

Evaluation of beliefs, practices and importance among Health Sciences University students regarding hand hygiene

Bewertung der Überzeugungen, Praktiken und Bedeutung von Universitätsstudenten der Gesundheitswissenschaften in Bezug auf die Händehygiene

Abstract

Aim: Healthcare-associated infections are largely preventable and pose a substantial burden on society. The most effective way to control infection is to ensure optimal hand hygiene. This cross-sectional study aimed to evaluate hand hygiene (HH) beliefs, practices, and importance levels among healthcare-professional students.

Methods: Students of Kutahya Health Sciences University, Faculty of Medicine, Faculty of Dentistry, Faculty of Health, and Vocational Schools of Health Services were included in this questionnaire-based study. The questionnaire contained a total of 45 items. The first nine included demographic information; the other items were divided into three sub-groups: hand hygiene belief scale (HBS), hand hygiene practice inventory (HHPI), and hand hygiene importance scale (HIS). The questionnaire used a 5-point Likert scale ranging from strongly disagree to strongly agree.

Results: A total of 884 participants (695 female, 189 male) with a mean age of 20.2 ± 2.61 (17-49) completed the survey by answering all questions. The mean total scale score of all participants was 145.7 ± 17.89 . The mean HBS score was 67.7 ± 10.91 , mean HHPI score was 64.7 ± 8.98 , and the mean HIS score was 13.4 ± 2.25 . It was determined that females and individuals under 20 years old had higher scores than males and participants > 20 years of age, and students in the medical and health sciences departments scored higher than students in vocational schools and the faculty of dentistry.

Conclusions: This study determined that students' belief, practice, and importance levels regarding the necessity of HH were high and that age, gender, and university department affected HH compliance.

Keywords: hand hygiene, belief, practice, importance, healthcare

Zusammenfassung

Zielsetzung: Health care assoziierte Infektionen sind zu einem großen Teil vermeidbar und stellen eine erhebliche Belastung für die Gesellschaft dar. Die wirksamste Methode zur Infektionskontrolle ist die Gewährleistung optimaler Händehygiene. Ziel der Querschnittsstudie war es, Überzeugungen, Praktiken und Wichtigkeitsgrade der Händehygiene von Kandidaten für den Beruf im Gesundheitswesen zu bewerten.

Methoden: An der Studie nahmen Studierende der Kutahya Health Sciences University, der Fakultät für Medizin, der Fakultät für Zahnmedizin, der Fakultät für Gesundheit und der Berufsschulen für Gesundheitsdienste teil. Der in der Studie verwendete Fragebogen enthielt 45 Fragen. Dabei enthielten die ersten neun Fragen demografische Informationen. Die anderen Fragen beinhalteten drei Untergruppen: Händehygiene-Überzeugungsskala (HÜS), Händehygiene-Praxisinventar

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(HPI) und Händehygiene-Wichtigkeitsskala (HWS). Der Fragebogen ist eine 5-Punkte-Likert-Skala, wobei jede Aussage von „Stimme überhaupt nicht zu“ bis „Stimme völlig zu“ reicht.

Ergebnisse: 884 Teilnehmer (695 Frauen, 189 Männer) mit einem Durchschnittsalter von $20,2 \pm 2,61$ (17–49) Jahren haben die Umfrage abgeschlossen und alle Fragen beantwortet. Der durchschnittliche Gesamtskalenwert aller Teilnehmer betrug $145,7 \pm 17,89$. Der durchschnittliche HÜS-Wert betrug $67,7 \pm 10,91$, der durchschnittliche HPI-Wert $64,7 \pm 8,98$ und der durchschnittliche HWS-Wert $13,4 \pm 2,25$. Es wurde festgestellt, dass Frauen und Personen unter 20 Jahren höhere Werte erzielten, während Studenten der medizinischen und gesundheitswissenschaftlichen Fakultäten bessere Werte erzielten als Studenten der Berufsschulen und der Zahnmedizinischen Fakultät.

Schlussfolgerungen: Die Studie ergab, dass die Überzeugung, Praxis und Wichtigkeit der Studenten in Bezug auf die Notwendigkeit von Händehygiene hoch waren und dass Alter, Geschlecht und Universitätsabteilung die Einhaltung der Händehygiene beeinflussten.

