

Hand hygiene knowledge, attitude, practice and hand microflora analysis of staff nurses in a rural tertiary care hospital

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ABSTRACT

Introduction: Hand hygiene play crucial role in infectious control. The present research is on accessing Knowledge, attitude, and practice of nursing staff regarding hand washing. Human hands are covered with several commensal and pathogenic microorganism. Pathogenic bacterial species especially *Staphylococcus* species are the most common to participate in nosocomial infections. **Methods:** Total 300 hand swab samples were taken from 150 nursing staffs followed by filling the questionnaire form. Standard culture media (Blood agar and MacConkey agar) were used to isolate the microorganisms. Microbial identification was done by using standard biochemical tests. **Results:** Our study concluded that over all staff members had moderate knowledge and attitude regarding hand washing. Coagulase-negative *Staphylococcus* isolates were the most dominant bacteria. Occurrence of *Staphylococcus aureus* was relatively less. **Conclusions:** Creating awareness and education regarding hand hygiene would definitely increase the attitude and practice of health care workers to minimizing the nosocomial infection.

Keywords: Hand hygiene, hand microflora, nosocomial infection, nursing staff, *Staphylococcus aureus*

Introduction

Adequate infection control practice is one of the key elements for restricting the spread of healthcare-associated infectious-disease. A numerous guidelines state that handwashing is the most essential procedure to prevent nosocomial infection but on

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the parallel hand many studies continue to report unacceptable health-care worker hand-hygiene compliance rates. Minimal sustained success has been outlined even after countless efforts to improve hand-hygiene behavior that focused on broad-based educational and motivational programs. Poor hand-hygiene adherence transpires due to unavailability of hand-washing sinks, lack of time to perform hand hygiene, patient's underlying condition, outcomes of hand-hygiene products on the skin, and unawareness of the guidelines.^[1,2] Healthcare syndicated infections are voluminously listed as a consequence of

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person-to-person transmission of nosocomial pathogens via the hands of healthcare personnel. It is also evident that the rise in levels of micro-organisms contamination has been identified due to flawed nursing practices, such as direct touching, contact with bodily fluids, and wound care. Even during relatively clean procedures, such as taking the pulse, measuring arterial blood pressure and checking temperature, nurses hands can become open to bacteria. The hand-washing habits of nurses are debatable for many reasons, which include the cumbersome structure of intensive care units, the characteristics of the patients in intensive care, the heavy workload in such units, and an insufficiency of nurses.^[3,4] Undeniably, with varied environmental factors and host factors, human skin is known to be immutably covered with microorganisms, both commensals and pathogens depending on topography. Either hospital surroundings or poor hygiene is one of the key factors of transient micro-flora on the hand which is dynamically responsible for cross-infections. The common organisms associated are *Staphylococcus aureus*, Coagulase negative *Staphylococcus* species, *Klebsiella* species, *Pseudomonas* species, *Acinetobacter* species, or any other pathogen which is present in the environment of a healthcare facility.^[5,6] Keeping this in view, the present study was done with two main objectives to access hand hygiene practices:

1. Evaluation of Hand-washing knowledge, attitude and practice among the nursing staff dealing with patients.
2. Analysis of Hand Micro flora of nursing staff.

Material and Methods

This prospective-study was done in Microbiology Department of Maharishi Markandeshwar Medical College and Hospital, Solan with prior Ethical clearance (MMU/IEC/P.No. 13/17) 09/03/2017. Total 150 nursing staff's hand swabs were taken with informed consent. Sterile swabs were used for taking the samples. Two hand swabs (Palm) were taken from each health care workers followed by filling the questionnaire form which was having questions about hand hygiene. Swabs were cultured on 5%-Blood agar and MacConkey agar. Bacterial colonies on culture media were identified by using standard biochemical tests. Gram stain; 3%-catalase test; oxidase test; triple-sugar-iron agar; nitrate reduction test; urease-production test; IMViC tests and sugar fermentation tests were used for identification of gram-negative bacteria. Gram stain; 3%-catalase test; slide/tube-coagulase test; mannitol fermentation test and DNase test were used for identification of gram positive bacteria followed by screening of MRSA (Methicillin resistant *Staphylococcus aureus*) by Cefoxitin (30 µg) disk diffusion method and antibiotic susceptibility pattern of *Staphylococcus aureus* by using antibiotics: Trimethoprim/Sulfamethoxazole (1.25/23.75 µg), Ciprofloxacin (5 µg), Erythromycin (15 µg), Clindamycin (2 µg), Linezolid (30 µg).^[6-8]

Results

This study involved 150 subjects and found that 80% of staff was in age group 20–25 years, followed by 20% in 26–30 years

Table 1: Socio- demographic characteristics of study subjects (n=150)

Socio-demographic Characteristics	Frequency (%)
Age groups	
<20	00
20 - 25	120 (80%)
26 - 30	30 (20%)
> 30	00
Service Duration as a Health Care Worker	
<6 months	19 (13%)
6-12 months	31 (21%)
1-2 yrs	50 (33%)
2-5 yrs	50 (33%)
>5 yrs	00 (00%)

Table 2: Use of Antiseptics in Day by Health Care Workers

Use of antiseptics	Frequency (%)
1 - 4 times	74 (49%)
5 - 10 times	52 (35%)
>10 times	24 (16%)

age group. Most of service duration of the staff (66%) was between 1 and 5 years [Table 1].

