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CBME curriculum - Impact on knowledge of hand hygiene among medical students: A cross-sectional study

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Abstract: *Background:* Practice of hand hygiene is an important measure to reduce the incidence of health care associated infections. *Objectives:* The current study was undertaken to assess the knowledge of hand hygiene among the under graduate medical students in different years of the course in our institution who follow CBME curriculum, with the aim to suggest improvements for any gaps and ultimately to improve patient care. *Material & Methods:* This questionnaire based cross sectional study was conducted among the Undergraduate medical students from first, second, third and final years at a tertiary health care centre. Universal sampling was done for selecting the study subjects. Hand hygiene knowledge questionnaire for health-care workers by World Health Organisation (WHO) was used for data collection. The responses were divided into three groups based on the score as good, moderate, and low knowledge. Data was entered in Excel sheet and analyzed by using Epi-info software. *Results:* The response rate for the study was 63%. Majority of the students (69%), have moderate knowledge in hand hygiene, and 27% of them had poor knowledge in hand hygiene. Final year students were better than the previous 3 year students, which showed that when they advance in their medical schooling years, their knowledge improve. Meanwhile, 93% of them had received formal training in hand hygiene within last 3 years and 92% of them routinely use alcohol-based hand rub for hand hygiene. *Conclusion:* It can be seen that as the year advances in their medical schooling, they acquire better knowledge of hand hygiene. Still the importance of repeated training cannot be underestimated, as witnessed from this survey. Even though they had training of hand hygiene, their knowledge percentage has yet to increase. Annual seminars and workshops can be helpful in this aspect. As medical students are the doctors of tomorrow, they should be thorough in the knowledge of hand hygiene.

Keywords: CBME, Hand hygiene, Hand wash, Students.

Introduction

Globally, healthcare-associated infections (HAIs) pose a serious risk to the well-being of both patients and healthcare workers (HCWs) [1]. The World Health Organization (WHO) has provided an overall estimate of about 1.4 million patients affected anytime by health care associated infections [2]. Healthcare worker's hands are a common way for pathogens to spread from one patient to another. Hand hygiene (HH) is therefore regarded as one of the most crucial elements of infection control [3].

HH is a broad term for hand washing practices intended to avoid colonization and infections in the patients, HCWs, as well as healthcare environment colonization. When HH is properly implemented, the risk of infection transmission through healthcare facilities is greatly decreased [1]. The WHO has defined certain guidelines on how to perform hand hygiene. The WHO's evidence-based "My Five Moments for Hand Hygiene" concept is one attempt for reducing the spread of HAIs [4]. Global adherence among HCWs is low, with an average total compliance rate of less than or about 50%, despite the significance of HH practices [5]. Based on the WHO's hand hygiene knowledge questionnaire for healthcare workers [6], a survey was carried out in Gulbarga, Karnataka, in 2015 and was found that the overall understanding of students was moderate [7]. National data from New Zealand in 2013 revealed that medical students seldom followed hand hygiene guidelines [8].

In India, the Competency Based Medical Education was started from 2019, following the guidelines of National Medical Commission. Now hand hygiene is being taught to medical students as part of their curriculum as early as during their foundation course and second year of medical education [9]. With early clinical exposure, they come in contact with health care workers of hospital and patients and learn many skills as the curriculum itself focuses more on skills. Medical students are the future doctors who will be providing care to patients. Therefore, they need to be thorough in their knowledge of hand hygiene. The current study was undertaken to assess the knowledge of hand hygiene among the under graduate medical students in different years of the medical course in our institution who follow CBME curriculum, with the aim to suggest improvements for any gaps and in turn to improve patient care.

Material and Methods

This was a questionnaire-based cross-sectional survey to assess the knowledge of hand hygiene practice among the undergraduate medical students of our tertiary health care centre. The Institutional Ethical Committee Approval was obtained for the conduct of study. All participants had to complete a 25-item self-administered WHO hand hygiene questionnaire for health-care workers [6]. The questionnaire was filled by the respondents in print format. Consent was obtained from all participants and participation was voluntary. Universal sampling method was used for data collection and medical undergraduates from the first year up to the final year were included in the study. Correct answers were given one point whereas incorrect answers scored zero. The maximum score achievable for knowledge was 25 points.

