



## Original Article

# Factors Influencing Hand Hygiene Adherence among Hospitalized Adults in South Korea

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**Purpose:** This study evaluated hospitalized patients' knowledge, attitudes, and adherence to hand hygiene practices and aimed to identify the factors influencing adherence during hospitalization. **Methods:** This cross-sectional correlational study was conducted using a structured questionnaire with 165 adult inpatients at a tertiary care hospital. Data collected between March 6 and 17, 2023, were analyzed using descriptive statistics, the t-test, one-way analysis of variance, Pearson correlations, multiple linear regression, and SPSS/WIN 27.0 software. **Results:** The mean knowledge score was 9.02/12, and the attitude mean score was 1.68 on a -3 to +3 scale. The average adherence level was 3.83/5 before hospitalization but 3.36 during hospitalization. Adherence was highest after restroom use and before meals, and lowest before and after room transfers. Hand hygiene adherence was positively correlated with knowledge ( $r=.42, p<.001$ ), attitude ( $r=.21, p=.008$ ), and daily hand hygiene ( $r=.65, p<.001$ ). Key predictors of hand hygiene adherence included daily hand hygiene ( $\beta=.58, p<.001$ ), knowledge ( $\beta=.15, p=.021$ ), caregiver's hand hygiene ( $\beta=.14, p=.024$ ), and other patients' hand hygiene ( $\beta=.12, p=.049$ ), explaining 50.0% of the variance. **Conclusion:** Improving hand hygiene adherence among inpatients requires targeted education, supportive environments, and public awareness. Emphasizing factors such as daily hand hygiene adherence, knowledge, caregiver's hand hygiene practices, and other patients' behaviors can effectively reduce healthcare-associated infections and improve patient safety.

**Key Words:** Attitudes; Hand hygiene; Inpatients; Knowledge; Patient adherence

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## INTRODUCTION

Healthcare-associated infections (HAIs) are infections acquired during medical care, including hospitalizations and outpatient treatments, by healthcare workers or caregivers [1]. HAIs are estimated to occur in approximately 5~10% of hospitalized individuals [1,2], leading to higher morbidity and mortality rates, extended hospital stays, and increased healthcare costs, underscoring the importance of effective prevention and management strategies [3]. Among the various methods used to prevent HAIs, hand hygiene (HH) is one of the simplest and most effective. Because the hands are the primary vectors of microbial transmission, proper HH can significantly reduce the incidence of HAIs by preventing cross-infection in healthcare settings [4,5]. Therefore, numerous studies have been conducted to improve HH practices among healthcare workers and caregivers [6,7].

Hospitalized patients are frequently vulnerable due to weakened immune systems, chronic illnesses, and the use of invasive devices, making them more susceptible to infections from environmental surfaces, medical equipment, and interactions with other patients or visitors [8,9]. Importantly, patients' hands can serve as vectors for self-contamination, particularly when touching wounds, catheters, or mucous membranes [10]. Besides protecting themselves from external pathogens, proper HH enables patients to actively participate in their health management, enhancing self-efficacy and promoting patient-centered safety practices [11,12].

Unlike healthcare workers, whose HH practices are systematically monitored, patient HH often receives less attention despite its critical role in comprehensive infection control [12]. In a tertiary general hospital, the risk of HAIs is relatively higher due to the complexity of medical conditions, frequent invasive procedures, and the presence of vulnerable patient populations, highlighting the importance of proper HH practices in these settings [13].

Hospitalized patients and visitors can also carry healthcare-associated pathogens, including multidrug-resistant organisms [14]. The colonization rates of patients with pathogenic microorganisms may exceed those of healthcare workers [15]. Despite the critical role of HH, adherence rates among hospitalized patients remain alarmingly low, ranging from 10~15% [5,16]. Although some domestic studies have investigated HH among patients in military or surgical wards [17,18], comprehensive research targeting a broader inpatient population in Korea is lacking.

HH knowledge and attitudes are key determinants of adherence [19]. Higher knowledge levels positively influ-

ence adherence and lead to improved infection prevention outcomes [16,20]. However, a positive attitude toward HH does not always translate into adherence, highlighting the need for further exploration of the relationship between attitudes and behaviors [21]. Moreover, there is an urgent need to assess the HH practices of hospitalized patients in Korea and identify the factors influencing adherence to develop effective strategies for HAI prevention and patient safety enhancement.

