WOLKITE UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF SURGERY

MAGNITUDE AND ASSOCIATED FACTORS OF SURGICAL SITE INFECTION AMONG PATIENTS ADMITTED TO SURGICAL WARD OF WOLKITE UNIVERSITY COMPREHENSIVE SPECIALIZED HOSPITAL, WOLKITE, ETHIOPIA.

Specialization in General surgery

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Magnitude and associated factors of surgical site infection among patients admitted to surgical ward of Wolkite university comprehensive specialized hospital, Wolkite, Ethiopia.

A thesis to be submitted to the department of surgery, college of medicine and health sciences in partial fulfillment of the requirements for the specialization in general surgery.

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Wolkite, Ethiopia

APROVAL SHEET

We hereby certify that we have read and evaluated this thesis titled" **Magnitude and associated factors of surgical site infection among patients admitted to surgical ward of Wolkite university comprehensive specialized hospital, Wolkite, Ethiopia"** prepared under our guidance by **Dr Abel Woldegiorgis**. We recommend that the thesis shall be submitted as fulfilling the requirements for the award of specialization in general surgery. It has been submitted for examination with my/ our approval as university advisor(s).

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As members of board of examiners of the specialization in general surgery thesis open defense examination, we have read and evaluated this thesis prepared by Dr Abel Woldegiorgis and examined the candidate, We, hereby certify that, the thesis is accepted for fulfilling the requirements for the award of certificate of specialization in general surgery.

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DECLARATION

I, the undersigned resident declare that this thesis titled "**Magnitude and associated factors of surgical site infection among patients admitted to surgical ward of Wolkite university comprehensive specialized hospital**" is my original work in partial fulfillment of the requirement for the specialization in general surgery.

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Date of Submission: 01/03/2026

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Abbreviations and acronyms

ASA American Society of Anesthesiologists

CDC Center for Disease Control

HAI Healthcare Associated Infections

ICU Intensive Care Unit

LMICs Low and Middle Income Countries

NHS National Health Services

NHSN National Health Safety Networks

OR Operation Room

SSI Surgical Site Infection

USA United States of America

WUCSH Wolkite University Comprehensive Specialized Hospital

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ABSTRACT

Background: Surgical site infections (SSI) are defined as infections apparent within 30 days of an operative procedure and a year if prosthetic implant is used.

Globally, surgical site infections (SSIs) are one of the most commonly encountered complications after surgery(1). No study, on SSI, had been done in Wolkite university comprehensive specialized hospital (WUCSH). Therefore, this study was intended to determine the magnitude and associated factors of surgical site infections among patients admitted to surgical ward of WUCSH.

Methods: Hospital based cross-sectional study was conducted on 168 files of patients who had been operated and admitted to surgical ward during the study period. Collected data was entered and analyzed using SPSS version 27. Binary logistic regression test was done to determine the relationship of SSIs and risk factors. Results were presented in tables and charts.

Results: A total of 984 patients underwent both emergency and elective surgeries during the study period. The magnitude of SSI was 14.9% (95% CI: 9.9-21.2). Age of the patient (AOR 1.45(95%CI: 1.09-1.93), contaminated wound class (AOR 3.09, 95%CI 1.09-8.78), presence of surgical drain (AOR 8.13: 95%CI: 2.41-27.39) longer postop stay (AOR 1.29, 95%CI 1.08-1.54) and high number of people in the OR (AOR 3.28, 95%CI 1.35-7.93) were found statistically significant risk factors. Surgical drain being the strongest risk factor.

Conclusion and recommendation: The magnitude of SSI was generally high. The risk factors associated with SSI were: older age of the patient, contaminated wound, use of surgical drain, prolonged postoperative hospital stay and presence of large number of people in OR during the procedure. It is advisable for the hospital to have a standardized protocol to use a surgical drain and strictly monitor OR traffic and early safe discharge of patients to reduce surgical site infection rates.

Key words: surgical site infection, associated factors, postoperative

CHAPTER 1: INTRODUCTION

1.1.Background

Health Care-Associated Infections are one of the principal public health concern and among the distinguished HAIs, Surgical Site Infections (SSI) contributing to significant increases of mortality and morbidity, considerable prolongation in length of hospitalization and added treatment expenses(2). Surgical site infections are defined as infections apparent within 30 days of an operative procedure and a year if prosthetic implant is used(3). The Centers for Disease Control and Prevention (CDC) classifies SSIs into three types: superficial infections, deep incisional infections, and infections involving organs or body spaces(4).

Surgical site infections (SSIs) significantly affect patient outcomes, prolonging hospital stays, increasing healthcare costs, and contributing to morbidity and mortality(5). According to the World Health Organization (WHO), SSIs occur in up to 20% of surgeries in low- and middle-income countries. Surgical site infection is one of the most common postoperative complications and occurs in at least five per cent of all patients undergoing surgery(6). The degree of surgical site contamination at the time of surgery affects the likelihood of SSI(3). Wounds are classified as clean, clean-contaminated, contaminated, or dirty or infected based on the presence and degree of contamination(7).

Surgical site infections result in socioeconomic problem as they frequently result in hospital re-admissions, expose for frequent surgeries, demanding long-term treatment, disability and patient morbidity(8). Patients with SSIs are more likely to require readmission to hospital or intensive care unit (ICU) treatment, and are at higher risk of death than those without such infections. Most of the time, it is associated with increased age, prolonged duration of hospital stay, blood transfusion and emergency surgery(9).

