

ASSESSING KNOWLEDGE OF HAND HYGIENE AMONG CBME AND NON-CBME MEDICAL UNDERGRADUATES: A QUESTIONNAIRE-BASED SURVEY

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ABSTRACT

Objective: The objective of the study is to evaluate the knowledge of hand hygiene among CBME and non-CBME medical undergraduates.

Methods: A descriptive cross-sectional questionnaire-based study was carried out among 390 medical undergraduate students of CBME (1st, 2nd, and 3rd year) and non-CBME batches (4th year and interns). The data collection tool containing 25 close-ended questions from WHO's "Hand Hygiene Knowledge Questionnaire for Health-Care Workers" was circulated to the participants as Google forms. Each correct response was given a score of "1" and each wrong response was given a score of "0". Based on the total score obtained, the knowledge level of hand hygiene of each participant was categorized into good, moderate, or poor. Data were analyzed using OpenEpi software.

Results: A total of 390 medical students including interns participated in this study, of which 222 (57%) were from the CBME batch and 168 (43%) were from the non-CBME batch. Of the 25 questions, >75% of the participants responded correctly to 13 questions. Statistical significance ($p < 0.05$) was observed with 5 questions in which the non-CBME students had better knowledge than CBME students. However, most of the participants ($n=288$) had a moderate level (73.85%) of knowledge of hand hygiene.

Conclusion: The knowledge gap about hand hygiene could lead to avoidance of regular usage of hand rub and poor compliance with it. Hence, it is important to address it during training sessions to ensure better hand hygiene practices.

Keywords: Hand hygiene, Knowledge, Medical students, Questionnaire.

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INTRODUCTION

At critical moments, a low-cost infection prevention and control intervention is hand hygiene [1]. Unclean hands of the health-care workers are a major source of Health-care associated infections (HCAI) [2]. It can lead to higher rates of morbidity and mortality, prolonged hospital stays, increase cost of healthcare, and escalate antimicrobial resistance rates [3]. Hence, the students must have good knowledge about hand hygiene for their own as well as patients' safety.

The WHO has provided guidelines and an evidence-based concept of "My five moments for hand hygiene" defining the critical moments for hand hygiene [2,3]. Despite being a cornerstone in infection prevention and control practices, knowledge and compliance with hand hygiene are unsatisfactory, especially among medical students [4,5]. Knowledge about hand hygiene is essential to ensure good hand hygiene practices [6].

This study aims to assess the baseline knowledge of hand hygiene among medical undergraduate students of CBME and non-CBME batches. Thereby, this study would provide feedback on the learning outcome concerning knowledge of hand hygiene of medical undergraduate students.

METHODS

Design

This is a descriptive cross-sectional questionnaire-based study, carried out in May 2022, after obtaining clearance from the Institute Ethical Committee, Indira Gandhi Medical College and Research Institute (No 368/IEC-33/IGMC&RI/PP-2/2022), by the Department of Microbiology, (IGMC and RI), a government tertiary care medical college in Puducherry with an average of 150 students in each academic year.

Study population

This study included medical undergraduate students in 1st, 2nd, 3rd, and 4th academic years and interns of our institute, who are aged ≥ 18 years and consented to participate in the study. Incomplete or duplicate responses and responses that were submitted past the due time were excluded from the study.

Data collection tool

The data collection tool of the study contains two parts, (a) details of the participants such as age and sex and (b) questions from the WHO's questionnaire titled "Hand Hygiene Knowledge Questionnaire for Health-Care Workers" [7] which consists of 25 close-ended questions for assessing the participants' knowledge.

Study procedure

The questionnaire along with the participant information sheet and consent form circulated to the participants as Google forms on a single day and subsequently receiving of responses was closed at 2 hours. The responses were collected and tabulated into MS Excel version 2010. For the 25 questions, each correct response was given a score of "1" and each wrong response was given a score of "0". Based on the total score obtained, the knowledge level of hand hygiene of each participant was categorized into good (score of $>75\%$, i.e., ≥ 19 marks), moderate (score of $50-75\%$, i.e., $13-18$ marks) or poor (score of $<50\%$, i.e., ≤ 12 marks).

Statistical analysis

Data analysis was performed using OpenEpi software. The categorical data were expressed as proportions and continuous data as mean \pm standard deviation. The Chi-square test was employed and a $p < 0.05$ was considered statistically significant.

