

Original Research Article

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## Cross-sectional Study of Hand Hygiene Practices and Comparison of Microbial Flora of Dominant and Non-dominant Hand amongst Health Care Personnel

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### ABSTRACT

#### Keywords

Health care personnel, Hand washing, Dominant and non-dominant hands, Microbial flora.

#### Article Info

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Hand hygiene is considered as the most effective method of controlling health care related infections. The present study was conducted to determine the awareness of hand washing among Health care personnel (HCP) and to compare the microbial flora of dominant and non-dominant hands of HCP. Sixty-nine HCP were interviewed using a pre-validated questionnaire regarding compliance of hand washing practices. Their dominant hand was noted. Using the sterile pre-moistened swab sticks sample was collected from both hands of HCP and cultivated on Blood Agar. Colony Forming Units counting and identification of bacteria was done. Participants who were aware of hand washing technique and hand washing guidelines comprised 97.10% and 85.5%, respectively. Out of all, 63.76% had received training in hand washing. The frequency of hand washing was four times or more for 49 (71.01%). Posters and information charts available in the hospital were the major sources (85.5%) of information on hand washing. Though there is strong awareness regarding hand-washing among healthcare workers, the compliance is inadequate. There was no significant difference in the microbial flora of dominant and non-dominant hands of health-care personnel.

### Introduction

Hand hygiene is the most effective measure for interrupting the transmission of microorganisms, which cause infection both in the community and in the healthcare setting (Jumma, 2005). Healthcare-associated infections (HAI) occur both in the developed and less developed nations (Saleem *et al.*, 2012) and are considered to be spread by the hands of health care personnel (HCP) through direct contact (Paul *et al.*, 2011; Pittet *et al.*, 2000). Despite the efficacy of hand cleansing in removal of transient bacteria, the hands of HCP have been frequently incriminated as

vehicles of transmission of nosocomial pathogens (McNeil *et al.*, 2014). The present study was conducted to determine the awareness of hand washing among HCP and to compare the microbial flora of dominant and non-dominant hands of HCP.

### Materials and Methods

This comparative, cross-sectional, prospective study was conducted at Rajiv Gandhi Medical College and Chhatrapati Shivaji Maharaj Hospital, Kalwa, Thane (Maharashtra, India)

over a period of three months. After obtaining permission from the Institutional Ethics Committee, HCP who gave written informed consent to participate in the study were interviewed using a pre-validated questionnaire wherein their dominant hand (right or left) and compliance of HCPs to the “My five moments of hand hygiene” recommendation of the World Health Organization (WHO, 2009) was also recorded.

### ***Sample collection and processing***

Sterile pre-moistened swabs were rubbed over palm including the inter-digital spaces and fingertips of both dominant and non-dominant hands. The swabs were cultured on blood agar and plates were incubated at 37°C for 24 hr. The growth of various bacteria and fungi, if any, was studied in terms of colony characteristics and colony forming units (CFU). Further identification was done by Gram staining and biochemical reactions (Collee *et al.*, 2006).

Dominant (right hand of the right-handed persons and left hand of left-handed persons) hands formed the first group and non-dominant (the remaining hands) the second group. The number of CFU on dominant and non-dominant hands was statistically analysed.

### **Observations**

The participants (n=69; males=22, 31.88%; females=47, 68.12%) comprised medical students (n=20; 28.98%), nurses (n=19; 27.53%), houseman (n=04; 05.79%), interns (n=09; 13.04%), laboratory technicians (n=13; 18.84%) and attendants (n=04; 05.79%). Their ages aged from 18 yrs to 56 yrs (mean=30 yrs; SD = 11.3 yrs: Confidence Interval = 27.279 to 32.721 yrs). Participants who were aware of hand washing technique

and hand washing guidelines (WHO, 2009) comprised 97.10% and 85.5%, respectively. Out of all, 63.76% were trained in hand washing (WHO, 2009).

Compliance of hand washing practices to WHO’s “My five moments of hand hygiene” is outlined in the Table. The frequency of hand washing was three times or less per day among 20 (28.98%) respondents while it was four times or more for 49 (71.01%). Posters and information charts available in the hospital were the major sources (85.5%) of information on hand washing.

In 63 participants, right side was dominant and in remaining 6 participants, left side was dominant. In 28 (40.57%), dominant hands had more CFUs while the reverse was observed in 33 (47.82%) participants. However, in 8 (11.6%) HCPs, the number of CFUs on dominant and non-dominant hands were the same. There was no significant difference in average colony forming units on dominant and non-dominant hand ( $p=0.838119$ ).

CFUs of *Staphylococcus aureus* were more on the dominant hand as compared to that on the non-dominant in 24 (34.78%) while the reverse was observed in 32 (46.38%) of HCPs. In 13 (18.84%) HCWs, the number of CFUs of *Staphylococcus aureus* on dominant and non-dominant hands were same. There was no significant difference in average CFU of *Staphylococcus aureus* on dominant and non dominant hand ( $p=0.844062$ ).

### **Results and Discussion**

Hand hygiene is known to prevent cross-infection in health care settings and though many countries have hand hygiene guidelines for healthcare settings, the overall compliance among HCPs is unsatisfactory (Christiaens *et al.*, 2006; Wendt, 2001).

Studies on hand hygiene have been chiefly observational and may be subject to observer bias. Blinding, randomization and controlling for confounding variables may not be feasible (Curtis *et al.*, 2003). In the healthcare setting, there is a dichotomy between knowledge and behaviour as regards hand hygiene (Jumma, 2005). There is evidence that HCPs may be unaware of their poor compliance, but other factors result in non-adherence (O'Boyle *et al.*, 2001). In the current study, though the awareness about hand-washing was 97.10%,

the compliance was in range of 41-69%.

Handedness has a significant ( $p < 0.001$ ) influence in bacterial communities (Fierer *et al.*, 2008). The influence of handedness on bacterial communities on the palm is likely due either to differences in skin environmental conditions (such as, sebum production, salinity, hydration) or to the dominant hand coming into contact with different types of environmental surfaces, as compared to the non-dominant hand.

**Table** Compliance to “Five moments of hand hygiene” among health care personnel (n=69)

“Five moments of hand hygiene”	Compliant	Not compliant	SEDP value #	p value
Before touching patient	41 (59.42)	28(40.58)	8.3601	0.0121
Before aseptic procedures	41 (59.42)	28(40.58)	8.3601	0.0121
After touching body fluid or waste	48 (69.56)	21(30.43)	7.8338	<0.00001
After touching a patient	36 (52.17)	33(47.83)	8.5045	0.30460
After touching patient surroundings	32 (46.37)	37(53.62)	8.4902	0.19683

Figures in parentheses indicate percentages

# Standard error of difference between two proportions

The bacterial communities on left and right hands from the same individual were more similar than expected. Dominant hands have similar overall levels of diversity as non-dominant hands but the composition of the bacterial communities on dominant and non-dominant hands from the same individual was significantly different (Fierer *et al.*, 2008). In current study there was no significant difference in the total CFU or CFU of the pathogen *Staphylococcus aureus* in dominant and non-dominant hands. Similarly, a study on subungual flora found no significant difference in mean CFU between the right and left hands of each subject (McGinley *et al.*, 1988).

**Limitations**

The spot surveillance of hand washing activity could have been significant instead of

questionnaire. But that too may not be considered as reliable method of data collection as behaviour alteration in presence of observer is possible.

In conclusion, though there is strong awareness regarding hand-washing among healthcare workers, the compliance is inadequate. There was no significant difference in the microbial flora of dominant and non-dominant hands of health-care personnel.

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