**UNIVERSITY OF DONGOLA**

**FACULTY OF MEDICINE AND HEALTH SCIENCES**

**DEPARTMENT OF COMMUNITY MEDICINE**

# RESEARCH PROPOSAL

# Hand Hygiene Knowledge and Practices among House Officers at Dongola Specialized Hospital, Dongola City, Sudan, 2026


**Students:**

**Ibrahim Musa Balla**Ibrahim

**Salah Alnour Adam Edris**

Supervisor

**Prof : SAMIA SADIG MOHAMED ISMAIL**

# 1. INTRODUCTION

## 1.1 Background

Hand hygiene is one of the most important and cost-effective measures for preventing healthcare-associated infections (HAIs) and reducing the transmission of microorganisms in healthcare settings. The World Health Organization (WHO) recommends hand hygiene at critical moments of patient care, including before touching a patient, before an aseptic procedure, after body-fluid exposure, after touching a patient, and after touching the patient's surroundings [1]. Despite its simplicity, hand hygiene compliance remains inadequate worldwide. WHO reports that average compliance with hand hygiene recommendations is approximately 40%, while the average compliance in intensive care units was about 59.6%. A substantial difference has also been reported between high-income and low-income countries, with compliance of approximately 64.5% and 9.1%, respectively [1,2].

Healthcare-associated infections represent a major patient-safety problem. Among every 100 patients admitted to acute-care hospitals, approximately 7 patients in high-income countries and 15 patients in low- and middle-income countries acquire at least one HAI during their hospital stay [2]. WHO also reports that about one in three healthcare facilities lacks adequate hand hygiene facilities at the point of care, highlighting the importance of both healthcare workers' behaviour and availability of appropriate resources [3].

Evidence from Sudan indicates that hand hygiene and infection-control practices require further improvement. A 2025 cross-sectional study among 420 clinical medical students from 13 Sudanese universities found that only 39.8% reported always practicing proper hand hygiene during clinical rotations. Overall, 73.8% demonstrated moderate infection-control knowledge and 50.2% demonstrated moderate practice, while only 28.8% had received formal infection-control training [4]. Another Sudanese study conducted among 196 dental healthcare workers at Khartoum Dental Teaching Hospital reported that 59.2% had fair hand hygiene knowledge, whereas only 26% demonstrated good hand hygiene practices. Although 77% reported using hand rub before patient contact and 89.3% reported washing their hands after glove removal or blood exposure, important knowledge gaps remained [5].

These findings indicate that adequate knowledge does not always translate into appropriate hand hygiene practice. Assessing both knowledge and practice is therefore important for identifying existing gaps and factors that may affect adherence to hand hygiene recommendations.

## 1.2 Problem Statement

Healthcare-associated infections remain a major global patient-safety challenge, disproportionately affecting developing countries and resource-limited healthcare systems [6,7]. In many African healthcare facilities, baseline rates of HAIs are high, compounded by overcrowding, limited infrastructure, and inconsistent infection prevention and control (IPC) practices [7,8].

House officers perform a high volume of invasive procedures, routine examinations, and daily ward rounds. Consequently, their hands frequently serve as vectors for microbial cross-contamination [9,10]. Despite high theoretical awareness, compliance rates with hand hygiene among junior doctors globally and regionally remain sub-optimal, often hindered by inadequate undergraduate/internship training, lack of accessible ABHR or clean running water, heavy patient loads, time constraints, and gaps in practical technique [11,12,13]. Assessing the knowledge, reported practices, and structural barriers among house officers at Dongola Specialized Hospital is essential to identify specific vulnerabilities and formulate targeted interventions.

## 1.3 Justification

This study will assess hand hygiene knowledge and practices among house officers at Dongola Specialized Hospital. The findings may help identify areas requiring training, improve awareness of recommended hand hygiene practices, and provide information that can support infection prevention and control activities within the hospital.

