

# Knowledge, attitudes, and practices of health-care workers regarding hand hygiene guidelines in Al-Qassim, Saudi Arabia: A multicenter study

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## ABSTRACT

**Introduction:** Hand hygiene is one of the most important ways to reduce the prevalence of nosocomial infections, morbidity, mortality, and health-care costs among hospitalized patients worldwide.

**Objectives:** We addressed this study to assess knowledge, attitudes, and practices regarding hand hygiene guidelines among health-care workers.

**Methods:** A multicenter cross-sectional study conducted from October to December 2015 including three hospitals in Al-Qassim, Saudi Arabia. A total of 354 participants completed a self-administered survey on knowledge, attitudes, and practices of hand hygiene. Analysis of variance was used to compare knowledge level across age, gender, profession, and hospitals. All analyses were performed with SPSS, version 21.

**Results:** Overall, the average knowledge score was 63%. There were significant differences in knowledge level across groups. Health-care workers over the age of 30 had higher scores than those younger than 30. Health-care workers at the tertiary hospital had higher scores than those at the secondary hospitals. Nearly, all reported positive attitudes toward hand hygiene as well as adhering to the guidelines regularly. Further, they reported that soap and water were the most common agents for cleaning hands.

**Conclusion:** The study findings indicate that there are gaps in the knowledge, which could be addressed with brief and more frequent training sessions, particularly in the secondary hospitals. However, the hand hygiene guidelines are well-known by the staff and well promoted in the hospitals reflected by the positive attitudes. Further improvements in adherence to the hand hygiene guidelines will continue to decrease the likelihood of nosocomial infections.

**Keywords:** Hand hygiene, nosocomial infections, Saudi Arabia, WHO guidelines

## Introduction

Hospital-acquired infections, also known as nosocomial infections, affect 5–10% of hospitalized patients in developed countries and 20% of patients in developing countries.<sup>[1]</sup> Infections have a variety of effects on patients including but not limited to extended stays in the hospital, pneumonia, and death.<sup>[2]</sup> Further, hospital-acquired infections increase the financial burden of families as well as the health-care systems.<sup>[3]</sup> Another complication is that infections are difficult to treat with antibiotics; drug resistance is becoming more common particularly among Gram-negative bacteria.<sup>[4,5]</sup>

Proper hand hygiene among health-care workers can significantly reduce the transmission of bacterial organisms.<sup>[6]</sup>

Unfortunately, adherence to hand hygiene guidelines and proper hand washing techniques among health-care workers are uncommon<sup>[7-9]</sup> even after educational efforts. Some studies suggest that after educational programs, 40–50% adherence rates to proper hand hygiene are feasible; however, a few studies have shown that adherence can be improved to as high as 80%.<sup>[10,11]</sup>

The World Health Organization has started an international hand hygiene initiative entitled “My 5 Moments.” These five moments that call for the use of hand hygiene include the moment before touching a patient, before performing aseptic and cleaning procedures, after being at risk of exposure to body fluids, after touching a patient, and after touching patient surroundings. The concept of this initiative is that it is easy to

understand and memorize and it is based on the geographical areas of the “patient-zone” and the “health-care zone.” This initiative was adopted and tested in several countries including Saudi Arabia.<sup>[12-14]</sup> The study showed an increase in compliance from 51% to 67%.<sup>[13]</sup>

Since this adoption of the “My 5 Moments” initiatives, studies have been conducted in Saudi Arabia that (1) address non-compliance with hand hygiene in medical facilities and (2) assess knowledge about hand hygiene among medical students. The first set of studies suggest that certain factors are associated with non-compliance to hand hygiene guidelines.<sup>[15,16]</sup> Example factors include being a physician (vs. nurse), before patient contact (vs. other four moments), and having a morning shift (vs. evening). The second study has shown that medical students correctly identify the importance of hand hygiene, but their understanding of the guidelines is weak.<sup>[17]</sup> Many students are confused about the appropriate indications for hand washing (soap and water) versus hand rubbing (alcohol agent). The former is the superior method for reducing the transmission of organisms.

