Original Research Paper

Volume-9 | Issue-2 | February-2019 | PRINT ISSN - 2249-555X

Microbiology

BACTERIAL CONTAMINATION OF BIOMETRIC FINGERPRINTING DEVICE- A POTENTIAL SOURCE OF HOSPITAL ACQUIRED INFECTIONS?

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ABSTRACT

INTRODUCTION: Nowadays biometric fingerprinting system is frequently used for identification and for marking attendance. When health care workers (HCWs) use this device, it may constitute a possibility of transmission of infectious organism and may lead to Hospital Acquired infection (HAIs)

OBJECTIVES: This study aims to find out the presence of pathogenic bacteria on the surface of biometric fingerprinting device in a tertiary care hospital.

METHODOLOGY: Samples were collected from the biometric devices, cultured and organism isolated, identified and antibiotic susceptibility was done.

RESULTS: Samples collected from Hospital, Medical College and Administrative block came positive for S. aureus(42.1%), CoNS (36.9%), *Klebsiella pneumoniae* (10.5%) and *Psuedomonsa aeruginosa (10.5%)*. Among the S. aureus 37.5% was MRSA. Both the Klebsiella and pseudomonas were 100% resistant to Azteronam.

CONCLUSION: Biometric fingerprinting device could be a point of transmission of drug resistant pathogenic microorganisms to HCWs, patients and community.

KEYWORDS : Biometric fingerprinting device, Pathogenic microorganism, Health care workers, Hospital acquired infections

INTRODUCTION

Nowadays biometric fingerprinting system is very frequently used for identification as well as for marking someone's presence. The acknowledgement of the fingerprint is by contact between skin of the finger and the touch interface of the device. Same touch interface of fingerprinting device is consecutively aligned by different people, which therefore can lead to transfer of microorganism from a person's hand to the biometric device and then to the fingers of the next person using it. When health care workers (HCWs) use this device, it may constitute a possibility of transmission of infectious organism because of their hands getting exposed to pathogenic microorganism[1, 2, 3], and can therefore be a source of Hospital acquired infections (HAIs).

Pathogenic microorganisms are constantly present in hospital environment. The hospital surfaces frequently get contaminated with microbial flora excreted by patients and HCWs. These contaminated surfaces of the hospital then become potential reservoirs for spread of pathogenic microorganisms in the hospital as well as the community. Presence of these dangerous microorganisms in the hospital environment increases the risk of infection among susceptible host[4].

Staphylococcus aureus, Pseudomonas aeruginosa and *Acinetobacter baumannii* are few of the microorganisms which may be carried on the hands of physicians & other HCWs. Even some of the antibiotic resistant variants like Methicillin Resistant Staphylococcus aureus (MRSA), Vancomycin Resistant Enterococcus (VRE) and dangerous Multidrug Resistant Gram Negative bacteria are also not uncommon. These microorganisms can easily survive in dry-surface environment such as the surface of the biometric fingerprinting device, and which may then become a source for further transmission[5].

In a hospital setting the biometric fingerprinting device has a frequent and unavoidable contact of its touch interface with the hands of HCWs. In most of the hospitals, routine cleaning involves hospital floor, working bench, table tops, nursing stations, dressing trolley etc. However, there is almost no practice of cleaning/ disinfecting touch interface of a biometric device. High rate of bacterial contamination in the above mentioned sites reflects poor hand hygiene among the healthcare workers as transmission occurs mainly through contaminated fingers.

Staphylococcus aureus is well known agent of HAI, having the ability to survive in hospital environment for several days[6]. The ability of S. aureus and MRSA to form biofilm on inanimate objects prolongs their survival and spread.

On human hands, most of the microorganism can survive for more than 30 minutes[7]. But many of the pathogenic bacteria can survive on non living surfaces for days to weeks, which may become a point for transmission of these dangerous bacteria[8]. The HCWs without even realizing may transfer these disease causing bacteria to patient or may inadvertently carry them home to their families, ultimately introducing the organism in the community.

AIM: This study was conducted to find out the presence of pathogenic bacteria on the surface of the biometric fingerprinting device in a tertiary care Hospital,

METHOD: This was a cross sectional analytical study conducted in the Department of Microbiology, National Institute of Medical Science and Research, Jaipur, in July 2018. The biometric system in the hospital is used by HCWs working in the hospital and includes Doctors, Nursing Staff, technicians, and multi-purpose workers, administrative staff etc. A total of 25 Biometric System in the medical college and hospital were studied.

Sample collection: Samples were collected using a sterile cotton swab moistened with sterile peptone water. Swabbing was done on the finger-print interface of the biometric system by rotating the cotton swab on the finger touch interface for 10 seconds.