1.2.**Statement of the problem**

World Health Organization reports that SSIs threaten millions of patients globally each year and contribute to the growing problem of antimicrobial resistance(4). Healthcare-associated infections (HAIs) are among the most common threats to patient safety worldwide, and SSIs represent one of the most frequent types of these infections(10). Despite advances in surgical techniques, sterilization methods, and the routine use of antibiotic prophylaxis, SSIs continue to

impose a significant burden on patients and healthcare systems. These infections can lead to prolonged hospital stay, delayed wound healing, repeated surgical procedures, increased healthcare costs, and higher morbidity and mortality rates(1).

Globally, the epidemiology of surgical site infections varies widely between high-income and low- and middle-income countries (LMICs). According to the World Health Organization, approximately 11% of patients undergoing surgery in LMICs develop surgical site infections, making SSI the most frequent healthcare-associated infection in these settings(10). In contrast, the incidence in high-income countries is much lower, ranging from 1.2% to 5.2% of surgical procedures(11). The burden of SSI is particularly high in Africa and other resource-limited regions. Studies in sub-Saharan Africa report SSI prevalence ranging from 6.8% to 26%, with some settings reporting even higher rates depending on surgical procedures and infection prevention practices(12). Furthermore, WHO data indicate that up to 20% of women undergoing cesarean section in Africa develop postoperative wound infections, highlighting the magnitude of the problem in the region(13). In Ethiopia, surgical site infections remain a significant public health problem despite improvements in surgical care and the existence of national infection prevention guidelines(11). Studies conducted in various Ethiopian hospitals have reported SSI prevalence ranging from 6.8% to 25%, while some analyses suggest that the overall burden may reach nearly 29% in certain settings(14). These infections contribute substantially to postoperative complications and increased healthcare expenditures in the country. The occurrence of surgical site infections is influenced by multiple factors, including patient-related, procedure-related, and healthcare system-related determinants. Patient-related factors include advanced age, malnutrition, comorbidities such as diabetes mellitus, and impaired immunity. Procedure-related factors include the type and duration of surgery, wound classification, emergency procedures, and blood transfusion. Healthcare system factors such as inadequate sterilization, poor adherence to infection prevention protocols, overcrowded operating rooms, and limited resources further increase the risk of SSI in low-resource settings. Although several studies have been conducted in Ethiopia to assess the prevalence and determinants of SSIs, most of these studies were conducted in selected urban hospitals, and the findings may not represent the situation in other regions of the country. Additionally, many reports from public sector hospitals are based primarily on microbiology laboratory records, which may not reflect the full clinical picture of postoperative infections in surgical wards. Wolkite University Comprehensive Specialized Hospital serves as a major referral and teaching hospital in the Gurage Zone and provides surgical services to a large population from

surrounding districts. The hospital performs a wide range of surgical procedures, including general surgery, orthopedic surgery, and other specialized operations. Despite its important role in providing surgical care, there is limited evidence regarding the magnitude and determinants of surgical site infections in this hospital. Resource-limited settings such as Wolkite University Comprehensive Specialized Hospital require evidence-based infection prevention strategies to improve surgical outcomes and optimize healthcare resource utilization. However, the scarcity of published data on local SSI magnitude and associated risk factors limits the development of targeted interventions and effective infection control programs. This knowledge gap hinders efforts to design appropriate strategies to reduce postoperative infections, improve patient outcomes, and strengthen infection prevention practices in the hospital. Since surgical site infections are largely preventable through measures such as appropriate antibiotic prophylaxis, proper surgical techniques, reduced preoperative hospital stay, and adequate postoperative wound care, identifying the magnitude and associated risk factors of SSI in the local setting is essential. Therefore, this study aims to assess the magnitude and associated factors of surgical site infections among postoperative patients at Wolkite University Comprehensive Specialized Hospital in 2025. The findings of this study will provide valuable evidence to support infection prevention programs, guide clinical practice, and improve the quality of surgical care in the hospital.

1.3. **Objective**

General Objective

- ✓ To assess the magnitude and associated factors of surgical site infection among patients admitted to surgical ward of Wolkite University comprehensive specialized Hospital in September 2024 to August 31, 2025.

Specific objectives

- ✓ To determine the magnitude of SSIs among patients admitted to surgical ward of Wolkite university comprehensive specialized hospital from September 1, 2024 to August 31, 2025
- ✓ To identify factors associated with SSIs among patients admitted to surgical ward of Wolkite university comprehensive specialized hospital from September 1, 2024 to August 31, 2025.

1.4.Significance of the study

Establish facility-specific infection prevention policy. Guide targeted interventions and resource allocation. Serve as baseline for future research.

A clear understanding of the magnitude and associated risk factors of SSIs in this study area is vital for implementing targeted interventions and improving patient outcomes. Thus assessing the magnitude and identifying the risk factors of SSIs at Wolkite University comprehensive specialized hospital is essential to improve surgical outcomes and patient safety.

This research will enable the hospital to make a facility specific policy on infection prevention and control and it will serve as a guide to make targeted interventions and resource allocation in prevention of SSIs. It will also serve as a baseline for future research.

1.5.**Justification of the study**

Despite Surgical site infection being a relatively serious problem among surgical patients, there are scanty published reports in our local hospitals. The sporadic reports from the public sector hospitals are mainly from the Microbiology laboratory records which may not show the complete clinical picture. Scarcity of published data on the risk factors involved in SSIs has impacted negatively on management of patients particularly in the resource strained set up. This study sought to determine specific risk factors that are associated with surgical site infection in the local setting. Results from this study can be used by policy makers to make informed decisions on issues of infection control pertaining to surgical wound sepsis.

