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Assessing the impact of hand hygiene training on medical students' knowledge: A study in a tertiary care hospital in West Bengal.

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Abstract

Background: Healthcare-associated infections (HAIs) continue to pose significant challenges to patient safety and healthcare systems worldwide. Poor hand hygiene among healthcare professionals remains a major contributing factor to the spread of HAIs. Despite its importance, hand hygiene compliance among healthcare workers, including medical students, remains low. Training programs to improve hand hygiene knowledge and compliance have been implemented globally. This study aimed to assess the impact of a hand hygiene training program on medical students at Burdwan Medical College & Hospital in West Bengal.

Methodology: A cross-sectional study was conducted involving 122 Professional MBBS students who were selected through purposive sampling. Written informed consent was obtained from each participant. The students' baseline hand hygiene knowledge was assessed using the WHO questionnaire before providing hand hygiene training. Post-training, the same questionnaire was used to evaluate the level of knowledge acquired. The data were analyzed using the student t-test to determine the statistical significance of the training program.

Results: The mean pre-test score was 11.24±5.29, while the mean post-test score significantly increased to 17.34±5.4 ($p<0.001$, 95% CI). This finding indicates a substantial improvement in hand hygiene knowledge among medical students after undergoing the training program.

Conclusion: Regular and frequent training programs on hand hygiene, accompanied by monitoring and timely feedback, are crucial for increasing awareness and compliance among medical students. It is essential for medical colleges to establish an Infection Prevention and Control Committee to organize and oversee such training initiatives, which play a pivotal role in mitigating the risk of HAIs.

Keywords

Hand Hygiene, Healthcare-Associated Infections, Medical Students, Training, Infection Prevention.

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Introduction

Healthcare-associated infections (HAIs) pose a significant global health challenge, affecting millions of individuals each year and leading to severe illnesses, prolonged hospital stays, and increased financial burden on healthcare systems. In underdeveloped nations, the incidence of such infections can be alarmingly high, reaching up to 19 percent[1]. The rise of multi-drug resistant infections and the limited availability of new antibiotics further emphasize the need to strengthen infection control and prevention measures in healthcare settings[2]. Hand hygiene is a well-established and easily implementable approach to reduce HAIs, combat antimicrobial resistance, and enhance patient safety[3]. However, promoting effective hand hygiene practices can be challenging, especially in resource-constrained settings with cultural variations that impact healthcare practices[1].

Healthcare workers (HCWs) play a critical role in transmitting virulent, multi-drug resistant infections through their contaminated hands, making HAIs preventable with proper hand washing[4]. Unfortunately, compliance with hand hygiene protocols among HCWs remains suboptimal, with up to 40% not practicing proper hand hygiene[5-7]. The World Health Organization (WHO) has recommended hand-washing techniques to minimize HAIs, but low compliance is often attributed to HCWs' lack of knowledge[8-10]. To address this issue, the WHO introduced the "My five moments for hand hygiene" concept, providing a scientific foundation and improving hand hygiene practices[11].

Interactive training programs and the availability of hand sanitizers have shown to significantly increase compliance with hand hygiene standards among HCWs[12,13]. A single session on fundamental hand hygiene techniques can lead to notable improvements[12,14]. Trampuz et al. emphasized importance of conducting simple training workshop in every ward of a hospital by demonstrating and explaining hand rubbing and hand washing[14]. In light of this context, our study aimed to assess the knowledge gaps and the impact of training on the awareness of hygiene among medical students at Burdwan Medical College & Hospital, West Bengal. Understanding the factors influencing hand hygiene knowledge and compliance among future healthcare professionals can contribute to enhancing infection control practices and ultimately improving patient outcomes.

The objective of this study was to evaluate the effectiveness of a training program in improving the knowledge and understanding of hand hygiene among professional MBBS candidates (4th semester) at Burdwan Medical College. The study aimed to assess the participants' baseline knowledge of hand hygiene through a pre-test, implement a structured training program, and then measure the knowledge gained by the participants through a post-test.

Methodology

Study Design

This quasi-experimental research was conducted in September 2022 at Burdwan Medical College in Purba Bardhaman, West Bengal, in accordance with the Helsinki Declaration.

Ethical Approval

The institutional ethics committee granted ethical approval for the study under the reference number BMC/1272 dated 6th June 2018.

Participants

The study included 122 Professional MBBS candidates (4th semester) who were selected using a purposive sampling method. Written informed consent was obtained from all participants.

Assessment Tool

The "Hand Hygiene Knowledge Questionnaires for Health-Care Workers" designed by the World Health Organization (WHO) were utilized to assess the participants' level of knowledge before and after the training.

Training Sessions

The training sessions were conducted to increase the participants' awareness and improve their hand

hygiene skills. The sessions included one lecture and six hands-on workshops, with each workshop accommodating 20 students. The training spanned over one month and was organized in the general lecture theatre and Microbiology practical room.

