ORIGINAL ARTICLE

Assessment of knowledge, attitude and practice of hand washing among health care workers in Ain Shams University hospitals in Cairo

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Key words

Hand washing • Health care workers • Knowledge • Attitude • Practice • Egypt

Summary

Most nosocomial infections are thought to be transmitted by the hands of health care workers. The aim of this work was to assess the knowledge, attitude and practice of hand washing among health care workers (HCW) in Ain-Shams University hospitals and to investigate the presence of the necessary facilities and supplies required for hand washing (HW) in ten wards. A cross-sectional descriptive and observational study was conducted for six months from June till November 2006. Observation of the HCW for hand washing practice was done at any opportunity of contact with the patients in the different wards by members of the infection control team. Knowledge & attitude of HCW towards hand hygiene was done through self-administered questionnaire to HCW in 10 different departments. The total opportunities observed were 2189 opportunities. Doctors showed a significantly higher compliance (37.5%) than other groups of HCW (P = 0.000), however only 11.6% of the opportunities observed for doctors were done appropriately. The most common type of HW practiced among HCW was the routine HW (64.2%) and the least was the antiseptic HW (3.9%). Having a short contact time and improper drying (23.2%) were the most common errors that lead to inappropriate HW. Most of the wards had available sinks (80%) but none of them had available paper towels. The mean knowledge score was higher in nurses compared to doctors (42.6 ± 11.7 versus 39.1 ± 10.5). Most of the nurses (97.3%) believe that administrative orders and continuous observation can improve hand washing practices. Implementation of multifaceted interventional behavioral hand hygiene program with continuous monitoring and performance feedback, increasing the supplies necessary for HW and institutional support are important for improving the compliance of hand hygiene guidelines.

Introduction

Most nosocomial infections are thought to be transmitted by the hands of health care workers. It has long been known that hand hygiene among health care workers plays a central role in preventing the transmission of infectious agents. Hand-washing (HW) is the most effective way of preventing the spread of infectious diseases [1]. But despite a Joint Commission requirement that Centers for Disease Control and Prevention hand hygiene guidelines be implemented in hospitals, compliance among health care workers remains low [2].

The reasons for low compliance to hand hygiene have not been defined in developing countries probably due to limited studies on hand hygiene [3]. Factors that contribute to non compliance to HW among health care workers are: lack of awareness and knowledge among health care workers as regard the importance, techniques, methods and quality of hand hygiene [4-8].

Moreover human factors that lead to low compliance to hand hygiene are 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]. Attitude is a significant predictor of intention to perform hand hygiene [11].

Improved compliance with hand washing was associated with a significant decrease in overall rates of nosocomial infection and respiratory infections in particular [13].

Hand hygiene technique is seldom incorporated into research studies and audits designed to increase compliance. As a result, numerous unanswered questions remain concerning this aspect of hand hygiene [13]. In order to be effective, efforts to improve compliance with hand washing guidelines must be multifaceted incorporating cognitive, emotional and behavioral aspects and should include increasing the availability and accessibility of hand washing sinks and alcohol-based hand rubs [14, 15].

Aim of the work

1) Assessment of knowledge, attitude and practice of hand washing among health care workers (HCW) in Ain- Shams University hospitals.
2) Careful inspection of ten wards in Ain- Shams University hospitals for facilities required for hand washing.

Subjects and methods

Design of the study

A cross sectional study was conducted in Ain Shams University hospitals from June till November 2006.

Study observations

This study aimed at checking all opportunities of hand washing practices among HCW in ten wards of Ain Shams University hospitals. Hand washing opportunities are those where the HCW could do invasive procedures, come into personal contact with the patient, do non-invasive procedures as blood pressure or temperature measurement, body fluid contact, waste disposal or come in contact with contaminated inanimate objects. Multiple opportunities could be observed for a single health care worker.

Data collection

Two infection control nurses from ten departments were trained on observing hand washing opportunities and filling out the forms needed.

The trained nurses filled the observational forms which recorded the events in each opportunity observed and in a covert manner. The observational form included a recording if the hand washing was done or not, also if done what was the type of hand washing and what type of errors if the HW was done incorrectly.

