Int.J.Curr.Microbiol.App.Sci (2017) *6*(12): 2698-2702

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 12 (2017) pp. 2698-2702**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.612.312

Study of Bacteriological Profile on Hands of Health Care Workers in ICU Setup in a Tertiary Care Hospital

Rincy Susan Mathew, R. Ambica and G.B. Shantala*

Department of Microbiology, Victoria Hospital Campus, Fort Road, Bengaluru-560002, Karnataka, India
**Corresponding author*

Keywords

Bacteriological profile, HCW, Hands, ICU, MRSA.

Article Info

Accepted:
19 October 2017
Available Online:
10 December 2017

A B S T R A C T

The most common channels for spread of Health care associated infections (HCAI) resulting in cross transmission are healthcare workers' (HCW) hands. The aim of this study was to assess the bacteriological profile on hands of the health care workers working in ICU setup during patient care. Imprints of fingertips and palms from the participant's hands were taken during their routine patient care onto 5% sheep blood agar plate and MacConkey agar plate. After incubation at 37ºC for 24 hours, the bacterial colonies were identified using standard biochemical reactions. *Staphylococcus* colonies were checked for methicillin resistance. 88.33% of samples had growth on their plates of which 43.39%had only the resident flora of the hand. 41.67% samples had *Staphylococcus* colonies on their plates, of which 16.67% were found to be *Staphylococcus aureus* and rest 25% were CoNS species. 06.67% of the *Staphylococcus aureus* isolates were resistant to cefoxitin and 05% of the CONS were methicillin resistant. 9.43% of the samples yielded gram negative bacilli on their plates, out of which 5.6% were identified as *Escherichia coli* and 03.7% as *Klebsiella* species. Both the species were multidrug resistant. Hand contamination progressively increased during routine patient care; pointing towards the unsatisfactory hand hygiene practices in the ICUs. The importance of simple barrier precautions must be highlighted through constant training of staff for their wholehearted compliance.

Introduction

Health care associated infections(HCAI)are a major issue in terms of patient safety.(1) HCAI leads to extended hospital stay, long-term disability, reduced antimicrobial susceptibility, increased expenditure to patients and their families, and increased mortality. One of the endemic areas of HCAI is the critical care ward which can occasionally lead to epidemic out breaks. This is due to the combination of various factors like invasive procedures, accumulation of a number of immuno compromised patients and their nursing.(2) The most common channels for spread of HCAI resulting in cross transmission are healthcare workers'(HCW) hands.(3) Hand hygiene, being the prime effective preventive measure, plays a pivotal role in prevention of nosocomial infections.

However the review of various hand hygiene studies prove that baseline hand hygiene compliance among healthcare workers is less.(4) In developing countries, the risk of infectious disease remains exceedingly high.

Methicillin resistant *Staphylococcus aureus* (MRSA) is one of the vital nosocomial pathogen. Of late, there has been substantial global surge in nosocomial infections owing to this microbe.[5] Colonized medical personnels are the main reservoirs of MRSA serving as vehicle for cross infection, eventually leading to outbreaks. Substantial reduction in MRSA outbreaks follows proper protective measures.

The aim of this study was to assess the bacteriological profile on hands of the health care workers working in ICU setup during patient care.

Materials and Methods

The study was a prospective study done in the department of Microbiology during December 2016 to January 2017. Study group included a total of 60 HCWs (18 doctors, 14 interns and 28 nurses) working in various ICUs in a tertiary care hospital. Informed consent was taken from all participants prior to sample collection. Imprints of fingertips and palms from the participant's hands were taken during their routine patient care onto 5% sheep blood agar plate (Figure 1) and MacConkey agar plate. The plates were incubated at 37ºC for 24 hours under aerobic conditions. After incubation, the bacterial colonies were identified using standard biochemical reactions[6] and further tested for antimicrobial susceptibility using Kirby-Bauer's disc diffusion methods as per Clinical and Laboratory Standards Institute (CLSI) guidelines 2016.[7] *Staphylococcus* colonies were checked for methicillin resistance using cefoxitin disc 30 µg (surrogate marker of mecA gene).

