

Knowledge, Beliefs and Practices of Nurses and Nursing Students for Hand Hygiene

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Abstract

Background: The current study aimed to determine the knowledge, beliefs, and practices of nurses and nursing students for hand hygiene.

Materials and Methods: The study population consisted of 340 subjects (164 nurses and 176 nursing students). Data collection tools included the hand hygiene belief scale and the hand hygiene practices inventory (HHPI). Chi-square and independent samples T-tests were used for data analysis.

Results: The mean scores of the HHPI were 66.36 ± 7.08 and 64.52 ± 4.90 for nurses and the students, respectively; the difference between the measures was statistically significant ($P < 0.001$). The mean scores of the nurses and the students for hand hygiene importance were 13.38 ± 1.75 and 13.29 ± 1.81 , for hand hygiene beliefs were 71.87 ± 8.35 and 73.00 ± 7.54 , and for hand hygiene knowledge were 33.81 ± 2.89 and 34.26 ± 2.23 , respectively. Although approximately 90.2% of the subjects in both groups were trained in hand hygiene, the influence of training on students was proportionally higher than that of nurses; while compliance with the principles of hand hygiene and beliefs in its importance in infection control were significantly higher in nurses.

Conclusions: There was a moderate level of knowledge, practices, perceives and beliefs in nurses and students for the importance of hand hygiene. Compliance with the importance of hand hygiene in infection control is complex, and perceptual factors concerning hand hygiene, in addition to an individual's knowledge could affect the behaviors related to hand hygiene compliance.

Keywords: Hand Hygiene, Hand Washing, Knowledge, Beliefs, Practices

1. Background

Healthcare-acquired infections are caused by microorganisms transmitted either endogenously or exogenously during the diagnosis, treatment and rehabilitation of hospitalized patients. The hands of the healthcare workers and patients play an important role in the transmission of infectious agents (1, 2). Hand hygiene (HH), either by hand washing or wiping the hands with disinfectants, helps to minimize the colonization of temporary flora on the hand, prevent the transmission of microorganisms and reduce the incidence of infections related to medical personnel. Hand hygiene alone is the most effective method to prevent cross contamination and reduce nosocomial infections.

However, studies indicated that the level of compliance with hand hygiene is low in health care workers (2-5). Compliance with HH varies based on hospital, department and working conditions. As workload of nurses and

medical personnel increases, the number of required hand washings increases, and this reduces compliance (4). Pittet et al. (4) showed that hand hygiene compliance in physicians aware of personnel monitoring was only 61%, and this dropped to 44% in uninformed physicians. Aiello et al. (6) reported HH compliance among healthcare professionals as 80%. In a systematic review on HH compliance, Erasmus et al. (7) reported an overall median rate of 40%. Unadjusted compliance rates were lower in the personnel of intensive care units (30% - 40%) than those of other wards (50% - 60%), lower among physicians (32%) than nurses (48%), and lower before (21%) rather than after (47%) touching the patients.

Human behavior is influenced by biological characteristics, environment, education and culture. Although these influences are usually interdependent, some are more effective than others (8). Hand hygiene compliance is also affected by a number of factors including the personal knowledge of hand hygiene, professional back-

ground, gender, perception of the benefits and barriers of hand hygiene, infectious disease severity, work intensity and presence of role models (4, 9, 10). Most of these factors are personal such as knowledge, attitudes, practices, beliefs and perceptions, and their identification helps to improve compliance with hand hygiene behaviors.

Although there were considerable researches on the hand hygiene knowledge and compliance of nurses and nursing students, there were a few researches on hand hygiene perceptions and beliefs in the same group. To achieve infection control goals, the appropriate behavior of the so-called role models is of particular importance (11). Lankford et al. reported that hand-hygiene behaviors can be affected by role model or peer compliance with hand-hygiene; while learned behaviors or time constraints may negatively influence the group compliance with hand-hygiene procedures (12). Barrett and Randle determined that compliance with hand-hygiene in healthcare workers was one of the most important factors affecting hand-hygiene compliance in nursing students (1). Similarly, Erasmus et al. reported that nurses and especially medical students, mentioned the presence of negative role models that is, experienced nurses or physicians who were noncompliant with hand hygiene guidelines as a reason for their own noncompliance (7). Moreover, Lymer et al. found that hand hygiene knowledge and practices that the experienced healthcare workers shared with nursing students certainly improved their compliance with hand hygiene (13).

