

A SURVEY OF KNOWLEDGE, ATTITUDES AND PRACTICES REGARDING HAND HYGIENE AMONG DOCTORS AND NURSES IN RIBAT UNIVERSITY HOSPITAL

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ABSTRACT Background: Hand hygiene is a very simple and life saving procedure. The average compliance among Healthcare workers (HCWs) still remains low. Poor infrastructure in Sudanese hospitals, inadequate training of staff, lack of well established infection prevention teams all contribute to high rates of hospital acquired infections (HAIs). **Aim:** This study was carried out to determine and to compare the knowledge, attitudes and practices of hand hygiene among HCWs in order to understand why compliance among HCWs is low. **Methods:** Data was collected using questionnaires from 237 HCWs working in the hospital and analyzed using the Statistical Packages for Social Sciences (SPSS) version 23. A p value of < 0.05 was considered significant. **Results:** Only 39.2% of HCWs in the hospital had received training sessions on hand hygiene in the past six months. Sufficient knowledge about hand hygiene was demonstrated in only 35.6% of the HCWs, 20.2% of them had positive attitudes and 18.1% adopted good hand hygiene practices. Nurses had significantly better knowledge and better practices of hand hygiene than doctors. There was however, no significant difference between the attitudes of the two categories of HCWs. **Discussion:** Insufficient knowledge, negative attitudes and poor practices of HCWs coupled with lack of training may be why HAIs in the hospital are high. **Conclusion:** Urgent training of the staff is recommended and should target doctors who may continue to spread infections in the hospital

KEYWORDS hand hygiene, healthcare workers and hospital acquired infections

Introduction

It is well established that the contaminated hands of healthcare workers play an essential role in the spread of organisms such as Methicillin-Resistant *Staphylococcus aureus* (MRSA), *Klebsiella* spp. and *C.difficile* among patients[1]. This mainly happens during their work when healthcare workers are exposed to patients and to surfaces in hospitals which occurs during auscultation,

palpation, and changing wound dressing and so on [2]. This exposure occurs tens to thousands of times each day and as it happens, a two-way exchange of organisms occurs between the hands of HCWs and objects that they touch [2]. The flora present on the hands of healthcare workers becomes gradually replaced by pathogenic micro-organisms that can then within a very short time spread throughout the hospital environment [3]. These organisms threaten not only the health of patients but may affect health care workers exposed to them as well [4].

Although huge advances have been made in healthcare; healthcare-related infection still affects 10% of patients in developed countries, and 25% in developing countries [5]. Consequently, hospital admission is associated with a high infection rate which results in prolonged hospital stay, a high morbidity and mortality rates [3]. Besides, it continues to have a huge

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financial impact on the patient and the economy [3].

Since doctors and nurses comprise the most significant percentage of healthcare workers that spend time with patients their compliance with hand hygiene is crucial in the prevention of infections among patients [6] and adoption of proper hand hygiene by this sector is the most critical measure in the prevention of hospital-acquired infections and the leading measure that can help in the reduction of hospital-acquired infections including multi-drug resistant infections [7].

Hand hygiene is a relatively simple procedure, and tremendous efforts have been made by health bodies to promote it in the healthcare setting [8]. Among these is the concept of 'My five moments of hand hygiene' that was established by the World Health Organization [8].

Aim

This research was carried out to assess and compare the knowledge, attitudes and practices of HCWs to get a better understanding of why HCWs do not comply with hand hygiene measures and ultimately to reduce HAIs in the hospital.

Objectives

- To assess the knowledge of hand hygiene among HCWs in Ribat University Hospital
- To explore the attitudes of HCWs in Ribat University Hospital towards hand hygiene
- To observe practices of hand hygiene among HCWs in Ribat University Hospital
- To compare the knowledge, attitudes and practices of hand hygiene among doctors and nurses in Ribat University Hospital.