1.6. **Scope of the study**

The study took place in Wolkite university comprehensive specialized hospital, Gurage zone, Central Ethiopia. The study determined the magnitude and associated factors of surgical site infections among patients in surgical ward at WUCSH. The study was done in the 2025 year.

1.7.**Operational definitions**

Surgical Site Infection (SSI): Defined per CDC as infection occurring within 30 days of the operation (or within 1year if implant used) involving the incision or deep tissues, confirmed clinically or microbiologically.

Magnitude of SSI: The proportion (%) of patients who develop surgical site infection among all patients who underwent major surgery and admitted to the surgical ward during the study period.

Prophylactic Antibiotic:

The administration of antibiotics before, during, or immediately after surgery to prevent infection, usually within 1hour before incision.

Length of Hospital Stay: The total number of days the patient remains admitted in the hospital before and after the surgical procedure.

CHAPTER 2: LITERATURE REVIEW

General overview of SSI:

Surgical care is an integral part of health care throughout the world, with an estimated 234 million operations performed annually. However, surgical care is also associated with a considerable risk of complications and death. A study on the incidence and nature of in-hospital ad verse events has shown that 1 in every 150 patients ad mitted to a hospital dies as a consequence of an adverse event and that almost two thirds of in-hospital events are associated with surgical care(15).

Global Perspectives on Surgical Site Infections

Globally, rates of SSIs for individual procedures vary widely depending upon the patient population, size of hospital, experience of the surgeon, and methods used for surveillance. Tertiary hospitals generally have the lowest rates of SSI compared to small (500 beds) teaching hospitals (4.6 versus 6.4 and 8.2 percent, respectively)(16).

SSIs represent a formidable challenge in healthcare systems worldwide, imposing significant clinical and economic burdens(17). It ranks among the most prevalent surgical complications, constituting 38% of all hospital-acquired infections globally(18). SSIs are a major cause of morbidity and mortality worldwide, affecting 5.6% of surgical procedures in developing countries. According to a World Health Organization (WHO) report, the incidence of SSIs ranges from 1.2 to 23.6 per 100 surgical procedures(19). Worldwide, it has been reported that more than one-third of postoperative deaths are related to SSIs(20). A meta-analysis reported a global SSI prevalence of 4.0% in high-income countries and up to 11.8% in low and middle income countries(21). Studies in the United States and Europe have shown decreasing trends in SSI prevalence due to improved perioperative care, surveillance, and adherence to infection prevention protocols(1). Epidemiological evidence suggests that approximately 2–5% of surgical patients worldwide develop surgical site infections However, the incidence is different among developed and developing countries; more patients from developing countries are affected than those from developed countries. The incidence of SSI is 2.6% in United States of America, 1.6% in Germany and 2.9% in different settings of European countries. However, in developing countries, it accounts two times higher than the developed countries(22). The average incidence of SSI in China is

4.5% among patients underwent abdominal surgery. Currently, available data suggest that SSIs increase the length of hospital stay, readmission rate, morbidity, mortality, and financial burdens for individuals and communities(23). Patients with an SSI have approximately 7–11 additional postoperative hospital-days, 2–11-times higher risk of death. Patients who develop SSIs are up to 60% more likely to spend time in an intensive care unit, 5 times more likely to be readmitted and 2 times more likely to die(15). In USA, it accounts 33.7% of overall hospital-related annual costs and additional 11 days of hospitalization per patient(19).
According to the World Health Organization (WHO), SSIs account for 14% to 16% of all hospital-acquired infections. In LMICs, the prevalence of SSIs is estimated to be as high as 20%, due to limited resources, poor infection control practices, and insufficient surgical infrastructure(9).

Surgical Site Infections in Sub-Saharan Africa

The World Health Organization (WHO) identifies SSIs as the second most common cause of nosocomial infections in LMICs, with reported prevalence ranging from 11% to 26% in sub-Saharan Africa(22). In low- and middle-income countries, more than one in ten surgical patients developed SSI. Even the risk of SSI is three to five times more susceptible to SSI in low- and middle-income countries than in high-income countries(24).

SSI places a significant burden on both the patient and health system especially in Sub Saharan Africa, where resources are limited and the average wound infection rates are 2 or 3 times higher than developed countries due to malnutrition, poor, and preoperative preparation(11). Moreover, in developing countries where resources are limited, even basic life-saving operations, such as appendectomies and cesarean sections, are associated with high infection rates and mortality(25).

A study conducted on prevalence and predictors of surgical site infections among patients undergoing major surgery in Tanzania revealed its incidence is higher than that reported in developed countries(26). The overall surgical site infection rate was 26.0%, of which 86.2% were superficial SSIs and 13.8% were deep SSIs(27). Regarding the predictors' pre-morbid illness, duration of operation, use of iodine alone for skin preparation, use of drain and cigarette smoking were significantly associated with SSIs. In Sub-Saharan Africa, various study results showed that SSI rate is ranging from 11 to 18%(28).