Therefore, academic guidelines and nursing clinical instructors should continuously educate students regarding the appropriate hand hygiene practices during clinical applications, act as role models for hand washing, and provide feedback frequently for the students to improve the rate of hand washing (14). Both clinical and academic learning environments can be effective in the integrating theory and practice, but nursing students can be more motivated to learn in clinical settings (15). Previous reports indicated that students are influenced by the social aspect of work in clinical environments and the behavior of their mentors, peers and colleagues (16, 17).

2. Objectives

Since nursing students work with nurses one-on-one in practical environments, it is beneficial to determine the hand hygiene knowledge, beliefs and practices of nurses and nursing students. In addition, determining the factors affecting hand-hygiene compliance in nursing students provides a chance to address any gaps in knowledge and practices before the students graduate and enter the medical community (1).

3. Materials and Methods

3.1. Study Aim and Design

The current descriptive study mainly aimed to determine the hand hygiene knowledge, beliefs and practices of nurses and nursing students. The study was conducted from April 20th to May 20th, 2011.

3.2. Research Population and Sampling Method

Students in the 2nd, 3rd and 4th grades of nursing in a health college in the Black Sea region and nurses of a hospital in the same area were selected for the study by simple randomized sampling method. All students and nurses who were willing to participate were included in the study. Those who were not willing to participate were excluded from the study. After obtaining the informed consent, a total of 164 nurses and 176 nursing students were presented on the data collection day and were enrolled into the study. Finally, 340 subjects who agreed to participate and completed the forms were selected.

3.3. Data Collection Tools

The subjects were asked to complete a questionnaire to collect socio-demographic characteristics and hand hygiene information were also gathered via completing the hand hygiene belief scale (HHBS), and the hand hygiene practices inventory (HHPI). The questionnaire was developed based on the related literatures (1-4, 9, 10) and consisted of 25 questions related to socio-demographic characteristics, hand hygiene, and the importance of hand hygiene in infection control. The subjects were asked to rate the impact of hand hygiene training using scores from 0 to 10 (0 = no impact, 5 = moderate impact, and 10 = considerable impact). They were also asked to rate the importance of hand hygiene in infection control using scores from 0 to 10 (0 = never important, 5 = moderately important, and 10 = considerably important). The questionnaire was reviewed by an infectious disease specialist before employment in the study.

The HHBS and HHPI consist of 23 and 14 items, respectively, each scored using 5-point Likert scales (HHBS, 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, and 5 = strongly agree; HHPI, 1 = never, 2 = sometimes, 3 = often, 4 = usually, and 5 = always). The total score for the HHBS and HHPI can vary from 23 to 115 and from 14 to 70, respectively.

A pilot test was conducted on 10 nurses and 10 nursing students to determine the extent to which the participants understood the items on the questionnaires and if the items required additional explanation. Based on the pilot test results, necessary adjustments were made to the questionnaires. The pilot test results were not presented in the study.

3.4. Data Evaluation and Analysis

The responses to the open-ended questions were manually grouped by researchers and then analyzed by the computer. Values were reported as mean \pm SD. Data were analyzed using SPSS software (SPSS Inc., Chicago, IL) using Chi-square, independent samples T-test, Mann-Whitney U test and ANOVA. $P < 0.05$ was considered as level of significance.

3.5. Ethical Aspects

The study was approved by the ethics committee of X (university name was removed for blinded review). Written approval was obtained from hospital and school management at the hospital and school in which the study was performed. Before the study, nurses and the students were informed about the purpose and plan of the research and the informed written consents were obtained.

