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Surgical Site Infections and Associated Factors Among Patients who Had Abdominal Operation in Bichena Primary Hospital, East Gojjam Zone, Amhara Region, North West Ethiop, 2022.

Shegaw, Getinet

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

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Surgical Site Infections and Associated Factors Among Patients who Had Abdominal Operation in Bichena Primary Hospital, East Gojjam Zone, Amhara Region, North West Ethiop, 2022.

Principal Investigator: Shegaw Getinet(Bsc,MSC STUDENT)

BAHIRDAR, ETHIOPIA, AUGUST, 2022.

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A RESEARCH PAPER SUBMITED TO BAHIR DAR UNIVERSITY, COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF MEDICINE, DEPARTMENT OF INTEGRATED EMERGENCY SURGERY AND OBSTETRICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTERS IN INTEGRATED EMERGENCY SURGERY AND OBSTETRICS.

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3	PROJECT TITTLE	MAGNITUDE OF SURGICAL SITE INFECTIONS AND ASSOCIATED FACTORS AMONG PATIENTS WHO HAD ABDOMINAL OPERATIONS		
4	TOTAL BUDGET	TEWENTY FOUR THOUSAND SEVEN HUNDRED FIFTEEN ETHIOPIAN BIRR.		
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6	PROJECT AREA	BICHENA PRIMARY HOSPITAL		
		EAST GOJJAM ZONE, AMHARA REGION, NORTH WEST ETHIOPIA		

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Candidate's Declaration form

This is to certify that magnitude of surgical site infections and associated factors among patients who had abdominal operation in Bichena primary hospital; 2022GC**.**The Thesis was submitted in partial fulfillment of the requirements for the degree of masters of Science in integrated emergency surgery and obstetrics Department of integrated emergency surgery and obstetrics. Bahir Dar University is given me the opportunity as a record of original work carried out by me and has never been submitted to this or any other health institution to get any other degree and certificates. The articles were properly cited, assistance and help I received during the course of this investigation had been acknowledged.

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This is to certify that I have supervised, read, and evaluated this Thesis result titled magnitude of surgical site infections and associated factors among patients who had abdominal operation in Bichena primary hospital; 2022GC**,** submitted by Shegaw Getinet in partial fulfillment of the requirements for the degree of masters of science in integrated emergency surgery and obstetrics, Department of integrated emergency surgery and obstetrics. Bahir Dar university, is Prepared under my guidance. I recommend the Thesis result were be submitted for Defense.

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We here by certify that we have examined this Thesis result entitled **"**magnitude of surgical site infections and associated factors among patients who had abdominal operation in Bichena primary hospital; 2022GC**,** submitted by Shegaw Getinet and We recommend and approved this Thesis result a degree of "Master of Integrated Emergency Surgery (Obstetrics,Gynecology and General Surgery)"

Board of Examiners

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Abstract

Background: Surgical site infections are infections that occur at or near surgical incision within 30 days of operation or within 1 year if implant is placed. The incidence varies from hospital to hospital. Several factors affect the development of surgical site infections. Even though the extent of surgical site infection in Ethiopia is high, there are no published studies on abdominal surgical site infection and no baseline information regarding SSI in Bichena Primary Hospital, North West Ethiopia.

Objective: The aim of the study was to assess the magnitude and associated factors of surgical site infections among abdominal operated patients in Bichena primary Hospital, Bichena Town, East Gojjam Zone, Amhara Region, Ethiopia, 2022.

Methods: A hospital based retrospective cross sectional study was conducted among all abdominal operated patients in two years. The sample size was computed for single population proportion magnitude of surgical site infection and the sample size was estimated to be 163. Adding 10%contingency a total 183 was the total sample size required. A pre-designated and pretested check list was used to collect the data. The data was collected by 2 BSc nurses trained for the data collection using a checklist prepared for the data collection. Data was analyzed using Epi-data version3.1.1 and export to SPSS 22.0 software for descriptive statistics and regression and the level of confidence was p-value<0.05.

Results: Among the total of 164 patients who had abdominal operation, the total magnitude of SSI was 44(26.8%) and with 95% confidence the true estimate lays between 20.1% to 33.5%.On multivariate logistic regression and with 95% confidence the true estimate lays between (95%CI:[20.1%-33.5%]).

On multivariate logistic regression analysis Patients with associated medical illness was 3.38 times more likely to develop SSI than those who do not have associated medical illness AOR=3.375(95%CI: [1.325,8.599,p<0.001]), and Patients admitted 5-7 days 91.1% times less likely AOR=0.089(95%CI: [0.076,0.953,p=0.002]), 8-14days 78.3% times less likely AOR=0.217(95%CI:[0.078,0.754,p=0.005]),and 15-21 days 72.4% times less likely AOR=0.276(95%CI: [0.047,0.599,p=0.001]) to develop surgical site infection than as compared to >=22days of post operative admissions.

Conclusion: The magnitude of SSI in the study institution was high.Surgical site infection is a major drain on hospitals catering to a high volume of patients. Associated medical illness and longer hospital stay were the important factors for development of surgical site infection.

Acronyms and abbreviations

AOA adjusted odd ratio

ASA American society of anesthesiologist

BSC Bachelor of Science

CDC Centers for disease control

CI confidence interval

GC Gregorian calendar

HAI Hospital acquired infection

HDI Human development index

ICU Intensive care unit

IESO Integrated emergency surgical officer

IPD In patient department

IHRERC Institutional health research and ethical review committee

LBO Large bowel obstruction

LMICs low and middle income countries

MPH Master of public health

MRN Medical record number

NI Nosocomial infections

NINSS Nosocomial infection national surveillance

NNIS National nosocomial infection surveillance system

OAP Oral antibiotic prophylaxis

OR Odds ratio

PI	Principal Investigators
RR	Relative risk
SBO	Small bowel obstruction
SSI	Surgical site infection
USA	united States of America
WHO	World health organizations

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1. INTRODUCTION

1.1 Background:

Surgical site infections (SSI) are infections that occurs at or near surgical incision within 30 days of operation or within 1 year if implant is placed .SSI is defined as a proliferation of pathogenic microorganisms which develops in an incision site either within the skin and subcutaneous fat (superficial) and musculofascial layers (deep) or in an organ or cavity, if opened during surgery (1).SSI is identified with redness, inflammation, heat, pain, a temperature of 38 0cSeptic drainage from the surgical site during the 30 days following operation (2).

SSI are a real problem to the surgeons and are considered as major infection control concern across the world. In the United States, every year SSI develops in 2%-5% of patients, resulting in at least 500,000 infections, 3.7 million excess hospital days and $1.6 billion in extra hospital charges. SSI are the most common nosocomial infections; accounting for 38% of hospital acquired infections (3).

According to a research done in journal of Medical science, and clinical Research, in elective surgeries, 3 patient developed SSI. In Emergency Surgeries, 8 patients developed SSI(4).SSI remain a major cause of morbidity and death among the operated patients and continue to represent about a fifth of all healthcare-associated infections. Although at least 5% of patients develop an SSI after surgery, these infections seem to cause remarkably little concern, remaining largely unreported in the media. Despite improvements in operating room practices, instrument sterilization methods, better surgical technique, and the best efforts of infection prevention strategies, surgical site infections remain a major cause of hospital-acquired infections and rates are increasing globally even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis. .