Schlüsselwörter: Händehygiene, Überzeugung, Praxis, Wichtigkeit, Gesundheitspflege

Introduction

To a great extent, healthcare-associated infections (HAIs) are preventable, but their morbidity and mortality pose a substantial burden on society [1], [2]. It has been estimated that hundreds of thousands of individuals are impacted by avoidable HAIs annually [3]. Various factors contribute to the occurrence of HAIs, stemming from deficiencies in health-related policies, infrastructure, organization, and knowledge [4]. Additionally, substandard practices and behaviors among healthcare professionals further exacerbate the risk of HAIs. The transmission of HAIs is primarily attributed to the contaminated hands of healthcare workers [5]. As a result, upholding high standards of hand hygiene (HH) has always been a paramount concern in the healthcare sector [6]. Despite the seemingly straightforward nature of HH, achieving and maintaining compliance with HH protocols in healthcare settings has consistently presented significant challenges on a global scale [7]. According to the literature, the average HH compliance rate is approximately 40% in high-income countries and less than 20% in low-income countries [8]. A study revealed that a mere 5.55% of medical and nursing students adhered to proper HH practices, indicating a prevalent lack of compliance among students [9].

Studies have identified various factors associated with low HH compliance within healthcare settings. It has been reported that inadequate staffing and overcrowding are linked to reduced HH adherence among healthcare workers, leading to an increase in HAIs caused by methicillin-resistant *Staphylococcus aureus* [10]. It has been stated that the place of duty and the workload of healthcare personnel are related to HH compliance [6]. In a study that monitored the HH practices of medical students upon entering intensive care units, it was observed that male students often neglected HH due to perceived time con-

straints, lack of role models for proper HH, and misinformation about the requirements [11]. Conversely, female students cited concerns about skin dryness or cracking and forgetfulness as reasons for non-compliance [11]. In various studies investigating the HH knowledge and attitudes of nursing and medical students, it was found that nursing students consistently exhibited higher compliance with HH practices [9], [12], [13], [14], [15]. This disparity has been attributed to differences in the timing of HH training between the two cohorts and the frequency of direct patient contact. Recent reports indicate that following HH protocols is linked to glove usage. Unnecessary glove use has negative consequences, while appropriate glove use has positive effects [12].

The primary focus of the literature on student HH compliance predominantly centers around medical and nursing students. Given the widespread inadequacy of HH compliance globally, it is essential to explore the knowledge and attitudes of students across all healthcare disciplines regarding HH practices.

The main purpose of this study was to evaluate the beliefs, practices, and importance of HH among healthcare-professional students. Additionally, the study seeks to assess the potential impact of various associated factors, including age, gender, university department, and HH training.

Methods

Study design and setting

In this descriptive, cross-sectional study, a survey form was used to determine the beliefs, practice, and importance of HH in students training to be health technicians and doctors, dentists, nurses, midwives, physiotherapists, and dieticians. The survey form was sent to participants online via a link or e-mail. The data collection process

continued between January 2024 and April 2024, and the collected data were recorded in a database. Ethical approval was obtained from Kutahya Health Sciences University Non-Interventional Clinical Research Ethics Committee on 15.01.2024 (decision number 2024/01-34).

Participants

Students of the Kutahya Health Sciences University, Faculty of Medicine, Faculty of Dentistry, Faculty of Health Sciences (midwifery, nursing, physiotherapy, nutrition and dietetics), and Vocational Schools of Health Services (oral and dental health technician, emergency and first aid, medical laboratory technician, physiotherapy technician, dental prosthesis technician, anesthesia technician, patient care, elderly care, medical imaging technician, disinfection/sterilization technician, occupational therapy technician) were included in the study. Students outside the specified universities and departments were excluded. Participants were categorized into four groups according to their department: Vocational Schools of Health Services (Group 1), Faculty of Health Sciences (Group 2), Faculty of Dentistry (Group 3), and Faculty of Medicine (Group 4).

