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Assessment of Related Factors Influencing Surgical Site Infection Prevention among Surgical Patients

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Abstract

Factors influencing surgical site infections (SSI) significantly increase mobidity, mortality and the health care costs particularly in resource limited settings likeNigeria. However,there is need to assess the factors influencing surgical site infection prevention and Objectives are to identify patient related factors, health care related factors and environmental related factors and the level of surgical site infection prevention. This cross-sectional descriptive survey aimed to assess factors influencing surgical site infection prevention among surgical patients. the sample size of 333 surgical patients, determined by using Taro-Yamane formula. Systematic sampling technique was used to select respondents and the study instrument used to collect data from the selected respondents at Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), Osun State, using a pretested, validated questionnaire. .Data analyzed with SPSS version 27, showed that 84.6% of respondents endorsed environmental controls, such as operating room (OR) cleaning (86.4%), ventilation (83%), and sterilization protocols (84.5%). Approximately 84.83% emphasized that patient hygiene, preoperative compliance, and postoperative wound care, supported by optimal Operating Room conditions, reduce surgical site infection risks, with diabetes increasing vulnerability in suboptimal environments (83 agreements). Healthcare procedural-related factors, including protocol adherence (74.95%

endorsement), were critical, yet 48.4% noted inconsistent compliance. Key findings revealed inadequate OR ventilation (OR=2.20, p=0.004), low patient compliance (OR=3.15, p=0.001), and poor healthcare worker adherence (OR=2.95, p=0.002) significantly increased SSI odds, with a 15.1% preventive rates. This study examines the factors influencing surgical site infection prevention among surgical patients. Recommendations include upgrading ventilation and sterilization systems, enhancing training, and improving resources. A multifaceted approach addressing environmental, patient, and provider-related factors is essential for reducing surgical site infection in low-resource settings.

Keywords: factors, surgical, patients, hygiene, preoperations, sterilization.

Introduction

Surgical site infection (SSI) is defined as an infection that occurs in surgical patients at the incision site within 30 days after surgery (Mangram *et al.*, 2022). It is a potential complication associated with any type of surgical procedure. It refers to infections occur- ring up to 30 days after surgery (or up to one year after surgery) and affecting either the incision or deep tissue at the incision site. Surgical site infection (SSI) is a significant health problem for older adults. It has been estimated that the number of general surgeries in older adults will increase by at least 18% between 2010 and 2050. According to the new WHO recommendations on preoperative measures for surgical site infections, the incidence of surgical site infections (SSI) ranges from 1.2 to 23.6 per 100 surgical procedures. Worldwide, it has been reported that more than one-third of postoperative death are related to SSIs).

This increasing number of surgeries leads to an increase in the incidence of postoperative wound infections on surgical sites A recent report published by the world health organization (WHO) showed that surgical site infection (SSI) is one of the most commonly occurring hospital-acquired infections (HAI) in low- and middle-income countries. This affects up to one-third of the patients who have undergone a surgical procedure. In the past, some authors have made attempts to find the different risk factors for postoperative infections and commonly reported factors are the long duration of surgery, improper pre-operative skin preparation, type of surgery, and associated comorbid conditions (Kumar *et al*., 2023).

In addition, the most crucial issue in preventing surgical site infections is the entire and absolute compliance of health professionals with the recommendations in the guidelines. Nurses play a major comprehensive role and span of continuum care in preventing surgical site infections (Mangram *et al*., 2022). Therefore, they can modify SSI risk factors in their daily practice such as improper hand hygiene and skin preparation to prevent SSI

However, adherence to recommended best practices remains low among nurses. Multiple studies have reported that proper

practices for the prevention of infection among nurses have been affected by some barriers such as lack of knowledge, resources, and SSI preventive guidelines among others.

Nigeria experiences SSI prevalence rates significantly above global averages, with estimates ranging from 10% to 30%, depending on the type of surgery and healthcare setting (Ogunlade and Adebayo, 2024). This high incidence is linked to factors such as limited healthcare funding, overcrowded surgical wards, insufficiently trained healthcare workers, and noncompliance with infection control measures. A study conducted in southwest Nigeria found that poor compliance with standard SSI prevention practices was a major contributing factor to the high incidence of surgical site infections (Ojo, 2023). The aim of this research work is to assess patient's related factors influencing surgical site Infection prevention among surgical patients in **Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Osun State**.

