Hand hygiene knowledge and practice: a cross-sectional study among medical students in Bahrain

Nawraa Mohamed Mujbel¹*, Nawraa Hamza Mohamed¹, Jamil Ahmed¹, Adel Alsayyad¹

ABSTRACT

Background: Medical Students are a part of the hospital team and can improve the compliance of infection control practices, thus reducing health care-associated infections.

Aims: This study aims to study the knowledge of hand hygiene among medical students at Arabian Gulf University (AGU).

Methods: This cross-sectional study targeted students of both gender from year 1 to year 6 during the academic year 2019-2020 at AGU. World Health Organization questionnaire was adopted and converted to an online version. It was sent to medical students to participate anonymously.

Results: A total of 159 medical students were included; 82 (52.2%) students from basic years (year 1-4) responded to the study versus 76 (47.8%) from clinical years (year 5-6). Both clinical and basic years students have moderate knowledge (>50%) as 17 out of 25 answers (including the clusters) were correct with a percentage of 50% and above.

Conclusion: Although generally there are good knowledge and practice among the medical students in this study, proper curriculum and training sessions should be conducted continuously with performance feedback to ensure proper hand hygiene practices and thus protect both patients and health care workers from acquiring infections in the hospital setting.

Keywords: Hand hygiene, knowledge, practice, medical student, Bahrain.

Introduction

Healthcare-related infections are a major public health issue that has become a burden worldwide. In addition, they are associated with severe complications among healthcare providers and patients [1].

Healthcare workers’ hands can transmit many pathogens, including drug-resistant strains. This issue can be solved simply by hand washing, but it is ignored by most health workers although recommendations are there [2].

As medical students are a part of the hospital team, exposure of clinical medical students to hospitals throughout their clinical rotations can increase the probability of acquiring healthcare-associated infection [3].

Previous studies on medical students in India and Qatar have concluded that the level of Knowledge is moderate in India and inadequate in Qatar among students. Therefore, more programs are needed to increase awareness [4,5]. Additionally, another study mentioned that the knowledge levels of hand hygiene were low in aspects such as healthcare workers’ hands as sources of infection and the minimum time needed to apply hand rubs. In contrast, knowledge levels were high in other aspects, such as indications for using hand hygiene. Also, the authors highlighted the need to strengthen infection prevention practices training as a separate entity in the existing curriculum [6]. Moreover, another group

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of researchers has shown that the students have self-learned the standard precautions of infection control and insufficient training regarding these practices. Therefore, they concluded that hand hygiene knowledge is low, and training is required to protect the students and their patients [7].

At the top of that, a study in Kuwait concluded that a substantial number of medical students in Kuwait university during clinical years appeared to have a poor level of both knowledge and practice of universal precautions and emphasize the necessity to optimize knowledge level and practice to reduce risk of preventable infections [8]. Furthermore, a study conducted in KSA had demonstrated that the student’s knowledge and attitude were low, which indicates the need for educational strategies changes to assure successful implementation of evidence-based practice in Saudi Arabia [9]. Moreover, a study conducted in South Africa concluded that medical students have poor hand hygiene knowledge [10]. At last, research conducted in Saudi Arabia concluded that the students had inadequate knowledge of hand hygiene. Therefore, it is needed to be enriched by well-structured curricular and extra-curricular programs and more positive attitudes by healthcare workers [1].

Several studies done in India, Pakistan, and Saudi Arabia concluded the requisite for improving hand hygiene knowledge and practices [2,3,9,11-14].

In 2006, a study done by Mann and Wood [15] showed that 49% of medical students thought there was insufficient emphasis on infection control in their course. Thus, they concluded in need for a more structured model for the teaching and assessment of infection control. In addition, studies were done in Saudi Arabia and India revealed the need for improvement in educational strategies [9,16].

Kulkarni et al. [6] mentioned that knowledge levels about Hand hygiene were low in the form of healthcare workers’ hands as sources of infection and the minimum time needed to apply hand rubs; on the other hand, knowledge levels were high in the form of indications for using hand hygiene, they concluded they have to strengthen infection prevention practices training as a specific course in the present curriculum.

Despite all of this, few types of research had positive results. Khurana et al. [17] showed that knowledge of students in infection control is satisfactory in Saudi Arabia, and formal curricular teaching is an effective way to increase students’ Knowledge of Standard Precautions and Infection Control. Also, Tavolacci et al. [18] mentioned that the overall score for infection control indicated that instruction was effective. Motamed et al. [19] mentioned good practices regarding handwashing, disposal of needles, gloves, mask, and gown usage.

