West African Journal of Allied Health Sciences

Advancing Allied Health Research in West Africa

www.wajahs.org

eISSN: 3115-4581 pISSN: 3115-4573

Review Volume 2, Issue 1, April 2026

Assessment of Knowledge, Attitude, and Practice of Surgical Hand Scrubbing Among Surgical Team Members at State Specialist Hospital Maiduguri, Borno State

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Abstract

Background: Surgical hand scrubbing is a cornerstone of infection prevention aimed at reducing microbial transmission during operative procedures. Despite established guidelines, compliance varies across healthcare settings, particularly in low- and middle-income countries. This study assessed the knowledge, attitude, and practice (KAP) of surgical hand scrubbing among surgical team members at the State Specialist Hospital, Maiduguri, Borno State, Nigeria.

Methods: A cross-sectional descriptive survey design was employed among 89 surgical team members, including surgeons, perioperative nurses, and anesthetists. Data were collected using a researcher-developed structured questionnaire covering sociodemographic characteristics, knowledge, attitude, and practice of surgical hand scrubbing. Data were analyzed using IBM SPSS version 23. Descriptive statistics summarized the variables, while Pearson correlation analysis was used to test associations at a significance level of $p < 0.05$.

Results: The majority of respondents (81%) demonstrated a high level of knowledge of surgical hand scrubbing, accompanied by generally positive attitudes and good compliance with recommended practices. Significant positive relationships were found between knowledge and practice ($r = 0.880$, $p < 0.05$), years of service and attitude ($r = 0.9988$, $p < 0.05$), and educational qualification and practice ($r = 0.9766$, $p < 0.05$).

Conclusion: Surgical team members at the State Specialist Hospital, Maiduguri exhibited high knowledge, positive attitudes, and satisfactory practices regarding surgical hand scrubbing. Knowledge, professional experience, and educational attainment significantly influenced compliance. Continuous training, supportive institutional policies, and adequate provision of facilities are recommended to sustain and improve adherence to surgical hand hygiene protocols.

Keywords: Knowledge, Attitude, Practice, Surgical hand scrubbing

 DOI: 10.5281/zenodo.19828513
Received: Dec 30, 2025 **Revised:** Jan 21, 2026 **Accepted:** Feb 28, 2026

Introduction

Surgical hand scrubbing (SHS) is a vital infection prevention measure that significantly reduces the microbial load on the hands and forearms of surgical personnel prior to donning sterile gloves. According to the World Health Organization (WHO) global guidelines for the prevention of surgical site infections (SSIs), SHS should be performed either using an appropriate antimicrobial soap and water or an alcohol-based hand rub World Health Organization, 2016. The rationale for this practice is based on the understanding that the skin, particularly the hands, is a primary source of microbial contamination during surgical procedures, and that glove perforations may permit pathogen transmission despite glove use.

Surgical site infections remain a major healthcare burden globally, with reported incidence rates ranging from 2.5% to 41.9%, particularly in low- and middle-income countries Shrestha & Acharya, 2021. In Nepal, for example, SSI rates ranged between 2.6% and 4% across tertiary hospitals, while compliance with SHS among surgical staff was reported to be as low as 13% in some regions Shrestha & Acharya, 2021. In Sweden, despite substantial investments aimed at improving patient safety, gaps in knowledge regarding the WHO Surgical Safety Checklist (WHOSSC) persist, with a considerable proportion of healthcare staff uncertain about their roles in its implementation Krupic et al., 2022.

Evidence suggests that compliance with SHS and other surgical safety protocols varies according to professional background, training, and sociodemographic characteristics. For instance, low adherence to recommended surgical attire practices has been reported among surgical personnel Khursheed et al., 2020, while targeted interven-

tions have been shown to significantly improve hand hygiene and glove-donning practices among dental surgeons Dhamdhere et al., 2023. Intraoperative hypothermia (IPH), another preventable surgical complication, remains prevalent due to gaps in nurses' knowledge and inconsistent adherence to warming protocols Kolade et al., 2017. Additionally, effective communication within surgical teams has been identified as a critical determinant of patient safety, with poor communication frequently associated with preventable errors and adverse outcomes **Vikan2024**; Hussain et al., 2024; World Health Organization, 2019.