Materials and Methods

Study design

This was a cross-sectional study that was conducted in nurses and doctors working in Ribat University Hospital, a 750-bed tertiary educational Hospital in Sudan. The study was carried out from September to November 2017. The sample size was determined using Slovin's formula [9] and was collected using a convenience sampling method. Ninety-nine questionnaires were collected from doctors and 138 from the nurse.

Study tool

The WHO Hand Hygiene Questionnaire [4] was used to assess the knowledge of HCWs on hand hygiene; questions used to determine attitudes and practices were derived from previously published literature [10].

The questionnaire consisted of 4 sections: Section A collected demographic data about the HCW. This section also asked the HCW whether they had participated in a hand hygiene workshop in the previous six months. Knowledge was assessed in section B using 25 questions [4]. Attitudes and practices were evaluated in sections C and D using ten questions and six questions respectively. The HCW had to respond to the individual questions using a 1-5 point scale that ranged from strongly agree to disagree [10] strongly.

The questionnaire was translated into Arabic to make it easier for participants to understand. Following translation, the questionnaire was piloted on seven nurses and doctors who were

later excluded from the study. The modified questionnaire was then delivered to the participants using the drop-and-collect technique [11]. The questionnaire took a total of 15 minutes to complete and participants were asked not to discuss the questions with each other during its completion.

Data analysis

Quantitative data were entered, managed, and analysed using SPSS version 23. Descriptive statistics were conducted for variables and data were presented as mean \pm standard deviation, minimum and maximum for continuous variables and as proportions for categorical variables. Chi-square was used to test significant associations between different categorical variables by comparing proportions between doctors and nurses groups. A p-value of less than 0.05 was considered statistically significant.

Questions on knowledge, attitudes and practices were re-coded into 0 and 1 scores for negative responses and positive responses respectively. Wrong answers and indeterminate ones such as neither agree nor disagree were regarded as negative attitudes and poor practices and were scored 0 whereas correct responses were given one score. All scores were then added and transformed into percentages. Scores equal to or more than 75% were considered as sufficient knowledge, positive attitudes and good practices while scores less than 75% were considered as insufficient knowledge, negative attitudes and poor practices.

Ethical considerations

Ethical clearance for this study was obtained from Ribat National University. Verbal consent was taken from all participants in the study. The questionnaires were filled anonymously, and no information was collected or retained about the identity of HCWs. All HCWs who completed the survey did so voluntarily and those unwilling to participate as well as those who wished to withdraw from the study were allowed to do so.

Results

A total of 237/423 HCWs participated in this study with a response rate of 56%. Eighty-two point five percent of the HCWs were female (n= 196). Nurses made up nearly 60% (n=138) of the 237 participants involved in this study. The mean age of HCWs was 30 years and their mean number of years of experience was six years. Only 39.2% of HCWs (n=85) claimed that they had received any training in hand hygiene in the past six months. Only 11.6% of doctors (n=10) attended training compared to 57.3% of nurses (n=75).

Knowledge of HCWs about hand hygiene

Sufficient knowledge on hand hygiene was demonstrated in only 35.6% of HCWs (Table 1). Seventy-eight point four percent of HCWs knew that the unclean hands of HCWs were the primary way by which harmful micro-organisms were spread between patients in hospitals (Table 2). Only 45.8% of respondents, however, were able to identify the most frequent source of germs causing HAIs (Table 2) with nearly 50% believing that these infections were caused by micro-organisms acquired from the hospital environment or surfaces instead of from micro-organisms found on or within the patient.

HCW's knowledge regarding when hand hygiene should be carried out to prevent the spread of germs to patients was

Table 1 Assessment of knowledge, attitudes, and practices of HCWs.

