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Compliance and Barriers among Nurses Regarding Surgical Site Infection Prevention Guidelines at Public Tertiary Care Hospitals of Islamabad

Rubina Afsar[1*], Rehana Khadim[2], Samina Yasmeen[3], Shagufta Parveen[1] and Mehreen Aslam[1]

[1]College of Nursing, Armed Forces Post Graduate Medical Institute, National University of Medical Sciences, Rawalpindi, Pakistan
[2]Pakistan Armed Forces Medical Journal, Army Medical College, Rawalpindi, Pakistan
[3]College of Nursing, Rawalpindi, Pakistan

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Corresponding Author:
Rubina Afsar
College of Nursing, Armed Forces Post Graduate Medical Institute, National University of Medical Sciences, Rawalpindi, Pakistan
rubinaafsar72@gmail.com

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ABSTRACT

Surgical Site Infections (SSI) are a common healthcare-related issue, occurring within 30 days to a year after surgery or prosthesis implantation. **Objective:** To assess nurses' compliance and identify barriers related to SSI prevention guidelines. **Methods:** A cross-sectional study conducted from February to July 2024 involved 270 participants from four hospitals in Islamabad, using convenience sampling. A validated questionnaire, based on WHO guidelines (2016), was adopted, comprising three sections: demographic information, compliance (before surgery, during surgery, and after surgery), and barriers to compliance. **Results:** The study revealed that while most participants had over five years of experience, only 43.7% adhered to SSI prevention standards. Significant barriers included insufficient surgical supplies, lack of formal training, limited hospital oversight, and poor communication within healthcare teams. **Conclusions:** Nurses exhibited limited awareness and adherence to SSI prevention guidelines, with key barriers hindering effective prevention. Addressing these challenges is essential to improving SSI control and patient outcomes.

INTRODUCTION

Surgical Site Infection (SSI) is an infection that develops within 30 days of a surgical operation or a year of prosthetic installation. SSI occurs in up to 30% of surgical procedures and accounts for up to 14% of hospital-acquired infection HAIs [1]. SSIs have been linked to a significant increase in patient morbidity and mortality, as well as healthcare expenses worldwide. Every year, over 234 million surgical patients are operated on worldwide, with 3%–16% of them having complications and other preventable surgical errors [1]. Several studies have examined the global prevalence and risk factors for SSIs. In Pakistan, there is a lack of nationally representative data to support evidence-based guidance [2]. Numerous studies have been conducted worldwide to evaluate nurses' knowledge, and practices related to SSI prevention. However, the literature review revealed that research on nurses' compliance with SSI prevention guidelines and the difficulties they encounter in Pakistan was lacking. Similarly, few studies have been conducted to assess nurses' knowledge, attitude, and practice regarding SSI prevention in Pakistan [3]. The identified gaps in the literature can therefore be addressed with great benefit from this study. Surgical Site Infection

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(SSI) rates in low- and middle-income countries (LMICs) range from 8% to 30%, making them the most frequent healthcare-associated infection (HAI) with substantial morbidity, mortality, and economic impacts [4]. Surgical Site Infections (SSIs) represent a significant public health concern in Pakistan, with prevalence rates varying widely across different studies and settings. Research indicates that the incidence of SSIs in Pakistan ranges from 9.3% to 33.6%, depending on various factors such as the type of surgery and patient demographics [2]. Nurses played a critical role in following and implementing SSI prevention recommendations in hospital settings, including preoperative, intraoperative, and postoperative phases. According to the CDC and WHO, SSI prevention guidelines can limit the spread of SSIs and provide occupational safety for healthcare professionals [5]. Guidelines apply to all healthcare settings and patients, regardless of their diagnosis. The guidelines cover various infection control topics, including preoperative showering, dietary assessment, antibiotic administration, surgical site preparation, hand washing, Personal Protective Equipment (PPE) use, and sharps disposal, aiming to reduce hospital-acquired infectious diseases [5]. However, current barriers to nurses' compliance with infection prevention guidelines are inadequate knowledge, leadership engagement, lack of resources, time constraints, and insufficient training [6]. The lack of local standard operating protocols and implementation manuals further exacerbates the situation, hindering effective practice and patient outcomes. Despite detailed infection control guidelines, SSI rates in Pakistan remain high, with low nurse practice levels, particularly in public-sector hospitals [7]. Nurses play a crucial role in preventing SSI by adhering to key practices such as consistent hand hygiene, aseptic techniques, skin antisepsis, timely prophylactic antibiotics, postoperative wound care, patient education, proper use of PPE, and effective communication with the surgical team. These practices help maintain a safe environment and reduce infection risks [8].

