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# Hand Hygiene Compliance and Its Associated Factors Among Health Care Workers at Mogadishu Somali Türkiye Recep Tayyip Erdoğan Training and Research in a Tertiary Care Hospital

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**Background:** Hand hygiene is a critical preventive measure for controlling infections, particularly in underdeveloped nations.

**Materials and Methods:** A cross-sectional study was conducted in a hospital in Mogadishu, Somalia, from January to March 2024. This study aimed to assess compliance with hand hygiene practices and related factors among healthcare professionals.

**Results:** The study population comprised 52% men and 47.3% women. Most participants held bachelor's degrees, with the majority being nurses or midwives. A significant proportion had over five years of work experience. Almost all participants were knowledgeable about hand hygiene. Most reported cleaning and drying their hands before, during, and after contact with bodily fluids during aseptic procedures. Age, gender, educational status, marriage, working experience, type of occupation, receiving hand hygiene training and knowledge, and having the availability of water, soap, alcohol, and gloves significantly affected the overall uptake of infection control measures in Mogadishu ( $p < 0.05$ ).

**Conclusion:** The findings highlight an urgent need for targeted interventions to enhance hand hygiene practices in Somalia. Addressing training gaps and resource shortages is crucial for reducing infection rates and safeguarding patient health in this high-risk setting.

**Keywords:** hand hygiene compliance, healthcare workers, Mogadishu, Somalia, infection control

## Introduction

Hand cleanliness is the practice of washing hands with either water and soap or an antibacterial hand massage in order to maintain the skin healthy and get rid of any temporary bacteria.<sup>1</sup> Since healthcare workers' hands are the most common route for pathogen transmission, effective hand hygiene is crucial for preventing healthcare-associated infections (HCAIs) and the spread of resistant pathogens.<sup>2</sup> It accounts for one for the biggest medical issues in the world and may be the only practical and effective way to minimize the frequency of harmful contact with internal fluids or bodily waste, mucous membranes, damaged skin, or wound care products when a patient is being cared for in various locations.<sup>3,4</sup> The most cost-effective way to prevent healthcare-associated infections (HCAIs) and limit the spread of microbes is through proper hand hygiene. A lack of awareness about hand hygiene in healthcare settings can strain facilities and compromise the safety of vulnerable patients.<sup>5,6</sup> Targeted awareness campaigns, particularly those supported by the media, have been effective in increasing public knowledge about the importance of hand hygiene. Although healthcare professionals typically have a strong understanding of these practices, continuous education, and reminders



are crucial to ensure that this knowledge is consistently applied. Fostering a culture of safety around hand hygiene is essential for improving patient outcomes and protecting those at greatest risk.<sup>7</sup> However, inadequate hand hygiene remains a significant cause of HCAs, particularly in developing countries, where poor adherence among healthcare workers contributes to increased morbidity, mortality, and healthcare costs.<sup>8,9</sup> In many underdeveloped areas, there is limited awareness and training regarding proper hand hygiene. Education and training programs are essential to improve understanding and compliance, thereby reducing infection rates. Prioritizing hand hygiene in underdeveloped countries is crucial for improving public health, reducing healthcare-associated infections, and alleviating the broader socio-economic impacts of infectious diseases. This study is urgent due to the rising threat of antibiotic resistance, which poses significant public health risks, particularly in developing regions. High rates of healthcare-associated infections, especially among vulnerable populations, underscore the need for improved infection control practices. Furthermore, there is a lack of research focused on infection control in Mogadishu, making this study essential for establishing a baseline for future interventions. By enhancing awareness and training among healthcare workers, the findings can inform policy changes and resource allocation, leading to safer healthcare environments and improved health outcomes. The study highlights the need for improved awareness and training among healthcare workers regarding infection control practices, which is vital for enhancing overall public health.

