

Knowledge of hand hygiene in undergraduate medical, dental, and nursing students: A cross-sectional survey

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ABSTRACT

Background: Hand hygiene is of paramount importance for the prevention of healthcare associated infections and the spread of antimicrobial resistance. There is a need to explore the concept of hand hygiene among the cross-disciplinary undergraduate healthcare students. **Aim:** To evaluate and compare the knowledge of hand hygiene among medical, dental, and nursing undergraduate students. **Materials and Methods:** A cross-sectional survey was conducted among 84 medical, 74 dental, and 40 nursing undergraduate students in a Tertiary Care Teaching Institute in Navi Mumbai, Maharashtra, India. Knowledge was assessed using the World Health Organization hand hygiene questionnaire. The scores for each were calculated and compared. The scores were further graded as low, moderate, and good. **Results:** Overall, only 7.5% of the participants had good knowledge regarding hand hygiene while majority (69.1%) had moderate knowledge. Medical students' hand hygiene knowledge was significantly ($P < 0.01$) higher than that of dental and nursing students. **Conclusion:** The overall low scores on hand hygiene knowledge indicate that undergraduate healthcare students require increased emphasis on hand hygiene education, behavior, and improvement in their current primary training as well as undergraduate curricula.

Keywords: Dental, hand hygiene, medical, nursing, undergraduate

Introduction

Healthcare-associated infections (HAIs) are of major concern when it comes to patient safety.^[1] Hand hygiene remains the primary measure to reduce HCAI and the spread of antimicrobial resistance across all settings, from advanced healthcare systems to local dispensaries in developing countries.^[1,2]

Studies have shown that the compliance among healthcare workers is low, despite the relative simplicity of hand hygiene procedure.^[2-5] Several barriers to compliance to hand hygiene have also been identified.^[6]

The risk of HCAI can be reduced by creating awareness, providing proper hand hygiene education, and training.^[1,6]

The World Health Organization (WHO) has introduced an evidence-based concept and guidelines on hand hygiene in healthcare to improve understanding, training, monitoring, and reporting of hand hygiene among healthcare workers.^[1] This concept and guidelines have been extensively used in the training of professional health workers but is rarely exploited in the undergraduate curriculum.

Several authors have reported that the knowledge, attitude, and observance of hand hygiene by the undergraduate healthcare students is poor.^[7-14] Cross-disciplinary studies are limited and mainly focused on the comparison between medical and nursing students.^[7-9] There is a need to explore the concept of hand hygiene among the cross-disciplinary healthcare undergraduate students, in India. It is imperative to inculcate the knowledge and good attitudes regarding hand hygiene at the time of primary education of healthcare workers. Therefore, the present study was conducted to assess and compare the knowledge of hand hygiene among medical, dental, and nursing undergraduate

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students during their primary training at a Tertiary Care Teaching Institute in Navi Mumbai, Maharashtra, India.

Materials and Methods

This was a cross-sectional, observational, and questionnaire-based survey conducted among medical, dental, and nursing undergraduate students studying in a Tertiary Care Teaching Institute in Navi Mumbai, Maharashtra, India. The study was conducted in the months of January and February 2015. The study protocol was approved by the Institutional Ethics Committee and written informed consent was obtained from all the participants.

Undergraduate students studying in the 2nd year of medical, dental, and nursing were approached to participate as they were in the interim phase of early clinical exposure. We excluded the undergraduate students unwilling to participate or give informed consent, interns, postgraduate residents, and staff faculty. The participants were explained the purpose of the study and were requested to complete and return the survey questionnaire immediately.

The hand hygiene knowledge questionnaire

The questionnaire used in this study assessed the knowledge domain of hand hygiene. To assess knowledge, we used WHO's hand hygiene questionnaire for healthcare workers.^[15] It comprised of 25 questions; each correct answer was given one point, and an incorrect answer was given zero. The answers to these questions were multiple choices/"yes" or "no" options.

The maximum score obtainable for knowledge was 25. The scores were calculated and expressed in percentage. An overall score of more than 75% was considered good, 50–74% moderate, and <50% was taken as poor.

Statistical method

The study data was analyzed on the Statistical Package for the Social Sciences version 17 (SPSS Inc., Chicago, IL, USA). The data was expressed in terms of the actual number, mean, median, and percentages. The characteristic of distribution was tested with Kolmogorov–Smirnov test. The data obtained was nonparametric, hence, the Krushal–Wallis test and Mann–Whitney U-test were used to compare between the groups. $P < 0.05$ was considered as statistically significant.

Results

Of 210 undergraduate students approached, 198 participated in this survey. The response rate of this study was 94.28%. Of these, 84 were medical, 74 were dental, and 40 were nursing students. In the present study, 95% (38 out of 40) of nursing student had claimed to have received formal training in hand washing while only 14.2% (12 out of 84) medical and 14.8% (11 out of 74) dental students had received formal training.

