JOURNAL OF
CONTEMPORARY MEDICINE

DOI:10.16899/jcm.1212334
J Contemp Med 2023;13(3):484-489

Original Article / Orijinal Araştırma

A Quasi-experimental Intervention Study on Handwashing Behavior of Healthcare Workers in the Emergency Department

Acil Serviste Görev Yapan Sağlık Çalışanlarında El Yıkama Davranışı Hakkında Yarı Deneysel Bir Çalışma

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Abstract

Aim: In this study, it was aimed to determine the attitudes, behaviors and knowledge of healthcare workers working in the emergency department of a hospital and to ensure correct handwashing with an intervention related to handwashing behavior.

Material and Method: The research was a quasi-experimental intervention study (retrospective pre-test/post-test design). The number of participants was 131 (research participation rate 86.7%). A data collection form comprising 37 questions was used. As a training intervention, a text was read to the participants under observation. Data were summarized with mean±standard deviation, median (min-max), frequency distributions, and percentages. The chi-square and Mc-Nemar tests were applied to investigate the relationships between data. $p<0.05$ was considered significant.

Results: The mean age of the participants was 32.04±6.52, 51.5% were women and 74.8% were nurses. Those who thought that they washed their hands adequately during an 8-hour work period were 67.2%. 69.5% of the healthcare workers answered correctly to 70% and more of the knowledge questions and got a score of 9 and above. A significant difference was found in 10 of the 14 intervention questions regarding handwashing ($p<0.05$).

Conclusion: In the research, it is found that the rate of those who think that they wash their hands enough during an 8-hour work period is more than two-thirds, found that more than two-thirds of the participants gave correct answers to the knowledge level questions related to handwashing and found that the training intervention performed is effective.

Keywords: Handwashing, healthcare worker, emergency service, training

Öz

Amaç: Bu çalışmada bir hastanenin acil servisinde görev yapan sağlık çalışanlarının el yıkama ile ilgili tutum, davranış ve bilgilerini değerlendirmek ve el yıkama davranışıyla ilgili bir müdahaleyle doğru el yıkamalarını sağlamak amaçlanmıştır.

Gereç ve Yöntem: Araştırma yarı deneysel bir müdahale çalışmasıdır (retrospektif ön-test/son-test tasarımı). Katılımcı sayısı 131'dir (araştırmaya katılma oranı %86,7). Araştırmada 37 sorudan oluşan bir veri toplama formu kullanılmıştır. Eğitim müdahalesi olarak katılımcılara gözlem altında bir metin okutulmuştur. Veriler ortalama±standart sapma, ortanca (min-maks), frekans dağılımları ve yüzdelikler ile özetlenmiştir. Veriler arası ilişkilerin araştırılmasında ki-kare ve Mc-Nemar testleri uygulanmıştır. $p<0,05$ anlamlı kabul edilmiştir.

Bulgular: Katılımcıların yaş ortalaması 32,04±6,52, %51,5'i kadın ve %74,8'i hemşireydi. Sekiz saatlik bir iş periyodunda ellerini yeterli sayıda yıkadığını düşünenler katılımcıların %67,2'siydi. Sağlık çalışanlarının %69,5'i bilgi sorularının %70'ine ve daha fazlasına doğru yanıt vererek 9 ve üzerinde bir puan aldı. El yıkamaya ilişkin 14 müdahale sorusundan 10'unda istatistiksel açıdan anlamlı fark bulundu ($p<0,05$).

Sonuç: Araştırma sonucunda sekiz saatlik bir iş periyodunda ellerini yeterli sayıda yıkadığını düşünenlerin oranının katılımcıların üçte ikisinden fazla olduğu, el yıkamayla ilişkili bilgi düzeyi sorularına katılımcıların üçte ikisinden fazlasının doğru yanıt verdiği ve yapılan eğitim müdahalesinin etkili olduğu bulunmuştur.