Surgical Site Infection in Ethiopia:

SSIs have been reported to be one of the most common causes of nosocomial infections accounting for 20 to 25% of all nosocomial infections particularly in Ethiopia and worldwide(29). In Ethiopia, the prevalence of SSI vary from hospital to hospital even from ward to ward and it ranges from 14.8–59% and also 6.5% from private hospitals up to 13.4% in public hospitals(18). A systematic review and meta-analysis found the pooled prevalence of SSIs in Ethiopia to be around 19.1%(30). Hospital-based studies in different regions of Ethiopia report SSI rates ranging from 10% to 30%, reflecting the variability in infection prevention and surgical care practices(30). Several studies conducted in Ethiopia reveal varying prevalence rates of SSIs depending on hospital setting and surgical discipline. For example, a study in Tikur Anbessa Hospital reported an SSI rate of 5.6%(31), while another in Jimma University Specialized Hospital found a rate of 11.4%(32). These variations reflect differences in hospital hygiene, perioperative care, and adherence to infection prevention guidelines(9).

Factors Associated with SSIs:

Numerous risk factors identified in various literature sources contribute to the predisposition to SSI, including pre-existing illnesses, duration of the operation, length of hospital stay, wound class, and wound contamination(18). Established risk factors for SSIs include age, gender, immune status, perioperative hyperglycemia, pre-existing diabetes, obesity, malnutrition, recent tobacco use, pre-existing remote body site infection, colonization with microorganism, perioperative hypothermia, the improper use of antibiotics and inappropriate pre and intra-operative techniques, type of wound, emergency surgical procedure and prolonged duration of surgical(33). Despite this fact, various authors have repeatedly identified, such as male gender, residence, nutritional status, advanced age and significant blood loss were highly associated with SSIs(20). Other risk factors for SSI are typically separated into patient-related (pre-operative), procedure-related (peri-operative) like type of surgery (emergency vs elective), duration (>2 hrs), use of drains, and foreign bodies and duration of surgery, wound classification (clean, clean-contaminated, contaminated, dirty) are intraoperative risk factors, and post- operative categories(33). System-related: hospital environment, hand hygiene, use of prophylactic antibiotics, poor postoperative care,

sterilization practices, surgical team experience(11). Changeable patient-related risk factors include poorly controlled diabetes mellitus, obesity, tobacco use, use of immunosuppressive medications, and length of preoperative hospitalization(22). Procedure-related risk factors include wound class, length of surgery, and shaving of hair, hypoxia, and hypothermia(23).

Research Gap and Relevance to Wolkite University Referral Hospital

As far as I searched in google scholar and Pubmed, there is No published research on magnitude of SSIs in Wolkite University Referral Hospital. Understanding local prevalence and risk factors is crucial for targeted interventions, patient safety improvements, and hospital policy development. Wolkite university comprehensive specialized hospital shares common challenges faced by most regional hospitals in Ethiopia, such as shortages in sterilization equipment, inadequate staffing, and lapses in perioperative antibiotic prophylaxis. This retrospective analytic study in this hospital would help establish the actual burden of SSIs. As far as I searched, this is the first study to assess magnitude and factors associated with SSIs in this setting.