Good practice	18.1% (41/227)	6.1% (6/98)	27.1% (35/129)	0.000
	Overall	Doctors	Nurses	P value
Sufficient knowledge	35.6% (69/194)	20.9% (18/86)	47.2% (51/108)	0.000
Positive attitude	20.2% (38/188)	14.8% (13/88)	25.0% (25/100)	0.102
Good practice	18.1% (41/227)	6.1% (6/98)	27.1% (35/129)	0.000

generally very good. Nearly all HCWs knew that transmission of infections to patients can be avoided by adopting proper hand hygiene practices before touching the patient and that exposure of the hands of the HCW to the patient's body fluids could transmit infections among patients. The majority also knew that adopting proper hand hygiene before performing clean or aseptic procedures prevents the spread of infections to patients (Table 2). However, 71.2% of the HCWs did not know that carrying out hand hygiene after the HCW has already been exposed to the patient's surroundings had no role in protecting the patient from acquiring infections (Table 2).

Similarly, the respondents generally had good knowledge about when hand hygiene should be carried out to avoid the spread of infections to HCWs. Almost all of them knew that they could protect themselves by cleaning their hands after they touched the patient and after being exposed to patient's body fluids and coming into contact with the immediate surroundings of the patient (Table 2). Only 40.5% of them, however, knew that adopting proper hand hygiene immediately before rather than after performing clean/aseptic procedures on patients did not prevent the HCW from becoming infected (Table 2).

Questions assessing the knowledge of HCWs on the use of hand rub vs hand washing using soap and water revealed that 76.1% of them knew that hand rub acts more rapidly than hand washing using soap and water and 53.6% knew that the hand rub is not superior in efficacy to hand wash (Table 2). Nearly 60% of the HCWs falsely believed that hand washing and hand rubbing should be performed one after the other and 72% of them believed that alcohol-based hand rub solutions cause skin dryness more than soap and water (Table 2). When asked about the least amount of time required for alcohol-based hand rub to act on germs only 55.9% knew the correct time (Table 2).

Ninety-seven percent of HCWs knew that either hand washing or hand rubbing must be done after removal of examination gloves (Table 2). Seventy-eight point one percent and 72.7% of the respondents knew that hand washing rather than hand rubbing must be done when the HCW was exposed to visible blood and after emptying a bedpan respectively (Table 2). On the other hand, 66.9%, 57.4% and 47% of them correctly identified hand rubbing as the method of choice before touching the patient, before giving them an injection and after making the patient's bed respectively (Table 2).

Most of the HCWs also knew that artificial nails, damaged skin and wearing jewellery were associated with an increased risk of colonization of the hands with germs (Table 2). However, nearly one third believed that the regular use of hand cream by the HCW was associated with colonization of the hands (Table 2).

Attitudes of HCWs towards hand hygiene and satisfaction with health facilities

Positive attitudes towards hand hygiene were found in 20.2% of the HCWs (Table 3). Eighty-five point six percent of HCWs reported that they performed the correct hand hygiene practices at all times and 78% believed that their knowledge about hand hygiene was satisfactory. Besides, 81.7% of HCWs admitted that they felt guilty if they did not perform hand hygiene and 72.8% felt frustrated when others did not clean their hands (Table 3). Also, 21.0% of HCWs believed that new staff was not adequately trained on hand hygiene and 69.2% reported that they did not find any difficulty in performing hand hygiene in the current hospital settings (Table 3). Seventy-six point one percent of HCWs also reported that when they were faced with medical emergencies it made hand hygiene difficult while 74.7% were reluctant to ask others to clean their hands. Fifty-three point three percent of the HCWs believed that sometimes they had more important things to do than hand hygiene. In addition, nearly half of the respondents believed that when they wore gloves this reduced the need to clean their hands (Table 3).

Hand hygiene practices among HCWs.

Good hand hygiene practices were found in only 18.1% of HCWs (Table 1). Most HCWs believed that notice boards reminded them to carry out hand hygiene and that hand hygiene is an essential part of their role (Table 4). Moreover, 69.0% of them reported that the infection prevention team had a good influence on their hand hygiene practices. However, 69.6%, 69.5% and 64.4% of the HCWs reported that sometimes they would forget to clean their hands; that it was difficult for them to attend hand hygiene courses due to their busy schedules and that they could not comply because of the frequency of hand hygiene required respectively (Table 4).