Anahtar Kelimeler: El yıkama, sağlık çalışanı, acil servis, eğitim

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Received *(Geliş Tarihi)*: 30.11.2022 **Accepted *(Kabul Tarihi)*:** 28.05.2023

INTRODUCTION

It is a historical fact known since the time of Ignaz Semmelweis (1818-1865) that it is important on hand hygiene both in daily life and in the working environment.[1] The lack of compliance with hand hygiene in numerous sectors, particularly in the fields of health-related work, can ease the spread of infectious diseases. Because of low hand hygiene compliance in healthcare workers (HCWs), healthcare-associated infections caused by highly virulent and multi-drug-resistant microorganism species may occur.[2] Every year, lots of patients worldwide are affected by healthcare-associated infections. However, the true global burden of healthcare-associated infections is unknown because of the difficulty of collecting reliable data in this area.[3] In a systematic review/meta-analysis study conducted by the World Health Organization (WHO), including studies on healthcare-associated infections from 23 high-income countries (131 national and multicenter studies) covering the years 1995-2010, the frequency of healthcare-associated infections was found 7.6% (3.5%-12%).[4] The Centers for Disease Control and Prevention (CDC) reports that one out of every 31 patients admitted to the hospital develops a healthcare-associated infection.[5]

Unclean hands of HCWs are held responsible for 20-40% of healthcare-associated infections, which cause serious morbidity, mortality, and cost increase. Up to 50% of healthcare-associated infections can be prevented with hand hygiene improvement programs.[2,3,6] WHO has in simple terms identified five key moments of hand hygiene. Accordingly, hand hygiene should be provided before contact with the patient, before aseptic procedures, after contact with the patient, after contact with body fluids, and after contact with surfaces around the patient.[6]

In the 2009 report of the WHO, it was reported that compliance with hand hygiene in HCWs was 38.7% (5%-89%) on average.[6] The CDC (2019) states that HCWs wash only half of the time they need to wash their hands while they work.[5] In a systematic review study covering the years 2014-2020, the compliance rate of HCWs with hand hygiene was found to be 41%.[7]

In this study, it was aimed to determine the attitudes, behaviors and knowledge of HCWs working in the emergency department about handwashing and to ensure correct handwashing with an intervention related to handwashing behavior.

MATERIAL AND METHOD

This research is a quasi-experimental type of intervention study. Ethical permission (Date: 28.04.2017 Number: 2017/904) from Necmettin Erbakan University Meram Faculty of Medicine Ethics Committee and institutional permission from Konya Provincial Health Directorate were obtained. The research was carried out in the emergency department of a training and research hospital in Konya province Meram district.

The population of the research comprised 151 physicians and nurses working in the emergency department between December 1, 2019 and January 31, 2020. Sample selection was not made for the research, and it was aimed at reaching the entire population. A total of 20 physicians and nurses did not participate in the study because of reasons such as not wanting to participate in the study, being on maternity leave, or being on assignment. The number of participants was 131 (research participation rate 86.7%).

A data collection form comprising 37 questions and 3 main parts was applied in the research. In the first part, some sociodemographic characteristics of the participants (6 questions), and in the second part, their knowledge, attitudes, and behaviors about handwashing were questioned (17 questions). In the third and last part, a text about handwashing (**Table 1**) was read to the participants under observation. It was thought that it would be a more effective method to take people one-on-one and explain to them the rights and wrongs of hand washing through a text by eliminating environmental distractions, rather than a training and intervention by gathering a group of people in a hall with many distractions and reading and explaining something from a slide for a certain period of time. Participants were asked to evaluate the knowledge and practices in the text they read, and whether they knew the text before reading it, by answering the 14 questions in the last part. This was a retrospective pre-test/post-test design.[8] The second part was the pre-test and the third part was the post-test. Within the research, a score was calculated from the knowledge questions. The lowest score that can be obtained from knowledge questions is 0, and the highest score is 12. Answering at least 70% of the knowledge questions correctly was evaluated as 'having sufficient knowledge'. In calculating the score, the 70% value was determined by the researchers with a generally accepted preconception.