4. Results

4.1. Characteristics of the Sample

The mean age of the nurses was 30.87 ± 6.67 years (range 18 - 51 years), and the mean age of the students was 21.80 ± 1.62 years (range 19 - 28 years). The average working experience of the nurses was 9.41 ± 7.44 years (ranging 1 - 38 years), 84.8% were female, 83.2% worked as ward nurses mainly in general and surgical wards, and 59.6% worked 9 - 16 hours a day. Regarding the students, 76.7% were female, 40.3% were in the 2nd year, and 97.7% worked 1 - 8 hours a day.

4.2. Hand Hygiene Results

The majority of the nurses (90.9%) and nursing students (93.2%) had studied hand hygiene within 0 - 12 months prior to the study (Table 1). The impact of training in hand hygiene guidelines was rated similarly, 7.36 ± 2.52 for nurses and 7.83 ± 1.86 for students ($T = 1.876$; $P = 0.062$). The mean scores of hand hygiene knowledge were also similar, 33.81 ± 2.89 (ranging 16 - 40) for the nurses and 34.26 ± 2.23 (ranging 26 - 40) for the students ($T = -1.596$; $P = 0.112$).

The mean HHPI scores were statistically different between the nurses (66.36 ± 7.08 ; ranging 42 - 70) and students (64.52 ± 4.90 ; ranging 46 - 70) ($T = 2.882$; $P = 0.004$). The mean HHBS scores were 85.32 ± 9.15 (range 85 - 110) and 86.39 ± 8.56 (range 86 - 110) for nurses and students, respectively ($T = -1.261$; $P = 0.208$) (Table 2).

Table 3 presents mean scores for hand hygiene practices and beliefs with some demographic characteristics of the subjects. There was a statistically significant difference between nurses and students regarding the gender, based on HHP and HHB scores ($P < 0.05$). The mean HHP and

Table 1. The Distribution the Duration of Hand Hygiene Training in the Study Subjects

Results	Nurses	Students
Hand hygiene training		
Trained	149 (90.9)	164 (93.2)
Untrained	15 (9.1)	12 (6.8)
Duration of the training		
0 - 12 months	84 (87.5)	129 (91.49)
13 months or higher	12 (12.5)	12 (8.51)

HHBS scores of the male nurses were higher than those of the female ones. But the mean HHP and HHBS scores of the female students were higher than those of the male ones ($P < 0.05$).

The compliance with hand hygiene principles was significantly different between the nurses (82%) and students (77%) ($T = -2.955$; $P = 0.003$) (Table 3). The mean rate of importance of hand hygiene in infection control were 9.07 ± 1.41 and 7.93 ± 2.32 for nurses and students, respectively; the difference between the groups was also significant ($T = -3.940$, $P = 0.001$) (Table 4).

The majority of the subjects usually performed hand hygiene in specific situations (Table 5). Hand hygiene was performed by the students significantly less than those of the nurses in the following conditions: after touching potentially contaminated objects, after physical contact with a patient, before patient contact and "after removing gloves ($P < 0.05$). The scores of beliefs in hand hygiene was high in all subjects, according to the HHBS (Table 6).

5. Discussion

In the present study, 90.9% of the nurses and 93.2% of the students were trained for hand hygiene guidelines, with the mean hand hygiene knowledge scores of 33.81 ± 2.89 and 34.26 ± 2.23 for nurses and students, respectively. However, both the students and nurses rated the impact of this training approximately 75% of the total impact score. Nurses reported more compliance with hand hygiene guidelines than students and also believed in performing hand hygiene important.

Appropriate hand hygiene depended on knowledge and training (3, 18), and also training positively affected hand hygiene (6). Compared to the high rates of training in the present study (90.9% in nurses and 93.2% in students), only 72% of nurses and 58.7% of nurse assistants in a university hospital were trained for hand hygiene guidelines in a study conducted by Demirdal Uyar and Demirturk. The mean scores for hand hygiene knowledge in the present

Table 2. Mean Scores of Knowledge, Practices and Beliefs on Hand Hygiene Among the Study Subjects^a

Results	Nurses	Students	Total	T	P Value
Hand hygiene knowledge	33.81 ± 2.89	34.26 ± 2.23	34.04 ± 2.58	-1.592	0.112
HHPI	66.36 ± 7.08	64.52 ± 4.90	65.26 ± 5.31	2.882	0.004
HHBS	85.32 ± 9.15	86.39 ± 8.56	85.89 ± 8.84	-1.261	0.208

Abbreviations: HHBS, hand hygiene belief scale; HHPI, hand hygiene practices inventory.