Pre-Test and Training

Prior to the training, a pre-test was conducted to assess the baseline knowledge of the participants. The students were then educated about the significance and moments of hand hygiene, and they were provided with demonstrations of adequate hand hygiene methods.

Post-Test and Evaluation

After the training program, the participants' knowledge gained during the training was assessed through a post-test using the same pre-validated questionnaire.

Data Analysis

Data management and analysis were performed using Microsoft Excel 2010. The pre- and post-test results were compared using the student t-test to determine significance, with a p-value of ≤0.05 considered as statistically significant.

Results

The study included 122 Professional MBBS candidates (4th semester) who received hand hygiene instruction, and their average pre-test score was 11.24±5.29. Following the training, the average post-test score significantly improved to 17.34±5.4 (P<0.01), indicating a notable increase in knowledge.

Table 1 presents a detailed comparison of knowledge regarding hand hygiene practices before and after training. Prior to the training, only 26.2% of participants reported receiving formal training in hand hygiene in the last three years, which remarkably increased to 100% after the training. The use of alcohol-based hand rub for hand hygiene showed an increase from 87.7% to 94.3% (P=0.07).

The study also assessed participants' understanding of the main route of cross-transmission of harmful germs between patients in a healthcare facility, which improved significantly from 70.5% to 93.4% (P<0.01). Similarly, knowledge about the most frequent source of germs responsible for healthcare-associated infections increased from 36.1% to 54.9% (P<0.01).

Regarding hand hygiene actions to prevent transmission of germs to patients and healthcare workers, there were substantial improvements in participants' knowledge. For instance, the understanding of performing hand hygiene before touching a patient increased from 88.5% to 95.1% (P=0.06), and immediately before a clean/aseptic procedure improved from 75.4% to 92.6% (P<0.01).

Table 2 provides a summary of the mean pre-test and post-test scores. The pre-test score averaged at 11.24 with a standard deviation (SD) of 5.29, while the post-test score significantly increased to 17.34 with an SD of 5.4 (P<0.01).

Table 1: Comparison of Hand Hygiene Knowledge in MBBS Students before and after Training using the WHO Questionnaire (N=122).

Questions	Before training n(%)	After training n(%)	p-value
Did you receive formal training in hand hygiene in the last three years?	32(26.2)	122(100)	<0.01*
Do you routinely use an alcohol-based hand rub for hand hygiene?	107(87.7)	115(94.3)	0.07

Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? (Health care workers' hands when not clean)		86(70.5)	114(93.4)	<0.01*
What is the most frequent source of germs responsible for health care associated infections? (Germs already present on or within the patient)		44(36.1)	67(54.9)	<0.01*
Which of the following hand hygiene actions prevents transmission of germs to the patient?	Before touching a patient (yes)	108(88.5)	116(95.1)	0.06*
	Immediately after risk of body fluid exposure (no)	65(53.3)	90(73.8)	<0.01*
	After exposure to the immediate surroundings of a patient (no)	79(64.8)	107(87.7)	<0.01*
	Immediately before a clean/aseptic procedure (yes)	92(75.4)	113(92.6)	<0.01*
Which of the following hand hygiene actions prevents transmission of germs to the health-care worker?	After touching a patient (yes)	110(90.2)	115(94.3)	0.23
	Immediately after a risk of body fluid exposure (yes)	98(80.3)	114(93.4)	<0.01*
	Immediately before a clean/aseptic procedure (no)	74(60.7)	101(82.8)	<0.01*
	After exposure to the immediate surroundings of a patient (yes)	100(82)	113(92.6)	0.01*
Which of the following statements on alcohol-based hand rub and handwashing with soap and water are true?	Hand rubbing is more rapid for hand cleansing than hand washing (true)	94(77)	110(90.2)	<0.01*
	Hand rubbing causes skin dryness more than hand washing (false)	55(45.1)	61(50)	0.44
	Hand rubbing is more effective against germs than hand washing (true)	37(30.3)	97(79.5)	<0.01*
	Hand washing and hand rubbing are recommended to be performed in sequence (false)	84(68.9)	92(75.4)	0.25
What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? (20 seconds)		110(90.2)	117(95.9)	0.08
Which type of hand hygiene method is required in the following situations?	Before palpation of the abdomen (rubbing)	73(59.8)	115(94.3)	<0.01*
	Before giving an injection (rubbing)	78(63.9)	111(91)	<0.01*
	After emptying a bed pan (washing)	112(91.8)	105(86.1)	0.15
	After removing examination gloves (rubbing)	47 (38.5)	104(85.2)	<0.01*
	After removing examination gloves (washing)	82(67.2)	94(77.5)	0.07
	After removing examination gloves (both)	25(20.5)	79(64.8)	<0.01*
	After making a patient's bed (rubbing)	58(47.5)	73(59.8)	0.05*
	After visible exposure to blood (washing)	112(91.8)	120(98.4)	0.01*
Which of the following should	Wearing jewelry (yes)	86(70.5)	110(90.2)	<0.01*

be avoided, as associated with increased likelihood of colonization of hands with Harmful germs?	Damaged skin (yes)	97(79.5)	90(73.8)	0.29
	Artificial fingernails (yes)	86(70.5)	117(95.9)	<0.01*
	Regular use of a hand cream (no)	104(85.2)	113(92.6)	0.06*

*P<0.05 is considered statistically significant.

