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RESEARCH ARTICLE

HAND HYGIENE PRACTICE AMONG NURSES IN THE EMERGENCY DEPARTMENT AT SELECTED HOSPITAL IN MAKKAH AL MUKARAMAH

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ABSTRACT

Background: Hand hygiene is the single most important preventive measure for reducing nosocomial infections, however, nurses frequently do not wash their hands in emergency departments.
Aim: This study was carried out to assess hand hygiene practice among nurses in the emergency department.
Subjects and Methods: A cross-sectional observational study was conducted including a convenience sample of 60 staff nurses in the emergency department at selected hospital in Makkah Al-Mukaramah. Data were collected through a predesigned questionnaire to assess hand hygiene practice among nurses in the emergency department.
Results: The results of the present study revealed that there is statistically significant relationship between the nursing shifting and after touching contaminated surfaces. Also, there is statistically significant relationship between nursing shifting and the uses of alchol-chlornexidine hand rub (ACHR)/ soap in the morning, afternoon, and in the night.
Conclusion and Recommendations: The nurses' practice towards hand hygiene in the emergency department (ED) needs to be improved by the educational program approach. Based on the findings of the study, the researchers recommend providing written guidelines about hand hygiene for all healthcare providers and introducing and demonstrating hand hygiene protocols to all caregivers.

INTRODUCTION

Infection associated with health care affects hundreds of millions of patients worldwide, contributing to death or incapacity as well as generating additional costs to those of the disease which initially required patient care. The most common cause of healthcare-associated infections is person-to-person transmission of nosocomial pathogens via the hands of healthcare personnel. Nursing practices, such as direct touching, contact with bodily fluids, and wound care, can result in high levels of microorganism contamination[1-3]. Lijima and Ohzeki (2006)[4] have determined that the number of microorganisms found on the hands of nurses increased significantly after they had performed care procedures. The microorganisms that colonize the external layer of the skin are temporarily eradicated when hands are washed with antiseptic and antimicrobial agents[5-6]. The hand hygiene habits of nurses are thought to be poor for many reasons, which include the complicated structure of emergency department, the characteristics of the patients in emergency department, the heavy workload in such units, in addition to insufficient number of nurses[7-9].

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The quality of hand hygiene by nurses was poor, theoretically, choice of hand hygiene agent depends on the type of clinical procedure performed and the degree of contamination likely to result, but really in most cases there is no alternative to soap. Even when skin disinfectants are available they may be avoided because they are perceived to be damaging to skin when used frequently[10]. Studies indicated that large areas of the hand surfaces were missed by nurses asked to wash hands in their usual manner[11]. Hand hygiene (HH) by health care workers reduces health care associated infections. There are only a few studies of HH and other infection control practices among emergency department (ED) staff[12-13] and these have often reported poor hand hygiene. The administration and staff of the study ED perceived a problem with accessibility of HH facilities and therefore requested a wearable dispensing device and improving access to alcohol-based hand sanitizers is recommended to improve to hand hygiene in ED[14]. Hand hygiene is the simplest, most effective measure for preventing nosocomial (hospital-associated) infections, yet studies indicate that, on average, healthcare workers follow recommended hand hygiene procedures on less than half the number of occasions [15]. The term 'hand hygiene' includes two primary actions: (1) hygiene the hands with soap and water to decrease colonization of transient flora by removing dirt, soil, and loose

flora and (2) rubbing hands with a small amount of highly effective, fast-acting antiseptic agent, termed a 'hygienic hand rub' [16]. Studies show that adherence to hand hygiene practices in most hospitals is low; most of them below 50%.[17] Comparison of the results of these studies is hampered by differences in their methodology and settings.

Low adherence to recommendations has been described in physicians in comparison with that in nurses, that in nurses, in males, in intensive care units (ICU); whenever the number of patients per HCW or the number of opportunities for hand hygiene per hour are high; before patient contact; and during the week compared with the weekend[18]Some of the factors negatively influencing compliance are lack of awareness of recommendations, failure to identify which actions require hand hygiene, and skepticism about the significance of hand hygiene in cross-infection control.