The level of hand hygiene knowledge was calculated by dividing the responses into three groups based on a score of more than 75% as good, 50-74% as moderate, and less than 50% was considered as low. Data was entered in Excel sheet and analyzed by using Epi-info software. Frequencies, Chi-square test etc were used. p value <0.05 was considered as significant.

Results

Out of total 600 students, 378 of them participated in the study. The response rate for the study was 63%. Girls (55.6%) outnumbered boys (44.44%) in volunteering for this study (Table 1). Majority of the participants were from second year (32%), followed by final year (26%), third year (22%) and first year (20%) (Table 2). 93% of them had received formal training in hand hygiene within last 3 years and 92% of them routinely use alcohol-based hand rub for hand hygiene (Table 3).

Table-1: Distribution of gender of study participants

Gender	Number	Percentage
Female	210	55.56
Male	168	44.44
Total	378	100

Table-2: Distribution of participants from different batches

Year	No. of students	Percentage
First year students	76	20.10582
Second year students	121	32.01058
Third year students	85	22.48677
Final year students	96	25.39683
Total	378	100

Table-3: Distribution of Hand hygiene among undergraduate students

Distribution	Number of participants	Percentage
Formal Training in Hand Hygiene		
Received	352	93.12%
Not received	26	6.88%
Routine use of alcohol based hand rub		
Yes	349	92.32
No	29	7.67

Table 4 shows the responses to survey based on hand hygiene knowledge questionnaire for health-care workers by WHO. 47% of the total agreed that health care workers hands when not clean will become the main route of cross transmission of potentially harmful germs between patients in a health care

facility. 42% of them shared the viewpoint that the environment surrounding the hospital is the most frequent source of germs responsible for health care associated infections. Only 30% of the participants were precise in their opinion that the most frequent source of germs are the ones which are already present on or within the patient.

Table-4: Table representing the responses to survey based on hand hygiene knowledge questionnaire for health-care workers by World Health Organisation (WHO)

Parameter		Frequency (Percentage)
1. Main route of cross transmission of potentially harmful germs between patients in a health care facility		
Health care workers hands when not clean		178(47%)
Air circulation in the hospital		43 (11.4%)
Patient's exposure to colonized surfaces		143 (37.8%)
Sharing Non invasive objects		14 (3.7%)
2. Most frequent source of germs responsible for health care associated infections		
Hospitals water system		49 (13%)
Hospital air		59 (16%)
Germs already present on or within the patient		113 (30%)
The hospital environment		157 (42%)
3. Hand hygiene actions that prevent transmission of germs to the patients		
Before touching a patient	Yes	366 (97%)
	No	12 (3%)
Immediately after a risk of body fluid exposure	Yes	347 (91.8%)
	No	31 (8.2%)
After exposure to the immediate surroundings of a patient	Yes	298 (79%)
	No	80 (21%)
Immediately before a clean/aseptic procedure	Yes	302 (80%)
	No	76(20%)
4. Hand hygiene actions that prevent transmission of germs to the health care worker		
After touching a patient	Yes	311 (82%)
	No	67 (18%)
Immediately after a risk of body fluid exposure	Yes	330 (87%)
	No	48 (13%)
Immediately before a clean/aseptic procedure	Yes	314 (84%)
	No	64 (17%)
After exposure to the immediate surroundings of a patient	Yes	327 (86.5%)
	No	51 (13.5%)
5. Hand rubbing is more rapid for hand cleansing than hand washing		
True		348 (92%)
False		30 (8%)
6. Hand rubbing causes skin dryness more than hand washing		
True		284 (75%)
False		94 (25%)
7. Hand rubbing is more effective against germs than hand washing		
True		234 (62%)
False		144 (38%)
8. Hand washing and hand rubbing are recommended to be performed in sequence		
True		296 (78%)
False		82 (22%)