Comparison of the knowledge, attitudes and practices of hand hygiene among nurses and doctors

Nurses had significantly better knowledge of hand hygiene than doctors (p-value <0.05) (Table 1). The responses of nurses were considerably better than doctors in 11 out of the 25 knowledge questions (Table 5). There was no significant difference between the attitudes in the two groups towards hand hygiene (p-value 0.102) (Table 1). However, significantly more nurses reported that they had sufficient knowledge about hand hygiene and that wearing gloves reduced the need of the HCWs to clean their hands compared to doctors (p-value < 0.05) (Table 6).

Significantly more nurses adopted better hand hygiene practices compared to doctors (p-value < 0.05) (Table 1). On the other hand, considerably more doctors admitted that they would

Table 2 Correct responses of HCWs to individual questions on knowledge about hand hygiene.

Question	Correct response	Incorrect response
1 Hand hygiene actions that prevent transmission of germs to the patient are done before touching a patient (yes)	233 (98.3%)	4 (1.7%)
2 Which type of hand hygiene method is required after removing examination gloves (rubbing/ washing)	227 (97%)	7 (3%)
3 Hand hygiene actions that prevent transmission of germs to the health care worker are done immediately after a risk of body fluid exposure (yes)	227 (95.8%)	10 (4.2%)
4 Hand hygiene actions that prevent transmission of germs to the patient are done immediately after risk of body fluid exposure (yes)	219 (93.6%)	15 (6.4%)
5 Hand hygiene actions that prevent transmission of germs to the health care worker are done after touching a patient (yes)	219 (93.2%)	16 (6.8%)
6 Artificial fingernail are associated with increased likelihood of colonization of hands with harmful germs (yes)	217 (93.1%)	16 (6.9%)
7 Damaged skin is associated with increased likelihood of colonization of hands with harmful germs (yes)	216 (92.7)	17 (7.3%)
8 Hand hygiene actions that prevent transmission of germs to the patient are done immediately before a clean/aseptic procedure (yes)	212 (91.0%)	21 (9%)
9 Wearing jewellery is associated with increased likelihood of colonization of hands with harmful germs (yes)	212 (90.6%)	22 (9.4%)
10 Hand hygiene actions that prevent transmission of germs to the health care worker are done after exposure to the immediate surroundings of a patient (yes)	210 (90.1%)	23 (9.9%)
11 Which of the following is the main route of transmission of potentially harmful germs between patients? (health care workers hands when not clean)	185 (78.4 %)	51 (21.6%)
12 Which type of hand hygiene method is required in after visible exposure to blood (washing)	182 (78.1%)	51 (21.9%)
13 Hand rubbing is more rapid for hand cleansing than hand washing (true)	178 (76.1%)	56 (23.9%)
14 Regular use of a hand cream is associated with increased likelihood of colonization of hands with harmful germs (no)	169 (72.8%)	63 (27.2%)
15 Which type of hand hygiene method is required after emptying a bed pan (washing)	168 (72.7%)	63 (27.3)
16 Which type of hand hygiene method is required before palpation of the abdomen (rubbing)	158 (66.9%)	78 (33.1%)
17 Which type of hand hygiene method is required before giving an injection (rubbing)	135 (57.4%)	100 (42.6%)
18 What is the minimal time needed for alcohol based hand rub to kill most germs on your hands? (20 sec)	132 (55.9%)	104 (44.1%)
19 Hand rubbing is more effective against germs than hand washing (false)	127 (53.6%)	110 (46.4%)
20 Which type of hand hygiene method is required after making a patient's bed (rubbing)	111 (47%)	125 (53%)
21 What is the most frequent source of germs responsible for health care associated infections? (germs already present on or within the patient)	108 (45.8%)	128 (54.2%)
22 Hand hygiene actions prevents transmission of germs to the health care worker immediately before a clean/aseptic procedure (no)	96 (40.5%)	141 (59.5%)
23 Hand washing and hand rubbing are recommended to be performed in sequence (false)	96 (41.9%)	133 (58.1%)
Which of the following should be avoided, as associated with increased likelihood of colonization of hands with harmful germs?		
24 Hand hygiene actions prevents transmission of germs to the patient after exposure to immediate surroundings of a patient (no)	67 (28.8%)	166 (71.2%)
25 Hand rubbing causes skin dryness more than hand washing (false)	65 (28.0 %)	167 (72.0%)