In the largest hospital-wide survey of hand hygiene practices, predictors of poor adherence to hand hygiene measures were identified according to[19]:

- Professional category (physicians, nurses, pharmacists, technicians, etc.)
- Hospital unit (emergency department, pediatrics, maternity, adult medical, etc.)
- Time of day/week (day, evening, night shifts, and Monday through Sunday)
- Type and intensity of patient care (intensive, moderate, minimal care).

In one study of 2.834 observed opportunities for hand hygiene, researchers found the average adherence rate was a shockingly low 48%. Adherence was highest among nurses during weekends and in pediatric units. Non-adherence was higher in intensive-care units, during procedures that carried a high risk of bacterial contamination, and when the intensity of patient care was high. In other words, the higher the need for hand hygiene, the lower the adherence[19]. The lowest adherence rate (36%) was found in intensive care units, where indications for hand hygiene were typically more frequent. The highest adherence rate (59%) was observed in pediatrics wards, where the average intensity of patient care was lower than in other hospital areas. This study indicates that much needs to be done to improve adherence to hand hygiene practices[20]. Studies indicate that the frequency of hand hygiene or antiseptic hand scrubs by personnel is affected by the accessibility of hand hygiene facilities. In some institutions, only one sink or hand hygiene product dispenser is available in rooms housing several patients. This discourages hand cleansing between patients and adds extra steps and effort for caregivers[21]. Fortunately, dispensers for alcohol-based hand rubs do not require plumbing. They can be located in every patient-care unit, lavatory, near doorways, and in other convenient locations. In addition, staff may use pocket dispensers of alcohol-based hand rub products. To avoid confusion between soap and alcohol hand rubs, both dispensers should be clearly marked. Soap dispensers should be placed beside sinks. Alcohol-based cleanser dispensers should be placed some distance from sinks[22].

Caregivers need to know that hygiene their hands with soap and water after use of an alcohol hand rub is neither necessary nor recommended. When personnel feel a “build-up” of emollients on their hands after repeated use of alcohol hand gels, some manufacturers recommend hand hygiene with soap and water to remove excessive gel[23]. The lack of adequate hand hygiene by our healthcare providers continues to be the primary cause of infection in our country’s healthcare facilities. Nosocomial, or hospital acquired, infections are the most common and pervasive of all preventable adverse events and result in substantial direct and indirect costs to our nation, not to mention the substantial pain and suffering for the unfortunate patients that are affected.[24] Despite the current clear evidence and widespread acceptance that healthcare provider adherence with hand hygiene is the cornerstone of effective infection control, rates of adherence observed in numerous studies are disappointing. HH adherence among healthcare providers ranges from 5% to 81%, with an overall average of 40%. Physician adherence is commonly inferior to that of nurses. Previous studies attempting to improve HH behavior of healthcare workers have been unable to sustain success in improving infection control practices. A multidisciplinary, hospital-wide program promoting HH has been the most effective means of improving HH practice.[25] In U.S. hospitals today, hand hygiene is still the exception rather than the rule. Most studies agree that between 40 to 60% of all doctors and nurses fail to wash their hands between patients. Low-level compliance with hand hygiene is particularly poor in ICUs, where studies show that compliance does not exceed 40%.[12]