Hand hygiene knowledge

The participants' hand hygiene knowledge has been summarized in Table 1. Overall, <50% undergraduate students (medical 46.4%, dental 48.6%, and nursing 37.5%) knew that unhygienic hands of healthcare workers were the main route of transmission of potential harmful germs and <35% students (medical 23.1%, dental 36.4%, and nursing 25%) were aware that the main source of germs in HCAI was from patients. Only, a few undergraduate students (medical 40.4%, dental 37.8%, and nursing 32.5%) knew that 20 s is the minimum time required for effective alcohol-based hand rub as per the WHO guideline.

The study documented poor knowledge regarding the correct type of hand hygiene method to be used in certain situations e.g., before the palpation of the abdomen, before giving an injection, and after making the patients bed [Table 1].

Level of hand hygiene knowledge

The knowledge on hand hygiene was moderate (69.19%, 137 of 198) among the total study participants. Only 7.59% of participants (15 of 198) had good knowledge regarding hand hygiene. Medical students had better hand hygiene knowledge in comparison to dental and nursing students [Table 2].

Comparison of hand hygiene knowledge scores

There was a statistically significant difference in the knowledge score between the three groups ($P < 0.001$). The difference in knowledge score among the medical students with dental and nursing students was statistically significant, however, between dental and nursing students the difference was not statistically significant [Table 3].

Discussion

The present study evaluated the knowledge regarding hand hygiene in multidisciplinary undergraduate healthcare students, including medical, dental, and nursing. The overall scores of hand hygiene were low.

Effective hand hygiene is deemed to be the most important factor in controlling the spread of infections.^[16] Hand washing should become an educational priority.^[16] To improve hand hygiene, efforts have been made by International Health Agencies such as the WHO and Centers for Disease Control and Prevention. They have come up with evidence-based concepts and guidelines on hand hygiene in healthcare settings.^[1,6]

The present study focuses on the knowledge of hand hygiene in undergraduate medical, dental, and nursing students who are involved in patient healthcare and are exposed to the environment of infection most of the time. Thus, the prevention of cross infection is a critical aspect in them.

It is important to identify and address the gaps in the knowledge of hand hygiene for future training sessions. In this study, we

Table 1: Hand hygiene knowledge in medical, dental, and nursing students on each question

Knowledge statements (correct responses)	Medical=84 (n) %	Dental=74 (n) %	Nursing=40 (n) %
Which of the following is the main route of the transmission of potentially harmful germs between the patients (healthcare workers hands when not clean)	(39) 46.43	(36) 48.65	(15) 37.5
What is the most frequent source of germs responsible for healthcare associated infections? (germs already present on or within the patient)	(20) 23.81	(27) 36.49	(10) 25
Hand hygiene actions that prevent the transmission of germs to the patient?			
Before touching a patient (yes)	(65) 77.38	(59) 79.73	(32) 80
Immediately, after the risk of body fluid exposure (yes)	(63) 75	(55) 74.32	(30) 75
After exposure to immediate surroundings of the patient (no)	(23) 27.38	(20) 27.03	(16) 40
Immediately, before the clean/aseptic procedure (yes)	(67) 79.76	(51) 68.92	(34) 85
Which of the following hand hygiene actions prevents the transmission of germs to the healthcare worker?			
After touching a patient (yes)	(65) 77.38	(47) 63.51	(34) 85
Immediately, after the risk of body fluid exposure (yes)	(65) 77.38	(57) 77.03	(31) 77.5
Immediately, before the clean/aseptic procedure (no)	(32) 38.10	(23) 31.08	(18) 45
After exposure to the immediate surroundings of the patient (yes)	(61) 72.62	(53) 71.62	(26) 65
Which of the following statements on alcohol-based hand rub and hand washing with soap and water are true?			
Hand rubbing is more rapid for hand cleansing than hand washing (true)	(54) 64.29	(44) 59.46	(26) 65
Hand rubbing causes skin dryness more than hand washing (false)	(50) 59.52	(31) 41.89	(11) 27.5
Hand rubbing is more effective against germs than hand washing (false)	(56) 66.67	(41) 55.41	(9) 22.5
Hand washing and hand rubbing are recommended to be performed in sequence (false)	(21) 25	(13) 17.57	(10) 25
What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? (20 s)	(34) 40.48	(28) 37.84	(13) 32.5
Which type of hand hygiene method is required in the following situations?			
Before palpation of the abdomen (rubbing)	(59) 70.24	(27) 36.49	(9) 22.5
Before giving an injection (rubbing)	(25) 29.76	(32) 43.24	(10) 25
After emptying a bed pan (washing)	(66) 78.57	(50) 67.57	(25) 62.5
After removing the examination gloves (rubbing/washing)	(84) 100	(72) 97.30	(38) 95
After making the patients bed (rubbing)	(26) 30.95	(17) 22.97	(9) 22.5
After visible the exposure to blood (washing)	(65) 77.38	(45) 60.81	(14) 35
Which of the following should be avoided, as associated with increased likelihood of colonization of hands with harmful germs?			
Wearing jewelry (yes)	(44) 52.38	(33) 44.59	(29) 72.5
Damaged skin (yes)	(80) 95.24	(70) 94.59	(36) 90
Artificial fingernails (yes)	(70) 83.33	(61) 82.43	(34) 85.5
Regular use of the hand cream (no)	(59) 70.24	(51) 68.92	(24) 60