^aValues are expressed as mean ± SD.**Table 3.** Distribution of Mean Scores for Practices and Beliefs in Hand Hygiene in Some Demographic Characteristics^{2,a}

Results	Nurses		Students	
	HHPI	HHBS	HHP	HHBS
Gender				
Female	66.19 ± 5.63	84.27 ± 8.45	64.99 ± 4.69	86.77 ± 8.45
Male	67.09 ± 3.71	92.18 ± 10.30	62.37 ± 5.06	84.70 ± 7.30
P Value	0.001 ^b	0.001 ^b	0.001	0.001
Age range, y				
18 - 27	66.69 ± 4.648	82.84 ± 9.11	64.52 ± 4.90	86.39 ± 8.56
28 - 37	66.01 ± 5.38	87.17 ± 7.99		
38 and older	66.43 ± 7.78	85.87 ± 13.00		
P Value	0.789 ^c	0.038 ^c 2 > 1; 2 > 3		

Abbreviations: HHBS, hand hygiene belief scale; HHPI, hand hygiene practices inventory.

^aValues are expressed as mean ± SS.^bMann-Whitney U test was employed.^cANOVA test was employed.**Table 4.** Importance of Infection Control and Compliance With Hand Hygiene^a

Results	Nurses	Students	T	P Value
Rate of compliance with hand hygiene compliance	82.08 ± 15.30	77.49 ± 13.07	2.955	0.003 ^b
Importance of infection control (0 - 10)	9.07 ± 1.41	7.93 ± 2.32	3.940 ^c	0.001

^aValues are expressed as mean ± SD.^bP < 0.05.^cMann-Whitney U test.

study were 33.81 ± 2.89 and 34.26 ± 2.23 in nurses and students, respectively (18). Despite the high rates of training, the impact of this training rated between moderate and considerable both in nurses and students. Challenges with infection control, which is monitored and trained by infection control committee members, include training-related behavioral changes in healthcare workers. Successful training activities benefit from social sciences and behavioral models (4). It is thought that the impact of perceived training is important to turn the theory into practice; therefore, the training activities should be adequate to create appropriate behavioral changes, students' post-

training hand hygiene practices should be observed and subsequent feedback should be provided.

The factors affecting healthcare workers' compliance with hand hygiene include the individual characteristics of the healthcare workers, working conditions (i.e., work load, availability of appropriate materials and possibility for hand hygiene) and cognitive perceptions (4). Therefore, compliance with hand hygiene varies according to the hospital, department and working conditions. As the nurses workload increases, the number of recommended hand washing instances per patient increases as well, which reduces the compliance (4).

Table 5. Distribution of Mean Scores in Hand Hygiene Practice^a

I cleanse my hands under the following conditions	Nurses	Students	T	P Value
1- After going to the toilet	4.92 ± 0.39	4.97 ± 0.16	1.364	0.117
2- Before caring for a wound	4.44 ± 0.88	4.44 ± 0.83	0.006	0.995
3- After caring for a wound	4.87 ± 0.41	4.83 ± 0.44	0.847	0.398
4- After touching potentially contaminated objects	4.87 ± 3.95	4.62 ± 0.62	4.368	0.001
5- After contact with blood or body fluid	4.94 ± 3.94	4.97 ± 0.16	0.959	0.339
6- After inserting an invasive device	4.81 ± 0.51	4.76 ± 0.54	0.939	0.348
7- Before entering to the isolation room	4.34 ± 0.95	4.16 ± 0.99	1.749	0.081
8- After physical contact with a patient	4.60 ± 0.75	4.14 ± 1.02	4.740	0.001
9- After exiting from the isolation room	4.74 ± 0.62	4.62 ± 0.73	1.680	0.094
10- Before endotracheal suctioning	4.48 ± 0.85	4.55 ± 0.74	0.836	0.404
11- After contact with a patient's secretions	4.92 ± 0.34	4.86 ± 0.39	1.572	0.117
12- Before physical contact with a patient	4.39 ± 0.92	4.03 ± 1.02	3.395	0.001
13- After removing gloves	4.77 ± 0.58	4.58 ± 0.74	2.688	0.008
14- If they look or feel dirty	4.87 ± 0.43	4.80 ± 0.49	1.271	0.204

^aValues are expressed as mean ± SD.