RESULTS

A total of 390 medical students and interns participated in this study, of which, 244 (62.6%) are female and 146 (37.4%) are male. The mean age of the participants is 20.6±1.5 years. Of the 390 participants, 222 (57%) are from the CBME batch, which includes the 1st, 2nd, and 3rd academic years, and 168 (43%) are from the non-CBME batch, which includes the 4th academic year and internship (Fig. 1).

Overall, 364 (93.33%) out of the 390 participants, have received formal training in hand hygiene and 313 (80.26%) have been using alcohol-based hand rub for hand hygiene routinely. The responses of the study participants of both CBME and non-CBME batches, to each question, are given in Table 1.

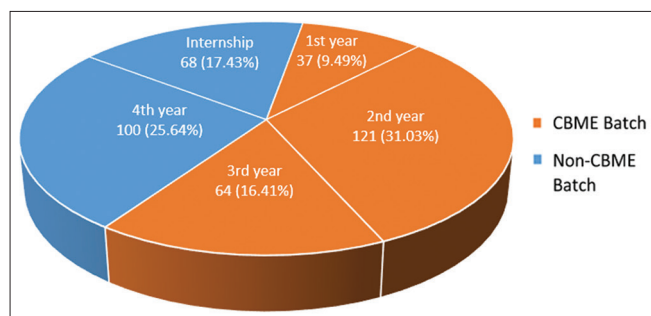


Fig. 1: Distribution of participants across the academic years (n=390)

The mean score of the study participants is 16.5±2.6. Out of the 390 participants, 288 (73.85%) have a moderate level of knowledge of hand hygiene, of which, a majority (n=175) of the students are from the CBME batch (Table 2), with a statistically significant p=0.01.

DISCUSSION

In this study, 93.33% of the participants have received formal training in hand hygiene at least once in their course, while only 70.8% and 64.2% of the participants had received formal training in hand hygiene in the studies done by Gore *et al.* and Bakarman *et al.* [5,8]. The higher percentage observed in our study may be due to hand hygiene awareness programs conducted in our institute, periodically. Of the 390 participants, 80.26% preferred to use alcohol-based hand rubs for hand hygiene routinely while in the study done by Chakiri *et al.*, [9] 71.2% of the participants preferred it.

The majority of participants (67.4%) in our study, have correct knowledge that unclean hands of the HCWs are the main route of cross-transmission of potentially harmful germs between patients in a health-care facility, which is higher compared to 53.4% and 48.63% of the participants, who correctly responded in the studies done by Nawab *et al.* and Mohesh *et al.* [10,11], respectively.

Only 28% of the participants of our study have been aware that the most frequent source of germs responsible for HCAI, is the germs already present on or within the patients, which is similar to the studies done by Bakarman *et al.* and Kamble *et al.*, [8,12] but less compared to the observation by Nair *et al.*, [4] where 41.5% of the participants possessed correct knowledge. The lack of such knowledge could lead to missed opportunities to perform hand hygiene.

Table 1: Percentage of correct responses to each question on hand hygiene knowledge

