



ORIGINAL RESEARCH PAPER

Microbiology

BACTERIOLOGICAL PROFILE OF CONTAMINATED HANDS AND SIGNIFICANCE OF HAND HYGIENE IN HEALTHCARE SETTINGS

KEY WORDS:Bacteriological profile, contaminated hands, hand hygiene, Hospital acquired infections

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ABSTRACT

The present study was carried out in a tertiary care hospital to study the Bacteriological profile of contaminated hands of Healthcare workers (HCW) in healthcare settings. Total 200 samples of swabs collected from hands of HCW from different departments of the hospital were collected for the study. Staphylococcus aureus (31%), Escherichia coli (24%), Klebsiella pneumonia (11%), Pseudomonas aeruginosa (6%) and Acinetobacter baumannii (1%) were the predominant organisms isolated during the study period. These organisms were resistant to multiple classes of antibiotics prescribed in the hospital and related to organisms isolated from Hospital acquired infections (HAIs). HCW Hand Hygiene (HH) compliance improved from 65.3 % to 92.4% after educational interventions. Strict hand hygiene is very necessary in health care settings to prevent HAIs and regular educational trainings should be done to promote hand hygiene and prevent HAIs.

Introduction:

Contact with the health care givers, including doctors and nurses, are a major source of hospital acquired infections¹. From time immemorial i.e. way back in 1847 when Ignaz Philipp Semmelweis for the first time demonstrated the role of hand washing in reducing peripartum mortality from 16% - 3.06 % in itself is a proof for the importance of hand hygiene in health care settings². Also, there is a greater risk of getting colonized with multidrug resistant organisms from cross transmission resulting in Hospital acquired infections (HAIs) and its complications³. The morbidity, mortality and financial burden associated with HAIs has been a major concern⁴. It has been reported by various authors that around the world the compliance rate of Hand hygiene is as low as 45%. Bacterial contamination of hands is an dynamic process and it is affected by various factors such non availability of water, cost of sinks and their installation in specific areas, overcrowding of the patients, understaffing of health care workers and in last the most important fact lack of time⁵. With this view, the present study was undertaken to evaluate the bacteriological profile of contaminated hands in a tertiary care hospital and understand the importance of hand hygiene in healthcare settings.

Material and Methods:

The present prospective, randomized study was carried out in a tertiary care hospital during the period of 3 months from January 2017 to March 2017. 200 clinical samples of hand swabs taken in the preintervention period from Healthcare workers (HCW) working in clinical areas of the hospital were included in the study for evaluation of Bacteriological profile.

Subject were required not to have used any hand antiseptic in the 8 hours preceding the application of the sample in the preintervention period to study the bacteriological profile of contaminated hands. Any active skin rashes or breaks in the skin in these regions excluded the subject from enrolment.

Bacteriological processing was done with swab culture enriched in mannitol broth for evaluation of the bacteria. Swabs were subjected to microbiological identification and antimicrobial sensitivity. The susceptibility of the organisms to various antibiotics was tested by using a modified Kirby Bauer disk diffusion method and the results were interpreted as per the CLSI guidelines. The isolates were tested for Methicillin resistant Staphylococcus aureus (MRSA), Extended spectrum beta lactamases(ESBL), AMP C beta lactamases and Metallo beta lactamases(MBL) producers.

After the swab testings, interventions were carried out in form of educational campaigns to promote hand hygiene and other infection control practices. Educational posters were displayed in all areas of the hospital. Regular audits and teachings regarding hand hygiene were conducted.

In the pre and post intervention period, hand hygiene compliance was calculated using the WHO guidelines and formula as given below:

$$\text{Hand hygiene compliance} = \frac{\text{Performed Hand hygiene actions}}{\text{Required Hand hygiene actions}} \times 100$$

Results and Discussion:

Antibiogram: The total number of swabs received from the HCW during the 3 month period was 200, of which 50 swabs were from doctors from para clinical specialities, 50 from doctors of clinical specialities, 50 from nurses and 50 from paraclinical staff. Staphylococcus aureus (31%), Escherichia coli (24%), Klebsiella pneumonia (11%), Pseudomonas aeruginosa (6%) and Acinetobacter baumannii (1%) were the predominant organisms isolated during the study period.