Data sources

The questionnaire contained a total of 45 items. The first 9 included demographic information: age, gender, faculty, program, class, type of highschool diploma, HH education, source of HH education, and the institution in which they practice. The other questions were divided into three subgroups: hand hygiene belief scale (HBS), hand hygiene practice inventory (HHPI), and hand hygiene importance scale (HIS). The HBS comprises 19 questions and assesses the belief in the necessity of HH application. The HHPI consists of 14 questions and evaluates HH application in hospital settings. The HIS contains 3 questions and gauges opinions on the importance of HH. The questionnaire was answered on a 5-point Likert scale with each statement ranging from strongly disagree (1 point) to strongly agree (5 points). The scale ranges from 36 to 180, with no specified cut-off point. The HBS scores range from 19 to 95, the HHPI scores range from 14 to 70, and the HIS scores range from 3 to 15. As the score on the scale increases, it indicates that the participants' knowledge, beliefs, and practices related to HH increase. The Cronbach alpha values for the scale were 0.80 for HBS, 0.74 for HHPI, and 0.77 for HIS [16]. The Turkish questionnaire's validity and reliability were also proven, and was presented to the students in their mother tongue [17]. Participants chose one or more options depending on the design of the questions. It took approximately 20 minutes to complete the survey by answering the questions.

Outcomes

Primary outcomes were investigation of HH knowledge, beliefs, practices, and importance levels of students at

a health sciences university. Secondary outcomes were examining the effect of the university department and gender, age, and HH education status on HBS, HHPI, and HIS scores and total scale score.

Sample size

Assuming an error level of 5%, a confidence level of 99%, and an estimated response rate of 50%, the number of people to be invited was 1172 and the required sample size 586. The study invited all students ($n=5390$) from the faculty of medicine, faculty of health sciences, and vocational schools of health services. A total of 884 students participated in the study and completed the questionnaire, resulting in a response rate of 16.4%.

Statistical analysis

Descriptive statistics of the data, including number, percentage, mean, standard deviation, minimum, and maximum were provided. To begin the statistical analysis, the assumption of normality was checked using Skewness & Kurtosis, the Kolmogorov-Smirnov test, and a histogram. Because the normality assumption was not met, the Mann-Whitney U-test was used. The Kruskal-Wallis test was used for variables with three or more independent groups that did not exhibit a normal distribution. The significance level was set at 0.05. Analyses were carried out in the IBM SPSS 25 program.

Results

Demographic data

A total of 884 participants (695 female, 189 male) with a mean age of 20.2 ± 2.61 (17–49) years completed the survey by answering all questions. 42.5% of the participants were studying at vocational schools of health services, 35.9% at a University health-sciences department, 16.5% at a University faculty of dentistry, and 5.1% at a University faculty of medicine. 64.9% of the participants stated that they had received HH training, while 35.1% stated that they had not (Table 1).

Evaluation of survey questions

The mean total scale score of all participants was 145.7 ± 17.89 . The mean HBS score was 67.7 ± 10.91 , the mean HHPI score was 64.7 ± 8.98 , and the mean HIS score was 13.4 ± 2.25 (Table 2).

The statements with the highest “strongly agree” rates were “Cleansing hands after going to the toilet can reduce transmission of infectious disease” (HBS-19) (71.2%), “I follow the example of senior healthcare workers when deciding whether or not to perform hand hygiene” (HBS-6) (62.2%) and “Performing hand hygiene after wound care can protect from infections” (HBS-18) (61.5%). On the other hand, the statements with the

Table 1: Demographic characteristics of the participants

Characteristic		Number (n)	Percent (%)
Gender	Male	189	21.4
	Female	695	78.6
Degree	Bachelor's degree	508	57.5
	Associate degree	376	42.5
University/vocational school	All vocational schools	376	42.5
	University faculty of health sciences	317	35.9
	University faculty of dentistry	146	16.5
	University faculty of medicine	45	5.1
Type of highschool diploma	Anatolian highschool	551	62.3
	Vocational and technical highschool	150	17.0
	Other	183	20.7
Hand hygiene training	Yes	574	64.9
	No	310	35.1
The place where hand hygiene training is received	University	490	55.4
	Highschool	68	7.69
	Public hospital	205	23.1
	Course	138	15.6
	Other	14	1.6
Place of internship	Public hospital	279	31.6
	University	83	9.4
	Didn't do an internship	570	64.5