Research Design

This descriptive study employed a cross sectional design to identify factors influencing Surgical site infection prevention among surgical patients in Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife. The design is considered most suitable for the study because of its being comparatively quick to conduct and easy to administer, limited control effects, its' propensity to foster respondents' participation, its' ability to chart aggregated patterns, as well as its' been readily amenable to inferential analytic techniques, among others, as was efficient in collecting data at a single point in time and allowed for the assessment of multiple variables simultaneously makes it appropriate for the study. It aligned with the study's objectives and provided a practical approach to exploring factors influencing SSI prevention. This design was cost-effective and suitable for informing hospital practices.

Research Setting

The study was conducted in Obafemi Awolowo University Teaching Hospitals complex (OAUTHC) in Osun State, Nigeria. Osun State. The teaching hospital was established in September 1975 by the old Western region Government of Nigeria. It was formerly known as the Ife University Teaching Hospitals Complex but had its name changed toin 1987 when the University of Ife was renamed after the legendary late chief Obafemi Awolowo.

The Ife University Teaching Hospitals Complex (now Obafemi Awolowo University Teaching Hospitals Complex) is unique in that it was founded on what is generally referred to as the Ife Philosophy. The Philosophy focuses on an integrated healthcare delivery system approach with emphasis on comprehensive health care service based on a pyramidal structure comprising primary care at the base, and secondary and tertiary services at hospital settings. The philosophy is designed to secure improvement in the physical, mental and socio-economic well-being of Nigerians through preventive, promotive, diagnostic, restorative and rehabilitative services. This philosophy allows for a unique experiment in healthcare delivery and health professional training in Nigeria. Therefore, unlike some other Teaching Hospitals,

this healthcare institution currently provides primary, secondary and tertiary care. It does this through its five health care units namely: Ife Hospital Unit, Ile-Ife; Wesley Guild Hospital, Ilesa; Urban Comprehensive Health center Eleyele, Ile –Ife; Multipurpose health center, Ilesa; and rural comprehensive health center, Imesi-Ile. The Ife Hospital Unit (IHU) is the biggest of all the facilities and the administrative headquarter of the hospital. IHU has various wards and specialties such as burns center, wound care center, the surgical units comprising the theatre and surgical wards, e.tc. Ife hospital unit not only serves as a referral center for other hospitals within Osun state and the neighboring states (Ondo, Oyo, and Ekiti states. It also serves as a training center for all cadres of health professionals. Besides, it is fast evolving into a center of excellence in the areas of surgical care. All these inform the choice of IHU as the research setting.

Target Population

The target population for this study comprised surgical patients admitted to the surgical wards, of Obafemi Awolowo University Teaching Hospital (OAUTH), Osun State, between August 2024 and October 2025. The population size of surgical patients during this period were 1, 250. This population encompassed individuals who had either undergone or were scheduled for surgical procedures. Surgical patients were selected due to their increased vulnerability to surgical site infections (SSIs), which made them essential for assessing infection outcomes.

Sample Size Determination

The sample size was determined using Taro-Yamanne's formula (2023) for population-based studies:

$$n = \frac{\mathrm{N}}{1 + N(e)^2}$$

Where:

Population size, N = 1250

e = Margin of error, e= 0.05 (which is 5%).

Step 1: Square the margin of error

$e2 = (0.05)2$

$=0.0025$

Step2:

Multiply the population size by e^2

$Nxe^2 = 1250x0.0025 = 3.125$

Step 3: Add 1 to the result gotten above

$1+Nxe^2 = 1+3.125 = 4.125$

Step 4: Divide the population size by their sum

Then,by integrating the values:

$$n = \frac{1250}{4.125}$$

$$n = 303.03$$

Using this formula, the sample size for the study was calculated to be 303 participants.