A ward inspection form was also filled by checking the availability of facilities needed for hand washing in each department, as sinks, soap, drying materials, alcohol based hand rubs, presence of gloves, hand hygiene guidelines and posters.

Instruments

Three research instruments were used in this study:

a) Hand washing observation form.
b) Ward inspection form.
c) Self administered questionnaire to assess the knowledge and attitude of health care workers towards hand hygiene practice.

Questionnaire of the study

Knowledge and attitude of HCW towards hand washing practices were assessed by a self administered questionnaire. This questionnaire included 20 questions for doctors or nurses and only 10 questions for workers assessing their knowledge about hand hygiene. It covered many aspects of hand washing practices as indications, techniques, minimum time required for each technique, materials used in hand washing. Three answers were offered after each question as True, false or unsure. Furthermore the questionnaire included questions on alcohol hand rubbing and using of gloves with hand washing.

Attitude questionnaire was distributed to nurses and included four questions based on Likart scale. This questionnaire aimed mainly on studying the attitude of HCW towards methods of improvement of hand washing practice in their workplace. Totally agree and agree answers were considered as a positive attitude.

A total score was given to both the knowledge and attitude questionnaire (out of 20). Forms were revised for completeness and consistency. Data entry, data checking and data analysis were done with the program SPSS (Statistical package for social science) version 11.0.

The study questionnaire had a score of 0.680 on testing its internal consistency by Alpha Cronbach's reliability analysis test.

Ethical consideration

Approval of the design and steps of the study were conducted with members of the infection control unit in Ain Shams University hospitals. Oral consent was taken from doctors and nurses before answering the questionnaires of the study. The observation of the hand washing practices is considered among the routine checking of infection control activities by the infection control nurse.

Results

A total of 2189 opportunities among health care workers in Ain Shams University hospitals were observed for compliance to hand Hygiene.

Most of the observed opportunities for hand washing were done by nurses (1180) followed by doctors (465).

Tab. I. Compliance to hand hygiene among different groups of health care workers in Ain Shams University.

Health care workers	Opportunities Observed Total	Hand Washing			
		Done		Appropriate	
		N.	(%)	N.	(%)
Doctors	465	174	37.5	54	11.6
Nurses	1180	429	36.4	44	3.7
Housekeepers	296	67	22.6	1	0.3
Others*	248	75	30.2	12	4.8
Total	2189	745	34.0	111	5.1
		$X^2 = 23.9$ P = 0.000		$X^2 = 52.5$ P = 0.000	

*Others include waste disposal workers and janitors

Tab. II. Compliance to hand hygiene among different departments and in different procedures in Ain Shams university hospitals.

	Opportunities Observed	Hand Washing			
		Done	N. %	Appropriate	N. %
Departments:					
Orthopedic	115	16	13.9	8	6.9
Neurosurgery	157	2	1.3	0	0
Plastic surgery	294	32	10.9	4	1.3
General surgery 7	156	63	40.4	0	0
NICU Pediatric	480	300	62.5	67	13.9
NICU Gynecology	345	136	39.4	29	8.4
Hematology	274	73	26.6	3	1.1
Chest ICU	368	123	33.4	0	0
Procedures:					
Invasive procedures	753	258	34.3	34	4.5
Non-invasive procedures	501	160	31.9	39	7.7
Personal contact	157	69	43.9	7	4.4
Body fluids contact	191	76	39.8	22	11.5
Contaminated inanimate objects	249	52	20.9	3	1.2
Waste handling	224	60	26.8	3	1.3
After using gloves	114	70	61.4	3	2.6
Total	2189	745	34.0	111	5.1

Collectively doctors (37.5%) showed a significantly higher compliance to hand washing compared to other groups of health care workers (P = 0.000), however only 11.6% of the opportunities observed from doctors were done in an appropriate way (Tab. I).

The departments included in the observations of opportunities of hand washing were orthopedic, neurosurgery, plastic and general surgery (722 observations), pediatric, gynecology and chest intensive care units (1193 observations) and the hematology departments (Tab. II).

The most practiced type of hand washing among HCWs was the routine hand washing (64.2%) and the least was the antiseptic hand wash (3.9%) (Tab. III).

