



Knowledge of hand cleanliness among medical students and nurses at tertiary healthcare centre: a cross-sectional study

Abstract

Background: Hand hygiene is documented as one of the foremost techniques to prevent cross-transmission of germs. **Objectives:** This paper aims to assess the knowledge of hand cleanliness among medical students and working nurses. **Methods:** It was a cross-sectional descriptive study, carried over a sample selected by non-probability convenient sampling technique. The questionnaire used here to assess the knowledge and practice on hand hygiene was adapted from the World Health Organization (WHO) Guidelines on Hand Hygiene in Health Care. The data thus collected were presented in terms of counts and percentages. Chi-square test was used to test the significance of the differences, and a p-value of less than 0.05 was considered as statistically significant. **Results:** Overall, 92.08% of participants have received training in handwashing. Twenty-five (41.60%) medical students believed that the microbes already present with the patient were responsible for hospital-acquired infection (HAI). Medical students had significantly higher knowledge than working nurses regarding dryness of skin due to hand rubbing over handwashing ($p < 0.05$). Medical students also had substantially higher awareness about the performance of handwashing and hand rubbing in sequence ($p < 0.05$), which they think was not right. Knowledge on the colonisation of hands with harmful microbes was more with the nurses. **Conclusion:** There is a need to increase awareness among medical students and nurses regarding procedural hand hygiene methods to prevent HAI. The current findings can be a basis for conducting a training programme on hand hygiene practices for the medical students, including paramedical staff members.

Keywords: Hospital-Acquired Infection. Cross Infections. Paramedical Staff. Hand Hygiene Actions.

**Bandana Mahanta¹, DK Das²,
Pollov Borah³, Putul Mahanta⁴,
Malamoni Dutta⁵**

¹Department of Anaesthesiology, Tezpur Medical College and Hospital, Tezpur, Assam, India, ²Department of Microbiology (Regional Institute of Ophthalmology [RIO]), Gauhati Medical College and Hospital, Guwahati, Assam, India, ³Department of Anaesthesiology, Jorhat Medical College and Hospital, Jorhat, Assam, India, ⁴Department of Forensic Medicine and Toxicology, Assam Medical College and Hospital, Dibrugarh, Assam, India, ⁵Department of Anatomy, Assam Medical College and Hospital, Dibrugarh, Assam, India

Correspondence: Prof. (Dr.) Putul Mahanta, 1, Karmabir Bordoloi Path, Rukmini Nagar, Assam Sashivalaya, Dispur, Kamrup (Metro), Assam, India. Pin: 781006. drpmahanta@gmail.com

Received: 19 May 2020
Revised: 31 August 2020
Accepted: 31 August 2020
Epub: 7 September 2020

INTRODUCTION

Infection caused due to hospital-acquired microbes is an evolving problem worldwide, and horizontal transmission of bacterial organisms continues to generate a high nosocomial infection rate in healthcare settings. Nosocomial infections due to poor hand hygiene are a significant cause of increased morbidity, mortality, and healthcare costs among hospitalised patients worldwide.[1]

The high prevalence of these infections, as high as 19% in developing countries, poses a challenge to healthcare providers.[2] Hand hygiene of medical professionals can be considered as one of the single most cost-effective public health measures for preventing hospital-acquired infection (HAI)[3] and is one of the essential methods suggested to avoid the spread of the coronavirus disease 2019 (COVID-19).[4]

Even if the World Health Organization (WHO) has issued guidelines for procedural hand wash to reduce the

prevalence of HAI, lack of acquaintance amongst healthcare workers is associated with poor compliance.[5] Despite the relative simplicity of this procedure, compliance with hand hygiene among healthcare providers is as low as 40%.[6]

Therefore, through this paper, the authors aim to assess the level of knowledge and practices of hand hygiene action among medical students and working nurses.

MATERIALS AND METHODS

This study is a cross-sectional descriptive survey carried out over 60 MBBS students and 40 working nurses from March 2018 to March 2019 at Tezpur Medical College Hospital, Tezpur, Assam, India. Before collection of the data, informed consent was taken. The questionnaire used here to assess the knowledge and practice on hand hygiene was adapted from the WHO Guidelines on Hand Hygiene in Health Care.[5]

The data thus collected were presented in terms of counts and percentages. Chi-square test was used to test the

significance of the differences, and a 'p' value of less than 0.05 was considered as statistically significant. Data were analysed by SPSS software version 18. From the ethics committee (H) permission was taken before the collection of the data.