To account for potential non-response rate or incomplete response was calculated as follows:

Sample size x non-response percentage was adjusted to 303 respondents to

$$\text{Non} - \text{response Rate} = \text{Sample Size} \times \frac{\text{Percentage of Non} - \text{response}}{100}$$

$$= 303 \times \frac{10}{100}$$

Non-response Rate = 303 × 0.1 = 30.3 = 333.3 in approximation 333

Thus, the sample size was adjusted to 333 respondents to accommodate for the expected non-response rate.

Sampling Techniques

A systematic sampling technique was employed. This allows the researcher to focus on respondents who can provide rich, relevant and detailed information about the factors under investigation, based on the age and type of surgery ,be it elective or emergency surgical procedure undergone with risk for surgical site infection e.g. orthopedic surgeries(joint replacement, fracture fixation),Gastro intestinal surgeries(e.g. bowel resection, appendectomies),Obstetric and gynecological surgeries(e.g. cesarean sections, hysterectomies),Cardiothoracic surgeries(e.g. bypass surgeries),Neurosurgical surgeries due to sensitivity and complexity involved.

Methods of Data Collection

Data was collected through face-to-face administration of the questionnaire by trained research assistants. Surgical patients completed the questionnaire at their convenience during hospital visits. The researcher and the research assistant visited the operating theatre and surgical wards during morning briefings and call hours to administer questionnaires. Respondents were assured of the confidentiality of their responses and were informed that their full participation were voluntary. An informed consent was included at the beginning of the questionnaire which respondents acknowledge before proceeding with the survey. Also, respondents were assured that their responses remain confidential and that their data were solely for research purposes.

In addition, questions were taken about ten to fifteen minutes to be completed and were collected immediately after completion. Respondents were informed of their voluntary nature of their participation. Anonymity was ensured by not requesting name or identifiable

information in the questionnaire. Data collection took place over a period of four weeks. The questionnaire was reviewed by the researcher for completeness during data collection period and incomplete questionnaires were acted upon for input of any missing data information.

Methods of Data Analysis

Data were analyzed using SPSS version 27. Descriptive statistics (frequencies, means, and standard deviations) summarized demographic, patient-related, and environmental data, while inferential statistics (chi-square tests and logistic regression) examined associations between environmental factors (e.g., OR ventilation quality, sterilization adherence), patient-related factors (e.g., hygiene compliance), healthcare procedural-related factors (e.g., protocol adherence), and SSI prevention. A significance level of $p < 0.05$ was used to identify significant associations.

Result and Discussion

Table 1: Patients related Factors influencing surgical site Infection among surgical patients

Statements	SA	A	D	SD	Mean
I maintain good personal hygiene before undergoing surgery	111 (33.5%)	177 (53.%)	43 (12.9%)	2 (0.6%)	2.99
I understand preoperative instructions given by my healthcare provider.	90 (27.4%)	197 (59%)	44 (13%)	2 (0.6%)	3.03
I understand the importance of maintaining a clean surgical site after the operation.	104 (31.1%)	178 (54%)	48 (14%)	3 (0.9%)	2.96
Pre-existing medical conditions such as diabetes increase my risk of surgical infections.	99 (30%)	177 (53%)	48 (14%)	9 (3%)	2.91
My healthcare provider considers my existing co-morbidities during my treatment plan.	104 (31.%)	170 (51%)	49 (15%)	10 (3%)	2.88
Healthcare providers have educated me on the importance of personal hygiene.	92 (28.4%)	193 (57%)	46 (14%)	2 (0.6%)	3.01
I follow healthcare professionals' recommendations on dietary changes before surgery.	90 (27.4%)	193 (58%)	48 (14%)	2 (0.6%)	3.03
I wash my hands regularly to reduce the risk of infections before surgery.	121 (36%)	165 (50%)	43 (13%)	4 (1%)	3.04
I feel confident in managing my health conditions to reduce infection risks.	108 (32.8%)	174 (52.3%)	48 (14%)	3(0.9%)	2.92
My smoking habits or alcohol consumption have been addressed by healthcare providers.	80 (24%)	200 (60.5%)	48 (14%)	5 (1.5%)	2.95

