

# Hand Hygiene Compliance by Nurses and Midwives during the COVID-19 Pandemic: An Observational Study in Southern Iran

Foozieh Rafati, Ali Kamali<sup>1</sup>, Shideh Rafati<sup>2</sup>, Nasibeh Salari, Neda Dastyar

Department of Nursing and Midwifery, Nursing and Midwifery School, Jiroft University of Medical Sciences, <sup>1</sup>Department of Infectious Diseases and Tropical Medicine, School of Medicine, Jiroft University of Medical Sciences, Jiroft, <sup>2</sup>Social Factors In Health Promotion Research Center, Hormozgan Health Research Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

## ORCID:

Foozieh Rafati:  
0000-0001-6274-0205

Ali Kamali:  
0000-0001-8676-1246

Shideh Rafati:  
0000-0003-3461-0555

Nasibeh Salari:  
0000-0003-3084-9964

Neda Dastyar:  
0000-0003-0590-7405

## ABSTRACT

**Background:** Despite frequent recommendations from the World Health Organization (WHO), hand hygiene compliance (HHC) is an ongoing challenge among health care workers (HCWs). **Objectives:** This study aimed to evaluate the HHC in Iranian nurses and midwives during the COVID-19 pandemic. **Methods:** This observational study was conducted on 200 nurses and midwives working in two hospitals in Jiroft, Iran in 2021. Data were collected using a demographic information checklist and the WHO Hand Hygiene Observation Form. Data analysis was performed using the MannWhitney U, Chi-square, Kruskal-Wallis, and Spearman correlation coefficient tests. **Results:** The average percentage of HHC in the nurses and midwives was 51.3%. HHC before touching the patient and before doing a clean/aseptic procedure was at the lowest rate (33.5% and 49%, respectively) but was at the highest rate (81.8%) after a body fluid exposure risk. **Conclusions:** The HHC rates were low among nurses and midwives during the COVID-19 pandemic. It is essential to implement interventions to promote HHC in HCWs, especially in pandemic conditions.

**KEYWORDS:** Compliance, Hand, Hygiene, Midwife, Monitoring, Nurse, Pandemic

## INTRODUCTION

The hands of health care providers are the most common route of pathogen transmission.<sup>[1]</sup> Hand hygiene is therefore accepted worldwide as an essential principle in the prevention of COVID-19.<sup>[2]</sup> COVID-19 first started in December 2019 in Wuhan, China, and quickly spread to other countries.<sup>[3]</sup> With the outbreak of the disease, the Centre for Disease Control (CDC) warned that COVID-19 spreads through direct and indirect contact with contaminated droplets. It was also announced that wearing a mask, keeping a social

distance of at least two meters, and washing the hands frequently with soap and water for at least 20 s are the most effective ways to prevent virus transmission.<sup>[4]</sup>

**Address for correspondence:** Mrs. Neda Dastyar, Shahid Hajghasem Solymani Square, Jiroft University of Medical Sciences, Jiroft, Iran.  
E-mail: nedadastyar98@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**Submitted:** 04-Jan-2022 **Revised:** 11-Sep-2022 **Accepted:** 14-Sep-2022  
**Published:** 18-Nov-2022

**How to cite this article:** Rafati F, Kamali A, Rafati S, Salari N, Dastyar N. Hand hygiene compliance by nurses and midwives during the COVID-19 pandemic: An observational study in Southern Iran. *Nurs Midwifery Stud* 2022;11:203-8.