Table 2: Distribution of the different hand-hygiene scores

	Number (n)	Min	Max	Mean $\pm$ SD
HBS	884	19	95	67.7 $\pm$ 10.91
HHPI	884	14	70	64.7 $\pm$ 8.98
HIS	884	3	15	13.4 $\pm$ 2.25
Total scale score	884	36	180	145.7 $\pm$ 17.89

HBS: Hand hygiene belief scale; HHPI: Hand hygiene practice inventory; HIS: Hand hygiene importance scale

highest “strongly disagree” rates were “When busy it is more important to complete my tasks than to perform hand hygiene” (HBS-2) (41.0%), “I can’t always perform hand hygiene in recommended situations because my patient’s needs come first” (HBS-5) (41.0%). Moreover, 20.9% of the participants strongly agreed with the “HBS-1” question, 52.1% with the “HBS-3” question, and 52.1% with the “HBS-4” question (see Table 3). Further, 21.4% strongly agreed with the “HBS-7” question, 17.9% with the “HBS-8” question, 42.2% with the “HBS-9” question, 59.8% with the “HBS-10” question, and 49.7% with the “HBS-11” question (Table 3).

In the question “I cleanse my hands...”, the statements with the highest “strongly agree” rates were “After going to the toilet” (HHPI-1) (83.6%) and “After contact with blood or body fluids” (HHPI-6) (81.4%), respectively. The statements with the lowest “strongly agree” rates were “Before entering an isolation room” (HHPI-8) (67.9%) and “Before patient contact” (HHPI-13) (67.3%). The statements with the highest “strongly disagree” rates were

“After caring for a wound” (HHPI-3) (1.7%) and “After removing gloves” (HHPI-14) (1.2%) (Table 4).

While 54.8% of the participants responded “strongly agree” to HIS-1, 31.2% responded “agree”. 63.3% responded “strongly agree” to HIS-2, while 29.3% responded “agree”. Furthermore, 61.9% responded “strongly agree” to HIS-3, while 29.9% responded “agree” (Table 3).

Influence of demographic data on HBS, HHPI, HIS and total scale scores

The effect of gender, age, and HH training on HBS, HHPI, HIS, and total scale scores is presented in Table 4. It was observed that HHPI, HIS, and total scale scores were significantly higher in women than in men ($p=0.000$, $p=0.002$, $p=0.005$, resp.). However, there was no statistically significant difference between the two genders in the HBS score ($p=0.997$). It was observed that HBS, HHPI, and total scale scores were significantly higher in the age groups <20 years compared to the age groups ≥ 20 years

Table 3: Distribution of participants according to their answers to hand hygiene belief, hand hygiene practice inventory and hand hygiene importance

Question No	Questions	Strongly disagree		Disagree		Partially agree		Agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
HBS 1	I have a duty to act as a role model for other health care workers	81	9.2	122	13.8	232	26.2	264	29.9	185	20.9
HBS 2	When busy, it is more important to complete my tasks than to perform hand hygiene	362	41.0	305	35.4	100	11.3	69	7.8	48	5.4
HBS 3	Performing hand hygiene in the recommended situations can reduce patient mortality	22	2.5	18	2.0	100	11.3	283	32.0	461	52.1
HBS 4	Performing hand hygiene in the recommended situations can reduce medical costs associated with HAIs	25	2.8	22	2.5	90	10.2	286	32.4	461	52.1
HBS 5	I can't always perform hand hygiene in recommended situations because my patient's needs come first	362	41.0	264	29.9	134	15.2	74	8.4	50	5.7
HBS 6	Prevention of hospital-acquired infection is a valuable part of a healthcare worker's job	19	2.1	18	2.0	62	7.0	235	26.6	550	62.2
HBS 7	I follow the example of senior healthcare workers when deciding whether or not to perform hand hygiene	146	16.5	149	16.9	187	21.2	213	24.1	189	21.4
HBS 8	I believe I have the power to change poor practices in the workplace	84	9.5	164	18.6	268	30.3	210	23.8	158	17.9
HBS 9	Failure to perform hand hygiene in the recommended situations can be considered negligence	58	6.6	654	6.1	120	13.6	279	31.6	373	42.2
HBS 10	Hand hygiene is a habit for me in my personal life	14	1.6	21	2.4	58	6.6	262	29.6	529	59.8
HBS 11	I am confident I can effectively apply my knowledge of hand hygiene to my clinical practice	23	2.6	25	2.8	105	11.9	292	33.0	439	49.7
HBS 12	It is an effort to remember to perform hand hygiene in the recommended situations	71	8.0	75	8.5	152	17.2	272	30.8	314	35.5
HBS 13	I would feel uncomfortable reminding a health professional to wash hands	217	19.7	190	21.5	231	26.1	172	19.5	117	13.2
HBS 14	If I disagree with a guideline, I look for research findings to guide my practice	34	3.8	58	6.6	264	29.9	289	32.7	239	27.0
HBS 15	Performing hand hygiene slows down building immunity to disease	163	18.4	152	17.2	139	15.7	178	20.1	252	28.5
HBS 16	Dirty sinks can be a reason for not washing hands	158	17.9	156	17.6	266	30.1	169	19.1	135	15.3
HBS 17	Lack of an acceptable soap product can be a reason for not cleansing hands	246	27.8	203	23.0	191	21.6	132	14.9	112	12.7