In the developed countries, SSI has been reported to affect from 5% to 15% of hospitalized patients in regular wards and as many as 50% or more of patients in intensive care units (ICU), while in developing countries the magnitude of the problem remains largely underestimated (5). According to world health organization (WHO), the risk of SSI in developing countries is higher than in equivalent surgical

procedures carried out in high-income countries. This is especially so in sub-Saharan Africa which accounts 15.5%(6).

Worldwide, SSI occur in 2%–20% of patients after operation, and the rate differs according to the environment in which operations are performed, local resources, and a number of patient- and surgery-related factors such as a research conducted in Iran teaching hospital on SSI the prevalence was 17.4%(7). Rates are likely higher in low and middle income countries (LMICs), and one study has shown as much as a 20%SSI rate in women in Africa who have cesarean sections (8).In LMICs, the pooled incidence of SSI was 11.8 per 100 surgical procedures.

In Africa, SSI was the leading infections in hospitals and incidence ranged from 2.5–30.9%. Substantial evidentiary variation on the prevalence of SSI exists across the globe, such as 10.56% in Nnewi, 53% in Iran, and 16.4% in Uganda(9).

SSI is the most common complication following major gastrointestinal surgery, affecting between 25% and 40% of patients after mid-line laparotomy in high-income settings (10). .SSI have also been associated with the emergence multi-drug resistant bacteria. We highlight preoperative, intraoperative, and postoperative interventions to combat SSI(11).

Several risk factors are known in the literature as predisposing to SSI and make up the surgical infection risk index of the National Nosocomial Infection Surveillance System (NNIS), such as the American Society of Anesthesiologists (ASA) index, which classifies patients according to their clinical condition, the Wound class, which represents the classification of the surgical wound be the surgical team in terms of the potential presence of microorganisms and; the Duration of Surgery(12).

Traditionally, local factors such as the degree of contamination and the surgical technique have been regarded as strong predictors for surgical site infection and wound dehiscence. More recent studies, however, have disregarded the significance of surgical technique, and others have identified systemic factors such as high age, gender, lifestyle, and coexisting morbidity as playing a significant role in the pathogenesis of these complications. Factors like site of surgery, size and depth of incision, antibiotic prophylaxis, instruments and suture material being used, wound

closure technique, patient related factors like co- morbidities and life style habits like smoking have significant effect on occurrence of such events. Surgical antimicrobial prophylaxis should be administered so as to ensure adequate tissue levels of antimicrobial from the time of the initial surgical incision until closure.

Rational antimicrobial use and continuing surveillance of bacterial antimicrobial sensitivity tests at local level are necessary to reduce emergence and spread of resistant bacteria isolates(13). The practice of aseptic technique during and after surgery should be the primary support rather than over-reliance on antibiotics to reduce emergence and spread of resistant pathogens.(1).

In Ethiopia, different studies reported that the, estimated pooled prevalence of SSI was 9.4%-25.22%.(14).

Therefore, the aim of this study were to assess the magnitude of abdominal surgical site infections and factors associated with it among surgically operated patient's cases in Bichena primary hospital.

1.2 Statement of the problem:

Surgical site infection is one of the most common surgical complications in the world; particularly in developing countries surgical infections constitute a large burden of disease globally. The increasing rate of antimicrobial drug resistance, likely related to antibiotic misuse, adds to the challenges.

Development of surveillance, infection prevention, and antimicrobial stewardship programs are initial steps forward(8).SSI remain a major cause of morbidity and death among the operated patients and continue to represent about a fifth of all healthcare-associated infections. Although at least 5% of patients develop an SSI after surgery(6) ,these infections seem to cause remarkably little concern, remaining largely unreported in the media.

Even though the extent of surgical site infection in Ethiopia is high, there are no published studies on abdominal surgical site infection and there is no baseline information regarding SSI in Bichena primary Hospital, North West Ethiopia. Therefore, it is necessary to conduct this study to establish the magnitude, and associated factors of abdominal surgical site infections in Bichena primary hospital. Despite improvements in operating room practices, instrument sterilization methods, better surgical technique, and the best efforts of infection prevention strategies, surgical site infections remain a major cause of hospital acquired infections (HAI) and rates are increasing globally even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis (15).

In the developed countries, SSI has been reported to affect from 5% to 10% of hospitalized patients in regular wards and as many as 15%-40% of patients in intensive care units (ICUs), while in developing countries the magnitude of the problem remains largely underestimated.SSI is the most common complication following major gastrointestinal surgery, affecting between 25% and 40% of patients after mid-line laparotomy in high-income settings (16).

In African countries the SSI rate reported has been found to be higher than that of developed countries - a case in point is a study done in sub Sahara Africa reported that the SSI rate was 15.5%(6). Based on CDC (1999) criteria for the detection of SSI, 15.6% and 13.58% of patients were found to have developed SSI in the year

2013 and 2014 respectively in a research conducted in university teaching hospitals in Abuja, Nigeria (17).

And according to the centers for disease control (C DC's) definitions review article report in Pakistan in 2017, 42.19% of the patients had a superficial, 40.1% had deep, and 17.71% had an organ/space SSI(18). Although high incidence of SSI is suspected in Ethiopia, the magnitude of the problem is not known, especially for abdominal surgeries. However, the estimated overall SSI rate was reported to be 12.3% in general surgical wards of teaching hospitals and 25.5% in Amhara region. In addition, previous study to assess NIs in the country showed that surgical site infection was the second commonest cause of nosocomial infection in Obstetrics and Gynecology than in general surgical wards (19).This research is needed, data in Ethiopia about SSI following emergency operation is still scarce and the true magnitude and associated factor not studied.

SSI leads to serious consequences, including increased costs due to its treatment and increased length of hospital stay(20). The risk of death in patients with SSI is increased when compared to those who did not develop an infection. The serious consequences imposed on patients who developed SSI determine the need for efforts to create strategies for the prevention of this infection. One of the strategies used is the determination of risk factors, which allows identifying clinical situations or conditions that predispose to the development of SSI(21).

The identification of risk factors contributes to the creation of SSI prevention strategies, thus allowing health professionals to take actions that reduce complications resulting from infections and minimize SSI rates(22).The purpose of this study is to assess the magnitude and associated factors of SSI on abdominal operations through a retrospective cross sectional medical chart review in Bichena Primary Hospital in 2022G.C.

1.3. Significance of the Study:

The result of the study would help Physicians, surgical ward nurses, operation theatre professionals and hospital managers to understand the magnitude of the problem and factors associated with SSI; it would also help the professionals to use appropriate infection prevention methods to combat the problem.

The information from this study would also serve as a baseline data for further researchers in the area by sitting the magnitude.

2 .LITERATURE REVIEW

2.1.Magnitude of Surgical Site Infections:

According to multi center cohort study by global surgical collaborative, the incidence of SSI varied between countries with high [9·4%], middle [14·0%], and low [23·2%] HDI (Human Development index) . The highest SSI incidence in each HDI group was after dirty surgery [17·8%] of patients in high-HDI countries; [31·4%] of patients in middle-HDI countries; [39·8%] of patients in low HDI countries. This study also found an association between SSI and death, with a three-fold increase from 1·5% in patients without SSI to 4·7% in patients with SSI(23).

In a study done in India Department of Physiology, G R Medical College, Gwalior, MP, reported that the overall surgical wound infection rate was 18.12% (24). Infection rate is 3.64% in clean wounds where as it was 41.17% in dirty wounds.The infection rate was more with emergency surgery (34.21%) when compared to elective surgery (14.93%) which was statistically significant (21).

According to systematic review and meta- analysis in 226 studies,the incidence varied from 5.8 in Europe to 12.6 per 100 appendectomies in Africa. The incidence of SSI increased when the level of income decreased, from 6.2 in high- income countries to 11.1 per 100 appendectomies in low- income countries(15).