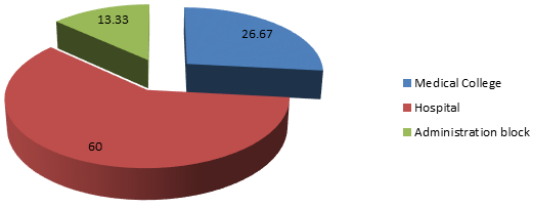
The swabs were then immediately transferred to bacteriology laboratory, where they were inoculated on Blood Agar, MacConkey Agar and Nutrient agar. The culture plates were incubated at 37°C for 24 hours. After incubation, the isolated organisms were identified through standard microbiological identification procedures including Gram staining and biochemical reactions. Antibiotic susceptibility was done according to CLSI guideline.

RESULTS: A total of 25 swabs of various biometric fingerprinting devices were collected The swabs were collected from the devices located at three major sites: - Six devices from the Medical college block, 14 devices from the Hospital block and five devices from the Administrative block.

Out of 25 swabs 15 (60%) were positive for growth of pathogenic microorganisms. And of the 15 positive culture samples, 9 (60%) samples were recovered from Hospital, 4(26.67%) from Medical

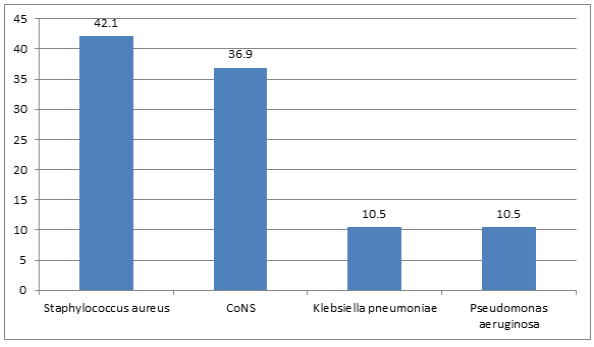
college and 2 (13.33%) from administrative block. (Fig. No. 1)

Fig. No.– 1 Distribution of Positive culture sample-



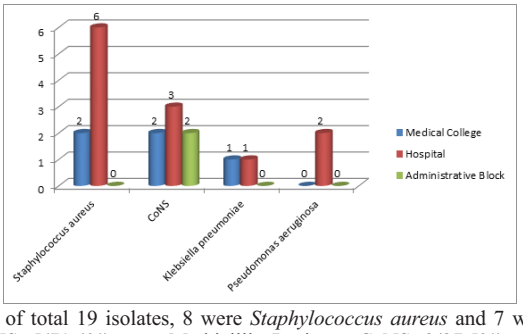
A total of 15 gram positive cocci and 4 Gram negative bacilli were recovered from the devices. Among the Gram positive cocci 8(42.1%) were of S. aureus and 7(36.9%) were CoNS. Among the Gram negative bacteria 2(10.5%) were of *Klebsiella pneumoniae* and 2(10.5%) were of *Psuedomonas aeruginosa* (Fig.no. 2)

Fig. No 2 Distribution of various isolates



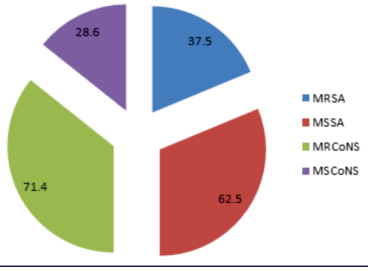
A total of 15 devices came positive for culture of which 11 gave pure bacterial growth whereas mixed bacterial growth was recovered from four sites. Thus a total of 19 bacterial isolates were recovered. Six isolates of *Staphylococcus aureus* were recovered from devices situated at hospital and 2 from Medical College. Three isolates of Coagulase Negative Staphylococcus spps (CoNS) were recovered from hospital and 2 isolates each from Medical College and Administrative block. Two isolates of *Pseudomonas aeruginosa* and 1 isolate of *Klebsiella pneumoniae* were recovered from hospital and 1 isolate of *Klebsiella pneumoniae* from Medical College. (Fig No. 3)

Fig. No. 3- Isolates recovered from various sites



Out of total 19 isolates, 8 were *Staphylococcus aureus* and 7 were CoNS, 5(71.4%) were Methicillin Resistant CoNS, 3(37.5%) were Methicillin Resistant *Staphylococcus aureus* (MRSA), 5(62.5%) Methicillin Sensitive *Staphylococcus aureus* (MSSA) and 2(28.6%) Methicillin sensitive CoNS. (Fig. No. 4)

Fig. No. 4- Distribution of MRSA & MRCoNS

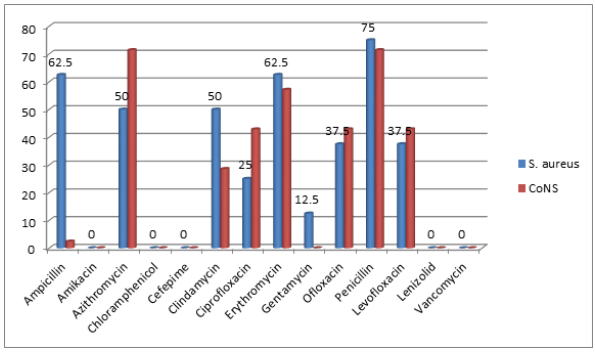


Among the *Staphylococcus aureus* recovered from the fingerprinting devices, 75% were resistant to Penicillin, 62.5% to Ampicillin , 62.5% to Erythromycin, 50% to Azithromycin, 50% to Clindamycin, 37.5% to Ofloxacin and 37.5% to Levofloxacin .