Understanding and adherence to the “5 moments” of hand hygiene are essential in the medical facilities among health-care workers. The purpose of the present study was to assess knowledge, attitudes, and practices of health-care workers in Al-Qassim, Saudi Arabia. The secondary objective was to assess whether there were any knowledge differences across factors such as age, gender, profession, and hospitals (secondary vs. tertiary).

## Methods

### Overview

A cross-sectional study was conducted at three governmental hospitals: (1) King Fahad Specialized Hospital (KFSH) which is a tertiary center, (2) Buraidah Central Hospital (BCH), and (3) Al Rass General Hospital (AGH); the latter is secondary centers. All three centers are located in Al-Qassim, Saudi Arabia. A total number of 345 respondents were included in the study. Data collection was carried out for 3 months from October to December 2015 using a self-administered questionnaire. The study purpose and procedures were explained to the participants and informed consent was taken on enrollment. The study protocol was approved by Qassim Regional Research Ethics committee in September 2015 and the Medical Research Center Ethical Committee at Qassim University in October 2015.

### Questionnaire

The instrument was designed to assess knowledge, attitudes, and practices related to hand hygiene among the health-care workers in all three hospitals. The questionnaire included 25 questions for knowledge, 5 questions for attitudes, and 5 for

practices. The knowledge assessment was based on the hand hygiene knowledge questionnaire for health-care workers from the World Health Organization (2009). Assessment of attitudes and practices was validated questions from earlier studies.<sup>[18,19]</sup>

### Data analysis

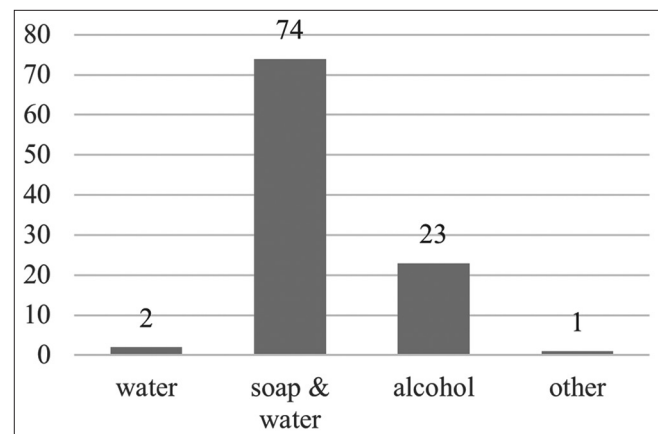
Descriptive statistics including frequency distributions and central tendencies were conducted. Knowledge score was computed; each item was allotted 1 point, and then, the score was converted to a percent out of 100. Analysis of variance – one-way was used to determine whether the knowledge scored varied across demographic characteristics such as age, gender, profession, or hospital. All analyses were performed with SPSS, version 21.

## Results

The sample consisted of mostly female (83%) nurses (80%) from a variety of departments at three hospitals. Most of the nurses were recruited from the KFSH (60%). Their ages ranged from 20 to 59 with a mean of 32 [Table 1]. The nurses reported using soap and water as the main agent for hand hygiene. Alcohol and other agents were used <25% of the time [Figure 1].

However, the health-care workers had low scores on the knowledge assessment [Table 2]. The average score was 62.6 (standard deviation = 8.12) on a 100 point scale. The scores ranged from 36 to 88% with a normal distribution [Figure 2].