According to a prospective multi- center study, the overall incidence of SSI in Italian Hospitals, was 5.2% which is lower than that reported in other Italian (range 5.4%–12.8%).The highest SSI incidence rates were observed in colon surgery (18.9%), gastric surgery (13.6%), and appendectomy (8.6%); the remaining surgical procedures had lower and similar SSI rates (range 3.2–4%) (25).

According to a hospital based, cross-sectional study conducted at Soba University Hospital in Khartoum, in Sudan the Prevalence of surgical site infections and evaluation of risk factors after surgery, Twenty-two patients (27.5%) developed SSI post operatively and superficial SSI was the most common type of SSI (81.8%).Occurrence of SSI was found to be associated with long operation time, malignant nature of the disease, intra-operative blood loss, and intra-operative hypo tension (26).

An observational study which was done at Malaysia general hospital the SSI incidence was 11.7% . The re-admission rate was 19.2% and the mean length of stay was 20.5 days (27).According to a research done in Pakistan, the overall SSI was (29.85%) and observed in different surgical procedures include; appendectomy (4.1%), exploratory laparotomy (12.3%),and mesh repair (4.1%); the average SSI rate in every single procedure was about (4.27%). Types of SSI identified were superficial, deep Incisional and organ/space (18.4%, 5.5%, and5.7%)respectively.

Incidence of SSI during admission, at readmission, and post-surveillance cases were (12.1%,6.0% and 11.6%)respectively(28). In a prospective cohort study done in Uganda the incidence of surgical site infection was 16.4% vs 23.4%. Superficial SSI accounted for 5.9%, whereas deep and organ space SSI accounted for 47.1% each(5). In prospective observational study Conducted at Hawassa University specialized Hospital, the overallSSI incidence rate was 24.6%.From this study SSI among clean and clean-contaminated wounds was (5.1%) and (69.4%) respectively(29).

According to a research done in Jimma university specialized hospital on obstetric cases from 770 women,the overall surgical site infection rate was 11.4% .Among the total 770 women studied, Cesarean Section accounted for (75.0%) followed by abdominal hysterectomy (21.6%)and the surgical site infections rate was almost similar (11.4% vs.10.6%), respectively. Of those who had surgical site infections, 64.8% had clean-contaminated wound and 35.2% had contaminated /dirty wounds. Majority of the operations were made for emergency Obstetric conditions (96.6%) and the Surgical Site Infections rate was two times higher compared to that of elective surgery(30).

According to a study done in west and east Gojjam zone hospitals, in Amhara region from 165 patients, nearly one- fourth, (25.5%) of the participants were developed surgical site infections. Among these, (90.5%) were in-hospital infections and (9.5%) were re-admissions. From those clean wound accounts 40%,clean contaminated 50.3% and contaminated wounds 9.7%(31).

Another cross-sectional study done on prevalence of Abdominal wound dehiscence and it's risk factors in a surgical unit of Karachi Civil Hospital, Pakistan, 7 cases developed Wound dehiscence giving an overall frequency of 6.6% with

greater percentage in Males.Emergency surgery showed a higher frequency of wound dehiscence (7.9 %) compared to elective surgery (3.3 %). The mortality rate of abdominal wound dehiscence was 10%. There was also increasing tendency towards wound dehiscence with highest risk 60 year and more(32).

2.2. Factors Associated with Surgical Site Infections:

There are many factors that affect the susceptibility of any wound to infection, some of which strongly predispose to wound infection. These factors include preexisting illness, length of operation, wound class, and wound contamination. Other factors such as associated medical illness extremes of age, malignancy, metabolic diseases, malnutrition, immunosuppression, cigarette smoking, remote site infection, emergency procedures, and long duration of preoperative hospitalization are not considered as independent risk factors for wound infections.

A study done on SSI and associated factors in a tertiary care hospital of Rajkot city, Gujarat it was found that the frequency of SSI increased with age and the highest rate of SSI (50%) was found in age group 51-60 years(33).

According to a research done in the University Clinical Center of Kosovo; several factors reduced the risk of SSI. These included: age less than 35 years, preoperative use of antibiotics, and duration of the operation less than 1 h. Previous cesarean section and one or more co morbidities were associated with 7.4 fold and 8 fold increased risk of SSI, respectively (34).

According a research done in Bolan Medical College the risks associated with higher incidence of SSI was found to be age (30-45 years) and Diabetes mellitus (uncontrolled diabetes in perioperative period)(35).

According to a multi-centre prospective cohort study in 10 Spanish hospitals the risk factors for organ-space SSI in colon surgery were male sex and ostomy creation. In rectal surgery, independent risk factors for organ-space SSI were male sex and longer surgery; whereas oral antibiotic prophylaxis (OAP) with intravenous antibiotic prophylaxis was a protective factor (36).

On average, across various procedures, the mean operative time was approximately 30min in patients with SSI compared with those patients Without (37).

