



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.2557782>Available online at: <http://www.iajps.com>

Research Article

**ASSESSMENT OF KNOWLEDGE , ATTITUDE AD PRACTICE
OF HAND HYGIENE AMONG MEDICAL STUDENTS IN HAIL
2017**

¹Dr.Thikra Mohammed Alblowi, ²Dr. somaia Ibrahim bashir, ³Dr. mashaal Abdullah Alshammari, ⁴Dr.Nada Raja marzooq Alharbi, ⁵Dr. Abrar Hamed saleh Alageel, ⁶Dr. Amal Abdullah Albuqaisi

¹Saudia Arabia ,Hail University, Collage of Medicine.

Abstract:

Background: According to the definition of World Health Organization, hand hygiene is a general term referring to any action of hand cleansing , it is the act of cleaning one's hands with or without the use of water or another liquid or with the use of soap for the purpose of removing soil, dirt, and/or microorganisms⁽⁹⁾.Healthcare-associated infections (HCAs) play a major role when it comes to patient safety.

Objectives: The present study aimed to assess the prevalence of the practice of hand hygiene among medical students in Hail collage of medicine, the knowledge about hand hygiene technique and its importance among medical students and Measure the student awareness regarding the "my five hand hygiene technique" and time consumed during it.

Methods: This is a cross-sectional study conducted in the period from the first of August to the end of September 2017 among medical students in the Department of General Surgery and Medicine ,Hail,Saudia Arabia, after having been approved by the research and ethics committee . An open and close electronic-based questionnaire ⁽⁸⁾ was distributed among 250 students during clinical years "4th year to 6th year".

Results: Total 124 medical students (4th year, 5th year and 6th year) took part in this study. 70.9% of them were female; 33.1% of them was from 4th year, 32.3% from 5th year and 34.8% from 6th year (Table 1) . Only 32.3% (n = 40) respondents knew about WHO and CDC guideline for hand hygiene before the beginning of clinical training.

Conclusion :The present study had shown that healthcare associated infection is a very serious obstacle worldwide. Thus hand hygiene has a major role in controlling infections. In our study we conclude that, there is a considerable number of students knew about WHO and CDC guidelines for hand hygiene before their clinical training, and the remaining are willing to know about it.

recommendation: Include teaching about hand hygiene in the curriculum of medical students. This can be introduced either in the courses like community and patient safety or during the bedside teaching in hospitals or primary care facilities.

Keywords: Hand hygiene , Healthcare, students, clinical training, infection.

Corresponding author:**Thikra Mohammed Alblowi,**

Saudia Arabia ,Hail University, Collage of Medicine.

Mobile:00966599819903, E-mail: Thikra.alblowi@gmail.com.

QR code



Please cite this article in press Thikra Mohammed Alblowi et al., *Assessment Of Knowledge , Attitude Ad Practice Of Hand Hygiene Among Medical Students In Hail 2017.*, Indo Am. J. P. Sci, 2019; 06(02).

INTRODUCTION:

According to the definition of World Health Organization, hand hygiene is a general term referring to any action of hand cleansing, it is the act of cleaning one's hands with or without the use of water or another liquid or with the use of soap for the purpose of removing soil, dirt, and/or microorganisms(9). Healthcare-associated infections (HAIs) play a major role when it comes to patient safety (1). It poses a continuing threat for mortality and morbidity among hospitalized patients (4). Healthcare-associated infections (HAIs) bear huge burdens on healthcare systems. More precisely, HAIs are associated with lengthy hospitalization, long-term disability, higher microbial drug resistance, increased morbidity, greater mortality, and extra healthcare-related costs (6). Hand hygiene is an important healthcare organizer worldwide and is a single most cost-productive and practical measure to decline the incidence of healthcare-associated infection and the prevalence of antimicrobial resistance across all settings—from advanced health care systems to primary healthcare(3). Despite the proven importance and benefits of washing hand, proper hand washing is not as pervasive as desired to prevent infections until now, especially in the developing countries that bear the greatest burden of infectious diseases(9). Many reasons for low compliance to hand hygiene have not been defined in developing countries probably due to limited studies on hand hygiene [3], however some factors that contribute to non compliance to HW among health care workers were stated by some researchers. These are mainly: lack of awareness and knowledge among health care workers as regard to the importance, techniques, methods and quality of hand hygiene [4-8], busyness [6], forgetfulness [9], low staff to patient ratio and attitudes among staff towards bio-safety [4]. Other factors related to low hand washing practices are insufficient supply of equipments, materials and resources for good hand hygiene maintenance [4, 5, 7, 10], skin condition as allergies and irritants to hand washing agents [4, 6, 7] (10). The risk of HCAI can be reduced by increasing awareness, providing proper hand hygiene education, and training (1). One of such efforts is the introduction of an evidence-based purport of "My five moments for hand hygiene" by World Health Organization (3).