Question	CBME batch n=222 (%)	Non-CBME Batch n=168 (%)	Total n=390 (%)	p-value
In a healthcare facility, the main route of cross-transmission of potentially harmful germs between patients (Answer: Healthcare workers' hands when not clean)	135 (60.8)	128 (76.2)	263 (67.4)	0.0013
The most frequent source of germs responsible for healthcare-associated infections (Answer: Germs already present on or within the patient)	60 (27)	49 (29.2)	109 (28)	NS
The hand hygiene actions that prevent transmission of germs to the patient				
Before touching a patient (Answer: Yes)	210 (94.6)	160 (95.2)	370 (94.9)	NS
Immediately after a risk of body fluid exposure (Answer: No)	45 (20.3)	36 (21.4)	81 (20.8)	NS
After exposure to the patient's immediate surroundings (Answer: No)	50 (22.5)	42 (25)	92 (23.6)	NS
Immediately before an aseptic/clean procedure (Answer: Yes)	201 (90.5)	154 (91.7)	355 (91)	NS
The hand hygiene actions that prevent transmission of germs to the healthcare worker				
After touching a patient (Answer: Yes)	200 (90.1)	158 (94)	358 (91.8)	NS
Immediately after a risk of body fluid exposure (Answer: Yes)	203 (91.4)	163 (97)	366 (93.9)	0.0231
Immediately before an aseptic/clean procedure (Answer: No)	42 (18.9)	59 (35.1)	101 (25.9)	0.0003
After exposure to the patient's immediate surroundings (Answer: Yes)	198 (89.2)	155 (92.3)	353 (90.5)	NS
Pertaining to alcohol-based hand rub and hand washing with soap and water, which of the following statements are true?				
Hand rubbing is more rapid for hand cleansing than hand washing (Answer: True)	184 (82.9)	138 (82.1)	322 (82.6)	NS
Skin dryness is caused more by hand rubbing than hand washing (Answer: False)	59 (26.6)	52 (31)	111 (28.5)	NS
Hand rubbing is more effective against germs than hand washing (Answer: True)	66 (29.7)	50 (29.8)	116 (29.7)	NS
Hand washing should be followed by hand rubbing (Answer: False)	88 (39.6)	75 (44.6)	163 (41.8)	NS
In case of alcohol-based hand rub, the minimal time required to kill most germs on your hands (Answer: 20 seconds)	142 (64)	96 (57.1)	238 (61)	NS
The type of hand hygiene method required in the following situations				
Before palpation of the abdomen (Answer: Rubbing)	164 (73.9)	131 (78)	295 (75.6)	NS
Before giving an injection (Answer: Rubbing)	158 (71.2)	106 (63.1)	264 (67.7)	NS
After emptying a bedpan (Answer: Washing)	165 (74.3)	140 (83.3)	305 (78.2)	0.0329
After removing the examination gloves (Answer: Rubbing/ Washing)	218 (98.2)	163 (97)	381 (97.7)	NA
After making a patient's bed (Answer: Rubbing)	98 (44.1)	67 (39.9)	165 (42.3)	NS
After visible exposure to blood (Answer: Washing)	176 (79.3)	149 (88.7)	325 (83.3)	0.0135
Likelihood of colonization of hands with harmful germs is increased with which factors?				
Wearing jewellery (Answer: Yes)	174 (78.4)	139 (82.7)	313 (80.3)	NS
Damaged skin (Answer: Yes)	214 (96.4)	163 (97)	377 (96.7)	NS
Artificial fingernails (Answer: Yes)	197 (88.7)	154 (91.7)	351 (90)	NS
Regular use of hand cream (Answer: No)	139 (62.6)	108 (64.3)	247 (63.3)	NS

NS: Not significant, NA: Not applicable

Table 2: Knowledge level on hand hygiene of students of CBME and Non-CBME batch

Knowledge level	CBME batch n=222 (%)	Non-CBME batch n=168 (%)	Total n=390 (%)
Good	33 (14.86)	45 (26.79)	78 (20)
Moderate	175 (78.83)	113 (67.26)	288 (73.85)
Poor	14 (6.31)	10 (5.95)	24 (6.15)

More than 90% of the participants have acknowledged that performing hand hygiene before touching a patient and immediately before a clean/aseptic procedure prevents the transmission of germs to the patient. Furthermore, >90% of the participants also agreed that performing hand hygiene after touching the patient or the patient's surroundings and after the risk of body fluid exposure prevents the transmission of germs to the health-care worker. These observations are similar to the observations by Gore *et al.* and Josh and Valsan [5,13].

In this study, 20.8%, 23.6%, and 25.9% of the participants have correct knowledge regarding the prevention of transmission of germs to the patient by performing hand hygiene immediately after the risk of body fluid exposure and after exposure to the immediate surroundings of a patient, and the prevention of transmission of germs to healthcare workers by performing hand hygiene immediately before a clean/aseptic procedure, respectively. This is similar to a study done by Mukerjee *et al.*, [14] where 24.21%, 44.21%, and 25.26% of their participants responded correctly to these questions, respectively.

While assessing the knowledge on advantages of using an alcohol-based hand rub over hand washing with soap and water, 82.6% of the participants have known that using hand rub is more rapid for hand cleansing than hand washing and 61% of the participants have known that 20 s is the minimal time needed for alcohol-based hand rub to kill most germs. These observations, while being higher than the observations by Nair *et al.*, [4] are comparable to the study done by Chakiri *et al.*, [9] where 79.2% and 69.8% of the participants agreed that hand rubs are more rapid and require only 20 s to kill most germs, respectively.

Less than one-third of the participants, in this study, responded correctly that using hand rub will not cause more skin dryness than handwashing, and also it is more effective against germs than handwashing (28.5% and 29.7%, respectively), which are lower than the studies by Nawab *et al.* and Thakker and Jadhav [10,15]. This knowledge gap is concerning, as it could lead to avoidance of regular usage of hand rub, thereby, poor compliance with hand hygiene.