Results and Discussion

Out of the 60 samples processed, 07(11.6%) samples did not yield any growth and all these samples were from nurses. All other 53 samples (88.33%) had growth on the plates. (Figure 2). All the plates with growth had Micrococci and gram positive bacilli on them, which are considered as the resident flora of hands. Of the 53 samples positive for growth, 23 samples (43.39%) had only the resident flora of the hand on their plates.

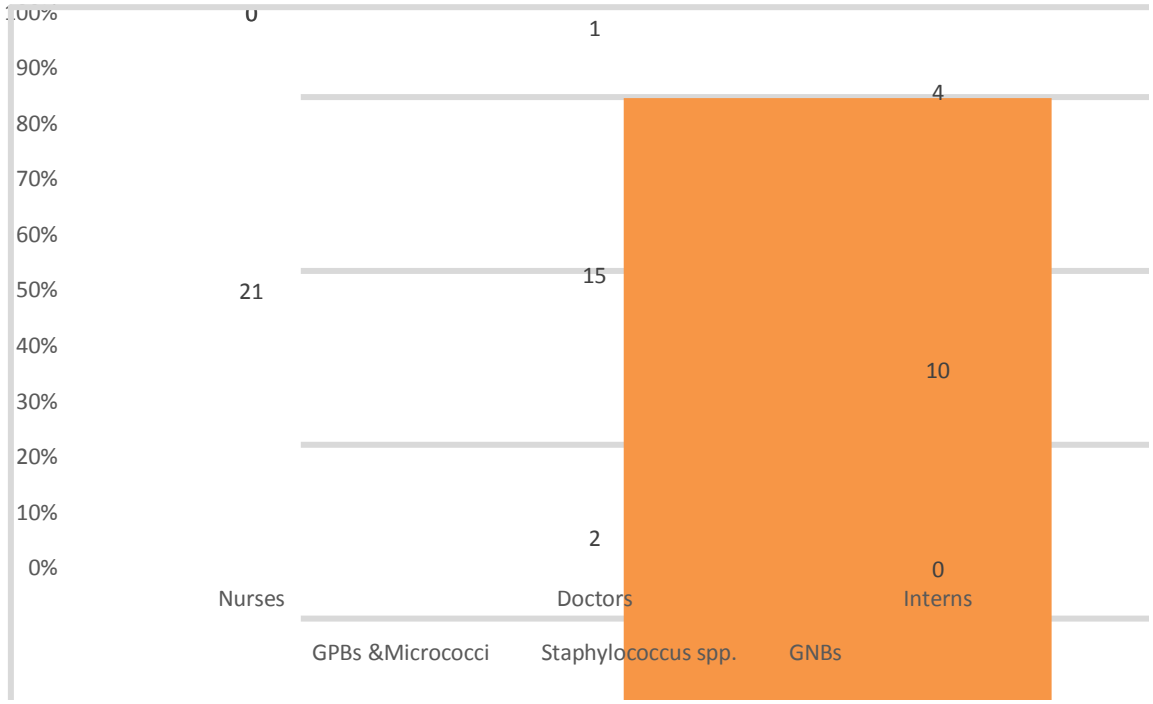
25 (41.67%) samples had *Staphylococcus* colonies on their plates. On further processing, 10 (16.67%) were found to be *Staphylococcus aureus* and rest (25%) were Coagulase negative *Staphylococcus* species. 04 (6.67%) of the *Staphylococcus aureus* isolates were resistant to cefoxitin and 03 (05%) of the CONS were methicillin resistant (Figure 3).

Five (9.43%) samples yielded gram negative bacilli on their plates. Out of which 03 (5.6%) were identified as *Escherichia coli* and 02 (3.7%) as *Klebsiella* species (Figure 2). Both the species were multidrug resistant. Mupirocin nasal ointment (3 times per day), chlorhexidine mouth rinse, and full-body wash with chlorhexidine soap for 5 days were recommended for MRSA carriers.

Our study shows that hand contamination progressively increased during routine patient care; pointing towards the unsatisfactory hand hygiene practices in the ICUs, consistent with the international literature of Nicholson *et al.*, (2016) who reported an average compliance rate of 38%.[8] Our study showed 16.67% colonization by *Staphylococcus aureus* on the hands of HCWs compared to the study done by Devi *et al.*, (2016) which showed 30% colonization.[9] MRSA carriage on the hands of HCWs was 6.67% according to our study compared to 25.3% according to the work done by Fadeyi *et al.*, (2010).[10] The disparity in the carriage rate might be due to the difference in sample size and method of MRSA screening.