Bahammam and Linjawi [9] have shown that the student’s knowledge and attitude were low, with no appreciable difference between the two groups (medical and dental students) in Saudi Arabia. Plus, Khurana et al. [17] concluded that no remarkable differences were noticed between the sexes or between colleges in students’ Knowledge of Standard Precautions and Infection Control in Saudi Arabia.

The research in Namibia showed that medical students accomplished better overall scores than nursing students and radiology students [3]. Several types of studies done in India, Italy, and France found that the knowledge of nursing students is better than medical students [18,20,21].

A study done in South Asian medical students presented those senior students (fifth year) had more excellent scores in combined knowledge, attitude, and practice toward hand, attire, and equipment hygiene compared to junior students (third/ fourth years) [22].

Few papers had studied the level of knowledge in respect to gender and sociodemographic data as for Jiulong et al. [3] stated that no appreciable difference in scores between genders or location of the high school being either in a rural or urban setting and only student group was significant as the main effect. Adding to that, a study conducted at Kuwait University agreed that neither the knowledge status nor any of the sociodemographic variables were significantly associated with the practice of universal precautions [8].

On the other side, Jayarajah et al. [22] revealed that female students had exceeded male students in hygiene compliance.

Thus, the aim of this study is to investigate the knowledge of hand hygiene among medical students at Arabian Gulf University (AGU) as they have a vital role in the future health care system and can improve the compliance of infection control practices, thus reducing healthcare-associated infections.

Materials and Methods

This is a cross-sectional study that has been conducted among medical students, including both genders, from year 1 to year 6 during the academic year 2019-2020 in AGU. Postgraduate students in other colleges of the university were excluded. We adopted the World Health Organization questionnaire (Hand Hygiene Knowledge Questionnaire for Health-Care Workers-attached) and eliminate some descriptive information not relevant to our studies, such as faculty, department, and profession. Then, we converted it into an online version using google forms. It was sent to medical students through university whatsup groups to participate in it anonymously.

The questionnaire includes the sociodemographic information of the participant (i.e., gender, age, and medical year), previous training, a group of questions regarding hand-hygiene knowledge in both forms of multiple-choice and yes/no questions. Data were analyzed using SPSS version 23. Categorical variables are presented as frequencies and percentages.

The Chi-Square test tested the correlation between
Hand hygiene knowledge and practice

categorical variables. Statistical significance was set at a
$p$-value less than 0.05.

The study protocol received ethical approval from AGU
(ethical committee). Since the questionnaire is made
online, medical students choose whether to participate
or not. We insured the privacy and confidentiality of all
collected information and did not collect identifying data.

Results

Descriptive data

Out of the total number of AGU students, the response
rate is 7.95%, as 159 enrolled in the study, among which
31 (19.5%) are males, and 128 (80.5%) are females. Most
of the participants are from Bahrain, with a total number
of 82 (51.6%) compared to Kuwait 45 (28.3%), KSA
25 (15.7%), and Oman 7 (4.4%). Eighty-two (52.2%)
students from basic years (year 1-4) responded to the
study versus 76 (47.8%) from clinical years (year 5-6)
(Table 1)

Questionnaire results

A total of 77 (48.4%) had stated that they received formal
training in handwashing in the last 3 years; 40 (52.6%)
students are from clinical years and 37 (44.6%) from
prior years. The majority of the students, 111 (69.8%),
are using alcohol-based hand rub routinely, out of the
61 (80.3%) are from clinical years, and 50 (60.2%) are
from essential years with a $p$-value of 0.006, which is
significant (Figures 1 and 2).

Eighty-eight of the students (55.3%) are aware that
health care workers’ hands, when not clean, are the main
route for the cross-transmission of potentially harmful
germs between the patient in a health care facility. There
was no appreciable difference in this knowledge between
clinical years (57.9%) and prior years (53%).

Thirty-two of the students (20.1%) know that germs
already present on or within the patient are the most
frequent source of germs responsible for the healthcare-
associated infection. There was no considerable
difference in this knowledge between clinical years
(18.4%) and prior years (21.7%).

Ninety-eight of the students appraised that 20 seconds is
the minimal time needed for an alcohol-based hand rub
to kill most germs on your hand. In addition, there was
no notable difference between clinical years (69.7%) and
prior years (54.2%) (Table 2).

The majority of the students showed good awareness
as regards hand hygiene actions that obstruct the
transmission of germs to the patients as follows: before
touching a patient 146 (91.8%), immediately before a
clean/aseptic procedure 136 (85.5%), and immediately
after the risk of body fluid exposure 124 (78%). On the
other hand, only 43 (27%) know that (after exposure
to the immediate surroundings) will not prevent the
transmission of germs to the patient.