Therefore, this study aimed to systematically investigate the knowledge, attitude, and adherence to HH among patients in a tertiary hospital. By identifying the factors influencing adherence, this study aimed to provide evidence-based insights for improving HH practices and lay the foundation for strategies to prevent HAIs and promote patient safety.

## METHODS

### 1. Study Design

This descriptive correlation study assessed HH knowledge, attitudes, and adherence among adult inpatients in a tertiary hospital and identified the factors influencing HH adherence.

### 2. Participants

Participants were hospitalized adult patients aged  $\geq 18$  years who had been admitted for more than one day at a tertiary general hospital in D Metropolitan City. Adult inpatients were included as they are capable of independently performing HH behaviors. A minimum hospitalization period of more than one day was required to ensure participants had sufficient exposure to the hospital environment and infection prevention protocols. Eligible participants had to communicate effectively and understand the questionnaire contents. Patients with significant physical or mental frailty or those unable to respond were excluded. The required sample size for multiple regression analysis was calculated using G\*Power 3.1.9.4 software. The sample size of this study was based on a previous study that investigated the HH practices of inpatients in the surgical ward [19]. With a significance level of  $\alpha = .05$ , a medium effect size of .15, a power of .80, and 22 predictor variables, the minimum required sample size was determined as 165 participants. Considering a dropout rate of 10%, questionnaires were distributed to 182 participants. After excluding 17 incomplete or invalid responses, 165 completed questionnaires were included

in the final analysis.

### 3. Measurements

A self-administered questionnaire was used to collect data on participants' general characteristics, HH-related attributes, HH knowledge, attitudes toward HH, and adherence to HH practices during daily life and hospitalization. Before use, the original developers authorized the tools for daily HH adherence, HH knowledge, and HH attitude via email. The tools for HH knowledge, daily HH adherence, inpatient HH adherence, and HH attitude were subjected to content validity testing (content validity index, CVI) by one Professor of infectious diseases, two nursing professors, one advanced practice nurse specializing in infection control, and two infection control nurses. A pilot study was conducted with ten hospitalized patients to confirm the appropriateness of the tools.

#### 1) Hand hygiene adherence

HH adherence was assessed separately for daily life before and during hospitalization in the hospital setting.

##### (1) Daily HH adherence

HH adherence tool for daily life before hospitalization consisted of a total of 10 items, including 8 items on HH opportunities for caregivers developed by Song [22] and 2 additional items on HH methods based on standard precautions [23]. The CVI of this tool was 1.00. Responses were recorded on a 5-point Likert scale from "never" (1 point) to "always" (5 points), with higher scores indicating higher adherence. The reliability of the HH opportunities items was Cronbach's  $\alpha = .83$  in Song's tool and .84 in this study. The reliability of the HH methods items was Cronbach's  $\alpha = .67$ . The overall reliability of the HH adherence tool was Cronbach's  $\alpha = .86$ .

##### (2) Inpatient HH adherence

HH adherence during hospitalization was measured using a 9-item tool comprising seven items for HH opportunities (after using the bathroom, before having a meal, before/after touching a wound, drain, or catheter, after contact with another patient, after sneezing or coughing, and before/after leaving the patient room) and two items for methods (at least 15 seconds, dried after washing), based on the standard precautions for HAIs [23] and the Centers for Disease Control and Prevention guidelines for patient HH in healthcare settings [24]. The CVI for this tool was 0.90. Responses were recorded on a 5-point Likert scale ranging from "never" (1 point) to "always" (5 points),

with higher scores indicating higher adherence. The reliability of this tool in this study was Cronbach's  $\alpha = .87$ .

#### 2) HH knowledge

HH knowledge was measured using a 12-item tool that combined six items from the HH knowledge tool for the general public by Lee and Park [25] and six items from the WHO HH knowledge questionnaire for healthcare workers [26] and modified to suit hospitalized patients. Based on expert reviews, the CVI of this tool was 0.83. Two items with an item-CVI of 0.70 were either removed or revised. One item on the effectiveness of hand sanitizers was removed, and another on HH timing was revised. Responses were scored as 1 for correct answers and 0 for incorrect or "don't know" answers, resulting in total scores ranging from 0 to 12, with higher scores indicating greater knowledge. The reliability, assessed using Kuder-Richardson 20 (KR-20), was .58.