Table 1. The text read to HCWs about handwashing

Handwashing is the simplest and most effective method of preventing healthcare-associated infections. Handwashing is of three types: Social handwashing, hygienic handwashing and surgical handwashing. A HCW working in a clinic is expected to know and practice hygienic handwashing. Hygienic handwashing is washing the palms, dorsum of the hands, wrists and interdigitals with warm water and soap for at least 15 seconds. Hot and cold waters are not recommended, as they will increase the risk of dermatitis. The area where the most intense microorganism is found on the hands is between the fingers. During handwashing, the faucet should not be touched and the faucet should be opened and closed with the help of paper towels. After handwashing, hands should be dried with a paper towel. Hands can be washed using liquid soap, foam soap, chlorhexidine soap, povidone iodine soap, chlorhexidine alcohol solution, povidone iodine alcohol solution. Using solid soap should be avoided. There are two types of flora on the hands, transient and resident. Microorganisms that are transmitted from patients to the hands of healthcare workers and adhere to the hand superficially constitute the transient flora. Transient flora has been associated with healthcare-associated infections. It is aimed at cleaning the transient flora with handwashing. According to the five moments of hand hygiene of WHO, hands should be washed in the following situations: 1-Before contact with each patient, 2-After contact with each patient, 3-After contact with body fluids, 4-Before aseptic procedures (such as oral care, wound care, catheter insertion), 5-After contact with surfaces around the patient.

The participants were informed and, after their verbal consent was obtained, the data collection form was applied under observation. The same researcher collected the data from all participants during the HCWs' lunch break. The data collection process was tried to be standardized by this application. The steps during the application of the data collection form are shown in **Figure 1**.

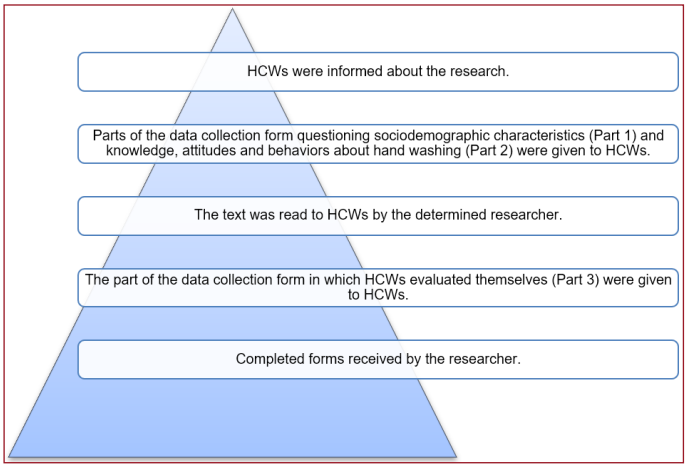

Figure 1. The steps during the application of the data collection form

Statistical Analysis

Data entry and analysis were performed with Jamovi software version 2.3. Data were summarized with mean±standard deviation, median (min-max), frequency distributions, and percentiles. The chi-square and Mc-Nemar tests were used to investigate the relationships between the data. $p<0.05$ was considered statistically significant.

RESULTS

Sociodemographic Characteristics

The mean age of 131 people participating in the study was 32.04±6.52. 51.5% of the HCWs were women and 48.5% were men. Sociodemographic characteristics of the HCWs are shown in **Table 2**.

Table 2. HCWs' sociodemografic characteristics

Characteristics	
Age (year)	34.78±6.57 (min:24, max:55)
Sex	
Female	51.5% (n=67)
Male	48.5% (n=63)
Marital status	
Single	39.7% (n=52)
Married	60.3% (n=79)
Educational status	
High school	14.5% (n=19)
University (2 years)	19.1% (n=25)
University (4 years)	66.4% (n=87)
Profession	
Phsyician	25.2% (n=33)
Nurse	74.8% (n=98)
Total working time (year)	8.90±6.32

Handwashing Characteristics

The rate of participants who received training on handwashing during school years was 89.2%, and the rate of participants who received training on handwashing in working life was 93.8%. The characteristics of healthcare workers related to handwashing are shown in **Table 3**.

