ENSIGN COLLEGE OF PUBLIC HEALTH

PREVALENCE OF SURGICAL SITE INFECTION AT LEKMA HOSPITAL IN THE LEDZOKUKU MUNICIPALITY, GREATER ACCRA REGION, GHANA.

By

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DEDICATION

I dedicate this work to God almighty, and my family.

DECLARATION

I hereby declare that this thesis has been the result of my own research, except references cited that have been duly acknowledged. It has never been submitted in part or full for any award of my intended degree.

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LIST OF ABBREVIATIONS

CDC	Center of Disease Control and Prevention
CHF	Congestive Heart Failure
CNS	Central Nervous System
C/S	Caesarian Section
ECG	Electro-Cardiogram
HIV/AIDs	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
I & D	Incision and Drainage
NHIS	National Health Insurance Scheme
M.I	Myocardial Infarction
O.R	Operating Room
P.O.D	Post-operative day
SSI	Surgical Site Infection
TID	Three times daily
U.S	United State of America
W.H.O	World Health Organization

DEFINITION OF TERMS

Myocardial Infarction	When blood flow stops to a part of the heart causing damage to heart muscle
Cardiac Ischemia	Lack of blood flow and oxygen to heart muscle
Coronary Artery Disease	When the arteries of the heart become, hardened and narrowed
Metabolic Equivalence	Amount of oxygen consumed while at rest
Anesthesia	Temporary induced loss of consciousness
Diabetes Mellitus	Metabolic disorder in which there is high blood sugar level
Decompensated Congestive Heart Failure	Sudden worsen of heart failure symptoms
Renal Insufficiency	Poor function of the kidneys because of lack of blood flow to the kidneys
Systemic Hypertension	High blood pressure in the artery that carry blood from the heart to the body tissues
Arrhythmia	An abnormal heart rhythm
Hypercholesterolemia	High levels of cholesterol in the blood
Unstable hemodynamic situations	Abnormal or unstable blood pressure
Prostatectomy	Surgical removal of the prostate gland
Hypoxemia	Low concentration of oxygen in the blood
Atelectasis	Collapse of a lung

Bronchospasm,	Sudden constriction of the muscles in the walls of the bronchioles
Obstructive sleep apnea	Obstruction of upper airway during sleep
Pulmonary Embolus	Sudden blockage of major artery in the lung
Left Ventricular Hypertrophy	Is a condition when the muscle wall heart's left pumping chamber becomes thickened

ABSTRACT

Introduction: Surgical site infection is one of the most common complications of surgery that leads to increased hospital stay and expenditure, unnecessary pain and psychological stress for surgical patients who develop this complication. Surgical site infection is the most common nosocomial infection amongst patients undergoing surgery. A limited number of studies have been conducted on prevalence of surgical site infections in Ghana, this study will help add on to data.

Specific Objectives: The specific objectives are to assess the possible causes of Post-operative site infections, determine the indications for surgery and analyze the prevalence of Post-operative site infections at LEKMA Hospital.

Method: The study adopted a retrospective cross-sectional design that used quantitative method (checklist, assessment tool) to gather data from patient health record, a structured questionnaire was administered to five health workers. A simple random sampling technique with proportional allocation was done for the selection of about 153 participants. The sample frame used was obtained from records on all surgical cases in LEKMA Hospital from January to December 2019. Data was analysed using STATA 14.0.

Results: The prevalence of SSI for both elective and emergency surgery is 9.8%. A total of 153 participants, females represented 62% of all surgical cases and 60% of SSI cases whilst males represented 38% of all surgical cases and 40% of SSI cases.

Emergency cases represented 70% of all surgical case and 60% of SSI cases, also elective cases represented 30% of all surgical cases and 40% of SSI cases. CPD accounted for 46% of all surgical cases and 67% of SSI cases, participants in the age group of 26years-32years accounted for 44.4% of all surgical cases and 46.6% of SSI cases. Appendicitis and Hernia contributed to 20% and 13 % respectively to SSI cases. Default on wound dressing, Tobacco use, Alcohol intake, and Pre-existing medical conditions are significantly associated with SSI at a p-value of 0.001.

Conclusion: LEKMA Hospital has a low prevalence rate for surgical site infection, the highest indication for surgery is cephalopelvic disproportion, standard preoperative and post-operative procedures are observed. The most significant risk factors for surgical site infection at LEKMA Hospital are default on wound dressing and alcohol intake.

CHAPTER ONE

INTRODUCTION

1.1 Background

Preoperative preparation or preoperative care is the physical and psychosocial preparation and management of a surgical patient before to surgery(Encyclopedia of surgery, 2019). Preoperative management/care must be individualized according to the patients' medical history, physical examinations, type of surgery and hospital protocols. But whether the surgery is minimally invasive and will take a few minutes or a major surgery preoperative preparation is extremely important in order to improve on the outcome of surgery by reducing the risk of complication and making the surgery as safe as possible (Swierzewski, 2015). Failure to do this may leads to many complications after surgery, chief amongst these is postoperative surgical site infection.

SSI is defined as an infection that is at or near a surgical incision within a period of 30 days of an operative procedure or within a year if an implant was left in-situ and the infection is thought to be secondary to the surgery(Khairy *et al.*, 2011). SSI contributes significantly to surgical morbidity and mortality each year. It accounts for 15% of all nosocomial infections among surgical patients. (Alp *et al.*, 2014). Post-surgical infection leads to increased length of postoperative hospital stay, higher rate of hospital readmissions and compromised health outcomes with significantly increased health expenditure for the surgical patient. Accordingly, the first and most important step in the treatment of all cases of surgical site infection is their prevention. ''This usually involves meticulous operative techniques coupled with timely administration of antibiotic prophylaxis, and several preventive measures that seek to reduce to the barest minimum the bacterial, viral, and fungal contamination threat from the operating room environment, surgical staff, surgical equipment/tools and the patient's own endogenous skin flora''(Nash, 2011).

1.2 Statement of Problem

Surgical site infection (SSI) is one of the commonest surgical complications with significant impact on patients. It leads to an increased number of days spent in the hospital, overuse of antibiotics and high hospital bills(Eckhauser *et al.*, 2015).

For both elective and emergency surgeries, it has been reported that the global prevalence of surgical site infection is approximately 12.3%, ranging from 9.4% in high income countries to as high as 23.2% in low income countries(Sawyer and Evans, 2018) and patients diagnosed with surgical site infection are five to six times more likely to be readmitted to the hospital, two times more likely to stay in the hospital, and two to three times more likely to die than patients without infections(Nsiah-Afriye, 2016).

In Africa the rate could be higher due to poor hygiene, less resource and financial constraint depending on the socio-economic status and geographical location of patient. It is therefore of great importance to clinicians globally to be abreast with the current trends of risks factors for SSI in their community. A doctor in Philadelphia reports SSI's are close to 10% but could be as higher if there are increased outpatient surgeries, reduced hospital stay after surgery, and thus incidence of unreported cases (Nash, 2011). Even though these surgeries were performed at accredited health facilities with qualified personnel and good equipment's certified and deemed fit for such operational procedures. In the presence of wrong procedures before surgery such as shaving of patient's hair instead of clipping where appropriate (Ireland, 2012), inadequate antibiotic prophylaxis, unsterile surgical instruments and delayed or inappropriate laboratory investigations, there will be an increase in surgical complications and bad prognosis thus increase in surgical site infection despite good and qualified clinicians and equipment.

There was no available record on the prevalence of surgical site infection at LEKMA Hospital. Per the reported prevalence for even developed countries, it's noteworthy that LEKMA Hospital which is in a developing country and thus at a higher risk for surgical site infections, does not have available data and statistics for the prevalence of surgical site infection. This research seeks to analyze the prevalence of surgical site infection and assess the causes of post-operative site infection and inform decision by policy makers at the municipality.

1.3 Rationale of study

Reducing the incidence of surgical site infection and its associated co-morbidities and mortality will be of immense benefit for the overall productivity of our country and improve the psychological and socio-economic outcome of every patient undergoing surgeries. This study was conducted to analyze the prevalence and assess the causes of surgical site infection at LEKMA Hospital. After finishing the study, data will be made available to management of LEKMA Hospital, and the municipal and regional health directorate for the necessary action to be taken. Also, this data can be used by the Ministry of health, Ghana health service, Christian health association, and all organizations and individuals interested in surgical site infection.

1.4 Conceptual Framework

Figure 1.1 represents a conceptual framework of outlined risk factors that are associated with SSI as identified in Chapter Two below. The purpose for the development of a conceptual framework was to help produce at an evidence-based and adequately informed understanding of factors associated with surgical site infection, in order to inform a study that would exhaustively investigate the prevalence and potential risk factors of surgical site infection. Included are patient related comorbidities, intraoperative and postoperative risk factors related to surgical site infection. The use of a conceptual model/framework for assessment of patients has unique relevance for clinical identification of risk factors and the management of patients in the pre-, peri- and postoperative period (Sandy-Hodgetts, Carville and Leslie, 2018).