Table 3 Attitudes of HCWs towards hand hygiene and satisfaction with health facilities.

		Good attitude	Poor attitude
1	I adhere to correct hand hygiene practices at all times	203 (85.6%)	34 (14.4%)
2	I feel guilty if I omit hand hygiene	188 (81.7%)	42 (18.3%)
3	I have sufficient knowledge about hand hygiene	189 (79.8%)	48 (20.2%)
4	I feel frustrated when others omit hand hygiene	161 (72.8%)	60 (27.2%)
5	Adhering to hand hygiene practices is easy in the current setup	163 (69.2%)	72 (30.8%)
6	Wearing gloves reduce the need for hand hygiene	119 (50.6%)	116 (49.4%)
7	Sometime I have more important things to do than hand hygiene	104 (46.7%)	119 (53.3%)
8	I am reluctant to ask others to engage in hand hygiene	58 (25.3%)	171 (74.7%)
9	Emergencies and other priorities make hygiene more difficult at times	55 (23.9%)	153 (76.1%)
10	Newly qualified staff has not been properly instructed in hand hygiene in their training	49 (21.0%)	181 (79.0%)

Table 4 Practices of hand hygiene.

		Good practices	Poor practices
1	Infection prevention notice boards remind me to do hand hygiene	194 (82.9%)	40 (17.1%)
2	Hand hygiene is an essential part of my role	194 (82.2%)	42 (17.8%)
3	Infection prevention team have a positive influence on my hand hygiene	160 (69.0%)	72 (31.0%)
4	The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary	84 (35.6%)	152 (64.4%)
5	It is difficult for me to attend hand hygiene courses due to time pressure	72 (30.5%)	164 (69.5%)
6	Sometime I miss out hand hygiene simply because I forget	71 (30.4%)	162 (69.6%)

Table 5 Comparison of the knowledge among nurses and doctors.

		Doctors	Nurses	P value
1	Which of the following is the main route of transmission of potentially harmful germs between patients? (health care workers hands when not clean)	34.1%	65.9%	0.000
2	What is the most frequent source of germs responsible for health care associated infections? (germs already present on or within the patient)	31.5%	68.5%	0.004
Which of the following hand hygiene actions prevents transmission of germs to the patient?				
3	Before touching a patient (yes)	41.2%	58.8%	0.198
4	Immediately after risk of body fluid exposure (yes)	40.2%	59.8%	0.231
5	After exposure to immediate surroundings of a patient (no)	28.4%	71.6%	0.008
6	Immediately before a clean/aseptic procedure (yes)	38.2%	61.8%	0.000
Which of the following hand hygiene actions prevents transmission of germs to the health care worker?				
7	After touching a patient (yes)	41.6%	58.4%	0.342
8	Immediately after a risk of body fluid exposure (yes)	41.9%	58.1%	0.589
9	Immediately before a clean/aseptic procedure (no)	32.3%	67.7%	0.016
10	After exposure to the immediate surroundings of a patient (yes)	40.5%	59.5%	0.105
Which of the following statements on alcohol-based hand rub and hand washing with soap and water are true?				
11	Hand rubbing is more rapid for hand cleansing than hand washing (true)	39.3%	60.7%	0.105
12	Hand rubbing causes skin dryness more than hand washing (false)	46.2%	53.8%	0.245
13	Hand rubbing is more effective against germs than hand washing (false)	33.1%	66.9%	0.004
14	Hand washing and hand rubbing are recommended to be performed in sequence (false)	28.1%	71.9%	0.000
15	What is the minimal time needed for alcohol based hand rub to kill most germs on your hands? (20 sec)	41.7%	58.3%	0.513
Which type of hand hygiene method is required in the following situations? (Washing, rubbing or none)				
16	Before palpation of the abdomen (rubbing)	40.5%	59.5%	0.377
17	Before giving an injection (rubbing)	38.5%	61.5%	0.155
18	After emptying a bed pan (washing)	36.3%	63.7%	0.007
19	After removing examination gloves (rubbing/ washing)	40.5%	59.5%	0.023
20	After making a patients bed (rubbing)	36.0%	64.0%	0.069
21	After visible exposure to blood (washing)	36.8%	63.2%	0.006
Which of the following should be avoided, as associated with increased likelihood of colonization of hands with harmful germs?				
22	Wearing jewellery (yes)	38.7%	61.3%	0.003
23	Damaged skin (yes)	42.1%	57.9%	0.223
24	Artificial fingernails (yes)	41.0%	59.0%	0.326
25	Regular use of a hand cream (no)	40.2%	59.8%	0.258

