



Hand Hygiene among Nurses and Physicians at a Tertiary Hospital in Jordan during the COVID-19 Pandemic: A Cross-sectional Comparative Study

Othman A. Alfquaha, RN, PhD^{1*}; Mohammad K. Alqurneh, RN, MSN¹; Heba H. Banisaid, RN¹

¹ Department of Nursing, Jordan University Hospital, The University of Jordan, Amman, Jordan;

* Corresponding Author: Email: Othman_alfquaha@yahoo.com

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ABSTRACT

Background: Hand hygiene has been one of the hottest topics in immunology and infection control, especially during the spread of COVID-19 pandemic. **Objectives:** This study aimed to assess the perception level of importance of hand hygiene among Jordanian nurses and physicians during the COVID-19 pandemic. Furthermore, it investigated the potential associations of several demographic factors, including gender, age and site of work on hand hygiene among nurses and physicians. **Methods:** The study adopted a cross-sectional comparative study design. A convenience sampling procedure was performed on 183 participants (100 nurses and 83 physicians). World Health Organization (WHO) perception survey for HCPs was used in this study. **Results:** Results showed a high perception level of importance of hand hygiene among nurses and physicians during the spread of the COVID-19 pandemic. Statistical analysis indicated that physicians had a significantly higher level of hand hygiene than nurses. Physicians and nurses showed high importance (46.4%) of preventing healthcare-associated infection in a patient's clinical outcome. Age was found to be associated with the perception level of importance of hand hygiene among both professions, whereas gender and site of work were not found to be associated with the perception level of importance of hand hygiene in both professions. **Conclusions and Implications to Nursing:** Physicians had a higher level of hand hygiene compared to nurses during the spread of the COVID-19 pandemic. More formal educational sessions on hand hygiene should be provided to prevent healthcare-associated infection and promote clinical outcomes.

Keywords: Hand-hygiene, Nurses, Physicians, Jordan.

What does this paper add?

1. Physicians had a higher level of hand hygiene compared to nurses in Jordan during the spread of the COVID-19 pandemic.
2. Physicians and nurses showed high importance (46.4%) of preventing healthcare-associated infection as a patient's clinical outcome.
3. Perception level of hand hygiene was found to be associated with age of nurses and physicians.

Introduction

Healthcare-associated infections (HAIs) are responsible for more than thousands of cases of morbidity and mortality in hospitals all over the world (WHO, 2011). Despite all precautions, HAIs are still the most important cause of increasing the length of stay and cost for health-care sectors (WHO, 2011). In a major study of the estimation of HAIs among acute-care public hospitals in Australia, the results showed a prevalence rate of 9.9% (Russo et al., 2019). In Brazil, a

retrospective study in intensive-care units (ICUs) found a significant increase in the cost resulting from HCAs (Leal & Freitas-Vilela, 2021). According to Centers for Disease Control (CDC), every year in the United States' hospitals, there are nearly two million patients who acquire HCAs (Haque et al., 2018).

Despite hand hygiene is the most effective practice to prevent HCAs with the simplicity of this practice, compliance with hand hygiene by healthcare providers (HCPs) is still very low (Sands & Aunger, 2020). Hand hygiene refers to the compliance with cleansing hands using soap and water or using antiseptic hand rub for the removal of transient microorganisms from hands in a way that keeps the skin condition (Wigglesworth, 2019).

The World Health Organization (WHO) has made recommendations regarding hand hygiene in health facilities, including before dealing with the patient and after touching the patient. There are also recommendations for washing hands with soap and water if the dirt is visible. In the case of simple handling, alcohol hand rub is used to clean hands (Pittet, Allegranzi, Boyce, & WHO, 2009). Despite these clear recommendations, HCPs are still non-compliant to hand washing (Engdaw et al., 2019). The causes for poor hand-hygiene compliance by HCPs, particularly physicians, are less understood. Studies investigating HCPs generally have reported a range of barriers, including environmental barriers, such as lack of access to sinks, difficulty of locating products, empty dispensers, excessive workloads, time constraints and personal barriers; i.e., attitudes (Engdaw et al., 2019; Alfuqaha et al., 2019; Alfuqaha & Alsharah, 2018). Highly medical-care activities are positively associated with lower rates of hand hygiene (Engdaw et al., 2019). Furthermore, a study was conducted in Palestine among HCPs and the results showed that nurses and physicians had a moderate level of knowledge regarding hand hygiene (Dreidi et al., 2016).

