



SURVEILLANCE OF HAND HYGIENE FOR MRSA CARRIAGE AMONG VARIOUS CATEGORIES OF HEALTHCARE WORKERS IN CRITICAL CARE UNITS TO CONTROL NOSOCOMIAL INFECTIONS AT GOVT. MEDICAL COLLEGE, KOTA

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ABSTRACT

INTRODUCTION: Poor hand hygiene of health care workers (HCW) is the main route of transmission for methicillin-resistant *Staphylococcus aureus* (MRSA), leading to adverse outcomes for infected patients. Lack of sensitization program on MRSA carriage to HCW is a major factor in nosocomial infection transmission. Surveillance of HCW, working in critical hot spot areas is beneficial in control of nosocomial infections.

OBJECTIVE

- The present study was undertaken to demonstrate the presence of bacterial flora on the hands of healthcare workers (HCWs) & to establish the carriage rate of MRSA among HCW in critical care units of GMC Kota
- To teach them proper hand hygiene technique using alcohol-based hand rub and determine the outcome for reduction of bacteria

METHODS: Hand impressions of 100 HCW were cultured on blood agar plates before and after proper technique of hand hygiene with alcohol based hand rubs. After processing the isolates were identified as *S. aureus*. Further categorization of *S. aureus* into MRSA was done by using cefoxitin disc diffusion method.

RESULTS AND DISCUSSION: 66 out of 100 of HCWs had 100 bacterial colonies or more on both hands before the application of hand rub. After use of alcohol hand rub with a proper hand hygiene technique, percentage reduction was >95% among doctors and medical students, 90-95 % in nurses & technicians, 50- 80 % among housekeeping staff.. *Staphylococcus aureus* was present on the hands of 20 persons of which 8 were MRSA.

CONCLUSIONS: Hands appear to be important route in MRSA carriage for nosocomial infections. Proper hand wash techniques, regular surveillance and time to time sensitization program controls nosocomial infection.

KEYWORDS : MRSA, hand hygiene, nosocomial infection

Introduction

Transient flora, which colonizes the superficial layers of the skin, are often acquired by HCW during direct contact with patients or contaminated environmental surfaces adjacent to the patients and are the organisms most frequently associated with Health care associated infections (HAI). The rate of HAI is nearly 1 in 20 hospitalized patients. Patients in the ICUs are more likely to get colonized or infected by multi drug resistant organisms.⁴ Methicillin resistant *Staphylococcus aureus* (MRSA) is one of the most important hospital acquired pathogens and recently there have been significant worldwide increase in nosocomial infections due to this organism since it was identified in 1961.¹ Colonized healthcare workers are the main reservoirs of MRSA. Spread of MRSA is facilitated by cross-transmission via the hands of healthcare workers². The carriers of MRSA are also at higher risk of getting endogenous infections with this super bug.³ The treatment options for MRSA are limited due to its resistance to all beta-lactam antibiotics resulting in higher treatment cost, prolonged antibiotic administration, and longer hospital stay resulting sometimes into fatal outcomes.¹ Due to terrible prognosis of MRSA infections epidemiological information is of utmost importance to prevent and control these infections. MRSA in hospital settings may transmit the organism to their household members spreading this multidrug resistant bacteria in the community creating a great public health problem.³ As 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.⁴

The present study was done to study the effectiveness of hand hygiene and role of education among health care personnel's like Doctors, Medical Students, Nurses, Technicians and housekeeping staff before and after using alcohol hand rub and thus to create awareness among the health care workers regarding hand washing

and other infection control measures to prevent nosocomial and cross-infections by demonstrating the reduction of transient bacteria on the hands by adopting such practice.

Material and Methods

The study was conducted in Government Medical College & associated hospitals Kota, Rajasthan. 100 HCW including resident doctors, medical students, nurses, Technicians and sanitary attendants with 20 subjects in each group, who agreed to participate in the study and were on duty in the in a critical Care units and central laboratory of the hospital, were screened after obtaining informed consent. Each person included in the study was demonstrated the correct steps of hand hygiene using alcohol-based hand rub available in the hospital at the time. (Sterillium i.e. 2-propanol 90 g/1000 ml and 1-propanol 60 g/1000 ml, Mumbai, India). Hand impressions were taken by touching all the 10 finger tips on blood agar plates before and after proper technique of hand hygiene with alcohol based hand rubs while switching on to the next patient. The alcohol-based hand rub was used for 30 seconds. (WHO guidelines on hand hygiene in healthcare, 2009) & is incubated aerobically at 37°C for 18-24 hours. After incubation the manual colony count was done to sum up all the colonies. Those showing >100 colonies were not counted further⁵. Identification of bacterial morphological types was done using Standard Methods and antimicrobial susceptibility was done for the potential pathogens which included *Staphylococcus aureus*, *Enterobacteriaceae* and *Acinetobacter spp.*⁶. On Gram stain and biochemical reaction basis isolates were identified as *S. aureus*. Further categorization of *S. aureus* into MRSA was done by using cefoxitin disc diffusion method. Sensitivity to vancomycin was tested by vancomycin disc diffusion.⁴