Why do healthcare workers continually fail to adequately wash their hands? The answer, unfortunately, remains elusive. Some of the reasons that have been suggested for such a low level of compliance include the lack of priority over other required procedures, insufficient time, inconvenient placement of hand hygiene facilities, allergy or intolerance to hand hygiene solutions, and lack of leadership from senior medical staff.[26] Nevertheless, new research suggests that having a busy workload, being in a technical specialty and performing activities with a high risk of cross-transmission are all factors that increase the odds that a physician will not follow hospital hand hygiene guidelines. Some studies show that the failure to properly wash ones hands is inversely related to status: Doctors are less likely to wash than nurses' aides.[28] Hand hygiene with tap water and detergents suspends millions of microorganisms and allows them to be rinsed off; this process is referred as mechanical removal of transient microorganisms. Hand hygiene with decontaminating agents kills or inhibits the growth of microorganisms, this referred as chemical removal for both transient and some resident microorganisms.[29-31] One study performed in Saudi Arabia shows that of total 163 healthcare professionals were surveyed for hand hygiene compliance; 57 (35%) were doctors, 92 (56.4%) nurses, and 14 (8.6%) patient care technicians. The overall compliance rate was 50.3%, and its distribution among staff was as follows; doctors 49.1%, nurses 52.2%, and technicians 42.8%. The highest compliance rate among doctors and nurses was found in surgical units. A low compliance in high intensity patient care area was observed such as in the Emergency Room and out patient department. The patient care technicians showed

highly variable results, as their compliance rate was 100% in medical units while 0% in various other clinical areas.[32] Low adherence to hand hygiene remains as a major constraint in the implementation of infection control program. There are new approaches to health promotion monitoring that include direct observation, self-reporting by healthcare workers, measurement of hand hygiene product usage, and electronic methods.[33] No ideal method of monitoring hand hygiene compliance has been developed;[34] however improving hand hygiene is an essential intervention to achieve one of the patient safety goals in a healthcare setting.

Significance of the study

Hand hygiene is the single most important technique in the prevention and control of nosocomial infections. The safest way for health care workers to protect themselves and their patients is through careful hand hygiene. At a time when costs for patient care are increasing and hospitals are threatened by bacterial resistance, prevention of nosocomial infections is a critically important issue.

Aim of the study

This study was carried out to assess hand hygiene practice among nurses in the emergency department.

Hypotheses

Nurse employees in the emergency department have a satisfactory skill that enables them to perform and practice hand hygiene according to required indications.

SUBJECTS & METHODS

Research design

A descriptive and quantitative approach was used for this study.

Subjects

A convenience sample consisting of 60 staff nurses (32 female & 28 male) employed in the emergency department at selected hospital in Makkah Al-Mukaramah were selected as participants in this study.

Setting

The study was conducted in the emergency department (both male ED and female ED) at selected hospital in Makkah Al-Mukaramah.

Tools of the study

The data was collected using An observational checklist for Hand hygiene in ED was obtained from (WHO guidelines on hand hygiene in health care 2009)[1] and itincluded: time required by the nurses to wash their hands (before patient care activities, after patient care activities, after touching contaminated surfaces, after gloves removal), and the solution that may be used in hand hygiene soap or alchol-chlornexidine hand rub (ACHR). Observation was done during routine work. On the basis of the indications for hand hygiene listed in the recommendations of the hand hygiene guideline of the CDC and prevention,[35] for assessing nurses' practice and situational analysis of hand-hygiene and drying practices between patients' contact in ED. The researcher noted when a hand hygiene episode was indicated and whether the staff member used either soap and hand hygiene or the alcohol sanitizer.

Methods

1. An official letter was directed from the Dean of the Faculty of Nursing to the Director of the Hospital.
2. Administrative permission to conduct the study was obtained from the Director of the Hospital and the head nurse of the emergency department after explanation of the aims of the study.
3. The tools of data collection were developed after reviewing the literature.
4. The developed tools were reviewed by consultant specialists for content validity, clarity, feasibility, and applicability of the tools.
5. Permission was obtained from nurses in the emergency department who participated in the study after explanation of the aims and nature of the study.
6. A pilot study was conducted on 10% of the study subjects (6 nurses) to test the clarity and applicability of the selected tools, and the necessary modifications were implemented as a result. The nurses selected for the pilot study were included as subjects of the study.