The spread of coronavirus disease 2019 (COVID-19) has influenced individuals and HCPs in adhering to non-pharmacological intervention guidelines, including frequent hand hygiene, hand sanitization and social distancing (Alfuqaha et al., 2022). In South Korea, a study found a marked decline in hand hygiene during the period of COVID-19 pandemic (Choi et al., 2021). On the opposite side, an observational study found that hand hygiene among HCPs has increased significantly during

the period of COVID-19 pandemic (Al-Maani et al., 2022).

Background

Compliance with hand hygiene among nurses and physicians is still relatively low, which reflects the importance of increased awareness for HCPs through research and monitoring (Sands & Aunger, 2020). The administration has an important role in supporting hand hygiene and must provide policies and standards to encourage healthcare providers to comply with hand hygiene (Wigglesworth, 2019). Hand hygiene has been one of the hottest topics in immunology and infection control, especially during the spread of coronavirus disease 2019 (COVID-19) pandemic. Several international studies have previously investigated the perception of importance of hand hygiene among nurses and physicians separately (Dreidi et al., 2016; Al-Mohaithef et al., 2020). There are only a limited number of such studies in Jordan and, up to our knowledge, none of them was directly involved in comparing these two professions in terms of hand hygiene and exploring the differences between them during the COVID-19 pandemic. This study aims to address this gap in the literature. Accordingly, this study aimed to assess the perception level of importance of hand hygiene among Jordanian nurses and physicians during the COVID-19 pandemic. Furthermore, it investigated the potential associations of several demographic factors, including gender, age and site of work on hand hygiene among nurses and physicians in Jordan.

Study Questions

- 1- What is the perceived level of hand hygiene among nurses and physicians in Jordan during the COVID-19 pandemic?
- 2- Are there statistically significant differences ($p \leq 0.05$) between nurses and physicians in Jordan in hand hygiene during the COVID-19 pandemic?
- 3- Are there statistically significant differences ($p \leq 0.05$) between nurses and physicians in hand hygiene during the COVID-19 pandemic attributed to gender, age and site of work?

Methods

Study Design

The study adopted the cross-sectional comparative study design at a tertiary hospital in Jordan to assess the

perception level of importance of hand hygiene among nurses and physicians during the COVID-19 pandemic.

Population and Data Collection

All HCPs (nurses and physicians) at a tertiary hospital located in Amman-Jordan were invited to participate in this study. There are many reasons to choose this hospital: largest hospital in Jordan (600 beds), center for COVID-19 patients, easy access for researchers. Inclusion criteria were all nurses and physicians who agreed to participate in this study. Exclusion criteria were maternity leave and long period of sickness leave. In the selected hospital, approximately 500 nurses and 250 physicians are working in different clinical sites of work (Altamimi et al., 2022). Using a 5% margin of error and 95% confidence level, the sample size would be 234 participants (Hair et al., 2014). Regarding this, we conveniently distributed 134 and 100 surveys to nurses and physicians, respectively. A total of 183 participants (100 nurses and 83 physicians) agreed to fill out the questionnaire with response rates of 70% and 83% for nurses and physicians, respectively. We prepared envelopes for participants that include a cover letter, demographic factors and a hand-hygiene scale. Because of COVID-19 pandemic, we went directly to the head of each site of work to explain the aim of the study and ask HCPs in their site of works. The supervisors requested their teams to fill the questionnaire forms separately. We collected the envelopes from the different sites of work during the period of May to July 2020.