(Continued)

Table 3: Distribution of participants according to their answers to hand hygiene belief, hand hygiene practice inventory and hand hygiene importance

Question No	Questions	Strongly disagree		Disagree		Partially agree		Agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
HBS 18	Performing hand hygiene after caring for a wound can protect from infections	23	2.6	32	3.6	67	7.6	218	24.7	554	61.5
HBS 19	Cleansing hands after going to the toilet can reduce transmission of infectious disease	20	2.3	19	2.1	44	5.0	172	19.5	629	71.2
Question No	I cleanse my hands:	Strongly disagree		Disagree		Partially agree		Agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
HHPI 1	After going to the toilet	7	0.8	19	2.1	5	0.6	112	12.7	741	83.6
HHPI 2	Before caring for a wound	7	0.8	18	2.0	32	3.6	186	21.0	641	72.5
HHPI 3	After caring for a wound	15	1.7	24	2.7	32	3.6	168	19.0	645	73.0
HHPI 4	After touching potentially contaminated objects	6	0.7	22	2.5	33	3.7	163	18.4	660	74.7
HHPI 5	If they look or feel dirty	6	0.7	21	2.4	18	2.0	143	16.2	696	78.7
HHPI 6	After contact with blood or body fluids	6	0.7	19	2.1	9	1.0	130	14.7	720	81.4
HHPI 7	After inserting an invasive device	8	0.9	24	2.7	39	4.4	196	22.2	617	69.8
HHPI 8	Before entering an isolation room	10	1.1	28	3.2	48	5.4	198	22.4	600	67.9
HHPI 9	After physical contact with a patient	5	0.6	26	2.9	35	4.0	188	21.3	630	71.3
HHPI 10	After exiting an isolation room	8	0.9	25	2.8	40	4.5	170	19.2	641	72.5
HHPI 11	Before endotracheal suctioning	10	1.1	25	2.8	51	5.8	176	19.9	622	70.4
HHPI 12	After contact with a patient's secretions	8	0.9	21	2.4	18	2.0	152	17.2	685	77.5
HHPI 13	Before patient contact	10	1.1	27	3.1	59	6.7	193	21.8	595	67.3
HHPI 14	After removing gloves	11	1.2	23	2.6	53	6.0	180	20.4	617	69.8
Question No	Questions	Strongly disagree		Disagree		Partially agree		Agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
HIS 1	Hand hygiene is considered an important part of the curriculum	10	1.1	25	2.8	89	10.1	276	31.2	484	54.8
HIS 2	The facilities in which I do clinical practice emphasize the importance of hand hygiene	8	0.9	18	2.0	39	4.4	259	29.3	560	63.3
HIS 3	The importance of hand hygiene is emphasized by my clinical supervisors	9	1.0	20	2.3	44	5.0	264	29.9	547	61.9

HBS: Hand hygiene belief scale; HHPI: Hand hygiene practice inventory; HIS: Hand hygiene importance scale

($p=0.037$, $p=0.026$, $p=0.010$). However, there was no statistically significant difference between the two age groups in the HIS score ($p=0.450$). When the effect of HH training on HBS, HHPI, HIS, and total scale scores was examined, only HIS scores were found to be significantly higher in the group that received HH training

($p=0.006$). No statistically significant difference was found in HBS, HHPI, and total scale scores between participants who received and did not receive HH training ($p=0.450$).