Parameter	Frequency (Percentage)
9. Minimal time required for alcohol based hand rub to kill most germs in your hands	
20 seconds	216 (57%)
3 seconds	21 (5.6%)
1 minute	122 (32%)
10 seconds	19 (5%)
10. Hand hygiene method required before palpation of abdomen	
Rubbing	286 (76%)
Washing	84(22%)
None	8 (2%)
11. Hand hygiene method required before giving an injection	
Rubbing	181 (48%)
Washing	183 (48%)
None	14 (4%)
12. Hand hygiene method required after emptying a bed pan	
Rubbing	124 (33%)
Washing	252 (67%)
None	2(0.5%)
13. Hand hygiene method required after removing examination gloves	
Rubbing	152 (40%)
Washing	222 (59%)
None	4 (1%)
14. Hand hygiene method required after making patient's bed	
Rubbing	157 (41.5%)
Washing	216 (57%)
None	5(1%)
15. Hand hygiene method required after visible exposure to blood	
Rubbing	85 (22.48%)
Washing	290 (76.7%)
None	3 (0.8%)
16. Which of the following should be avoided as associated with increased likelihood of colonisation of hands with harmful germs? A. wearing jewellery	
Yes	276 (73%)
No	102(27%)
17. Which of the following should be avoided as associated with increased likelihood of colonisation of hands with harmful germs? B. Damaged skin	
Yes	320 (85%)
No	58 (15.3%)
18. Which of the following should be avoided as associated with increased likelihood of colonisation of hands with harmful germs? C. Artificial finger nails	
Yes	307 (81%)
No	71 (19%)
19. Which of the following should be avoided as associated with increased likelihood of colonisation of hands with harmful germs? D. Regular use of hand cream	
Yes	198 (52.4%)
No	180 (47.6%)

97% of the respondents admitted that hand hygiene actions before touching a patient will definitely prevent transmission of germs to them meanwhile, 80% of them concurred that hand hygiene immediately before a clean/aseptic procedure will prevent transmission of germs to patient. Regarding the hand hygiene action for the prevention of transmission of germs to health care worker, 82% of the subjects reported that hand hygiene practice after touching a patient will be helpful, 87% agreed that the practise immediately after a risk of body fluid exposure will be useful and 86.5% opined that the practise after exposure to the immediate surroundings of a patient is beneficial.

Majority (92%) of them agreed that hand rubbing is more rapid for hand cleansing than hand washing and 62% of them opined that hand rubbing is more effective against germs than hand washing. Only 25% disagreed that hand rubbing causes skin dryness more than hand washing, and only 22% opposed the opinion that hand washing and hand rubbing are recommended to be performed in sequence.

57% of the students correctly selected 20 seconds as the minimal time required for alcohol-based hand rub to kill most germs in the hands. Hand rubbing was selected as the hand hygiene method required before palpation of abdomen, before giving an injection, after emptying a bed pan and after making patient's bed by 76%, 48%, 33% and 41.5% of the students, respectively. On the other hand, hand-washing was selected as the hand hygiene method to be performed after visible exposure to blood by 76.7% of participants. Wearing jewellery (73%), damaged skin (85%) and artificial finger nails (81%) were selected by majority as situations associated with increased likelihood of colonisation of hands with harmful germs. Only 47.6% of them disagreed that regular use of hand cream would increase the likelihood of colonisation of hands.

Figure-1 represents the distribution of knowledge of hand hygiene among medical students. Majority (68.5%) of the students exhibit moderate knowledge regarding hand hygiene, 27% show poor knowledge and only 4.5% of them have good knowledge regarding hand hygiene. Majority of the final year students have good and moderate knowledge, while majority of the first year students have poor knowledge. The knowledge regarding hand hygiene is found to be increasing with the higher years of the course.

Fig-1: Distribution of knowledge among different phases of MBBS

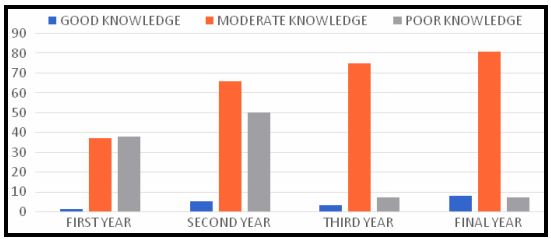

Table 5 shows the association distribution of knowledge of hand hygiene with respect to formal training in hand hygiene received in the past. There was no significant association between formal training in hand hygiene received in past and knowledge of hand hygiene.

Table-5: Knowledge in hand hygiene with respect to formal training in hand hygiene

Formal training in hand hygiene in the last 3 years	Poor knowledge	Moderate knowledge	Good knowledge	χ^2	p-value
Received	91	245	16	3.33	0.0679
Not received	11	14	1		
p-value >0.05 (not significant)					

Discussion

The understanding of hand hygiene practices among medical college students of different years of course, who would soon be providing healthcare in the future, was investigated in this study. Similar to other studies done previously, girls outnumbered boys in the practice of hand hygiene [10-11]. While boys participated more in a study conducted in Saudi Arabia [12].