RESULTS

In the present study, 92.08% had claimed to have received training in handwashing. The result showed that 55 (91.67%) medical students and 37 (92.50%) nurses had received the training in handwashing. According to a data analysis report, 45 (75.00%) medical students and 30 (75.00%) nurses knew about hand hygiene. Table 1 narrates the knowledge of the facts on the source of microorganisms responsible for HAI.

The facts on the hand hygiene actions that prevent transmission of microorganisms to the patient among the medical students and nurses are narrated in Figure 1. A majority (97.5%) of nurses agree to take that transmission of germs can be prevented if action is taken before touching a patient.

The current findings unveiled that nurses had a slightly higher knowledge level than the medical students regarding hand hygiene actions that prevent the transmission of microorganisms to the healthcare employees working in the healthcare institutes. This is shown in Table 2 which are not found to be statistically significant.

Details of knowledge on alcohol-based hand rubbing and handwashing with soap and water as a means to prevent HAI have been narrated in Table 3. Medical students had significantly higher knowledge than nurses regarding the dryness of skin due to hand rubbing over handwashing (p<0.05). Also, a significant number of medical students do not agree with the handwashing and hand rubbing methods to be performed in sequence (p<0.05) to be true.

Comparison of knowledge of medical students and nurses on different methods of hand hygiene are shown in Table 4. No significant difference was observed between the understanding of medical students and nurses on hand hygiene methods, except for 'hand rubbing after making a patient's bed' which was significantly more (p<0.05) among medical students (31.67%) as compared to nurses (12.50%).

Nurses showed significantly better knowledge than medical students in the fact that wearing jewellery could increase the likelihood of colonisation of hands with harmful microbes (p<0.05). The analysis of data also reveals, 38 (95.00%) nurses and 47 (78.33%) medical students agreed to these findings. However, regarding the knowledge of damaged skin, artificial fingernails, and regular use of hand cream, no difference was observed between the medical students and nurses (Table 5).

DISCUSSION

In the present study, 92.08% knew about the importance of handwashing which was almost similar to some recent studies.[7,8] According to the present result, 75.00% of participants of both groups reflect the knowledge of hand hygiene which was in agreement of a review.[7] However, another study[9] reported a moderate (58%) level of knowledge with an average (56%) practice of it contradicting the current results.

Microbes already present with the patient are believed to be one of the causes of HAI by 25 (41.6%) medical students and 11 (27.5%) nurses. Not surprisingly, about 20% of all nosocomial infections occur in the intensive care unit (ICU) as revealed by some recent studies,[10,11] support the current findings.

Table 1: Knowledge of the origin of microbes causing HAI

Responses	Subjects		p-value
	Medical students (n=60)	Nurses (n=40)	
Microbes already present on or within the patient is the common source responsible for HAI- Yes?	25 (41.60%)	11 (27.50%)	0.148