These five moments that call for the use of hand hygiene include the moment before touching a patient, before performing aseptic and clean procedures, after being at risk of exposure to body fluids, after touching a patient, and after touching patient surroundings(3). Little is known about the clerkship (clinical) medical students' knowledge of

hand hygiene as the single most important protective measure to reduce nosocomial healthcare associated infections(6).

Several authors have reported that the knowledge, attitude, and observance of hand hygiene by the undergraduate healthcare students is poor(1). We found the medical students to have a low overall rate of hand hygiene (3). Van De Mortal et al. However, we found the nursing students' hand hygiene knowledge and self-reported practices to be significantly better than that of medical students (3). Otherwise, the remedial measures included:

- 1) Enrollment of hand hygiene in the prescribed syllabus, at various levels.
- 2) Application of perfect hand hygiene practices by teaching faculty, to convey the message by example.
- 3) Regular feedback/reminders to students erring in hand hygiene practices.
- 4) Promulgation of YouTube links to clips on application of hand hygiene by leading institutions of the world, followed by classroom discussion on these clips.
- 5) distribution/pasting of posters (at bedside teaching stations) based on the "Five Moments for Hand Hygiene" concept in English and local (Arabic) language.
- 6) Dedication of some faculty members to hand hygiene promotion programme(2).

OBJECTIVES :

This study aims to:

1. Assess the prevalence of the practice of hand hygiene among medical students in Hail collage of medicine.
2. Assess the knowledge about hand hygiene technique and its importance among medical students.
3. Measure the student awareness regarding the "my five hand hygiene technique" and time consumed during it.

METHODOLOGY:

This is a cross-sectional study conducted in the period from the first of August to the end of September 2017 among medical students in the **Department of General Surgery and Medicine**, Hail, Saudi Arabia, after having been approved by the research and ethics committee. An open and close electronic-based questionnaire (8) was distributed among 250 students during clinical years "4th year to 6th year".

Students were requested to complete an electronic questionnaire. The questionnaire was administered to explore students' demographical data as well as their

knowledge, attitude, and practice towards hand hygiene. There are questions related to the importance of hand hygiene, education, compliance, and role models. Knowledge was assessed using WHO's hand hygiene questionnaire. Demographic data included age, gender, level and 17 questions includes multiple choice and multi question with answers of "yes" or "no". The purpose of the study was explained very clearly. The participation of students was voluntary, and the questionnaires were kept anonymous. The total number of responses collected is 122, and data was processed and analyzed using SPSS and Microsoft Excel. The link of electronic-based questionnaire <https://www.surveymonkey.com/r/COG6NB6>

Statistical Analysis

Descriptive statistics was used for the categorical variables. All the categories were presented in frequencies and percentages.

The analysis was performed in 95% confidence interval using Statistical Package for Social Science (SPSS), version 20 (IBM, Armonk, NY, USA).

RESULT :

This cross-sectional Study was done involving the medical students of Hail to know about the knowledge, attitude, and practice regarding hand hygiene. Total 124 medical students (4th year, 5th year and 6th year) took part in this study. 70.9% of them were female; 33.1% of them was from 4th year, 32.3% from 5th year and 34.8% from 6th year (Table 1). Only 32.3% (n = 40) respondents knew about WHO and CDC guideline for hand hygiene before the beginning of clinical training. Seventeen percent participant would like to know about hand hygiene if the information was available before the start of their

clinical training (Table 2). 61.3% respondents thought the main route of cross-transmission of potentially harmful germs between patients in a health-care facility is unclean health-care workers hands (Table 3). 41.1% respondents thought 20 seconds is the minimal time needed for alcohol-based hand rub to kill most germs in the hands while 29% respondents thought 1 minute is the minimum time (Table 4). Half of the participants did not think using gloves can eliminate the necessity of hand hygiene (Table 5). When asked about the practices that may increase the likelihood of growth of harmful microbes on the hands the respondents gave different answers which are presented in (table 6). Most of the respondents thought wearing jewelry, damaged skin and artificial fingernails can increase the likelihood. While asked about the number of steps of hand washing the most frequent answer was '5 steps' – by 21.8% respondents followed by '6 steps' – by 20.9% respondents (Table 7). Majority of respondents identified the right process of hand washing (Chart 1). More than half (58.1%) of the respondents used both – alcohol-based hand rub and soap & water for hand washing. (Table 8). Knowledge about the appropriate method of hand washing in the different situation was presented in chart 2. Most of the respondents spared 20-30 seconds for hand washing (Chart 3). More than half of the respondents (53.2%) disinfects their hands before and after every patient contact while 4.8% never disinfect their hand (Table 9). 38.7% respondents never disinfect the membrane of their stethoscope (Table 10).