Most of the staff (49%) was using antiseptics 1–4 times followed by 35% staff who was using 5–10 times in a day [Table 2].

Questionnaire regarding general information revealed that 84% staff nurses said to have adequate facilities for hand washing in their working area. About 90% staff had good knowledge about the importance of hand hygiene in nosocomial infections. About 52% staff believed that regular hand washing with soap do not decrease the bacterial load of the hands. Moreover, 59% staff members assumed that wearing hand gloves could be the replacement for hand washing. Majority staff nurses (84%) knew importance of handwashing with antiseptic soap. Almost all staff members (99%) were aware about 7 steps of hand washing [Table 3].

Attitude-based questions were asked to staff members in which less members (14%) felt irritated after repeated hand washing. 14% of the staff tend to forget washing their hands while dealing with patients as 54% of staff workers thought emergencies and other priorities make hand washing more difficult to perform. Maximum number of health care workers (80%) always ensured correct hand washing at all the times. 96% staff felt disappointed when their colleagues omitted the hand hygiene [Table 4].

While asking practice-based questions, majority staff (71%) had habit of washing their hands before wearing gloves. Most of the staff members (86%) said that they always ensured effective hand washing by using antiseptic soap followed by alcohol-based hand-sanitizer. Half of the members (51%) admitted to follow proper 7 steps of hand washing. 50% staff members preferred alcohol-based hand rub over antiseptic soap on unsoiled hands.

71% of the health care workers had not given instructions about the hand hygiene during their training and orientation classes. We found that only 48% staff were maintaining hand hygiene before and after physically handling of the patients. 61% of them said that infection prevention team and their activities do not remind them to maintain hand hygiene [Table 5].

Out of 300 swabs collected from the hands of 150 nurses working in critical areas, 285 hand swabs showed the growth. Almost all the swab showed growth of more than 2 organisms on culture media. Out of 531 isolates 39 (7.34%) isolates were *Staphylococcus aureus* and 44% of them were found to be Methicillin resistant (MRSA) based on the Cefoxitin resistance as per CLSI guidelines. The major Gram-Positive pathogenic organisms seen were Coagulase negative *Staphylococcus* species

190 (35.78%) followed by *Micrococcus* (17.32%) whereas amongst Gram Negative bacteria *Acinetobacter* species (11.29%) and Other Non-fermenters (1.12%) were predominant. Few of the *Candida* species 12 (2.25%) were also isolated [Table 6].

The antimicrobial susceptibility pattern of *S. aureus* isolates varies widely by region because it depends on antibiotic exposure to that particular population. In the context of antibiotic susceptibility pattern in our study, Linezolid (100%) was found to be highly active followed by Clindamycin (50%) whereas Trimethoprim/Sulfamethoxazole was found to be least sensitive against *Staphylococcus aureus* [Table 7].

Discussion

Most important and basic practice to minimize the health care associated infections in primary care is maintaining the proper Hand hygiene by the primary care physicians. Implementation of hand washing technique on the regular basis in primary care physicians is contributing in lowering the morbidity and mortality.^[9] Present study found out that over all nursing staff members had moderate knowledge, attitude, and practice regarding hand hygiene, similar finding were too reported by other researchers.^[10,11] Our study population was relatively younger compared to other studies^[12,13] as 80% of staff members belonged to age group of 20–25 years. Occurrence of healthcare-associated-infections decreased after strict implementation of hand-hygiene.^[14] Studied conducted in hospitals revealed that healthcare staff was frequently using antiseptics ranged from 30-100 times per shift which was quite high compared to our study where staff was using antiseptics 1–4 times per shift.^[15,16] Present study showed that attitude of staff was quite good regarding hand washing. When we assessed for hand hygiene practices, we found that majority of staff were not doing better practices. Whereas a study done by MHJD Ariyaratne *et al.* revealed that only 5.53% workers were performing good practices.^[10] The attitude regarding correct hand hygiene practices should be followed at all times, proper training and orientation infection control programs for improvement of hand hygiene can improve overall attitude of health care staff.^[17]

Out of 300 swabs, 15 swabs (5%) were culture negative as staff had recent hand washing history and it was comparable

Table 3: Knowledge based questions

Knowledge Based Questions	Yes	No
1. Do you have adequate facilities for hand washing in your working area?	126 (84%)	24 (16%)
2. Do you know about importance of hand washing in hospital acquired infections?	135 (90%)	15 (10%)
3. Do you think hand washing with regular soap decrease the germ burden?	72 (48%)	78 (52%)
4. Does wearing gloves reduce the need for hand washing?	61 (41%)	89 (59%)
5. Do you think, you should use antiseptics soap for proper hand washing?	126 (84%)	24 (16%)
6. Do you know about 7 steps of hand washing?	148 (99%)	2 (1%)