In the studies done by Modi *et al.* and Arthi *et al.*, [16,17] 31.4% and 22.7% of the participants responded that handwashing and hand rubbing need not be done sequentially. While, in our study, 41.8% of the participants agreed that handwashing and hand rubbing are not recommended to be performed in sequence. Washing hands with soap and water immediately before or after using an alcohol-based hand rub may lead to dermatitis, thereby leading to increased chances of colonization of hands with pathogens [18].

On examining the knowledge of our participants on the preferred method of hand hygiene in certain situations, 75.6% and 67.7% of them agreed to use a hand rub before palpation of the abdomen and before giving an injection. The majority of the participants (97.7%) acknowledged that after removing examination gloves either hand rubbing or hand washing should be done. Less than half (42.3%) of the participants responded correctly that hand rub should be used after making a patient's bed. These observations are similar to the findings of Bakarman *et al.* [8] and higher than that of the study done by Mukerjee *et al.* [14]. Most of the participants pointed out that hand washing with soap and water should be done after emptying a bedpan (78.2%) and after visible exposure to blood (83.3%), which is higher than that of the study done by Arthi *et al.* [17].

Many participants agreed that wearing jewelry, the presence of damage to the skin, and wearing artificial fingernails (80.3%, 96.7%, and 90%, respectively) are associated with the increased likelihood of colonization of hands with harmful germs. These observations are higher than that of the studies by Jose and Valsan, Kamble *et al.* [12,13]. In our study, 63.3% of the participants are aware of the fact that regular use of hand cream will not increase the risk of colonization of hands with germs, which is similar to the finding by Goyal *et al.*, [19] but lower than that of the studies by Thakker and Jadhav, Arthi *et al.* [15,17].

In our study, out of the 390 participants, a majority (73.85%) had a moderate level, while 20% had a good level and 6.15% had a poor level of knowledge of hand hygiene. These observations are better than that of the study done by Modi *et al.*, [16] where 80.9%, 12.2%, and 6.9% of the participants had moderate, good, and poor levels of knowledge, respectively. This is in contrast to the study done by Chakiri *et al.*, [9] where 58.5%, 39.2%, and 2.4% of the participants had moderate, good, and poor levels of knowledge, respectively.

We also compared the non-CBME batch students along with the CBME batch students about the knowledge domain of hand hygiene. To the best of our knowledge, this is the first study where a comparative analysis was done among the CBME and non-CBME undergraduate medical students. Statistical significance ($p < 0.05$) was observed with the following questions, (i) the main route of cross-transmission of potentially harmful germs between patients in a healthcare facility ($p = 0.0013$), (ii) prevention of transmission of germs to health-care workers by performing hand hygiene immediately after the risk of body fluid exposure ($p = 0.0231$), (iii) the prevention of transmission of germs to health-care workers by performing hand hygiene immediately before a clean/aseptic procedure ($p = 0.0003$), (iv) the type of hand hygiene method required after emptying a bedpan ($p = 0.0329$), and (v) the type of hand hygiene method required after visible exposure to blood ($p = 0.0135$). In all these questions, the non-CBME batch students performed better than the CBME batch students. Furthermore, the non-CBME batch students had a good level of knowledge compared to the CBME batch students with a statistically significant $p = 0.01$. This increased level of knowledge among the non-CBME batch students could be due to handling the patients and performing hand hygiene techniques frequently during the final year and internship.

Although the overall knowledge of our medical undergraduates on hand hygiene is satisfactory, they still lack in certain areas, indicating room for improvement. Hence, it is important to address these identified knowledge gaps during subsequent training sessions to ensure better hand hygiene practices.

CONCLUSION

A lack of knowledge about hand hygiene could lead to missed opportunities to perform it. This knowledge gap is concerning, as it could lead to avoidance of regular usage of hand rub and poor compliance with it. If left uncorrected, it would greatly enhance the spread of HCAI. This emphasizes the importance of onsite practice apart from formal training.

AUTHORS' CONTRIBUTIONS

Dr. Ramani Balaraman was involved in the planning, writing, and execution of the study. Dr. Jayavarthinni Manavalan was involved in the planning, writing, and reviewing of the manuscript. Dr. Nandita Banaji was involved in the planning and reviewing of the manuscript.

CONFLICT OF INTEREST

The authors have no known conflicts of interest to declare.

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