## Materials and Methods

### Overview

The researcher employed a quantitative methodology for this study, utilizing self-administered questionnaires as the primary data collection instrument. A cross-sectional study design was implemented, and the research was conducted at the Mogadishu-Somalia-Turkey Recep Tayyip Erdoğan Training and Research Hospital. A facility-based cross-sectional study design with sample size of 300 healthcare workers, The study used established questionnaires tailored to assess infection control practices, ensuring that all relevant aspects were covered and the inclusion of diverse factors (age, experience, resource access) ensured that the study accurately measured the complexities of hand hygiene compliance.

The stability of responses over time could be evaluated by administering the same questionnaire to the same participants at different times.

### Target Population

The study populations were all healthcare providers who had contact with patients during the time of data collection at tertiary hospitals. All healthcare providers who had contact with patients—those who were actively working beyond six months in the facilities at the time of data collection—were included in the study.

### Variables

The dependent variable was hand hygiene compliance. The independent variables were socio-demographic variables (age, sex, marital status, level of education, profession, and year(s) of working experience), type of working unit (Medical unit, Paediatric unit, Surgical unit, Intensive Care Unit, Laboratory Unit, Obstetrics and Gynaecology Unit, OPD, Emergency Unit), hand hygiene knowledge and attitude related factors attitude towards hand hygiene, knowledge on five moments of hand hygiene, training on hand hygiene protocols and guidelines), and availability and accessibility of hand hygiene facilities inpatient wards (hand washing soap, alcohol-based hand rub, posters on hand hygiene, protocol and guidelines on hand hygiene, glove and knows availability of infection prevention control committee).

### Research Design

This was a descriptive cross-sectional study that utilised quantitative research methods of data collection and analysis for a specific point in time. This design allowed for collection of extensive data within a short time on issues based on the relationship between the variables understudy.

## Sampling Techniques

The study was designed as a prospective, observational cross-sectional survey conducted on a voluntary basis. To ensure sufficient statistical power, the minimum sample size was calculated to be 300 participants, taking into account a 5% margin of error, a 95% confidence interval, and an assumed response distribution of 50%.<sup>10</sup>

## Statistical Analysis

SPSS version 23.0 (IBM, New York, USA) was utilized for data analysis in this study. Descriptive statistics were presented as counts and percentages. The Kolmogorov–Smirnov test and histogram analysis were employed to assess the normality of the data. Categorical variables were reported as numbers and percentages, and comparisons were made using the Chi-square test, Bonferroni correction test, or Fisher’s exact test, as appropriate. A significance level of  $p < 0.05$  was established for determining statistical significance.

## Ethical Approval

Mogadishu Somalia Turkey Recep Tayyip Erdoğan Training and Research Hospital Clinical Research Ethics Committee Unit applied for study permission (Approval no: 16816). Before the start of data collection, each participant in the study provided written informed consent, and only those who willingly participated were included. Individuals who were absent or unwell during the data collection period were excluded from the study. After obtaining their informed consent, the participants were given the questionnaires to complete independently.

## Results

### Socio-Demographics

52.7% of the participants were male, and 47.3% were female. The majority of the cases were in the age range of 25–40 years. More than half of them were not married. Their education level was generally-bachelor’s degree.

Half of those included in the study were nurses or midwives. The majority had more than five years of working experience most medical workers were included (Table 1).

**Table 1** Demographic Data of Participants

Parameters		N	%
Age	<25	57	19.0
	25–40	236	78.7
	>40	7	2.3
Gender	Male	158	52.7
	Female	142	47.3
Marital status	Married	131	43.7
	Unmarried	169	56.3
Educational status	Diploma or lower	10	3.3
	Bachelor degree	229	76.3
	Masters degree	53	17.7
	None	8	2.7
Profession	Nurse/Midwife	152	50.7
	Residency	63	21
	Specialist	41	13.7
	Laboratory technician	10	3.3
	Cleaner	13	4.3
	Student	21	7

(Continued)