HAI: Hospital-Acquired Infection

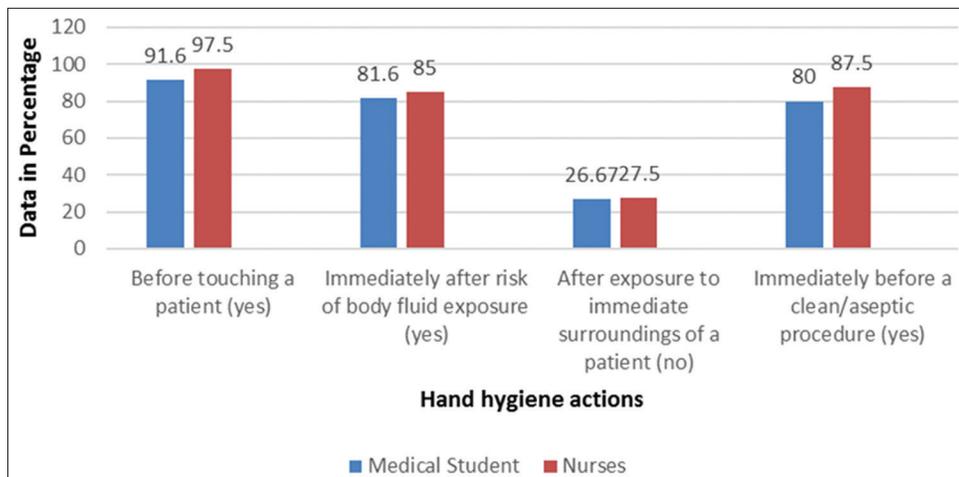


Figure 1: Hand hygiene actions preventing the transmission of germs to the patient (data are shown in %).

Table 2: Hand hygiene actions preventing the transmission of germs to the healthcare worker

Responses	Subjects		p-value
	Medical students (n=60)	Nurses (n=40)	
After touching a patient? Yes	57 (95.00%)	39 (97.50%)	0.648
Immediately after a risky body fluid exposure? Yes	52 (86.67%)	36 (90.00%)	0.758
Immediately before an aseptic procedure? No	27 (45.00%)	25 (62.50%)	0.086
After exposure to immediate surroundings of a patient? Yes	42 (70.00%)	33 (82.50%)	0.157

Table 3: Knowledge of alcohol-based hand rub and handwashing with soap

Responses on the statement: Which of the following statements on alcohol-based hand rub and handwashing with soap and water is true?	Subjects		p-value
	Medical students (n=60)	Nurses (n=40)	
Is hand rubbing more rapid for hand cleansing than handwashing? (True)	42 (70.00%)	31 (77.50%)	0.408
Does hand rubbing cause skin dryness more than handwashing? (False)	22 (36.67%)	7 (17.50%)	0.039
Is hand rubbing more effective against microbes than handwashing? (False)	27 (45.00%)	14 (35.00%)	0.319
Are handwashing and hand rubbing recommended to be performed in sequence? (False)	28 (46.67%)	10 (25.00%)	0.029
Is 30 seconds the minimal time needed for alcohol-based hand rubbing to kill most germs on your hands? (True)	23 (38.33%)	11 (27.50%)	0.263

Table 4: Comparison of knowledge in medical students and nurses on hand hygiene method

Responses on the statement: What type of hand hygiene method is required in the following circumstances?	Subjects		p-value
	Medical students (n=60)	Nurses (n=40)	
Before palpation of the abdomen- (Rubbing)	16 (26.67%)	15 (37.50%)	0.088
Before giving an injection- (Rubbing)	15 (25.00%)	13 (32.50%)	0.413
After emptying a bedpan- (Washing with soap and water)	40 (66.67%)	32 (80.00%)	0.146
After removing examination gloves- (Rub/washing)	40 (66.67%)	31 (77.50%)	0.242
After making a patient's bed- (Rubbing)	19 (31.67%)	5 (12.50%)	0.028
After visible exposure to blood- (Washing with soap and water)	28 (46.67%)	23 (57.50%)	0.288

Table 5: Knowledge on the colonisation of hands with harmful microbes

Responses	Subjects		p-value
	Medical students (n=60)	Nurses (n=40)	
Increased likelihood of colonisation of hands with harmful microbes is caused by:			
Wearing jewellery- Yes	47 (78.33%)	38 (95.00%)	0.022
Damaged skin- Yes	57 (95.00%)	37 (92.50%)	0.932
Artificial fingernails- Yes	48 (80.00%)	36 (90.00%)	0.181
Regular use of hand cream- No	33 (55.00%)	27 (67.50%)	0.211

In the current study, 97.5% of nurses said yes to appropriate hand hygiene action before touching a patient for preventing HAI. They believe hands are the most common vehicle for transmission of organisms, and hand hygiene is the single most effective means, as suggested by WHO.[5]

Regarding knowledge on alcohol-based hand rub and handwashing with soap and water, a better response was received from the medical students. The WHO Guidelines[5] also mentioned washing of hands with soap and water. The same report suggested handwashing if soiled or visibly dirty with blood or other body fluids and to use an alcohol-based hand rub, e.g. 0.5% chlorhexidine with 70% w/v ethanol if hands are not visibly dirty.