Table 4: Influence of gender, age, and HH training on hand hygiene belief scale, hand hygiene practice inventory, hand hygiene importance scale and total scale scores

Characteristic	Gender	Mean $\pm$ SD	Test statistic	p
HBS	Female	67.6 $\pm$ 10.48	-0.004	0.997
	Male	67.8 $\pm$ 12.39		
HHPI	Female	65.5 $\pm$ 7.84	-5.164	0.000*
	Male	61.5 $\pm$ 11.79		
HIS	Female	13.5 $\pm$ 2.05	-3.040	0.002*
	Male	12.8 $\pm$ 2.81		
Total scale score	Female	146.7 $\pm$ 16.17	-2.830	0.005*
	Male	142.00 $\pm$ 22.84		
	Age	Mean $\pm$ SD	Test statistic	p
HBS	<20	68.4 $\pm$ 11.91	-2.083	0.037
	$\geq$ 20	67.1 $\pm$ 10.00		
HHPI	<20	65.0 $\pm$ 9.23	-2.224	0.026*
	$\geq$ 20	64.4 $\pm$ 8.78		
HIS	<20	13.4 $\pm$ 2.33	-0.756	0.450
	$\geq$ 20	13.4 $\pm$ 2.19		
Total scale score	<20	146.7 $\pm$ 19.2	-2.571	0.010*
	$\geq$ 20	144.8 $\pm$ 16.73		
	HH Training	Mean $\pm$ SD	Test statistic	p
HBS	Yes	68.1 $\pm$ 10.35	-0.883	0.377
	No	66.9 $\pm$ 11.85		
HHPI	Yes	65.0 $\pm$ 8.52	-1.106	0.269
	No	64.00 $\pm$ 9.76		
HIS	Yes	13.50 $\pm$ 2.11	-2.766	0.006*
	No	13.1 $\pm$ 2.46		
Total scale score	Yes	146.6 $\pm$ 16.73	-1.604	0.109
	No	144.0 $\pm$ 19.79		

p<0.05, Mann-Whitney U-test, HBS: Hand hygiene belief scale; HHPI: Hand hygiene practice inventory; HIS: Hand hygiene importance scale

Influence of the university department on HBS, HHPI, HIS, and total scale scores

In terms of the influence of university department on HBS, HHPI, HIS, and total scale scores, statistically significant differences were found among the four groups (Table 5). When comparing HBS scores, group 2 was found to be higher than groups 1 and 3 ($p=0.00$, $p=0.00$). There was no significant difference between the other groups ($p>0.05$). In terms of HHPI scores, group 2 scored higher than group 3 ($p=0.00$), and no significant difference was found between the other groups ($p>0.05$). When comparing HIS scores, group 2 scores were found to be higher than those of groups 1 and 3 ($p=0.00$, $p=0.00$), with no significant difference found between the other groups ($p>0.05$). Furthermore, when comparing total scale scores, group 2 had higher scores than groups 1 and 3 ($p=0.00$, $p=0.00$), and group 4 scores were found to be higher than those of group 3 ($p=0.007$). No significant difference was found between the other groups ($p>0.05$). When comparing the mean ages of these four groups, it was observed that groups 1 and 2 had lower mean ages

compared to groups 3 and 4 ($p=0.00$, $p=0.00$, $p=0.00$, and $p=0.00$) (Table 5).

Discussion

Ensuring HH is the most effective way to infection control. This study evaluated the HH beliefs, practices, and importance levels of students at a health sciences university and examined the effect of demographic data. Our results showed that demographic data such as age, gender, university department, and HH training impact HH beliefs, practices, and importance.