### Access this article online

#### Quick Response Code:



**Website:**  
www.nmsjournal.com

**DOI:**  
10.4103/nms.nms\_1\_22

Since the mid-eighteenth century, hand washing has been considered a necessary medical standard before performing any procedure. Then, in the early 19<sup>th</sup> century, hand hygiene was introduced as a universal standard.<sup>[5]</sup> Hand hygiene is the simplest and most cost-effective measure to prevent and control nosocomial infections<sup>[1,6]</sup> and can reduce the risk of the COVID-19 outbreak by 24%–31%.<sup>[2]</sup> Many studies have demonstrated the relationship between infection control, patient and staff safety, and hand hygiene.<sup>[5–8]</sup> Thus, the World Health Organization (WHO) and studies conducted in this field have recommended various strategies to promote hand hygiene among health care professionals.<sup>[7,9]</sup> Despite the WHO's recommendations, health care workers (HCWs) have poor compliance with hand hygiene protocols.<sup>[10]</sup> Hand hygiene compliance (HHC) rates among HCWs are estimated at 20%–40%.<sup>[11]</sup> Although some studies have examined hand hygiene among HCWs, none have examined hand hygiene among nurses and midwives in Iran during the COVID-19 pandemic. Investigating the extent of HHC provides a basis for identifying areas of weakness, providing feedback to HCWs, and developing effective interventions to promote hand hygiene in healthcare settings.<sup>[12]</sup>

### Objectives

This study aimed to assess HHC among nurses and midwives working in the teaching hospitals of Jiroft University of Medical Sciences in 2021.

## METHODS

### Study setting and participants

A cross-sectional study was conducted on all midwives and nurses working in two teaching hospitals of Jiroft University of Medical Sciences in southern Iran. The data were collected from May to July 2021. Participants were recruited using a convenience sampling. Inclusion criteria were working in hospital wards, at least six months of work experience, and direct involvement in patient care. Nurses and midwives who were informed of the covert observation and those working in the COVID-19 wards were excluded from the study. The sample size was determined using the data provided by Seyed Nematian *et al.*,<sup>[13]</sup> where 39% of nurses complied with the hand hygiene protocol. Accordingly, using the formula for calculating the proportion in a limited population [Figure 1], with a Type I error of 0.05,  $d = 0.05$ ,  $P = 0.39$ , and given that a total of 350 nurses and midwives were available, the sample size was estimated at 200 (130 nurses and 70 midwives).

### Data collection instruments

Data were collected using a demographic information checklist and the WHO Hand Hygiene Observation

$$n = \frac{Nz^2p(1-p)}{Nd^2 + z^2p(1-p)}$$

Figure 1: The sample size calculation formula

Form.<sup>[14]</sup> The demographic information checklist assesses the participants' age, work experience, gender, marital status, and education level. This checklist was completed using the data available in the nursing offices of each hospital. The WHO Hand Hygiene Observation Form assesses hand hygiene at five mandatory moments, namely, before touching a patient, before a clean/aseptic procedure, after a body fluid exposure risk, after touching a patient, and after touching patient surroundings.<sup>[14]</sup> The percentage of HHC is calculated by dividing the number of acceptable health care actions performed by the total number of hand hygiene opportunities  $\times 100$ .<sup>[15]</sup> The hand hygiene observation form has been used in many earlier studies.<sup>[1,13,15–17]</sup> We used inter-rater reliability<sup>[18]</sup> to examine the reliability of the hand hygiene form. For this purpose, two observers were asked to complete the hand hygiene form in a pilot study. Then, the percentage of agreement between the raters was calculated at 90%. Disagreements were then resolved by negotiation.

### Data collection

The senior researcher selected two volunteer observers with master's degrees among the supervisors (one observer in each hospital) and instructed them to use the hand hygiene observation form to evaluate HHC. To start data collection, the hospital wards were first selected by lottery (i.e. Emergency Department, Intensive Care Unit, Inpatient, Surgical, Midwifery, and Maternity Care Units). The observers attended the selected wards on morning and evening shifts upon the full observance of health protocols. They identified eligible nurses and midwives and assessed their HHC via direct but covert observations during the care activities. The observations were made following the WHO's recommendations and the protocols used in previous studies.<sup>[13,14,16]</sup> The average time to complete each checklist was about 20 min.

### Ethical considerations

The study protocol was approved by the ethics committee of Jiroft University of Medical Sciences under the code IR.JMU.REC.1400.003. We also sought permission from the hospital officials and the infection control departments. The observers were instructed about the confidentiality and anonymity of the participants' data, and each questionnaire was only identified with a unique code. As this study posed no risk to the participants, compliance with the hand hygiene protocol was assessed

through direct but covert observations. To avoid the Hawthorne effect, we also conducted the observations without participant consent. All steps were performed in accordance with the relevant guidelines of the Helsinki Declaration.