Study Tool

A self-reported perception survey for HCPs was utilized to measure the importance of hand hygiene and the effect of HCAs on clinical outcomes. World Health Organization perception survey for HCPs was used in this study (WHO, 2021). This scale consists of 24 questions distributed into two parts. The first part is related to demographic factors which include gender, age, profession, site of work, receiving formal training and alcohol hand rub. The second part is about the perceptions of healthcare-associated infection and hand hygiene. The perception survey was rated on a 4-point Likert-type scale as follows: 4 “High”, 3 “Moderate”, 2 “Mild”, 1 “Low”. Calculation criteria were based on the overall average using the following form: (upper score – lower score)/levels (Alfuqaha et al., 2022). If HCPs

score between 1 and 2, this represents a low importance of hand hygiene, if they score from 2.01 to 3, this represents a moderate importance of hand hygiene and if they score from 3.01 to 4, this represents a high importance of hand hygiene. The total Cronbach’s alpha for the perception survey in our study was 0.85. A previous study showed 0.86 for Cronbach’s alpha (Oh, 2019), indicating good reliability.

Data Analysis

Quantitative data was entered and analyzed using the Statistical Package for Social Sciences (SPSS. V22). Frequencies, means, standard deviations, independent sample t-test and analysis of variance (one-way ANOVA) were used to answer the study questions. *P*_value of 0.05 was deemed significant.

Ethical Considerations

Approval from the institution review of board committee of a tertiary hospital in Jordan was obtained. Participants were assured that their identity will remain anonymous and that there will be no follow-up of identities when they have filled the questionnaire forms. After completing the survey, nurses and physicians closed the envelopes and returned them to the supervisors without any information of identity.

Results

Two hundred thirty-four questionnaire forms were distributed. One hundred eighty-three participants returned valid questionnaire forms for analysis. Table 1 shows the participants’ demographic characteristics.

More than a half of the participants were females (50.8%). The percentage of nurses was (54.6%), while the percentage of physicians was (45.4%). (88%) and (92%) of the participants were less than 30 years old for physicians and nurses, respectively. Sixty-two percent of participating nurses did not receive formal training in the last three years, while the percentage for physicians was (72.3%). Nurses and physicians routinely use an alcohol-based hand rub for hand hygiene with percentages of (74%) and (86.7%) for nurses and physicians, respectively (Table 1).

Results indicated that the level of perception of importance of hand hygiene in physicians (3.19 ± 0.40) was higher than that in nurses (3.04 ± 0.58) during the COVID-19 pandemic and this difference was statistically significant (Table 2). The overall level of

perception of importance of hand hygiene was high in both professions during the COVID-19 pandemic. Independent sample t-test was used for gender and age, while one-way ANOVA test was used for site of work of HCPs. Results showed that age of nurses ($t = 3.21, p < 0.01$) and physicians ($t = 3.12, p < 0.01$) was found to

be associated significantly with the perception level of importance of hand hygiene during the COVID-19 pandemic. Other demographic factors; gender and site of work, were not found to be associated with the level of perception of importance of hand hygiene among nurses and physicians (Table 2).

Table 1. Sample characteristics of nurses (n=100) and physicians (n=83)

Variable	Descriptive		Physicians (83)	Nurses (100)
Gender		Total n (%)	n (%)	n (%)
	Male	90 (49.2)	44 (53)	46 (46)
	Female	93(50.8)	39 (47)	54 (54)
Age	Less than 30 years	165 (90.2)	73 (88)	92 (92)
	More than or equal to 30 years	18 (9.8)	10 (12)	8 (8)
Site of work	Medical floor	36 (19.7)	12 (14.5)	24 (24)
	Surgical floor	77 (72.1)	54 (65.1)	23 (23)
	Intensive-care units	20 (10.9)	5 (4.8)	16 (16)
	Emergency room	17 (9.3)	1 (1.2)	16 (16)
	Obstetric room	18 (9.8)	6 (7.2)	12 (12)
	Pediatric floor	15 (8.2)	6 (7.2)	9 (9)
Receiving formal training	Yes	61 (33.3)	23 (27.7)	38 (38)
	No	122 (66.7)	60 (72.3)	62 (62)
Alcohol hand rub	Yes	146 (79.8)	72 (86.7)	74 (74)
	No	37 (20.2)	11 (13.3)	26 (26)

Table 2. Association of demographic factors with the perceived level of importance of hand hygiene among nurses (n=100) and physicians (N=83)

