analysis

Number of swabs	No growth	Number of yielding growth (%)
50	44	6 (12)

Table 2: Swab after the biometric analysis

Number of swabs	No growth	Number of yielding growth (%)
50	44	6 (12)



Figure 1: Swab collection



Figure 2: Biometric registrations

have been located onto the surfaces of the fingerprinting devices.^[14] All these findings show that biometric devices harbor bacteria on them depending on their location and in a way, aid in transmitting them. The biofilm-forming ability of microorganisms offers an additional survival advantage on these objects.^[3]

CONCLUSIONS

Biometric devices may serve as vehicles for the transmission of nosocomial pathogen/microorganisms, especially among medical students and health-care workers. Strict adherence to infection control such as handwashing (soap or antiseptic agents), installing antiseptic agents near the device, disinfection of high-touch areas, and awareness will minimize the risks.

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Conflicts of interest

There are no conflicts of interest.

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