This study proposed to assess nurses' compliance with SSI prevention guidelines and identify the barriers they face in implementing these guidelines.

METHODS

A cross-sectional study was conducted to assess nurses' compliance with and identify barriers regarding Surgical Site Infection (SSI) prevention guidelines. The sample size was calculated using the Rao Soft Sample Size Calculator, with a 95% confidence level, a 5% margin of error, and an accessible population size of 800, yielding an initial sample size of 260. After accounting for a 10% attrition rate, the adjusted sample size was 286. Data collection involved 286 participants; however, 16 incomplete questionnaires were discarded, leaving 270 participants for analysis. In Inclusion criteria, registered nurses working in surgical settings, with at least 6 months of experience in the field of surgery, were included in the study. While in exclusion criteria, nurses who were on leave during the data collection period or those with less than 6 months of surgical experience were excluded. Written informed consent was obtained from all participants before data collection. Participants were informed about the study's purpose, procedures, potential risks, and benefits, ensuring their voluntary participation. Convenience sampling was employed due to time, resource, and access constraints. Ethical approval for the study was obtained from the IRB/ERC Committee (Reference No. 461-AAA-ERC-AFPGMI). Two validated questionnaires, developed based on the WHO SSI Prevention Guidelines (2016), were utilized to measure nurses' compliance and barriers. Content Validity Index (CVI) was assessed by a panel of five experts, and the tool's reliability was calculated using Cronbach's alpha (0.86 for compliance and 0.87 for barriers). A pilot test was conducted on 27 nurses (10% of the sample) in a nearby hospital. The questionnaire consisted of three sections: (a) Socio-demographic Information (7 items); (b) Compliance: Nurses' adherence to SSI prevention protocols before, during, and after surgery was assessed using a 5-point Likert scale ranging from Never to Always. The compliance level for each stage (before, during, and after surgery) was categorized as follows: (a) Low Compliance: Before Surgery: 21-26, During Surgery: 47-50, After Surgery: 48-51, (b) Moderate Compliance: Before Surgery: 27-30, During Surgery: 51-55, After Surgery: 52-54, (c), High Compliance: Before Surgery: 31-34, During Surgery: 56-59 After Surgery: 55-58. These categories were established by dividing the scale range for each stage by the number of categories (low, moderate, and high) as used in previous studies. (d) Barriers: A 15-item Likert scale assessed the barriers nurses face when complying with SSI prevention guidelines. The responses were recorded on a 5-point Likert scale, ranging from strongly disagree to strongly agree [8, 9]. This section aimed to identify the factors preventing nurses' adherence, such as lack of resources, inadequate training, or poor communication within healthcare teams. Data analysis was performed using SPSS version 27.0. Descriptive statistics were applied to calculate frequencies and percentages. The compliance categories (low, moderate, and high) were analyzed to determine the distribution of nurses' adherence across the different stages of surgery (before, during, and after surgery).

RESULTS

According to the statistics in table 1, most respondents were aged between 41 and 50 years, with 60.7% being women and 39.3% men. A significant proportion of nurses (46.7%) held a post-RN degree, while only 3% had obtained a master's degree. Nearly half of the respondents (45.9%)

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reported having 1 to 5 years of experience in surgical wards. However, 63.7% of the nurses did not receive training in SSI prevention, which may have affected compliance and put patient safety at risk. The study recommends enhancing adherence to SSI prevention guidelines by developing comprehensive training programs for the 63.7% of nurses who lack this training.