Gender-related differences in knowledge of surgical hygiene practices have also been documented, with female students often demonstrating higher levels of knowledge than their male counterparts Karaman et al., 2019; Shrestha & Acharya, 2021. Despite ongoing global efforts to improve compliance with infection prevention measures, there remains a paucity of research examining knowledge, attitudes, and practices related to SHS among surgical team members in Northern Nigeria. This study therefore aims to assess the level of knowledge, attitude, and practice regarding surgical hand scrubbing and to explore the sociodemographic factors influencing compliance among surgical team members at the State Specialist Hospital, Maiduguri.

Methods

Study Design

This study adopted a cross-sectional, non-experimental descriptive survey design. The design was considered appropriate for assessing the knowledge, attitude, and practice of surgical hand scrubbing among surgical team members. It allows for the collection of data at a single point in time and facilitates the exploration of current practices and associated factors within the hospital setting.

Study Area

The study was conducted at the State Specialist Hospital, Maiduguri, located along Post-Office Road on the Maiduguri Expressway in Borno State, Nigeria. The hospital was commissioned on February 18, 1983, by the then President of Nigeria, Alhaji Shehu Shagari, and serves as a major tertiary healthcare facility in the region. The hospital comprises multiple wards and five operating theatres, namely:

- the main operating theatre with five operative suites;
- the labour ward theatre with one operative suite;
- the ophthalmic theatre with one operative suite;
- the accident and emergency theatre with one operative suite; and
- the kidney theatre with two operative suites.

The main operating theatre is located on the first floor at the eastern end of the hospital and is connected to all hospital wards, thereby facilitating efficient access to surgical care. The theatre complex is designed to accommodate both elective and emergency surgical procedures and is consistently staffed by competent surgical personnel.

Study Population and Sampling Technique

The study population comprised all surgical team members, including surgeons, perioperative nurses, and anaesthesiologists, working in the operating theatres of the hospital. The total population of eligible surgical staff was 90, consisting of 30 surgeons, 40 perioperative nurses, and 20 anaesthesiologists.

A census sampling technique was employed, whereby all available and consenting surgical team members working in the main operating theatre, obstetrics and gynaecology theatre, and accident and emergency theatre were included in the study. Data collection was carried out during active surgical periods when the team members were present.

Instrumentation

Data were collected using a self-developed structured questionnaire. The instrument consisted of five sections:

- Section A: Demographic characteristics of respondents;
- Section B: Knowledge of surgical hand scrubbing;
- Section C: Attitude towards surgical hand scrubbing;
- Section D: Practice of surgical hand scrubbing; and
- Section E: Perceived factors hindering effective surgical hand scrubbing.

Sections B to E comprised close-ended items measured on a four-point Likert scale, scored as follows:

- Very Good = 4;
- Good = 3;
- Bad = 2; and
- Very Bad = 1.

Validity and Reliability

Face validity of the instrument was ensured through expert review. The questionnaire was assessed by the research supervisor for relevance, clarity, and logical sequence of items. Reliability was established using the test–retest method. The questionnaire was administered to five surgical personnel during a pilot study on two occasions, one week apart. The responses obtained were subjected to correlation analysis to determine the consistency and reliability of the instrument.

Ethical Considerations and Data Collection Procedure

Ethical approval was obtained and presented to the Head of Department of the main operating theatre prior to data collection. Following departmental approval, the questionnaires were administered to eligible surgical staff. A trained research assistant facilitated the distribution and retrieval of questionnaires during surgical sessions. Participation was voluntary, and confidentiality of respondents' information was strictly maintained.

Data Analysis

Data collected were analyzed using the IBM Statistical Package for the Social Sciences (SPSS), version 23. Descriptive statistics, including frequencies and percentages, were used to summarize demographic and categorical variables. Inferential analysis was conducted using the Chi-square (χ^2) test to examine associations between variables, with the level of statistical significance set at $p < 0.05$.

Results

This study assessed the knowledge, attitude, and practice of surgical hand scrubbing among surgical team members at the State Specialist Hospital, Maiduguri, Borno State. Descriptive statistics were used to analyze respondents' demographic characteristics and to answer the research questions, while inferential statistics using Pearson correlation analysis were employed to test the study hypotheses. Of the 89 questionnaires distributed, all were completed and returned, yielding a response rate of 100%. The findings are presented in tables and described according to the study objectives.

Demographic Characteristics of Respondents

A total of 89 surgical team members participated in the study. Most respondents were aged between 26 and 45 years, and the majority possessed a university degree. Surgeons and perioperative nurses constituted the largest professional groups, while anaesthetists accounted for a smaller proportion of participants. Nearly half of the respondents had less than 10 years of professional experience. In terms of religious affiliation, more than half identified as Muslims. The surgical workforce was predominantly male.