Here in the current study, 23 (38.33%) medical students and 11 (27.50%) nurses agreed that 30 seconds is the minimal time needed for alcohol-based hand rub to kill most germs on the hands which are in agreement with a study[12] where they suggested optimal duration of handwashing to be 30-60 seconds. The fact that 30 seconds of hand rubbing with alcohol-based gel, seems sufficient is also agreed by other recent studies.[13,14]

According to the data, 55% of medical students and 65% of nurses in the current study agree that hand rubbing is better than handwashing to reduce bacterial contamination which is in agreement of a recent study,[14] and this insignificant differences between handwashing method compared to

hand rub in the current study are also seconded by a review report.[15]

Hand rubbing is a useful measure of hand hygiene, preferred if taken before palpation of the abdomen, before giving an injection, and after making a patient's bed by 16 (26.67%), 15 (25.00%), and 19 (31.67%) medical students, respectively. Alcohol-based hand rub was not inferior in terms of reduction of bacterial counts, as compared to the conventional WHO's six-step technique supports the current results.[16]

In the present study, 40 (66.67%) medical students and 32 (80.00%) nurses believe handwashing with soap and water after emptying a bedpan is an effective measure to prevent the transmission of microbes. The present findings contradict the results that hand rubbing with an alcohol-based gel is more effective than handwashing with either antiseptic soap or non-antiseptic soap in reducing bacterial contamination of volunteers' hands.[12]

In a study conducted in Southern Rajasthan, India, [17] compliance to hand hygiene practice was 33.33% before and 43.33% after patient contact whereas another research[18] undertaken in a teaching hospital in Port Harcourt, Nigeria showed 51.2% washed hands after handling the patient. In contrast to this, the present study observed that before palpation of the abdomen and pushing an injection, rubbing as a hand hygiene method was accepted by 32.08% and 28.75% of participants respectively while others deny. Similarly, after emptying a bedpan, removing examination gloves, and after visible exposure to blood, handwashing as a method was accepted by the majority (73.33%, 72.08%, and 52.08%) of participants respectively in the current study tallied with a similar survey.[19]

According to the analysis report, 38 (95.00%) and 36 (90.00%) nurses believe wearing jewellery and artificial fingernails respectively like that of 57 (95.00%) medical students for damaged skin could increase the likelihood of colonisation of hands with harmful microbes. It has been found that the skin under rings may be more heavily colonised with microorganisms than the rest of the hand and it may also increase the risk of glove tears. Jewellery may prevent proper washing of the skin, which may not appropriately dry up following handwashing if worn around the wrist. Moreover, chipped nail polish or nail polish worn for more than four days has been shown to foster the presence of microorganisms which resist removal, as revealed in a study,[20] supported the fact of the current results.

Limitations

The present study was undertaken with 100 participants. It could have been possible to get significant results with a larger sample covering all the medical colleges of Assam which was not done in this study.

Conclusion

The present findings demonstrate that medical students are still lagging in the knowledge of hand hygiene in comparison to working nurses. The results may call for necessary training or conducting of educational programme on hand

hygiene and practice of it which, in turn, will reduce the incidence of HAI, and associated mortality and morbidity in hospitals.

AUTHOR CONTRIBUTIONS

BM conceived the content, retrieved the data, wrote the manuscript, and approved the final version. DKD extracted the data, wrote the paper, and approved the final version. PB and MD retrieved the data, wrote the manuscript, and approved the final version. PM conceived the content, helped in data extraction, revised the manuscript critically, and approved the final version.