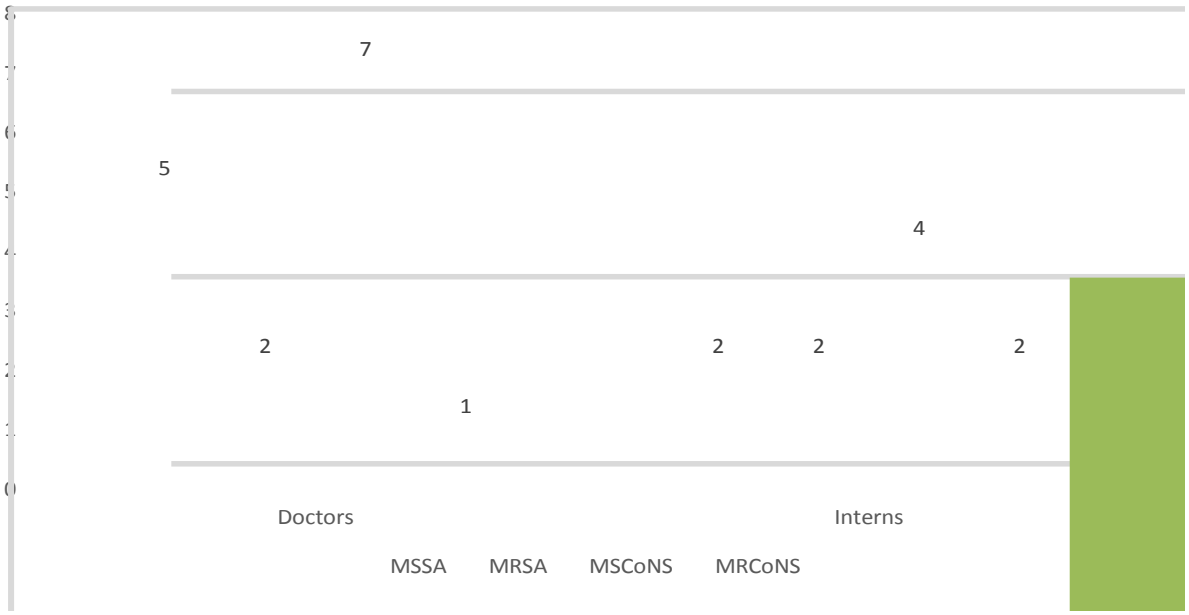
Fig.1 Figure showing Blood agar plate with growth after incubation

Fig.2 Schematic representationof distribution of various microorganisms in study groups



GNB – Gram Negative Bacilli
GPB – Gram Positive Bacilli

Fig.3 Schematic representation of distribution of *Staphylococcus* spp. among various study groups



MSSA – Methicillin Sensitive *Staphylococcus aureus*
MRSA - Methicillin Resistant *Staphylococcus aureus*
MSCoNS – Methicillin Sensitive Coagulase negative *Staphylococcus species*
MRCoNS - Methicillin Resistant Coagulase negative *Staphylococcus species*

Nevertheless, nurses were more compliant to hand hygiene practices compared to doctors according to our study which is consistent with the study done by Pittet *et al.,* (2001).[11] Poor doctor compliance with hand hygiene is still an unresolved and puzzling topic.[12] Some of the stated explanations for poor hand hygiene include skin irritation, inaccessible hand washing supplies, wearing gloves, "being too busy", or "not thinking about it.