Table 6 Comparison of the attitudes of doctors and nurses towards hand hygiene.

		Doctors	Nurses	P value
1	I adhere to correct hand hygiene practices at all times	84	119	0.851
2	I have sufficient knowledge about hand hygiene	37.6%	62.4%	0.013
3	Sometime I have more important things to do than hand hygiene	43.3%	56.7%	0.892
4	Emergencies and other priorities make hygiene more difficult at times	38.2%	61.8%	0.639
5	Wearing gloves reduce the need for hand hygiene	32.8%	67.2%	0.006
6	I feel frustrated when others omit hand hygiene	42.9%	57.1%	0.879
7	I am reluctant to ask others to engage in hand hygiene	32.8%	67.2%	0.124
8	Newly qualified staff has not been properly instructed in hand hygiene in their training	32.7%	67.3%	0.143
9	I feel guilty if I omit hand hygiene	41.0%	59.0%	0.184
10	Adhering to hand hygiene practices is easy in the current setup	39.3%	60.7%	0.315

Table 7 Comparison of hand hygiene practices and satisfaction with facilities among the different HCWs.

		Doctors	Nurses	p value
1	Sometime I miss out hand hygiene simply because I forget	31.0%	69.0%	0.030
2	Hand hygiene is an essential part of my role	43.8%	56.2%	0.167
3	The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary	34.5%	65.5%	0.129
4	Infection prevention team have a positive influence on my hand hygiene	33.8%	66.3%	0.000
5	Infection prevention notice boards remind me to do hand hygiene	38.1%	61.9%	0.014
6	It is difficult for me to attend hand hygiene courses due to time pressure	36.1%	63.9%	0.316

sometimes forget to clean their hands compared to nurses (p-value 0.03) (Table 7) and on the contrary, significantly more nurses reported that the infection control team positively affected their hand hygiene practices and that notice boards reminded them to clean their hands (p-value <0.05) (Table 9).

Discussion

HCWs involved in patient care should have adequate knowledge about hand hygiene and should receive training early on during their career before they get used to doing things the wrong way and developing poor practices and habits [12]. Providing various training courses to HCWs in hospitals has been known to increase hand hygiene compliance rates and to reduce HAIs [13] subsequently. Ansari et al. (2015)[14] compared the knowledge on hand hygiene in HCWs in Delhi before and after they were trained and found that in both groups it improved significantly from 2.2% to 45.5% in nurses and from 7.1% to 46.4% in doctors. Similarly, Ekwere and Okafore (2013) [15] have demonstrated that training of HCWs in infection control not only increased their knowledge about hand hygiene but it also improved their hand hygiene practices.