3. Conceptual frameworks

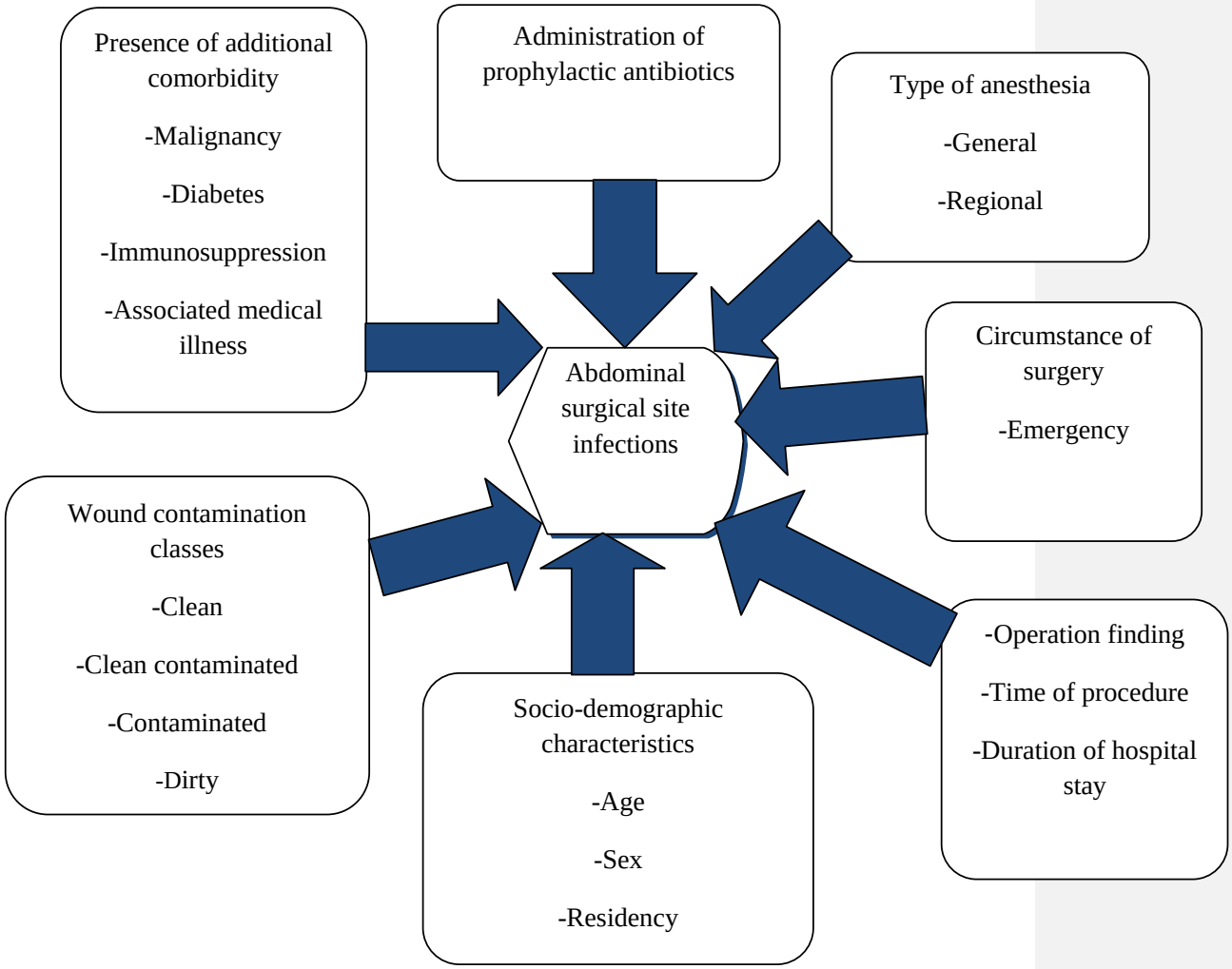

Figure 1.Conceptual framework developed by PI

4. Objectives

4.1. General Objective

To determine the magnitude and associated factors of surgical site infections among abdominal operated patients in Bichena primary Hospital, Bichena Town, East Gojjam Zone, Amhara Region, Ethiopia,2022GC .

4.2. Specific Objectives

To determine the magnitude of surgical site infections among abdominal operated patients

To identify factors associated with surgical site infections among abdominal operated patients.

5. MATERIALS AND METHODS

5.1. Study Setting and Period

This study was conducted at Bichena primary hospital ,Bichena Town , East Gojjam Zone ,Amhara Region, Northwest Ethiopia, about 265 km from the capital Addis Ababa, in 2022GC. Bichena primary hospital is one of the hospital found in Amhara regional state which is administered by Amhara regional heath bureau, located at East Gojjam Zone Bichena Town. It was established in 2007EC.The hospital's catchment population is 522,000 of which 261,522 are males and 260,478 are females and it approximately serves 58,960 patients per year. It has 36 inpatient beds. A total of 958 emergency abdominal operations were done in 2 years. The hospital has 216 staffs among these 113 are health professionals.

5.2. Study Design:

A hospital based cross sectional study was conducted among all abdominal operated patients in two years.

5.3. Study Population

5.3.1. Source Population:

All operated patients who were admitted to Bichena primary hospital from Sep. 1, 2019 to Aug. 31 2020GC.

5.3.2. Study population

All abdominally operated patients who were admitted in Bichena primary hospital during Sep.1, 2019 to Aug.31 2020.

5.4. Inclusion and Exclusion Criteria

5.4.1. Inclusion Criteria:

Patients who had abdominal operations regardless of age and circumstance of the surgery were included in this study.

5.4.2. Exclusion Criteria

Patients who were operated in another hospital and later referred to Bichena primary hospital and death cases within three days post-surgery.

5.5. Sample Size and Sampling Procedure

5.5.1 Sample Size

For the first objective the sample size would be computed for single population proportion of prevalence of SSI using the formula:

$$N = (Z\alpha/2)^2 P(1-P) / d^2$$

Where **N**=sample size, **Z** =(1.96) statistic for level of confidence, **P**=(0.123) estimated prevalence,and **d**=(0.05) precision

The sample size would be calculated considering the proportion of surgical site infection 12.3% (Shiferaw etal. BMC Surgery 2020) the sample size was estimated to be 166. Adding 10% contingency, a total of 183 was the total sample size required for this study.

Table 1.Sample size calculation from previous related data

	Factors	Assumptions							
		Ratio	Power %	CI%	AOR	Non-exposed group	Non response rate = 10%	final sample size	Reference
1	Clean-Contaminated wound	1:1	80	95	3.27	12.3	17	183	25
2	pre-operative hospital stay>4hours	1:1	80	95	6	61.4	8	88	
3	Malnutrition	1:1	80	95	29.35	64.3	6	58	33

So; the larger sample **183** from the outcome variable was selected as a size.

5.5.2. Sampling Procedure

All record of abdominal operation done at Bichena primary hospital during Sep, 2019 to Aug, 2020 would be traced using operation room; surgical ward and OPD log books. From these log books, all medical record numbers (MRN) of abdominal operated patients who were admitted in Bichena primary hospital during retrieval

period were listed from **1-183**. **183** cases was selected by simple random sampling.

5.6. Data Collection.

5.6.1. Data collection methods

The data was collected by 2 BSc nurses trained for the data collection using a checklist prepared for the data collection. Socio-demographic and clinical factors as well as pre and intra operative data that was associated with surgical site infection (which were recorded at the time of treatment started) was retrieved from patient records. A study participant were identified from Operation theatre, inpatient and outpatient charts and logbooks.

5.6.2. Data Collection Instruments

Checklist adopted from WHO surgery safety and the nosocomial infection national surveillance scheme (NINSS) that was developed by NINSS and CDC was modified to fit for the study objectives and the study setting; this tool was used to extract data for the study participants.

5.6.3. Data collectors

The data were collected by 2 BSc nurses working in the hospital who were trained on data collection tools for two days and the data collection process was supervised by the investigator.

5.7. VARIABLES

5.7.1. Independent Variables

1. Sociodemographic characteristics: Age, Sex and Residence.

2. Types of anesthesia: general vs. regional.

3. Circumstance of surgery: Emergency surgery

4. Administration of prophylactic antibiotics

5. Wound contamination classes: clean, clean contaminated, contaminated and dirty.

6. Presence of additional co morbidity: malignancy, DM, immunosuppressant and associated medical illness

7. Operation finding , time of procedure and duration of hospital stay

5.7.2. Dependent Variable

Abdominal surgical site infection (Yes/No)

5.8. Operational Definition of surgical site infection:

Abdominal Operation: a surgical procedure which is done in the person's abdominal region to diagnose or treat a medical condition (CDC,2018).

SSI: an infection that occurs after surgery in the part of the body where the surgery took place.

Superficial SSI: infection involves only skin and subcutaneous tissue of incision.

Deep Incisional SSI: infection involves deep tissues, such as fascial and muscle layers. **Organ/Space SSI:** infection involves any part of the anatomy in organs and spaces other than the incision which was opened or manipulated during operation.

Clean: no viscous is opened in a surgical procedure during which the respiratory, alimentary and genitourinary tracts are not entered.

Clean-contaminated: refers to operative wounds in which the respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination. Viscous is opened and there is minimal spillage.

Contaminated:refers to open, fresh, accidental wounds or operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered, including necrotic tissue without evidence of purulent drainage.

Dirty or infected: includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera.

Prophylactic Antibiotic: refers to the prevention of infectious complications by administering an effective antimicrobial agent prior to exposure to contamination during surgery.

Associated medical illness: an abnormal condition of a part,organ,or system of an organism resulting from various causes such as infection,inflammation,and environmental factors catheterized by an identifiable group of signs,symptoms or both.