Knowledge of Surgical Hand Scrubbing

Table 4.2 presents the level of knowledge of surgical team members regarding surgical hand scrubbing at the State Specialist Hospital, Maiduguri, assessed using the McDonald's scale. A high level of knowledge was recorded among 81% of respondents, while 17% demonstrated an average level of knowledge and only 2% exhibited poor knowledge. These findings indicate that the majority of surgical team members possessed a high level of knowledge regarding surgical hand scrubbing.

Attitude Toward Surgical Hand Scrubbing

The results in Table 4.3 indicate generally positive attitudes toward surgical hand scrubbing among the surgical team. Most respondents acknowledged the importance of surgical hand scrubbing and agreed that it should be universally practiced in the operating theatre. A substantial proportion also believed that proper hand scrubbing helps prevent surgical site infections. However, some respondents expressed disagreement regarding the consistency of hand scrubbing practices, suggesting variability in adherence among team members.

Practice of Surgical Hand Scrubbing

Findings from Table 4.4 show that the majority of surgical team members adhered to standard surgical hand scrubbing practices. Most respondents reported routine hand washing with soap and water, as well as the use of antiseptic agents such as alcohol, iodine, or chlorine. The use of personal protective equipment was also commonly reported, including aprons, gloves, head covers, boots, masks, gowns, and eye protection. Nonetheless, compliance with the use of utility gloves was comparatively lower, indicating a need for improvement in complete adherence to safety protocols.

Relationship Between Knowledge and Practice

Table 4.5 reveals a statistically significant relationship between knowledge and practice of surgical hand scrubbing among surgical team members at the State Specialist Hospital, Maiduguri. A strong positive correlation was observed ($r = 0.880$), with a p-value of 0.000 ($p < 0.05$). Consequently, the null hypothesis was rejected, indicating that higher levels of knowledge were strongly associated with better hand scrubbing practices.

Relationship Between Years of Service and Attitude

The results presented in Table 4.6 demonstrate a statistically significant correlation between years of service and the attitude of surgical team members toward surgical hand scrubbing. The analysis yielded a high correlation coefficient ($r = 0.9988$) and a p-value of 0.0023 ($p < 0.05$). The null hypothesis was therefore rejected, suggesting that professional experience significantly influences attitudes toward surgical hand scrubbing.

Relationship Between Educational Qualification and Practice

Table 4.7 shows a statistically significant association between educational qualification and the practice of surgical hand scrubbing among surgical team members. A strong positive correlation was recorded ($r = 0.9766$), with a p-value of 0.0018, which is below the 0.05 level of significance. The null hypothesis was rejected, indicating that higher ed-

Table 1: **Demographic Information of the Respondents ($n = 89$)**

Variable	Category	Frequency	Percentage (%)
Age (years)	18–25	5	5.6
	26–35	38	42.7
	36–45	40	44.9
	≥46	6	6.8
	Total	89	100.0
Educational qualification	Diploma	16	18.0
	B.Sc	23	25.8
	Specialty	50	56.2
	Total	89	100.0
Profession	Surgeons	39	43.8
	Peri-operative nurses	40	44.9
	Anesthetists	10	11.2
	Total	89	100.0
Working experience (years)	0–10	43	48.3
	11–20	23	25.8
	21–30	13	14.7
	31–40	10	11.2
	Total	89	100.0
Religion	Islam	52	58.4
	Christianity	37	41.6
	Total	89	100.0
Gender	Male	67	75.3
	Female	22	24.7
	Total	89	100.0

Table 2: **Attitude of Surgical Team Members towards Surgical Hand Scrubbing in State Specialist Hospital Maiduguri ($n = 89$)**

S/N	Statement	SA	A	DA	SDA	Total
1	Surgical hand scrubbing is very important in the theatre	36 (40.9)	44 (50.0)	7 (8.0)	1 (1.1)	89 (100.0)
2	Surgical hand scrubbing must be practiced by everybody in the theatre	19 (21.6)	50 (56.8)	12 (13.6)	7 (8.0)	89 (100.0)
3	Surgical hand scrubbing is not always necessary	19 (21.6)	6 (6.8)	38 (43.2)	25 (28.4)	89 (100.0)
4	Surgical hand scrubbing prevents surgical site infections	61 (69.3)	20 (22.5)	8 (8.2)	0 (0.0)	89 (100.0)

ucational attainment is strongly associated with better adherence to proper surgical hand scrubbing practices.