The participants did not clearly distinguish which actions prevented transmission to the patient versus actions that prevented transmission to the health-care workers. Furthermore, it was unclear whether washing or rubbing was required in certain situation such as after emptying a bedpan. There were no significant differences in hand hygiene knowledge between males and females or across professional levels (specialists vs. nurses vs. students). There were significant differences by age and by institution. Health-care workers aged 30 and above had significantly higher knowledge score than those aged 20–29

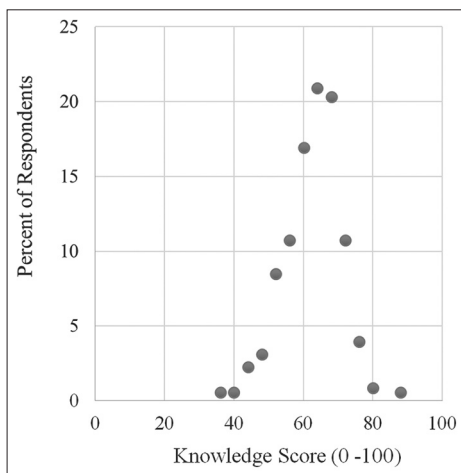


**Figure 1:** Commonly used agents for hand hygiene among health-care workers in Al-Qassim, Saudi Arabia ( $n = 354$ )

**Table 1:** Demographic characteristics of health-care workers in Al-Qassim, Saudi Arabia ( $n=354$ )

Variable	Count (%)/mean $\pm$ SD
Age	31.9 ( $\pm 7.57$ )
Gender	
Female	294 (83.1)
Male	60 (16.9)
Profession	
Specialists/consultants/residents/interns	57 (16.1)
Nurses/technicians	283 (79.9)
Medical and nursing students	14 (4.0)
Hospitals	
KFSH	211 (59.6)
BCH	55 (15.5)
AGH	88 (24.9)
Departments	
Internal medicine	56 (15.8)
Surgery	40 (11.3)
Intensive care unit	22 (6.2)
Mixed medical/surgical	42 (11.9)
Emergency unit	50 (14.1)
Obstetrics	1 (0.3)
Pediatrics	11 (3.1)
Long-term/rehabilitation	7 (2.0)
Outpatient clinic	6 (1.7)
Other	119 (33.6)

KFSH: King Fahad Specialized Hospital, BCH: Buraidah Central Hospital, AGH: Al Rass General Hospital, SD: Standard deviation

**Figure 2:** Distribution of hand hygiene knowledge score among health-care workers in Al-Qassim, Saudi Arabia ( $n = 354$ )

( $P < 0.001$ ). Further, health-care workers at the KFSH had significantly higher knowledge scores than health-care workers at either Buraidah Central or AGH ( $P = 0.001$ ) [Table 3].

Overall, they reported positive attitudes toward hand hygiene. More than 90% of them reported that the hospital policies affect

them positively and they adhere to the guidelines at all times [Figure 3a]. Further, nearly, all health-care workers endorsed that they need training and knowledge on hand hygiene that the guidelines are necessary and that hand hygiene should be followed at all times [Figure 3b].

## Discussion

The main finding of the study was that the knowledge scores were low, overall, among health-care workers in Al-Qassim hospitals; also, there were significant differences between older and younger health-care workers ( $>30$  years) as well as between the secondary and tertiary hospitals. Results indicating low knowledge level are in line with other studies in Saudi Arabia<sup>[17,20]</sup> as well as internationally.<sup>[18,21]</sup> There is a caveat that should be noted; when we examined incorrect responses to individual questions, we found that many respondents identified “hand washing” as necessary when “hand rubbing” was sufficient. This type of error in understanding or implementation would not increase infections, but in fact, they may be overcompensating. To date, this is the first study in Saudi Arabia to compare hand hygiene knowledge across different institutions. Hence, this is a novel finding that tertiary hospitals may have a more knowledgeable staff regarding hand hygiene than secondary hospitals.

The second main finding of the study was that health-care workers have a positive attitude toward hand hygiene guidelines. They recognize their importance and report that they try to follow them all of the time. This finding is similar to the studies that have assessed attitudes toward hand hygiene in medical settings.<sup>[17,22]</sup> Overall, appreciation for the importance of good hand hygiene is high, particularly among advanced medical students and those health-care workers in training.