Table 1: Demographic Information of the Respondents (n = 270)

Variables	Categories	N (%)
Age of Respondents	20-30	54 (20.0%)
	31-40	88 (32.6%)
	41-50	107 (39.6%)
	51-60	21 (7.8%)
Gender of Respondents	Male	106 (39.3%)
	Female	164 (60.7%)
Level of Professional Education	Diploma	92 (34.1%)
	Post R.N	126 (46.7%)
	GBSN	44 (16.3%)
	MSN	08 (3.0%)
Work Experience in Surgical Ward	1 Year	66 (24.4%)
	5 Years	124 (45.9%)
	10+ Years	80 (29.6%)
Attended SSI Prevention Guidelines Training Program	No	172 (63.7%)
	Yes	98 (6.3%)
Clinical Placement Area	General Surgery	70 (25.9%)
	Neurosurgery	20 (7.4%)
	Post Cardiac	29 (10.7%)
	Orthopedics	29 (10.7%)
	Urology	25 (9.3%)
	O.T	27 (10.0%)
	E.N.T/Eye	13 (4.8%)
	Gynecology	24 (8.9%)
	Pediatrics	15 (5.6%)
	Surgical ICU	18 (6.7%)
Marital Status of the Respondent	Single	90 (33.3%)
	Married	175 (64.8%)

Table 2 presented the compliance levels of nurses with SSI prevention guidelines at three critical time points: before surgery, during surgery, and after surgery (n=270). Prior to surgery, a significant majority of nurses (53.3%) demonstrated moderate compliance, while 24.4% exhibited low compliance and 22.2% showed high compliance. During surgery, compliance significantly improved; only 0.7% of nurses had low compliance, 49.3% had moderate compliance, and 50% had high compliance. However, after surgery, compliance levels declined, with 33.3% of nurses returning to low compliance. Moderate compliance remained constant at 53.3%, while only 13.3% maintained high compliance. These data indicate a significant decrease in postoperative compliance with SSI prevention practices, highlighting the need for ongoing education and support for nurses.

Table 2: Participants' Responses to the Compliance with SSI Prevention Guidelines, Before, During and, After Surgery (n=270)

A score of the Nurse's Compliance with SSI Prevention Guideline	Time Line		
	Before Surgery N (%)	During Surgery N (%)	After Surgery N (%)
Low	66 (24.4%)	2 (0.7%)	90 (33.3%)
Moderate	144 (53.3%)	133 (49.3%)	144 (53.3%)
High	60 (22.2%)	135 (50.0%)	36 (13.3%)

In table 3, regarding the barriers to compliance with Surgical Site Infection (SSI) prevention guidelines, about 53% of nurses strongly agreed that several factors hindered their adherence. These included insufficient supplies of surgical consumables, an inappropriate nurse-to-patient ratio (95.5%), lack of time (56.7%), and the absence of a professional model (62.2%). Additionally, 51.1% of nurses believed that some measures for preventing SSI were not their responsibility. These factors collectively represented the major barriers nurses faced in following SSI prevention guidelines.

Table 3: Response of the participants of facing Barriers to Compliance with SSI Prevention Guidelines

S. No.	Barriers to Compliance with Surgical Site infection Prevention Guidelines	Strongly Disagree N (%)	Disagree N (%)	Undecided N (%)	Agree N (%)	Strongly Agree N (%)
01	Inadequate Supply of Surgical Consumables (cap, mask, scrub, antiseptic solution)	0 (0.0%)	0 (0.0%)	17 (6.3%)	110 (40.7%)	143 (53.0%)
02	Lack of Supervision by the Hospital Infection Control Committee	1 (0.4%)	28 (10.4%)	95 (35.2%)	146 (54.1%)	0 (0.0%)
03	Inadequate knowledge about disinfection and Sterilization Techniques	48 (17.8%)	94 (34.8%)	0 (0.0%)	118 (43.7%)	10 (3.7%)
04	Lack of Training on Measures for the Prevention of Surgical Site Infections in the Hospital	0 (0.0%)	0 (0.0%)	24 (8.8%)	128 (47.4%)	118 (43.7%)
05	Lack of Evidence-based Recommendations for Preventing Surgical Site Infections	0 (0.0%)	0 (0.0%)	39 (14.9%)	190 (70.4%)	41 (15.2%)
06	Inappropriate Nurse-to-Patient Ratio	0 (0.0%)	0 (0.0%)	0 (0.0%)	11 (4.1%)	259 (95.9%)
07	Lack of a Role Model or Mentor in SSI Prevention	0 (0.0%)	3 (1.1%)	24 (8.9%)	168 (62.2%)	75 (27.8%)