The prevalence of hand washing was higher after doing the different procedures or interventions than before doing them, yet hand washing was done in a more appropriate way before doing the different intervention except for the non-invasive procedures were it was nearly similar before and after.

The knowledge questionnaire was filled by 152 HCW. The mean knowledge score was higher among nurses compared to doctors (42.6 ± 11.7 versus 39.1 ± 10.5).

The assessment of the knowledge of HCWs in different departments showed that the highest mean score was in the Neonatal Intensive Care Unit (NICU) pediatric department. Doctors had high mean score in knowledge in General surgery department 7 (47.5 ± 8.6), nurses (48 ± 2.7) and workers (63.3 ± 1105) in the NICU pediatric department (Tab. IV).

Although the highest mean knowledge of hand washing was among nurses in the NICU pediatric 48.0 ± 2.7 yet the lowest attitude score was found among nurses in the same department 68.0 ± 7.5 (Results are not shown in tables).

As regards the attitude of nurses towards hand hygiene, it was found that 96% of nurses believe that hand washing is protective to health care personnel against infection. Also it is noted that 97.3% of the nurses believe that administrative orders and continuous observation can improve hand washing practices. As regards lowering of nosocomial infection rates 92% of the nurses believe that this method (Hand washing) can lower nosocomial infection rates more than any other method of infection control.

Only 70.7% of the nurses had positive attitude towards the improvement of hand washing by watching role models do hand washing (Tab. V).

The most common form of inappropriate hand washing was in the improper drying and having short contact time (23.2%) (Fig. 1).

As regards the wards inspection for HW supplies and facilities, most of the wards had available sinks (80%) but none of them had available paper towels for drying of the hands (Tab. VI).

Discussion

Hand hygiene prevents cross infection in hospitals, however adherence to guidelines is commonly poor.[16] While the techniques involved in hand hygiene are simple, the complex interdependence of factors that determine hand hygiene behavior makes the study of hand hygiene complex [17].

Tab. III. Appropriateness of hand washing in different types of hand washing and before and after different procedures among HCW in Ain Shams University hospitals.

	HW done		Appropriate HW	
	N.	%	N.	%
Types of hand washing (HW):				
Routine HW	480	64.2	17	3.5
Antiseptic HW	29	3.9	8	27.6
Alcohol hand rub	236	31.7	86	36.4
Total	745	100	111	14.9
Appropriate HW before and after interventions	**N. of HW done**			
1 - Invasive Procedure				
Before	107		22	20.6
After	151		12	7.9
Total	258		34	13.1
2 - Non invasive Procedure				
Before	67		16	23.9
After	93		23	24.7
Total	160		39	24.4
3 - Personal contact				
Before	22		4	18.2
After	47		3	6.4
Total	69		7	10.2
4 - Body fluids contact				
Before	19		12	63.2
After	57		10	17.5
Total	76		22	28.9
5 - Contaminated inanimate objects				
Before	14		2	14.3
After	38		1	2.6
Total	52		3	5.8
6 - Wastes handling				
Before	4		1	25.0
After	56		2	3.6
Total	60		3	5.0
7 - Using gloves				
Before	2		1	50
After	68		2	2.9
Total	70		3	4.3

Tab. IV. Comparison between the mean knowledge scores of HCWS, doctors, nurses and workers in different departments in Ain Shams University.

Department	HCWS N = 152	Doctors N = 42	Nurses N = 75	Workers N = 35
			Mean+ SD	
Orthopedic	36.7 ± 15.2	25.8 ± 8.0	44.2 ± 15.3	50.0 ± 0
Neurosurgery	42.9 ± 10.1	33.3 ± 2.8	44.0 ± 10.4	47.5 ± 9.5
Plastic surgery	41.8 ± 11.9	40.0 ± 7.0	37.7 ± 11.9	55.0 ± 5.7
General Surgery 7	42.2 ± 9.5	47.5 ± 8.6	41.4 ± 9.8	40.0 ± 10.0
NICU Pediatric	51.8 ± 9.5	46.6 ± 5.7	48.0 ± 2.7	63.3 ± 11.5
ICU Pediatric	41.2 ± 8.5	41.2 ± 8.5		
NICU gynecology	41.7 ± 10.4	42.5 ± 9.5	43.3 ± 11.7	37.5 ± 9.5
ICU gynecology	44.1 ± 14.8	45.0 ± 17.7	45.0 ± 10.0	40.0 ± 28.2
Hematology	44.7 ± 13.4	42.0 ± 2.7	42.7 ± 16.6	52.0 ± 10.9
Chest ICU	36.0 ± 12.8	35.0 ± 9.3	41.5 ± 10.8	26.0 ± 15.1
Collective mean knowledge score of doctors, nurses and workers = 39.1 ± 10.5, 42.6 ± 11.7 and 44.2 ± 15.0 respectively				