Table 2: Comparison of pre-test and post-test hand hygiene knowledge scores (n=122).

	Mean	SD	Mean S.E.	p-value
Pre-Test Score	11.24	5.29	0.48	<0.01*
Post Test Score	17.34	5.4	0.49	

*P<0.05 is considered statistically significant.

Discussion

The findings of this study undeniably highlight the significant impact of hand hygiene training on medical students, as demonstrated by a considerable increase in knowledge among those who participated in the training program.

In our study, we observed that a relatively low percentage (26.2%) of medical candidates had received formal instruction in hand hygiene during the previous three years. This finding aligns with previous research by Glad Mohesh et al.[15], while Nair et al. reported a higher percentage (79%) of participants with formal hand hygiene training, and Kamble et al. found an even higher percentage (85.4%) of respondents with formal training on hand hygiene[16,17]. Therefore, it is evident that there is room for improvement, and the hand hygiene training program in our institute should be conducted more frequently to ensure all medical students receive proper instruction.

Our study demonstrated a significant improvement in knowledge scores, with a mean pre-test score of 11.24±5.29, increasing to 17.34±5.4 in the post-test after training. The difference between pre- and post-test scores was statistically significant (P<0.00001), indicating a knowledge increase of 54.27%. These results are in line with another study conducted in south India, which revealed an improvement in knowledge scores from 9.35±1.57 to 11.94±1.77 post-training, with an average improvement of approximately 27.7% (p<0.001)[18]. Such findings reaffirm the crucial role of training in enhancing awareness of hand hygiene among medical students.

Rykkje et al. emphasized the importance of hand hygiene education and the use of alcohol-based hand rubs as the most effective method to decontaminate hands and reduce healthcare-associated infections[13]. Medical students need to be well-versed in these practices during their educational programs to understand the risks of handling patients and the potential for infection transmission. Similarly, Ahuja et al. found a substantial increase in knowledge after training, and Chandak et al. emphasized the significance of regular training workshops and sessions to reduce nosocomial infections and improve patient care[19,20].

Furthermore, Sjoberg et al. demonstrated that basic hygiene lectures positively influenced knowledge and attitudes among healthcare staff, leading to a significant increase in hand sanitizer usage for hand hygiene[12]. Such interventions can result in lasting changes in behavior, with increased compliance observed even months after the training[12]. Our study's findings corroborate these outcomes and emphasize the need for regular and frequent training programs on hand hygiene to sustain increased knowledge levels among medical students.

Nevertheless, this study has certain limitations. The evaluation of knowledge gained regarding hand hygiene alone may not provide a comprehensive picture; assessing hand hygiene attitude, practice,

and compliance would complement the findings. Additionally, a longitudinal study with observation-based assessment would have strengthened the conclusions. Expanding the study population to include all healthcare workers in the facility would offer a more comprehensive understanding of hand hygiene practices within the healthcare setting.

Limitations

The study design limits the ability to establish a cause-and-effect relationship between the training and knowledge improvement. A longitudinal study would have provided more robust evidence of the training's lasting impact. The study focused solely on assessing knowledge improvement following the training. Additional aspects, such as attitudes, compliance, and actual hand hygiene practices, were not evaluated. The study was conducted in a single medical college, which may limit the generalizability of the findings to other healthcare settings. The study used purposive sampling, which may introduce selection bias. A more randomized sampling approach could reduce the potential for bias.

Conclusion

In conclusion, this study demonstrates the significant positive impact of hand hygiene training on the knowledge of medical students regarding proper hand hygiene practices. The findings indicate that a well-structured training program can effectively increase awareness and understanding of hand hygiene principles among medical students. By improving their knowledge, medical students are better equipped to handle patients and prevent healthcare-associated infections, contributing to safer and more effective patient care.

Recommendation

It is crucial to conduct regular and frequent hand hygiene training programs for medical students. These training sessions should be integrated into the medical curriculum to ensure all students receive proper instruction on hand hygiene practices. Future studies should expand their assessments beyond knowledge and include the evaluation of hand hygiene attitudes and practices among medical students. Understanding their attitudes and behavior towards hand hygiene will provide a more comprehensive picture of their adherence to proper hand hygiene protocols. To gain a holistic understanding of hand hygiene practices within the healthcare setting, future studies should include all categories of healthcare workers, beyond medical students alone.

Conflicts of Interest

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

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