### Statistical analysis

Continuous variables were reported using mean and standard deviation, and the categorical variables were reported using frequency and percentage. Normality of the quantitative variables (i.e. HHC, age, and work experience) was rejected by the Kolmogorov–Smirnov test ( $P < 0.001$ ). Therefore, the quantitative variables of the two groups were compared using the Mann–Whitney U and the Kruskal–Wallis tests. The Chi-square test was used to compare the subgroups in terms of categorical variables.  $P < 0.05$  was considered statistically significant and the data were analyzed by SPSS software (IBM, Armonk, New York, version 16).

### RESULTS

The age range of the participants was 24–52 years. A total of 109 and 91 participants were observed in the morning and evening shifts, respectively. Table 1 shows other demographic characteristics. Due to the nature of their work, nurses and midwives worked in different wards and also differed in terms of gender ( $P < 0.05$ ). However, no statistically significant difference was found between the two groups for other personal characteristics ( $P > 0.05$ ) [Table 1]. The average percentage of HHC was 51.3%.

**Table 1: The participants' demographic characteristics<sup>a</sup>**

Variable	Nurse (n=130)	Midwife (n=70)	P <sup>b</sup>
Age (years)	32.24 ± 8.1	32.33 ± 6.0	0.245
Work experience (years)	6.88 ± 6.9	6.76 ± 5.4	0.343
Gender			
Male	40 (20.0)	0	<0.001 <sup>b</sup>
Female	90 (45.0)	70 (35.0)	
Marital status			
Married	75 (37.5)	48 (24.0)	0.170 <sup>b</sup>
Single	55 (27.5)	22 (11.0)	
Education			
Bachelor	123 (61.5)	69 (34.5)	0.265 <sup>b</sup>
Master/Ph.D.	7 (3.5)	1 (0.5)	
Hospital ward			
Emergency	60 (30.0)	0	<0.001 <sup>b</sup>
ICU	31 (15.5)	0	
Inpatient	39 (19.5)	0	
Surgery	0	10 (5.0)	
Midwifery	0	20 (10.0)	
Maternity	0	40 (20.0)	

<sup>a</sup>Data presents as mean±SD or n (%), <sup>b</sup>Chi-square test.

ICU: Intensive care unit, SD: Standard deviation

Table 2 presents hand hygiene opportunities and attempts and shows that HHC rates did not differ significantly between nurses and midwives in terms of gender, education, marital status, work shifts, hospital ward, and work experience ( $P > 0.05$ ) [Table 2]. HHC rates differed significantly between the different situations. The lowest HHC rates were observed before touching a patient and before doing a clean/aseptic procedure (33.5% and 49%, respectively) whereas the highest rate (81.8%) was observed after a body fluid exposure risk [Table 3]. The *post hoc* dunn's test showed that the differences in HHC were significant only at two moments, i.e. before touching a patient and before a clean/aseptic procedure [Table 4].

### DISCUSSION

The results of this study showed that about half of our participants were compliant with the hand hygiene protocol. This rate is low especially during the COVID-19 pandemic, however, the HHC rate in this study was higher than those in studies conducted before the COVID-19 pandemic in Isfahan (12.8%)<sup>[19]</sup> and northeast Iran (43%).<sup>[20]</sup> Nonetheless, the HHC rate in our study was similar to a study conducted in the United States (US) where the HHC rate was estimated using automated hand hygiene monitoring systems installed in 90 hospitals. The HHC rate was 46% before the pandemic and rose to 60% immediately after the pandemic. However, it gradually declined, reaching 54% four weeks after the pandemic.<sup>[12]</sup> Our findings also differed from the results of a recent study in China where the HHC in a pediatric ward increased from 83% to 100% after an audit and training program was implemented in another ward.<sup>[21]</sup> The reasons for the low HHC rate in our study were possibly the increased workload of the HCWs during the COVID-19 pandemic, lack of knowledge,<sup>[1]</sup> inefficiency of infection control programs implemented in the hospitals, and lack of adequate supervision and feedback.<sup>[22]</sup> In addition, nurses' desire to reduce contact time with patients during the COVID-19 pandemic could negatively affect their HHC.