In this study, the HHPI score was quite high (mean 64.7 $\pm$ 8.98), consistent with other studies conducted in Turkey [18], [19], [20]. Although the average HBS score (mean 67.7 $\pm$ 10.91) was lower than in the study by Birgili et al. [21], our study had similar HIS (mean 13.4 $\pm$ 2.25) and high HHPI and total scale scores (145.7 $\pm$ 17.89). Unlike this study, HBS in some similar studies in the literature consisted of 22 questions, with a possible score range of 22-110. In those studies, the average HBS score

Table 5: Influence of university department on hand hygiene belief scale, hand hygiene practice inventory, hand hygiene importance scale and total scale scores

		N	Min	Max	Mean ± SD	P			Test Statistics**	P**
Group 1	HBS	376	19	95	65.6±12.07	0.000*	Group 1	Group 2	43803.00	0.000**
Group 2		317	35	95	70.6±9.27		Group 1	Group 3	26498.00	0.539
Group 3		146	19	80	65.7±9.80		Group 1	Group 4	6595.00	0.016
Group 4		45	56	95	70.6±9.74		Group 2	Group 3	17254.50	0.000**
							Group 2	Group 4	6740.00	0.550
							Group 3	Group 4	2638.00	0.046
Group 1	HHPI	376	14	70	63.9±10.06	0.001*	Group 1	Group 2	53900.00	0.022
Group 2		317	28	70	66.2±6.47		Group 1	Group 3	24175.00	0.028
Group 3		146	14	70	62.7±10.47		Group 1	Group 4	7969.00	0.505
Group 4		45	28	70	65.8±7.67		Group 2	Group 3	17846.500	0.000**
							Group 2	Group 4	6856.00	0.655
							Group 3	Group 4	2622.50	0.036
Group 1	HIS	376	3	15	12.9±2.52	0.000*	Group 1	Group 2	43937.50	0.000**
Group 2		317	6	15	14.1±1.45		Group 1	Group 3	26954.50	0.736
Group 3		146	3	15	12.8±2.56		Group 1	Group 4	6666.00	0.013
Group 4		45	6	15	13.7±2.14		Group 2	Group 3	16710.50	0.000**
							Group 2	Group 4	6832.00	0.593
							Group 3	Group 4	2540.50	0.014
Group 1	Total Scale Score	376	41	180	142.5±20.1	0.000*	Group 1	Group 2	42752.50	0.000**
Group 2		317	95	180	150.9±12.97		Group 1	Group 3	26593.50	0.581
Group 3		146	36	164	141.3±19.14		Group 1	Group 4	6539.00	0.013
Group 4		45	110	180	150.2±14.29		Group 2	Group 3	15481.50	0.000**
							Group 2	Group 4	6702.00	0.512
							Group 3	Group 4	2403.50	0.007**
Group 1	Age	376	18	48	19.9±2.68	0.000*	Group 1	Group 2	59271.00	0.957
Group 2		317	18	49	19.99±2.64		Group 1	Group 3	13901.00	0.000**
Group 3		146	17	31	21.4±2.08		Group 1	Group 4	5439.50	0.000**
Group 4		45	18	31	20.8±2.18		Group 2	Group 3	12157.00	0.000**
							Group 2	Group 4	4739.00	0.000**
							Group 3	Group 4	2548.00	0.021

p<0.05, Kruskal Wallis Test. P**<0.01, Mann-Whitney U test. HBS: Hand hygiene belief scale; HHPI: Hand hygiene practice inventory; HIS: Hand hygiene importance scale, Group 1: Vocational School of Health Services; Group 2: Faculty of Health Sciences; Group 3: Faculty of Dentistry; Group 4: Faculty of Medicine

of nursing students was reported as 86.4 ± 8.56 and 89.8 ± 7.98 [18], [20].

This study revealed that gender has an impact on HH, with women achieving higher scores on HHPI, HIS, and the total scale. Multiple studies have indicated that female participants tend to have higher scores, and research on HH compliance has also shown that female healthcare workers demonstrate higher levels of compliance [18], [22], [23], [24]. In contrast, one study reported higher HHBS and HHPI scores in male participants compared to females [20], and another study indicated no effect of gender [21]. These findings suggest the need for tailored interventions to address gender-specific barriers to HH adherence within healthcare settings. The difference between genders in this study may have been

because most participants were women and men were not adequately represented.