In our study, majority of the students had already received formal training in hand hygiene within last 3 years and more than 90% of them routinely use alcohol-based hand rub for hand hygiene. Nearly 57% of students did not receive any formal training in hand hygiene and 72% use an alcohol-based hand rub daily, according to the study done among medical students from Mumbai, in 2017 [13]. It is clear that the COVID 19 pandemic has played a major role in creating awareness about hand hygiene among the general population as well as medical professionals [14].

From the survey it is clear that below 50% of the participants have better understanding of the source of potential germs and most common route of cross transmission in hospital. The need for practising hand hygiene is still unknown to majority of the medical students. On the other hand, majority of them had better understanding of the "five moments of hand hygiene" [4]. This was in agreement with the study done by Graf et al., where 67% had awareness about WHO's "Five Moments for Hand Hygiene" [15].

Previously, a UK study done in 2006, found that 58% of medical students were unaware of correct indications for ABHR and half of the students reported a perceived lack of teaching on infection control and hand hygiene during their education [16]. This scenario has undergone a dramatic change in the last few years. The knowledge about when to do hand hygiene is already acquired by most of the medical students, through their second-year curriculum, as well as during their clinical postings. Moreover, the Pandemic module introduced after COVID 19, repeatedly trains the students on hand hygiene and other infection control measures [17].

The knowledge regarding the effectiveness, adverse effects, and usefulness of both hand washing and hand rubbing was found to be varying among the students. There still seems to be some confusion regarding the selection of hand rubbing or hand washing as the required procedure for attaining hand hygiene in various scenarios. Even though they are aware that hand hygiene needs to be performed, the students are of differing opinion in selecting hand wash, hand rub or both. This was similar to the findings from a study conducted in a medical university in Saudi Arabia [18].

More than 50% of them are aware of the contact time required for alcohol-based hand rub. Similar results were observed in a survey conducted in Sri Lanka [19]. Even though majority of them knew that jewellery, damaged skin or artificial finger nails could increase the likelihood of colonization with pathogens, only a minor percentage knew about the effect of hand cream usage and colonization of hands. Almost identical results were obtained for this section in the study done by Liyanage et al [19]. On the contrary, students showed better awareness in this section for all scenarios in the research done by Alotaibi et al [18].

In our study majority of the students showed moderate knowledge regarding hand hygiene, which was similar to the findings from the study conducted in Mumbai (81%) [13], Raichur (74%) [20] and Karad (74%) [5].

On comparing students of different years of medical education, final year students were better than the previous 3 year students which showed that when they advance in their medical schooling years, their knowledge and skills, they gain from different sources like the teachers, books and observing paramedical staff etc improve and thereby their adherence to such hand hygiene practices remains high. This is in agreement with a similar study conducted by G Mohesh and A Dandapani [11]. Moreover, various studies have shown that the behaviour of students is strongly influenced and moulded by their mentor's attitude at the bed side. As training progresses, the role models shift from teachers to senior staff and students are likely to be less cooperative if any of these role models are not practicing proper hand hygiene, which is typical in hospital settings [12, 21-23].

If there is no curriculum set with hand hygiene concepts and skills, students might end up by developing faulty hand hygiene practices [12, 21]. This lacuna in the medical curriculum is now rectified through the introduction of the new Competency Based Medical Education (CBME) curriculum for the medical students by the National Medical Council (NMC), which organizes special training classes or lectures for hand hygiene

practice [17]. The inclusion of regular theoretical education and practical demonstrations on hand hygiene from early on in the curriculum can prime the medical students to these basic health precautions before they take on clinical posts [24].

Conclusion

Hand hygiene is an important practice to prevent transmission of infections. There is better awareness about hand hygiene among the students. It can be seen that as the year advances in their medical schooling they acquire better knowledge of hand hygiene. Still the importance of repeated training cannot be underestimated, as witnessed from this survey. Even though they had training of hand hygiene, their knowledge percentage has yet to increase. Annual seminars and workshops can be helpful in this aspect.

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