#### 3) HH attitudes

Attitudes toward HH were measured using an 8-item tool based on the Handwashing Assessment Inventory developed by O'Boyle, Henly, and Duckett [27], as translated by Jeong [28]. The CVI of this tool was 1.00. Responses were scored on a 7-point Likert scale, ranging from -3 points (left-hand vocabulary) to +3 points (right-hand vocabulary). In this study, the average score was calculated by dividing the total sum of item scores by the number of items. The score ranges from -24 to +24, with a higher score indicating a more positive attitude toward HH. Cronbach's  $\alpha$  of the original tool [27] was .91, and that of the translated version by Jeong [28] was .75. The reliability in this study was also .75.

### 4. Data Collection

Data were collected from March 6 to 17, 2023. Prior to data collection, the researcher visited the nursing department of the healthcare institution to obtain permission. The study purpose, procedures, confidentiality, voluntary participation, withdrawal rights, and contact information of the principal investigator were explained to potential participants. Participants who voluntarily agreed to participate provided written consent and completed the questionnaires. For participants who could not complete the questionnaire independently, caregivers completed it, or the researcher read the items aloud and recorded their responses. Completion of the questionnaire took approximately 15~20 min. Completed questionnaires were sealed in envelopes and collected by the researcher. Participants

were offered small tokens of appreciation upon completion of the survey.

## 5. Data Analysis

The data collected for this study were analyzed using SPSS/WIN 27 (IBM Corp., NY, USA). The participants' general characteristics, HH-related attributes, knowledge, attitudes, daily HH adherence before hospitalization, and HH adherence during hospitalization were analyzed using frequencies, percentages, means, and standard deviations. Differences in HH adherence during hospitalization based on participants' general characteristics and HH-related attributes were examined using independent t-tests and one-way ANOVA, and post-hoc analysis was conducted using Scheffé tests. The relationships between HH knowledge, attitudes, and adherence during hospitalization were analyzed using Pearson correlation coefficients. Multiple linear regression analysis was performed to identify factors influencing HH adherence during hospitalization.

## 6. Ethical Consideration

This study was approved by the institutional review board of the researcher-affiliated institution (IRB No. KNUCH 2022-12-027). Participants were informed that their data would be handled anonymously and used solely for the purposes of this study. They were also assured that they could withdraw from the survey at any time without facing any disadvantages.

# RESULTS

## 1. Participants' Characteristics

The mean age of the participants was  $54.52 \pm 16.88$  years, with 39.4% ( $n=65$ ) in the 40-59 and  $\geq 60$  years age groups. Female participants comprised 53.9% ( $n=89$ ) of the participants. Participants' education levels were as follows: 18.8% ( $n=31$ ) had a middle school education or less, 37.6% ( $n=62$ ) completed high school, and 43.6% ( $n=72$ ) had a college education or higher. By department, 43.6% ( $n=72$ ) of the participants were admitted to internal medicine wards, while 56.4% ( $n=93$ ) were admitted to surgical wards. Regarding hospitalization history, 70.9% ( $n=117$ ) of the participants were hospitalized for the first time within the past six months, whereas 29.1% ( $n=48$ ) had been hospitalized two or more times. First-time hospitalizations accounted for 70.9% ( $n=117$ ), and the average length of stay was  $7.18 \pm 13.31$  days. Patients hospitalized for  $\leq 7$  days accounted

for 77.6% ( $n=128$ ). Among the participants, 31.5% ( $n=52$ ) had undergone surgery during hospitalization, and 32.1% ( $n=128$ ) used medical drainage devices. Participants who had experienced an infectious disease in the past six months accounted for 26.7% ( $n=44$ ). In total, 78.2% ( $n=129$ ) were ambulatory, and 60.6% ( $n=100$ ) had a primary caregiver during hospitalization. The mean daily frequency of HH before hospitalization was  $6.53 \pm 5.16$  times, and during hospitalization, it was  $6.61 \pm 4.00$  times. Regarding HH education, 49.1% ( $n=81$ ) and 43.6% ( $n=72$ ) received education prior to and during hospitalization, respectively. Among the participants, 81.8% ( $n=135$ ) perceived the effectiveness of HH in preventing infectious diseases to be high. Regarding others' observed HH practices, 89.1% ( $n=147$ ) reported hospital staff performing HH, 58.8% ( $n=97$ ) reported caregivers performing HH, and 23.6% ( $n=39$ ) reported other patients in the same room performing HH (Table 1).