Tab. V. Assessment of attitude towards hand washing of Nurses in Ain Shams University.

Attitude of nurses	N.	%
1 - HW is protective to health care personnel	72	96.0
2 - HW can be improved by administrative orders and continuous observation	73	97.3
3 - HW lowers nosocomial infections more than any other methods of IC	69	92.0
4 - HW can be improved by role models	53	70.7

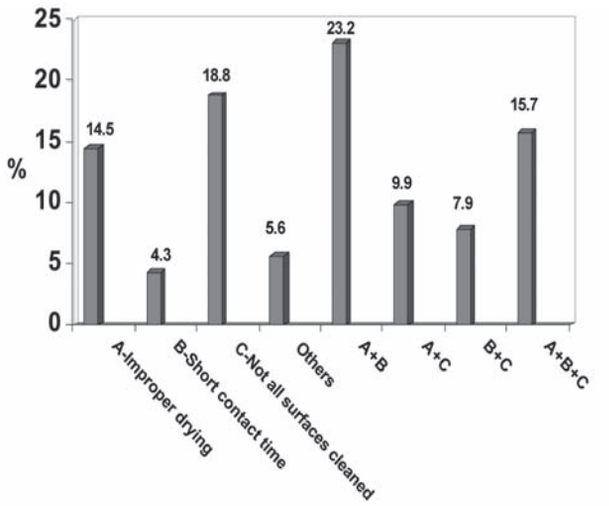
In our study the overall hand hygiene compliance among health care workers is 34%, this agrees with Patarakul [9] who reported that hand hygiene among HCWs before patient contact was less than 50%. Also this compliance rate comes in agreement with Pittet [18] who observed 20000 opportunities for hand hygiene before implementing a hand hygiene campaign during routine patient care in a teaching hospital in Geneva and the compliance to HW was 48%. This gives an idea for our need to such programs in order to raise our compliance to hand hygiene. Our result was much better than Kim [19] who reported overall compliance of hand washing to be 22.1%.

As regard compliance to hand hygiene in chest Intensive Care Unit (ICU) was 33.4%, in NICU pediatrics 62.5% & NICU in gynecology department 39.4%. These results were much better than Rosenthal [20] who reported a rate of 23.1% before implementing a hand hygiene education, training and performance feedback program in one medical surgical ICU and one coronary ICU of one hospital in Argentina. Also our results concur with Lipsett [21] who reported a range of 28%-74% in his study. Our results were comparable with Won [12] study in a level III NICU in a teaching hospital where he found compliance to hand hygiene to be 43%.

Doctors showed the highest compliance to HW (37.5%) in comparison to nurses (36.4%) and housekeepers (22.6%) and this disagrees with Lipsett [21] who reported a higher compliance among nurses (50%) compared to doctors (15%) and nursing supporting personnel (37%). Minimizing the gap found between the knowledge and attitude in nurses as found in Pediatric NICU could improve the compliance rates to HW in nurses.

Good hand washing technique, ensuring that all surfaces of the hands receive contact with the decontaminating agent, has been accepted for many years [13]. Inappropriate hand washing was observed in 23.2% of the opportunities for hand washing in our study. The causes for inappropriate hand washing were having a short contact time less than 30 seconds and improper drying. Basurrah [17] found that the duration of hand washing was suboptimal for all HCWs in medical and surgical wards in a tertiary center in Riyadh. Improper drying of hands was found in 14.5% of our opportunities, while in Kuzu [22] study in a university hospital in Turkey 79.8% of HCWs didn't dry their hands. Appropriate health education programs should be implemented to raise the compliance in this issue.