REFERENCES

1. Maheshwari V, Kaore NC, Ramnani VK, Gupta SK, Borle A, Kaushal R. A study to assess knowledge and attitude regarding hand hygiene amongst residents and nursing staff in a tertiary health care setting of Bhopal city. *J Clin Diagn Res.* 2014;8:DC04-7.
2. World Health Organization. The burden of health care-associated infection worldwide: a summary [Internet]. 2010 Apr 30 [cited 2020 Apr 13]. Available from: https://www.who.int/gpsc/country_work/summary_20100430_en.pdf
3. Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa-Silva CL, Donaldson L, et al.; WHO Global Patient Safety Challenge, World Alliance for Patient Safety. Evidence-based model for hand transmission during patient care and the role of improved practices. *Lancet Infect Dis.* 2006;6:641-52.
4. World Health Organization. Coronavirus disease (COVID-19) advice for the public [Internet]. 2020 Apr 1 [cited 2020 April 13]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
5. World Health Organization. WHO guidelines on hand hygiene in health care [Internet]. 2009 [cited 2020 Apr 13]. Available from: http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf
6. Longtin Y, Sax H, Allegranzi B, Schneider F, Pittet D. Videos in clinical medicine. Hand hygiene. *N Engl J Med.* 2011;364:e24.
7. Nair SS, Hanumantappa R, Hiremath SG, Siraj MA, Raghunath P. Knowledge, attitude, and practice of hand hygiene among medical and nursing students at a tertiary health care centre in Raichur, India. *ISRN Prev Med.* 2014;2014:608927.
8. Birks M, Coyle M, Porter J, Mills J. Perceptions of hand hygiene amongst health care workers in Sibul, East Malaysia. *Int J Infect Control.* 2011;8:10-3.
9. Lalrindiki K, Shinde MB, Zagade T, VR M. Knowledge and practices regarding advanced patient care among staff nurses working in a tertiary care hospital. *Int J Sci Res.* 2015;4:590-5.
10. Habboush Y, Guzman N. Infection control [Internet]. Treasure Island, FL: StatPearls Publishing; 2020 Jan [cited 2020 Jun 20]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK519017/>
11. Martin-Loeches I, Rodriguez AH, Torres A. New guidelines for hospital-acquired pneumonia/ventilator-associated pneumonia: USA vs. Europe. *Curr Opin Crit Care.* 2018;24:347-52.
12. Alsagher MR, Soudah SA, Khsheba AE, Fadel SM, Dadiesh MA, Houme MA, et al. Handwashing before and after applying different hand hygiene techniques in places of public concern in Tripoli-Libya. *Open Microbiol J.* 2020;14:364-75.
13. Lund S, Jackson J, Leggett J, Hales L, Dworkin R, Gilbert D. Reality of glove use and handwashing in a community hospital. *Am J Infect Control.* 1994;22:352-7.
14. Girou E, Loyeau S, Legrand P, Oppein F, Brun-Buisson C. Efficacy of handrubbing with alcohol based solution versus standard handwashing with antiseptic soap: randomised clinical trial. *BMJ.* 2002;325:362.
15. Nasution TA, Yunita R, Pasaribu AP, Ardinata FM. Effectiveness hand washing and hand rub method in reducing total bacteria colony from nurses in Medan. *Open Access Maced J Med Sci.* 2019;7:3380-3.

16. Tschudin-Sutter S, Sepulcri D, Dangel M, Ulrich A, Frei R, Widmer AF. Simplifying the World Health Organization protocol: 3 steps versus 6 steps for performance of hand hygiene in a cluster-randomized trial. *Clin Infect Dis*. 2019;69:614-20.
17. Meghwal SC, Sharma S, Galav A, Jain M. Hand washing facilities and adherence to hand hygiene practices in a tertiary care centre in Southern Rajasthan. *J Res Med Dent Sci*. 2015;3:119-21.
18. Alex-Hart BA, Opara PI. Handwashing practices amongst health workers in a teaching hospital. *Am J Infect Dis*. 2011;7:8-15.
19. Amisshah I, Salia S, Craymah JP. A study to access hand hygiene knowledge and practices among health care workers in a teaching hospital in Ghana. *Int J Sci Res*. 2016;5:301-7.
20. Cimon K, Featherstone R. Jewellery and nail polish worn by

health care workers and the risk of infection transmission: a review of clinical evidence and guidelines [Internet]. Ottawa, ON: Canadian Agency for Drugs and Technologies in Health; 2017 Mar 3 [cited 2020 April 13]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK487444>

Mahanta B, Das DK, Borah P, Mahanta P, Dutta M. Knowledge of hand cleanliness among medical students and nurses at tertiary healthcare centre: a cross-sectional study. *Open J Psychiatry Allied Sci*. 2020 Sep 7. [Epub ahead of print]

Source of support: Nil. **Declaration of interest:** None.