Conceptual Framework

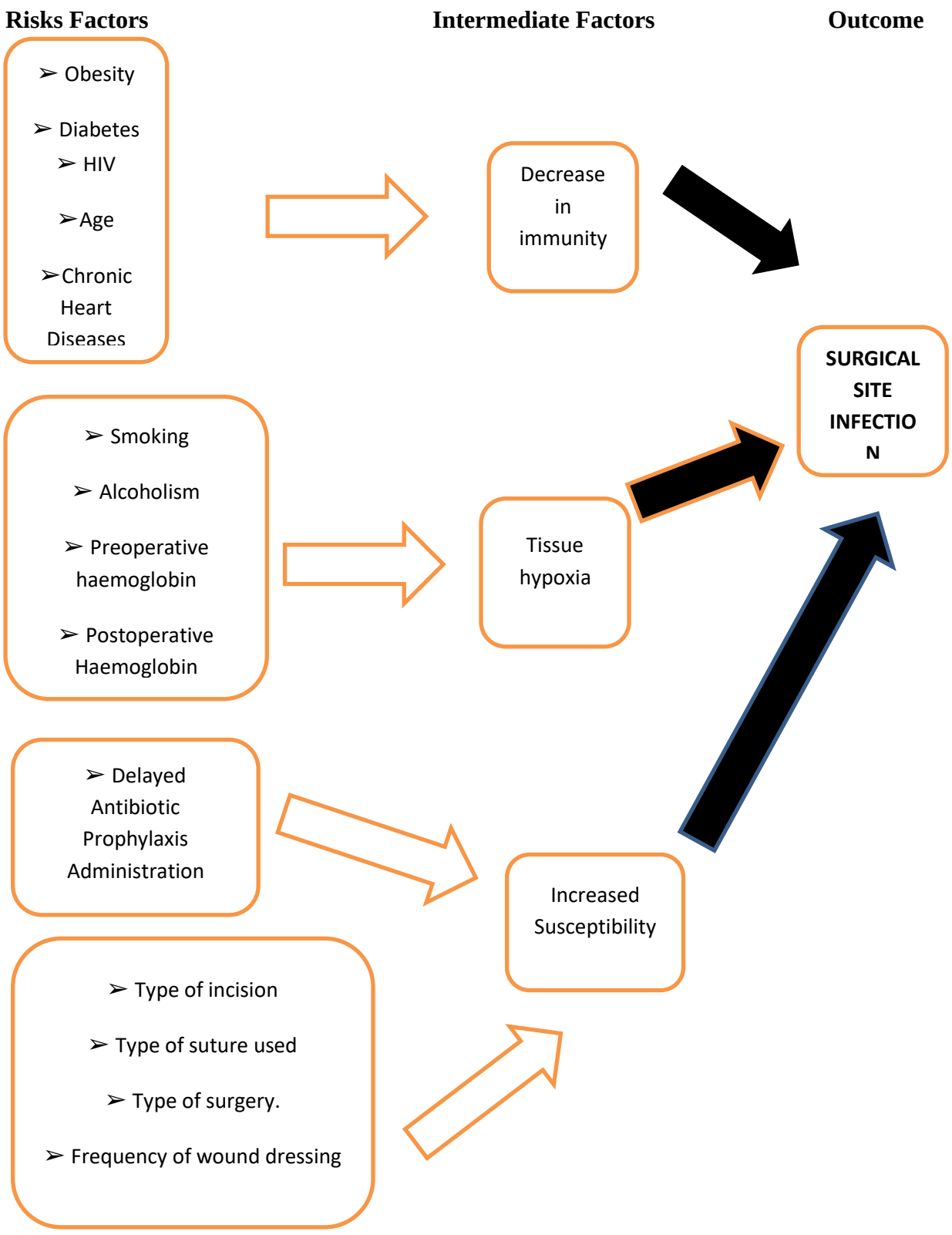

Figure1: Conceptual framework on Surgical Site Infection

1.5 Research Questions

1) What are the possible causes of Postoperative site infections at LEKMA Hospital?
2) What are the indications for surgery at LEKMA Hospital?
3) What is the prevalence of Post-operative site infection at LEKMA Hospital?

1.6 Objectives

1.6.1 General Objectives

The general objective of this study was to assess the prevalence of post-operative site infection for both emergency and elective surgeries at LEKMA Hospital

1.6.2 Specific Objectives

The specific objectives are to:

1) To assess the causes of Post-operative site infections at LEKMA Hospital.
2) To determine the indications for surgery at LEKMA Hospital.
3) To analyze the prevalence of Post-operative site infections at LEKMA Hospital

1.7 Profile of study area/site

The study was conducted at LEKMA Hospital, which is a Ministry of Health facility built in the year two thousand and ten (2010) situated at Teshie in the Ledzokuku Municipal District, Greater Accra Region, Ghana.

LEKMA Hospital is a hundred (100) bed capacity General Hospital with all the units of a General Hospital available and accessible to the general public, including specialist services, laboratory and radiological facilities, a Malaria Research Centre and an Herbal Medicine Unit.

The hospital serves as the Municipal Hospital for the Ledzokuku-Krowor (Teshie / Nungua) area.

The hospital's clinical staff is made up of a team of 22 doctors which includes 9 specialists;

physician assistants; more than 200 nurses; pharmacist and paramedical staff.(*ABOUT US – LEKMA HOSPITAL*, 2020)

The Ledzokuku municipality is bounded by The La Nkwantaanang Madina Municipal District to the North, and Gulf of Guinea to the south, the East by Krowo Municipal District and the West by the La Dade-Kotopon Municipal District and Kpeshie lagoon it a total area of 50 square kilometers(*Profile – Ledzokuku Municipal Assembly*, 2019) it lies between Latitude: 5° 34' 59.99" N and Longitude: 0° 05' 60.00" E with an elevation of 13 meters above sea level and a population of 171,875 as at 2019.(*latitude and longitude GPS coordinates of Teshie (Ghana, Africa)*, 2020)

1.7.1 Culture

Teshie is one of the independent towns in the Ga state, through oral tradition the indigenous people migrated from Israel and passed through and partially settled in many lands/countries such as Nigeria and Togo before finally settling in the Gold Coast now Ghana. They also came in various groups that arrived on the shores of this countries/land at different times, the people of Teshie initially settled in La before moving to their present location.

They celebrate the Homowo festival which means hooting at anger, some rites of passage are the naming ceremony (Kpojiemor), puberty rite (Otofo), marriage ceremony (Yoo kpeemor) and funeral rite (Yala Feemor), these rites are observed in all towns in the Ga state (*Profile – Ledzokuku Municipal Assembly*, 2020).

1.7.2 Economy

Teshie is regarded as a major fishing community out of the many fishing communities, in the Greater Accra Region, it has a total of 1000 fishermen, 135 registered canoes and 121 embossed canoes. and majority of the indigenes that live close to the sea are fishermen with their wives and daughter being fishmongers.

Housing characteristics and environmental conditions form the basic stratification factor for the different classes of income zones in this Municipality. About 41% of localities in the Municipality is inhabited by people of high-income status, a majority of about 50% is inhabited by people of middle-income status whilst approximately 9% of the localities are inhabited by people of low-income status. The high-income zones are mainly characterized by good neighborhood infrastructure, well-defined sector layouts and properties with high tax value.

The middle-income zones are usually not as well planned as the high-income zones whilst the low-income zones are characterized by unplanned sector layout with poor/non-existent utilities and neighborhood infrastructure (*Profile – Ledzokuku Municipal Assembly*, 2020).

Figure 2: Map of Ledzokuku Municipal District

1.8 Scope of Study

The global prevalence of surgical site infection for both elective and emergency surgeries, has been reported to be approximately 12.3%, ranging from 9.4% in high income countries to as high as 23.2% in low income countries(Sawyer and Evans, 2018) and patients diagnosed with surgical site infection are five to six times more likely to be readmitted to the hospital, two

times more likely to stay in the hospital, and two to three times more likely to die than patients without infections (Nsiah-Afriye, 2016).

In Africa the rate could be higher due to poor hygiene, less resource and financial constraint depending on the socio-economic status and geographical location of patient. It is therefore of great importance to clinicians globally to be abreast with the current trends of risks factors for SSI in their community. Reducing the incidence of surgical site infection and its associated morbidities and mortality will be of immense benefit for the overall productivity of our country

The study seeks to investigate the risk factors for surgical site infection for both elective and emergency surgeries LEKMA Hospital, Ghana. This will help reduce to the barest the minimum the avoidable incidence of surgical site infection at district, regional and national levels.

1.9 Organization of Report

The Chapter one introduces the topic. It also discusses the background of the study, problem statement, justification of the study, research questions, objectives of the study, profile of study area, and organization of the study.

Chapter two presents a review of some works done by other researchers on the topic. It reviews relevant literature on the study.

Chapter three deals with the research methods and design, techniques and tools for data collection.

Chapter four deals with results and analysis.

Chapter five discusses the results in chapter four and provides an in-depth analysis of the results and findings.

Chapter six presents the conclusion and recommendations of the study by summarizing the key findings and directing recommendations to the appropriate stakeholders.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

For most patients and especially if it is the first time, preparing for surgery is usually complicated with patients given a long list of things they will have to do or abstain from prior to the scheduled surgery. Patients' usually forget to ask for exhaustive explanations of preoperative procedures because they are mostly preoccupied with the fear and anxiety of the surgery. (Swierzewski, 2015). According to the encyclopedia of surgery, patients who are physically and psychosocially prepared for surgery usually experience better surgical outcomes. It can therefore be said that preoperative teachings and techniques greatly help the clinician and patient reduce the incidence and prevalence of surgical site infection (SSI) and help bridge the information gap about the surgical experience for the patient. This will go a long way to alleviate most of his fears and anxiety most surgical patients experience. Patients who are more knowledgeable about what to expect after surgery, and who have an opportunity to express their goals and opinions about the surgery, often cope better with postoperative pain and decreased mobility (Encyclopedia of surgery, 2019).

Clinicians have been trained to prepare patients both physically and psychologically, clinicians also prepare the working environment (objects, instruments and machines) that the patient will come into contact with; all these are done meticulously before, during and after surgery in order to reduce the occurrence of post-surgical complications, chief amongst these complications is Surgical Site Infection (Encyclopedia of surgery, 2019).

The paramount goal of every medical assessment prior to surgery, is to reduce the patient's surgical and anesthetic perioperative morbidity or mortality, and to return the patient to a desirable physical and physiological functioning in the fastest and safest way possible. (*Reducing Surgical Site Infections: A Review*, no date).

It is very important in the practice of surgery to realize and acknowledge that the risks associated with surgery is multifactorial and bears an important relation to the preoperative medical condition of the patient, the invasiveness of the surgical procedure and the type of anesthetic administered (Zambouri, 2007).

Adequate history taking and physical examination is an important part of preparing a patient for surgery, also a good focus on risk factors for cardiac and pulmonary complications and a determination of the patient's functional capacity, are very vital to any preoperative medical evaluation of the patient(Zambouri, 2007).

It is also necessary that all laboratory investigations that will be done are absolutely needed and necessary with a reasonable justification or indication from the patient's medical status, nature of the proposed procedure or possible drug therapy, and not on a routine basis. Persons without any known pre-existing medical conditions may need much more than a quick medical review in order to make sure that, no hidden medical condition has been overlooked in order to bring the risks associated with surgery to the barest minimum.

Those with a history of any pre-existing medical condition or diseases should be managed to a stable state before the surgery; it is vital to ensure that before such a patient is sent to the operating room adequate consultation(s) with appropriate medical personnel is done in a time and manner that allows all party involved to have adequate time to make meaningful and well thought contribution(s) to help optimize the patient's health.

The preoperative and post-operative preparation involves procedures that are effectively carried out based on the nature of the expected surgical procedure, as well as the findings of the diagnostic workup and the pre-operative and post-operative evaluation (Zambouri, 2007).

The subsequent pages give a detailed and stepwise approach to the art and science of pre-operative and post-operative care/management. When these procedures are not observed to the latter, it may lead to post-surgical complications, which may result in surgical site infection, after these an enquiry on surgical site infection is made.

GENERAL HEALTH ASSESMENT

2.2 History

Doctors and surgeons have always placed extreme importance on patients' history, it is regarded as the most important component of the preoperative and post-operative evaluation because if done properly it will provide the clinician with most of the information and clues the doctor needs to know about the patient's condition and how to even go about managing it. According to, (Zambouri, 2007), history taken from patient should always include a past and

current medical history, a surgical history, a family history, drug history, a social history (use of alcohol, tobacco, illegal drugs and NHIS registration), a history of allergies to both drugs and food; any unusual reactions problems or complications associated to drugs, previous anesthetics or food.

It is very important to take patient through a list of allergy precipitators such as topical, local, regional and general anesthesia, antibiotics, adhesive and skin preparations, latex and analgesics. An enquiry into the family's history of adverse drug reactions associated with anesthesia is very important, the drug history includes current and past medications including herbal preparations that may interfere with anesthesia, increase or lower blood pressure than what is desirable or expose the patient to an increased risk of bleeding or clot formation such as NSAIDS, Heparin, Warfarin, Glucocorticoid, Phenytoin, Garlic and Ginseng (Mali, 2012).