Factors	Description	Mean (SD)	t/F	p-value	
Gender	Nurses	Male	3.02 (0.61)	t= 0.36	0.72
		Female	3.06 (0.55)		
	Physicians	Male	3.15 (0.45)		
		Female	3.23 (0.32)		
Age	Nurses	< 30 years	3.09 (0.53)	t= 3.21	0.01*
		≥ 30 years	2.44 (0.80)		
	Physicians	< 30 years	3.17 (0.41)		
		≥ 30 years	3.34 (0.26)		
Site of work	Nurses	Medical floor	3.13 (0.49)	F= 0.54	0.74
		Surgical floor	3.07 (0.53)		
		ICUs	2.88 (0.73)		
		Emergency room	3.07 (0.54)		
		Obstetric room	3.09 (0.62)		
		Pediatric floor	2.88 (0.67)		
	Physicians	Medical floor	3.21 (0.32)	F= 1.82	0.11
		Surgical floor	3.21 (0.32)		
		ICUs	2.67 (0.88)		
		Emergency room	3.46 (0.0)		
Physicians	Obstetric room	3.34 (0.18)			
	Pediatric floor	3.13 (0.40)			
Hand-hygiene perception	Nurses	3.04 (0.47)	t= 1.99	0.04	
	Physicians	3.19 (0.52)			

SD: Standard deviation. t: Independent sample t-test. F: F-distribution. ICUs: Intensive-care units. p_value: significant at level 0.05*.

Looking deeply at the questions of perception of HCAs and hand hygiene scale, seventy-seven percent of nurses and (84.3%) of physicians believed that HCAI was not transferred to inpatients. The average scores presented for nurses (77%) and physicians (84.3%) indicated that HCAs did not transfer to hospitalized patients. Leaders and managers promoted hand hygiene in each profession (63% and 88%) for nurses and physicians, respectively. Less than (47%) of participants showed a moderate effect of HCAs on a patient's outcome as well as moderate effectiveness of hand rub in preventing it. Eighty percent of the participants

assured that alcohol-based hand rub is available at each point of care. Nevertheless, results showed that (69.4%) of the participants were neutral toward hand-hygiene posters displayed at the point of care as reminders. Almost two thirds (65.6%) of the participants were neutral about receiving formal education on hand hygiene. In this hospital, there was a daily round of assigned nurses to check out the alcohol dispensers and refilling the empty ones. The perceptions of the importance of hand hygiene among nurses and physicians are presented in Table 3.

Table 3. Perception of importance of hand hygiene among nurses (n=100) and physicians (n=83)

Items	High importance	Moderate importance	Mild importance	Low importance
In general, what is the impact of a healthcare-associated infection on a patient's clinical outcome?	Total n (%)	Total n (%)	Total n (%)	Total n (%)
	85 (46.4%)	84 (45.9%)	12 (6.6%)	2 (1.1)
Nurses	41 (41%)	47 (47%)	10 (10%)	2 (2%)
Physicians	44 (53%)	37 (44.6%)	2 (2.4%)	0
What is the effectiveness of hand hygiene in preventing healthcare-associated infection?	86 (47%)	81 (44.3%)	11 (6%)	5 (2.7%)
Nurses	45 (45%)	44 (44%)	6 (6%)	5 (5%)
Physicians	41 (49.4%)	37 (44.6%)	5 (6%)	0
Among all patient safety issues, how important is hand hygiene at your institution?	33 (18%)	75 (41%)	57 (31.1)	18 (9.8%)
Nurses	21 (21%)	44 (44%)	27 (27%)	8 (8%)
Physicians	12 (14.5%)	31 (37.3%)	30 (36.1%)	10 (12%)
Leaders and senior managers at your institution support and openly promote hand hygiene.	136 (74.3)	23 (12.6)	12 (6.6)	12 (6.6)
Nurses	63 (63)	16 (16)	11 (11)	10 (10)
Physicians	73 (88)	7 (8.4)	1 (1.2)	2 (2.4)
The health-care facility makes alcohol-based hand rub always available at each point of care.	147 (80.3)	10 (5.5)	13 (7.1)	13 (7.1)
Nurses	70 (70)	7 (7)	11 (11)	12 (12)
Physicians	77 (92.8)	3 (3.6)	2 (2.4)	1 (1.2)
Hand-hygiene posters are displayed at points of care as reminders.	127 (69.4)	15 (8.2)	19 (10.4)	22 (12)
Nurses	64 (64)	9 (9)	13 (13)	14 (14)
Physicians	63 (75.9)	6 (7.2)	6 (7.2)	8 (9.6)
Each health-care worker receives formal education on hand hygiene.	120 (65.6)	30 (16.4)	16 (8.7)	17 (9.3)
Nurses	66 (66)	15 (15)	9 (9)	10 (10)
Physicians	54 (65.1)	15 (18.1)	7 (8.4)	7 (8.4)