Conceptual framework

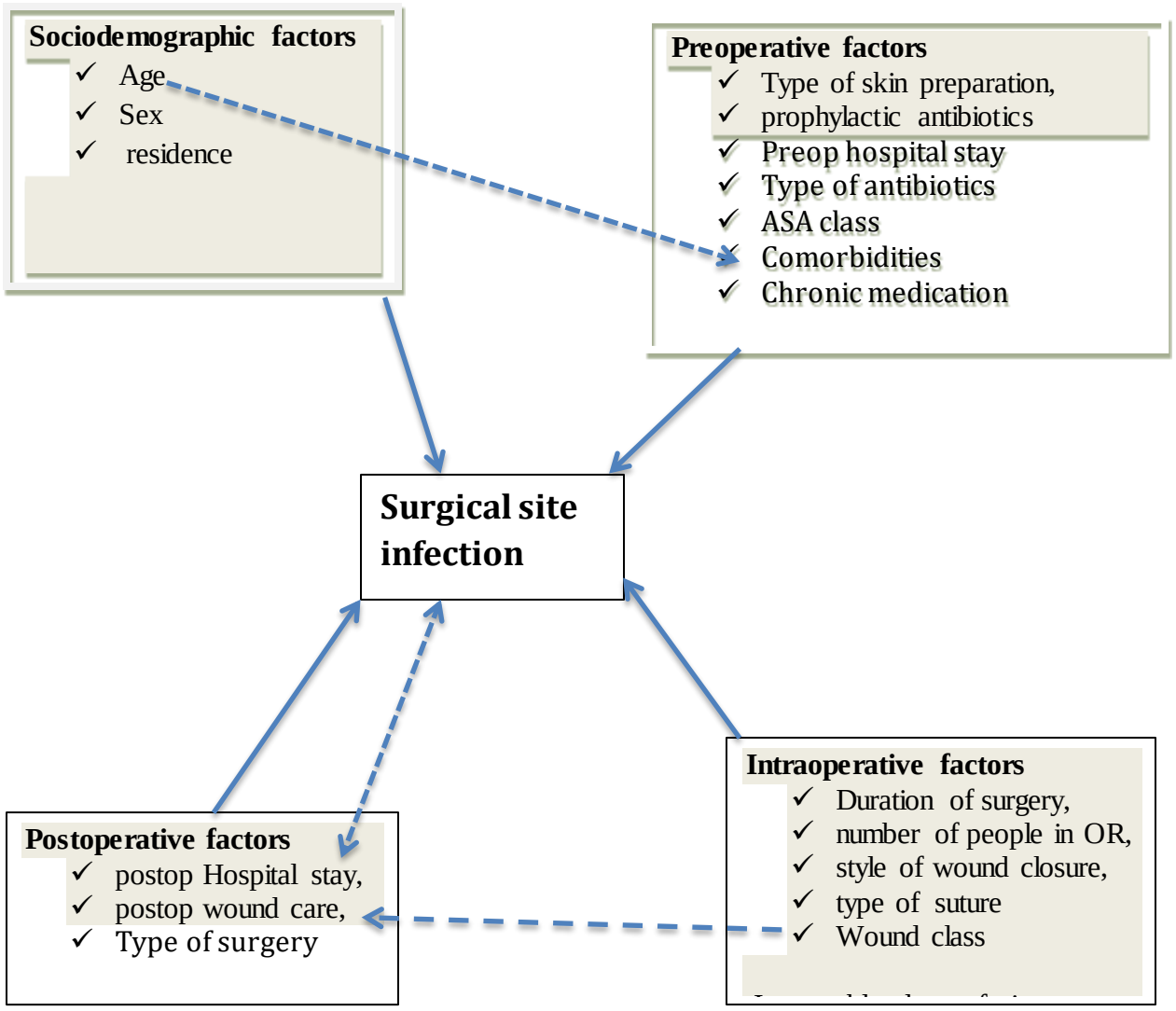

Figure 1: conceptual framework

CHAPTER 3: METHODS AND MATERIALS

3.1. Study area

Wolkite University comprehensive specialized Hospital (WUCSH) is found in central region of Ethiopia, located in Wolkite town of Gurage Zone at a distance of 158 km south to the capital city, Addis Ababa. The teaching hospital was established in 2019 and serves for about 4 million people in the region. It has a total capacity of 220 inpatient beds in four major departments and other units with a total of 115 physicians, 240 non-physician health professionals and 156 supportive and technical staffs. Every month, in average, 454 surgical patients visit the hospital out of which 82 patients are admitted to the surgical ward.

3.2. Study period

The study period was a one year study (from September1, 2024 to August 2025) with a data extraction period in the month of October 2025.

3.3. Study Design:

The study utilized cross-sectional study design.

3.4. population

3.4.1. Source Population:

The study involved all patients who were operated on and admitted to surgical ward of Wolkite university comprehensive specialized hospital with in the last 12 months preceding the study.

3.4.2. Study Population:

All Patient cards who had major surgeries and met the inclusion criteria during the study period.

3.5. Sample size and sampling procedure

The sample size is calculated using a single population proportion formula:

$$n = \frac{Z^2 * p * (1 - p)}{d^2}$$ for 95% confidence level

Assuming:

p-estimated prevalence (11.5%), taken from a research published in 2020(36).

It is the prevalence of SSI in Debre Tabor hospital, which is a comparable setting to Wolkite university hospital and is a recent research published in reputable journals.

d- Margin of error (5%)

Confidence level = 95% (Z = 1.96)

$n = (1.96)^2 * 0.115 * (1 - 0.115) / (0.05)^2 = 156$

adding 10% accounting for incomplete records of study participants.

16 + 156 = 172

The final sample size is **172** patients

3.6. **Sampling technique**:

A systematic random sampling method was used after a list of all post-operative patients admitted during the study period is compiled. The total number of eligible patients (N-984) was estimated based on hospital records like procedure and follow up registries. It is computed by considering the previous study has demonstrate that, so simply take 11.5%(36). And 95% confidence level and 5% margin of error. The largest sample size was considered (n = 172). And each study participant was selected by systematic random sampling method from post-operative patients' who undergone surgery at Wolkite university referral Hospital during the study period. The sampling interval (K) was calculated as: $\boldsymbol{K}$**=984/172=5.7~6**

The first participant was selected randomly from the first 6 records using a lottery method and Subsequent participants was selected at regular intervals (every 6^{th} patient) until the required sample size is reached. A sampling frame was prepared from the 984 operated cases.

3.7. **Inclusion and exclusion criteria**

3.7.1. **Inclusion criteria**

*Patients who undergone major surgery and had been admitted to surgical ward within the study period.

*Patients who have complete clinical records

4.7.2. **Exclusion criteria:**

- ✓ Patients who are transferred in from other institutions
- ✓ Patients with incomplete medical records i.e. if more than 10% of data is missing.

3.8. Study Variables

Dependent Variable:

Surgical site infection (Yes/No)

Independent Variables:

*__Sociodemographic factors__: age, sex, residence,

*__Pre-operative factors__: HTN, DM, smoking, chronic medication

preop hospital stay(days), timing of antibiotic prophylaxis, ASA class

*__Intra-operative factors__: type of surgery, duration of surgery, wound class, use of drains, and number of people in the OR,

*__Post-operative:__ hospital stay, wound care, use of antibiotics,

3.9. Data collection tools and procedures

Data was collected using a structured checklist form which was adapted from CDC and WHO SSI incident guideline. The checklist is designed to systematically capture relevant information and consists of four major sections. Data was collected from Patient medical charts and operation notes. Direct observation and HMIS of surgical lists and operation registries also served as data sources. Data collectors were Trained BSc nurses and medical interns who took training on data extraction process, and components of the checklist for half a day.

3.10. Data processing and analysis

The collected data was checked for its completeness manually and then entered and analyzed using SPSS v27. Descriptive statistics including percentage, frequency distribution, mean and standard deviation was used to describe the data on surgical site infection. A Bivariate logistic regression analysis was done to see the association between the risk factors and outcome variable. Then, multivariable logistic regression analysis was employed by selecting only variables with P-value <0.25 in the bivariate analysis. Adjusted

Odds ratio with 95% CI is going to be used to measure the strength between dependent and independent variables. P value < 0.05 was used to determine level of statistical significance.