In children, history taking should include birth history which focuses several on risk factors such as prematurity at birth, any perinatal complications and congenital, chromosomal or anatomic malformations with a history of recent infections, especially upper and lower respiratory tract infections. In general, a history obtained from patient should at the end of the day include, a complete review of systems which aims at finding any undiagnosed disease or chronic disease which is not being managed properly, it is said that diseases of the respiratory and cardiovascular systems are the most relevant when it comes to evaluating of a patients fitness for anesthesia and surgery (Zambouri, 2007).

2.3 Physical Examination

A full and a comprehensive physical examination is essential to complement the findings obtained during the history taking process, a good physical examination should always build up on the essential information gathered during the history taking process with at least a pre-anesthesia focused physical examination, this should include but not limited to, assessment of the airway, lungs and heart, with documentation of vital signs. Unexpected and abnormal findings on the physical examination should be thoroughly investigated before any elective surgery is proceeded with (Pasternak *et al.*, 2002).

2.4 Laboratory Examination

In the medical field, it is common knowledge that history and physical examination are the most relevant diagnostic tools to any clinician but it is best when these finding are supported by laboratory findings thus laboratory investigations serve to confirm what the clinician finds on history and physical examinations.

Research supports the fact that 'routinely carrying out laboratory tests in patients who are apparently healthy after a good history and physical examination is not beneficial or cost effective. The clinician should always analyze the risk-benefit ratio of any lab test ordered. Studies show that 5% of patients in a healthy population tend to have results which fall outside the normal range, laboratory tests should therefore be ordered based on the information obtained from the history and physical examination, the age of the patient and the complexity of the surgical procedure'(Zambouri, 2007; Committee on Standards and Practice Parameters *et al.,* 2012)

Also, inability to run adequate laboratory test for the patient before and after surgery may predispose patient them to infections as surgeons will not be able to properly adjust antibiotic requirement when necessary.

2.5 Drug Assessment

An adequate history of all drugs a patient is currently on is vital for pre and peri-operative is assessment in as some drugs can interact with anesthetics which may be lead to an increased risk to peri-operative complication or death, also a previous and current drug history can prompt the clinician to an important disease condition the patient may have skipped. It also gives the clinician the chance to decide which drugs may have to be stopped, continued or increased to help optimize patient for the surgery (*Preparing for Your Event*, 2005).

2.6 Assessment of operative risk by 'American Society of Anesthesiologists' Classification of Physical Status

'Perioperative risk is a direct function of the preoperative medical status of the patient, the invasiveness and of the surgical operation, the type of anesthetic administered and the overall duration of the surgery.

The grading system of the American Society of Anesthesiology (ASA) was introduced originally as a simple description of the physical state of a patient. Despite its apparent simplicity as indicated in table 2.1, it has to this day remained as one of the few prospective descriptions of the general health of a surgical patient and its correlation with the risk of anesthesia and surgery. It is extremely useful and should be applied to all patients who present for any surgical procedure. Based on the ASA grading system, increasing physical status or ASA class is associated with increasing mortality. The unavoidable incidence of an emergency surgery dramatically increases the risk of surgery, and this is even more relevant to patients in ASA class 4 and 5'(Zambouri, 2007; Daabiss, 2011).

Table 2.1: Classification of Physical Status by American Society of Anesthesiologists'

Status	Disease State
ASA class 1	**No organic, physiologic, biochemical or psychiatric disturbance**
ASA class 2	**Mild to moderate systemic disturbance that may or may not be related to the reason for surgery. Examples: Heart disease that only slightly limits physical activity, essential hypertension, diabetes mellitus, anemia, extremes of age, morbid obesity, chronic bronchitis.**
ASA class 3	**Severe systemic distribution that may or may not be related to the reason for surgery, (does limit activity). Example: Heart disease that limits activity poorly controlled essential hypertension, diabetes mellitus with vascular complication, chronic pulmonary disease that limits activity, angina pectoris, and history of prior myocardial infarction.**
ASA class 4	**Severe systemic distribution that is life-threatening with or without surgery. Example: CHF, persistent angina pectoris, advanced pulmonary, renal, or hepatic dysfunction.**

ASA class 5	**Moribund patient who has little chance of survival but is submitted to surgery as a last resort (resuscitative effort). Example: uncontrolled hemorrhage as from a ruptured abdominal aneurysm, cerebral trauma, pulmonary embolus.**
ASA class 6	**A declared brain-dead patient whose organs are being removed for donor purposes.**
E	**A "E" is added to the status number to designate an emergency operation.**

Table:1 (Medscape, 2020)

2.7 Assessment of operative risk by existing and current medical conditions.

2.7.1 Diabetes Mellitus

Diabetic patients with uncontrolled glycemic level are predisposed to impaired wound healing with an increased inclination to infections because of defects in chemotaxis, opsonization, and phagocytosis. This is extremely important when areas of micro-vascularization, such as the fingers and toes, are the sites that need surgical intervention. Additionally, the high prevalence of microangiopathy in the skin and peripheral neuropathy in the diabetic population presents a situation that makes is more difficult for wound to heal at peripheral sites to heal. Considering the increased probability of SSI the clinician may administer antibiotic prophylaxis to help reduce any potential SSI and may augment cautiously with epinephrine (Schwartz, 2020).

The perioperative morbidity and mortality risk associated with the diabetic population is higher than that of non-diabetics. It is therefore very important to note and remember that a diabetic patient who needs or undergoes a surgical procedure is more likely to be harmed by neglect of the long-term complications of diabetes than from the short-term control glycemic levels. Patients who have been diagnosed with diabetes for a long time tend develop complications in one or more organs. Any diabetic patient who needs elective surgery should be carefully assessed for signs and symptoms of peripheral vascular, cerebrovascular and coronary disease before they are scheduled for surgery. All relevant co-existing pathologies must be recognized and carefully managed to desirable targets before, during and after the surgery has been done (Zambouri, 2007).

The incidence of death after a Myocardial Infarction is higher in diabetics than non-diabetics. MI may be clinically "silent" if the diabetic patient has developed autonomic neuropathy. It is therefore necessary that a high index of suspicion for Myocardial Infarction be maintained throughout the perioperative period if any unexplained hypotension, dysrhythmias, hypoxemia or electrocardiogram changes develop. Eight (8) to about thirty-one (31) percent of type 2 diabetics are reported to have asymptomatic coronary artery disease on stress testing. Management with administering beta-blockers perioperatively should be considered in diabetics with a history of coronary artery disease in order to limit the occurrences of perioperative ischemia. It should be noted that diabetics benefit as much or more than the non-diabetic population from post-MI beta blockade even though there has been some discord regarding the use of beta blockers in diabetics (this is due to concerns of worsened glucose intolerance and masking symptoms of hypoglycemia).

Adequate control of glycemic concentration lower than 10 mmol/L (180 mg/dL) must be achieved and maintained preoperatively until oral feeding is resumed after the surgery. It is necessary for oral hypoglycemic drugs to be withheld on the day of surgery for a drug with a short half-life and up to 48 h preoperatively for a long acting agent such as chlorpropamide. A glucose and insulin combination is preferred over other hypoglycemic methods since this gives the most satisfactory method of overcoming the dangerously silent metabolic consequences of starvation and surgical stress in the diabetic patient. Generally, there is no need for insulin infusion in diabetics who are diet-controlled regardless of type of surgery, or in diabetics who are on oral agents only and are undergoing minor surgeries.

Some perioperative complications of hyperglycemia such as dehydration, impaired wound healing, worsened CNS and spinal cord injury due to ischemia or hypoxia, inhibition of white blood cell chemotaxis and function (associated with an increased risk of infection), and hyperosmolarity leading to hyper viscosity and thrombogenesis may occur and need to be looked out for. A blood glucose level higher than 10 mmol/ L (180 mg/dL) results in osmotic diuresis; glycosuria may lead to dehydration and increases the risk of urinary tract infection. As a general rule in a 70-kg patient, 1 unit/h of regular insulin lowers the glucose by approximately 2530 mg/dL (1.5 mmol/L), (Zambouri, 2007).

2.7.2 Hypertension

Patient’s with any history of hypertension should have their blood pressure monitored a couple of time to make sure the hypertension is under control since patients with an increased blood

pressure can bleed profusely during surgery. This is much more critical when operating on highly vascular regions of the body or in larger areas, such as the thigh or scalp (Schwartz, 2020).

Hypertension increase incidence of perioperative bleeding and formation of hematomas and can be a significant factor of poor outcome after graft or flap surgery, if this happens a surgical site infection is inevitable as the connected tissue will have no access to oxygenated blood supply and die off. It is very important to note that preoperative sedatives and adequate pain management after surgery are very important in lessening undesirable pain and anxiety which can subsequently increase blood pressure in the hypertensive patients (Medscape, 2020).

2.7.3 Bleeding Tendency

The importance of detecting or diagnosing bleeding tendencies in surgical patient cannot be over emphasized as this can lead to profuse bleeding and life-threatening situations in the operating room. Once the surgical team is aware of this condition it is very important to start appropriate management to control it or take the necessary precautionary measures before surgery. Also, some medications, inherited disorders and underlying diseases conditions, can interfere with the normal coagulation process. In general, bleeding disorders occur as a result of defects of the platelets, the intrinsic or extrinsic coagulation system, or a combination of these factors (Schwartz, 2020).

In order to adequately screen for such defects, the clinician must ask about any history of bleeding problems in the family; any personal history of problematic bleeding in previous injuries, surgeries, or dental procedures; a history of gum bleeds or epistaxis; history of patient needing blood transfusions in the past; and a complete drug history.

If any bleeding diathesis is suspected, the laboratory investigations below can be ordered: a full blood count, a prothrombin time (PT) and an activated partial thromboplastin time (aPTT). Based on the result the patient may be referred to a physician specialist or hematologist before or after the surgery for further testing and management advice . (Medscape, 2020).

2.7.4 Hepatitis and HIV disease

Severe liver disease is associated with decreased protein synthesis that may result in coagulation disorders and impaired wound healing. End-stage liver disease caused by hepatitis B, C or by any other means may create bleeding abnormalities and patient may require

preoperative fresh-frozen plasma or clotting factors. Additionally, severe caution must be taken when administering drugs, including antibiotics and anesthetics that are metabolized in the liver if the patient can do without them, they should be avoided. These include sedatives, lidocaine, and amide-linked local anesthetics (Schwartz, 2020).

HIV positive patients who are under proper management with no complications have approximately the same rate as HIV negative patients with postoperative infections and decreased wound healing (Dua, Wajed and Winslet, 2007).

2.7.5 Organ transplantations/artificial joints

Patients who have undergone organ transplants or any surgical procedure that uses artificial joints may require prophylactic antibiotics, more so if the surgery occurred within the past one (1) year but dosage and duration depends on the surgeon in the absence of these prophylaxis patients stand an increased chance of developing surgical site infection (Schwartz, 2020).