## 2. Participants' Level of HH Knowledge, Attitudes, and Adherence

The participants' HH knowledge had an average score of  $9.02 \pm 1.81$  out of 12 points, with a correct response rate of 75.2%. The average score of attitude toward HH was  $1.68 \pm 0.90$  points, indicating that participants generally had positive attitudes. The average daily HH adherence score was  $3.83 \pm 0.67$  points. The highest adherence was observed after visiting a public patient room, whereas the lowest adherence was reported after handling money or coughing or blowing the nose. The average inpatient HH adherence score was  $3.36 \pm 0.75$  points. The highest adherence during hospitalization was observed after using the restroom, whereas the lowest adherence was reported before and after leaving the patient's room for medical tests or examinations, and after coughing or sneezing (Table 2)

## 3. Differences in HH Adherence according to General and HH-related Characteristics

Inpatient HH adherence was higher among female participants and those who had experienced infectious diseases, although the differences were not statistically significant. Statistically significant differences in inpatient HH adherence were observed according to the HH-related characteristics. Participants who received HH education before hospitalization ( $t=2.92$ ,  $p=.004$ ) and believed that HH was effective in preventing infection ( $t=2.13$ ,  $p=.034$ ) and who observed HH practices among hospital staff ( $t=2.24$ ,  $p=.026$ ), caregivers ( $t=3.96$ ,  $p<.001$ ), and other pa-

**Table 1.** Differences in Hand Hygiene Adherence according to General and Hand Hygiene-Related Characteristics (N=165)

Characteristics	Categories	n (%)	M±SD	t or F	p
Age (year)	20~39	35 (21.2)	3.27±0.63	0.83	.437
	40~59	65 (39.4)	3.45±0.84		
	≥ 60	65 (39.4)	3.31±0.72		
Gender	Man	76 (46.1)	3.24±0.78	-1.78	.077
	Woman	89 (53.9)	3.45±0.73		
Education	≤ Middle school	31 (18.8)	3.27±0.71	1.04	.357
	High school	62 (37.6)	3.29±0.80		
	≥ College	72 (43.6)	3.45±0.73		
Department	Internal medicine	72 (43.6)	3.40±0.68	0.63	.531
	Surgical	93 (56.4)	3.32±0.81		
Number of admissions within 6 months	First	117 (70.9)	3.35±0.78	-0.28	.780
	Two or more admissions	48 (29.1)	3.38±0.71		
Length of stay	≤ 7 days	128 (77.6)	3.38±0.74	0.65	.518
	≥ 8 days	37 (22.4)	3.29±0.80		
Surgical history	Yes	52 (31.5)	3.38±0.77	0.24	.813
	No	113 (68.5)	3.35±0.75		
Drain	Yes	53 (32.1)	3.31±0.80	0.50	.620
	No	112 (67.9)	3.38±0.74		
Experience of infectious disease	Yes	44 (26.7)	3.18±0.80	-1.82	.071
	No	121 (73.3)	3.43±0.73		
Mobility status	Independent	129 (78.2)	3.33±0.71	0.36	.698
	Assistive device required	12 (7.3)	3.39±0.91		
	Not possible	24 (14.5)	3.47±0.91		
Caregiver	Family	85 (51.5)	3.33±0.71	1.63	.199
	Non-family	15 (9.1)	3.69±1.00		
	None	65 (39.4)	3.31±0.74		
Pre-admission HH education	Yes	81 (49.1)	3.53±0.75	2.92	.004
	No	84 (50.9)	3.19±0.73		
HH education during admission	Yes	72 (43.6)	3.34±0.73	-0.28	.779
	No	93 (56.4)	3.37±0.78		
Pre-admission daily HH frequency			6.53±5.16		
Inpatient HH frequency			6.61±4.00		
Perceived effectiveness of HH in preventing infections	High	135 (81.8)	3.41±0.76	2.13	.034
	Low	30 (18.2)	3.09±0.65		
Hospital staff's HH practices	Yes	147 (89.1)	3.40±0.72	2.24	.026
	No	18 (10.9)	2.98±0.91		
Caregivers' HH practices	Yes	97 (58.8)	3.54±0.70	3.96	< .001
	No	68 (41.2)	3.08±0.75		
Other patients' HH practices	Yes	39 (23.6)	3.71±0.67	3.51	< .001
	No	126 (76.4)	3.24±0.74		