Table 1: Level of education of all respondents (n = 124)

	Female	Male	Total n (%)
4 th year	28	13	41 (33)
5 th year	31	9	40 (33)
6 th	29	14	43 (38)
T total n (%)	88 (70.9)	36 (29.0)	124 (100)

Table 2: Percentage of all respondents who have known about WHO and CDC guideline for hand hygiene before the beginning of clinical training (n = 124)

FEMALE				
	YES	NO	I would like	Total n (%)
4 th year	12	11	5	28 (22.6)
5 th year	12	18	1	31 (25.0)
6 th year	10	15	4	29 (23.4)
Total n (%)	34 (27.4)	44 (35.5)	10 (8.1)	88 (70.9)
MALE				
4 th year	4	7	2	13 (10.5)
5 th year	1	6	2	9 (7.3)
6 th year	1	10	3	14 (11.3)
Total n (%)	6 (4.8)	23 (18.6)	7 (5.7)	36 (29.0)
Grand total n (%)	40 (32.3)	67 (54.0)	17 (13.7)	124 (100)

Table 3 Knowledge about the main route of cross-transmission of potentially harmful germs between patients in a health-care facility (n = 124)

	Health-care workers' hands when not clean	Air circulating in the hospital	Patients' exposure to colonized surfaces	Sharing non-invasive objects between patients	Total n (%)
FEMALE					
4 th year	20	2	4	3	29 (23.4)
5 th year	18	2	5	5	31 (25.0)
6 th year	19	4	3	3	29 (23.4)
Total n (%)	57 (45.9)	8 (6.5)	12 (9.7)	11 (8.9)	89 (71.8)
MALE					
4 th year	6	3	4	0	13 (10.5)
5 th year	6	2	0	1	9 (7.3)
6 th year	7	0	4	3	14 (11.2)
Total n (%)	19 (15.3)	5 (4.0)	8 (6.5)	4 (3.2)	36 (29.0)
Grand total n (%)	76 (61.3)	13 (10.5)	20 (16.1)	15 (12.1)	100 (100)

Table 4: Knowledge about the minimal time needed for alcohol-based hand rub to kill most germs on the hands

	20 secs	1 min	3 secs	10 secs	Other	Total	n (%)
FEMALE							
4 th year	13	4	1	8	2(30 Sec)	28	(22.6)
5 th year	11	8	5	5	1(5 Min)	30	(24.2)
6 th year	8	14	0	6	1(30 Sec)	29	(23.4)
Total n (%)	32 (25.8)	26 (20.9)	6 (4.8)	19 (15.3)	3 (2.4)	86	(69.4)
MALE							
4 th year	5	4	1	2	1 (5 Min)	13	(10.5)
5 th year	6	3	1	0	0	10	(8.1)
6 th year	8	3	2	1	1(30 Sec)	14	(11.3)
Total n (%)	19 (15.3)				2 (1.6)	37	(29.8)

Table 5: Percentage of respondents who think using gloves eliminate the necessity to hand hygiene (n = 124)