2.7.6 Pregnancy

Elective surgeries should be postponed after childbirth to avoid any potential adverse effects during fetal organogenesis. Some antibiotics such as penicillin and erythromycin are generally safe during pregnancy, but others, such as tetracycline, can cause bone growth retardation and staining of dental enamel in the fetus. Lidocaine is safe in low doses, but can cause fetal CNS and cardiac depression when in excess. Paracetamol is used regularly in pregnant patients even though it can cross the placenta to the fetus. Drugs should always be selected with the greatest precaution during pregnancy and lactation (Schwartz, 2020).

2.7.7 Snoring/Sleep Apnea

According to Medscape 80% of patients with breathing problems related to sleep disorders are male. Conscious sedation may aggravate these conditions and is best avoided. An auxiliary source of oxygen may be needed for these patients and is administered using a nasal prong. Cautiously use electrocautery in the operation room in order to avoid accidental fire from a spark while obtaining hemostasis, which may lead to more surgical complication for the patient on the operating table (Medscape, 2020).

2.7.8 Seizure Disorders/Stroke

Surgeons should be careful to avoid large doses of anesthesia in patients with history of seizures this is to prevent inducing convulsions.

“Cerebrovascular accidents are a major cause of morbidity and mortality in elderly persons. Monitoring the blood pressure before during and after surgery is very essential to help diagnose and properly manage the risk to surgery. Also, if accelerated hypertension occurs, it must be immediately treated or the procedure must be terminated. An enquiry into previous history of cerebrovascular accident is important for several reasons, a history of stroke may be a clue to an underlying coronary heart disease, and it is an indication that the patient is most likely on an antiplatelet agent (e.g., aspirin, ticlopidine) or warfarin (Coumadin)” (Schwartz, 2020).

2.7.9 Nutrition

Deficiencies of some vitamins such as vitamins C, A, and K can impair normal wound healing. Zinc deficiency affects protein synthesis and cell migration.(Brabin et al, 2001) Vegetarian patients have also been reported to experience delays in wound healing this may be due to the limited variety of macro and micro nutrient source (Nancy Collins, 2020).

Malnutrition leads to a significant increase in the operative death rate. Weight loss of more than 20% caused by illness (e.g. cancer, intestinal disease) results in a higher death rate and a greater than three-fold increase in SSI rate. Evaluating the nutritional history is very important in preoperative evaluation, it helps provides a working knowledge of the basic nutritional deficiencies associated with certain diseases condition, especially vitamin deficiencies. Standard biochemical parameters that indicate impairment in the visceral protein mass include a serum albumin level of less than 3 g/dL or a serum transferrin level of less than 150 mg/dL.

Currently no consensus has been reached about the indications of short-term (7-10 d) preoperative hyperalimentation. A good nutritional status can significantly improve wound healing and boost immune function. Current indications for supportive measures before elective surgery include a history of more than 10% body weight loss or an anticipated prolonged postoperative recovery period during which the patient will not be fed orally. Patients who have had a gastric bypass or lap band procedure have surgically induced malabsorption syndromes. Vitamin supplements and protein shakes preoperatively improve healing (Zambouri, 2007).

2.7.10 Herpes Simplex Virus

A history of herpes simplex virus infection is important for surgical sites around the genital or perioral region. It can be precipitated by trauma or stress; thus, surgery can induce an active infection and antiviral prophylaxis may be required. “Management depends on whether or not a history of herpes simplex virus infection is known. In general, persons with frequent outbreaks need higher doses. For most perioral procedures, acyclovir is sufficient (400 mg 8 hourly starting 2 days before the scheduled date for surgery and continued until re-epithelialization occurs, at an average of 10-14 days after surgery. Lysine at 1500 mg/d is a naturopathic supplement effective for stabilizing the lip mucosa preoperatively to avoid herpes breakouts (Schwartz, 2020).

2.7.11 Other Conditions

Other medical conditions which may not be so common in the general population but clinicians need to be aware of since they can result in post-surgical complication are

1. Patients with medical devices like pacemakers, artificial heart valve and prosthetic joints in them.
2. Endocrine problems like thyrotoxicosis can increase cardiac sensitivity to adrenaline.
3. Relevant skin problems, such as discoid lupus erythematosus, psoriasis, lichen planus, or extensive verrucae, may be exacerbated after surgery.

Connective-tissue diseases may delay the wound healing process or widening of their scars formed. Permanent sutures placed in the dermis decrease scar widening postoperatively therefore patient must be informed of the possibility of suture reaction such as secondary removal by granuloma formation (Menke *et al.*, 2007).

2.8 Assessment of Operative Risk by Specific Organs

Surgery-related morbidity and mortality generally fall into three main categories: cardiovascular, respiratory and infectious complications. The risk to surgical morbidity and mortality increases with increasing age. The reason for an age-related increase in surgical complications appears to correlate with an increased likelihood of underlying disease states in older person” (Zambouri, 2007). It is therefore very important for doctors to assess at least

these systems before surgery. Therefore, even though other organ systems are also important for the general wellbeing of the patient. The study will focus on the main two which is cardiovascular and pulmonary/respiratory risk assessment.

2.8.1 Assessment Cardiovascular Risk

With the information above the body's ability to maintain cardiovascular integrity or increase cardiac output in response to minor or significant stress during or after surgery may be one of the most fundamental determinants in the final outcome of a minor or major surgery. Conditions like congestive heart failure, unstable angina, or recent myocardial infarction should prompt a thorough cardiac workup before a major elective surgery involving regional or general anesthesia. It's also important to obtain either stress thallium echocardiography or dobutamine echocardiography to ascertain whether coronary ischemia is reversible. This test maybe followed by coronary artery angiography to precisely define anatomical lesions that would be potentially accommodative to revascularization with either intraluminal stents or open cardiac bypass surgery" (Schwartz, 2020).

In the recent past and even now most clinicians still use several risk factors to predict fatal or life-threatening complications of cardiac origin, after noncardiac operations. Conditions such as; Diabetes mellitus, hypertension, smoking, hyperlipidemia, stable angina pectoris, remote myocardial infarctions, ST-segment or T-wave changes on electrocardiogram, bundle-branch blocks, mitral valvular disease, and cardiomegaly are conditions that must never be overlooked. However, the above conditions are apparently less pertinent determinants of cardiac risk than had been previously thought"(Medscape, 2020). Current literature say's The Goldman criteria as indicated in table 2.2 takes precedence over the aforementioned risk factors.

Table 2.2 Goldman Criteria for Weighing of Cardiac Risk Factors.

Criteria	**Points**
Historical	
-Age older than 70 years	5
-Myocardial infarction in previous 6 months	10

Examination	
-S_3 gallop or jugular venous distension	11
-Significant aortic valvular stenosis	3
Electrocardiogram	
-Premature atrial contractions or rhythm other than sinus	7
-More than 5 premature ventricular contractions per minute	7
General Medical Conditions (3 points if any below apply)	3
-Abnormal blood gas levels	
-Abnormal potassium/bicarbonate levels	
-Abnormal renal function	
-Liver disease or bedridden	
Operation	
-Emergency	4
-Intraperitoneal, intrathoracic, aortic	3
Total possible points	53

(Medscape, 2020)

Below is The Interpretation of The Risk Index (Medscape, 2017)

0-5 Points is classified as Class I with 1% Complications,

6-12 Points is classified as Class II with 7% Complications,

13-25 Points is classified as Class III with 14% Complications

26-53 Points is classified as Class IV with 78% Complications

"Out of the 53 total possible points in the scheme of weighting cardiac risk factors, 28 points are attributable to conditions that are potentially treatable. Therefore, surgery should be

postponed until the patient's overall cardiac status improves, including potential revascularization. For patients with myocardial ischemia, elective surgery should be postponed until patient is optimized and urgent surgery should be preceded by coronary artery bypass. The risk of reinfarction during an elective procedure performed within 3 months after a myocardial infarction exceeds 30%, while the infarction rate decreases to 4.5% after 6 months" (Schwartz, 2020).

2.8.2 Assessing Respiratory Risk

A detailed history and physical examination are the most important parts of preoperative respiratory risk assessment role the importance of spirometry remains uncertain (Zambouri, 2007). "Respiratory complications occur in 2 major patient groups: (1) patients with normal lungs who develop respiratory abnormalities secondary to anesthetic agents and (2) patients with overt chronic lung disease in whom the problems of anesthesia and the operation are superimposed on intrinsically diseased pulmonary tissue"(Schwartz, 2020).

The risk factors for respiratory/pulmonary are

- Procedure-related risk factors: based primarily on how close the surgery is to the diaphragm (i.e. upper abdominal and thoracic surgeries are the highest risk procedures).
- Length of surgery (> 3 hours) and general anesthesia versus epidural or spinal.
- Emergency surgery.
- Underlying chronic pulmonary disease or symptoms of respiratory infection.
- Smoking.
- Age >60 years.
- Obesity.
- Presence of obstructive sleep apnea.
- Poor exercise tolerance or poor general health status.

(Zambouri, 2007)

2.9 Surgical Site Infection

The skin serves as a natural barrier against infection. There are many established protocols and standardized precautions, to help prevent infections however, any surgery that causes a break in the skin can lead to an infection. These infections are termed surgical site infections because they occur on the part of the body where the surgery took place. If you have surgery, the chances of developing an SSI are about 1% to 3% (John Hopkins Medicine, 2017). SSI is infection at or near surgical incisions within 30 days of an operative procedure or within a year if an implant was left in place and the infection is thought to be secondary to the surgery (Gaynes *et al.,* 2001).

The CDC classifies surgical wound infections based on (a) The depth of incision made and (b) the incisions proximity to a body part and the type of infection present (c) Location in body organ/space(Horan *et al.,* 2001) as shown in figure 2.3 below.

2.9.1 Surgical Wound Classification by Depth of Incision

1. Superficial incisional (involving only skin or subcutaneous tissue of the incision)

2. Deep incisional (involving fascia and/or muscular layers).

2.A Deep incision primary (DIP)—SSI identified in a primary incision in a patient who has had an operation with 1 or more incisions

2.B. Deep incision secondary (DIS)—SSI identified in a secondary incision in a patient who has had an operation with more than 1 incision.

3. Organ/space (involving any part of the body opened or manipulated during the procedure, excluding skin incision, fascia, or muscle layers).