4. Ethical consideration

Ethical clearance was obtained from Wolkite University IRB and Data confidentiality was ensured by anonymizing records and the data was used only for research purpose.

5. Dissemination of results

Results will be submitted to Wolkite University and Shared with hospital leadership and surgical staff. It will also be presented at relevant conferences and submitted for publication in peer-reviewed journals.

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CHAPTER 4: RESULTS

4.1 Sociodemographic and preoperative clinical characteristics

A total of 984 patients underwent both emergency and elective surgeries during the study period. Of these patients, 4 were excluded from the study due to incomplete data and failure to meet the inclusion criteria and only 168 patient cards (yielding a response rate of 97.7%) were enrolled in the study. From a total of 168 patients, 110(65.5%) were males. The mean (±SD) age of the patients was 48.30(±13.91) years and about 98(58.3%) of the patients were rural residents (Table1).

Table 1: Sociodemographic and preoperative clinical characteristics (n=168)

variable	category	Frequency	Percentage
Gender	Male	110	65.5
	Female	58	34.5
Residence	Urban	70	41.70
	Rural	98	58.3
Chronic medication	Yes	22	13.1
	No	146	86.9
Hypertension	Yes	21	12.5
	No	147	87.5
ASA class	I	44	26.2
	II	33	19.6
	III	11	6.5
	Unrecorded	80	47.6
Diabetes	Yes	8	4.8
	No	160	95.2
Type of surgery	Elective	63	37.5
	Emergency	105	62.5
Wound class	Clean	57	33.9
	Clean-contaminated	89	53
	Contaminated	22	13
Specialty	General surgery	131	78
	Orthopedics	22	13.1
	Neurosurgery	15	8.9
Skin preparation	Povidone	154	91.7
	Povidone+alcohol	14	8.3

4.2. Magnitude of surgical site infection and other clinical variables

The overall magnitude of surgical site infection in this study was found to be 14.9% (95%CI 9.9-21.2).

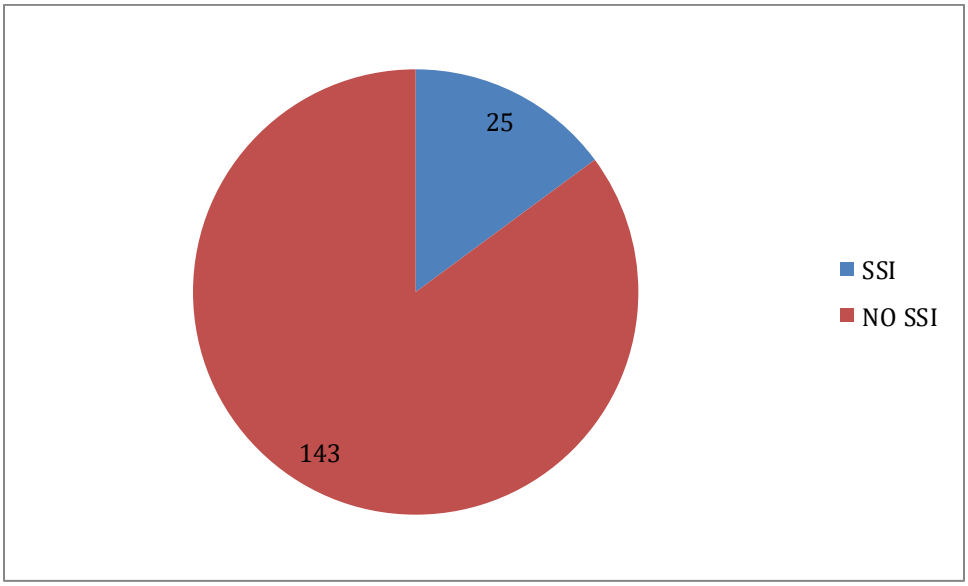

Figure 2: pie chart showing magnitude of SSI (n=168)

Most of the operations were emergency (62.5%) and the rest (37.5%) were elective. Most procedures (63.1%) lasted more than two hours and a quarter of the patients had surgical drain left in situ, All patients (100%) took ceftriaxone 1gm iv as a prophylactic antibiotics within an hour before surgery. The mean (±SD) hospital stay was 7.83 (±10.07) and the post-operative hospital stay ranges from 2 up to 45 days. Only 4(2.4%) of patients had intraoperative transfusion and sudden glove perforation was reported in only 9(5.4%) of patients. One hundred twenty (71.4%) patients had sterile and timely wound care.

Table 2: Intra and postoperative variables

Variables	category	Frequency	Percentage
Suturing style	Interrupted	119	70.8
	Continuous	28	16.7
	Subcuticle	21	12.5
Suture type	Vicryl	141	83.9
	Silk	27	16.1
Type of SSI	Superficial	22	88
	Deep	3	12
Treatment given	Iv antibiotics	14	56
	Wound care only	8	32
	Relaparotomy	3	12

4.3 Factors associated with surgical site infection

The association of independent variables with the dependent variable was investigated using both bivariate and multivariate logistic regression model. Hosmer-Lemeshow goodness –of-fit test (p-value of 1) was used to check model fitness with the data set. In the binary logistic analysis, 10 independent factors had a $p < 0.25$ (patient's age, use of chronic medication, type of surgery, wound class, longer preoperative stay, presence of large number of people in the OR, longer postop hospital stay, higher ASA class, duration of surgery, and having surgical drain) were entered in to multivariate analysis and only 5 variables (surgical drain, older age, contaminated wound, large number of people in the OR and longer postop hospital stay) remained statistically significant at the 95% CI level. Elderly patients have 1.45 times increased risk of developing SSI than younger patients. Patients who have pronged postoperative hospital stay have 1.29 times (95%CI: 1.08-1.54) increased risk of developing SSI than early discharged patients.