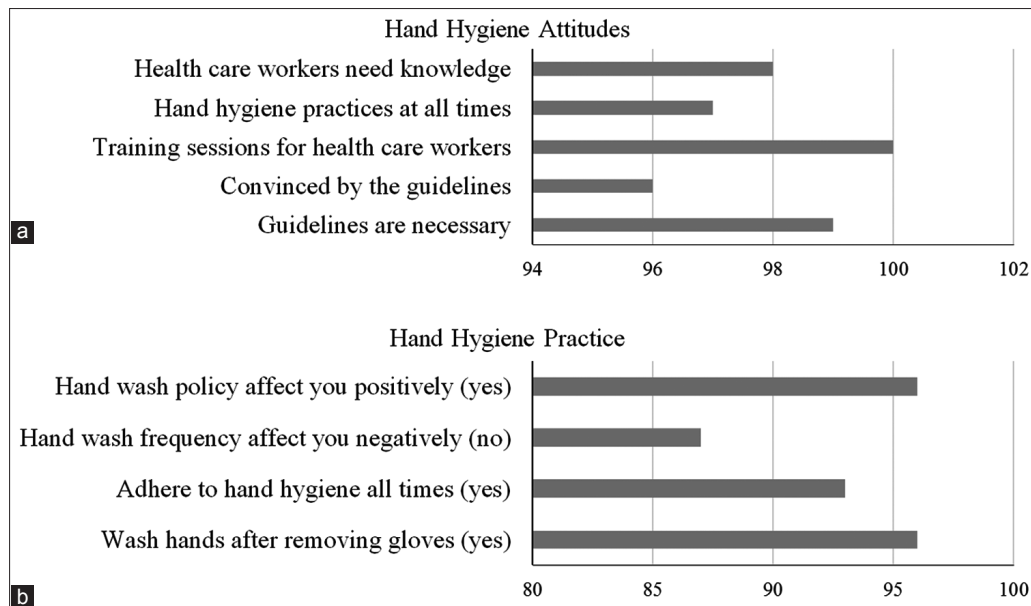
Although this study assesses knowledge, practices, and attitudes regarding hand hygiene, the data are limited because it is self-reported. To assess hand hygiene practices more accurately, one would need to assess the behavior objectively through selected observations. Studies that have assessed adherence to guidelines through observation have found that rate of adherence is ranged between 34% and 50% (number of hand hygiene performance/number of hand hygiene opportunities) with physicians showing slightly lower adherence than nurses and technicians.<sup>[7,8,16,21]</sup>

Beyond self-reported data, the study has some limitations. The sample selection was not conducted evenly across sample characteristics; hence, some subgroup comparisons could not be made because of small sample sizes. For example, if you wanted to compare knowledge level among older physicians compared to young physicians. Furthermore, this study was conducted in Al-Qassim region and thus is not representative of the entire country. Therefore, the finding is only generalizable to this region and not to all of Saudi Arabia.

