



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 1(10): 96-99
www.allresearchjournal.com
Received: 22-07-2015
Accepted: 31-08-2015

M. Anitha

Department of Microbiology,
Shri Sathya Sai Medical
College & Research Institute,
Thiruporur, Sri Balaji
Vidyapeeth University, Tamil
Nadu, India.

J. Hema priya

Department of Microbiology,
Shri Sathya Sai Medical
College & Research Institute,
Thiruporur, Sri Balaji
Vidyapeeth University, Tamil
Nadu, India.

S. R. Swathy

Department of Microbiology,
Shri Sathya Sai Medical
College & Research Institute,
Thiruporur, Sri Balaji
Vidyapeeth University, Tamil
Nadu, India.

G. B. Pavithra

Department of Microbiology,
Shri Sathya Sai Medical
College & Research Institute,
Thiruporur, Sri Balaji
Vidyapeeth University, Tamil
Nadu, India.

Correspondence

M. Anitha

Department of Microbiology,
Shri Sathya Sai Medical
College & Research Institute,
Thiruporur, Sri Balaji
Vidyapeeth University, Tamil
Nadu, India.

Prevalence of hand hygiene among various categories of healthcare workers in hospital setting

M. Anitha, J. Hema priya, S. R. Swathy, G. B. Pavithra

Abstract

Health care workers hands are the most usual type of vehicle for transmission of health care associated infections. The present study was undertaken in a hospital setting to demonstrate the presence of bacterial flora on the hands of healthcare workers (HCWs). By using proper hand hygiene method to reduce the risk of cross-transmission of infection in healthcare facilities (HCFs).

Materials and Methods: A total of 50 number of different Health care workers (Doctors, Medical students, Nurses, Technicians, and Attenders) were tested for microbes. Each person's hand impressions were cultured before and after application of alcohol based hand rub.

Results: Before the application of hand rub, 56% of the HCWs carried *Micrococci*, 12% were MRSA, 8% ESBL, 8% *Staphylococcus epidermidis* and 2% *Enterococcus faecalis* on their hand but after use of alcohol hand rub with a proper hand hygiene technique, it was found to be zero growth among HCWs.

Conclusion: This study reveals high knowledge of the role of hand washing in the prevention of cross infection. Hence hand hygiene is a major component of standard precautions and one of the most effective methods to prevent transmission of pathogens associated with health care. An alcohol-based hand rub requires less time and is microbiologically more effective.

Keywords: Alcohol based hand rub, Hand hygiene, Health care workers, Hospital setting

1. Introduction

Hand hygiene (HH) is a compliance of cleansing hands using soap and water or using antiseptic hand rub for removal of transient microorganism from hands, and in the way of keeping the skin in dirtless condition. Any method of cleansing is referred to as hand hygiene. Hand hygiene is the most simplest and effective measure to prevent infections. However, about 50% of health care associated infection occurs due to contaminated hand of health care providers (HCPs).⁽¹⁾

Health care associated infections (HAI) affect 1 in 20 hospitalized patients. Patients in the ICUs are more likely to get colonized or infected by multi drug resistant organisms. Most of these infections are spread via health care workers' hands. HH is the single most effective measure to prevent this spread. Despite its relative simplicity, HH compliance rates vary and may still be very poor.^(2,3) Hospital acquired infection through the hands of health care workers is mostly due to poor hand hygiene of the health care providers.⁽⁴⁾ Hand hygiene compliance is the way of minimizing the transmission of microorganism which may be multi drug resistant for those patients who have been infected and admitted in the hospital due to their cause and has got some other infection by contaminated health care provider's hands.⁽⁵⁾

Hand hygiene is now regarded as one of the most important aspect of infection control activities. In the wake of the growing burden of health care associated infections (HCAIs), the increasing severity of illness and complexity of treatment, superimposed by multi-drug resistant (MDR) pathogen infections, health care practitioners (HCPs) are overturning back to the basics of infection preventions by simple measures like hand hygiene. This is because enough scientific evidence supports the observation that if properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities (HCFs)^(6,7).

Healthcare-associated infections (HAIs) are a major concern in the hospitals. The HAIs has increased the morbidity and mortality of the patients and are responsible for increase in the

Cost of treatment, prolong the hospital stay, and increases the cost of healthcare, all over the world. HAIs are also responsible for increase in the transmission of multidrug-resistant organisms (MDRO) in a healthcare organization. Hand hygiene has now been recognised as one of the most effective intervention to control the transmission of infections in a hospital as well as control of antimicrobial resistance (AMR) (8). Many nosocomial infections are caused by pathogens transmitted from one patient to another by way of HCWs who have not washed their hands after handling patients or HCWs who do not practice control measures such as use of hand disinfection, glove etc (9).