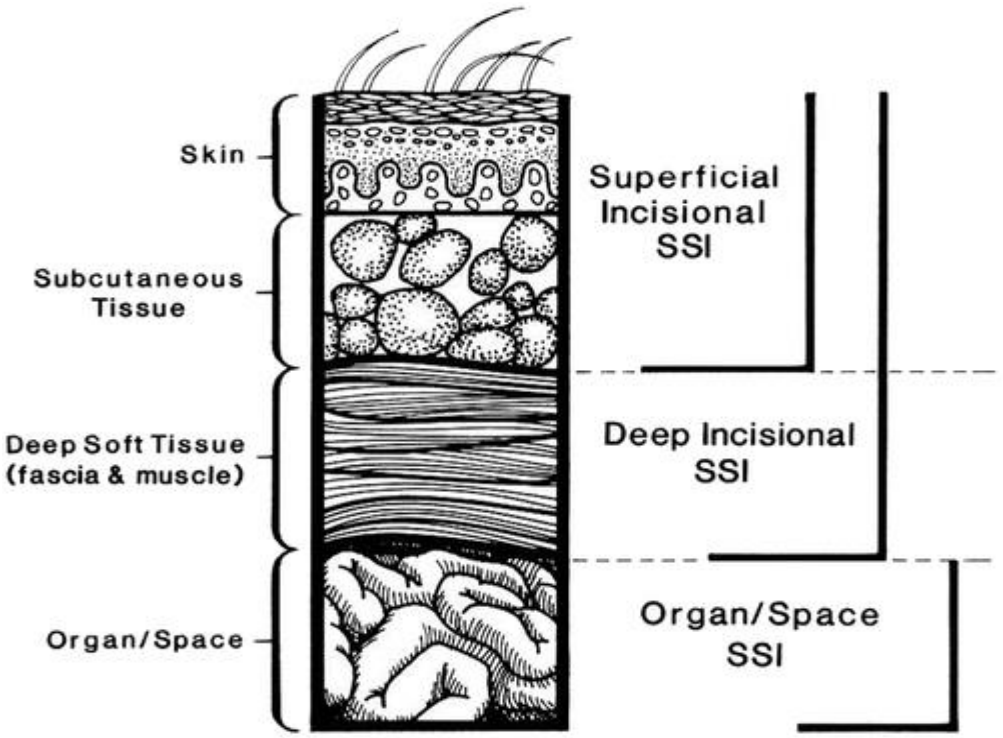

Figure 3: Cross-section of abdominal wall depicting CDC classifications of SSI (Anderson *et al.*, 2014).

2.9.2 Surgical Wound Classification by the Incision's Proximity to a Body Part and the Type of Infection Present.

I. Class I/Clean

An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this class if they meet the criteria.

II. Class II/Clean - Contaminated

An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations that involve the biliary tract, appendix, vagina, and oropharynx are included in this class, provided no evidence of infection or major break in technique is encountered.

III. Class III/Contaminated

Open, fresh, accidental wounds. It includes operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered are included in this category.

IV. Class IV/Dirty - Infected

Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation (Anderson *et al.*, 2014).

SSI contributes significantly to surgical morbidity and mortality each year. It accounts for 15% of all nosocomial infections among surgical patients. (Alp *et al.*, 2014). Post-surgical infection leads to increased length of postoperative hospital stay, higher rate of hospital readmissions and compromised health outcomes with significantly increased health expenditure for the surgical patient. Accordingly, the first and most important step in the treatment of all cases of surgical site infection is their prevention. ‘‘This usually involves meticulous operative techniques coupled with timely administration of antibiotic prophylaxis, and several preventive measures that seek to reduce to the barest minimum the bacterial, viral, and fungal contamination threat from the operating room environment, surgical staff, surgical equipment/tools and the patient’s own endogenous skin flora’’(Nash, 2011).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the study design, study population, sample size determination and sampling procedure. It also takes a look at the data collecting tool and pre-testing, ethical consideration, study variables and study limitations.

3.2 Research Method and Design

The study adopted a retrospective cross-sectional design that used a quantitative method which provided the option to examine the relationship between surgical site infection and its associated risk factors. A simple random sampling technique with proportional allocation to employed in selecting participants.

3.3 Data Collection Techniques and Tools

The study data was collected using a structured questionnaire and a WHO developed checklist and assessment tool that was designed to help standardize pre-operative, peri-operative and post-operative procedures and techniques to help reduce the incidence of surgical site infection for all types of surgeries (Sawyer and Evans, 2018).

Data was collected from five health workers and medical health records of patients that had surgery in the research time frame after informed consent was sought from all stake holders, relevant data was extracted from the health records of participants with collection tools specifically designed for the study.

Structured questionnaires were given to healthcare providers.

Participants that fell within the exclusion criteria were replaced with the next available participant that qualified. This was repeated until the required sample size was obtained.

3.4 Study Population

The research included all patients that had surgery at LEKMA Hospital the previous year.

3.4.1 INCLUSION CRITERIA

1. Persons who had undergone both elective and emergency surgery at the LEKMA Hospital from January to December 2019.
2. Be 18 years or older.
3. Be mentally sound.
4. Be of either sex or any race.

3.4.2 EXCLUSION CRITERIA

1. Patients who are mentally unstable.
2. Patients who are immunocompromised such as HIV/AIDS, cancer and patients with evidence of steroid abuse at the time of surgery.
3. Patients below the age of 18years.
4. Wounds which are not from surgical source and that the break in continuity of skin was not from a surgical source.
5. Wounds from road traffic accidents, abscess and burns.
6. Surgeries and surgical incisions/procedures like circumcisions and incision & drainage which did not require admission into the ward was excluded from the research

3.5 Study Variables.

The following are the variables that were investigated under the study:

1. Dependent variable – Surgical Site Infection

2. Independent variable(s) – Age, Marital Status, Religion, Tobacco Use, Alcohol Intake, Pre-existing Medical History (Diabetes, Chronic Heart Disease, Anaemia), Estimated Blood Loss, Duration of surgery, Standard Aseptic Technique, Duration of admission before discharge, Number of days for diagnosis of SSI after discharge, Education of patient on wound care, Regular wound dressing.

3.6 Sample Size

Sample is defined as a small set of cases that is selected from a large pool and examined in detail in such a manner that can be generalized to the population; for this to happen the sample has to be representative, a representative sample is a small collection of cases/unit that closely reproduces or represent features of interest in a larger collection of cases i.e. population (Djamba and Neuman, 2002). This sample size is calculated based on a previous research in surgical site infection at the Komfo Anokye Teaching hospital using 9.67% prevalence (Nsiah-Afriye, 2016).

The sample size will be calculated using the Cochran's formula as shown below;

$$n = \frac{Z^2 \times pq}{e^2}$$

Where,

n = sample size (Cochran, 1977)

Z = the z-score that corresponds with 95% confidence interval which is 1.96

p = Proportion of surgical site infection 9.7% ≅ 10%which is equals to 0.097

q = Proportion of patients without surgical site infection which is equal to 1- 0.097% = 0.903

e = Margin of error set at 5% (0.05)

Therefore,

$$n = \frac{(1.96)^2 \times (0.10 \times 0.90)}{(0.05)^2} \cong 138$$

-

A non-response rate of 11 % resulting to about 15 respondents will be added to the minimum sample size to get 153 participants.

Proportion Allocation

LEKMA Hospital had a total of one thousand seven hundred and twenty-eight (1,728) surgeries. The departments that had surgeries enrolled in the study were Surgical Department/Ward which had four hundred and seventy-seven (477) cases and the Obstetrics &

Gynecology Department/Ward which had one thousand two hundred and fifty-one (1251) cases.

Using proportional allocation formula: $ns = (Ns/N) \times n$

Where;

ns= Proportion of obstetric or gynecological and surgical cases to be allocated to the department

Ns= Total number of obstetric & gynecological cases or surgical cases at the Department/Ward.

N= Total number of obstetric & gynecological surgeries at LEKMA.

n= The sample size for this study

(1) For Obstetrics and Gynecology Department/Ward:

$n = \frac{(1251)}{(1728)} \times 153 = 111$ which is 72% of total surgeries.

(2) For Surgical Department/Ward: $n = \frac{(477)}{(1728)} \times 153 = 42$ which is 28% of total surgeries.

3.7 Pre-Testing

A pilot study is a small-scale study conducted before the main study, on a limited number of subjects from a population with similar characteristics as the main population intended for the study, to test the research feasibility, data collection instruments, sample recruitment strategies, and other research methodology in preparation for a larger study(Hassan, Schattner and Mazza, 2006).

The structured questionnaire and adopted checklist and assessment tool for secondary data collection was tested at La General Hospital, a health facility located in the La Dade-Kotopon Municipal District.

The structured questionnaire checklist and assessment tool was pre-tested to identify any potential problems.

After the pre-testing exercise, all necessary corrections were made before proceeding to the actual field for data collection.

3.8 Data Handling

Data was collected using a developed checklist and a structured assessment tool and a structured questionnaire for health care workers. Informed consent was obtained from all relevant stake holders Research assistants were trained to assist in collecting the data. Guidance was given where necessary. Two months was used in collecting data. The research instrument was given to the Research Supervisor for acceptance and to cross- check to see whether it is sufficiently comprehensive in seeking the proper range of responses and whether the questions have good content and face validity. Reliability of the tool was assured by accurate and careful phrasing of each question to avoid ambiguity. This was done to detect any failure which will be removed before the tool is deployed. Research assistants where educated on the need to record accurate data as failure to do so will lead to a skewed result with an equally skewed interpretation and recommendation.

Also, respondents where advised on the need to answer questionnaires truthfully

3.9 Data Analysis

Data was cleaned, coded and entered STATA statistical software package *(StataCorp.2007. Stata Statistical Software. Release 14.0 StataCorp LP, College Station, TX, USA)* a statistical package for data processing and analysis, the data was analyzed for both descriptive and inferential statistics using the STATA. The results were presented as tables, figures and graphs.

3.10 Ethical Consideration

A letter of approval was taken from Ensign College of Public Health and given to the Greater Accra Regional health directorate, a letter of approval from the Regional Health Director was then sent to the Municipal health directorate and the LEKMA Municipal District, to carry out the study in the area as shown in Appendix I.

An approval letter of informed consent was obtained from the Management and Medical Director of LEKMA Hospital before data collection commenced as shown in Appendix I.

Informed consent was obtained from health workers that answered the questionnaire, during the administration of questionnaires, and participants who decided not to partake in the exercise again had the liberty to do so at any time. Information provided by participants on the questionnaires was be handled with strict confidentiality as shown in Appendices IV and III respectively.

In order to ensure privacy and confidentially of information no personal identifiers like names of participants or folder numbers will be recorded.

Data access is limited to only the principal investigator, research assistants, and supervisor of the study. All data collected were stored under lock and key and will be destroyed after 5 years. There will be no compensation for participating in this study.

3.11 Limitations of the Study

1. Poor documentation of the history of cases that developed surgical site infection and how they were treated and managed at the healthcare facilities
2. Difficulty in tracing some folders of interest even though folder numbers had been obtained from the ward.
3. Poor visibility of Doctors hand writing and scanty surgical procedure notes made data collection a difficult.
4. Time constraint due to the unforeseen Corona Virus pandemic made it difficult for researcher to have access to the hospital to take data, this together with a genuine concern for the health and safety of primary researcher and research assistant as the study was being conducted in a hospital that recorded positive cases of the Corona Virus resulted in a long brake in data collection until hospital administration reviewed safety protocols to give hospital access to non-essential persons before data collection was resumed.

CHAPTER FOUR

RESULTS

4.1 Introduction

The general objective of this study was to investigate the prevalence of post-operative site infection for both emergency and elective surgeries at the LEKMA Hospital in the Ledzokuku Municipality of Ghana, a total of one hundred and fifty-three (153) patients' health records were reviewed.

4.2 Socio-Demographic Characteristics of Participants

4.2.1 Distribution by sex

A total of 153 participants were recruited in the study; 62% of the participants were females, whilst 38% of them were males as seen in table 4.1.