Microbial contamination of the hands of HCWs is a dynamic process resulting from numerous elements (Pittet *et al.,* 2000).[13] The ratio of 1 nurse per bed is not maintained in many ICUs requiring the same staff to attend different patients at the same time. Another reason of ICU being an endemic area for HCAI is that both the infected and the immunocompromised cases are also being attended by same supportive staff like pantry services, physiotherapist, conservancy staff etc.[2] Attitude and compliance with hand hygiene are behavioral in essence. Various strategies to induce behavioral changes have been suggested, such as patient education, administrative sanction or reward, enhancement of role modeling by superiors, and establishment of an institutional safety climate.[12] Other modalities which can be implemented are: the multimodal and multidisciplinary approach; including communication and educational tools; reminders in the work setting; active participation and feedback at both individual and organisational levels, and the involvement of institutional leaders.[13]

Limitation of our study was that hand imprints were taken on agar plates rather than glove juice technique for estimating the bacterial contamination of hands of HCWs, which would have been a better technique. One more limitation was that HCWs' level of knowledge about microbial contamination of hand and their adherence to infection control policies were not assessed. The threshold of bacterial hand contamination associated with a substantial risk for subsequent infection requires further research.

Our study indicates an urgent need for training HCWs to improve the level of their knowledge about infection control measures and stern adherence to infection control policies.[5] WHO hand hygiene knowledge questionnaire is an appropriate tool for assessing knowledge among healthcare providers and to study the compliance towards hand hygiene. The importance of simple barrier precautions must be highlighted through constant training of staff for their wholehearted compliance.[2]Timely reporting of MRSA colonization in health care providers helps in preventing outbreaks in high risk units.

References

1. Haley RW, Culver DH, White JW, Morgan WM, Emori TG, Munn VP, *et al.,* The efficacy of infection surveillance and control programs in preventing nosocomial infections in US Hospitals. Am J Epidemiol. 1985; 121(2): 182–205.
2. Gupta A, Kaul N, Saraswat V, VSM P. A study of bacteriological profile in an ICU setup and effect of barrier nursing on the existing profile. Indian J Anaesth. 2005; 49(1): 31–6.
3. Allegranzi B, Pittet D. Role of hand hygiene in healthcare-associated infection prevention. J Hosp Infect. 2009; 73(4): 305–15.
4. Jumaa PA. Hand hygiene: Simple and complex. Int J Infect Dis. 2005; 9(1): 3–14.
5. Pant ND, Sharma M. Carriage of methicillin resistant *Staphylococcus aureus* and awareness of infection control among health care workers working in intensive care unit of a hospital in Nepal. Braz J Infect Dis. 2016; 20(2): 218–9.
6. Collee, J. G., Mackie, T. J., & McCartney JE. Mackie and McCartney practical medical microbiology. 14th ed. New York: Churchill Livingstone.
7. Batel JB. M100. Performance Standards for Antimicrobial Susceptibility Testing. Clinical Laboratory Standards Institute. 2016.
8. Nicholson AM, Tennant IA, Martin AC, Ehikhametalor K, Reynolds G, Thoms-Rodriquez CA, *et al.,* Hand hygiene compliance by health care workers at a teaching hospital, Kingston, Jamaica. J Infect Dev Ctries. 2016; 10(10): 1088–92.
9. Devi A, Thantry K, Sern NP, Ramnavas S, Ramachandran S, Tan MZ, *et al.,* Surveillance Study on Nasal and Hand Carriage of Methicillin-Resistant *Staphylococcus aureus* (MRSA) among Dental and Medical Staff and Students of a Medical University. OHDM, 15(2).
10. Fadeyi A, Bolaji BO, Oyedepo OO, Adesiyun OO, Adeboye MAN, Olanrewaju TO, *et al.,* Methicilin resistant Staphylococcus aureus carriage amongst healthcare workers of the critical care units in a Nigerian hospital Department of medical Microbiology and Parasitology, Department of Anaesthesia, Department of Paediatrics and Child Health, 2010; 6(1): 18–23.
11. Pittet D. Compliance with hand disinfection and its impact on hospital-acquired infections. J Hosp Infect. 2001; 48(SUPPL. A).
12. Hugonnet S, Perneger T V, Pittet D. Alcohol-based handrub improves compliance with hand hygiene in intensive care units. Arch Intern Med. 2002; 162(9): 1037–43.
13. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, *et al.,* Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet. 2000; 356(9238): 1307–12.

How to cite this article:

Rincy Susan Mathew, R. Ambica and Shantala, G.B. 2017. Study of Bacteriological Profile on Hands of Health Care Workers in ICU Setup in a Tertiary Care Hospital. *Int.J.Curr.Microbiol.App.Sci.* 6(12): 2698-2702. doi: https: //doi.org/10.20546/ijcmas.2017.612.312