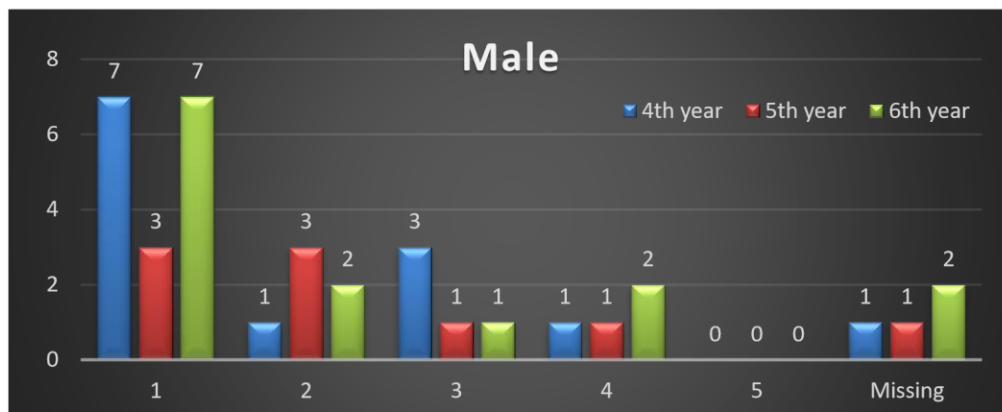
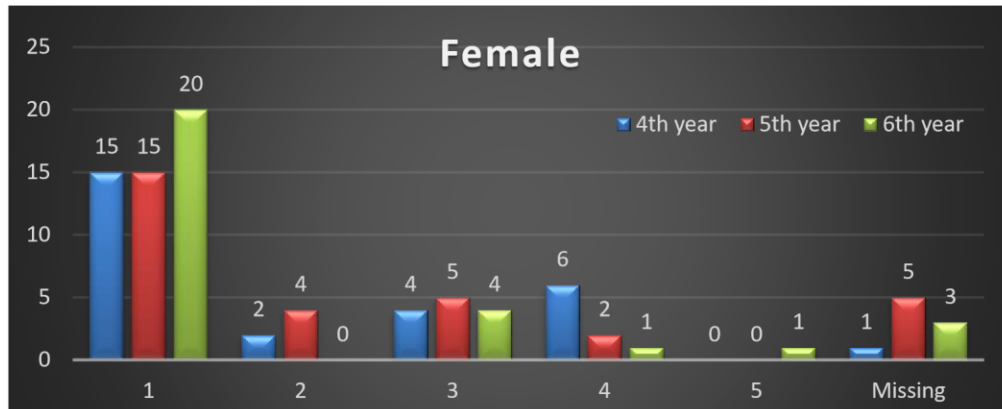
	Yes	I don't know	No	Missing	Total	n (%)
FEMALE						
4 th year	7	19	2	0	28	(22.6)
5 th year	12	13	5	1	31	(25.0)
6 th year	12	12	5	0	29	(23.4)
Total n (%)	31 (25.0)	44 (35.5)	12 (9.7)	1 (0.8)	88	(70.9)
MALE						
4 th year	5	6	2	0	13	(10.5)
5 th year	4	5	0	0	9	(7.3)
6 th year	7	7	0	0	14	(11.3)
Total n (%)	16 (12.9)	18 (14.5)	2 (3.2)	0 (0.0)	36	(29.0)
		10 (8.1)	3 (2.4)			
		36 (29.0)	22 (17.7)			

Table 6: Knowledge about the practices which increase the likelihood of colonizing hand with harmful pathogens among the respondents (n = 124)

	MALE n (%)			FEMALE n (%)			
	6th	5th	4th	6th	5th	4th	
Wearing Jewelry							
• Yes	18 (14.5)	20 (16.1)	20 (16.1)	7 (5.6)	4 (3.2)	10 (8.1)	
• No	10 (8.1)	10 (8.1)	9 (7.3)	6 (4.8)	5 (4.0)	3 (2.4)	
Damaged skin							
• Yes	23 (18.5)	26 (20.9)	25 (20.2)	10 (8.1)	7 (5.6)	12	
• No	5 (4.0)	4 (3.2)	4 (3.2)	2 (1.6)	2 (1.6)	1 (0.8)	
Artificial fingernails							
• Yes	24 (19.4)	23 (18.5)	25 (20.2)	8 (6.5)	7 (5.6)	12 (9.7)	
• No	4 (3.2)	7 (5.6)	4 (3.2)	4 (3.2)	2 (1.6)	2 (1.6)	
Regular use of hand cream							
• Yes	6 (4.8)	11 (8.9)	9 (7.3)	4 (3.2)	2 (1.6)	5 (4.0)	
• No	22 (17.7)	19 (15.3)	20 (16.1)	9 (7.3)	7 (5.6)	9 (7.3)	

Table 7: Knowledge about the number of steps of hand washing (n = 124)