**Table 1** (Continued).

Parameters		N	%
Work experience (years)	<5	83	27.7
	5–10	183	61
	>10	34	11.3
Department	Pediatric ward	29	9.7
	Maternity ward	29	9.7
	Laboratory unit	13	4.3
	Operation room	11	3.7
	Medical ward	47	15.7
	Surgical ward	29	9.7
	Burn unit	3	1.0
	Emergency Unit	25	8.3
	ICU Unit	63	21
	Dialysis Unit	13	4.3
	OPD	26	8.7
	Dental unit	6	2
	Physiotherapy unit	2	0.7
Ortes protez unit	4	1.3	

## Hand Hygiene Compliance and Associated Factors

The Hand hygiene knowledge, attitudes, and behaviours of the participants were examined. Almost all of the participants had knowledge about Hand hygiene. The majority of them knew the five movements required for HH. The majority had received HH training. Therefore, they were aware of the importance of HH in infection control. There was no problem accessing water, soap, alcohol-based disinfectant or gloves. The hospital also supported its personnel in this regard (Table 2).

## Hand Washing and Associated Factors

Hand washing was also evaluated. It was observed that the majority of those included in the study washed their hands before contact, after contact, before an aseptic procedure and after contact with body fluids. Washing time was generally

**Table 2** Factors Associated with Hand Hygiene Compliance Among Healthcare Providers

Factors		N	%
Knowledge on hand hygiene	Yes	286	95.3
	No	14	4.7
Knows the 5 moments of hand hygiene	Yes	260	86.7
	No	40	13.3
Received training on hand hygiene	Yes	257	85.7
	No	43	14.3
Knew the presence of infection control committee (IPC)	Yes	265	88.3
	No	35	11.7
Available soap and water	Yes	289	96.3
	No	11	3.7
Presence of posters on hand hygiene	Yes	225	75
	No	75	25

(Continued)

**Table 2** (Continued).

Factors		N	%
Presence of gloves	Yes	287	95.7
	No	13	4.3
Attitude towards hand hygiene	Positive	275	91.7
	Negative	25	8.3
Alcohol based hand rub is available	Yes	288	96
	No	12	4
Promotion of hand hygiene by hospital	Yes	276	92
	No	24	8

10–20 seconds or more than 60 seconds. The majority of them believed that hand washing protects health workers. Half of the workers thought that hand washing protects from infection at a very high rate. Most of them dried their hands with disposable paper towels after hand washing. More than half of them occasionally used alcohol-based aseptic procedures. The most common reasons for not using alcohol-based products and not washing hands were heavy workloads and time limitations (Table 3).

**Table 3** Behavioral Characteristics of Hand Hygiene Compliance and Its Associated Factors Among Healthcare Workers

Behavior and Associated Factors		N	%
Wash hands before patient contact	Yes	226	75.3
	No	74	24.7
Wash hands after patient contact or bedside procedure	Always	187	62.3
	Sometimes	102	34
	Rarely	7	2.3
	Never	4	1.3
Wash hands before clean/aseptic procedure	Always	168	56
	Sometimes	88	29.3
	Rarely	26	8.7
	Never	18	6
Wash hands after body fluid exposure risk	Always	219	73
	Sometimes	67	22.3
	Rarely	14	4.7
Duration required for effective hand washing with soap and water	10–20sec	95	31.7
	30–40sec	71	23.7
	40–60sec	41	13.7
	Longer than 60sec	93	31
Hand washing can be protective to healthcare workers	Yes	234	78
	No	66	22
Effectiveness of handwashing prevents nosocomial infections	Very high	154	51.3
	High	111	37
	Low	8	2.7
	I don't know	27	9

(Continued)

**Table 3** (Continued).

Behavior and Associated Factors		N	%
Hand washing method used	Use of tap water only	38	12.7
	Use of tap water+soap	182	60.7
	Use of alcohol hand rub only	7	2.3
	Use of tap water+antiseptic soap	73	24.3
Dry hands after washing	I mostly dry my hands	216	72
	I often dry my hands	67	22.3
	None	17	5.7
Hand drying methods	Use of common towel	7	2.3
	Use of disposable paper towel	258	86
	Use of personal handkerchief	1	0.3
	None	34	11.3
Use of alcohol based hand rub antiseptic	Sometimes	175	58.3
	Always	102	34
	Never	23	7.7
Reason for not using alcohol based hand rub antiseptic	Skin reaction/allergy	92	30.7
	Heavy work load	122	40.7
	Shortage of time	59	19.7
	Though not important	27	9
Reasons for not performing handwashing	Workload/shortage of time	132	44
	Lack of awareness/knowledge	50	16.7
	Forgetfulness	63	21
	No reason	55	18.3