Table 4.1: Distribution of Gender

Gender	**Frequency**	**Percentage (%)**
Male	58	37.91
Female	95	62.09
Total	**153**	**100**

4.2.2 Distribution by Age

The age distribution of participants are as follows, a total of 44.44% of participants were between the age group of 26 to 32 years representing the highest, followed by 26.14% of respondents being between the age group of 33 to 39 years, 18.95% were between the age-group 19 - 25 years, whilst 9.15% of respondents were between the age of group 40 - 46 years and 1.31% were 47 years and above, as shown in table 4.2.

Table 4.2 Socio-Demographic Characteristics of Participants at LEKMA Hospital

Characteristic	**Frequency**	**Percentage (%)**
Age-Group		
19-25years	29	19
26-32years	68	44.44
33-39years	40	26.14
40-46years	14	9.15
47years and above	2	1.31
Total	**153**	**100%**

4.3 Distribution by Religion

Most of the participants where Christians representing about 68% followed by Muslims and other Religions.

4.3.1 Distribution by Marriage

Majority of are married participants about 52% followed by single status.

4.4 Pre-operative Preparation

The result from the study indicated that a majority of patient go through the required pre-operative procedures, clinical examination n=153 (100%), , antibiotic prophylaxis n= 153 (100%), informed consent form signed n=150 (98%), anesthetic review n=127 (83%) ,with the least being laboratory investigation 24 hours prior to surgery n= 80(52%), anesthetic review n=127 (83%) table 4.3 gives the detail and appendix (I) indicates the perioperative checklist.

Table 4.3: Result of Pre-Operative Preparation Checklist

Variable	Response	Frequency	Percentage (%)
Consent	Yes	150	98
	No	3	2
	Total	**153**	**100**
Clinical Examination	Yes	153	100
	No	0	0
	Total	**153**	**100**
Laboratory Investigations 24 Hours prior to surgery	Yes	146	95
	No	7	5
	Total	**153**	**100**
Anesthetic Review	Yes	127	83
	No	26	7
	Total	**153**	**100**
Antibiotic Prophylaxis	Yes	153	100
	No	0	0
	Total	**153**	**0**

4.5 Post-operative Checklist

The study indicated 100% n=153 were given antibiotic antibiotics after surgery, 9.8% n=15 developed SSI, 86% n=132 had regular wound dressing, 20% n=30 had an underlying medical

condition, 24% n=37 had complications after surgery. Table 4.4 gives detail about post-operative checklist.

Table 4.4: Result of Post-operative checklist

Variable	Response	Frequency	Percentage (%)
Antibiotics given after surgery	Yes	153	100
	No	0	0
	Total **Total**	**153** **153**	**100** **100**
Was client diagnosed of S.S.I.	Yes	15	9.8
	No	138	90.2
	Total	**153**	**100**
Regular wound dressing	Yes	132	86
	No	21	14
	Total	**153**	**100**
Underlying medical conditions	Yes	30	20
	No	123	80
	Total	**153**	**100**
Complications during or after surgery?	Yes	37	24
	No	116	76
	Total	**153**	**100**

4.6 Causes of SSI.

Surgical staffs were interviewed to find out what they perceived as the possible cause of SSI, what they did to prevent it in the operating rooms(theatre) and wards and if SSI are common. All of the surgical staff that were interviewed (D1, D2, N1, N2, N3) indicated that non-adherence to aseptic technique to be cause to SSI, default on wound dressing (D2), Underlying medical condition (D1), low immunity (N2) and lack of proper demarcations at the ward (N3) were some of the factors ascribed to be possible causes of SSI by the surgical staffs, the interview was transcribed and analyzed for accurate deduction Tables 4.5 and 4.6 give details about the interview.

Table 4.5: Results of Interview on Causes of SSI's -Doctors.

Question	D1	D2
1. What are the causes of SSI?	1. Non-adherence to aseptic technique. 2. Underlying medical conditions like Diabetes, Hypertension and immune suppression 3. Wrong suture materials and technique that create dead space which encourages bacterial growth.	1. Non-adherence to aseptic technique 2. Patients who default on wound dressing schedule. 3. Contaminations at site of surgery from endo and exogenous source.
2. What is done at the theatre to prevent or reduce SSI?	1. Sterilization of surgical instrument. 2. Aseptic and adequate scrubbing of hands.	1. Wearing clean gown, mask, hair net and prescribed foot wears.

		2. Proper preparation of incision site with an antiseptic.
3. Are SSI common in the wards?	1. No	1. No

Table 4.6: Results of Interview on Causes of SSI's –Nurses

Question	N1	N2	N3
What are the causes of SSI	1. Non-adherence to aseptic technique	1. Low immunity of patients from chronic or systemic disease.	1. Lack of proper demarcations at the wards.
What do you do to prevent SSI	1. Adherence to septic technique such as barrier nursing and making sure sterile equipment remain sterile.	1. Wearing clean gown, mask, hair net and prescribed foot wears	1.Dressing of clean wounds first before contaminated ones.
Are SSI common in the ward?	No	1. No	1.No

4.7 Surgical Procedures

At LEKMA Hospital the prevalence of SSI was 9.8% as indicated in Figure 3.

Descriptive statistics involving charts, frequency tables and percentages were used in the presentation of the data.

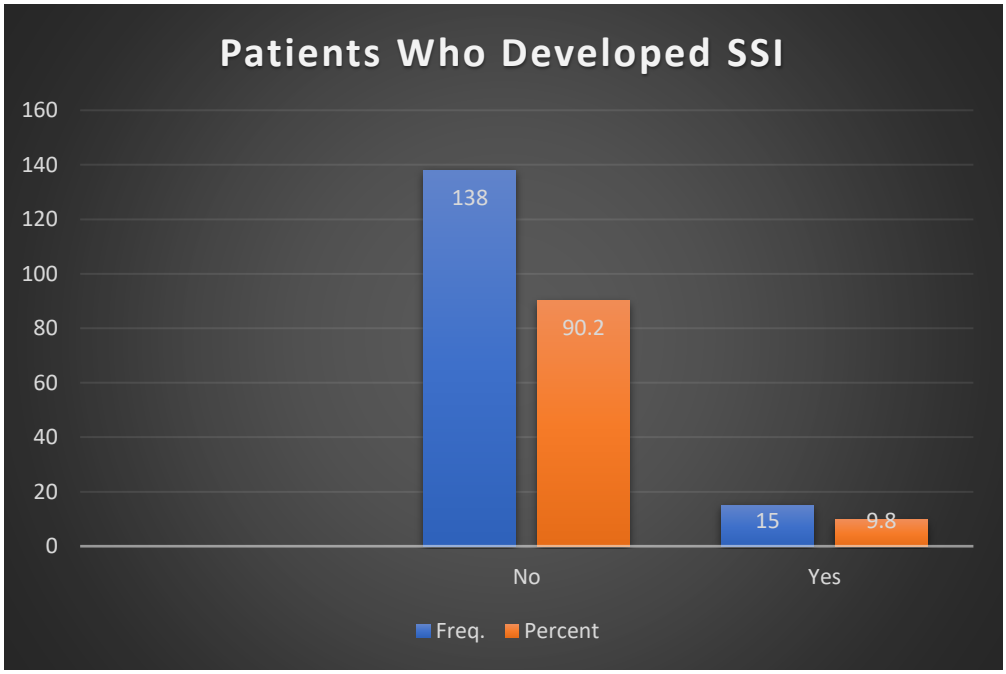

Figure 4. Patients who developed SSI

4.8 Surgical Conditions at LEKMA Hospital

4.8.1 Type of Surgery

Out of the 153 cases emergency cases were 107 representing 69.93% and elective cases where 46 representing 30.07%.

4.8.2 Indication for Surgery at LEKMA Hospital

As seen in figure 5 below on the list of surgical conditions; CPD was about 45.75%, obstructed labour 13.07%, appendicitis 13.07%, preterm labour 11.76%, obstructed hernia 9.15%, and strangulated hernia 7.19%.

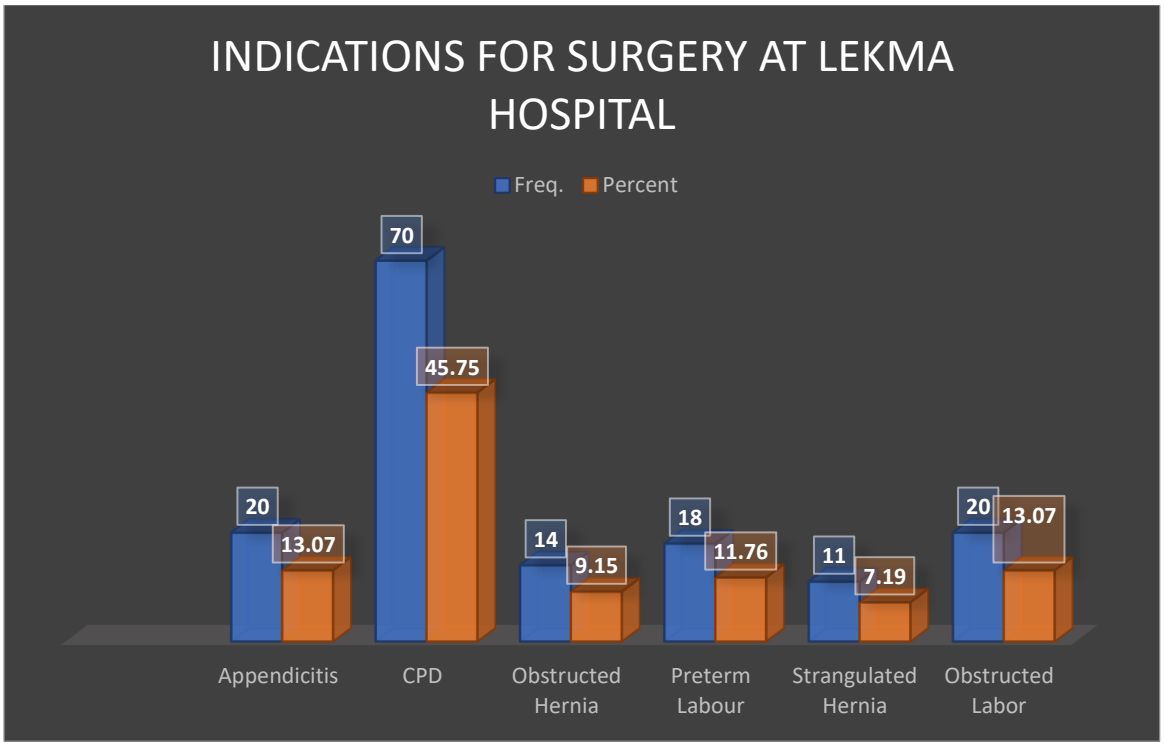

Figure 5: Indication for Surgery at LEKMA Hospital

4.9 Risk Factors to Surgical Site Infection

Aseptic techniques were observed before and after surgery for all 153 cases, clients were given adequate antibiotics prophylaxis before surgery and after surgery for all 153 cases, adequate laboratory investigations were ordered for 146 cases representing 95% of all cases.