	FEMALE			MALE			Total
	4th	5th	6th	4th	5th	6th	
2 Steps	2	0	0	0	1	0	3 (2.4)
3 Steps	4	3	3	1	1	0	12 (9.7)
4 Steps	0	1	1	1	1	0	4 (3.2)
5 Steps	6	6	5	4	2	4	27 (21.8)
6 Steps	5	8	7	3	2	1	26 (20.9)
7 Steps	4	2	2	2	0	3	13 (10.5)
8 Steps	3	1	1	0	0	0	5 (4.0)
9 Steps	1	0	0	0	0	2	3 (2.4)
10 Steps	2	2	2	0	0	1	7 (5.6)
11Steps	0	1	0	0	0	3	4 (3.2)
Missing	0	1	0	0	0	3	4 (3.2)
I don't know	0	6	6	2	2	0	16 (12.9)
	1	1	2	0	0	0	4 (3.2)
Total	28 (22.6)	31 (25.0)	29 (23.4)	13 (10.5)	9 (7.3)	14 (11.3)	

Chart 1: Knowledge about the process of hand washing in males and females (n = 124)

1. Apply of soap in a cupped hand, rub palm to Palm, right palm over left dorsum with interlaced fingers and vice versa, palm to Palm with fingers interlaced, backs of fingers to opposing palms with fingers interlocked, rotational rubbing of thumbs, rotational rubbing backwards and forwards with clasped fingers
2. Apply of soap in a cupped hand, rub palm to Palm, right palm over left dorsum with interlaced fingers and vice versa, palm to Palm with fingers interlaced, backs of fingers to opposing palms with fingers interlocked, rotational rubbing backwards and forwards with clasped fingers
3. Apply of soap in a cupped hand, rub palm to Palm, right palm over left dorsum with interlaced fingers and vice versa, palm to Palm with fingers interlaced, backs of fingers to opposing palms with fingers interlocked, rotational rubbing of thumbs and forwards with clasped fingers
4. Apply of soap in a cupped hand, palm to Palm with fingers interlaced, backs of fingers to opposing palms with fingers interlocked, rotational rubbing of thumbs, rotational rubbing backwards and forwards with clasped fingers
5. None of the above

Table 8: Practice of hand washing by different products among all respondents (n = 124)

	Alcoholbased hand rub	Handwashing with soap and water	Both	Missing	Total
FEMALE					
4th years	5	2	20	1	28
5th years	6	2	18	5	31
6th years	8	4	14	3	29
Total n (%)	19 (15.3)	8 (6.5)	52 (41.9)	9 (7.3)	88 (70.9)
MALE					
4th years	5	0	6	2	13
5th years	1	1	6	1	9
6th years	4	1	8	1	14
Total n (%)	10 (8.1)	2 (1.6)	20 (16.2)	4 (3.2)	36 (29.0)

Chart 2: Knowledge about appropriate method of hand washing in different situations (n =124)

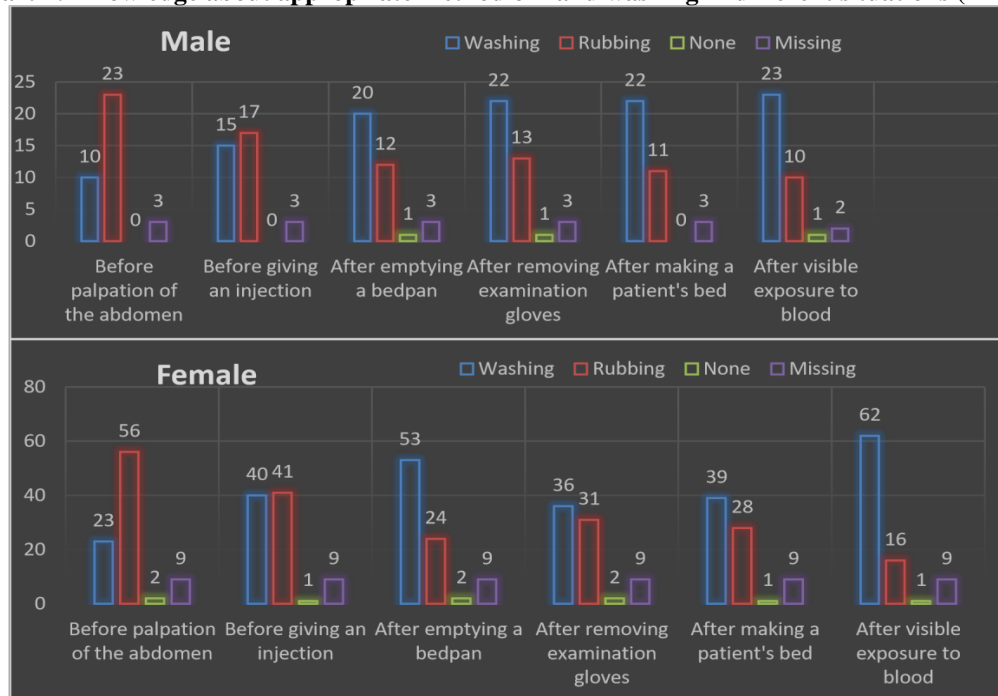


Chart 3: Time spared for hand washing by all respondents (n = 124)