The data was collected over a period of 3 months (August, September and October) in 2012. Firstly, the researchers were listed about 213 indications for hand hygiene related only to ED that collected from many resources, [35]on the basis of these indications that noted when a hand hygiene episode was indicated and whether the staff member used. The number of indications for hand hygiene was estimated according to the following assessment:

1. Directly observe personnel long enough to observe approximately 213 indications *(213 indication of hand hygiene were observed during a period of 8 hours)*.
2. Divide the total number of indications by the total time observed to obtain a mean number of indications for hand hygiene per hour *(213/8= 27 indication per hour)*.
3. Multiply the value obtained in step 2 by 24 to get the mean number of indications per day *(27×24=648 indication per day)*.
4. Obtain the patient census for the period the observations were made *(Patient census for day of observation was 35)*.
5. Calculate mean number of indications for hand hygiene per day per patient by dividing mean number of indications per day by the census value *(648/35=18 indications for hand hygiene per day per patient)*.

In second step, direct observations for the subjects using hand hygiene observational checklist in ED were conducted by the researchers to determine actual frequency and indications for

hand hygiene. Researchers recorded the number of patient contacts and activities for each participant during two-hour observation periods in each shift. Activities were categorized as either clean or dirty according to indication. The use of gloves was noted and hand-hygiene technique and duration were recorded. A hand-hygiene break in technique was defined as failure to wash hands after a patient contact and before proceeding to another patient or activity. The observers conducted observations openly, without interfering with the ongoing work, and keep the identity of the health care providers confidential. Finally, the researchers recorded the hand hygiene behavior of each participant in their hand hygiene observation checklist, and the researchers conducted 60 assessment sheets about hand hygiene for those participants to assess their performance regarding hand hygiene practice.

Statistical analysis

The collected data was organized, categorized, tabulated and statistically analyzed to evaluate the difference between the groups under study as regards the various parameters using the Statistical Package for Social Science (SPSS) program, version 16.0 for Windows Data Editor. The statistical significance and associations were assessed using the arithmetic mean ($\overline{X}$), the standard deviation (SD), and the T-test to calculate the difference between two independent variables. A significant P value was considered when $P < 0.05$, and it is not significant when $P > 0.05$.

Ethical consideration

This study was approved by Um Al Qura University, the selected hospital, and permission to conduct the research during the shift was obtained from the head nurse of the emergency department.

RESULTS

The results obtained from this study are categorized as follows

Table (1): shows the characteristics of the study sample. It included 60 nurses, 53.3% of them were females. Concerning years of experience, 51.7% had one year experience. The majority (96.7%) of subjects had the profession of nurse and 45.0% worked in the morning shift. Most of the sample (86.7%) had attended a hand hygiene training program and (88.3%) used an alcohol-based hand rub. Table (2): shows that, the most of the study sample across day, evening and night shifts responded don't perform hand hygiene before patient care activities (77.8%, 72.2% and 80%) respectively. But, during day, evening and night shifts, the majority of the study sample (92.6%, 83.3%, and 86.7% perform hand hygiene after patient care activities. There is statistically significant relationship between the nursing shifting and before or/ after patient care activities because the P value > (0.05). Table (3): Shows that the percentage of nurses who perform hand hygiene in emergency department after touching contaminated surfaces are more than who did not perform as it is clear from the observation percentages in the three shifts as follows (96.3%, 83.3 %, 86.7 %)respectively.