In this study, students under 20 had higher HBS, HHPI, and total scale scores. In this study, where the population consisted of students, although the students were close in age, this significant difference shows that the younger population takes HH more seriously. In contrast, a study on young health professional candidates from Generation Z reported that age had no significant effect [22]. In addition, several studies have reported a positive correlation between increasing age and HH scale scores [23], [25]. Unlike other studies in the literature, this study, which included all health-professional students at a health sciences university, revealed that vocational schools and dentistry students had lower HBS, HHPI, HIS, and total scale scores compared to medical and health-sciences

faculty students. It has been shown that the importance given to HH in health-sciences departments and medical faculty curricula is not given in vocational schools and dentistry faculties. The brevity of training (two years) in vocational schools and the absence of invasive treatment attempts with patients in some departments may have affected the low scores. However, considering the duration of dentistry education (five years) and the internship periods (two years) where one-on-one contact with the patient is provided, it should be possible to make improvements in the dental curriculum regarding HH. In addition, inadequate knowledge, attitudes, and practices regarding HH have been reported in studies focusing on dental students or dentists [26], [27], [28]. In some studies comparing medical and nursing students, nursing students were reported to have higher scores, while in other studies, medical students were reported to have higher scores [9], [14], [15], [29], [30], [31]. In this study, no difference was found between health-sciences students and medical students, which is consistent with studies in which medical and nursing students had similar scores. Similar to this study, Baier et al. [22] reported that dental students had lower HH knowledge than medical technical assistants and trainee nurses. In the study by Thakker et al. [30], medical students had better HH knowledge than dental and nursing students.

The analysis showed that HH training could impact students' beliefs about and importance attributed to HH, as well as their practice scores. It was found that the training was effective in achieving higher scores in all subgroups and total scale scores, but the difference was only significant in the HIS score. The fact that HH training did not cause a significant difference in the effective total scale score may have been due to the information campaigns conducted worldwide through mass media during the COVID-19 pandemic and the increase in public awareness.

In this study, the participants' highest level of agreement in providing HH was determined as "After going to the toilet" and "After contact with blood or body fluids", and this data is consistent with previous studies [18], [24]. In addition, the lowest level of agreement was determined as "Before patient contact" and "Before entering an isolation room". This is similar to the study of Nicholson et al. [32], which reported that healthcare professionals are more likely to wash their hands after patient contact rather than before. Unfortunately, the fact that students did not realize the necessary importance of HH before patient contact suggests that the healthcare professional's responsibility to protect the patient is not fully established. In addition, in this study, the statement with the highest level of agreement, consistent with the literature, is "Cleansing hands after going to the toilet can reduce transmission of infectious disease" [18], [24].

Limitations

The main limitation of this study was the risk of response bias and overestimation due to its online survey-based

nature. It was also conducted at a single health-sciences university in Turkey and these findings may not be generalizable to different populations. In addition, although the required sample size was reached, attempts were made to reach all students and the questionnaire was sent twice at 2-week intervals as a reminder, the participation rate remained low. Another limitation of the study is that the number of female and male participants and the number of participants between departments could not be equal because the survey was volunteer-based. In addition, studies that monitor HH practices and compare them with the reported responses may be valuable in revealing students' HH beliefs, practices, and importance levels.

Conclusion

This study revealed that the beliefs about the necessity of HH, the practice thereof, and the importance attributed to HH among health-professional students received high scores. However, enhancing the role of HH education in the curriculum, as well as emphasizing its necessity, particularly in departments with lower average hand-hygiene scores, may be beneficial. It was also determined that age, gender, and university department affect HH compliance. Therefore, personalizing HH training according to demographic characteristics may be valuable.

Notes

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Ethical approval

Ethics committee approval was obtained from Kutahya Health Sciences University Non-Interventional Clinical Research Ethics Committee on 15.01.2024 (decision number 2024/01-34)

Funding

None.

Competing interests

The authors declare that they have no competing interests.

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Please cite as

Terzioglu B, Yenyapı A, Aydın E, Tunc Y, Percin Renders D. Evaluation of beliefs, practices and importance among Health Sciences University students regarding hand hygiene. *GMS Hyg Infect Control*. 2025;20:Doc66.

DOI: 10.3205/dgkh000595, URN: urn:nbn:de:0183-dgkh0005955

This article is freely available from

<https://doi.org/10.3205/dgkh000595>

Published: 2025-11-21

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