Results

- 34% of the study subjects had colony counts <100 and 66% of

- them had colony counts > 100 on both hands before the application of hand rub. (Table-1)
- After use of alcohol hand rub with a proper hand hygiene technique, percentage reduction was 95% among doctors & medical students, 90-95% among nurses and technicians, and 50-80% among housekeeping staff. (Table-2)
 - The pathogens isolated from the hands of HCW were *Staphylococcus aureus*, *Klebsiella* spp, *Escherichia coli*, *Pseudomonas* spp and *Acinetobacter* spp (Table-3). *Staphylococcus aureus* carriage was present on the hands of 20 persons, of which 8 were MRSA. (Figure-1) The growth of pathogens was absent after the use alcohol based hand rub

Table-1

Health care workers	<100 colonies before hand hygiene		>100 colonies before hand hygiene	
	Number	%	Number	%
Doctors (n= 20)	12	60	08	40
Medical students (n= 20)	08	40	12	60
Nurses (n= 20)	05	25	15	75
Technicians (n= 20)	05	25	15	75
Housekeeping staff (n= 20)	04	20	16	80
Total =100	34		66	

Table 2

Health care workers	% reduction in colony count after hand hygiene using alcohol hand rub	
	<100 colonies before hand hygiene	>100 colonies before hand hygiene
Doctors	>95%	>95%
Medical students	>95%	>95%
Nurses	>90-95%	>90-95%
Technicians	>90-95%	>90-95%
Housekeeping staff	>50-80%	>50-80%

Table-3

Pathogens isolated	Number	%
<i>Staphylococcus aureus</i>	20	50
<i>Klebsiella</i> Sp.	06	15
<i>E.coli</i>	10	25
<i>Pseudomonas</i> Sp.	02	05
<i>Acinetobacter</i> Sp.	02	05

Figure 1

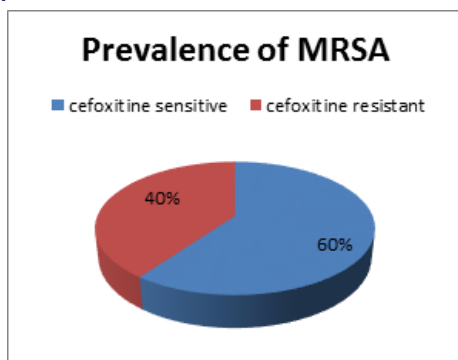
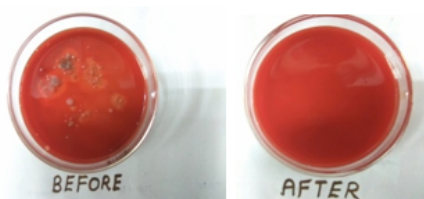


Figure 2



BEFORE image shows bacterial growth on the thumb and

fingers impression on blood agar plate. AFTER image shows no bacterial growth on thumb and fingers impression after education and application of alcohol hand rub

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

The highest rates of hand contamination are reported from critical care areas. The hands may become contaminated by merely touching the patient's intact skin or objects in patients' rooms or during the procedures like recording blood pressure².

Hands of HCWs act as an important source of multi drug resistant pathogens like MRSA, VRE, MDR-Gram Negative bacteria (GNBs), multiplying in and being shed from the skin thus resulting in cross transmission WHO guidelines reported that these MDR pathogens can survive as long as 150 h. Approximately 10⁶ skin epithelial cells containing viable microorganisms are shed daily from the normal skin which can contaminate the gowns, bed linen, bedside furniture, and other objects in the patient's immediate environment.⁷

Proper hand hygiene is the single most important, simplest, and least expensive means of reducing the prevalence of HAIs and the spread of antimicrobial resistance⁸. Several studies have demonstrated that hand washing virtually eradicates the carriage of MRSA which invariably occurs on the hands of HCPs working in ICUs an increase in hand washing compliance has been found to be accompanied by a fall in MRSA rates⁹.

In the present study, bacterial growth was observed in all the HCWs (100%) before hand hygiene. This correlates with the study conducted by Sarfraz A et al., which also showed bacterial colonisation in majority of HCWs¹⁰

In our present study, ABHR (Alcohol Based Hand Rub) has shown a broad spectrum of bactericidal activity which is effective against most of the bacterial species causing nosocomial infections which is in concordance with other studies also (Kampf, et al., 2008)

In our study, 40% of the HCW carried pathogens on their hands out of which 20% were MRSA (8/40) and 12% were ESBL producers (5/40). These transient flora were effectively removed by following the correct steps of hand hygiene using alcohol based hand rub. There was >95% reduction in the bacterial load in all the health care workers except in case of sanitary attendants where there was 50-80% reduction in bacterial count. This could be because of their lack of knowledge and training with respect to hand hygiene. Thus educational level do play a pivotal role in hand hygiene adherence & in turn, control of HAI. This emphasises on need of repeated demonstration of the steps and importance of hand hygiene among sanitary attendants. The other possibility could be that the bioburden (dirt, organic matter, chemical) on the hands of housekeeping staff may be high which can make the hand rub ineffective that might require hand wash with soap and water first.¹¹

The study also gave the evidence that CMEs and training programmes could be effective in strengthening the hand hygiene practice (Kapil, et al., 2015).¹¹

This study provides important tool in the role of hand sanitation, MRSA control policy and MRSA control sensitization program which removes reservoirs, vectors, & victims of MRSA nosocomial transmission

LIMITATION.

1. Genetic relatedness of the isolates with those isolated from patients cannot be established as genotyping was not done.
2. Fungal isolates were not considered and Antifungal

susceptibility testing was not done.

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