Statements	SA	A	D	SD	Mean
I avoid eating or drinking as instructed before surgery.	93 (28.1%)	189 (57%)	48 (14%)	3 (0.9%)	2.87
I receive adequate support to manage co-morbidities before surgery.	83 (25%)	199 (60%)	49 (14.4%)	2 (0.6%)	2.84
erage %	29.53%	55.37%	13.9%	1.2%	2.95

Survey Field, 2024

Table 2. Bivariate Analysis: Patient related factors vs. Level of SSI Prevention

Patient related factors	SSI Cases	No SSI Cases	Total	Chi-square (p-value)
COMPLIANCE CATEGORY				
High (Strongly Agree/Agree)	26 (9.8%)	239 (90.2%)	265	6.45 (p=0.01)
Low (Disagree/Strongly Disagree)	66 (97.1%)	2 (2.9%)	68	
PERSONAL HYGIENE				
High (Strongly Agree/Agree)	28 (10-6%)	230 (89.1%)	258	6.44 (P= 0.001)
Low (Disagree/Strongly Disagree)	64 (85.3%)	11 (14.7%)	75	
PREOPERATIVE INSTRUCTION				
Fasting (Strongly Agree/Agree)	25 (9.8%)	231 (90.2%)	256	
No fasting (Disagree/Strongly Disagree)	67 (87.01%)	10 (12.98%)	77	
Maintaining Clean Surgical Site				
High Strongly Agree/Agree)	26 (10.2%)	230 (89.8%)	256	6.28 (p=0.001)
Low (Disagree/Strongly Disagree)	68 (88.3%)	9 (11.7 %)	77	
Pre-existing Medical Condition				
High Risk (Strongly Agree/Agree)	28 (10.6%)	232 (89.9%)	260	6.44 (p=0.001)
Low Risk (Strongly Disagree)	70 (95.9%)	3 (4.1%)	73	
Comorbidities				
High (Strongly Agree/Agree)	30 (11.3%)	228 (88.4%)	258	646 (p=0.001)
Low (Disagree/ Strongly Disagree)	65 (86.7%)	10 (13.3%)	75	
Education				
Effective (Strongly Agree/Agree)	29 (11.2%)	229 (88.8%)	258	6.70 (p=0.002)
Ineffective (Disagree/Strongly Disagree)	66 (88%)	9 (12 %)	75	
Dietary Changes				
Proper modification ((Strongly Agree/Agree))	28 (10.6%)	230 (89.1%)	258	6.86 (p0.003)
Improper modification (Disagree/ Strongly Disagree)	68 (90.7%)	7 (9.3%)	75	

Table 3: Relationship between patients related factor and the level of surgical site prevention

Variable	Coefficient (β)	Std Error	t-Statistic	p-Value	Decision (α = 0.05)
Intercept	0.312	0.155	2.01	0.091	-
Patient Related Factors	9.743	0.050	10.15	<0.001	Reject H_0
Personal Hygiene	0.032	0.002	0.47	0.001	Significant
Preoperative Instruction	0.041	0.002	0.46	0.001	Significant
Maintaining Clean Surgical Site	0.001	0.002	0.65	0.001	Significant

Variable	Coefficient (β)	Std Error	t-Statistic	p-Value	Decision (α = 0.05)
Pre-existing Medical Condition	0.001	0.047	0.63	0.001	Significant
Comorbidities	0.001	0.047	0.65	0.001	Significant
Education	0.031	0.002	0.65	0.002	Significant
Dietary Changes	0.031	0.003	0.47	0.003	Significant
Compliance	0.031	0.046	0.45	0.001	Significant

