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Opinions of healthcare professionals on hand hygiene use and evaluation of hand hygiene compliance rates

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Abstract

Aim: The aim of this study was to determine the hand hygiene habits, beliefs, and practice levels of healthcare workers.

Materials and Methods: A total of 238 healthcare workers were included in this cross-sectional survey study. The first part of the questionnaire included sociodemographic data and questions about hand hygiene habits, while the second part included questions from the Hand Hygiene Belief Scale (HHBS) and Hand Hygiene Practice Inventory (HHPI).

Results: The mean age of the participants was 33.16±8.54 years and 147 (61.8%) of them were male. The majority of the participants were nurses/health officers (n=92, 36.8%). The rate of those who had previously participated in in-service training was 58.4%. The mean HHBS score was 79.79 and the mean HHPI score was 60.08. The mean HHBS score was higher in women than in men (p=0.003). In terms of occupational groups, the mean HHBS score of physicians (p=0.024) and the mean HHPI score of nurses/health officers (p=0.006) were higher. It was determined that the mean HHPI score of the employees working in internal clinics was higher than those working in surgical clinics (p=0.044), while there was no significant difference in terms of the mean HHBS score. The mean HHPI was higher in participants who received in-service training on hand hygiene (p=0.004). Participants who spent <15 seconds on average while washing their hands had a lower mean HHPI than participants who spent a longer time washing their hands (p=0.003).

Conclusion: In the study, it was found that the belief in hand hygiene was high and the practice was generally adopted. The fact that employees especially in surgical departments paid less attention to hand hygiene practice was an important problem. Increasing the frequency of in-service pieces of training to increase compliance with hand hygiene and eliminating the preventive factors will be extremely beneficial for reducing nosocomial infections.

Introduction

Healthcare-associated infections (HAIs) are an important threat to patient safety and one of the most encountered issues during the hospitalization process. In developed countries, approximately 5-10% of hospitalized patients are exposed to such infections, while this rate is higher in developing countries [1,2]. Healthcare workers play a central role in the transmission of microorganisms to patients' hands [3]. The human skin is colonized with bacteria. Depending on the body location, there is a variation, but it has been shown that healthcare workers' hands contain between $3.9x10^4$ to $4.6x10^6$ CFU/cm^2 bacteria. The skin is classified into two types: transient and resident flora. Transient flora is the one most commonly associated with HAIs and is the primary target of hand hygiene in healthcare settings. Healthcare workers' hands harbor numerous pathogens in transient flora, including *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter* spp., *Enterobacter* spp., and *Candida* spp. On the other hand, resident flora resides deeper in the skin and is less pathogenic [4,5].

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Hand hygiene is considered the most effective method to prevent hospital infections and the spread of antimicrobial-resistant pathogens [6,7]. The World Health Organization (WHO) has implemented the "My 5 Moments for Hand Hygiene" and "SAVE LIVES: Clean Your Hands" programs to emphasize the importance of hand hygiene and reduce HAI rates. This approach recommends healthcare workers to clean their hands using alcohol-based hand sanitizers or wash their hands with soap and water. The five key indications for hand hygiene are before touching a patient, before a clean/aseptic procedure, after exposure to body fluids, after touching a patient or the patient's surroundings [1,8]. However, hand hygiene compliance among healthcare workers is often below 40% [1,2]. There are several factors contributing to low hand hygiene compliance among healthcare workers. These include a lack of full understanding of the importance of hand hygiene in preventing hospital infections, lack of understanding of hand hygiene techniques, development of contact dermatitis, staff shortages in healthcare facilities, excessive workload, and difficulty accessing traditional hand hygiene points [9]. This study aims to determine the hand hygiene habits, beliefs, and practice levels of healthcare workers.

Materials and Methods

Study design, population and sample

In this cross-sectional survey study, 238 healthcare workers at Harran University Faculty of Medicine were included. No sampling method was used to determine the sample. The study population consisted of people who were actively working and volunteered to participate in the study.