Items	High importance	Moderate importance	Mild importance	Low importance
Clear and simple instructions for hand hygiene are made visible for every health-care worker.	133(72.7)	26 (14.2)	18 (9.8)	6 (3.3)
Nurses	67 (67)	15 (15)	13 (13)	5 (5)
Physicians	66 (79.5)	11 (13.3)	5 (6)	1 (1.2)
Health-care workers regularly receive feedback on their hand hygiene performance.	121 (66.1)	34 (18.6)	9 (4.9)	19 (10.4)
Nurses	67 (67)	19 (19)	5 (5)	9 (9)
Physicians	54 (65.1)	15 (18.1)	4 (4.8)	10 (12)
You always perform hand hygiene as recommended (being a good example for your colleagues).	124 (67.8)	32 (17.5)	9 (4.9)	18 (9.8)
Nurses	68 (68)	15 (15)	6 (6)	11 (11)
Physicians	56(67.5)	17(2.5)	3 (3.6)	7 (8.4)
Patients are invited to remind health-care workers to perform hand hygiene.	102 (55.7)	35 (19.1)	25 (13.7)	21 (11.5)
Nurses	57 (57)	19 (19)	12 (12)	12 (12)
Physicians	45 (54.2)	16 (19.3)	13 (15.7)	9 (10.8)
What importance does the head of your department attach to the fact that you perform optimal hand hygiene?	115 (62.8)	31 (16.9)	23 (12.6)	14 (7.7)
Nurses	53 (53)	18 (18)	20 (20)	9 (9)
Physicians	62 (74.7)	13 (15.7)	3 (3.6)	5 (6)
What importance do your colleagues attach to the fact that you perform optimal hand hygiene?	96 (52.5)	39 (21.3)	35 (19.1)	13 (7.1)
Nurses	50 (50)	21 (21)	18 (18)	11 (11)
Physicians	46 (55.4)	18 (21.7)	17 (20.5)	2 (2.4)
What importance do patients attach to the fact that you perform optimal hand hygiene?	101 (55.2)	29 (15.8)	26 (14.2)	27 (14.8)
Nurses	58 (58)	10 (10)	14 (14)	18 (18)
Physicians	43 (51.8)	19 (22.9)	12 (14.5)	9 (10.8)
How do you consider the effort required by you to perform good hand hygiene when caring for patients?	67 (36.5)	17 (9.3)	38 (20.8)	61 (33.3)
Nurses	40 (40)	8 (8)	21 (21)	31 (31)
Physicians	25 (30.1)	9 (10.8)	17 (20.5)	32 (38.6)

The instructions of hand hygiene were clear, simple and visible among all HCPs. Nurses (67%) were more regularly receiving feedback on their hand-hygiene performance than physicians (56.1%). Moreover, being a good example for colleagues in nurses (68%) was relatively better than in physicians (67%). Patients were invited to remind both nurses and physicians in the

hospital to perform hand hygiene at nearly the same level (57% and 54.2%). Supervisors, colleagues and patients believed that physicians practice a better hand-hygiene procedure than nurses. Finally, the effort required to perform good hand hygiene when caring for patients was higher among physicians (38.6%) than among nurses (31%).

Discussion

The present study highlights good adherence to hand hygiene by nurses and physicians. The study results showed a positive perception of importance of hand hygiene among HCPs during the COVID-19 pandemic, which is consistent with the findings of Dwipayanti et al. (2021). However, the results disagree with a previous study which found poor adherence in HCPs before the COVID-19 pandemic.

The significant differences between nurses and physicians toward the perception of hand hygiene may be linked to the role of physicians during operations, direct procedures with COVID-19 patients and extra working hours of physicians in this hospital (Abalkhail et al., 2021). This result disagrees with a study conducted by Azim et al. (2016), which found that nurses had 1.5 times higher compliance toward hand hygiene than physicians before the COVID-19 pandemic.