5.9. Data Processing and Analysis

The collected quantitative data were coded, entered, cleaned and analyzed using Epi-data version 3.1.1 and export to SPSS version 22.0. Bi-variate and multivariate analysis was conducted to identify the factors associated with surgical site infections.A multivariate analysis was performed to evaluate several known risk factors associated with the development of SSIs. Multivariate stepwise logistic regression analyses were used to adjust for multiple predictive factors and their interactions. The 0.1 level was defined for entry into the model. Multi-variable $\chi 2$and p values were used to characterize the independence of these factors. Odds ratio (OR) and 95% confidence interval (95%CI) were used to quantify the relationship between the outcomes of interest and each independent factor. All the tests were 2-sided, and the threshold of significance was set at $p < 0.05$. Multivariate goodness-of-fit was tested using Hosmer-Lemeshow test (0.762).The predictive validity of the models was assessed by calculating the area under the receiver operating characteristics (AUROC) curve. The accuracy determined by the AUROC curve was interpreted as poor if within 0.51 and 0.69; useful if within 0.70 and 0.79; and good if ≥ 0.80. Statistical /analyses were performed using SPSS, Version 22 .

5.10. Data Quality Control

The quality of data was assured by using a standardized checklist prepared by WHO surgery safety and the nosocomial infection national surveillance scheme (NINSS) modified for this study purpose. The modified checklist was pretested before the actual survey. Pretest was done on 5% of the study sample size. Necessary adjustment was incorporated to the checklist based on the findings of the pretest. The process of data collection was supervised by the investigator on daily bases. The collected data was checked for completeness, accuracy, and consistency every day by the investigator.

6. Ethical consideration

The ethical issue of this study was approved by the ethical committee of Bahir Dar University, Collage of medicine and health Sciences. Official permission to undertake the study was obtained from Bichena primary hospital. The supportive staffs (i.e. Card room workers and surgical staffs) was informed about the purpose of the study and informed voluntary, written and signed consent was obtained from the head of hospital. Confidentiality of patient's information was assured and information recorded anonymously.

7. Results

7.1. Socio-demographic characteristics of the study participants

A total of 164 patient registrations fulfilled the inclusion criteria and investigated in the study. The majority of the study participants were males 99(60.4%) and 65(39.6%) were females with the M: F sex ratio of the study participants were 1.52.

The mean age of the study participants were 2.84 years (standard deviation of ±0.81) with the age range of between 8 to 87 years. Children under the age of 15years were 11 (6.7%), 15-24 years were 36 (22%), 25-64 years were 85 (51.8%) and elders above the age of 65 years were 32 (19.5%).Majority of the study participants 120 (73.2%) were residents' of rural areas outside of Bichena town while 44 (26.8%) were residents' of urban areas living in Bichena town (Table 2**)**. Majority of the procedures done were emergency abdominal operation procedures which accounts 139 (84.8%) while 25 (15.2%) cases were elective abdominal procedures. From emergency abdominal operation procedures 19 (11.6%) were traumatic while 120 (73.2%) were non- traumatic (Table 3).

Table 2~~2~~.Sociodemographic characteristics of clients who had abdominal operation in Bichena primary hospital,2022.

Variables	Frequency	Percent
Age		
0-14 years	11	6.7
15-24 years	36	22.0
25-64 years	85	51.8
>=65 years	32	19.5
Sex		
Male	99	60.4
Female	65	39.6
Residence		
Rural	120	73.2
Urban	44	26.8

From those emergency abdominally operated cases; acute appendicitis accounts 42(25.6%) , Peritonitis accounts 27(16.5%), Large Bowel Obstruction accounts 17(10.4%), small bowel obstruction accounts 14(8.5%), perforated peptic ulcer disease accounts 14(8.5%), compound bowel obstruction accounts 6 (3.7%),Penetrating injury accounts 7(4.3%), Intussusceptions accounts 4(2.4%),thoracoabdominal injury accounts 6(3.7%), and blunt abdominal injury accounts 2(1.2%) (Table 3).

Table 33.List of emergency and elective operation in Bichena primary hospital,2022.

Emergency and elective cases	Frequency (N=164)	Percent (%)
Elective	25	15.2
small bowel obstruction	14	8.5
Intussusceptions	4	2.4
large bowel obstruction	17	10.4
Compound bowel obstruction	6	3.7
Perforated PUD	14	8.5
Acute appendicitis	42	25.6
Peritonitis	27	16.5
Penetrating abdominal injury	7	4.3
Blunt abdominal injury	2	1.2
Thoracoabdominal injury	6	3.7
Total	164	100.0

7.2. Magnitude of surgical site infection

Among the total of 164 patients who had abdominal operation, the total magnitude of SSI was 44(26.8%) and with 95% confidence the true estimate lays between(95%CI:[20.1%-33.5%]).

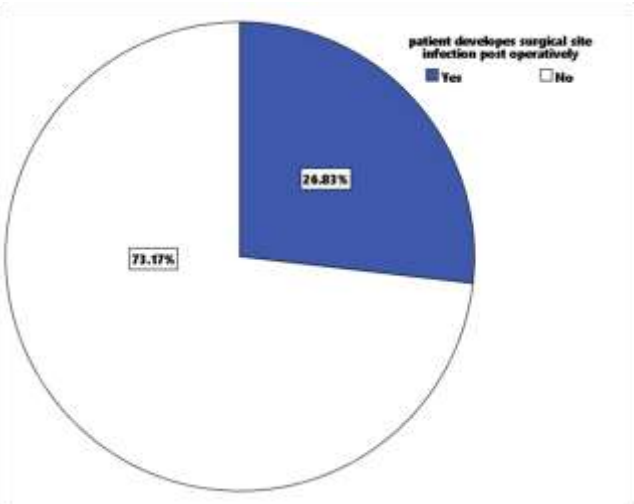

Figure 2.Magnitude of surgical site infection in Bichena primary hospital,Bichena town,East Gojjam zone,Amhara region,Ethiopia,2022.

From those surgical site infections observed were; superficial SSI accounts 27(16.5%) followed by deep post-operative SSI 14(8.5%) and organ space 3(1.8%).

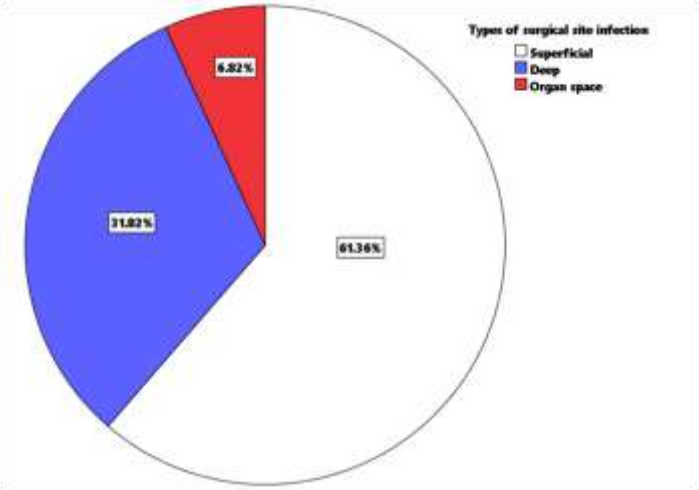

Figure 3.Types of surgical site infection at Bichena primary hospital,East Gojjam zone,Amhara region,Ethiopia,2022.

The incidence of surgical site infection in wound classes: clean wounds was minimum which accounts 12.8 %(6/47), clean contaminated wound accounts 16.2 %(6/37), contaminated wound accounts 37.3 %(22/59) and dirty wound accounts 47.6 %(10/21).