## Socio-Demography and Hand Hygiene Association

Healthcare workers under 25 years of age reported washing hands at a significant rate before contact, after contact, before aseptic procedure and in case of body fluid contact. Washing time was longer than one minute for those over 40 years of age. The most important reason for not using alcohol-based in this age group was that they thought it was unnecessary ( $p<0.05$ ). The belief that five-movement practice, hand washing before aseptic procedure and HH protect from infection were significantly higher in female gender ( $p<0.05$ ). Again, HH knowledge, presence of ICC, effective duration of HH and alcohol-based intake before aseptic procedure were higher in married HCWs. However, the belief that HH protects against infection was higher in unmarried health workers ( $p<0.05$ ). Hand washing after contamination with body fluids and use of alcohol-based disinfectants after aseptic procedures were more common in master degrees. In uneducated people, hand washing time was more than one minute. Bachelor's degree were more likely to believe that hand washing protects from infection ( $p<0.05$ ). Nurses had the highest rate of knowledge about HH in five movements among the occupational groups ( $p<0.001$ ). Hand washing before contact with the patient, after contact, after aseptic procedure and after contamination with body fluids was more common in those with less than five years of occupational experience. Those with more than five years of experience were more knowledgeable about infection control measures ( $p<0.05$ ) (Table 4).

## Other Factors Associated with Hand Hygiene

The level of knowledge and accuracy of application were higher in those who received HH training. Interestingly, awareness of the importance of HH in infection control was higher in those who did not receive training ( $p<0.05$ ). Positive attitude of those with high HH knowledge was shown. Similarly, those who washed their hands before and after most procedures had positive attitudes towards HH. Hand washing time, method and belief in infection prevention generally caused a negative perception ( $p<0.05$ ). Visuals reminding HH caused a positive perception ( $p<0.05$ ). Access to

**Table 4** Knowledge and Behaviour About Hand Hygiene According to Demographic Parameters

Questions	Age	p-value
Wash hands before patient contact	Yes, (<25 years = 87.7%)	0.007
Wash hands after patient contact or bedside procedure	Always, (<25 years = 86%)	0.002
Wash hands before clean/aseptic procedure	Always, (<25 years = 75.4%)	0.016
Wash hands after body fluid exposure risk	Always, (<25 years = 84.2%)	0.008
Duration required for effective hand washing with	>60 sec, (>40 years = 42.9%)	0.017
Reason for not using alcohol based hand rub antiseptic	Though not important, (>40 years = 42.9%)	0.019
	<b>Gender</b>	
Knows the five moments of hand hygiene	Yes, Female = 91.5%	0.026
Wash hands before clean/aseptic procedure	Always, Female = 59.9%	0.034
Effectiveness of handwashing prevents infections	Very high, Female = 57.7%	0.025
	<b>Marital status</b>	
Knowledge on hand hygiene	Yes, Married =98.5%	0.027
Knew the presence of infection control committee	Yes, Married =93.1%	0.029
Duration required for effective hand washing with	>60 sec, Married =40.5%	0.020
Hand washing can be protective to healthcare workers	Yes, Unmarried = 84	0.005
Use of alcohol based hand rub antiseptic	Sometimes, Married =67.2%	0.008
	<b>Educational status</b>	
Wash hands after body fluid exposure risk	Always, Masters degree = 86.8%	0.018
Duration required for effective hand washing	>60 sec, None = 62.5%	0.012
Hand washing can be protective to healthcare workers	Yes, Bachelor degree = 80.3%	0.018
Use of alcohol based hand rub antiseptic	Sometimes, Masters degree = 66%	0.021
	<b>Profession</b>	
Knows the five moments of hand hygiene	Yes, Nurse/Midwife = 48%	<0.001
	<b>Work experience</b>	
Knew the presence of infection control committee	Yes, 5–10 years = 96.2%	<0.001
Wash hands before patient contact	Yes, <5 years = 92.8%	<0.001
Wash hands after patient contact or bedside procedure	Always, <5 years = 79.5%	0.007
Wash hands before clean/aseptic procedure	Always, <5 years = 72.3%	0.001
Wash hands after body fluid exposure risk	Always, <5 years = 86.7%	0.001
Duration required for effective hand washing	10–20sec, >10 years = 47.1%	0.001