Of the CoNS isolates recoverd, 71.43% were resistant to both Penicillin and Azithromycin and 57.14% to Erythromycin.

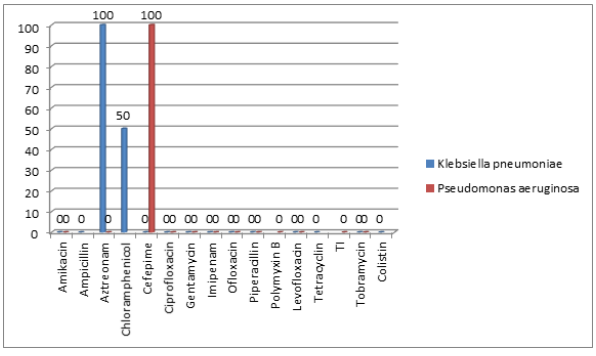
Both Staphylococcus aureus and CoNS were found to be 100% sensitive to Lenizolid and Vancomycin.(Fig. No. 5)

Fig. No. 5. Sensitivity pattern of *Staphylococcus aureus* & CONS



Both the isolates of Klebsiella were resistant to Aztreonam (100%) and 50% resistant to Chloramphenicol. Both the isolates of Pseudomonas were resistant to Cefepime (100%) (Fig. No. 6)

Fig. No.6- Sensitivity pattern of Kelbsillea & Pseudomonas



DISCUSSION:

The biometric fingerprinting devices are widely used in the hospital for marking the presence of HCWs. Microbial colonization of such devices may spread the potential pathogens among unsuspecting users[9].

In our study, 15 (60%) of the specimens collected from biometric fingerprinting devices showed growth of pathogenic bacteria, of which 8 (42.1%) were S. aureus and 3 (37.5%) were MRSA. Whereas 7 (36.9%) isolates were CoNS of which 5 (71.4%) were of MRCoNS. Of the 19 isolates, 2 (10.5%) isolates each belonged to *Pseudomonas aeruginosa* & *Klebsiella pneumoniae.*

Of all the gram positive cocci isolated, 75% were resistant to Penicillin, 71.43% to Azithromycin, 65.5% to Ampicillin and 65.5% to Erythromycin respectively.

Gram negative bacteria were 100% resistant to Aztreonam and Cefepime & 50% to Chloramphenicol.

Acinetobacter species and Pseudomonas species are well known nosocomial pathogens and their presence on biometric devices can lead to their spread in the hospital and community. Though no Acinetobacer species was recovered in our study, we did recover drug resistant Pseudomonas and Klebsiella spps. Studies by Uneke CJ, et al & Nirupa S, et al have shown the presence of Acinetobacter species, Pseudomonas species and E coli on other inanimate objects of hospital[10,11]. Nancy S et al reported 33.3% S. aureus isolation and 70% MRSA prevalence on biometric devices[12]which is quite high compared to our study as we recovered 42.1 % of S. aureus of which 37.5 % was MRSA.

Our Teaching hospital has more than seven hundred HCWs who mark attendance twice daily with these biometric devices. Colonization of such devices by potential pathogens like MRSA and drug resistant Gram negative bacteria indicates the possible spread of these pathogens among the hospital as well as in the community population. Most of the HCWs before starting their work day and at the end of it mark their attendance with biometric devices. At the end of the work day, HCWs wash their hands in their respective departments and then mark attendance on biometric device. Their fingers may get contaminated with pathogens persisting on the devices. HCWs rarely wash hands post marking their attendance on these devices and casually go about their day. This may lead to dissemination of pathogens from hospital into community.

Limitations: The molecular characterization of the potential pathogens was not performed. We could not prove the association of pathogens isolated from objects and prevalent nosocomial infections. The study was conducted in one of the tertiary care hospital in rural Rajasthan, and results of the study may not be generalized.

CONCLUSION: At the time of this study, very few studies in India had been done in assessing pathogenic bacterial contamination of the biometric fingerprinting device. Isolation of potential pathogens like MRSA, Pseudomonas, Klebsiella from a common point of contact poses threat of transmission among hospital and community population. Findings of this study are important to emphasize hand hygiene and decontamination of these sites on a regular basis.

Recommendations: Availability and use of hand washing/hand sanitizer after contact with biometric systems may reduce the possibility of transmission of potential pathogens. Placing a dispenser near the device will encourage this practice. Decontamination of the device with alcohol based disinfectants would reduce the microbial flora from the biometric finger printing device interface surface. This is a convenient method to quickly disinfect the small surface area of a Biometric device. Provision of non-hand touch techniques for identification or attendance system, like the retinal scan, facial recognition or voice recognition system though expensive would help in cutting down the transmission of these organisms.

Conflict of Interest: Nil

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