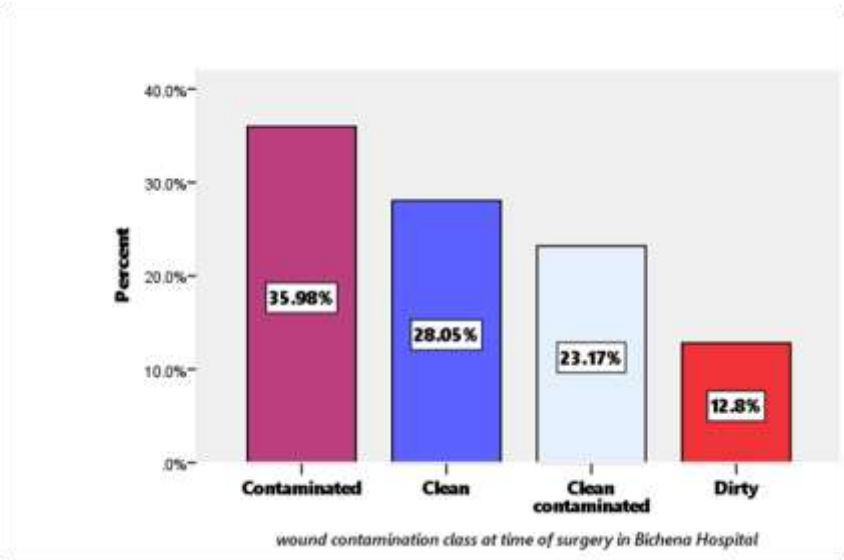

Figure 4.Wound contamination class at time of surgery in Bichena primary hospital,Bichena town,East Gojjam zone,Amhara region,Ethiopia,2022.

Out of 164 cases 142(86.6%) were provided prophylactic antibiotics preoperatively while 22(13.4%) were not provided prophylactic antibiotics preoperatively. Among those who provided prophylactic antibiotics preoperatively; only 36(25.4%) of them develop SSI, while 8(36.4%) of those who did not provide prophylactic antibiotics preoperatively develop SSI.Among 44 patients who develop surgical site infection 17 (38.64%) were patients with associated medical illness like immunocompromised patients 7(41.18%),hypertension 5(29.41%),anemia 4(23.53%) and others account 1(5.88%). Among 44 patients who develop surgical site infection post-operatively with total duration of hospital stay account:5-7 days 6(13.64%),8-14 days 21(47.72%),15-21 days 14(31.82%) and >=22days 3(6.82%).

7.3. Factors Associated With Surgical Site Infection

In the Bi-variate analysis factors associated with p-value <0.25 development of surgical site infection were age of the patient (p-value 0.033), associated medical illness (p-value 0.002), and wound contamination class at time of surgery (p-value<0.001): clean contaminated COR=1.682(95%CI: [0.992-2.851]), contaminated COR=5.333(95%CI: [0.230-7.755]), dirty COR=6.667(95%CI: [0.827-8.724]), and total duration of hospital stay (p-value=0.02),type of antiseptic used(p-value=0.105),estimated volume of intraoperative blood loss(p-value=0.116)

Factors which have p-value <=0.25 in Bi-variate logistic regression analysis were entered to Multivariate logistic regression analysis and which revealed that Patients with associated medical illness was 3.38 times more likely to develop SSI than those who do not have associated medical illness AOR=3.375(95%CI: [1.325,8.599]),p-value<0.001 to develop surgical site infection. Patients admitted 5-7 days was 91.1% times less likely AOR=0.089(95%CI: [0.076,0.953]),p-value 0.002, 8-14 days was 78.3% times less likely AOR=0.217(95%CI:[0.078,0.754]),p-value 0.005and 15-21 days was 72.4% times less likely AOR=0.276(95%CI: [0.047,0.599]),p-value 0.001 to develop surgical site infection than as compared to >=22days of post operative admissions (Table 5).

Table 44.Univariate analysis of surgical site infection.

Factors		SSI(N=44)	No SSI(N=120)	p-value
Age	0-14 years	6(13.64%)	5(4.20%)	**0.033**
	15-24 years	6(13.64%)	30(25.00%)	
	25-64 years	11(25.00%)	74(61.60%)	
	>=65 years	21(47.72%)	11(9.20%)	
Sex	Male	28(63.64%)	71(59.17%)	0.604
	Female	16(36.36%)	49(40.83%)	
Residence	Rural	35(79.54%)	85(70.83%)	0.265
	Urban	9(20.46%)	35(29.17%)	
Admission to operation interval	<24 hours	13(29.55%)	31(25.83%)	0.635
	>24 hours	31(70.45%)	89(74.17%)	
Circumstance of surgery	Elective	6(13.64%)	19(15.83%)	0.729
	Emergency	38(86.36%)	101(84.17%)	
Type of anesthesia	General	37(84.10%)	102(85.00%)	0.641
	Spinal	7(15.90%)	16(13.33%)	
	Other	0(0.00%)	2(1.67%)	
Prophylactic antibiotics given before surgery	Yes	36(81.82%)	106(88.33%)	0.278
	No	8(18.18%)	14(11.67%)	
Pre-opertive blood	Yes	7(15.91%)	12(10.00%)	

transfusion	No	37(84.09%)	108(90.00%)	0.295
Type of antiseptic used	Saline based	5(11.36%)	6(5.00%)	**0.105**
	Iodine based	20(45.46%)	73(60.83%)	
	Saline and iodine	11(25.00%)	31(25.84%)	
	Saline and alcohol	8(18.18%)	10(8.33%)	
Associated medical illness	Yes	17(38.64%)	19(15.83%)	**0.002**
	No	27(61.36%)	101(84.17%)	
Wound contamination class at time of surgery	Clean	6(13.64%)	40(33.33%)	**0.000**
	Clean contaminated	6(13.64%)	32(26.67%)	
	Contaminated	22(50.00%)	37(30.83%)	
	Dirty	10(22.72%)	11(9.17%)	
Estimated volume of intraoperative blood loss	<1000ml	36(81.82%)	109(90.83%)	**0.116**
	>1000ml	8(18.18%)	11(9.17%)	
Total duration of hospital stay	5-7 days	6(13.64%)	71(59.16%)	**0.02**
	8-14 days	21(47.72%)	35(29.17%)	
	15-21 days	14(31.82%)	9(7.50%)	
	>=22 days	3(6.82%)	5(4.17%)	

Table 5.Factors associated with development of SSI after abdominal operation in Bichena primary hospital,2022.