M=mean; HH=hand hygiene; SD=standard deviation.

tients in the same room ( $t=3.51$ ,  $p<.001$ ) showed significantly higher adherence (Table 1).

#### 4. Correlation between Participants' HH Knowledge, Attitudes, and Adherence

Inpatient HH adherence was significantly and positively correlated with HH knowledge ( $r=.42$ ,  $p<.001$ ), attitudes

toward HH ( $r=.21$ ,  $p=.008$ ), and daily HH adherence ( $r=.65$ ,  $p<.001$ ) (Table 3).

#### 5. Factors Influencing Inpatient HH Adherence

To identify the factors influencing inpatient HH adherence, a multiple linear regression analysis was conducted using independent variables, including Pre-admission HH



**Table 2.** Participants' Levels of HH Knowledge, Attitude, and Adherence

(N=165)

Variables	M±SD	Min	Max	Range
HH knowledge	9.02±1.81	5.00	12.00	0~12
HH attitudes	1.68±0.90	-1.25	3.00	-3~3
Daily HH adherence	3.83±0.67	1.70	5.00	1~5
After using a public restroom	4.47±0.83	1.00	5.00	1~5
Before handling food	4.33±0.92	1.00	5.00	1~5
When arriving home	4.26±1.02	1.00	5.00	1~5
After using the bathroom at home	4.22±0.93	1.00	5.00	1~5
Before eating at home	3.92±1.04	1.00	5.00	1~5
Before having a meal at a restaurant	3.91±0.97	1.00	5.00	1~5
After sneezing or coughing	3.33±1.08	1.00	5.00	1~5
After handling money	3.06±1.18	1.00	5.00	1~5
Inpatient HH adherence	3.36±0.75	1.67	4.89	1~5
After using a restroom at the hospital	4.46±0.81	1.00	5.00	1~5
Before having a meal at the hospital	3.48±1.09	1.00	5.00	1~5
After touching a wound, drain, or catheter	3.24±1.19	1.00	5.00	1~5
After contact with another patient	3.22±1.16	1.00	5.00	1~5
Before touching a wound, drain, or catheter	3.18±1.20	1.00	5.00	1~5
After sneezing or coughing	3.14±1.05	1.00	5.00	1~5
Before and after leaving the patient's room	2.86±1.19	1.00	5.00	1~5

HH=hand hygiene; M=mean; Max=Maximum; Min=Minimum; SD=standard deviation.

**Table 3.** Pearson Correlation Coefficients among the Main Variables

(N=165)

Variables	Inpatient HH adherence	HH knowledge	HH attitudes	Daily HH adherence
	r (p)	r (p)	r (p)	r (p)
Inpatient HH adherence	1			
HH knowledge	.42 (< .001)	1		
HH attitudes	.21 (.008)	.38 (< .001)	1	
Daily HH adherence	.65 (< .001)	.41 (< .001)	.39 (< .001)	1

HH=hand hygiene.