The variable class of contaminated wound had 3.09 times (95%CI: 1.09-8.78) added risk of SSI than clean wounds. Patients who had drain had 8.12 times (95% CI: 2 .41-27.39) increased risk of SSI than patients who do not have surgical drain insitu. Another variable found to be significantly associated with SSI is large number of people in OR (P-value: 0.009, AOR: 3.28, 95%CI: 1.35-7.93).

Table 3: Multivariable analysis of factors associated with SSI in 2025, WUCSH, Ethiopia (n=168)

Variables	**Category**	**SSI**				**P-**
		Yes	No	**COR 95% CI**	**AOR 95%CI**	**value**
Number of people in the OR				2.43(1.75-3.35)	**3.28(1.35-7.93)**	**0.009**
Surgical drain	Yes	12	30	0.28(0.12-0.70)	**8.13(2.41-27.39)**	**0.001**
	No	13	113			
ASA class	I			1	1	1
	II			1.17(0.91-1.51)	2.21(1.14-4.31)	
	III			1.84(0.66-5.13)	1.23(0.66-3.13)	
	IV			1.31(0.72-3.54)	1.15(0.45-2.92)	0.775
Preop hosp stay				0.42(0.28-1.32)	1.15(0.01-1.98)	0.150
Postop stay(days)				1.47(1.19-1.80)	**1.29(1.08-1.54)**	**0.004**
Age(years)				1.27(1.14-1.44)	**1.45(1.10-1.93)**	**0.009**
Wound class	I			1	1	1
	II			0.42(0.08-2.28)	3.48(1.44-8.40)	
	III			2.21(1.14-4.31)	**3.09(1.09-8.78)**	**0.034**
Chronic medicat	Yes			.44(0.19-1.07)	1.74(0.47-6.41)	0.404
	No			1	1	1
Type of surgery	Emergency			2.60(1.04-6.55)	2.19(0.46-10.42)	0.321
	Elective			1	1	1
Duration of surgery	>2hrs			1.34(0.41-3.57)	2.61(1.04-6.55)	0.40
	<2hrs			1	1	

CHAPTER 5: DISCUSSION

5.1 Magnitude of Surgical site infection

This study result showed that the magnitude of surgical site infection was high; we found that 14.9%(95% CI: 9.9%, 21.2%) of the clients who undergone surgery had surgical site infection which is in line with the report of the systematic review and meta-analysis in Ethiopia(17), the study done in Ethiopia like Jima University Hospital 11.4%(32), Wolaita Sodo Teaching and referral hospital 13%(6), a systematic review and meta-analysis study 12.3% (14), Southern hospitals of Ethiopia 11% (24) study in India 13.04% (19) in Mwanza Tanzania 10.9%(26).

Even though many hospitals in Ethiopia are planning to have zero SSI, it has continued to be a drawback of quality of surgical care(11). The findings of this study on SSI prevalence rate are lower than studies done in Tanzania where SSI is 26.0%(27). Hospital-based studies in different regions of Ethiopia report SSI rates ranging from 10% to 30%, reflecting the variability in infection prevention and surgical care practices(30). However, our study was higher than, the studies conducted in developing countries 6%(7), the study done in Italy 5.2% (15), 4.09% in Turkey(37).The possible explanation for this might be care of the patient and time difference of the study The difference in reported prevalence could be due to difference in study setting and study design. This finding was lower than the study conducted in Ethiopia at Tikur Anbessa Hospital, Addis Ababa (47 to 59%) (31). However, the prevalence is higher than studies conducted in other hospitals of Ethiopia, such as in Felege Hiwot Referral Hospital, 10.2%, (28).

5.2. Factors associated with surgical site infection

Multivariate logistic regression analysis results showed older age, longer post-operative hospital stay, presence of surgical drain, High OR traffic and contaminated wound were found to be significantly associated with SSI at p-value of ≤ 0.05. These risk factors were also identified in researches conducted with a larger number of patients and involving general surgeries. Regarding age of the patients, as age increases, likelihood of developing SSI (p-value 0.009, AOR: 1.45(95%CI: 1.10-1.93) also increases. The high prevalence of SSI in elderly patients may be related to low immunity associated with old age(25).

Another variable that showed a statistically significant association with SSI was the longer postop hospital stay (P-value-0.004, AOR: 1.29, 95%CI: 1.08-1.54). This variable was

consistently reported as a risk for SSI in other many studies(17). It is inferred that this may be related to a longer exposure of the incision site to hospital pathogens. The variable class of wound was also statistically associated with SSI (p=0.034, AOR 3.09, (%%CI: 1.09-8.78). The wound class is reported in several literatures as a risk factor associated with SSI which necessitates careful assessment of the nature of wound before surgery. These findings are also similar in a study reported from Felege Hiwot Referral Hospital(34), Nepal(39), and India(19). Another statistical significant association was also obtained between surgical drain and surgical site infection. Patients who had drain (P-value: 0.001 AOR = 8.13, 95% CI: 2 .41-27.39) are more likely to have surgical site infection as compared to those patients who never used to have drain. The result is consistent with the studies done in university hospitals like Jimma(32), Wolaita Sodo(6), and the systematic and meta-analysis study done in Ethiopia(14), The probable reason for this could be that having drain in-situ affects ambulation of the patient and increases morbidity and may serve as an entry point for pathogens as well. Another variable found to be significantly associated is large number of people in OR (P-value: 0.009, AOR: 3.28, 95%CI: 1.35-7.93). Number of people in the operating theatre may be increased as it is a teaching hospital. This would result in repeated OR door openings, increased Airborne Microbial Contamination, increased Personnel as Sources of Pathogens. WHO and CDC infection prevention guidelines recommend minimizing OR traffic to reduce SSI risk.(3)(40)(40)(40)(40)(39)(38)(38)(38)(38)(38).