variables		SSI (N=44)	No SSI (N=120)	Bivariate and multivariate analysis	
				COR(95%CI)	AOR(95%CI)
Age	0-14 years	6(13.64%)	5(4.20%)	1.591(0.395,6.407)	0.590(0.416,1.516)
	15-24 years	6(13.64%)	30(25.00%)	9.545(0.652,9.857)	0.440(0.083,2.343)
	25-64 years	11(25.00%)	74(61.60%)	2.843(0.888,6.746)	0.073(0.022,1.245)
	>=65 years	21(47.72%)	11(9.20%)	1.000	1.000
Associated medical illness	Yes	17(38.64%)	19(15.83%)	0.299(0.137,0.652)	**3.375(1.325,8.599)**
	No	27(61.36%)	101(84.17%)	1.000	1.000
Type of antiseptic used	Saline based	5(11.36%)	6(5.00%)	1.042(0.231,4.704)	2.225(0.262,8.908)
	Iodine based	20(45.46%)	73(60.83%)	1.342(0.119,1.982)	0.445(0.104,1.909)
	Saline and iodine	11(25.00%)	31(25.84%)	0.444(0.140,1.410)	0.761(0.144,4.030)
	Saline and alcohol	8(18.18%)	10(8.33%)	1.000	1.000
Wound contamination class at time of surgery	Clean	6(13.64%)	40(33.33%)	1.000	1.000
	Clean contaminated	6(13.64%)	32(26.67%)	1.682(0.992,2.851)	0.447(0.078,2.573)
	Contaminated	22(50.00%)	37(30.83%)	5.333(0.230,7.755)	0.582(0.140,2.414)
	Dirty	10(22.72%)	11(9.17%)	6.667(0.827,8.724)	0.327(0.057,1.885)
Estimated volume of intraoperative blood loss	<1000ml	36(81.82%)	109(90.83%)	0.454(0.169,1.217)	0.456(0.101,2.014)
	>1000ml	8(18.18%)	11(9.17%)	1.000	1.000
Total duration of hospital stay	5-7 days	6(13.64%)	71(59.16%)	7.100(1.355,8.201)	**0.089(0.076,0.953)**
	8-14 days	21(47.72%)	35(29.17%)	1.330(1.216,4.619)	**0.217(0.078,0.754)**
	15-21 days	14(31.82%)	9(7.50%)	0.386(0.073,0.925)	**0.276(0.047,0.599)**
	>=22 days	3(6.82%)	5(4.17%)	1.000	1.000

8. Discussion

Out of 164 cases that undergo abdominal operations 44 patients developed surgical site infection which gave a magnitude of 26.8%.The present study revealed that; patients who had associated medical illness and total duration of hospital stay were significant contributors for the development of surgical site infection. Despite modern surgical techniques and the use of antibiotic prophylaxis, SSI is one of the most common complications encountered in surgery. SSI places a significant burden on both the patient and the health system. Despite the advances made in its control, it remains a significant limiting factor in advancing the horizons of surgery.According to Raghav J.etal SSI is, therefore, a significant cause of morbidity; extended hospital stays and higher health expenses. SSI is the result of the failure of the host defense system in controlling the external source inciting the infection in the human body and delaying wound healing. Chronic medical circumstances such as hypertension, immunosuppressant, cancer, and anemia also influence the defenses of the host and boost the probability that a surgical infection would develop(38).

Out of 164 cases that undergo abdominal operations: 44 patients developed surgical site infection which gave magnitude of 26.8% with (95%CI: [20.1%-33.5%]). As in most studies in Africa and other developing continents, the incidence of SSI in my study was high at 26.8%.The finding is higher to those studies conducted in Asela Referral and Teaching Hospital (23.3%)(13), Felegehiwot Referral Hospital (9.4%)(22), Hawasa University hospital (24.6%)(29), Ethiopia (24.6%) (20), South Western Uganda (16.4%)(5), Global collaborative (9.3%)(39), and Nepal (23%)(40) but these findings are almost concordant with those studies conducted in Tanzania (26%)(41)and Sudan (27.1%) (26). This higher SSI prevalence could be due to various issues like high flow patients as the hospital served more than 45 thousand people which cause overcrowding, lack of adequate postoperative care, shortage of trained manpower, failure to preserve sterility during surgical procedures, insufficient infection control due to deprived hygiene and water shortage, resource and structural constraints, and lack of awareness regarding SSI among the overall population.

This study is lower in a study done in Pakistan (29.8%)(28). This discrepancy could be due to since this study was cross-sectional study, there was no post discharge

follow-up and patients may develop SSI and may seek treatment nearby health facilities other than the study area.

Several risk factors were found to be significantly associated with the development of SSI including: malignant nature of the disease, intra-operative blood loss, intra-operative hypotension, and long operation time. Majority of the patients had superficial wound infections, which were discovered mostly during post-operative hospital stay with drainage from the wound site 5–6 days post operatively. Those patients with SSI were handled according to the standard guidelines and wound dressing twice per day was offered for patients with SSI.

Post operative SSI remains one of the most important causes of morbidity in surgically treated patients. These patients incur higher cost because of longer hospitalizations, more nursing care, additional wound care, potential readmission to the hospital, and further surgical procedures. These findings reflect a lack of adequate postoperative care and failure to maintain sterility during surgical procedures, inadequate infection control due to poor hygiene, resource and structural constraints, and lack of awareness regarding nosocomial infections among the general population.On multivariate analysis, I have found that associated medical illness and total duration of hospital stay were found to be independent risk factors for SSI ($P<0.05$). Associated medical illness was 3.38 times more likely to develop SSI than those who do not have associated medical illness AOR=3.375(95%CI: [1.325-8.599]) to develop surgical site infection(Table-5). Similarly Raghav J.etal conducted a study on 393 patients, out of which 88 Developed SSI in these cases significant independent risk factors were associated comorbidities, duration of surgery and low hematocrit(1).Rawan S.etal conducted a study on 80 patients in Sudan, out of which 22 Developed SSI in these cases significant independent risk factors were long operation time of more than three hours , malignant surgical diseases , intra-operative blood loss , and intra-operative hypo-tension(2). Longer duration of hospital stay has long been established as an important predictor of the postoperative surgical site infections.According to Khadilkar DR.etal.the average stay of the patients with SSI ranged from 12 to 18 days(4). In my study, the risk of SSI was statistically higher in total duration of hospital stay 15-21 days was 72.4% times less likely AOR=0.276(95%CI: [0.047-0.599]) to develop surgical site infection as compared with in total duration of

hospital stay 5-7 days which was 91.1% times less likely AOR=0.089(95%CI: [0.076-0.953]) and 8-14 days 78.3% times less likely AOR=0.217(95%CI:[0.078-0.754]) to develop surgical site infection (Table 5).This shows as duration of hospital stay increases the risk of development of Surgical site infection also increased .This is supported a study in Canada by Alkaaki A.etal and in Nigeria by Ahmed O etal. Which was 1.07 times high likely to develop surgical site infection as duration of hospital increase AOR=1.07(95%CI: [1.011–1.131])(3) . Moreover, an increased operative time was associated with both higher SSI rate and prolonged postoperative stay. Although we did not evaluate the economic impact of SSI in my study, it is likely that longer postoperative stay due to SSI entails a higher cost of patient care(4).

Generally, prolonged hospital stay was associated with increased surgical site infections among patients who underwent surgical procedures. This finding was consistent and was supported by another study(5).Similarly Rahel M.etal conducted a study on 249 patients in Ethiopia the prevalence of SSI was 24.5% in these cases significant independent risk factors were educational status, pre-morbid illness, pre-operative and post-operative hospital stay, ASA score, and the type of wound(6). My findings confirmed previous knowledge that surgeries with longer duration of hospital stay are associated with higher risk of SSI. According to Bibi S,etal.associated medical illness is a well-documented risk factor for SSI. Medical patients with hypertension, immunosuppressant disease, anemia and cancer are at risk of impaired systemic and intestinal immune function, as well as decreased digestive and absorptive capacity due to the altered architecture of the gut barrier(42).

9. Limitation of study

The primary outcome was measured from data that is obtained from secondary data sources. So, there was high proportion of missed value, which may affect the true result of the research and the data was collected by chart review retrospectively, that limit to assure the quality of the data. There was no available published data on prevalence of surgical site infections and associated factors among patients who had abdominal operation from in our country.