education, the HH practices of hospital staff, caregivers, and other patients, perceived effectiveness of HH in preventing infections, HH knowledge, HH attitude, and Daily HH adherence. Additionally, although gender did not show a significant association in this analysis, it was included in the regression model based on previous studies demonstrating that women tend to exhibit higher HH adherence than men [19,25,28]. The assumptions for the regression analysis were tested, and no autocorrelation of the residuals was observed (Durbin-Watson statistic=1.796). Thus, the assumptions of homoscedasticity and normality were satisfied. Tolerance values exceeded 0.1, and variance inflation factors were <10, indicating no multicollinearity among the independent variables. The results showed that higher daily HH adherence ( $\beta=.58, p<.001$ ), higher HH knowledge ( $\beta=.15, p=.021$ ), higher HH practices of caregivers ( $\beta=.14, p=.024$ ), and higher HH practices of other patients ( $\beta=.12, p=.049$ ) were significantly as-

sociated with higher inpatient HH adherence. Although the perceived effectiveness of HH in preventing infections was included as an independent variable due to its significant association in univariate analysis ( $t=2.13, p=.034$ ), it did not show a significant effect in the multivariate regression model ( $p=.974$ ). Similarly, other variables such as pre-admission HH education ( $p=.251$ ) and hospital staff's HH practices ( $p=.170$ ) also showed significant associations in univariate analysis but did not remain significant in the multivariate model. These variables explained 50.0% of the variance in inpatient HH adherence, which was statistically significant ( $F=18.60, p<.001$ ) (Table 4).

## DISCUSSION

This study aimed to identify the level of HH adherence among hospitalized patients in a tertiary general hospital and the factors that influence their adherence.

**Table 4.** Factors Affecting Inpatient Hand Hygiene Adherence

(N=165)

Variables	Categories	B	SE	$\beta$	t	p
(Constant)		0.58	0.30		1.00	.203
Gender	Man Woman (ref.)	0.05	0.09	.03	0.57	.573
Daily HH adherence		0.66	0.07	.58	8.78	< .001
Pre-admission HH education	Yes No (ref.)	0.10	0.09	.67	1.15	.251
Caregivers' HH practices	Yes No (ref.)	0.22	0.09	.14	2.28	.024
Other patients' HH practices	Yes No (ref.)	0.22	0.11	.12	1.98	.049
Hospital staff's HH practices	Yes No (ref.)	0.19	0.14	.08	1.37	.170
Perceived effectiveness of HH in preventing infections	High Low (ref.)	0.00	0.11	.00	0.03	.974
HH knowledge		0.06	0.02	.15	2.33	.021
HH attitudes		-0.10	0.05	-.12	-1.94	.054

F=18.60,  $R^2=.52$ , Adjusted  $R^2=.50$ ,  $p < .001$ 

HH=hand hygiene; ref.=reference group.

The average HH adherence score among inpatients was 3.36. Adherence was the highest after using the restroom and before meals, whereas it was the lowest before and after moving between patients' rooms and after coughing or sneezing. These findings were consistent with those of Lee et al. [29], who observed similar trends among hospitalized patients in the United States (95.8% adherence after defecation and 48.1% adherence after moving between patient rooms). Although the participants demonstrated an awareness of HH opportunities in daily life, they appeared to lack an understanding of HH requirements within healthcare settings, particularly regarding personal and shared spaces [20]. To address this, healthcare facilities should emphasize HH at critical points, such as before and after using personal and shared spaces, before cleaning or aseptic procedures, and after exposure to bodily fluids. To enhance HH adherence at these critical moments, healthcare facilities can implement patient-centered strategies, including providing personal HH kits with alcohol-based hand sanitizers and visual instruction cards and using reminder cues such as posters or bedside stickers highlighting key HH moments [5,12,16,21].

Moreover, the rate of alcohol-based hand sanitizer use during hospitalization was relatively low (39.4 %). This may be attributed to patients mistakenly perceiving HH resources in hospitals as reserved for healthcare staff,

leading to underutilization [11]. Providing clear information regarding the location and proper use of alcohol-based hand sanitizers can enhance patient adherence [11, 16]. Additionally, developing HH products specifically for patients can be an effective approach. In cases where the use of hand sanitizers is not feasible, there have been instances where alcohol-based hand sanitizer wipes were provided for patients [30].