Table 1. Socio-demographic characteristics of nurses in the emergency department at King Abdul-Aziz Hospital

Socio-demographic characteristics	Frequency (60)	% (100)
Gender:	32	53.3
Females	28	46.7
Males		
Years of experience:	31	
1 year	13	51.7
1-4 years	12	21.7
5-10 years	4	20.0
> 10 years		6.7
Profession:		96.7
Nurse	58	3.3
Auxiliary nurse	2	
Nursing shifts:		45.0
Day (7am-3pm)	27	30.0
Evening (3pm-11pm)	18	25.0
Night (11pm-7am)	15	
Training in hand hygiene:		86.7
Yes	52	13.3
No	8	
Use of alcohol-based hand rub:	53	88.3
Yes	7	11.7
No		

Also, the table found that the percentage of nurses who did not perform hand hygiene in emergency department after glove removal are greater than who performed, as it is clear from the observation percentages in the three shifts as follows (85%, 77.8%, and 86.7%). And there is statistically significant relationship between the nursing shifting and after touching contaminated surfaces and after glove removal because the P value < (0.05). Table (4): shows that, the percentage of nurses who use ACHR as hand hygiene in emergency department are more than the percentage of nurses who use soap, and also more than the none of uses, as it is clear from the observation percentages as follows (85.2%, 77.8%, 73.4%)respectively. Also, there is statistically significant relationship between nursing shifting and the uses in the morning, afternoon, and in the night because the P value < (0.05). Table (5): Shows that there is statistically significant relationship between the nurses' gender and their hand hygiene practice before/ after patient care activities as (T-test = 4.867and P value < 0.05). Also, the table shows that there is statistically significant relationship between the nurse's gender and their hand hygiene practice after touching contaminated surfaces/ after glove removal and the uses of ACHR or soap as (T-test = 4.567, and 4.215 and P value < 0.05). Table (6): Shows that there is no statistically significant relationship between the nurses' years of experience and their hand hygiene practice before/ after patient care activities, after touching contaminated surfaces/ after glove removal and the uses of ACHR or soap as (T-test = -0.097, -0.668 and -0.102 and P value > 0.05). Table (7): Shows that there is statistically significant relationship between the profession of nurses and their hand hygiene practice before/ after patient care activities as (T-test = 4.867and P value < 0.05).

Also, the table shows that there is statistically significant relationship between the profession of nurses and their hand hygiene practice after touching contaminated surfaces/ after glove removal and the uses of ACHR or soap as (T-test = 4.340 and 4.185 and P value < 0.05).

Table 2. Hand hygiene observation for nurses in ED before and after patient care activities

Floor	Before Patient Care Activities				After Patient Care Activities				T-test	P Value	Sig.
	Yes		No		Yes		No				
Assigned Time	No. (60)	% (100)	No. (60)	% (100)	No. (60)	% (100)	No. (60)	% (100)			
Day (7am-3pm) *Nurses' no=27*	6	22.2	21	77.8	25	92.6	2	7.4	3.608	< 0.05	(S)
Evening (3pm-11pm) *Nurses' no=18*	5	27.8	13	72.2	15	83.3	3	16.7	3.418	< 0.05	(S)
Night (11pm-7am) *Nurses' no=15*	3	20.0	12	80.0	13	86.7	2	13.3	3.573	< 0.05	(S)

Table 3. Hand hygiene observation for nurses in ED after touching contaminated surfaces and after glove removal

Floor	After Touching Contaminated Surfaces				After Glove Removal				T-test	P Value	Sig.
	Yes		No		Yes		No				
Assigned Time	No. (60)	% (100)	No. (60)	% (100)	No. (60)	% (100)	No. (60)	% (100)			
Day (7am-3pm) *Nurses' no=27*	26	96.3	1	3.7	4	15	23	85.0	4.108	< 0.05	(S)
Evening (3pm-11pm) *Nurses' no=18*	15	83.3	3	16.7	4	22.2	14	77.8	3.718	< 0.05	(S)
Night (11pm-7am) *Nurses' no=15*	13	86.7	2	13.3	2	13.3	13	86.7	3.873	< 0.05	(S)

Table 4. Hand hygiene observation for nurses in ED about the uses of ACHR and soap