The reported compliance with hand washing in the present study (82% in nurses, 77% in students) was higher than those of the previous studies. Chau et al. determined, through observation, that hand washing and antiseptic hand rub use among nurses were 53.8% and 54.1%, respectively (19), and hand washing frequency in an extensive care unit was 12.9% in a study performed in the Istanbul University in Turkey (20). Pittet et al. reported that hand hygiene compliance in physicians who were aware of personnel monitoring was 61% and only 44% in those who were unaware of monitoring (4). These differences may be explained by the method of data collection; the rate of self-reported hand hygiene compliance can be higher than that of observed compliance, although previous studies reported little to no differences between the reported and observed frequencies of hand hygiene practices (21, 22). Similar to the present results, the rate of self-reported hand hygiene compliance in a study by Allison et al. was 80%. To achieve a better understanding of hand hygiene practices, an observational study with nurses and students is recommended (6). Despite differences in the frequency of hand hygiene practices between studies, the rate of hand washing by healthcare workers, including physicians, was lower than expected (4, 6, 21, 22).

The mean scores of the HHPI showed that nurses and students generally applied hand hygiene in situations identified in the inventory. However, the frequencies of after touching potentially contaminated objects, after physical contact with a patient, before touching a patient and

after removing gloves in the students were significantly lower than those of the nurses. The nurses in the study by Whitby, McLaws and Ross reported that their level of compliance was influenced by their own assessment regarding the degree of dirtiness or the lack of cleanliness in a patient, which resulted in hand hygiene primarily only after direct contact with the patient (8). This limited practice of hand hygiene is supported by the results of numerous studies (7, 8, 23). Moreover, in an emergency room, the rate of total hand washing, following all types of contact, in healthcare workers was 20.3%, and the rate was significantly lower in what called clean contacts than that of called unclean (24). The use of gloves was in the lower rate compared with hand washing by giving a false sense of security (20, 25, 26).

In the present study, the mean score of the importance of hand hygiene in infection control (on a scale of 1 - 10) was 9.07 ± 1.41 and 7.93 ± 2.32 for nurses and students, respectively. Comparatively, Van de Mortel et al. reported that the mean scores of hand hygiene importance were 9.60 ± 0.008 and 9.29 ± 0.2 for nursing and medical students in Greece, respectively, and 9.68 ± 0.71 and 9.59 ± 0.84 in nursing and medical students, respectively, in Italy (10, 27). Of the physicians, 85% were aware that cross-contamination can occur with a lack of compliance with hand hygiene practices (25). The relatively low rating for the importance of hand hygiene in students in the present study may affect their hand hygiene practices in their future job. Increasing the frequency of hand hygiene