## 1.4 Research Questions

• What is the level of hand hygiene knowledge among house officers at Dongola Specialized Hospital?

• What are the reported hand hygiene practices among house officers?

• What factors are associated with hand hygiene practices among house officers?

• What barriers to appropriate hand hygiene are reported by house officers?

## 1.5 Research Hypothesis

House officers with better hand hygiene knowledge and appropriate training are more likely to report appropriate hand hygiene practices.

# 2.Objectives

## 2.1 General Objective

To study knowledge and practices regarding hand hygiene among house officers at Dongola Specialized Hospital, Dongola City, Sudan, in 2026.

## 2.2 Specific Objectives

• To assess the level of knowledge regarding hand hygiene among house officers.

• To assess reported hand hygiene practices among house officers.

• To identify factors associated with appropriate hand hygiene practices.

• To identify perceived barriers to appropriate hand hygiene.

# 3. LITERATURE REVIEW

## 3.1.Iternational

3.1.1. Hand hygiene is considered one of the most important measures for preventing healthcare-associated infections (HAIs) and reducing the transmission of microorganisms between healthcare workers, patients, and the healthcare environment. The World Health Organization (WHO) recommends hand hygiene as a fundamental component of infection prevention and control and describes specific indications for hand hygiene during patient care, including the “Five Moments for Hand Hygiene” framework[14].

3.1.2. Evidence has also demonstrated that the technique used for hand hygiene is important. A systematic review evaluating the WHO-recommended technique found evidence that the six-step technique can reduce the microbial load on healthcare workers’ hands. However, differences in technique, duration, product volume, and clinical circumstances may influence effectiveness[15].

## 3.2.Regional

3.2.1. In sub-Saharan Africa, hand hygiene remains an important challenge in healthcare facilities because of healthcare-associated infections, limited resources, inadequate infrastructure, and inconsistent access to water, soap, and alcohol-based hand rubs. A narrative review of studies conducted among healthcare workers in sub-Saharan Africa estimated overall hand hygiene compliance at approximately 21.1%. Major barriers included heavy workload, inadequate infrastructure, lack of water and soap or hand sanitizers, and poorly positioned hand hygiene facilities [16].

3.2.2. More recent evidence from several sub-Saharan African countries has continued to demonstrate concerns related to hand hygiene and infection prevention. A 2024 cross-sectional survey conducted among healthcare workers in tertiary hospitals in Benin, Burkina Faso, and the Democratic Republic of Congo assessed knowledge, awareness, and practices related to antiseptics, disinfectants, and hand hygiene products, highlighting the importance of both healthcare-worker behavior and the quality and appropriate use of infection-control products [17].

## 3.3.Local

3.3.1. More recent Sudanese evidence has continued to identify gaps in hand hygiene practice. A study among healthcare workers at Khartoum Oncology Hospital reported that 97.2% considered hand hygiene important for infection prevention; however, 60% reported that they did not wash their hands before touching patients, and 20% reported using the same gloves for more than one patient[18].

3.3.2. A 2025 study among dental healthcare workers at Khartoum Dental Teaching Hospital also found differences between knowledge and practice. Although many participants reported using hand rub before patient contact and washing their hands after glove removal or blood exposure, only 26% demonstrated good hand hygiene practices overall [19].

# 4. MATERIALS AND METHODS

## 4.1 Study Design

A hospital-based  Analytic cross-sectional study.

## 4.2 Study Area

The study will be conducted at Dongola Specialized Hospital, Dongola City, Sudan.

## 4.3 Study Period

The study will be conducted during 2026 according to the approved research timetable.

## 4.4 Study Population

The study population will consist of house officers working at Dongola Specialized Hospital during the study period.

## 4.5 Inclusion Criteria

• House officers working at Dongola Specialized Hospital during the study period.

• House officers who agree to participate in the study.

## 4.6 Exclusion Criteria

• House officers who are absent during data collection.