Nearly all students showed a good awareness regarding
hand hygiene actions that prevent transmission of germs
to the health care worker as follows: after touching a
patient 149 (93.7%), immediately after the risk of body
fluid exposure 148 (93.1%), and after exposure to the
immediate surroundings of a patient 142 (89.3%). On
the other hand, only 43 (27%) know that (immediately
before a clean/aseptic procedure) will not prevent the
transmission of germs to the health care worker.

When compared between clinical and primary years, no
difference in knowledge was detected (Table 3).

Students have information that hand rubbing is essential
before palpation of the abdomen 54 (34%), before
giving an injection 54 (34%), after making a patient
bed 50 (31.4%), and after removing examination gloves
46 (28.9%). In contrast, students have information that
handwashing is needed after emptying a bedpan 107
(67.3%), after removing examination gloves 96 (60.4%),
and after visible exposure to blood 104 (65.4%).

<p>| Table 1. Demographic characteristics of the participated medical students in AGU. |
|-----------------------------------------------|---------------|-------------|-------------|</p>
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>128</td>
<td>80.5</td>
<td>159</td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahrain</td>
<td>82</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>KSA</td>
<td>25</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>Kuwait</td>
<td>45</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>Oman</td>
<td>7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
<td>83 (52.2%)</td>
</tr>
<tr>
<td>Basic year</td>
<td>Year 1</td>
<td>13</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>Year 2</td>
<td>21</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>Year 3</td>
<td>16</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Year 4</td>
<td>33</td>
<td>20.8</td>
</tr>
<tr>
<td>Clinical</td>
<td>Year 5</td>
<td>31</td>
<td>19.5</td>
</tr>
<tr>
<td></td>
<td>Year 6</td>
<td>45</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>159</td>
</tr>
</tbody>
</table>
Figure 1. Previous formal training in hand hygiene in the last 3 years.

Figure 2. Routine use of alcohol based hand rub for hand hygiene (During the presence in hospitals).
Two cluster questions only showed better knowledge among basics years compared to clinical years students, in which the number of students who answered with the correct method of hand hygiene (before giving an injection) is 34 (41%) out of 54 from basics years and only 20 (26.3%) from clinical years, with a p-value of 0.012 which is significant.

Adding to that, 34 (41%) students from essential years know that rubbing (after making a patient’s bed) is the correct method of hand hygiene compared to only 16 (21.1%) students from clinical years, p-value 0.003 (Table 4).

**Basic versus clinical years**

Our study compared between basics and clinical years, and it showed the followings; no remarkable difference in methods preventing the spread of germs among both patients and health care workers between basics and clinical years except that clinical years (90.8%) know more than hand hygiene (immediately before a clean/aseptic procedure) will prevent the transmission of germs to the patient compared to basics years (80.7%), p-value 0.071 (Table 3).

When asked to choose the proper method of hand hygiene in different clinical situations, it showed no crucial difference in knowledge unless when asking about (before palpation of the abdomen) in which 42.2% of essential years answered it correctly compared to only 25% of clinical years with a p-value of (0.07), on the other hand, clinical years (69.7%) know that (after emptying a bedpan), washing is the optimal method. In comparison, only 65.1% of essential years got it right, a p-value of (0.094) (Table 4).

**Discussion**

One hundred fifty-nine respondents were enrolled in the study, 83 of them are in basics years, and 76 are in clinical years. Our results showed that both clinical and basic years students have moderate knowledge (>50%) as 17 out of 25 answers (including the clusters) were correct with a percentage of 50% and above.

In our study, 48.4% of medical students had stated that they received formal training in handwashing. On the other hand, a study in India stated that 85.45% of medical students had claimed they received formal training in handwashing [4]. In addition, Nair et al. [20] study mentioned that 79% of the students had claimed they received formal training in handwashing. Thus, the result of our study disclosed lower participation in handwashing training programs.

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**Table 2. General knowledge of hand hygiene among medical students in AGU.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Correct answer</th>
<th>Basics years</th>
<th>Clinical years</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility?</td>
<td>Health-care workers’ hands when not clean</td>
<td>44 (53%)</td>
<td>44 (57.9%)</td>
<td>88 (55.3%)</td>
<td>0.501</td>
</tr>
<tr>
<td>What is the most frequent source of germs responsible for health care-associated infections?</td>
<td>Germs already present on or within the patient</td>
<td>18 (21.7%)</td>
<td>14 (18.4%)</td>
<td>32 (20.1%)</td>
<td>0.279</td>
</tr>
<tr>
<td>What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands?</td>
<td>20 seconds</td>
<td>45 (54.2%)</td>
<td>53 (69.7%)</td>
<td>98 (61.6%)</td>
<td>0.100</td>
</tr>
</tbody>
</table>