materials required for HH or hand washing were other factors that significantly affected the perspective on the subject ( $p<0.05$ ). Similarly, the hospital's support for its personnel in this regard was also associated with positive perception ( $p<0.05$ ), (Table 5).

**Table 5** Hand Hygiene Compliance According to Education, Attitude and Availability

Questions	Received Training on Hand Hygiene	p-values
Knowledge on hand hygiene	Yes, yes = 97.3%	0.001
Knows the five moments of hand hygiene	Yes, yes = 88.7%	0.016
Hand washing can be protective to healthcare workers	Yes, no = 95.3%	0.002
Effectiveness of handwashing prevents infections	Very high, yes = 53.3%	0.006
Hand washing method used	Use of tap water and soap, yes = 63.8%	0.005
Dry hands after washing	I mostly dry my hands, yes = 72.4%	0.007
	<b>Attitude towards hand hygiene</b>	
Knowledge on hand hygiene	Yes, positive = 96.4%	0.021
Knows the five moments of hand hygiene	Yes, positive = 89.5%	<0.001
Wash hands before patient contact	Yes, positive = 78.9%	<0.001
Wash hands after patient contact or bedside procedure	Sometimes, negative = 72%	<0.001
Wash hands before clean/aseptic procedure	Always, positive = 60.7%	<0.001
Wash hands after body fluid exposure risk	Always, positive = 76%	<0.001
Duration required for effective hand washing	Longer than 60sec, negative = 60%	0.007
Effectiveness of handwashing prevents infections	High, negative = 64%	0.001
Hand washing method used	Use of tap water+soap, negative = 76%	0.036
	<b>Presence of posters on hand hygiene</b>	
Hand washing can be protective to healthcare workers	Yes, yes = 82.5%	0.004
Use of alcohol based hand rub antiseptic	Sometimes, yes = 59.6%	<0.001
	<b>Available soap and water</b>	
Hand washing method used	Use of tap water only, no = 63.6%	<0.001
Dry hands after washing	I mostly dry my hands, yes = 73.4%	0.005
	<b>Presence of gloves</b>	
Duration required for effective hand washing	10–20sec, no = 61.5%	0.017
Hand washing can be protective to healthcare workers	Yes, yes = 79.1%	0.043
	<b>Alcohol based hand rub is available</b>	
Dry hands after washing	I mostly dry my hands, yes = 72.9%	0.005
	<b>Promotion of hand hygiene by hospital</b>	
Knowledge on hand hygiene	Yes, yes = 96.7%	0.003
Knows the five moments of hand hygiene	Yes, yes = 89.5%	<0.001
Wash hands before patient contact	Yes, yes = 78.3%	<0.001
Wash hands before clean/aseptic procedure	Always, yes = 57.6%	0.003
Hand washing can be protective to healthcare workers	Yes, no = 95.8%	0.036
Effectiveness of handwashing prevents infections	Very high, yes = 53.6%	0.003

