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ORIGINAL ARTICLE

STUDY OF BACTERIAL FLORA OF HANDS OF HEALTH CARE GIVERS IN A TERTIARY CARE HOSPITAL IN EASTERN INDIA

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ABSTRACT: Bacterial contamination of palm of hand of health care givers like doctors and nurses can be an important source of nosocomial infections. Proper hand hygiene is hence key to prevent spread of such cross-infection. We studied the bacterial flora of palm of hand of 101 clinical staff (Doctors of clinical specialties and nurses) and compared it with bacterial flora of 99 non-clinical staff (Doctors of non-clinical specialties and lab technicians and attendants). Hand swab was collected by a sterile swab moistened with sterile normal saline. Out of 101 clinical staff, 63(62.37%) showed hand swab positivity for bacteria. On the other hand, out of 99 non-clinical staff, 72 showed hand swab positivity for bacteria (72.72%). Among clinical staff, hands of 60.3% doctors (38 out of 63) and 65.7% nursing staff (25 out of 38) was contaminated with bacteria. The bacterium most commonly isolated from hands of clinical staff was *Staphylococcus aureus*, while the bacteria most frequently recovered from hands of non-clinical staff were *Acinetobacter lwoffii*. Only 1 isolate of Methicillin resistant *Staphylococcus aureus* (MRSA) was recovered, from hand of a doctor in Pediatrics department. Antibiotic susceptibility test of the isolates was also performed against 3 antibiotics: Cotrimoxazole, Amikacin and Levofloxacin; in addition, Cefoxitin (30 µg) disk was used to check for MRSA (Methicillin Resistant *Staphylococcus aureus*). Most of the strains were sensitive to all the 3 antibiotics. This study highlights the importance of proper hand washing and awareness of its importance and monitoring among hospital staff.

KEYWORDS: Hand swab, Positive, Isolates.

INTRODUCTION: Contact with health care givers, including doctors and nurses, are a major source of nosocomial infections.(1) Such infection is mostly caused by Staphylococcus aureus and Enterococcus spp.(1) The concept of cleansing hands with any antiseptic agent to prevent infections probably merged in the early 19th century.(2) In a paper published in 1825, a pharmacist declared that physicians and others attending patients with contagious diseases would benefit from moistening their hands with liquid chloride solution; however, as a result of the seminal studies by Ignaz Semmelweis and Holmes, hand washing gradually became accepted as one of the most important measures for preventing transmission of pathogens in health-care facilities.(2)

Transient bacterial flora, which colonize the superficial layers of the skin, are more susceptible to removal by routine hand washing, and cause majority of healthcare-associated infections.(2) Ideally, a hand hygiene preparation should at least have activity against bacteria, yeasts, and coated viruses.(3) Health care workers have three opportunities for the post contamination treatment of hands: (i) the social hand wash, which is the cleaning of hands with plain, non-medicated bar or liquid soap and water for removal of dirt, soil, and different organic substances; (ii) the hygienic or antiseptic hand wash, which is the cleaning of hands with antimicrobial or medicated

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soap and water ("scrub"); most antimicrobial soaps contain a single active agent and are usually available as liquid preparations; and (iii) the hygienic hand disinfection, which normally consists of the application of an alcohol-based hand rub into dry hands without water.[3]

Keeping in mind the above factors, we planned this study to evaluate the bacterial load of palm of hands of clinical staff (Doctors + nurses) and compare findings with that of non-clinical staff (non-clinical doctors, lab technicians and others).

AIM: To study the bacterial load of palm of hand of clinical staff.

OBJECTIVES:

- To collect hand swab from the subjects and culture on suitable media.
- To observe colonies, identify the isolates and perform antibiotic susceptibility.
- To find out different resistotypes in the isolates retrieved and compare and correlate them with resistotypes recovered from lesions and samples of patients.

MATERIALS AND METHODS: Type of Study: Laboratory and OPD (Outpatient Department) based observational study.

Ethical Issues: This was an inter-departmental study within the institute. Written informed consent was obtained from the volunteers after explaining them duly, the importance of carrying out this study. Permission was taken from institutional ethics committee prior to conduction of the study.

Time of Study: The work was carried out from April 2014 to January 2015 (9 months).

Sample Collection: Hand swab was collected from the subjects using sterile cotton swab-stick, moistened with autoclaved normal (0.85%) saline. Palmar creases and interdigital spaces were also swabbed, and sample was collected by gently rolling the swab stick over the areas for 6-7 seconds. The volunteers were also asked when they last washed their hands before this procedure.

Inoculation: After collection, samples were inoculated on 5% sheep blood agar and MacConkey agar, streaked and incubated aerobically for 24 hours.

OBSERVATION: After incubation the plates were observed for colony morphology and colony count; suitable tests like Gram stain, catalase, Coagulase and a panel of biochemicals (Indole production, Citrate utilisation, motility using semisolid agar stab, Urease and TSI) were put up for identification. For example, if Gram positive cocci in clusters was recovered, catalase and slide coagulase along with mannitol fermentation (using 1% w/v Andrade's indicator) were performed. If Gram negative bacilli were found, biochemical tests were carried out. Antibiotic susceptibility test was performed by Kirby-Bauer disk diffusion method as per CLSI protocol using the following antibiotic disks: Cotrimoxazole (25 µg), Amikacin (30 µg) and Levofloxacin (5 µg) disks (Hi Media Labs, New Delhi, India); Cefoxitin disk (30 µg) was used to detect MRSA.[4]

Resistotyping: The resistotypes of the isolates was noted. The same for clinical isolates was noted, and compared with resistotypes retrieved from hand swab isolates.