4.9.1 Bivariate test on Association between socio-demographic status and indication for surgery with development of SSI

Using Fisher's exact to test for association between socio-demographic status and developing SSI, none were significant using a p-value<0.05; Age-group, gender, religion, surgical condition and marital status all had p-values more than 0.05 which made them insignificant when testing for association with SSI, as shown in table 4.7 below.

Table 4.7: Bivariate Analysis on Association between Socio-demographic Status and Developing of SSI

Characteristics **Age**	**SSI** **(N=15)** **N (%)**	**P-value for Fisher's Exact Value**
19-25years 26-32years 33-39years 40-46years 47years and above	6 (40.00) 7 (46.67) 2 (13.33) 0 (0.00) 0 (0.00)	0.202
Indication for Surgery Appendicitis CPD Obstructed Labour Preterm Labour Strangulated Hernia Obstructed Labour	 3 (20.00) 10 (66.67) 1 (6.67) 0 (0.00) 1 (6.67) 0 (0.00)	0.241
Gender Male Female	 6 (40.00) 9 (60.00)	1.000
Religion Christian Muslim Other	 12 (80.00) 2 (13.33) 1 (6.67)	0.194
Marital Status Single Married	 11 (73.33) 4 (26.67)	0.055
Irregular/default on wound dressing	14(93.3) 1(6.67)	0.001*

The distribution of SSI by age group; 26-32 n=6(47%), 19-25years n=6(40%), 33-39 n=2(13%), age groups 40-46 and 47years and above did not record any case of SISI as shown below in figure 6.

Also, the distribution of SSI by indication for surgery, CPD n=10(66.7), Appendicitis n=3(20%), Obstructed labour n=1(6.7), strangulated hernia n=1(7%), preterm labour had no case of SSI as shown below in figure 7.

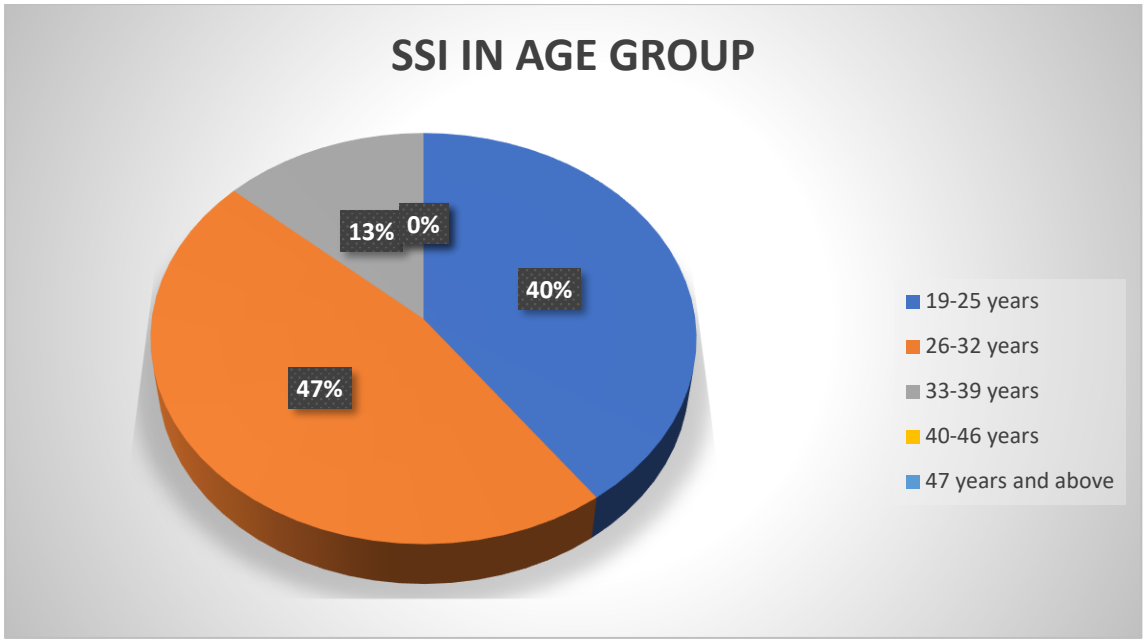

Figure 6: Surgical site infection in age group

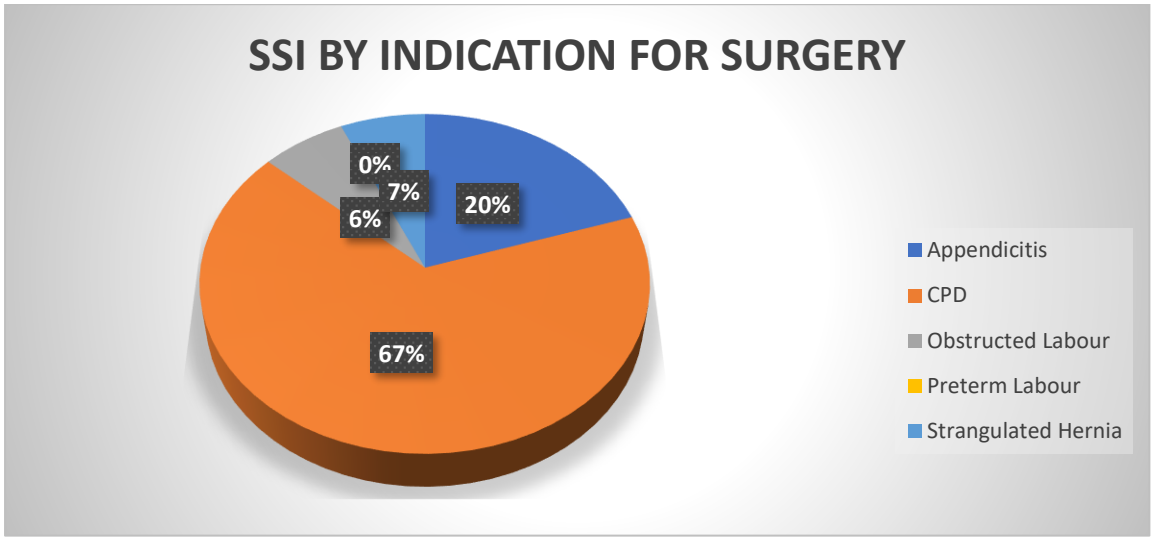

Figure 7: Surgical site infection by indication of surgery

4.9.2 Bivariate test on Association between independent variables and the dependent variable.

Using Fisher's exact to test for association between the risk factors and developing surgical site infection; with a p-value<0.05; Alcohol intake, Tobacco use, pre-existing medical condition, marital status and default on wound dressing were significant determinants of SSI, as shown in table 4.8 and figure 8.

Table 4.8 Association of risk factors to SSI.

Did patient develop SSI	**Alcohol Intake**	**Percentage**	**Tobacco Use**	**Percentage**	**Pre-existing Medical Condition**	**Percentage**	**Default on Wound Dressing**	**Percentage**
Yes	13	86.67 %	14	93.33 %	12	80%	14	93.30 %
No	2	13.33 %	1	7.00 %	3	20%	1	6.70 %
Total	15	100%	15	100%	15	100%	15	100%
P-value	0.001		0.001		0.001		0.001	

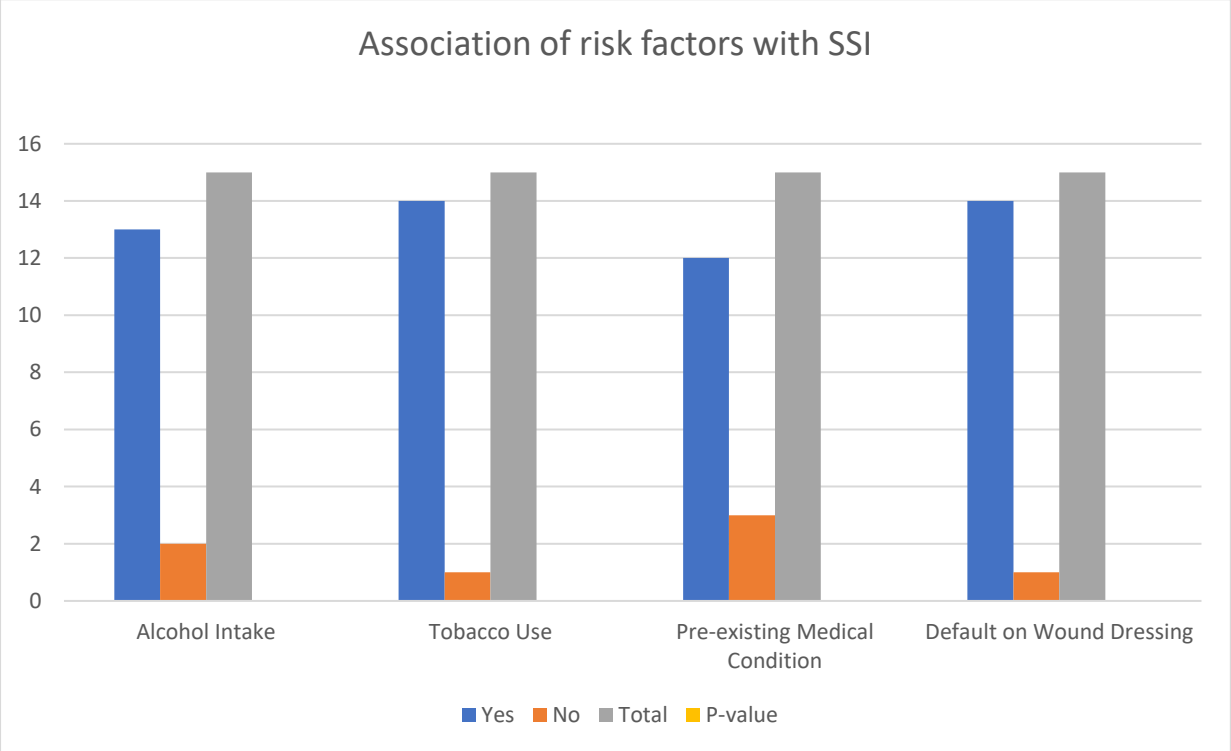

Figure 8: Association of risk factors with SSI

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This part of the research elaborates on details of results gathered from the research on prevalence of surgical site infection by analyzing the socio-demographic and risk factors associated with surgical site infection. They are presented as follows:

5.2 Prevalence

A lot of research, time and money has been invested into making surgeries much safer than they were decades ago, the world of surgery in the twenty first century have unquestionably seen great improvement in procedure technique and outcome of surgeries. This has hopefully increased the survival rate of patients that seek surgical treatment, who decades ago would have had lesser chance of survival with an increased rate of surgical site infection. The study was carried out to investigate the prevalence of post-operative site infection for both emergency and elective surgeries at LEKMA Hospital.

The study indicated the prevalence rate to be 9.8%. One of the specific objectives of this study was to determine the prevalence of surgical site infection at LEKMA hospital, also the above finding answers research question three **'What is the prevalence of SSI in LEKMA Hospital'**. A prevalence of 9.8% corresponds with literature of global prevalence of surgical site infections approximately at 12.3%; ranging from 9.4% in high income countries to as high as 23.2% in low income countries(Sawyer and Evans, 2018), but another source shows 9.8% to be very high, about 2 to 3 times higher than what the researcher found from another literature review. In the U.S the chances of developing an SSI are about 2.8%(Barie, 2002), and 1.4% in Thailand (Chungsiriwattana *et al.*, 2019). This when analyzed on its own may indicates a high incidence of post-operative site infection at the LEKMA Hospital, but when compared with the global incidence of 9.8% to 12.3% and the current literature that says most developing countries may fall within the upper limit for this range I will say the incidence rate is not too high when compare with the perspective of developing countries, whilst bearing in mind the financial cost and inconvenience (longer admissions days and pain) to both patient and hospital management.