Our results indicated that HHC was at the lowest rates before touching the patient and before a clean/aseptic procedure. This finding shows that self-protection is the main motive for hand hygiene in HCWs.<sup>[23–25]</sup> It appears that our participants prioritized self-protection over patient safety. Although self-protection is critical, the WHO highlights the critical role of nurses and midwives in saving millions of lives,<sup>[21,26]</sup> especially in the fight against COVID-19. Thus, officials in the healthcare system need to take effective measures to improve the education, awareness, and motivation of HCWs to comply with hand

**Table 2: The descriptive statistics for hand hygiene compliance in the two groups**

Variable	Opportunities	Actions	Compliance (%)	Mean±SD <sup>a</sup>	Z <sup>b</sup>	P <sup>b</sup>
Professional group						
Nurse	444	219	49.32	49.92 ± 27.40	-0.860	0.390
Midwife	232	119	51.29	53.90 ± 30.56		
Gender						
Male	129	64	49.61	48.62 ± 27.92	-0.449	0.654
Female	547	274	50.09	51.98 ± 28.73		
Marital status						
Married	409	206	50.36	51.76 ± 29.09	-0.298	0.766
Single	267	132	49.43	50.60 ± 27.79		
Education						
Bachelor	649	326	50.23	51.75 ± 28.56	-0.658	0.511
Master/Ph.D.	27	12	44.44	40.83 ± 27.41		
Shifts						
Morning	371	188	50.67	51.13 ± 27.42	-0.103	0.918
Evening	305	150	49.18	51.53 ± 29.96		
Hospital ward						
Emergency	211	104	49.28	49.47 ± 30.70	K-W statistic=4.14 df=5	0.530
ICU	100	51	51.00	51.77 ± 26.39		
Inpatient	133	64	48.12	49.14 ± 23.06		
Surgery	33	14	42.42	45.83 ± 29.46		
Midwifery	66	29	43.93	46.16 ± 34.94		
Maternity	133	76	57.14	59.79 ± 27.82		

<sup>a</sup>The mean percentage of each group =  $\frac{\text{The sum of hand hygiene percentage in the group}}{\text{Total number of participants of the group}}$ , <sup>b</sup>Calculated by Mann-Whitney *U*-test or Kruskal-Wallis test. ICU: Intensive care unit, SD: Standard deviation

**Table 3: The average hand hygiene compliance rate in different situation of hand hygiene**

Time of hand hygiene	Mean percentage of hand hygiene compliance ± SD	P <sup>a</sup>
Before touching a patient	33.5 ± 47.3	<0.001
Before a clean/septic procedure	49 ± 50	
After a body fluid exposure risk	81.8 ± 42.8	
After touching a patient	75.9 ± 42.8	
After touching the patient's surrounding	66.3 ± 47.5	

<sup>a</sup>Kruskal-Wallis test. SD: Standard deviation

hygiene, especially before touching patients. The current study showed no significant differences in HHC rates by gender, education, work experience, ward type, and shift. Another study in Iran also showed that education and work experience did not predict HHC.<sup>[13]</sup> Contrarily, a study in the US showed that emergency room nurses had lower HHC than other nurses.<sup>[27]</sup> A study in Saudi Arabia also showed that nurses with more experience and higher education had higher HHC rates.<sup>[15]</sup> The conflicting results can be attributed to differences in clinical settings, organizational guidelines, and how and when data were collected.

This study was a cross-sectional study. Thus, longitudinal studies should be performed to investigate

the impact of the epidemic on the HHC of medical staff's, especially those working night shifts. Moreover, to prevent the participants' awareness of direct observation, it was not possible to closely monitor them. Thus, observers may have not noticed instances such as contamination of the participants' hands when performing procedures. However, assessing hand hygiene through direct but covert observation was the main strength of this study.