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Statistical Methods: Z test of significance was done to assess significant difference between mean colony counts of clinical staff vs non-clinical personnel.

RESULTS: The hands of majority of doctors and nurses, and non-clinical staff was found to be colonized with one or more bacterial strains.

Out of 63 doctors of clinical specialties, 38 showed bacterial contamination of palm of hands. Also, out of 38 nursing staff, 25 showed bacterial flora on hand.

On the contrary, the hands of 33 doctors of non-clinical departments (out of 48) were colonized with one or more bacterial strains. Other non-clinical staff showed 76.5% hand swab positivity for bacteria (39 out of 51). On query, only 40% of volunteers (61% of clinical staff and 19% of non-clinical staff) admitted to performing hand washing within a period of 10 minutes before the swabbing of their hands.

The major bacterium isolated from hands of clinical staff (doctors + nurses) was *Staphylococcus aureus* (11 isolates out of 33). Other common bacteria in order of frequency were *Acinetobacter baumannii* (10 isolates), *Pseudomonas aeruginosa*, (9 isolates) Coagulase negative *Staphylococcus* spp. (9 isolates) *Acinetobacter lwoffii*, (8 isolates) Escherichia coli (3 isolates) and Corynebacterium spp. other than *C. diphtheriae*. (2 isolates).

On the other hand, the most frequently isolated bacterium from non-clinical staff was *Acinetobacter lwoffii* (20 isolates). Other common ones were Coagulase negative *Staphylococcus* spp. (16 isolates), Staphylococcus aureus and *Acinetobacter baumannii* (12 each), *Pseudomonas aeruginosa* (7 isolates) and *Micrococcus* spp. (4 isolates).

Colonisation of hand with 2 microorganisms (bacteria or fungi) was found in 6 non-clinical personnel as compared to only 1 in case of clinical staff. Out of these 6 cases from non-clinical staff, 1 showed mixed colonisation of *Candida* spp. with bacteria. *Candida* spp. was not isolated from hands of clinical staff. With respect to hand flora in doctors, hands of doctors from clinical specialties were mostly colonized with *S. aureus*, followed by *A. baumannii* and *A. lwoffii*. As far as doctors of non-clinical specialties are concerned, they were mostly having A. baumannii on their palms, followed by Coagulase negative *Staphylococcus spp*. The hands of nursing staff were mostly contaminated with A. baumannii, followed by *P. aeruginosa* and Coagulase negative *Staphylococcus* spp. The mean bacterial colony count (load) of hands of clinical personnel was 54.55, while the same for non-clinical staff was 27.56. This difference was thus significant using Z-test of significance between means.[5]

The resistotype of *S. aureus* isolated from clinical samples during this period was noted. It was found that there were 9 resistotypes of S. aureus in lab isolates, 2 of which matched the resistotypes of doctors of clinical departments (Type 1: susceptible to amikacin, levofloxacin and cotrimoxazole, and Type 2: susceptible to Amikacin and Cotrimoxazole but resistant to Levofloxacin. There was only 1 isolate in hand flora of *S. aureus*, from a clinical staff, which was MRSA (Methicillin Resistant *S. aureus*), but no such isolate was retrieved from patients' samples.

There were 3 resistotypes of *A. baumannii* from samples; 2 of them were found in hands of clinical staff (both doctors and nurses).

DISCUSSION: The promotion of effective measures to improve hand hygiene is one of the five foremost goals of the WHO's current worldwide Patient Safety Initiative [High 5s].[6] The human skin is home to about 10^{12} microbes.[7] There are four main groups of bacteria that predominate almost

everywhere on the skin of doctors and nurses: Diphtheroids (e. g. corynebacteria other than *Corynebacterium diphtheriae*), micrococci (which include the staphylococci such as *Staphylococcus epidermidis*), streptococci (either alpha (α) or gamma (γ) hemolytic), and the enterococci.[7] Besides bacteria the skin also is the home to yeast (like *Candida* spp.) and fungi.[6] Washing reduces the transient flora (contaminating flora) by about 2 to 3 $\log_{10}$ levels.[6] Pioneering works of Semmelweis and Florence Nightingale proved that proper sanitation and hand washing with general cleanliness of doctors and supporting staff like nurses could prevent nosocomial transmission of infections.[8] Despite efforts to promote hand washing amongst medical staff, Hand hygiene compliance rates in different developed countries rarely exceed 50%.[8]

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. Furthermore, common resistotype patterns were found in clinical isolates and isolated from hands of clinical staff, highlighting that the flora could have come from the patients' lesions to the health care givers' hand, or vice versa. This study is the first of its kind in this region and emphasizes the importance of meticulous hand washing to prevent cross-transmission and nosocomial transmission of pathogenic bacteria.

A similar study from Western India found that 60% of mobile phones of resident doctors had surface contamination with harmful bacteria like Coagulase negative *Staphylococcus* spp. Diphtheroids and *Aspergillus niger*.[9] Another Indian study from Gujarat mentions high rate of bacterial colonization of hands of health care workers, predominantly by S. aureus, much like our findings, which were reduced by 95-99% by proper alcohol hand rub.[10] We also found that although frequency of bacterial colonisation of hands of clinical personnel was lower than non-clinical personnel, clinical staff had significantly higher bacterial load on their hands. Further such studies are required to address these issues.

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