Table 1 shows the antibiotic sensitivity pattern of the common isolated organisms in the pre intervention period:

Antibiotics	Escherichia coli (48%) Sensitivity	Klebsiella pneumoniae (22%) Sensitivity	Pseudomonas aeruginosa (12%) Sensitivity	Acinetobacter baumannii (2%) Sensitivity	Staphylococcus aureus (62%) Sensitivity
Amikacin	67	71	54	37	42
Ampicillin	22	20	0	0	32
Cefazolin	20	14	0	0	41
Cefuroxime	23	15	0	0	37
Cefoperazone	42	37	33	27	32
Cefepime	53	49	43	39	28
Ciprofloxacin	24	33	38	22	41
Imipenem	61	55	41	40	45
Teicoplanin	-	-	-	-	88
Vancomycin	-	-	-	-	91
Linezolid	-	-	-	-	90

Methicillin resistant Staphylococcus aureus (MRSA) was isolated from 42 out of the 62 isolates (68%) of Staphylococcus aureus before hand hygiene. Although, S. aureus is a common flora of human skin; it is also well documented fact that S. aureus is a primary causative agent of HAI⁶⁻⁹. In addition, it was the most common pathogenic organism isolated from the present study. While the total isolation of Extended spectrum beta lactamases(ESBL) producers and AMP C beta lactamases from Enterobacteriaceae was 58% and 45% respectively. Metallo beta lactamases(MBL) producers was isolated from 59% isolates of Pseudomonas aeruginosa and 60% isolates of Acinetobacter baumannii respectively. With respect to hand flora in doctors, hands of doctors from clinical specialties were mostly colonized

with *S. aureus* while doctors of non-clinical specialties were mostly having *Pseudomonas aeruginosa* on their palms. The hands of nursing staff were mostly contaminated with *P. aeruginosa* and *Staphylococcus* species. Our study shows that the same bacterial flora was found from hands of clinical staff and patients' lesions. This could be due to improper hand wash, lack of facilities of adequate hand washing or lack of related awareness among the concerned persons. Information is available about bacterial contamination on the hands of HCWs in healthcare settings during routine patient care^{10,11,12}. In these studies, a correlation was established between the total count of bacteria on the hands of medical staff and factors such as the duration and type of clinical activities, suggesting that, under routine conditions, hand contamination is a dynamic process¹³.

Hand Hygiene (HH) compliance:

A total of 1251 Hand Hygiene (HH) opportunities were observed during routine patient care studied in the pre intervention and post intervention period. There were 600 HH opportunities (48%) in the pre period, and 651 (52%) in the post period. Overall, HCW HH compliance improved from 65.3% in the Pre period to 92.4% in the Post period (P<0.05). In our study it was observed that majority of the HCW were aware of hand hygiene but failed to practice it due to lack of time and increase workload. In a study by Kapil et al¹⁴, it was shown that there was 95-99% reduction in the bacterial load in all the HCW except in case of lab attendants where there was only 70-90% reduction and in case of sanitary attendants there was only 50% reduction in bacterial load after using alcohol based hand rub. Hand hygiene (HH) before patient contact is strongly recommended by the World Health Organization (WHO)¹⁵ and by Centre for Disease Control(CDC) HH guidelines¹⁶ as a measure to prevent cross-transmission of micro-organisms. Compliance to hand hygiene practices should be multimodal and multidisciplinary approach¹³. Educations and training programmes could be effective in strengthening the hand hygiene practice¹⁴. In a study by KuKanich et al. it was demonstrated that hand hygiene performance by HCW in outpatient clinics could be improved through promoting the use of gel sanitizer and information posters¹⁷. This study emphasizes the need for frequent educational programmes on hand hygiene to increase the awareness at all levels of health care and strengthen the supply and usage of alcohol based hand rub in the health care centres, thus effectively controlling the spread of many nosocomial infections.

Conclusion:

1. Most of the organisms isolated from the hands of Healthcare workers were potential pathogens and known causes of hospital acquired infections. Furthermore these organisms were resistant to multiple classes of antibiotics prescribed in the hospital. Hence, Strict hand hygiene is very necessary in health care settings to prevent HAIs.
2. Hand hygiene is one of the most effective tools for the prevention and control of hospital acquired infections(HAIs).
3. Regular educational interventions through trainings and use of posters should be carried out to increase awareness of Infection control practices especially hand hygiene among Healthcare workers.

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