The aim of our study is to find the effectiveness of hand hygiene among health care personnel's like Doctors, Medical Students, Nurses, Technicians and Attenders before and after using alcohol hand rub.

2. Materials and Methods

The study was conducted in Shri Sathya Sai Medical and Research Institute from March 2015 to May 2015. A total sample of 50 subjects. 10 Doctors, 10 Medical students, 10 Nurses, 10 Technicians and 10 Attenders, who agreed to participate in the study, were included. Each person included in the study was demonstrated the correct steps of hand hygiene using alcohol-based hand rub available in the hospital. Fingertip impressions were collected before and after hand hygiene.

Bacterial culture

The cultures from the hands of all the participants were taken by touching all the 10 finger tips on the sheep blood agar plates before and after the procedure of hand hygiene. After overnight incubation, Identification of bacterial morphological types was done using Standard Methods and antimicrobial susceptibility was done for the hospital pathogens that are more likely to be transferred by hands in a healthcare setting. (8, 10)

People were excluded if they had skin irritation or eczema, if they have taken antibiotics during the previous 2 weeks or have performed surgical hand disinfection during the preceding 24 hours.

3. Results

Our study affirms that the pathogens are present on the hands but could be removed effectively by proper hand hygiene using alcohol-based hand rub. In our present study, hand samples were collected from a total of 50 HCWs, among which 56% of the HCWs carried *Micrococci*, 12% were MRSA, 8% ESBL, 8% *Staphylococcus epidermidis* and 2%

Enterococcus faecalis on their hand. We have proved in our study, before disinfecting the health care workers finger tips, the organisms were found to be 16% for Doctors, 18% for Medical students, 16% for Nurses, 20% for Technicians, 16% for Attenders as shown in the Table 2.

Table 1 depicts the bacterial growth before and after applying alcohol based hand rub in different categories of the hospital staff. HCWs had bacterial growth like *Micrococci*, MRSA, ESBL, *Staph. epidermidis* and *Enterococcus faecalis* beforehand hygiene.(Figure1) Following hand hygiene method (alcohol hand rub), the percentage reduction was 99-100% in all the Doctors, Medical students, Nurses, Technicians and Attenders. (Figure 2)

A total of 6 persons carried *Staphylococcus aureus* on their hands of which all of them were MRSA, 4 persons had *Klebsiella sp.* or *E. coli* on their hands of which three were ESBL producers, 28 had *Micrococci*, 4 had *Staph. Epidermidis* and 1 person had *Enterococcus faecalis* (Table 2).The growth in all the persons was absent after hand hygiene (alcohol hand rub).

The presence of transient bacteria carried on the hands of HCWs is significant in persons working in hospital, as the environment and patients are commonly colonised with bacteria. Hand hygiene has been shown to be an effective method to control transmission of infection by reducing the transient flora (11, 12).

In order to assess the efficacy of the education program, this kind of study can be a good module for knowledge. It provides convincing evidence that the transient flora can be significantly reduced after appropriate hand hygiene.

Table 1

Health care workers	No of samples collected	Before using alcohol hand rub	After using alcohol hand rub
Doctors	10	6 <i>Micrococci</i> , 2 MRSA	Sterile
Medical students	10	5 <i>Micrococci</i> 2 <i>Staph epidermidis</i> 2 MRSA	Sterile
Nurses	10	5 <i>Micrococci</i> 2 <i>Staph epidermidis</i> 1 <i>Klebsiella pneumoniae</i> (ESBL)	Sterile
Technicians	10	7 <i>Micrococci</i> 3 <i>Klebsiella pneumoniae</i> (ESBL)	Sterile
Attenders	10	5 <i>Micrococci</i> , 1 <i>Enterococcus faecalis</i> , 2 MRSA	Sterile

Table 2

Organisms Isolated	Doctors	Medical Students	Nurses	Technicians	Attenders	%
<i>Micrococci</i>	6	5	5	7	5	56
MRSA	2	2	-	-	2	12
ESBL	-	-	1	3	-	8
<i>Staph epidermidis</i>	-	2	2	-	-	8
<i>Enterococcus faecalis</i>	-	-	-	-	1	2
Total percentage	16	18	16	20	16	



Fig 1: shows bacterial growth on the finger tips impression on sheep blood agar plate before using alcohol based hand rub.



Fig 2: shows no bacterial growth on finger tips impression after application of alcohol hand rub

4. Discussion

Our study demonstrates that the pathogens are present on the hands but could be removed effectively by proper hand hygiene using alcohol-based hand rub. In the present study 56% of the HCW carried *Micrococci* on the hand and of *Staphylococcus aureus* 12% were MRSA, followed by ESBL and *Staphylococcus epidermidis* were 8%, and 2% *Enterococcus faecalis*.