Discussion

This study examined the knowledge, attitude, and practice of surgical hand scrubbing among surgical team members at the State Specialist Hospital, Maiduguri, Borno State, Nigeria. The findings provide important insights into infection prevention behaviors within the operating theatre and highlight key factors influencing compliance with recommended surgical hand hygiene standards.

Knowledge of Surgical Hand Scrubbing

The present study demonstrated a high level of knowledge of surgical hand scrubbing among the majority of respondents, with over four-fifths exhibiting adequate knowledge. This finding suggests that surgical team members at the study facility are generally well informed about the principles and importance of surgical hand hygiene. High knowledge levels are essential, as surgical hand preparation is a cornerstone of infection prevention and a critical component of patient safety strategies in operative care.

The World Health Organization (WHO) emphasizes that proper surgical hand preparation significantly reduces microbial load on the hands and forearms and lowers the risk of surgical site infections (SSIs)World Health Organization, 2016; World Health Organization, 2019. The high knowledge observed in this study is consistent with recent studies conducted among surgical personnel in similar settings, which reported that formal education, in-service training, and repeated exposure to infection control guidelines contribute significantly to improved knowledge of hand hygiene practices Dhamdhere et al., 2023; Khursheed et al., 2020.

Table 3: **Practice of Surgical Hand Scrubbing among Surgical Team Members in State Specialist Hospital Maiduguri ($n = 89$)**

S/N	Action / Measure Taken	Yes	No	Total
1	Do you wash hands with soap and water?	67 (72.1)	21 (23.9)	89 (100.0)
2	Wash with alcohol, iodine, or chlorine?	63 (71.6)	26 (28.4)	89 (100.0)
3	Do you wear apron?	64 (72.7)	24 (27.3)	89 (100.0)
4	Utility gloves?	52 (59.1)	36 (40.9)	89 (100.0)
5	Head cover?	73 (83.0)	15 (17.0)	89 (100.0)
6	Boots/shoes?	76 (86.4)	12 (13.6)	89 (100.0)
7	Eye protector/goggles?	64 (72.7)	24 (27.3)	89 (100.0)
8	Mask?	73 (83.0)	15 (17.0)	89 (100.0)
9	Examination gloves?	78 (88.6)	10 (11.4)	89 (100.0)
10	Gown?	79 (89.8)	9 (10.2)	89 (100.0)

Table 4: **Pearson Product Moment Correlation Analyses of Selected Factors Associated with Surgical Hand Scrubbing among Surgical Team Members in State Specialist Hospital Maiduguri ($n = 89$)**

Variable	n	$\bar{x}$	SD	DF	r	P-value
Knowledge vs Practice						
Knowledge	89	34.386	3.967	88	2*0.980**	2*0.000
Practice of surgical hand scrubbing	89	28.611	2.487	88		
Years of Service vs Attitude						
Years of service	89	51.389	2.567	88	2*0.9988**	2*0.0023
Attitude of surgical team members	89	22.827	1.377	88		
Level of Education vs Practice						
Level of education	89	41.212	2.572	88	2*0.9766**	2*0.0018
Practice of surgical hand scrubbing	89	29.732	1.422	88		

**Correlation is significant at the 0.01 level (2-tailed).

This suggests that continued professional education plays a vital role in sustaining adequate knowledge among surgical team members.

Attitude toward Surgical Hand Scrubbing

Findings from this study revealed generally positive attitudes toward surgical hand scrubbing. Most respondents acknowledged the importance of hand scrubbing and recognized its role in preventing surgical site infections. Positive attitudes toward infection prevention measures are critical, as attitude has been shown to strongly influence compliance with clinical guidelines and safe practices in the operating theatre Krupic et al., 2022; Sharif et al., 2016.

However, some respondents expressed reservations regarding the consistency of hand scrubbing practices among team members. This variability suggests that although attitudes are largely favorable, situational factors such as workload, emergency procedures, staffing shortages, and time pressure may interfere with consistent adherence. Similar inconsistencies between attitude and practice have been reported in other low- and middle-income healthcare settings, where systemic and organizational challenges limit full compliance with infection control protocols Hussain et al., 2024; World Health Organization, 2019.

Practice of Surgical Hand Scrubbing

The practice of surgical hand scrubbing among respondents was generally satisfactory, with most participants reporting routine hand washing with soap and water, use of antiseptic agents, and appropriate use of personal protective equipment. These findings indicate that high knowledge and positive attitudes were largely translated into practice, which is essential for effective prevention of SSIs.