Table 2: Level of the knowledge of hand hygiene

Hand hygiene knowledge	Total students (n=198) (n) %	Medical (n=84) (n) %	Dental (n=74) (n) %	Nursing (n=40) (n) %
Low	(46) 23.23	(13) 15.47	(19) 25.67	(14) 35
Moderate	(137) 69.19	(61) 72.61	(52) 70.27	(24) 60
Good	(15) 7.58	(10) 11.90	(3) 4.05	(2) 5

Table 3: Comparison of hand hygiene knowledge score between the groups

Hand hygiene domain	Medical (n=84)	Dental (n=74)	Nursing (n=40)	P	Medical versus dental	Medical versus nursing	Nursing versus dental
Knowledge score							
Median (IQR)	16 (14, 18)	15 (12, 16)	13 (12, 15)	<0.001*	Z=-2.77, P=0.006†	Z=-3.62, P<0.001†	Z=-1.82, P=0.068†
Mean±SD	15.39±3.13	14.09±3.08	13.57±2.47				

*Kruskal-Wallis test; †Mann-Whitney U-test. SD: Standard deviation; IQR: Inter quartile range

documented a poor knowledge level with regard to the sources and transmission of germs, and appropriate actions/type of hand hygiene methods used in all the three groups. Majority of the undergraduate students were unaware that unhygienic hands of healthcare workers was the main route of germ transmission in a healthcare setting and the frequent source of germs responsible

for HCAs was from patients. Less than 40% of the participants in each group knew that 20 s was the minimum time required for effective alcohol-based hand rub as per the WHO hand hygiene^[1] guideline. The study documented an unsatisfactory level of knowledge regarding the correct type of hand hygiene method to use in certain situations (e.g, before palpation of the

abdomen, before giving an injection, and after making a patients bed) and appropriate use of hand rub and hand washing. These findings are similar to studies documented by Nair *et al.*,^[7] and Ariyaratne *et al.*^[9]

In this study, we found that the knowledge of hand hygiene in medical students was significantly higher than that of dental ($P = 0.006$) as well as nursing students ($P < 0.001$).

Nair *et al.*,^[7] van de Mortel *et al.*,^[8] and Ariyaratne *et al.*,^[9] have documented that the nursing students had better hand hygiene knowledge than medical students which is different from our findings. Undergraduate medical students have community medicine as a subject in their early course of study, and this could probably be the reason why the medical students had significantly higher knowledge in our study.

Nair *et al.*,^[7] studied knowledge, attitude, and practices of hand hygiene using a similar questionnaire, between the medical and nursing students in Raichpur (India). They documented that only 9% of participants had good knowledge regarding hand hygiene. Nursing students knowledge ($P = 0.023$) and attitude ($P = 0.023$) were significantly better than medical students. Similarly, van de Mortel *et al.*,^[8] compared the knowledge, beliefs, and practices of hand hygiene between the nursing and medical students. They found that the nursing students had significantly higher knowledge and practices than medical students. Ariyaratne *et al.*,^[9] also identified that the medical and nursing students had unsatisfactory knowledge regarding the source, transmission of germs, the hand hygiene methods, and the type to use in certain clinical situations.^[9]

Individual studies focused on dental students have identified a poor knowledge, low attitude, and behavior towards hand hygiene and infection control.^[12,17,18] However, there exists a paucity in the literature on head to head comparison studies of dental students with medical and nursing students with regard to the hand hygiene. To the best of our knowledge, this is the first study where a multidisciplinary comparison was conducted in the undergraduate students which included dental students as well.

The findings of this study suggest that formal training in hand hygiene needs to be inculcated at the undergraduate level. A formal hand hygiene education can have a positive influence on the attitude and practice of undergraduate students. It is important that undergraduate students or professionals working in the healthcare sector maintain good hand hygiene because they are directly involved in primary patient care. To improve hand hygiene among the undergraduate students, there should be increased emphasis on hand hygiene education, behavior, and the implementation of hand hygiene training modules.

Limitation of the study: This study was conducted in a single institute setup. It was a cross-sectional survey conducted with a limited sample size. A self-reporting questionnaire was used for assessment, and thus, likely to be affected by bias (recall and

self-observation). Further multicentric studies and qualitative assessments are warranted to identify the potential gaps in hand hygiene among the undergraduate healthcare students.

Conclusion

The overall low scores and unsatisfactory hand hygiene knowledge responses indicate that the undergraduate healthcare students require increased emphasis on hand hygiene education and improvement in their current primary training as well as undergraduate curricula.

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Conflicts of interest

There are no conflicts of interest.

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