During this study, the authors observed noncompliance with perioperative protocols, such as changing gloves and dressings before closing by the surgeon. In addition, violations to perioperative protocols in the surgical ward were detected, related to the lack of hospital surgical materials and supplies available to care for surgical wounds, suggesting improper handling and wound contamination. This study included SSIs detected, cultured, and managed on an outpatient basis; the actual overall SSI incidence could have been higher than reported here, because there were patients who underwent outpatient surgery and were lost to follow-up and thus were not recruited. In other words, the uncertainty around the accuracy of post discharge surveillance has hampered researchers' ability to get more exact SSI rates.

10. Conclusion

Surgical site infection is a major drain on hospitals catering to a high volume of patients. The post-operative infection increases the workload of the staff, cost of stay and dressing material used, not to mention the mental and physical agony of the patients.

11. Recommendations

To Amhara Region Health Bureau and N Go's

The overall incidence rate of SSI was high in the study area than other country reports.And among the predictors identified for incidence of SSI was associated medical illness and longer duration of hospital stay. So;regional health bureau and N Go's should develop prevention strategies such as surveillance,education, accountability and providing ongoing feed backs of SSI rates to leaderships.

To health care providers

It is better to provide optimum care and treatment for patients with associated medical illness and longer duration of hospital stay. Strengthened timely surveillance and supervision mechanisms on SSI.provide pre-operative prophylactic antibiotics consistently for patients with extreme age groups, contaminated and dirty wounds throughout operation and post-operative period and all the health professionals should follow surgical site infection prevention guidelines and strategies during surgery such as stick to hand hygiene protocols,wipe of equipment's between cases,prevent hypothermia,and use antiseptics pr-operativelly.

To future researchers

I recommend further researchers:to use prospective study design to identify additional predictors of SSI in relation to factors contributing to poor surgical site infection prevention on abdominal operation.

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13. Appendix

11.1. APPENDIX I: Format for Information Sheet and Informed Consent for Hospital

My name ---------- I want to collect data for the study being conducted in Bichena primary Hospital by Shegaw Getinet who is studying master degree on integrated emergency obstetrics, gynecology and general surgery at Bahir Dar University, college of medicine and health sciences. I kindly request you to lend me your attention to explain you about the study and your hospital being selected as the study site.

The study title: magnitude of surgical site infection and associated factors among patients who had abdominal operation in Bichena primary Hospital, Bichena Town, Amhara Regional State, Ethiopia.

Purpose of the study: The findings of this study can be of a paramount importance for the hospital to plan intervention programs. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Integrated Emergency Surgery for the principal investigator.

Procedure and duration: I will collect data from operation registration book and patients chart using check list to provide me with pertinent data that is helpful for the study. There are 25 questions to be checked where there will be filled on the check list. The data collection will take about 5 to 10 days, so I kindly request you to write formal letter to the hospital staff to cooperate during data collection.

Risk and benefits: The risk of being selected in this study has very minimal risk for your hospital, and no risk for the patients. But the findings from this research may reveal important information for the hospital and health bureau planners.

Confidentiality: The information collected in the patient chart will be confidential. There will be no information that will identify patients in particular, to do so; all patient information will have a code. The findings of the study will be general for the study population and will not reflect anything particular of individual person or patient. The check list will be coded to exclude showing names.

Rights: This study will be done if you are voluntary on the behalf of the hospital. You have the right to declare to be done or not this study in your hospital. If you choose to be done the study, you have the right to withdraw from the study at any time. You do not have to answer for any incomplete patients' charts or lost patients' charts.

Contact address

If there is any question or enquire about this study or the procedure please contact

Address of the PI

Shegaw Getinet Mobile phone 0923423646,

Address of the IRERC

Tele 058---

NB: PI = Principal Investigator

IHRERC = Institutional health Research and Ethical Review Committee

Declaration of informed voluntary consent: I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues to confidentiality, the rights of participating and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that they did not want. I am also informed that the hospital has the right to stop this study from being conducted in the hospital if any misdeeds and unethical procedures are observed during data collection procedures in the hospitals premises. Therefore I declare my voluntary consent on behalf of hospital management to allow this study to be conducted in the hospital with my initials (signature)

Name & Signature of CGH CEO _____Date_____

Name and signature of data collector_____ Date_____

12.2 APPENDIX II: DATA COLLECTION CHECK LIST Instructions for data collectors

You are kindly requested to fill all formats genuinely. Circle the choices given and if open ended questions write it from charts, since the data is secondary data if anything missing, contact principal investigator. Thank you for your cooperation.

Case number.....

Table 6.Research checklist formats

S No	Variables	Category	Code
1	Socio demographic factor		
1.1	Age	0-14years 15-24 years 25-64 years >=65 years	1 2 3 4
1.2	Sex	Male Female	1 2
1.3	Residence	Rural Urban	1 2
2	Preoperative and intraoperative data		
2.1	Admission to operation interval	<24hours >24hours	1 2
2.2	Circumstance of surgery	Elective Emergency	1 2
2.3	If emergency	Traumatic Non traumatic	1 2
2.4	If emergency surgery, specify the diagnosis	SBO(small bowel obstruction) LBO(large bowel obstruction) Compound bowel obstruction Perforated peptic ulcer disease (PUD) Acute appendicitis Peritonitis Penetrating abdominal injury Blunt abdominal injury Thoraco-abdominal injury Intussusceptions	1 2 3 4 5 6 7 8 9 10
2.5	Associated illness	Yes No	1 2
2.6	If yes	Anemia Hypertension Immune-suppression Other infection Cancer	1 2 3 4 5
2.7	Type of anesthesia used	General Spinal Others	1 2 3
2.8	Prophylactic antibiotics given before surgery	Yes No	1 2
2.9	Preoperative blood transfusion	Yes	1

		No	2
2.10	Post operative diagnosis	Same Different	1 2
2.11	Operation done by	General surgeon Emergency surgeon	1 2
2.12	Assistant	General surgeon Emergency surgeon General practitioner Nurse	1 2 3 4
2.13	Wound contamination class at the time of surgery	Clean Clean-contaminated Contaminated Dirty	1 2 3 4
2.14	Estimated volume of Intraoperative blood loss	< 1000ml > 1000ml	1 2
2.15	Type of Antiseptic technique	saline based Iodine based Saline and Iodine Saline and alcohol	1 2 3 4
2.16	Postoperative drug used	Ceftriaxone Ceftriaxone and metronidazole Ampicillin	1 2 3
2.17	Use of drain	Yes No	1 2
2.18	Date of Discharge		
2.19	Discharge status	SSI Improved Died Same	1 2 3 4
2.20	Any kind of drug use at discharge?	Yes NO	1 2
2.21	For the above question, if YES SPECIFY		
3	Infection data		
3.1	Patient develops SSI post operatively?	Yes No	1 2
3.2	Type of SSI …….	Superficial Deep/Incisional Organ Space	1 2 3
3.3	Date of infection after Surgery		
3.4	Total duration of Hospital stay		
3.5	How was the infection managed?	Antibiotic Wound cleaning and dressing Surgery Other specify	1 2 3 4

Name and signature of data collector……..

Date of data collection…….

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF INTEGRATEDEMERGENCY SURGERY (OBSTETRICS, GYNECOLOGY AND GENERALSURGERY)

SURGICAL SITE INFECTIONS AND ASSOCIATED FACTORS AMONG PATIENTS WHO HAD ABDOMINAL OPERATION IN BICHENA PRIMARY HOSPITAL, EAST GOJJAM ZONE, AMHARA REGION, NORTH WEST ETHIOP, 2022.

PRINCIPAL INVESTIGATOR: SHEGAW GETINET(BSC,MSC STUDENT)

BAHIRDAR, ETHIOPIA, AUGUST, 2022.