WHO guidelines recommend strict adherence to surgical hand preparation protocols, including antiseptic use and appropriate protective barriers, to minimize intraoperative contamination World Health Organization, 2016. Nevertheless, comparatively lower compliance with the use of utility gloves observed in this study suggests gaps in full adherence to safety protocols. Partial compliance has been widely reported in the literature and is often associated with inadequate supply of protective equipment, perceived inconvenience, or underestimation of occupational risk Khursheed et al., 2020; Shehu et al., 2025. Addressing such gaps requires institutional commitment to ensuring availability of resources and reinforcing standard operating procedures through supervision and monitoring.

Relationship between Knowledge and Practice

A strong and statistically significant positive relationship was found between knowledge and practice of surgical hand scrubbing. This finding reinforces the widely accepted

premise that increased knowledge leads to improved compliance with recommended infection prevention practices. Similar associations have been reported in recent studies demonstrating that educational interventions and structured training programs significantly improve hand hygiene compliance among surgical personnel Dhamdhere et al., 2023; Labrague et al., 2012.

This relationship underscores the importance of continuous education and refresher training as effective strategies for sustaining optimal surgical hand hygiene practices, particularly in high-risk clinical environments such as operating theatres.

Relationship between Years of Service and Attitude

The significant positive association between years of service and attitude toward surgical hand scrubbing suggests that professional experience enhances appreciation of the importance of infection prevention measures. Experienced surgical personnel are more likely to have encountered postoperative complications, including SSIs, which may strengthen their commitment to preventive practices. This finding aligns with previous research indicating that experiential learning and prolonged clinical exposure contribute to more favorable attitudes toward patient safety interventions Hussain et al., 2024; Krupic et al., 2022.

Relationship between Educational Qualification and Practice

The observed significant association between educational qualification and surgical hand scrubbing practice indicates that higher educational attainment is linked to better adherence to recommended protocols. Advanced education may enhance understanding of evidence-based practice, critical thinking, and accountability, which are essential for consistent compliance with infection control standards. Similar findings have been reported in studies showing that healthcare workers with higher educational levels demonstrate better hand hygiene practices and infection prevention behaviors Sharif et al., 2016; Shehu et al., 2025.

Implications for Clinical Practice

Overall, the findings of this study highlight that while knowledge and attitudes toward surgical hand scrubbing are high, institutional and systemic factors continue to influence consistency of practice. Strengthening infection prevention programs through regular training, supportive supervision, adequate staffing, and uninterrupted supply of hand hygiene materials is essential. Implementing multimodal strategies, as recommended by WHO, may further enhance compliance and reduce the burden of surgical site infections.

Ethical Considerations

Prior to the commencement of the study, ethical approval was obtained from the Ethical Review Committee of the State Specialist Hospital, Maiduguri, following the submission of a research proposal and cover letter. Informed consent was obtained from all participants, who were assured of anonymity, confidentiality, and the voluntary nature of their participation. Participants were informed of their right to withdraw from the study at any stage without penalty.

Throughout the data collection process, respondents were treated with respect and dignity, and their rights and welfare were upheld. All data were handled with strict confidentiality, and ethical principles of honesty, transparency, and integrity were maintained. There was no manipulation or fabrication of data or results.

Conclusion

The findings of this study indicate that surgical team members at the State Specialist Hospital, Maiduguri, possess a very high level of knowledge and a generally positive attitude toward surgical hand scrubbing, with practices largely compliant with recommended standards. Factors influencing hand scrubbing practices included overcrowded working environments, staffing challenges, workload pressures, and inadequate institutional commitment to infection prevention initiatives. All tested hypotheses demonstrated statistically significant relationships, confirming that higher knowledge, longer years of service, and greater educational attainment positively influence attitudes and practices related to surgical hand scrubbing.

Recommendations

Based on the study findings, the following recommendations are proposed:

1. **Policy and Infrastructure Support:** Governmental and non-governmental organizations should invest in equipping operating theatres and organizing regular training workshops to strengthen surgical hand scrubbing practices.
2. **Institutional Regulation:** Hospital management should establish and enforce clear policies to ensure consistent adherence to surgical hand hygiene standards.
3. **Broader Research Scope:** Future studies should replicate this research across multiple state specialist hospitals to improve the generalizability of findings.
4. **Alternative Research Methodology:** Further research should incorporate observational methods to objectively assess hand scrubbing practices and techniques.

Funding Disclosure

No external funding was received for this study

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Conflict of Interest

None

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