In order to conduct the study, approval was obtained from the Harran University Clinical Research Ethics Committee with decision number HRU/21.11.14 dated 07.06.2021. All procedures of the study were conducted in accordance with the Helsinki Declaration.

Data collection tools

Survey Form: The applied survey consisted of two sections. In the first section, there were questions related to sociodemographic data such as age, gender, marital status, education level, etc., along with questions about hand hygiene habits. The second section included questions from the Hand Hygiene Belief Scale (HHBS) and the Hand Hygiene Practice Inventory (HHPI).

Hand Hygiene Belief Scale (HHBS): This scale was developed by Thea van de Mortel in 2009 and its validity and reliability for the Turkish population were tested by Karadağ and colleagues, resulting in a 22-item HHBS with 2 subscales. The HHBS subscales consist of the Hand Hygiene Importance subscale with 14 items and the Belief subscale with 8 items [10,11]. The HHPI is a 5-point Likert scale consisting of 14 items. For HHBS, the scoring is as follows: 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree, 5=strongly agree. For HHPI, the scoring is: 1=never, 2=sometimes, 3=often, 4=most of the time, 5=always.

Statistical analysis

The data obtained from the research were transferred to a computer environment and analyzed using the SPSS (Statistical Package for Social Sciences) 16.0 software package. In descriptive analyses, frequency data were presented as counts (n) and percentages (%), and numerical data were presented as mean±standard deviation, median (min-max). The normal distribution of numerical data was evaluated using the Kolmogorov-Smirnov and Shapiro-Wilk tests. In cases where the numerical data did not follow a normal distribution for two independent groups, the distribution was examined using the Mann-Whitney U test. For numerical data among more than two independent groups that did not exhibit a normal distribution, the distribution was examined using the Kruskal-Wallis test. Post hoc analysis with the Mann-Whitney U test was conducted for variables that showed significant results in the Kruskal-Wallis test, and the Dunn-Bonferroni correction was applied. The relationship between non-normally distributed numerical variables was examined using Spearman's correlation analysis. A statistical significance level of $p<0.05$ was accepted for all tests.

Results

The mean age of the 238 participants in the study was 33.16±8.54 years. Among them, 147 (61.8%) were male, and 155 (65.1%) were married. The majority of participants were nurses/health officers (n=92, 36.8%), while 112 (47.1%) held a university degree. Out of the participants, 139 (58.4%) indicated that they had received in-service training related to hand hygiene, and 201 (84.5%) believed that they had sufficient knowledge about hand hygiene (Table 1).

The distribution of participants' HHBS scores was presented in Table 2. The mean score for the Hand Hygiene Importance Subscale was 54.23±15.97, and the mean score for the Hand Hygiene Belief Subscale was 25.55±7.06, with a total HHBS mean score of 79.79±14.85. The Cronbach's alpha value for HHBS was determined to be 0.853. The distribution of participants' HHPI scores was provided in Table 3, with an observed mean score of 60.08±12.66. The Cronbach's alpha value for HHPI was calculated as 0.979.

The mean score distributions of HHBS and HHPI according to participants' sociodemographic and hand hygiene-related characteristics were presented in Table 4. The mean HHBS score was found to be higher in females compared to males (p=0.003). Married participants had a higher mean HHPI score than single participants (p=0.027). A significant difference was observed in HHPI mean scores based on educational levels (p=0.043), which was attributed to a higher mean HHPI score in primary school graduates compared to those with a doctoral degree (p=0.001). Significant differences in mean HHBS and HHPI scores were found among occupational groups (p=0.008; p=0.015), where the difference in HHBS scores was due to doctors having a higher mean score than other employees (p=0.024), and the difference in HHPI scores was due to nurses/health officers having a higher mean score than other employees (p=0.006). A significant difference was detected in HHPI mean scores between internal clinics and surgical clinics (p=0.044). There were significant differences in mean HHBS and HHPI scores according to work shift (p=0.039; p=0.040), with the difference in HHBS scores being attributed to lower scores

Table 1. Sociodemographic and hand hygiene characteristics of the participants.