Strength and limitations of the study

Strengths:

- The first of its kind in the hospital
- Used a structured checklist adapted from WHO and CDC guidelines
- High response rate, 97.7%
- Rigorous statistical analysis with multivariate logistic regression

Limitations

- Being Single center study which limits generalization to other settings
- Possible underestimation of SSI magnitude because patients might develop infection after being discharged from hospital
- Being Retrospective study

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The overall magnitude of SSI was 14.9%. Surgical site infection at Wolkite University Comprehensive Specialized Hospital is influenced by patient-related factors (older age), procedure-related factors (contaminated wounds and surgical drains), and hospital-related factors (high OR traffic and prolonged postoperative stay). Targeted strategies addressing these risk factors are essential to reduce SSI prevalence and improve surgical outcomes.

6.2 Recommendations

To surgeons: optimize Surgical Drain Use

They should have a standardized protocol for drain insertion, maintenance and timely removal.

Department of surgery: Promote safe early discharge:

Surgery department has tp device a discharge protocol

As early discharge planning for patients with stable vital signs and clean, uncomplicated wounds, combined with proper outpatient follow-up is important to prevent SSI.

OR head nurse:

Need to monitor OR traffic strictly

Healthcare workers:

Focus on High-Risk Patients

Special attention should be given to elderly patients and those with contaminated wounds, including careful preoperative preparation, intraoperative precautions and close postoperative monitoring to reduce the risk of surgical site infections.

Future researchers: better to do prospective study on SSI.

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Annex II: Surgical Site Infection (SSI) Data Collection Checklist

Instructions: This checklist is to be completed by data collectors for each eligible patient. Use patient medical records, operation notes, and follow-up documentation. Tick appropriate boxes or fill in values as needed.

SECTION I: **Patient profile**

Variable	Response
Patient MRN	_____
1. Age (in years)	_____
2. Sex	☐ Male ☐ Female
3. Residence	☐ Urban ☐ Rural
4. Smoking Status	☐ Smoker ☐ Non-smoker
5. Alcohol intake	☐ alcoholic ☐ Non-alcoholic
6. Chronic medication	☐ Yes ☐ No
7. Diabetes Mellitus	☐ Yes ☐ No
8. Hypertension	☐ Yes ☐ No
9. HIV/AIDS	☐ Positive ☐ Negative ☐ Unknown
10. Other comorbidities (specify)	_____

SECTION II: Preoperative Factors

Variable	Response
11. Preoperative hospital stay (days)	_____
12. Antibiotic prophylaxis given?	☐ Yes ☐ No
13. Timing of prophylactic antibiotic	☐ <1 hr ☐ >1 hr ☐ Not given
14. Type of prophylactic antibiotic used	_____
15. Skin preparation used	☐ Povidone-iodine ☐ Alcohol-based ☐ both

SECTION III: Intraoperative Factors

Variable	Response
16. Date of Surgery	_____
17. Type of Surgery	☐ Elective ☐ Emergency
18. Surgical specialty	☐ General ☐ Ortho ☐ Neurosurgery ☐ Other
19. Wound classification	☐ Clean ☐ Clean-contaminated ☐ Contaminated ☐ Dirty
20. Technique of wound closure (suturing)	☐ interrupted☐ continuous ☐ III ☐ subcuticle
21. Suture used	☐ vicryl ☐ silk☐ III ☐ catgut
22. ASA score (if available)	☐ I ☐ II ☐ III ☐ IV
23. Duration of surgery (hours)?	☐ <1 ☐ 1-2 ☐ III ☐ >2
24. Use of surgical drain?	☐ Yes ☐ No
25. Glove perforation reported?	☐ Yes ☐ No ☐ Unknown
26. Number of people in operating room?	_____
27. Intraop blood transfusion?	☐ Yes ☐ No

SECTION IV: Postoperative Factors

Variable	Response
28. Postoperative hospital stay (days)?	_____
29. Postoperative wound care documentation?	☐ Adequate ☐ Incomplete
30. Antibiotic continued post-operatively?	☐ Yes ☐ No ☐ Not recorded
31. Surgical site infection occurred?	☐ Yes ☐ No
31.1. If YES, SSI type	☐ Superficial ☐ Deep ☐ Organ/Space
31.2.Date of SSI diagnosis	_____

31.3.Method of diagnosis	☐ Clinical ☐ Microbiological
31.4.Treatment given for SSI	☐ Oral ABX ☐ IV ABX ☐ Reoperation ☐ Wound care only
31.5. Patient outcome	☐ Recovered ☐ Re-admitted ☐ Re-operated ☐ Died ☐ Ongoing follow-up

Remarks:

_____

_____

_____

_____

_____

_____

_____