Floor	The Uses of ACHR		The Uses of Soap		Non		T-test	P Value	Sig.
Assigned Time	No. (60)	% (100)	No. (60)	% (100)	No. (60)	% (100)			
Day (7am-3pm) *Nurses' no.=27*	23	85.2	3	11.1	1	3.7	3.697	< 0.05	(S)
Evening (3pm-11pm) *Nurses' no.=18*	14	77.8	1	5.5	3	16.7	3.549	< 0.05	(S)
Night (11pm-7am) *Nurses' no.=15*	11	73.4	2	13.3	2	13.3	3.454	< 0.05	(S)

Table 5. The relation between the nurses' gender and the observation of hand hygiene practice among nurses in ED

Gender	Female *(n=32)*		Male *(n=28)*		T-test	P Value	Sig.
	No.	%	No.	%			
Before /After patient care activities	23	71.9	7	25	4.867	< 0.05	(S)
After touching contaminated surfaces /After glove removal	24	75.0	7	25	4.567	< 0.05	(S)
The Uses (ACHR/ Soap)	21	65.6	10	35.7	4.215	< 0.05	(S)

Table 6. The relation between the nurses' years of experience and the observation of hand hygiene practice among nurses in ED

Years of experience	1 year *(n=31)*		1-4 Years *(n=13)*		5-10 years *(n=12)*		> 10 years *(n=4)*		T-test	P Value	Sig.
	No.	%	No.	%	No.	%	No.	%			
Before /After patient care activities	7	22.6	3	23.1	3	25.0	1	25.0	-0.097	> 0.05	(NS)
After touching contaminated surfaces /After glove removal	7	22.6	5	38.5	3	25.0	1	25.0	-0.668	> 0.05	(NS)
The Uses (ACHR/ Soap)	7	22.6	4	30.8	4	33.3	2	50.0	-0.102	> 0.05	(NS)

Table 7. The relation between the profession of nurses and the observation of hand hygiene practice among nurses in ED

Profession	Nurse (n=58)		Auxiliary nurse (n=2)		T-test	P Value	Sig.
	No.	%	No.	%			
Before /After patient care activities	42	72.4	0	00.0	4.867	< 0.05	(S)
After touching contaminated surfaces /After glove removal	43	74.1	1	50.0	4.340	< 0.05	(S)
The Uses (ACHR/ Soap)	41	70.7	1	50.0	4.185	< 0.05	(S)

DISCUSSION

This study has demonstrated that nurses in ED commonly wash their hands less frequently than they should, Failure to wash hands was attributed to many factors. About nursing shifts in EDs, this study reveals that about half of the study sample of nurses works the day shift and this is due to the increased numbers of patients to the ED during the day time more often than during the evening and night. It also shows that There is statistically significant relationship between the nursing shifting and before or/ after patient care activities as nurses have more compliance during day shifts than evening shifts. Although one systematic review studied hand hygiene compliance among nurses revealed that the effect of the time of day (daytime shifts vs evening, night, or weekend shifts) was studied in 10 articles, with 6 studies showing no effect for time of day.[36] In the present study the majority of nurses have received formal training in hand hygiene during the past three years, while only 13,3% of nurses who responded had not received any formal training. The results disagree with a previous study on hand hygiene in the emergency department: degree of compliance, predictors and change over time. More than half of nurses in that study (59%) had attended training sessions about hand hygiene in the two years before conducting of study[37]. Furthermore, there is a statistically significant correlation between formal training in hand hygiene in the last three years and the nurses' practice, and this reflects that training programs about hand hygiene are important to improve this skill among nurses in EDs. These results were in accordance with [38, 39] who stated that when the influence of training on the hand-hygiene behavior of nurses was assessed, there was a significant increase in the frequency of hand-hygiene events in a single shift. Similarly, other studies found that the total time spent on hand hygiene by assistant nurses increased significantly after training.