Variables		n (%)
Sex	Female	91 (38.2)
	Male	147 (61.8)
Marital status	Married	155 (65.1)
	Single	83 (34.9)
Education level	Primary education	23 (9.7)
	High School	59 (24.8)
	Undergraduate	21 (8.8)
	University	92 (38.6)
	Master's Degree	15 (6.3)
	Doctorate degree	28 (11.8)
Profession	Nurse/ Health officer	112 (47.1)
	Cleaning staff	46 (19.3)
	Doctor	39 (16.4)
	Other	41 (17.2)
Working department	Internal clinic	67 (28.2)
	Intensive care unit	56 (23.5)
	Surgical clinic	41 (17.2)
	Polyclinic	13 (5.5)
	Laboratory	11 (4.6)
	Emergency service	8 (3.4)
	Operating Room	8 (3.4)
	Other	34 (14.2)
Working shift	Night	8 (3.4)
	Day	110 (46.2)
	Alternating day/night	120 (50.4)
Duration of employment (years);	(mean±SD; min-max)	6.43±6.83 (4.0;0.1-28.0)
Duration of employment (years);	(mean±SD; min-max)	9.39±7.80 (7.2; 0.0-35.0)
Participating in in-service training on hand hygiene	Yes	139 (58.4)
Self-knowledge level on hand hygiene	I think my knowledge is sufficient	201 (84.5)
	I think I need to improve my knowledge	34 (14.3)
	I think my knowledge is insufficient	3 (1.3)
Frequently used material for hand hygiene	Water and soap	188 (79.0)
	Alcohol-based hand sanitizer	50 (21.0)
Average time spent on hand washing	<15 seconds	12 (5.0)
	15-30 seconds	174 (73.1)
	>30 seconds	52 (21.8)
Total		238 (100.0)

in participants working at night compared to those working during the day ($p<0.05$), and the difference in HHPI scores being attributed to lower scores in participants working night/day shifts compared to those working alternating shifts ($p=0.048$). Participants who received in-service training on hand hygiene had higher HHPI mean scores ($p=0.004$). A statistically significant difference was found in HHPI mean scores between participants who believed their hand hygiene knowledge was sufficient and those who believed they needed to improve their knowledge ($p=0.003$), with the former group having higher scores. Participants who spent an average of <15 seconds washing their hands had lower HHPI mean scores compared to those who washed their hands for a longer duration ($p=0.003$).

Discussion

Compliance with hand hygiene is a complex behavior influenced by various factors. Identifying individual factors such as knowledge, attitude, practice, belief, and perception can enhance adherence to hand hygiene. Additionally, identifying problematic beliefs and attitudes can contribute to determining more appropriate health education or intervention methods [11]. In this study, we aimed to contribute to the understanding of healthcare workers' hand hygiene beliefs and practices by using the validated HHBS and HHPI scales in our country. In our study, the participants' mean total HHBS score was found

Table 2. Distribution of the participants' mean HHBS scores.

