Research Article

Comparison of Conventional Hand Wash and Isopropyl Alcohol Hand Rub among Healthcare Workers and Doctors Working in Gastromedicine ICU: An Observational Study

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ABSTRACT

Nosocomial infection rate is often higher for intensive care unit (ICU) than other units of hospitals, and hands of health-care workers (HCWs) as well as on resident duty doctors play a major role in the transmission of the infections. Aim of this study was to compare the efficacy of conventional hand wash with the Isopropyl alcohol Hand rub in reducing the transient bacterial flora on the hands of nurses and posted doctors in a Gastromedicine ICU. The 32 nurses and 14 resident duty doctors posted in our ICU during January-March 2022 were included in this observational study. A total of 250 samples were collected for the residual bacterial flora on fingers using the impression method on MacConkey agar plates. The subjects then used Isopropyl alcohol hand rub or conventional hand wash and the residual bacterial flora was rechecked by testing the impression of fingers on MacConkey agar. *Escherichia coli, Klebsiella spp*., non-lactose fermenting Gram-negative bacilli, staphylococci, and streptococci formed the transient bacterial flora on the hands. Moderate to heavy bacterial density was seen in more than 94 % of the hands before washing or hand rub application. Conventional hand wash resulted in a drastic reduction in the transient bacterial flora on hands in 55 % of cases whereas Isopropyl alcohol hand rub achieved the effect in 97 % of the samples. Compared with conventional hand wash, Isopropyl alcohol hand rub is far more efficient in reducing transient bacterial flora on the hands of HCWs, and in resident duty doctors it is more convenient and time-saving. It is recommended as a hand hygiene practice in critical areas especially in the gastro medicine ICU because most of the patients are immunocompromised and it may act as a protective barrier.

Keywords: ICU, Hand Wash, Isopropyl alcohol Hand Rub.

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INTRODUCTION

Hand hygiene is the single most important step to cross-transmission & avoid nosocomial infection since most illnesses are transmitted by the palms of health care workers (HCWs). Nosocomial infections (NI) rates are often greater in ICU (15-40%) in comparison to general hospital practice which ranges from 3.5-10%.[1] These NI result in complications, increased hospital stay, additional financial burden, and increased mortality. The precise prevalence data on NI are lacking for India. In ICU, the number of direct contacts between the hands of the HCW and patients is greater, and this leads to an increased rate of NI. [2] Hands play a major role in the transmission of blood-borne, enteric, and respiratory tract infections. Hand hygiene has been considered the most important tool in NI control[3,4]. The bacterial flora on the hands(skin) is differentiated as resident flora and transient flora[5]. The transient flora is responsible for the transmission of infection in healthcare setup and elimination of the same should be the target in hand washing or disinfection practices. The availability of water for hand washing itself is a problem in some Indian hospitals. Hand drying facility in the form of an air-dryer or sterile napkins is more difficult. ICUs are often understaffed and frequent washing and drying could be difficult owing to time constraints as well. Alcohol hand rubs have been claimed to be more efficient[6] in reducing the microbial flora on the hands.

The present study was done to compare the reduction in the degree of bacterial contamination after conventional hand washing and alcoholic hand rub on the hand of nursing staff as well as resident duty doctor posted in gastro ICU in a tertiary care center. This study will help the infection control committee to train health care workers to reduce the transmission of nosocomial infections.

MATERIALS AND METHODS

Study site

In the Big Apollo Spectra Hospital, Patna, Bihar, India. The study was carried out in the 12 bedded ICU and 13 bedded HDU of the hospital.

Subjects and sample collection

A total of 32 nurses and 14 resident doctors posted in the ICU were included in the study. The hands were checked for the presence of transient bacterial flora during the middle of the routine activities. Periodic random

examinations were made by collecting 250 samples from January 2022 to March 2022. Obviously, the study included multiple examinations of the Gastromedicine ICU nurses and resident doctors. The sample collection included getting impressions of the finger of hands on the surface of the MacConkey agar plate (100 mm diameter). Two separate plates were used for left and right-hand fingers. Following the sample collection, the staff and resident duty doctor were asked to carry out hand washing or alcoholic hand rubs (alternate basis). After hand washing, the hands were dried using sterile napkins and in case of alcoholic hand rub hands are allowed to air dry. Following the hand wash or alcoholic rub impression of fingers was repeated from both the hands-on fresh media to check the resident flora.

Hand wash and alcoholic rub

Standard 30 seconds hand wash was carried out using liquid soap. The soap contained lauryl sulfate as a detergent and glycerine and other emollients. The soap dispenser dispensed 0.5 ml per push. The avitizer (Avillions Lab Pvt. Ltd.) alcoholic hand rub each ml containing 70% v/v isopropyl alcohol and 3% glycerol was used. The alcohol dispenser delivered 3 ml per application.

Bacteriological Study

The McConkey Agar (HIMEDIA H0085-500G) supported the growth of staphylococci, Group D streptococci, and gram-negative enterococci. The plates after finger impression were incubated at 37 degrees Celsius for 24 hours and the colonies were identified by Gram's staining and standard biochemical test. The growth of colonies less than 20 was considered as scanty whereas colonies 20-100 were reported as moderate growth and greater than 100 as heavy growth. The finger impression beforehand washes or hand rubs were considered untreated.

Ethical issues

The project was approved by the hospital's ethical and research committee. All the staff members and resident doctors explained the study design and were asked to use hand wash or hand rub as they perform routinely.

Statistics

The selection for hand rub or hand wash was on an alternate basis. Differences between bacterial flora before and after hand rub or hand wash were compared using paired t-test (MICROSOFT EXCEL). Chi-square test without Yates correction, one-tailed P value, 2×2 contingency table.