The main factors influencing inpatient HH adherence were daily HH practices, HH knowledge, caregivers' HH practices, and the HH practices of other patients. Notably, better daily HH practices were associated with higher HH adherence during hospitalization, which aligns with the findings of studies conducted in hospitalized patients in the United States [30,31]. Therefore, nationwide campaigns and educational programs promoting routine HH as part of public health enhancement should be continuously emphasized [25]. In particular, this study revealed that HH adherence after coughing or blowing the nose remained low, highlighting the need for improvement. HH after coughing is a critical component of cough etiquette that effectively prevents respiratory infections [23]. Thus, efforts should be made to develop educational materials and promote campaigns that emphasize HH and proper cough etiquette [29].

Knowledge was a critical factor influencing HH adher-

ence. Participants with higher HH knowledge demonstrated better adherence, emphasizing the importance of motivating patients to recognize the significance of infection prevention and practicing HH effectively [19,32]. Although hospitals are mandated to provide HH education to inpatients through materials such as admission guides and posters [33], only 43.6% of the participants in this study reported receiving HH education during their hospitalization. These findings highlight the need for enhanced and systematic education. Repetitive and structured educational programs are essential for improving HH knowledge. Future studies should explore effective strategies to educate inpatients and their caregivers about the appropriate timing and methods for HH during hospitalization [16].

The HH practices of caregivers and other patients in the same room also significantly influenced inpatients' HH adherence. In South Korea, caregivers frequently assist inpatients with meals and personal hygiene management [22]. Caregivers are at a high risk of cross-infection as care providers and play a critical role in supporting patients' HH. Therefore, caregivers' HH practices are important. However, the HH rate among caregivers was < 50% [6]. This highlights the need to include caregivers in patient HH education programs. Additionally, in East Asian cultures, including South Korea, collectivism strongly influences behavior, meaning that individuals' actions are often shaped by others' behaviors. Public health practices, such as HH, are subject to cultural influences. Therefore, it is essential to incorporate cultural characteristics when developing strategies to promote HH adherence.

Although pre-admission HH education, hospital staff's HH practices, perceived effectiveness of HH in preventing infections, and HH attitudes were significant in univariate analysis, they did not remain significant in the multivariate model, suggesting mediation by stronger predictors such as daily HH practices and HH knowledge [7,20,32]. A positive attitude toward HH is often considered a key factor influencing adherence. However, some studies have reported conflicting results, with some suggesting that HH attitudes have minimal or no direct impact on actual HH practices [20,21]. Similarly, in this study, participants generally displayed positive attitudes toward HH, but no significant effect on adherence was observed. This may be because attitudes alone do not necessarily lead to behavioral change; instead, a combination of factors, such as knowledge, environmental conditions, and social norms, is likely to play a role [21,28]. Further research is required to clarify the relationship between HH attitudes and adherence.

The findings of this study provide valuable insights into the current status of HH adherence among inpatients and the factors influencing it. These findings offer practical evidence for healthcare institutions to develop strategies to enhance inpatient HH adherence. Strengthening systematic education for patients and caregivers, increasing awareness of critical HH moments, and improving accessibility to HH resources are crucial steps toward increasing adherence. These efforts are expected to contribute significantly to the effective prevention of HAIs [34].

However, this study was limited to a single university hospital, which restricts the generalizability of the findings. Additionally, the possibility of social desirability bias in the participants' responses cannot be entirely ruled out.

## CONCLUSION

This study identified the current status of HH adherence among inpatients and the key factors influencing it. HH knowledge, daily HH adherence, and HH practices of caregivers and other patients played significant roles in HH adherence. These findings provide critical evidence for healthcare facilities to develop strategies to enhance HH adherence. To improve adherence, targeted educational programs and campaigns tailored to inpatients, healthcare workers, and caregivers are essential. Enhancing the accessibility of HH resources, such as personal HH kits, and promoting awareness through interactive campaigns can foster a culture of shared responsibility for infection prevention.

Future studies should focus on collecting data from diverse healthcare institutions to derive more generalizable results and explore strategic approaches that effectively drive behavioral changes in HH practices.

## CONFLICTS OF INTEREST

The authors declared no conflict of interest.

## AUTHORSHIP

Study conception and design acquisition - Kim S and Choi J; Data collection - Kim S; Data analysis & Interpretation - Kim S and Choi J; Drafting & Revision of the manuscript - Kim S and Choi J

## DATA AVAILABILITY

Please contact the corresponding author for data availability.

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