Table 3. HCWs' handwashing characteristics

Characteristics	n	%
Receiving training on handwashing during school years		
Yes	116	89.2
No	14	10.8
Receiving training on handwashing in working life		
Yes	122	93.8
No	8	6.2
Thinking that he/she wash his/her hands enough during an 8-hour work period		
Yes	88	67.2
No	43	32.8
The reason that reduces the frequency of handwashing the most		
Workload	66	51.6
Damage to hands due to washing	35	27.3
Lack of washbasin	3	2.3
Distrust of handwashing environment and material	14	10.9
Other	10	7.8
The most frequently used material for handwashing		
Antiseptic solution	15	11.6
Liquid soap	110	85.3
Water only	2	1.6
Other	2	1.6

The mean number of handwashing was 16.50±10.45 and the median number of handwashing was 15 (1-50) during an eight-hour work period. Of those who thought that they washed their hands adequately during an 8-hour work period (n=88), 17% were physicians, and 83% were nurses.

Level of Knowledge Related to Handwashing

61.2% of the HCWs knew that the most effective method of preventing nosocomial infections was handwashing. The rate of those who knew that the flora responsible for hospital infections was transient flora was 76%. 61.1% of the HCWs knew exactly and accurately the situations where hands should be washed according to the five moments of hand hygiene of WHO. The knowledge levels of the HCWs regarding hand hygiene are shown in **Table 4**.

69.5% of the HCWs answered 70% or more of the knowledge questions correctly and scored 9 or more. There was a significant difference between responding to 70% or more of the knowledge questions and gender (Chi-square=7,879, $p=0.005$). The frequency of females who scored 9 and above was higher than that of males. There was no relationship between the variables of marital status, education level, occupation, handwashing education at school, handwashing education in working life, and thinking that he washed his hands adequately ($p>0.05$).

Table 4. Knowledge levels of HCWs about hand hygiene

Questions	n	%
What is the most effective way to prevent hospital infections?		
Using personal protective equipment	45	34.9
Handwashing*	79	61.2
Other	5	3.9
Which flora is implicated in healthcare associated infections?		
Resident flora	29	24.0
Transient flora*	92	76.0
Which region has the most microorganisms on the hand?		
Palm	24	18.5
Dorsum of the hands	0	0.0
Interdigital*	64	49.2
Fingertips	33	25.4
Wrist	2	1.5
Other	7	5.4
Is it enough to wash hands only with water?		
Yes	7	5.3
No*	124	94.7
Should hands be dried after washing?		
Yes*	119	91.5
No	11	8.5
Should hands be washed after wearing gloves?		
Yes*	118	92.2
No	10	7.8
Should hands be washed before contact with each patient?		
Yes*	114	87.7
No	16	12.3
Should hands be washed after contact with each patient?		
Yes*	126	96.9
No	4	3.1
Should hands be washed after contact with body fluids?		
Yes*	112	86.2
No	18	13.8
Should hands be washed before aseptic procedures?		
Yes*	100	76.9
No	30	23.1
Should hands be washed after contact with surfaces around the patient?		
Yes*	95	73.1
No	35	26.9
How long should the hygienic handwashing period be?		
10 seconds	15	11.4
15 seconds*	30	22.9
30 seconds	79	60.3
Other	7	5.3
Total score [mean±sd/median(min-max)]	9.14±1.62 / 9 (4-12)	
Total score for physicians	9.10±1.95 / 9 (4-12)	
Total score for nurses	9.16±1.50 / 9 (5-12)	

*Indicates correct answers.