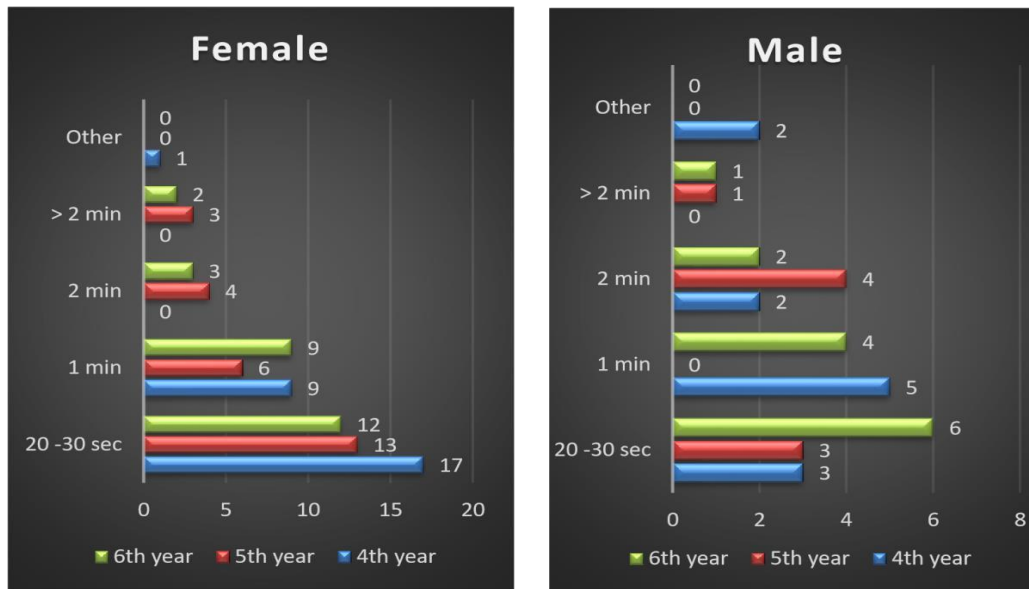


Table 9: How often do you disinfect your hands during a day in the clinical setting?

	After every patient contact	Before and after every patient contact	2 or 3 times per day	Never	All	Missing	Total n (%)
FEMALE							
4 th years	1	22	3	1	0	1	28
5 th years	0	14	10	0	2	5	31
6 th years	1	13	8	2	2	3	29
Total n (%)	2 (1.6)	49 (39.5)	21 (16.9)	3 (2.4)	4 (3.2)	9 (7.3)	88 (70.9)
MALE							
4 th years	0	7	3	2	0	1	13
5 th years	0	4	3	1	0	1	9
6 th years	0	6	6	0	1	1	14
Total n (%)	0	17	12	3	1	3	36
Grand total n (%)	2 (1.6)	66 (53.2)	33 (26.6)	6 (4.8)	5 (4.0)	12 (9.7)	124 (100)

Table 10: Frequency of disinfection of stethoscope membrane by the respondents (n = 124)

	After every patient contact	Before and after every patient contact	2 or 3 times per day	Never	All	Missing	Total n (%)
FEMALE							
4th years	5	5	6	9	2	1	28
5th years	0	5	9	12	0	5	31
6th years	1	10	4	11	0	3	29
Total n (%)	6 (4.8)	20 (16.1)	19 (15.3)	32 (25.8)	2 (1.6)	9 (7.3)	88 (70.9)
MALE							
4th years	1	4	4	3	0	1	13
5th years	1	1	0	6	0	1	9
6th years	2	2	2	7	0	1	14
Total n (%)	4	7	6	16	0	3	36

DISCUSSION:

Health care-associated infection is a very important health issue globally, and hand hygiene is an effective method of infection control. The methods of hand hygiene are widely publicized and simple(12). Recent studies have found low awareness level regarding hand hygiene among medical students and certified healthcare providers (13- 17). In our study one hundred and twenty four medical students participated in the questionnaire. 70.9% of them were females, 29% of them were males; 33.1% of them were from 4th year, 32.3% from 5th year and 34.8% from 6th year, while Alfaisal university study included One hundred and eleven students 57% of them were males and 43% were females (6). Regarding knowledge about hand hygiene before starting clinical training, in our study 32.3% (n = 40) respondents knew about WHO and CDC guideline for hand hygiene before the beginning of clinical training. 34 female students (27.4%) and 6 male students (4.8%), while 44 (35.5%) of female participants and 23 (18.6%) of males didn't know about WHO and CDC guideline for hand hygiene before the beginning of clinical training, 10 (8.1%)

females and 7(5.7%) males answered "I would like ". (Table 2). Comparing this with Alfaisal university study which showed that only 14 students (13%) stated that they have reviewed the CDC and WHO guidelines for hand hygiene prior to starting their clerkship clinical training(6)we find that much higher percentage of our participants know about hand hygiene before starting their clerkship clinical training (32.3%).

Most of the participants in our study (61.3%) stated that the main route of cross- transmission of potentially harmful germs between patients in a health-care facility is the unclean hands of the health workers, it is higher than that found in study done in India where <50% undergraduate students included in the study answered correctly that unhygienic hands of healthcare workers were the main route of transmission of potential harmful germs. (1).

On asking about the number of steps of hand washing 21.8% respondents answered correctly '5 steps', while 20.9% respondents answered '6 steps' (Table 7). On the same time we found that the majority of

respondents identified the right process of hand washing (Chart 1). On the other hand the Indian study documented poor knowledge regarding the correct type of hand hygiene method to be used in certain situations among the students included. (1).

More than half (58.1%) of the respondents use both – alcohol-based hand rub and soap & water for hand washing (Table 8). Knowledge about the appropriate method of hand washing in the different situation was presented in (chart 2) and it shows a high adherence to CDC and WHO guidelines for hand hygiene. 41.1% of the respondents answered correctly that the minimal time needed for alcohol-based hand rub to kill most germs on the hands is 20 seconds (table 4) and most of them spared 20-30 seconds for hand washing (Chart 3). This is considered a high rate of knowledge compared to what is found in the study done in India as they stated that only, a few undergraduate students knew that 20 s is the minimum time required for effective alcohol-based hand rub as per the WHO guideline(1).

Half of the participants in our study (50%) do not know if using gloves eliminate the necessity to hand hygiene, and only 12.9% of the participants answered correctly as no (table 5). Also our study reflected the high knowledge of the participants about the practices which increase the likelihood of colonizing hand with harmful pathogens as most of them think that Wearing Jewelry, Damaged skin and Artificial fingernails increase the likelihood of colonizing hand with harmful pathogens(table 6).

However, this study showed that, more than half of the respondents (53.2%) disinfects their hands before and after every patient contact while only 4.8% never disinfect their hands (Table 9) this is lower than that found in study done in Alfaisal University, College of Medicine where 74% of the study participants disinfects their hands before and after every patient contact.(6).

Strikingly 38.7% respondents never disinfect the membrane of their stethoscope and only 21.7% disinfect it before and after every patient contact (Table 10). In **Alfaisal University** study shows, Hand hygiene should be performed before and after each patient encounter (regardless of performing physical examination)(6), and 82 students (74%) answered this question correctly. Moreover, 81 students (73%) correctly answered that hand hygiene should be enforced before and after each physical examination. In addition, while 86 students (77%) properly disagreed to the following statement: "After washing hands, turn off water taps with your hands" (6), only 71 students (64%)

properly agreed to the following statement: "After washing hands, turn off water tap using piece of paper towel" (6)

CONCLUSION :

The present study had shown that healthcare associated infection is a very serious obstacle worldwide. Thus hand hygiene has a major role in controlling infections. In our study we conclude that, there is a considerable number of students knew about WHO and CDC guidelines for hand hygiene before their clinical training, and the remaining are willing to know about it. Additionally respondents have a fair knowledge about the role of hand hygiene in reducing the risk of infection transmission between patients and the practices that increase this risk. Also they have good knowledge about the exact number of steps needed for hand hygiene that is mention in WHO and CDC protocols. Along with, more than half of them use both alcohol based hand rub and soap and water for hand washing. Furthermore, the study shows that a considerable number of the respondents have fair practice regarding hand hygiene that they disinfect their hands before and after every patient and they wash their hand or rub them with alcohol-based for the appropriate time. Despite of that, and considering the importance of the hand hygiene still there is a need for mindful efforts of all health care providers including medical and nursing students towards improving the level of their knowledge, practice and attitude regarding hand hygiene according to international organizations protocols such WHO and CDC in order to improve and limit the healthcare associated infection.