## Discussion

With this study, for the first time, we are assessing the status of infection control precautions among health workers in Mogadishu. In underdeveloped or developing countries such as sub-Saharan Africa, the demographic structure of the population strongly influences the epidemiology of infectious diseases.<sup>11</sup> Mortality as a result of increasing antibiotic resistance is now a global problem. For this reason, there is an increasing need to increase infection control awareness in Africa. Limited studies conducted in this location have revealed that hand hygiene compliance is an important problem among healthcare workers, children, and adults.<sup>12,13</sup> In a study conducted in Canada, the hand hygiene compliance of nurses was examined. It was found that the compliance rates of the older age group and those with more professional experience were quite high.<sup>14</sup> Our study supports these findings, demonstrating that factors such as age, working experience, occupational group, and marital status significantly impact infection control practices. While healthcare workers receive regular training from infection control nurses and generally possess a good level of knowledge on the subject, gaps in practical implementation remain evident—there may be many reasons for this finding.<sup>15</sup> Similar to our study, studies conducted on healthcare workers in different regions of Africa found that they had adequate knowledge about hand hygiene, but the rate of practice was quite low.<sup>16–18</sup> In a study conducted in Ethiopia, hand hygiene compliance was evaluated among health workers, and only 40% of the participants showed correct compliance. In particular, it was noted that those who received training were four times more likely to comply than those who did not. The fact that those working in treatment centres were four times more likely to have hand hygiene compliance than those working in traditional hospitals was another important point highlighted. According to the occupational group, nurses were found to be more compliant.<sup>19</sup> The rate of hand hygiene perception was high in our study. However, access to soap and water, availability of alcohol-based soap and water, availability of gloves, information posters, and the hospital's support to the staff in this regard significantly affected this rate, particularly related to workload and time. Educational interventions and improved resource accessibility, alongside fostering positive attitudes, can enhance compliance. Regular training of the staff on infection control precautions was another factor that significantly affected the rate. In studies conducted in different geographies; system change, education and training, evaluation and feedback, reminders in the workplace, and institutional safety climate are the main topics highlighted.<sup>20–22</sup> In our study, the effect of these main topics was examined and a significant effect was shown. In a meta-analysis involving 65,370 healthcare workers during the COVID-19 pandemic, it was found that the combined application of factors such as extra training meetings, local opinion leaders, supervision and feedback, reminders, special interventions, monitoring of healthcare delivery performance, educational games, and/or patient-mediated interventions significantly increased hand hygiene compliance. In particular, it was highlighted that the application of multiple strategies together rather than a single strategy significantly increases compliance with infection control precautions.<sup>23</sup> In many parts of Africa, practising such cost-effective and easy-to-implement activities among health workers could significantly increase awareness. Establishing systems for monitoring compliance with infection control practices is vital. Regular audits and feedback mechanisms can help identify gaps and reinforce the importance of adherence among healthcare workers.

Health facilities must ensure the availability of essential resources, such as soap, water, and alcohol-based sanitizers, as well as personal protective equipment. Policies should be put in place to facilitate consistent access to these resources.

This study is the first of its kind to assess infection control precautions among healthcare workers in Mogadishu, filling a critical gap in the existing literature and also it examines a range of variables influencing hand hygiene compliance, including age, work experience, occupational group, and access to resources, offering a comprehensive understanding of the barriers to effective infection control.

## Study Limitation

Of course, the study has some limitations. Conducting the study in a single centre is one of them. In addition, since the study was planned as a survey, there is always the possibility of bias in the responses of the participants. Controlling the compliance of the personnel participating in the study with a hygiene through informed or unannounced observation may reduce bias.

## Conclusion

This study is the first to assess infection control precautions among healthcare workers in Mogadishu, it provides critical insights into the state of infection control precautions among healthcare workers in Mogadishu, highlighting both the challenges and opportunities for improvement. Despite adequate knowledge of hand hygiene practices, compliance remains low, influenced by factors such as resource availability and training. The findings underscore the urgent need for enhanced awareness, regular training, and accessible resources to improve infection control practices. By addressing these issues, healthcare facilities can significantly reduce healthcare-associated infections and promote safer environments for patients. Ultimately, this study serves as a foundation for future research and policy initiatives aimed at strengthening infection control in similar contexts across developing regions.

## Disclosure

The authors report no conflicts of interest in this work.

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