## 4.7 Sampling Technique

Total coverage  persons

## 4.8 Sample Size

For a cross-sectional study assessing hand hygiene knowledge and practice, the required sample size can be calculated using the single population proportion formula: $\mathbf{n = Z^2P(1-P) / d^2}$

Where:

- n = required sample size
- Z = standard normal value at 95% confidence level = 1.96
- P = expected proportion/prevalence
- 1−P = complementary proportion
- d = margin of error = 0.05

When there is no reliable previous estimate for the expected proportion, P = 0.50 is used because it gives the maximum required sample size.

$$\mathbf{n = (1.96)^2 \times (0.5) \times (1-0.5) / (0.05)^2}$$

$$\mathbf{n = 384.16}$$

Therefore, the minimum required sample size is approximately 384 participants.

### Adjustment for Non-response

To compensate for a 10% non-response rate, the adjusted sample size is calculated as follows:

$$\mathbf{n\ adjusted = 384 / (1-0.10) = 426.7}$$

Therefore, the final sample size would be approximately 427 participants [20].

## 4.9 Data Collection Tool

Data will be collected using a structured self-administered questionnaire. The questionnaire will include sections on demographic characteristics, knowledge of hand hygiene, reported practices, training, availability of facilities, and perceived barriers.

## 4.10 Study Variables

Independent variables may include age, sex, duration of clinical experience, department/rotation, previous hand hygiene training, and availability of hand hygiene materials. The main outcome variable will be appropriate hand hygiene practice as measured by the study questionnaire.

## 4.12 Data Collection Procedure

After ethical and administrative approval, eligible participants will be approached and informed about the study. Participants who consent will complete the questionnaire. Completed questionnaires will be checked for completeness and securely stored.

## 4.13 Quality Control

The questionnaire will be reviewed for clarity and relevance before data collection. Data collectors, if used, will receive appropriate instructions. Completed questionnaires will be checked regularly for missing or inconsistent responses.

## 4.14 Data Analysis

Data will be entered, cleaned, and analyzed using appropriate statistical software such as SPSS. Descriptive statistics will be presented using frequencies, percentages, means, or medians as appropriate. Associations between categorical variables may be assessed using the chi-square test or Fisher's exact test. A p-value of $<0.05$ may be considered statistically significant.

## 4.15 Ethical Considerations

• Ethical approval will be obtained from the relevant authority before the study begins.

• Administrative permission will be obtained from Dongola Specialized Hospital.

• Participation will be voluntary and based on informed consent.

## 4.16 Questionnaire Structure

• Section A: Socio-demographic and professional characteristics.

• Section B: Knowledge of hand hygiene.

• Section C: Hand hygiene practices.

• Section D: Training and education.

• Section E: Availability of facilities and perceived barriers.

# 5. WORK PLAN AND TIMELINE

| Activity | Month 1 | Month 2 | Month 3 | Month 4 |
|---|---|---|---|---|
| Proposal preparation and approval | ✓ | | | |
| Literature review and questionnaire preparation | ✓ | ✓ | | |
| Data collection | | ✓ | ✓ | |
| Data entry and analysis | | | ✓ | |
| Report writing | | | ✓ | ✓ |
| Final submission/presentation | | | | ✓ |

# 6. BUDGET

| Item | Estimated Cost (SDG) |
|---|---|
| Printing and photocopying | 200,000 |
| Stationery | 20,000 |
| Transportation | 100,000 |
| Data entry/analysis | 150,000 |

| | |
|---|---|
| Communication/Internet | 50,000 |
| Total | 520,000 |

# 6. REFERENCES


1. World Health Organization. Infection prevention and control: hand hygiene. Geneva: World Health Organization; 2023.

2. World Health Organization. Global report on infection prevention and control. Geneva: World Health Organization; 2022.