RESULTS

The bacterial spectrum of the transient flora on the fingers of the nursing staff and resident doctors in the Gastromedicine ICU setup is depicted in [Table-1]. The data show that during the course of routine healthcare activities in ICU, both Gram-positive cocci and Gram-negative bacilli get deposited on the hands. A qualitative reduction in the flora occurs after hand washing and a substantial reduction occurred after alcoholic hand rubs.

The transient flora was measured before and after hand wash by a semi-quantitative method. The transient bacteria loosely adhered to the finger skin were transferred by contact of fingers over the solid culture media and gradations based on the number of colonies were made as shown in [Table-2].

Table 1: The prevalence and spectrum of the bacterial flora on the fingers

Organisms	Untreated Hands (N=250)	After Hand Wash with Soap + Water (n=125)	Hand wash after alcohol hand rub (n=125)
Staphylococci	118 (55.69%)	36 (28.8%)	4 (3.2%)
Group D Streptococci	27 (10.8%)	8 (6.4%)	1 (0.8%)
Escherichia Coli	25 (10 %)	24 (19.2%)	3 (2.4%)
Klebsiella spps.	10 (4 %)	22 (17.6%)	6 (4.8%)
Non Lactose Fermenter	15 (6 %)	15 (12 %)	2 (1.6%)
Spore bearing bacilli	55 (22 %)	20 (16 %)	12 (9.6%)

Table 2: Effect of hand wash Vs alcoholic hand rub on disinfection of hands

Organisms	Untreated Hands (N=250)	After Hand wash with Soap + Water (n=125)	Hand wash after alcoholic hand rub (n=125)
No Growth/Scanty Growth (20 colonies)	15 (6%)	75 (P = 0.001)	105 (P = 0.001)
Moderate Growth (20-200 colonies)	170 (68%)	30 (P = 0.001)	15 (P = 0.001)
Heavy Growth (Colonies >100)	65 (26%)	20 (P = 0.029)	5 (P = 0.001)

In our study, we observed that bacterial population grade as no or scanty growth on comparing conventional hand wash over Isopropyl alcohol hand rub have statistically significant reduction in transient flora (p=0.001) (p<0.005).

We also found that moderate (p=0.001) and heavy (p=0.001) bacterial growth were extremely reduced in persons who washed their hands after Isopropyl alcohol hand rub compared with conventional hand washing with soap and water and was extremely statistically significant. Only less than 7 % of the persons had nil or scanty growth, whereas 68% had moderate bacterial flora and 26% had heavy flora on the hands before hand washing or alcoholic hand rubs. The reduction of bacterial flora following an alcoholic rub was far greater than after hand washing with soap water.

DISCUSSION

Hands are normally colonized by two types of flora – the resident flora and transient bacterial flora, according to the layer of the skin they colonize. Resident flora which is less pathogenic, bacteria are more resistant to removal (e.g. Coagulase-negative staphylococci and diphtheroid). Transient flora is more likely to cause disease and is less resistant to removal (e.g. Staphylococcus aureus, gram-negative bacilli).

Staphylococci are a common organism responsible for NI. The proportion of NI caused by staphylococci is reported to be 26.4 % among UTIs, 23.3% among septicaemia and 29% in lower respiratory tract infections. In the present study, staphylococci were grown from 118 of 250 hand samples collected before hand washing and alcoholic hand rubs. Not mentioned in the result but 36 out of 125 staphylococci were coagulase-positive staphylococcus aureus. The prevalence of NI caused by gram-negative bacteria has been increasing in ICU setups and it was reported to be as high as 64%[8]. Transient colonization of gram-negative bacteria ranges from 21% to 86% and the highest rate was noted in ICU. [9] In the present study (22 %) 55 out of 250 samples collected before washing or alcoholic rub revealed the growth of gram-negative bacilli. Transient gram-negative bacteria have been reported to persist in all 14 health care workers after washing from soap and water. [10] In the present study, even after hand washing with soap and water, gram-negative bacteria were seen on the hands of more than 50% of nurses and resident doctors. The gram-negative enteric bacteria are resistant to soap or detergent and no medicated soap cake becomes contaminated and leading to colonization of the hands of personnel and subsequent transmission as NI.[11,12] It needs to be mentioned that soap cakes are still being used in the majority of hospitals and the provision of liquid soap dispensers needs to be suggested in hospital practice. Repeated application of detergents and soaps results in transepidermal water loss, damage to the stratum corneum, and irritative contact dermatitis.[13] Alcohols along with emollients such as glycerine appear to be the safest antiseptic agent for the skin[14] and the advantage is the fast drying of the alcoholic preparation without the need for a towel.

The present study clearly documents a more efficient reduction of the microbial flora on hands by alcoholic hand rubs in comparison to conventional hand wash. The cost of the alcoholic hand rub is Rs 2.35 per application whereas hand washing will be less than Rs 0.75 per wash. However, the alcoholic rub may not be expensive if the efficiency, side effects, time saved, and mainly the reduction in NI is considered. We have yet not measured the infection rate as in the interventional study. However, the use of alcoholic hand rub practice over a 10-month period reduced NI by 36% in 498 bedded acute care facilities[15] and in the other setup by 41%[16]. In the Centers for Disease Control and Prevention Guidelines[17], a hygienic hand disinfectant with an alcohol-based hand rub is the preferred treatment of hand hygiene for HCWs and needs to be practiced before and after the care of every patient.

CONCLUSION

Compared with conventional hand wash, alcoholic hand rub is far more efficient in reducing transient bacterial flora on the hands of HCVWs, and in resident duty doctors it is more convenient and time-saving. It is recommended as a hand hygiene practice in critical areas, especially in Gastromedicine ICU.

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