Variables	Mean±SD	Median (min-max)
It is considered an important part of the hand hygiene education program.	3.97±1.31	4 (1-5)
Services in clinical practice settings make it easier to emphasize the importance of hand hygiene.	3.82±1.23	4 (1-5)
The clinical care/service manager emphasizes the importance of hand hygiene.	3.82±1.31	4 (1-5)
I have a duty to be a role model for other healthcare employment.	3.76±1.25	4 (1-5)
When I am busy at work, it is more important to protect my work than to pay attention to hand hygiene	3.51±1.45	4 (1-5)
Performing hand hygiene in recommended situations may reduce the patient mortality rate.	3.85±1.31	4 (1-5)
Costs associated with hospital-acquired harms from operating hand hygiene to obtained portions.	3.99±1.30	4 (1-5)
Since the needs of the patients take priority, I cannot always perform the hygiene of the materials used.	3.30±1.39	4 (1-5)
Prevention of nosocomial infections is an important part of the role of healthcare workers.	3.95±1.36	4 (1-5)
I take the behavior of health workers experienced in hand hygiene as a role model.	3.60±1.45	4 (1-5)
Acquiring a healthcare-associated infection could threaten my life or career.	3.84±1.30	4 (1-5)
I believe that I have the power to change wrong/bad practices in the work environment.	3.55±1.36	4 (1-5)
Failure to maintain hand hygiene in the recommended situations may be considered negligent.	3.71±1.33	4 (1-5)
Hand hygiene is a habit for me in my personal life.	3.97±1.30	4 (1-5)
I am confident that I can apply my knowledge of hand hygiene effectively in my clinical work.	3.96±1.29	4 (1-5)
In recommended situations, remembering hand hygiene requires an effort.	2.53±1.38	2 (1-5)
It makes me uncomfortable to remind healthcare workers to wash their hands.	3.06±1.42	3 (1-5)
Maintaining hand hygiene slows down the acquisition of immunity against diseases.	3.40±1.50	4 (1-5)
Dirty sinks can be an excuse for not washing hands.	3.10±1.50	3 (1-5)
The lack of a suitable cleaning product can be a reason for not cleaning hands.	3.05±1.46	3 (1-5)
Ensuring hand hygiene after caring for a wound can help protect against infections.	4.00 ±1.33	4.5 (1-5)
Washing hands after using the toilet reduces the risk of spreading infectious diseases.	4.04±1.39	5 (1-5)
Hand Hygiene Importance Sub-dimension	54.23±15.97	59 (14-70)
Hand Hygiene Belief Sub-dimension	25.55±7.06	26 (10-40)
HHBS Total Score Average	79.79±14.85	82 (43-110)

Table 3. Distribution of Participants' HHPI Score Averages.

Variables	Mean±SD	Median (min-max)
After using the toilet	4.41±1.02	5 (1-5)
Before caring for a wound	4.17±1.10	5 (1-5)
After caring for a wound	4.35±0.97	5 (1-5)
After touching potentially dirty objects	4.23±1.04	5 (1-5)
After contact with blood and body fluids	4.38±0.99	5 (1-5)
After inserting an invasive instrument to a patient	4.36±1.00	5 (1-5)
Before entering the room of an isolated patient	4.30±0.96	5 (1-5)
After touching the patient's skin	4.31±1.01	5 (1-5)
After entering the room of an isolated patient	4.31±0.96	5 (1-5)
Before endotracheal aspiration procedure	4.23±1.06	5 (1-5)
After contact with patient secretions	4.40±1.09	5 (1-5)
Before contact with a patient	4.06±1.09	5 (1-5)
After removing the gloves	4.22±1.01	5 (1-5)
When my hands are dirty or look like that	4.34±1.03	5 (1-5)
HHPI	60.08±12.66	66 (14-70)

to be 79.79, and the mean HHPI score was 60.08. Based on this, it can be stated that healthcare workers significantly embrace hand hygiene beliefs and practical application. In a study conducted by Karahan et al. [12], the mean score for the hand hygiene belief scale was 84.03, and the mean score for the hand hygiene practice inventory was 63.97. The results indicated that employees had positive beliefs about hand hygiene and mostly practiced it.

Despite limitations in both water and soap washing and the use of alcohol-based hand sanitizers, they remain the most effective hand hygiene methods [13]. The effectiveness of handwashing is closely related to washing technique and duration [14]. The recommended duration for handwashing with water and soap or antiseptic soap is at least 15 seconds [5]. In our study, handwashing with water and soap was the preferred hand hygiene method. The proportion of individuals who spent more than 15 seconds washing hands was 95%. The higher average hand hygiene practice score among participants who spent more than 15 seconds washing their hands compared to those who spent less time not only indicates the significant emphasis on

Table 4. Distribution of HHBS and HHPI scores according to sociodemographic and hand hygiene characteristics of the participants.