The data in this study indicate that currently, HCWs in Ribat University Hospital have inadequate knowledge, negative attitudes and poor practices of hand hygiene. This is an adverse finding but one that has been reported elsewhere. A study done in Addis Ababa, Ethiopia reported that the knowledge of HCWs was only found to be fair and that their practices were suboptimal [16]. Surprisingly, studies from other neighbouring countries, like Lagos revealed that knowledge, attitudes and practices of hand hygiene were far better than those found in our study [15]. Insufficient knowledge in the HCWs may be due to infrequent attendance of hand hygiene workshops while their poor attitudes may be due to understaffing, work overload, poor salaries and lack of motivation of the HCW. All of these factors are known to affect the attitudes of HCWs and have been reported elsewhere [17]. Both the insufficient knowledge of hand hygiene and poor attitudes in the HCWs negatively influence their hand hygiene practices. It therefore, comes as no surprise that less than one-fifth of the HCWs in this study adopted good hand hygiene practices. A study conducted in another tertiary hospital in Sudan found that only 41% of HCWs do not always clean their hands before touching patients [18].

This study revealed that nurses had significantly better knowledge and practices of hand hygiene but no significant difference in attitudes towards hand hygiene when compared to doctors. Studies that compared the knowledge, attitudes and practices of hand hygiene between doctors and nurses revealed varying results in the two groups with some reporting better knowledge, attitudes and practices among nurses than doctors and vice versa. One study conducted in Nigeria reported findings that were similar to ours where nurses had significantly better knowledge, attitudes and practices than doctors [19]. On the other hand, another study was done in Embu, Nigeria, found that despite both groups of HCWs having insufficient knowledge about hand hygiene doctors had significantly better knowledge than nurses [20]. Along similar lines, several studies in India found that doctors have better knowledge on hand hygiene than nurses and they attributed this difference to doctors receiving more higher education in India than nurses. [3]

It is believed that one of the reasons why nurses have significantly better knowledge about hand hygiene is because nurses play a more critical role in providing safe patient care, so nursing

education is more structured around hand hygiene than medical education [21,22]. It has been well documented in the literature that when nurses graduate from nursing schools, they have good hand hygiene knowledge and that they can safely practise in hospitals and follow infection control guidelines [21, 22].

This has, in fact been highlighted by several studies that have compared the knowledge of hand hygiene among nursing and medical students. In 2010 Van de Mortel et al.[23] carried out a study in Greece where they compared the knowledge of final year medical and nursing students. In their study they found that knowledge of hand hygiene among the nursing students was significantly better [23]. A more recent study done in a Sri Lankan University also found similar findings [24]. Studies carried out in India have also shown that the knowledge of nursing students to be significantly better than that of medical students [10].

Conclusion

Based on this study, we can conclude that the knowledge, attitudes and practices of HCWs in Ribat University hospital were extremely unsatisfactory with significant inconsistencies in their knowledge on hand hygiene. Urgent measures should be introduced to increase compliance of the HCWs with hand hygiene to reduce HAIs in the hospital and to provide safe patient care. Despite nurses having insufficient knowledge, poor attitudes and practices of hand hygiene they still demonstrated significantly better knowledge and practices than doctors in the study. There was no significant difference in the attitudes of both categories of HCWs. Training sessions on hand hygiene should be carried out more frequently and should target doctors who contribute to the spread of HAIs.

Limitation of the study

The response rate among participants was only 56%. This reduced the effective sample size and may have resulted in non-response bias. The results obtained from the study may not be a true reflection of the knowledge, attitude and practices of HCWs in Ribat University Hospital since HCWs neglected to answer some parts of the questionnaire.

Disclosure Statement

There were no financial support or relationships between the authors and any organization or professional bodies that could pose any conflict of interests.

Competing Interests

Written informed consent obtained from the patient for publication of this case report and any accompanying images.

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