Recommendations:

1. Include teaching about hand hygiene in the curriculum of medical students. This can be introduced either in the courses like community and patient safety or during the bedside teaching in hospitals or primary care facilities.
2. Raise the awareness of medical students towards hand hygiene by posters, out class presentations and activities.

REFERENCE:

1. Thakker, V. S., & Jadhav, P. R. (n.d.). Knowledge of hand hygiene in undergraduate medical, dental, and nursing students: A cross-sectional survey. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26985420>
2. Ahmad, S., Kadi, A., & Azzam. (2014, October 29). Hand Hygiene Practices in Medical Students: A Follow-Up Study. Retrieved from <https://www.hindawi.com/journals/isrn/2014/591879/>

3. Al, A., & Salati, S. A. (n.d.). Hand Hygiene Practices among Medical Students. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/23024653>
4. Herbert, G., V., Paul, Kessler, H., H., Frings, & Andreas. (2013, April 11). Knowledge of and Adherence to Hygiene Guidelines among Medical Students in Austria. Retrieved from <https://www.hindawi.com/journals/ipid/2013/802930/>
5. Nair, Sasidharan, S., Ramesh, Hiremath, Gurushantswamy, S., Siraj, . . . Pooja. (2014, February 06). Knowledge, Attitude, and Practice of Hand Hygiene among Medical and Nursing Students at a Tertiary Health Care Centre in Raichur, India. Retrieved from <https://www.hindawi.com/journals/isrn/2014/608927/>
6. Hamadah, R., Kharraz, R., Alshanjity, A., AlFawaz, D., Eshaq, A. M., & Abu-Zaid, A. (2015, August 24). Hand Hygiene: Knowledge and Attitudes of Fourth-Year Clerkship Medical Students at Alfaisal University, College of Medicine, Riyadh, Saudi Arabia. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26430584>
7. Alfredo, Martínez-Redondo, Elena, Francisco, J., Jiménez-Romano, Alfredo, Alfredo. (n.d.). Hand hygiene technique quality evaluation in nursing and medicine students of two academic courses. Retrieved from http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-11692015000400708
8. The link of electronic-based questionnaire <https://www.surveymonkey.com/r/CQG6NB6>
9. Sultana, M., Mahumud, R. A., Sarker, A. R., & Hossain, S. M. (2016). Hand hygiene knowledge and practice among university students: Evidence from Private Universities of Bangladesh. Risk Management and Healthcare Policy, 13. doi:10.2147/rmhp.s98311
10. Sa, H., & A, M. (2017). Compliance With Vaccination As An Occupational Safety Measure Among Health Care Workers At Ain Shams University Hospitals, Cairo, Egypt. Egyptian Journal of Occupational Medicine, 41(3), 343-355. doi:10.21608/ejom.2017.3925
11. Kumar, P. V., & Padmaja, P. (2017). Knowledge, Attitude, Practices of Biomedical Waste Management among Nursing Students and Staff in a Tertiary Care Hospital. Annals of International Medical and Dental Research, 3(4). doi:10.21276/aimdr.2017.3.4.cm1
12. P. Mathur, "Hand hygiene: back to the basics of infection control," Indian Journal of Medical Research, vol. 134, no. 11, pp. 611–620, 2011.
13. Qushmaq, D. Heels-Ansdell, D. J. Cook, M. B. Loeb, and M. O. Meade, "Hand hygiene in the intensive care unit: prospective observations of clinical practice," Polskie Archiwum Medycyny Wewnetrznej, vol. 118, no. 10, pp. 543–547, 2008.
14. S. Z. Bukhari, W. M. Hussain, A. Banjar, W. H. Almaimani, T. M. Karima, and M. I. Fatani, "Hand hygiene compliance rate among healthcare professionals," Saudi Medical Journal, vol. 32, no. 5, pp. 515–519, 2011.
15. M. Basurrah and T. Madani, "Handwashing and gloving practice among health care workers in medical and surgical wards in a tertiary care centre in Riyadh, Saudi Arabia," Scandinavian Journal of Infectious Diseases, vol. 38, no. 8, pp. 620–624, 2006.
16. E. Duroy and X. Le Coutour, "Hospital hygiene and medical students," Medecine et Maladies Infectieuses, vol. 40, no. 9, pp. 530–536, 2010.
17. Feather, S. P. Stone, A. Wessier, K. A. Boursicot, and C. Pratt, "'Now please wash your hands': the handwashing behaviour of final MBBS candidates," Journal of Hospital Infection, vol. 45, no. 1, pp. 62–64, 2000.