Variables		HHBS		HHPI	
		Median (min-max)	Test value p post hoc	Median (min-max)	Test value p post hoc
Sex	Female	85 (46-104)	2.963*	67 (29-70)	0.755*
	Male	81 (43-110)	**0.003**	66 (14-70)	0.450
Marital status	Married	83 (43-110)	1.953*	67 (14-70)	2.205*
	Single	81 (46-101)	0.051	63 (28-70)	**0.027**
Education level	Primary education[a]	83 (45-110)		69 (16-70)	
	High School[b]	81 (43-101)	10.684**	66 (14-70)	11.432**
	Undergraduate[c]	81 (74-101)	0.058	66 (39-70)	**0.043**
	University[d]	83 (45-108)		66 (26-70)	
	Master's Degree[e]	78 (46-100)		68 (42-70)	**a-f:0.001**
	Doctorate degree[f]	88 (56-104)		60.5 (18-70)	
Profession	Nurse/ Health officer[a]	82 (46-108)	11.835**	68 (28-70)	10.534**
	Cleaning staff[b]	86 (48-104)	**0.008**	66.5 (14-70)	**0.015**
	Doctor[c]	86 (48-104)	**c-d: 0.024**	60 (18-70)	**a-c: 0.006**
	Other[d]	76 (45-101)		63 (26-70)	
Working department	Internal clinic[a]	85 (46-103)		67 (36-70)	
	Intensive care unit[b]	83 (74-101)		56 (18-70)	
	Surgical clinic[c]	81 (45-110)	9.905**	62.5 (16-70)	14.446**
	Polyclinic[d]	79 (45-101)	0.194	69 (28-70)	**0.044**
	Laboratory[e]	80 (74-95)		60 (40-70)	**a-c: <0.05**
	Emergency service[f]	68 (50-101)		47 (14-70)	
	Operating Room[g]	73.5 (43-88)		69 (38-70)	
	Other[h]	82 (45-108)		67.5 (26-70)	
Working shift	Night[a]	61 (45-92)	6.475**	42 (16-70)	6.456**
	Day[b]	83.5 (45-110)	**0.039**	65 (18-70)	**0.040**
	Alternating day/night[c]	82 (43-108)	**a-b:<0.05**	67 (14-70)	**a-c:0.048**
Participating in in-service training on hand hygiene	Yes	82 (43-110)	0.737*	68 (16-70)	2.888*
	No	82 (46-104)	0.461	65 (14-70)	**0.004**
Self-knowledge level on hand hygiene	I think my knowledge is sufficient[a]	83 (43-110)		67 (14-70)	11.705**
	I think I need to improve my knowledge[b]	77.5 (46-104)	4.507**	59.5 (18-70)	**0.003**
	I think my knowledge is insufficient[c]	77 (66-78)	0.105	40 (35.53)	**a-b: 0.033**
The material used for hand hygiene	Water and soap	83 (43-110)	1.005*	66 (26-70)	0.471*
	Alcohol-based hand sanitizer	81 (45-101)	0.315	68 (14.70)	0.637
Average time spent washing hands	<15 seconds[a]	77.5 (49-101)	4.537**	47.5 (26-68)	12.121**
	15-30 seconds[b]	82 (43-110)	0.103	66 (14-70)	**0.002**
	>30 seconds[c]	85.5 (45-108)		67.5 (16-70)	**a-b: 0.012 a-c: 0.003**

*: Mann Whitney U Test **: Kruskal Wallis Test.

handwashing but also suggests awareness of general hand hygiene indications.