## CONCLUSION

This study showed that the HHC rates among nurses and midwives were low, especially before touching patients and before doing a clean/aseptic procedure. It is suggested to design hand hygiene promotion interventions for nurses and midwives to prevent the transmission of the disease to them and to create a safe environment for patients, especially during the COVID-19 pandemic. Regular and frequent auditing and feedback on the hand hygiene practices of nurses, midwives, and other HCWs are recommended to promote hand hygiene practices in hospitals.

## Acknowledgments

The authors would like to appreciate the Vice-Chancellor for Research and Technology of Jiroft University of Medical Sciences, all the participants, and the sincere

**Table 4: Multiple comparison of hand hygiene adherence rates in different situations**

Comparison two by two situations	Test statistic	SE	Standard test statistic	P <sup>a</sup>
Before touching a patient - Before a clean/septic procedure	-53.663	20.408	-2.630	0.009
Before touching a patient - After touching the patient's surroundings	-110.097	20.693	-5.320	<0.001
Before touching a patient - After touching a patient	-142.418	17.676	-8.057	<0.001
Before touching a patient - After a body fluid exposure risk	-159.835	19.127	-8.357	<0.001
Before a clean/septic procedure - After touching the patient's surroundings	-56.434	23.852	-2.366	0.018
Before a clean/septic procedure - After touching a patient	-88.755	21.287	-4.169	<0.001
Before a clean/septic procedure - After a body fluid exposure risk	-106.172	22.506	-4.717	<0.001
After touching patient surroundings - After touching a patient	32.321	21.561	1.499	0.134
After touching the patient's surroundings - After a body fluid exposure risk	49.738	22.765	2.185	0.029
After touching a patient - After a body fluid exposure risk	17.417	20.062	0.868	0.385

<sup>a</sup>Post hoc dunn's test. SE: Standard error

and honest cooperation of the observers who helped us in conducting this study.

### Financial support and sponsorship

This study was financially supported under code 565 by the Jiroft University of Medical Sciences.

### Conflicts of interest

There are no conflict of interest.

## REFERENCES

- Farmani Z, Kargar M, Khademian Z, Paydar S, Zare N. The effect of training and awareness of subtle control on the frequency of hand hygiene among intensive care unit nurses. *BMC Res Notes* 2019;12:647.
- Rundle CW, Presley CL, Militello M, Barber C, Powell DL, Jacob SE, et al. Hand hygiene during COVID-19: Recommendations from the American Contact Dermatitis Society. *J Am Acad Dermatol* 2020;83:1730-7.
- Umakanthan S, Sahu P, Ranade AV, Bukelo MM, Rao JS, Abrahao-Machado LF, et al. Origin, transmission, diagnosis and management of coronavirus disease 2019 (COVID-19). *Postgrad Med J* 2020;96:753-8.
- Onyeaka HK, Zahid S, Patel RS. The unaddressed behavioral health aspect during the coronavirus pandemic. *Cureus* 2020;12:e7351.
- Ataee RA, Ataee MH, Mehrabi Tavana A, Salehi M. Bacteriological aspects of hand washing: A key for health promotion and infections control. *Int J Prev Med* 2017;8:16.
- von Lengerke T, Lutze B, Krauth C, Lange K, Stahmeyer JT, Chaberny IF. Promoting hand hygiene compliance: PSYGIENE – A cluster-randomized controlled trial of tailored interventions. *Dtsch Arztebl Int* 2017;114:29-36.
- Martos-Cabrera MB, Mota-Romero E, Martos-García R, Gómez-Urquiza JL, Suleiman-Martos N, Albendín-García L, et al. Hand hygiene teaching strategies among nursing staff: A systematic review. *Int J Environ Res Public Health* 2019;16:3039.
- Al Kuwaiti A. Impact of a multicomponent hand hygiene intervention strategy in reducing infection rates at a university hospital in Saudi Arabia. *Interv Med Appl Sci* 2017;9:137-43.
- Gould DJ, Moralejo D, Drey N, Chudleigh JH, Taljaard M. Interventions to improve hand hygiene compliance in patient care. *Cochrane Database Syst Rev* 2017;9:CD005186.
- Zhao Q, Yang MM, Huang YY, Chen W. How to make hand hygiene interventions more attractive to nurses: A discrete choice experiment. *PLoS One* 2018;13:e0202014.
- Kaveh MH, Motamed-Jahromi M, Hassanipour S. The effectiveness of interventions in improving hand hygiene compliance: A meta-analysis and logic model. *Can J Infect Dis Med Microbiol* 2021;2021:8860705.
- Moore LD, Robbins G, Quinn J, Arbogast JW. The impact of COVID-19 pandemic on hand hygiene performance in hospitals. *Am J Infect Control* 2021;49:30-3.
- Seyed Nematian SS, Palenik CJ, Mirmasoudi SK, Hatam N, Askarian M. Comparing knowledge and self-reported hand hygiene practices with direct observation among Iranian hospital nurses. *Am J Infect Control* 2017;45:e65-7.
- Sax H, Allegranzi B, Chraïti MN, Boyce J, Larson E, Pittet D. The world health organization hand hygiene observation method. *Am J Infect Control* 2009;37:827-34.
- Fouad M, Eltahir S. Hand hygiene initiative: Comparative study of pre- and postintervention outcomes. *East Mediterr Health J* 2020;26:198-205.
- Labi A, Obeng-Nkrumah N, Nuertey BD, Issahaku S, Ndiaye NF, Baffoe P, et al. Hand hygiene practices and perceptions among healthcare workers in Ghana: A wash intervention study. *J Infect Dev Ctries* 2019;13:1076-85.
- Kolola T, Gezahegn T. A twenty-four-hour observational study of hand hygiene compliance among health-care workers in Debre Berhan referral hospital, Ethiopia. *Antimicrob Resist Infect Control* 2017;6:109.
- Ebadi A, Zarshenas L, Rakhshan M, Zareiyan A, Sharifnia S, Mojahedi M. Principles of Scale Development in Health Science.