Table 4: Attitude Based Questions

Attitude Based Questions	Yes	No
1. Do you feel irritated by washing your hands again and again?	21 (14%)	129 (86%)
2. Do you often simple forget to wash your hands?	21 (14%)	129 (86%)
3. Do you think emergencies and other priorities make hand washing more difficult to manage?	69 (46%)	81 (54%)
4. Do you ensure correct hand washing at all times?	120 (80%)	30 (20%)
5. Do you feel bad when often other staff omit hand hygiene?	136 (91%)	14 (9%)

Table 5: Practice Based Questions

Practice Based Questions	Yes	No
1. Do you wash your hands before wearing the gloves?	43 (29%)	107 (71%)
2. Do you ensure effective hand washing by using antiseptic soap followed by hand sanitizer?	129 (86%)	21 (14%)
3. Do you follow the proper 7 steps of hand washing?	77 (51%)	73 (49%)
4. Do you prefer alcohol based hand rub over antiseptic soap on unsoiled hands?	75 (50%)	75 (50%)
5. Were you being instructed properly about hand hygiene in your training and orientation?	43 (29%)	107 (71%)
6. Do you maintain hand hygiene before and after physically handling the patients?	72 (48%)	78 (52%)
7. Do you maintain hand hygiene only before physically handling the patients?	0	150 (100%)
8. Do infection prevention team and their activities always remind you to maintain hand hygiene?	58 (39%)	92 (61%)
9. Are you right handed or left handed?	140 (93%) R	10 (7%) L

Table 6: Microorganisms isolates from dominant hands of nursing staff

S. No.	Isolates	Right Hand	Left Hand	Total (%)
1.	MSSA	15	7	22 (4.14%)
2.	MRSA	9	8	17 (3.20%)
3.	Coagulase Negative <i>Staphylococcus</i>	80	110	190 (35.78%)
4.	<i>Micrococcus</i>	45	47	92 (17.32%)
5.	<i>Streptococcus</i> species	06	06	12 (2.25%)
6.	<i>Enterococcus</i> species	00	03	03 (0.56%)
7.	Diphtheroids	21	18	39 (7.34%)
8.	<i>Bacillus</i> species	28	35	63 (11.86%)
9.	<i>Pseudomonas aeruginosa</i>	07	05	12 (2.25%)
10.	<i>Acinetobacter</i> species	34	26	60 (11.29%)
11.	Other Non-fermenters	03	03	06 (1.12%)
12.	<i>Escherichia coli</i>	01	00	01 (0.18%)
13.	<i>Citrobacter</i> species	01	00	01 (0.18%)
14.	<i>Proteus mirabilis</i>	00	01	01 (0.18%)
15.	<i>Candida</i> species	06	06	12 (2.25%)
	No Growth	06	09	15
	Total number of isolates	256	275	531

Table 7: Antibiotic Susceptibility Pattern of *Staphylococcus aureus*.

Antibiotic	Sensitive %	Resistant %
Erythromycin	46	54
Clindamycin	50	50
Ciprofloxacin	42	58
Trimethoprim/Sulfamethoxazole	31	69
Linezolid	100	00

to a study done by Fahriye Eksi *et al.*^[18] CONS were the most predominant isolate among all isolates accounting for 35.78%. On other hand Mathavi Sureshkumar *et al.*^[19] reported Diphtheroids (47%) as most dominant isolate. In our study occurrence of *Staphylococcus aureus* (7.34%) were less compared to other studies as Veena Maheshwari *et al.*^[17] reported 36.14% and Asim Sarfraz *et al.*^[20] reported 33% occurrence of *Staphylococcus aureus* out of all isolates. Our study revealed that 44% strains of *S. aureus* were MRSA, almost same result was documented by R Kapil *et al.*^[21] with 45% occurrence of MRSA. In contrast to present finding, Ranweer *et al.*^[22] reported the lower occurrence of MRSA (7%). Linezolid (100%) was found to be most effective antibiotic among all tested, Veena Maheshwari *et al.*^[17] and Williams JV *et al.*^[23] also stated the same results whereas other antibiotics were showing little higher resistance. Growth from *Enterobacteriaceae* family found to be very less in our study.

Conclusion

Nursing staff is one of important domain of primary care physicians as they play crucial role in infection control. Our study concluded that knowledge, attitude, and practice about hand washing in our nursing staff were found to be moderate. Load

of *Staphylococcus aureus* was comparatively less on staff's hand as staffs were following adequate hand hygiene practices. It was very important to know the current status about hand hygiene so that we can overcome those deficiencies by conducting more training programs regarding improvement of hand hygiene. Continuous teaching and monitoring of staff regarding hand hygiene practices will encourage them to follow correct hand hygiene practices.

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Conflicts of interest

There are no conflicts of interest.

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