**Table 3. Knowledge about methods preventing transmission of germs among both patients and health care workers of medical students in AGU.**

<table>
<thead>
<tr>
<th>No.</th>
<th>Cluster question</th>
<th>Correct answer</th>
<th>Basics years</th>
<th>Clinical years</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Before touching a patient</td>
<td>Yes</td>
<td>74 (89.2%)</td>
<td>72 (94.7%)</td>
<td>146 (91.8%)</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>Immediately after a risk of body fluid exposure</td>
<td>Yes</td>
<td>65 (78.3%)</td>
<td>59 (77.6%)</td>
<td>124 (78%)</td>
<td>0.917</td>
</tr>
<tr>
<td>3</td>
<td>After exposure to the immediate surroundings of a patient</td>
<td>No</td>
<td>23 (27.7%)</td>
<td>20 (26.3%)</td>
<td>43 (27%)</td>
<td>0.843</td>
</tr>
<tr>
<td>4</td>
<td>Immediately before a clean/aseptic procedure</td>
<td>Yes</td>
<td>67 (80.7%)</td>
<td>69 (90.8%)</td>
<td>136 (85.5%)</td>
<td>0.071</td>
</tr>
</tbody>
</table>
In contrast, regarding the usage of alcohol-based hand rub routinely, our results showed better compliance (69.8%) than a study in India in which they got only 58.1% [4]. Our clinical year’s students (69.7%) could recognize the standard duration of handwashing compared to a previous study conducted in Saudi University. However, only 39.0% of their clinical years could respond correctly [7].

As a cause of the spread of infection, 78.6%, 91.8% of medical students in our study know that wearing jewellery and artificial nails, respectively, can increase the spread of infection compared to 63.46%, 60.78% in Shamseldin Elshafie and Ibrahim [5] study.

Regarding the statement about hand rubbing and handwashing, 74.8% of medical students of our study claimed that hand rubbing is not more efficient against germs than handwashing compared to Nair et al. [20], where only 45.7% claimed that too. Furthermore, in the same study, 46.3% know that handwashing and hand rubbing are not commanded to be performed in order, while 33.3% only from our study know that [20].

The study’s sample size is small, which may not illustrate the actual knowledge of the university students. Secondly, the questionnaire was conducted online, which may allow a re-answer. Finally, the questionnaire is in a multiple-choice form which helps the participant guess the answers.

There is a demand for the continuous program to be conducted to both clinical and basic years students about hand hygiene and infection control in general.

**Conclusion**

In conclusion, both clinical and basic years students have moderate knowledge (>50%) as 17 out of 25 answers (including the clusters) were correct with a percentage of 50% and above. Although it is acceptable compared to other studies, proper curriculum and training sessions should be conducted continuously with performance feedback to ensure proper hand hygiene practices and thus protect both patients and health care workers.

### Table 4. Knowledge about proper method of hand hygiene in different clinical situations among medical students in AGU.

<table>
<thead>
<tr>
<th>No.</th>
<th>Cluster question</th>
<th>Correct answer</th>
<th>Years Basics years</th>
<th>Clinical years</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Before palpation of the abdomen</td>
<td>Rubbing</td>
<td>35 (42.2%)</td>
<td>22 (25%)</td>
<td>57</td>
<td>0.07</td>
</tr>
<tr>
<td>2</td>
<td>Before giving an injection</td>
<td>Rubbing</td>
<td>34 (41%)</td>
<td>20 (26.3%)</td>
<td>54</td>
<td>0.012</td>
</tr>
<tr>
<td>3</td>
<td>After emptying a bedpan</td>
<td>Washing</td>
<td>54 (65.1%)</td>
<td>53 (69.7%)</td>
<td>107</td>
<td>0.094</td>
</tr>
<tr>
<td>4</td>
<td>After removing examination gloves</td>
<td>Rubbing</td>
<td>22 (26.5%)</td>
<td>24 (31.6%)</td>
<td>46</td>
<td>0.404</td>
</tr>
<tr>
<td>5</td>
<td>After making a patient’s bed</td>
<td>Rubbing</td>
<td>34 (41%)</td>
<td>16 (21.1%)</td>
<td>50</td>
<td>0.003</td>
</tr>
<tr>
<td>6</td>
<td>After visible exposure to blood</td>
<td>Washing</td>
<td>48 (57.8%)</td>
<td>56 (73.7%)</td>
<td>104</td>
<td>0.103</td>
</tr>
</tbody>
</table>

### List of Abbreviations

AGU Arabian Gulf University

WHO World Health Organization

### Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

### Funding

None.

### Consent to participate

Consent was taken from medical student.

### Ethical approval

Research and Ethics Committee Arabian Gulf University via reference number E036-P14/19

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### References