**Table 2:** Comparison of knowledge in different hospitals regarding various aspects of hand hygiene practices

Knowledge questions.		KFSH <i>n</i> =211		AGH <i>n</i> =88		BCH <i>n</i> =55	
K1	Which of the following is the main route of cross-transmission of potentially harmful germs between patients (Health-care workers' hands when not clean)	173	82.0%	72	81.8%	46	83.6%
K2	What is the most frequent source of germs responsible for health-care-associated infections? (Germs already present on or within the patient)	82	38.9%	19	22.1%	21	38.2%
Which of the following hand hygiene actions prevents transmission of germs to the patient?							
K3	Before touching a patient (yes)	211	100.0%	80	97.7%	53	96.4%
K4	Immediately after a risk of body fluid exposure (no)	30	14.2%	11	12.5%	13	23.6%
K5	After exposure to the immediate surroundings of a patient (no)	23	10.9%	15	17.0%	12	21.8%
K6	Immediately before a clean/aseptic procedure (yes)	202	95.7%	84	95.5%	50	90.9%
Which of the following hand hygiene actions prevents transmission of germs to the health-care worker?							
K7	After touching a patient (yes)	207	98.1%	83	94.3%	52	94.5%
K8	Immediately after a risk of body fluid exposure (yes)	203	96.2%	80	90.9%	51	92.7%
K9	Immediately before a clean/aseptic procedure (no)	28	13.3%	19	21.6%	9	16.4%
K10	After exposure to the immediate surroundings of a patient (yes)	207	98.1%	82	93.2%	52	94.5%
Which of the following statements on alcohol-based hand rub and hand washing with soap and water are true?							
K11	Hand rubbing is more rapid for hand cleansing than hand washing (true)	185	87.7%	72	81.8%	38	69.1%
K12	Hand rubbing causes skin dryness more than hand washing (false)	101	47.9%	28	31.8%	14	25.5%
K13	Hand rubbing is more effective against germs than hand washing (true)	105	49.8%	39	44.3%	6	10.9%
K14	Hand washing and hand rubbing are recommended to be performed in sequence (false)	47	22.3%	13	14.8%	5	9.1%
K15	What is the minimal time needed for alcohol-based hand rub to kill most germs on your hands? (20 s)	173	82.0%	44	50.0%	40	72.7%
Which type of hand hygiene method is required in the following situations?							
K16	Before palpation of the abdomen (rubbing)	159	75.4%	66	75.0%	44	80.0%
K17	Before giving an injection (rubbing)	103	48.8%	44	50.0%	14	25.5%
K18	After emptying a bedpan (rubbing)	3	1.4%	9	10.2%	4	7.3%
K19	After removing examination gloves	26	12.3%	13	14.8%	14	25.5%
K20	After making a patient's bed (rubbing)	55	26.1%	29	33.0%	26	47.3%
K21	After visible exposure to blood (washing)	204	96.7%	76	86.4%	51	92.7%
Which of the following should be avoided, as associated with increased likelihood of colonization of hands with harmful germs?							
K22	Wearing jewellery (yes)	207	98.1%	79	89.8%	52	94.5%
K23	Damaged skin (yes)	201	95.3%	75	85.2%	51	92%
K24	Artificial fingernails (yes)	204	96.7%	86	97.7%	55	100.0%
K25	Regular use of a hand cream (no)	75	35.5%	64	72.7%	25	45.5%

KFSH: King Fahad Specialized Hospital, BCH: Buraidah Central Hospital, AGH: Al Rass General Hospital



**Figure 3:** Hand hygiene (a) attitudes and (b) practices among health-care workers in Al-Qassim, Saudi Arabia ( $n = 354$ )

**Table 3:** Differences in hand hygiene knowledge score across selected demographic characteristics among health-care worker in Al-Qassim, Saudi Arabia ( $n=354$ )

Variable	Mean±SD	P-value from F-test
Age		<0.001 (significant)*
20–29	60.9 (7.86)	
30–59	64.0 (8.09)	
Gender		0.157
Female	62.9 (7.64)	
Male	61.3 (10.14)	
Profession		0.126
Specialists/consultants/residents/interns	60.9 (9.17)	
Nurses/technicians	62.8 (7.97)	
Medical and nursing students	65.4 (5.57)	
Hospitals		0.001 (significant)*
KFSH	63.9 (7.44)	
BCH	60.0 (7.74)	
AGH	61.2 (9.30)	

\*Significant  $P < 0.05$ . KFSH: King Fahad Specialized Hospital, BCH: Buraidah Central Hospital, AGH: Al Rass General Hospital, SD: Standard deviation

## Conclusion

We conclude that there are gaps in the knowledge, which could be addressed with brief and more frequent training sessions, particularly in the secondary hospitals. However, hand hygiene guidelines are well-known by the hospital staff, including nurses and physicians, and well-promoted in the hospitals reflected by the positive staff attitudes. Future research should consider assessing hand hygiene adherence using observational measurement.

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