Handwashing-Related Intervention Results

After reading the text containing information about handwashing (**Table 1**), the participants were asked to state what they knew as "I knew" and what they did not know as "I didn't know" before reading this text. HCWs evaluated themselves by this method. According to this, it was determined that the HCWs have already known the information 'Handwashing is the most effective and simplest method to prevent healthcare-associated infections', 'Hands should be washed after contact with each patient', 'Hands should be washed after contact with body fluids' and 'Before aseptic procedures (such as oral care, wound care, catheters) hands should be washed'. The knowledge questions answered before reading the text (pre-test) and I knew/I didn't know answers that HCWs evaluated themselves (post-test) were analyzed with the Mc-Nemar test. The results of the intervention are shown in **Table 5**.

Table 5. Handwashing intervention results

Expressions	p
Handwashing is the simplest and most effective method of preventing healthcare-associated infections.	0.125
Handwashing is of three types: Social handwashing, hygienic handwashing and surgical handwashing.	0.001*
A HCW working in a clinic is expected to know and practice hygienic handwashing.	0.016*
Hygienic handwashing is washing the palms, dorsum of the hands, wrists and interdigitals with warm water and soap for at least 15 seconds.	0.001*
After handwashing, hands should be dried with a paper towel.	0.001*
Hands can be washed using liquid soap, foam soap, chlorhexidine soap, povidone iodine soap, chlorhexidine alcohol solution, povidone iodine alcohol solution.	0.001*
There are two types of flora on the hands, transient and resident.	0.001*
Transient flora has been associated with healthcare-associated infections.	0.001*
It is aimed at cleaning the transient flora with handwashing.	0.001*
Hands should be washed before contacting each patient.	0.031*
Hands should be washed after contact with each patient.	0.500
Hands should be washed after contact with body fluids.	1.000
Hands should be washed before aseptic procedures (such as oral care, wound care, catheter insertion).	0.250
Hands should be washed after contact with surfaces around the patient.	0.001*

*The ones with statistically significant difference between the pre-test and post-test are marked.

DISCUSSION

The rate of participants who think that they wash their hands adequately in an eight-hour work period is 67.2%. Of those who thought that they washed their hands adequately during an 8-hour work period, 17% were physicians and 83% were nurses. In the study by Yurttas et al.[9] the hand hygiene compliance of the participants was 66.4% among physicians and 73.9% among nurses-midwives. In the study by Dikis et al.[10] in which they evaluated 5 years from 2014 to 2018, hand hygiene compliance rates were found between 37% and 70% in nurses and between 28% and 49% in physicians. In the study by Kosucu et al.[11] the general hand hygiene compliance rate of HCWs was found to be 58%, nurses 69%, and physicians 45%. In the systematic review by Gon et al.[12] in which they included 15 studies, hand hygiene compliance among birth attendants working in health institutions are in a wide range, from 0% to 100%. Phan et al.[13] observed that hand hygiene compliance was 43.6% and increased after the intervention. The rates of compliance with hand hygiene in

different institutions evaluated in the study by Tyagi et al. were found to be 12%, 33%, and 44%.[14] Studies evaluating handwashing compliance with a survey method similar to our study could not be found in the literature by researchers. For this reason, studies that evaluated handwashing compliance by observation were included in the discussion. The handwashing rate we found in our research is consistent with the literature. It has also been known for years that nurses wash their hands at a higher rate than physicians do. The reason for this may be that nurses take more roles in patient care-related jobs compared to physicians.

In our study, HCWs stated work intensity as the reason that reduces the frequency of hand washing the most. In a study by Aktug Demir et al.[15] in another hospital in Konya, it was found that the reason that most decreased the frequency of handwashing was workload. In the WHO's Hand Hygiene Guide in Healthcare, irritation caused by hand hygiene products, lack of placement of hand hygiene products, lack of materials, workload, lack of time, thinking that the patient's needs are more priority, thinking that the risk of infection transmission from patients is low, belief that wearing gloves is sufficient for hygiene, lack of knowledge, lack of role models and forgetfulness are stated as the reasons that reduce handwashing compliance rates.[6]