- Tehran: Jame-e-Negar; 2017.
19. Mostafazadeh-Bora M, Bahrami M, Hosseini A. A survey of nurses' compliance with hand hygiene guidelines in caring for patients with cancer in a selected center of Isfahan, Iran, in 2016. *Iran J Nurs Midwifery Res* 2018;23:119-24.
  20. Vafaei Nezhad R, Yaghoubi A, Ghazvini K. Compliance of healthcare workers with hand hygiene practices in the northeast of Iran: An overt observation. *Int J Publ Health Sci* 2018;7:289-92.
  21. Wong SC, AuYeung CH, Lam GK, Leung EY, Chan VW, Yuen KY, *et al.* Is it possible to achieve 100 percent hand hygiene compliance during the coronavirus disease 2019 (COVID-19) pandemic? *J Hosp Infect* 2020;105:779-81.
  22. Arise K, Nishizaki S, Morita T, Yagi Y, Takeuchi S. Continued direct observation and feedback of hand hygiene adherence can result in long-term improvement. *Am J Infect Control* 2016;44:e211-4.
  23. Erasmus V, Brouwer W, van Beeck EF, Oenema A, Daha TJ, Richardus JH, *et al.* A qualitative exploration of reasons for poor hand hygiene among hospital workers: Lack of positive role models and of convincing evidence that hand hygiene prevents cross-infection. *Infect Control Hosp Epidemiol* 2009;30:415-9.
  24. Korniewicz DM, El-Masri M. Exploring the factors associated with hand hygiene compliance of nurses during routine clinical practice. *Appl Nurs Res* 2010;23:86-90.
  25. Smiddy MP, O'Connell R, Creedon SA. Systematic qualitative literature review of health care workers' compliance with hand hygiene guidelines. *Am J Infect Control* 2015;43:269-74.
  26. Peters A, Lotfinejad N, Guitart C, Simniceanu A, Padoveze MC, Borzykowski T, *et al.* "Nurses and midwives: Clean care is in your hands": The 5<sup>th</sup> May 2020 World Health Organization SAVE LIVES: Clean Your Hands campaign. *Antimicrob Resist Infect Control* 2020;9:54.
  27. Sands M, Aunger R. Determinants of hand hygiene compliance among nurses in US hospitals: A formative research study. *PLoS One* 2020;15:e0230573.