In this study, we noted that about two thirds of HCPs had received formal training on hand hygiene. Despite the fact that hand hygiene is one of the best measures for infection control, many studies linked poor adherence to hand hygiene to decreased level of awareness (Engdaw et al., 2019; Le et al., 2019). The majority of HCPs felt that the resources and facilities available for hand hygiene were adequate and that this was the main reason for their compliance (Kirtil & Akyuz, 2018). The availability of alcohol-based hand rub solution at the points of care is considered a strong predictor of adherence to hand hygiene among HCPs (Wang et al., 2021). Thus, the availability of hand rub has greatly modified the hand-hygiene practices and is increasingly considered as a cornerstone of inpatient care. This result is different from the results of Le et al. (2019) in Vietnam, who found poor adherence to hand hygiene due to lack of resources and lack of awareness.

It was observed that alcohol-based hand rub was available in all the sites of work during the COVID-19 pandemic. The role of leaders and managers at the hospital in promoting hand hygiene was positively influencing the adherence to hand hygiene in the hospital. Nonetheless, our results highlight how hand hygiene is important at hospitals and call for more attention, as only 33% of the HCPs perceived a high importance among them about hand hygiene. Many researches have discussed the patient's role in reminding HCPs to perform hand hygiene during the COVID-19 pandemic (Wang et

al., 2021; Hillier, 2020). It is important to encourage patients to remind HCPs to perform hand hygiene before caring for them. This strategy has been recommended by many organizations and authorities worldwide, including the WHO and CDC (WHO, 2011). On the other hand, the participants in the study perceived a moderate level in the colleagues' support toward hand hygiene which needs more effort in promoting teamwork and multidisciplinary interaction to improve the willing of hand hygiene.

Finally, the results of this study showed a significant association between the perception of importance of hand hygiene and the age of nurses and physicians during the COVID-19 pandemic. Surprisingly, older physicians perceived hand hygiene to be more important compared to younger physicians. Due to their experience, older physicians recognize the importance of hand hygiene in preventing infection. On the opposite side, younger nurses rated higher levels of hand hygiene than older nurses. Potential explanations for higher perceptions of younger nurses include fresh knowledge and training skills among younger nurses. These results disagree with those of Bimerew and Muhawenimana (2022), who found that age was not associated with hand hygiene. Other studied factors among nurses and physicians (gender and site of work) were not found to be associated with the level of perception of the importance of hand hygiene. This result agrees with a previous study (Al Kadi & Salati, 2012). Other studies found that significant differences in hand hygiene were attributed to gender and years of experience (Vikke et al., 2019; Al-Mohaithef et al., 2020). Such conflicting results concerning the association between demographic variables and the perceived level of importance of hand hygiene could be related to differences in cultures along with differences in the organizational structures of the studied settings. Further research studies are recommended in this regard.

Limitation

Our study has some limitations, including self-reported questionnaire, sample size and the period of COVID-19 pandemic.

Conclusion and Implications to Nursing

Investigating perceptions and knowledge of hand-hygiene practices in a tertiary hospital provide useful information for planning and implementing programs to improve hand hygiene among HCPs and decrease the

incidents of HCAs. The study showed that nurses and physicians experience high perception levels of importance of hand hygiene, but physicians had a higher level toward hand hygiene than nurses during the COVID-19 pandemic. Around (47%) of physicians and nurses showed high importance of preventing healthcare-associated infection in a patient's clinical outcome. Nurses and physicians in Jordan did not take enough formal course training on hand hygiene, which highlights the role of administration and infection-control services to implement more courses on hand hygiene to improve the knowledge, which finally leads to decrease the incidents of HCAs, especially during the spread of COVID-19 pandemic. Availability of alcohol-based hand rub was perceived as a useful action for improving adherence to hand hygiene and patients are

invited to remind HCPs to perform hand hygiene. More studies are recommended among other HCPs, such as pharmacists and physiotherapists, during the COVID-19 pandemic.

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Conflict of Interest Statement

Authors have no conflict of interest to declare.

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