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08	Poor Integration of Research findings into Practice	0 (0.0%)	76 (28.1%)	94 (34.8%)	96 (35.6%)	4 (1.50%)
09	Lack of time makes it Hard for Nurses to Follow SSI Prevention Guidelines	0 (0.0%)	0 (0.0%)	10 (3.7%)	107 (39.6%)	153 (56.7%)
10	Nurses do not have the Required Skills for Effective SSI Prevention	0 (0.0%)	0 (0.0%)	108 (40.0%)	144 (53.3%)	18 (6.7%)
11	Some Measures for SSI Prevention may not be Clearly defined as Nurses' Responsibilities	0 (0.0%)	0 (0.0%)	4 (1.5%)	138 (51.1%)	128 (47.4%)
12	Lack of Awareness about SSI Prevention guidelines	2 (0.7%)	8 (3.0%)	0 (0.0%)	109 (40.4%)	151 (55.9%)
13	Communication Gaps Hinder the Effective Implementation of SSI Prevention Guidelines	0 (0.0%)	10 (3.7%)	19 (7.0%)	107 (39.6%)	134 (49.6%)
Prevention Guidelines						
14	Nurses may Resist Adopting new Guidelines due to Established Routines	0 (0.0%)	77 (28.5%)	147 (54.5%)	46 (17.0%)	0 (0.0%)
15	Without Regular feedback, Nurses May not identify Areasfor Improvement	0 (0.0%)	0 (0.0%)	0 (0.0%)	75 (27.8%)	195 (72.2%)

DISCUSSION

This study assessed nurses' compliance and identified barriers to adhering to surgical site infection prevention guidelines. The study indicated that participating nurses had various levels of compliance with SSI prevention guidelines. For example, 43.9% of nurses reported frequently ensuring that patients bathe or shower before surgery, whereas 54.8% rarely used chlorhexidine for skin preparation, showing inconsistent adherence. These findings are consistent with those of those who observed similar compliance rates in preoperative hygiene routines [10]. The inconsistent compliance is challenging, given the evidence that showed that preoperative bathing reduces microbial load and SSI risk [11]. The study also found that more than 90% of nurses were given antibiotics before surgery, which is consistent with an 83% compliance rate [12]. In this study, more than half of the participants did not utilize alcohol-based treatments for skin preparation before surgery, in contrast to a Bangladeshi study in which over 70% of nurses did so. This study's nurses demonstrated high compliance (over 90%) with handwashing after surgery, which is comparable with the findings of [13]. This devotion indicates a recognition that hand hygiene plays a crucial role in SSI prevention. However, awareness of other SSI requirements, such as preoperative hair removal techniques, was low, with just 43.3% correctly recognizing clipping as the best approach, in contrast to the study, which had 100% inaccurate answers [13]. Due to a lack of resources, many institutions continue to use razors instead of clippers [14]. The study highlighted various challenges to SSI guideline compliance, including 93% of nurses believing that certain SSI prevention practices were beyond their purview. These findings are consistent with those of, those who reported that nurses faced constraints such as a lack of professional role models, insufficient time, and limited education [15]. Inadequate availability of surgical materials, such as caps, masks, and antiseptic solutions, was a widespread issue, as reported by those who also mentioned a shortage of personal protective gear [16]. The study identified a lack of training on SSI guidelines as a major hurdle, with 93% of nurses reporting no formal instruction in this area. This is similar to the findings of, those who discovered that educational gaps impede compliance [17, 18]. Furthermore, high nurse-to-patient ratios were regarded as a major issue, with 99% of nurses reporting staffing shortages. This finding is consistent with, those who exposed that high staffing levels can contribute to negative outcomes such as burnout and SSIs [19]. Another significant hurdle was the lack of a feedback system, which was reported by more than 95% of nurses as limiting their capacity to identify areas for development and reported similar conclusions, finding that inefficient feedback mechanisms impeded hospital performance improvement [20].

CONCLUSIONS

The study found moderate adherence to Surgical Site Infection (SSI) prevention guidelines among nurses, despite significant barriers like resource limitations, inadequate training, and staffing issues. Addressing these issues is crucial for improving patient outcomes and reducing infection rates. Regular training programs, stronger infection control protocols, and collaboration with the Pakistan Nursing Council are recommended.

Authors Contribution

Conceptualization: RA
Methodology: RA
Formal analysis: RA, SP, SY, MA
Writing, review and editing: RK, SY

All authors have read and agreed to the published version of the manuscript

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Conflicts of Interest

All the authors declare no conflict of interest.

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