Table 6. The Mean Scores for Hand Hygiene Belief^a

Statements	Nurses	Students	T/z	P Value
Hand hygiene is considered as an important part of the curriculum.	4.64 ± 0.51	4.74 ± 0.58	1.671	0.096
The facilities in which I do clinical practicum emphasize the importance of hand hygiene.	4.43 ± 0.69	4.36 ± 0.79	0.801	0.424
The importance of hand hygiene is emphasized by my clinical supervisors.	4.30 ± 0.87	4.19 ± 0.93	1.142	0.254
I have a duty to act as a role model for other healthcare workers.	4.13 ± 0.89	4.27 ± 0.89	1.420	0.156
When busy, it is more important to complete my task than to perform hand hygiene.	2.36 ± 1.30	2.25 ± 1.22	0.790	0.430
Performing hand hygiene in the recommended situations can reduce patient mortality.	4.19 ± 0.89	4.60 ± 0.66	4.745	0.001
Performing hand hygiene in recommended situations can reduce medical costs associated with hospital-acquired infections.	4.62 ± 0.64	4.71 ± 0.60	1.366	0.173
I can't always perform hand hygiene in recommended situations because my patient's needs come first.	2.69 ± 1.39	2.65 ± 1.17	0.099	0.921
Prevention of hospital-acquired infections is a valuable part of a healthcare worker's role.	4.47 ± 0.49	4.81 ± 0.53	2.564	0.011
I follow the guidelines of senior healthcare workers when deciding whether or not to perform hand hygiene.	3.73 ± 1.34	3.42 ± 1.38	2.070	0.039
An infectious disease in a healthcare setting may threaten my life or career.	4.60 ± 0.63	4.51 ± 0.85	0.495	0.621
I believe I have the power to change poor practices in the workplace.	3.84 ± 1.10	3.95 ± 0.95	0.666	0.506
Failure to perform hand hygiene in the recommended situations can be considered negligence.	4.15 ± 0.95	4.17 ± 1.08	0.163	0.0871
Hand hygiene is a habit for me in my personal life.	4.58 ± 0.53	4.52 ± 0.71	0.808	0.420
I am confident I can effectively apply my knowledge of hand hygiene to my clinical practice.	4.38 ± 0.78	4.50 ± 0.69	1.559	0.120
I try to remember performing hand hygiene in recommended situations.	3.21 ± 1.42	3.38 ± 1.34	1.152	0.250
I would feel uncomfortable reminding a health professional to wash his hands.	3.18 ± 1.46	3.40 ± 1.36	1.387	0.166
Performing hand hygiene after caring for a wound can prevent from infection transmission.	2.59 ± 1.45	2.24 ± 1.34	1.387	0.166
Dirty sinks can be a reason for not washing hands.	2.53 ± 1.36	2.81 ± 1.30	1.879	0.061
Lack of soap can be a reason for not cleansing hands.	2.74 ± 1.37	2.71 ± 1.35	0.192	0.848
Performing hand hygiene after caring for a wound can protect from transmission of infectious diseases.	4.58 ± 0.68	4.72 ± 0.66	2.596	0.009
Cleansing hands after going to the toilet can reduce transmission of infectious disease.	4.75 ± 0.45	4.85 ± 0.51	2.854	0.004

^aValues are expressed as mean ± SD.

training and evaluation during the university years, particularly in the clinical setting, may improve students' hand hygiene knowledge, beliefs and practices.

The mean scores for hand hygiene beliefs in the present study (nurses, 85.32 ± 9.15; students, 86.39 ± 8.56) indicated that both nurses and students had positive beliefs. Similar results were obtained from studies conducted in Australia and Greece (9,10). The beliefs about the outcomes of the individuals' behaviors in increasing the compliance with hand hygiene and the value of these outcomes were factors affecting the learning process. It is thought that recognizing beliefs on hand hygiene could affect students' hand hygiene knowledge, beliefs and practices and help students to have a positive view toward a hand hygiene practice culture.

HHP and HHBS of the male nurses were higher than those of female ones. However, male nurses in Turkey are admitted to nursing education since 2007 and their popu-

lation is quite small (28). There are limited studies focusing on gender differences in hand hygiene. Most of the studies are focused on hand washing rates between genders, but not on differences between gender on practice and belief. It is recommended that further research should examine factors that affect HHP and HHBS rates within professional groups and how they differ based on gender.

4.1. Conclusions

Hand hygiene is the most basic approach to control nosocomial infections. However, non-compliance with hand hygiene is still a major problem in hospitals. Any innovation that improves the hand hygiene practices in health care workers is important in terms of saving money and lives and the prevention of suffering (9). Healthcare workers' awareness about hand hygiene knowledge, beliefs and practices promotes hand hygiene training and

evaluation, particularly in the clinical setting and improves learning outcomes.

Footnote

Authors' Contribution: Study design: Mevlude Karadag and Ozge Iseri; data collection and analysis: Mevlude Karadag, Ozge Iseri, Nuriye Yildirim and Ilker Etikan; manuscript writing: Mevlude Karadag.

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