Model Summary: $R^2 = 0.971$, F (3, 380) = 820.4, P <0.001

From Table 1-3. The finding shows that improvement in any of patient related factors leads to a corresponding decrease in the level of surgical site infection prevention. **84.3%** of the total respondents strongly agreed on several key aspects of **surgical site infections (SSIs) prevention**. These include the understanding that patient related factors causing SSIs occur at the site of surgery, and that individuals at higher risk for developing SSIs are those who are immuno-compromised, such as diabetic patients. Respondents also acknowledged that patient-related factors, such as underlying conditions and lack of dietary changes are significant contributors to the occurrence of SSIs. A large majority of the respondents also believed that **SSI prevention is achievable**, that **orthodox medicine**, rather than traditional medicine, should be the treatment option for SSIs, and that administering **prophylactic antibiotics pre-operatively** can reduce the risk of SSIs in patients. However, **13.6%** of the respondents were not fully supportive of these statements. Also, lack of compliance to treatment regimen or inability to cope financially or missing of dose execrates surgical site infection. These outcomes resonate with the research conducted by Brown *et al.* (2022), which found that many caregivers reported that coping strategies, such as seeking social support and engaging in self-care activities, were vital for mitigating their stress levels. Financial resources play a critical role in influencing the severity of the challenges faced by patients. Martinez and Nguyen (2023) highlighted that the income levels of patients are influential factors; those who are economically vulnerable tend to experience greater difficulties.

Studies by **Johnson et al. (2024)** suggest that a **multimodal approach** to SSI prevention is essential, especially in resource-limited settings. Such an approach should include **proper hand hygiene**, **preoperative antisepsis**, **antimicrobial stewardship**, and optimization of the **operating room environment**. These strategies are critical for reducing SSIs when traditional infection control measures may not be feasible.

Mwaniki et al. (2023) provide a broader perspective on SSI prevention, citing evidence-based guidelines from the **World Health Organization (WHO)** and other global health bodies. These guidelines emphasize the importance of **standardizing infection control protocols**, improving **hygiene practices**, and ensuring **appropriate surgical antimicrobial prophylaxis** to reduce SSIs globally. The **WHO (2022)** and **CDC (2022)** guidelines reinforce the importance of these practices, especially in high-risk environments, to help create

standardized protocols that can be adapted for both **high-resource** and **low-resource settings**.

My study aligns with prior research by Lee *et al*. (2022): Patel and Kumar (2023), which advocate for a multimodal approach to SSI prevention, emphasizing proper hand hygiene, preoperative antisepsis, antimicrobial stewardship, and optimized operating room environments. These strategies are essential for reducing SSIs, although their feasibility may vary in different settings.

Building on this, my findings reinforce the importance of tailored infection control protocols and highlight the need for context-specific adaptations. Furthermore, my work underscores that addressing both global best practices and local contextual factors is crucial in crafting effective infection prevention strategies. This comprehensive approach aims to bridge the gap between international standards and practical implementation, ultimately contributing to better patient outcomes and reduced incidences of SSIs in my specific healthcare setting.

Global health organizations such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have established comprehensive guidelines emphasizing the importance of infection prevention measures—including proper hand hygiene, antisepsis, antimicrobial stewardship, and optimized operating room practices—to reduce surgical site infections (SSIs). These internationally recognized standards serve as the foundation for effective infection control strategies worldwide.

Conclusion

This study concludes that significant progress has been made in understanding and mitigating **surgical site infections (SSIs)**, substantial challenges remain, particularly in **low-resource settings** such as **Nigeria**. Despite the increasing awareness and the development of **evidence-based guidelines**, **systemic barriers**, including **inadequate healthcare resources**, **psychological stress**, and the escalating threat of **antimicrobial resistance (AMR)**, continue to exacerbate the burden of SSIs. In these settings, where **healthcare infrastructure** and access to services are often limited, the effectiveness of infection prevention strategies is frequently undermined. results suggest the following implications assessing the patient's related factors and identifying any risks for SSI, educating patients about effects of comorbidity before and after surgery, and ensuring patient is adequately hydrated and nourished to support healing, maintaining a sterile surgical field to prevent contamination, the use of appropriate surgical techniques to minimize tissue trauma.

Recommendation

Based on the findings of the study, the following recommendations were made in order to address the surgical site infection among of surgical patients. Hospitals and healthcare institutions should develop well-structured operating room and other health facilities like to support patient's treatment programs for caregivers of surgical patients, Counseling, stress management, workshops, and educational resources should be organized to help health

caregivers for effective practices. Providing training for all healthcare workers on how to manage post-operative care recognizes early signs of complications, and use medical equipment if needed.

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