It was found that 61.1% of the research participants knew exactly and correctly the situations in which hands should be washed according to the five moments of hand hygiene of WHO. In the study by Aktug Demir et al., the rate of those who fully knew the five moments of hand hygiene was 10%.[16] In the study by Toraman et al., handwashing rates were reported as 70% before contact with the patient and 81% after contact with body fluids.[17] In the study by Kosucu et al., based on the five moments of hand hygiene, the compliance of HCWs was found to be 58%.[11] In the literature, there are different rates of knowing and complying with the five moments of hand hygiene. The reason for this situation may be the variations of the groups included in the research, as well as the hand hygiene-related training and the content of the training received.

69.5% of the participants provided correct answers to at least 70% of the knowledge level questions related to handwashing. There was no significant difference between physicians and nurses in terms of hand hygiene knowledge level. In the study by Ozturk et al., the mean level of knowledge evaluated with 10 questions was 8.[18] In the study by Aktug Demir et al., the rate of correct answers to the 11 questions asked to evaluate the level of hand hygiene knowledge was between 46.2% and 94.6%.[15] The situation we determined in our study and the scores and rates in the literature are similar. It can be stated that the level of knowledge about hand washing of the HCWs within the research is at a moderate level. The reason for this situation may be handwashing training and the content of the training. However, it is thought that these rates may have increased due to the effect of the COVID-19 pandemic.

In the self-evaluation section, most participants stated that they did not know 10 of the 14 statements before the research. In the study by Ozturk et al.[18] the mean level of knowledge evaluated with 10 questions was found to be 8 before the education and 9 after the education. Wisniewski et al.[19] determined that the educational intervention related to hand hygiene had positive results on HCWs. In the study by Karaoglu and Akın,[20] it was found that the knowledge scores of nurses increased after the training. Since the studies in which the pre-test and post-test application were made consecutively could not be reached by the researchers, the studies that had time between the pre-test and post-test application were used in the discussion. Both in our study and similar studies in the literature, the educational intervention provided an increase in the level of hand hygiene knowledge in HCWs. These increases can be associated with the need to remind the subject at regular intervals.

Advantages and Limitations of the Research

The research was carried out in the busiest emergency service in the city center. In this way, the status of the HCWs serving a large number of patients was evaluated. With the research, the attention of the HCWs was drawn to handwashing. Because of the intervention feature of the study, the employees were allowed to correct their deficiencies and mistakes. Additionally, since the research was conducted in the pre-covid-19 pandemic period, it is important to indicate the handwashing status of the HCWs in the pre-pandemic period. With this feature, it will be a good benchmark for similar studies to be conducted during and after the Covid-19 pandemic.

All emergency services, both public and private, in the province could not be included in the research due to time and cost constraints. Since the study is an intervention type, its generalizability to the population of the study is limited. In our research, a method in which individuals evaluate themselves was used (retrospective pre-test/post-test). No follow-up/observation was made. Sociodemographic characteristics such as age, gender, profession, and hand washing characteristics of 20 people who did not participate in the study are not known. These are the limitations of the study.

CONCLUSION

As a result of the research, it was determined that most HCWs received training on handwashing; they thought they washed their hands adequately; they knew the five moments of hand hygiene of WHO correctly, and the level of knowledge about handwashing was high. The educational intervention was effective. These rates may have increased because of the importance of hand hygiene messages widely presented from various sources during the Covid-19 pandemic.

It is thought that handwashing, which is a key factor in preventing the spread of communicable diseases and reducing healthcare-associated infections, should be added to the pre-graduate and post-graduate training programs of the HCWs at regular intervals, by determining the content, under observation and in practice. Additionally, conducting research on the knowledge levels of the HCWs before and after the training activities may play an important role in evaluating the training effectiveness and improving the training provided.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Necmettin Erbakan University Meram Faculty of Medicine Non-Pharmaceutical and Non-Medical Device Research Ethics Committee (Date: 28.04.2017, Number: 2017/904).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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