Fig. 1. Forms of inappropriate hand hygiene among observed opportunities (Total 605).



A - Improper drying is any method of dying other than dying in fresh clean towel.

B - Short contact time is below 30 seconds in routine hand washing and alcohol hand rub, or less than 2 minutes in hygiene wash.

C - Not all surfaces cleaned.

D - Others.

A complex interplay of cognitive, socioeconomic and technical factors may determine hand washing practice among hospital based health workers especially doctors, regardless of the location of the country or hospital they work in [22]. Administrative support [22] and improved availability of resources [23] provide a positive influence on the efforts made to improve adherence to HW which will eventually advance the infection

Tab. VI. Ward assessment in different departments in Ain Shams University Hospitals (n = 10).

Items	N.	(%)
Number of available sinks	8	(80)
Number of sinks where soap is available	4	(40)
Availability of hand drying material	1	(10)
Availability of paper towel	0	(0)
Availability of cloth towel	1	(10)
Availability of alcohol hand rub	4	(40)
Availability of automatic sinks	1	(10)
Availability of gloves at point of care	7	(70)
Written hand hygiene guidelines	3	(30)
Availability of communication material for hand hygiene(HH)	5	(50)
Staff formally educated on HH	7	(70)
A product selection process has been implemented	1	(10)
Feedback performance provided to staff	1	(10)

control in hospitals. Inspection of the wards showed a marked deficiency of supplies and resources necessary for performing hand washing. Only 10% of the wards had available automatic sinks and hand drying material while soap was found in only 40% of the sinks. The study done by Ji [24] revealed that being short of water accounted for 22% of the reasons of non compliance to hand washing. In our study 20% of the observed wards had no available sinks. Improving the availability of materials and supplies essential for hand hygiene is a basic step in improving the compliance with hand washing.

Alcohol based hand rubbing reduces the mean bacterial counts on hands more effectively than hand washing with antimicrobial soaps [25, 26]. In our study HW in 64.2% of the observed opportunities were routine hand washing with soap, in comparison to 99.3% in Kuzu study [22] and alcohol based hand rubs were recorded for 31.7% of the opportunities which is lower in comparison to Wendt [27] study in Germany whom reported alcohol based hand rub of (52.2%). To enhance the compliance to alcohol based hand rubs this necessitates the increase of supplies and continuous education. Whitby [28] found that introduction of alcohol based hand rub without an associated behavioral modification program proved to be ineffective.

In observing the invasive procedures it was found that HW was done in 20.6% of the opportunities before the procedures while it was done in 7.9% of the opportunities after the procedures. Those rates are compared to 13.8% and 35.6% in Arenas study [29] who conducted his study among HCW in haemodialysis units in Spain. HCW should be keen not to transmit infection to their patients. Raising the awareness of HCW in this issue is very important. Kim [19] found a positive association between glove use and subsequent hand disinfection. In our study HW was reported in 61.4% of the observed opportunities after removal of the gloves.

Our results showed a higher positive attitude among nurses (96.0%) towards HW protection of health care personnel in comparison to 86.2% in a study in Italy among HCWS in ICUs [30].

Most of the nurses in our study (97.3%) believe that hand washing practices can be improved by administrative orders and this contradicts Harris [31] who found that healthcare workers are not in favor of interventions involving rewards and punishments, but are more attracted to interventions that make hand-washing easier.

Using hand hygiene as a sole measure to reduce infection is unlikely to be successful when other factors in infection control, such as environmental hygiene, crowding, staff levels and education are inadequate [17]. The staff of 7 wards (out of 10) had previously received formal education on hand washing hygiene. All HCW should have continuous education to raise their awareness and compliance towards hand hygiene. Only 30% of the observed wards had written hand hygiene guidelines. These guidelines should be generalized to all wards of the hospital.

Recommendations

Implementation of multifaceted interventional behavioral hand hygiene program is important for improving the compliance to hand hygiene guidelines.

Implementation of hand washing training programs for undergraduate doctors, house officers and nurses would improve HW practice. Those training programs should be implemented at intervals and assessed for the improvement of hand washing practices in the hospital.

Continuous monitoring and performance feedback is beneficial beside the increase in supplies necessary for hand washing and institutional support.

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