According to our study, HCWs finger tips were tested before and after applying ABHR, before applying, bacterial growth were seen in HCWs but after applying ABHR, finger tips were found to be sterile. Hence this alcohol based Hand washing is the single most effective way to reduce the spread of microorganisms in hospital setting. The presence of ABHR (Alcohol Based Hand Rub) was positively associated with HH compliance than those who did not have access on ABHR. This is in line with other studies done in Taiwan and Brazil. The availability of ABHR resulted in significant improvement HH compliance of HCPs^(13, 14).

Similarly like our study Kapil *et al.*⁽⁸⁾, proved that the HCWs carried MRSA and ESBL producers on their hand but could be removed effectively by proper hand hygiene using alcohol-based hand rub.

WHO guidelines reported that the hands of HCWs are commonly colonized with pathogens like Methicillin Resistant *S.aureus*(MRSA), vancomycin resistant *Enterococcus* (VRE), MDR-Gram Negative bacteria (GNBs), *Candida* spp. and *Clostridium difficile*, which can

survive as long as 150 h. Approximately 106 skin epithelial cells containing viable microorganisms are shed daily from the normal skin⁽¹⁵⁾ which can contaminate the gowns, bed linen, bedside furniture, and other objects in the patient's immediate environment.

Boyce JM, Pittet D. in their study stated that the hand carriage of resistant pathogens has repeatedly been shown to be associated with nosocomial infections. The highest rates of hand contamination are reported from critical care areas, which also report most cases of cross transmission. The hands may become contaminated by merely touching the patient's intact skin or inanimate objects in patients' rooms or during the "clean" procedures like recording blood pressure.⁽¹⁶⁾

Coagulase-negative *staphylococci* are by far the most common cause of bacteremia related to indwelling devices. Most of these infections are hospital-acquired, and studies over the past several years suggest that they are often caused by strains that are transmitted among hospitalized patients. Other important infections due to coagulase-negative *staphylococci* include central nervous system shunt infections, native or prosthetic valve endocarditis, urinary tract infections, and endophthalmitis. Intravenous treatment of systemic infections is usually required because coagulase-negative *staphylococci* have become increasingly resistant to multiple antibiotics⁽¹⁷⁾.

Micrococcus spp. and closely related genera though considered harmless saprophytes that inhabit or contaminate the skin, mucosa, and oropharynx; however, they can be opportunistic pathogens for the immunocompromised people.⁽¹⁸⁾ *M. luteus* has been reported as the causative agent in cases of intracranial abscesses, pneumonia, septic arthritis, endocarditis, and meningitis.⁽¹⁹⁾ In a study by Trampuz *et al.* advocated simple training sessions for HCWs to be held in each ward to introduce the advantage of alcohol hand rub over hand washing.⁽²⁰⁾

The WHO "SAVE LIVES: Clean Your Hands" programme reinforces the "My 5 Moments for Hand Hygiene" approach as key to protect the patients, HCWs and the health-care environment against the spread of pathogens and thus reduce HAIs. This approach encourages HCWs to clean their hands: before touching a patient, before clean/aseptic procedures, after body fluid exposure/risk, after touching a patient and patient's surroundings^(21, 22).

Proper hand hygiene is the single most important, simplest, and least expensive means of reducing the prevalence of HAIs and the spread of antimicrobial resistance.⁽²³⁾ several studies have demonstrated that hand washing virtually eradicates the carriage of MRSA which invariably occurs on the hands of HCPs working in ICUs⁽²⁴⁾ an increase in hand washing compliance has been found to be accompanied by a fall in MRSA rates⁽²⁵⁾.

Transmission of Health-care-associated *Klebsiella* spp. has also been documented to reduce with improvement in hand hygiene. The evidence suggests that adherence to hand hygiene practices has significantly reduced the rates of acquisition of pathogens on hands and also has ultimately reduced the rates of HAIs in a hospital⁽²³⁾.

5. Conclusion

Hand washing is one of the most easiest and basic method of personal hygiene. It must become an educational priority. Educational interventions for HCWs provides clear evidence that HCWs hands are grossly contaminated with pathogens on contact with the patient and therefore ALCOHOL

BASED HAND RUBS are the easiest and most effective means of decontamination and thereby it reduces the rates of HAIs.

One of the reasons why the microbes have survived in nature is probably due to their simplicity: a simple genomic framework with genetic encryption of basic survival strategies ⁽²⁶⁾. To tackle these microbes, human beings will have to follow basic and simple protocols for the prevention of infection. The health care practitioners in our country need to update themselves to inculcate the simple, basic and effective practice of hand hygiene in their daily patient care and serve as a role model for future generations of Health care personnel's.

6. Acknowledgement

We would like to take the opportunity to thank the Management for support and encouragement for research activity at SSSMC & RI.

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