3. World Health Organization. Key facts and figures: hand hygiene. Geneva: World Health Organization; 2023.

4. Ali MB, et al. Infection control competency in surgical settings among clinical medical students in Sudan: a cross-sectional study. BMC Med Educ. 2025;25:1573.

5. Mohamed WHI, Bashir AA. Knowledge and practices of hand hygiene among dental care workers in Khartoum, Sudan: a cross-sectional study. J Public Health Community Med. 2025;3(1):34-42

6. Centers for Disease Control and Prevention. Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings. Atlanta, GA: CDC; 2024. Available from: https://www.cdc.gov/infectioncontrol/guidelines/core-practices/index.html

7. Allegranzi B, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: a systematic review and meta-analysis. The Lancet. 2011 Jan 15;377(9761):228-241. doi:10.1016/S0140-6736(10)61458-4.

8. Bagheri Nejad S, Allegranzi B, Syed SB, Ellis B, Pittet D. Health-care-associated infection in Africa: a systematic review. Bulletin of the World Health Organization. 2011 Oct 1;89(10):757-765. doi:10.2471/BLT.11.088179.

9. Pittet D, Allegranzi B, Sax H, Dhar S, Pessoa-Silva CL, Donaldson L, et al. Evidence-based model for hand transmission during patient care and the role of improved practices. The Lancet Infectious Diseases. 2006 Oct;6(10):641-652. doi:10.1016/S1473-3099(06)70600-4.

10. Nair SS, Hanumantappa R, Hiremath SG, Metgud CS, Vedgiri RS. Knowledge, attitude, and practice of hand hygiene among medical students in a tertiary care hospital of North Karnataka, India. International Journal of Community Medicine and Public Health. 2014 Mar;1(1):12-16.

11. Al-Khawaldeh OA, Al-Hussami M, Darawad M, Al-Jitawi M. Knowledge and practices of hand hygiene among healthcare workers in Jordan. International Journal of Nursing Practice. 2015 Oct;21(5):422-430. doi:10.1111/ijn.12234.

12. Kingston L, O'Connell NH, Dunne CP. Hand hygiene-related clinical trials reported since 2010: a systematic review. Journal of Hospital Infection. 2016 Apr;92(4):309-320. doi:10.1016/j.jhin.2015.11.012.

13. Abdalrahman MB, El-Nagar SA, Abd-Elrhaman EA. Knowledge and practice regarding hand hygiene among healthcare workers in a tertiary care hospital in Sudan. Sudanese Journal of Paediatrics. 2018;18(2):42-50.

14. World Health Organization. WHO guidelines on hand hygiene in health care. Geneva: World Health Organization; 2009.

15. Gozdzielewska L, Kilpatrick C, Reilly J, Duncan EM, Storr J, Cumming O, et al. Comparing the effectiveness of hand hygiene techniques in reducing the microbial load and covering hand surfaces in healthcare workers: updated systematic review. Am J Infect Control. 2022;50(10):1079-1090.

16. Allegranzi B, et al. Barriers to hand hygiene practices among health care workers in sub-Saharan African countries: a narrative review. Am J Infect Control. 2019;47(5):565-573.

17. Lompo P, Heroes AS, Ouédraogo K, Okitale P, Wakpo A, Kalema J, et al. Knowledge, awareness, and risk practices related to bacterial contamination of antiseptics, disinfectants, and hand hygiene products among healthcare workers in sub-Saharan Africa: a cross-sectional survey in three tertiary care hospitals. Antimicrob Resist Infect Control. 2024;13:44.

18. Magbol M, Mohammed S, Hamad NMA, et al. Knowledge and practice of healthcare workers about hand hygiene in Khartoum Oncology Hospital, 2021. 2022.

19. Mohamed WHI, Bashir AA. Knowledge and practices of hand hygiene among dental care workers in Khartoum, Sudan: a cross-sectional study. J Public Health Community Med. 2025;3(1):34-42

20. Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva: World Health Organization; 1991.