In our study, it was determined that women exhibited a higher level of hand hygiene belief and emphasized the importance of hand hygiene more than men. However, there was no difference between genders in terms of hand hygiene practices. A study conducted on the general population during the COVID-19 pandemic demonstrated that women had more knowledge about handwashing compared to men and were more likely to put that knowledge into practice [15]. Another study conducted on healthcare workers in a university hospital showed that women had higher hand hygiene compliance [16]. Similarly, in another study, it was found that women had better hand hygiene beliefs and practices [12].

When considering occupational groups, it was determined that doctors had a higher mean HHBS score, while nurses/health officers had a higher mean HHPI score. These results suggest that doctors hold a higher level of hand hygiene belief and emphasize the topic more; however, there is not an equal parallel in their practical application. Erasmus et al. [6] showed in their systematic review that hand hygiene compliance rates were lower among doctors compared to nurses. In a study by Nargiz Koşucu et al. [17], the hand hygiene compliance rate was found to be higher among nurses compared to doctors and other

healthcare assistants. On the other hand, in the study by Karahan et al. [12], there was no significant difference in hand hygiene beliefs and practices based on occupational groups.

The level of hand hygiene compliance among healthcare workers has been shown to decrease depending on conditions such as hospital environment and architectural structure, clinic density, distance to sinks and hand antiseptics, and excessive workload [12,18]. In the study by Karahan et al. [12], healthcare workers in internal departments had a higher belief in maintaining hand hygiene compared to those in other units, but there was no difference in terms of practical application. Erasmus et al. [6] demonstrated in their study that hand hygiene compliance in intensive care units was lower compared to internal and surgical departments. In our study, it was found that employees working in internal clinics had a higher mean HHPI score compared to those working in surgical clinics, with no significant difference in HHBS mean scores. In surgical departments where more interventional procedures are performed and the potential for infection development is higher, it is crucial to pay more attention to hand hygiene practices. The inadequacy in practice despite the need highlights a significant issue. A more detailed analysis is required to understand the reasons that deter healthcare workers in these clinics from adhering to hand hygiene practices.

Providing education aimed at increasing hand-washing compliance among healthcare workers is one of the most strategic steps. Regularly conducting educational programs can significantly contribute to improving hand hygiene compliance [19]. In the study by Aktuğ Demir et al. [20], the rate of in-service training on hand hygiene was determined to be 80.4%. Gürbüz et al. [21] found in their study that 95% of nurses and other healthcare workers participated in hand hygiene training programs, while the rate was lower among doctors (73%). In our study, the participation rate in in-service training was notably low compared to the literature. However, participants who received in-service training had higher HHPI mean scores. Therefore, it can be concluded that in-service training has a positive impact on hand hygiene practices. Increasing the frequency of hand hygiene education by the infection control committee, intensifying interactive applications, and utilizing various motivational tools to encourage higher participation would be beneficial.

Conclusion

Hospital-acquired infections continue to be a significant cause of morbidity and mortality. Factors such as limited treatment options and the issue of antimicrobial resistance make preventive measures even more crucial. Hand hygiene, being simple and cost-effective, is the most effective preventive method. In this study, it was found that healthcare workers had a high belief in hand hygiene and that its implementation was generally embraced. Although doctors exhibited higher hand hygiene belief scores among occupational groups, the same level of success in implementation was not observed. Notably, the lack of attention to hand hygiene practices among employees in surgical departments is a significant concern. Another important finding was the inadequate participation in in-service training. Especially among those who received in-service training, higher hand hygiene practice was observed, highlighting the importance of education. In conclusion, to enhance hand hygiene compliance, it is essential to minimize inhibiting factors such as hospital physical conditions, increased workload, and lack of hand hygiene equipment. Increasing the frequency of in-service training can contribute significantly to reducing hospital-acquired infections.

Ethical approval

In order to conduct the study, approval was obtained from the Harran University Clinical Research Ethics Committee with decision number HRU/21.11.14 dated 07.06.2021.

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