A further study [40] aimed at changing hand-hygiene behaviors determined that, following training, nurses washed their hands more frequently before providing care to patients. The results obtained in the present study imply that the nurses were affected by the training, that they understood the importance of hand hygiene after the training, and thus spent more time on it as a result. Regarding the use of an alcohol-based hand rub for hand hygiene, most of the nurses in this study preferred to use hand hygiene with alcohol-based hand rub, and the number of those who reported hygiene their hands with antiseptic soap was low. The reason for this is that bars of soap may become contaminated during use and thus trigger an outbreak. These results were in accordance with [41] who stated that most of medical and nursing staff cleans their hands more frequently by rubbing them with alcohol-based hand products than by hygiene with soap. Another study [42] stated that the availability of alcohol-based hand antiseptics in units at all times, and the emphasis on the importance of this practice during in-service training might have influenced the preference of the nurses. Regarding hand hygiene observation for nurses in ED before and after patient care activities, the most of the nurses don't perform hand hygiene before patient care activities across day, evening and night shifts. But, during day, evening and night shifts the majority of the nurses perform hand hygiene after patient care activities, and there is statistically significant relationship between the nursing shifting and before or/ after patient care activities.

Present study in Saudi Arabia also revealed a low hand hygiene non-compliance after body fluid exposure risk (30.8%), after patient contact (16.9%), and after contact with patient surroundings (50%). Higher levels of non-compliance were found before patient contact (59.3%). The event before patient contact has a significant 6 times higher risk of hand hygiene non-compliance compared to the event after patient contact. The WHO found poor levels of compliance before an aseptic task and it is suggested that activities that are high risk to the patient have lower compliance.[43,44]Allegranzi and Pittet reported that HCW compliance was high when hands were visibly dirty or sticky.[45] These activities have a perceived element of risk to them, for example, after exposure to body fluids[46]. In addition to hand hygiene observation for nurses in ED after touching contaminated surfaces and after glove removal, this study found that the percentage of nurses who performed hand hygiene in emergency department after touching contaminated surfaces are higher than who did not perforemed. This is congruent with another study that stated that the percentage of hand hyegiene compliance before patient contact (21%) rather than after (47%) patient contact[36]. Regarding the relationships between socio-demographic characteristics of the nurses and observation of their hand hygiene according to indications and uses in ED, this study revealed that there is statistically significant relationship between the nurses' gender and profession and their hand hygiene practice before/ after patient care activities, hygiene practice after touching contaminated surfaces/ after glove removal and the uses of ACHR or soap. This confirmed what was reported by a previous study [47] on hand hygiene frequency in selected hospitals and among adults in EDs, which showed that females hand washed more frequently than males following use of toilet facilities.

Studies [48, 49] suggested that inter-gender differences in hand hygiene behavior may be the result of intrinsic differences in the emphasis parents place on hand hygiene for girls and boys. It also may be the case that females tend to be more compliant. Furthermore, this study revealed that there is no statistically significant relationship between the nurses' years of experience of nurses and their hand hygiene practice before/ after patient

care activities, hygiene practice after touching contaminated surfaces/ after glove removal and the uses of ACHR or soap. While Karabay *et al.* (2005) note that hand hygiene compliance is seen more in junior nurses and newly recruited staff[50]. Although, the knowledge, attitude and behavior toward hand hygiene are present among nurses in ED in this study but, improving hand hygiene perception to the nursing students needs both understanding and motivation about their individual's behavior. Furthermore, to evaluate specific actions that contributes to the risk factors of the patient's health.

Conclusion

The study shows that overall nurse employees in the emergency department of selected hospital in Makkah Al-Mukaramah have adequate practicetowardsh and hygiene, but their professional practice needs to be improved through training courses which enhance their performance.

Recommendation

Based on the findings of the study, the researchers recommend

1. Provision of written guidelines about hand hygiene for all healthcare providers.
2. Introduction and demonstration of hand hygiene protocols to all caregivers.
3. Encouragement for leaders to begood role models and support antiseptic hand hygiene practice.
4. Monitoring and feedback for all healthcare providers, including physicians, nursing care providers, food service personnel, laboratory technicians, pharmacists, and therapists.

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