5.3 Socio-demographic Distribution of Respondents.

5.3.1 Distribution by Gender

In this study, 58 (52.94%) were males and 95 (62.09%) were females. This was consistent with literature which indicated a higher rate for female when compared with male, Mawalla et al. reported female preponderance of surgical site infections 116 (46.4%) males and 134 (53.6%) females (Mawalla *et al.*, 2011).

5.3.2 Distribution by Age

In this study, the ages ranging from 26-32 recorded the highest number of surgeries recorded n68 (44%), followed by ages 33-39 n40 (26%), followed by ages 19-25 n29(19%) then ages 40-46 n14(9%) lastly 47years and above n2(1.31). Young people ranging from ages 26-32 recorded the highest case whilst the older population recorded the lowest cases indicating most people in the working population were more prone to surgeries, the active youth ranging from 19-25 and 26-32 together contributed to 63% of the total case study, this finding of concern as it could impact negatively on the lead productivity of the district.

5.3.3 Pre-operative Preparation

The result from the study indicated that a majority of patient go through the required pre-operative procedures, clinical examination n=153 (100%), , antibiotic prophylaxis n= 153 (100%), informed consent form signed n=150 (98%), anesthetic review n=127 (83%) ,with the least being laboratory investigation 24 hours prior to surgery n= 80(52%), anesthetic review n=127 (83%). The surgical staff performed above average on the pre-operative checklist as most folders had evidence suggesting the above preparation done was done.

5.3.4 Distribution of Surgical cases and SSI.

The study revealed that out of the 153 cases studied, prevalence of surgical site infection was n=15 representing 9.8%.

Emergency cases where 107 representing 69.93% and elective cases where 46 representing 30.07%; 9 emergency cases reported an incident of SSI representing 60% of total SSI cases also 6 elective cases an incident of SSI representing 40% of all reported cases of SSI.

From the total number of infected cases, caesarean section on account of cephalopelvic disproportion reported the highest incidence of n=10 cases representing about 67% of total cases of SSI, followed by n=3, appendicectomy, n=1 caesarean section on account of obstructed labor and n=1 herniorrhaphy on account of strangulated hernia both represented about 7% each for to total number of SSI cases. This was not consistent with standard knowledge of herniorrhaphy and appendicectomy procedures as they invade the intestines and thus have a higher contamination burden than caesarean section.(A, Rahman M and H, 2012) this deviation could be due to the higher occurrence of indication for caesarean section, n=108 in total than the other procedures during the study.

5.3.5 Causes of SSI

Surgical staffs were interviewed to find out what they perceived as the possible cause of SSI, what they did to prevent it in the operating rooms and wards and if SSI are common. All of the surgical staff that were interviewed (D1, D2, N1, N2, N3) indicated that non-adherence to aseptic technique to be cause to SSI, default on wound dressing (D2), Underlying medical condition (D1), low immunity (N2) and lack of proper demarcations at the ward (N3) were some of the factors ascribed to be possible causes of SSI by the surgical staffs.

Surgical staff had an accurate perception about the possible causes of surgical site infection.(*Surgical site infections - Infectious Disease Advisor*, 2020)

5.3.6 Association of Risk Factors to Developing Surgical site infection.

Using Fisher's exact to test for association between socio-demographic status and developing SSI, none were significant using a p-value<0.05; below is a breakdown of each test.

Age-group when tested had a p-value of 0.202 and was not significantly associated with developing surgical site infection.

Gender when tested had a p-value of 1.000 and is not significantly associated with developing surgical site infection.

Religion when tested had a p-value of 0.194 and is not significantly associated with developing surgical site infection

Surgical condition when tested had a p-value of 0.241 and is not significantly associated with developing surgical site infection.

Marital status when tested had a p-value of 0.055 and is not significantly associated with developing surgical site infection.

5.3.7 Bivariate analysis test on Association between independent variables and the dependent variable.

Using Fisher's exact to test for association between the risk factors of developing surgical site infection; with a p-value<0.05; below is summary of the test which answers the first specific objective and research question respectively.

Alcohol intake was significantly associated with developing surgical site infection for this study with a p-value of 0.001, also 88% of respondents that developed post-surgical site infection had a positive history of alcohol intake.

The finding does not support literature, there is no widely accepted evidence or research that supports alcohol intake leads to an increased risk of SSI (Shabanzadeh and Sørensen, 2014).

Tobacco use is significantly associated with developing surgical site infection with a p-value of 0.001, also 93% of respondents that developed surgical site infection had a positive history of tobacco use. Literature supports this finding even though the percentage for this study is high.(Mawalla *et al.*, 2011) which found tobacco users to be 26% more likely to develop SSI.

Pre-existing medical condition is significantly associated with developing surgical site infection with a p-value of 0.001. Approximately, 80% of respondents that developed post-operative surgical site infection had pre-existing medical condition.

Diabetic patients with uncontrolled glycemic level are predisposed to impaired wound healing with an increased inclination to infections because of defects in chemotaxis, opsonization, and phagocytosis. This is extremely important when areas of micro-vascularization, such as the fingers and toes, are the sites that need surgical intervention. Additionally, the high prevalence of microangiopathy in the skin and peripheral neuropathy in the diabetic population presents a situation that makes is more difficult for wound to heal at peripheral sites to heal (Schwartz, 2020). A diabetic patient who needs elective surgery should be carefully assessed preoperatively for signs and symptoms of peripheral vascular, Cerebrovascular and coronary disease. Co-existing pathologies must be recognized and cautiously managed before during and after surgery.

Hypertension increase incidence of perioperative bleeding and hematoma formation and c

an be a significant cause of poor outcome of surgery (Schwartz, 2020).

Patient's immunity level was also identified as a risk factor to SSI, it was indicated by 2 respondents (D1 and N2) which suggests it as an important cause among patients admitted thus contributing to the rate observed. Altered immunity would delay wound healing and increase risk of infection in patients (WHO Surgical Site Infection Prevention Guidelines).

Default on wound dressing is significantly associated with developing surgical site infection with a p-value of 0.001. About 93% of patients who defaulted on their wound dressing schedule developed surgical site infection. This finding supports literature as aseptic and adequate wound dressing is essential for wound healing especially when it comes to surgical wounds (Barie, 2002).

5.3.8 Indication for Surgery at LEKMA Hospital

Out of the total 153 cases enrolled into the study, Emergency cases were 107 representing 69.93% and elective cases were 46 representing 30.07%.

Caesarean section on account of cephalopelvic disproportion had the highest frequency of 70 representing about 46%, second highest was appendicectomy on account of appendicitis and caesarean section on account of obstructed labour both with frequencies of 20 representing 13% respectively, this is followed by caesarean section on account of preterm labour with frequency of 18 representing about 12%, then herniorrhaphy on account of obstructed hernia with a frequency of 14 representing about 9% least was herniorrhaphy on account of strangulated hernia with a frequency of 11 representing about 7% of total surgeries enrolled into the study.

It is worthy to note that cephalopelvic disproportion, preterm labour and obstructed labour both lead to caesarean section thus making a total of 108 representing about 71%.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The study sought to improve the outcome of surgery and reduce the rate of surgical site infection at LEKMA Hospital in the Ledzokuku Municipal District of Greater Accra Region Ghana.

The conclusion and recommendation are presented as follows:

6.1.1 Prevalence

The study revealed that the prevalence rate for surgical site infection 9.8% after elective and emergency surgery is low. Most participants were females, the age group with the highest participants is 26-32 age group, the same age group also recorded the highest occurrence of surgical site infection.

6.1.2 Risk Factors

Most of the WHO checklist for pre-operative and post-operative checklist signed consent form, administration of adequate antibiotic prophylaxis, laboratory investigation and anesthesia review were done before and after surgeries. Study showed that significant risk factors for surgical site infection at LEKMA Hospital are, default on wound dressing, tobacco intake, pre-existing medical conditions and alcohol intake.

6.1.3 Indication for Surgery

Emergency surgeries was more than elective surgeries, also cephalopelvic disproportion was the highest indication for surgery and caesarean section was the highest types of surgery and herniorrhaphy being the least type of surgery at LEKMA Hospital for this study.

6.2 Recommendation

The following recommendations are being made for consideration by the major stakeholders.

6.2.1 Ghana Health Service and Christian Health Association of Ghana

Health campaign should be organized to educate the general population about the negative health impact of smoking and alcohol use.

Ministry of health should liaise with Food and Drugs Board Ghana Ports Authority to increase taxes on importation of tobacco and alcohol products, also alcohol products should not be advertised on bill boards by the roadside.

Doctors and all health workers should be encouraged to write more legibly in-patient health record (folders) to help in future research.

All health workers especially surgical staffs should be encouraged to be extra diligent when attending to patients with known risk factors to surgical site infection.

6.2.2 LEKMA Hospital

To help reduce incidence of default after surgery, Surgeon's and nurses should involve the Public Health Department when discharging patients who had surgeries, this will help public health nurses and community nurse take vital information to track and organize home visits for discharged patients.

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APPENDICES

APPENDIX I: LETTERS OF INTRODUCTION

ENSIGN COLLEGE OF PUBLIC HEALTH - KPONG

OUR REF: COPH/AR/EL/DES/2020/12
YOUR REF:
Tel: +233 245762229
Email: academicregistrar@ensign.edu.gh
Website: www.ensign.edu.gh

P. O. Box AK 136
Akosombo
Ghana

Tuesday, 17 March 2020

THE REGIONAL DIRECTOR OF HEALTH
GREATER ACCRA REGIONAL HEALTH DIRECTORATE
ADABRAKA
ACCRA
Dear Sir/Madam,

ACCRA REGION RECEIVED 27 MAR 2020 Reg. Dir. of Health Service

LETTER OF INTRODUCTION

We write to respectfully introduce to you: Korley, Collins Markwei (Student Identification Number:187100135), a second year student of the Master of Public Health (MPH) degree program of the College.

As part of the requirements for graduation, is writing a thesis on: **"FACTORS CONTRIBUTING TO SURGICAL SITE INFECTION IN LEDZOKUKU KROWO MUNICIPALITY, GREATER ACCRA, GHANA "**, and needs to visit some of the units in your outfit to collect data.

The student has received ethical clearance from the Institutional Review Board (IRB) of the College and we wish to assure you of the application of the highest level of research ethics in the collection of data from the units under your outfit for this project and treat respondents with strict confidentiality.

We are also confident that the recommendation from the findings would equally be useful to your outfit.

We would, therefore, be grateful if you kindly accede the student any assistance he/she may require in the collection of data in your outfit for the thesis.

Thank you,

Respectively yours,

PATRICK KUMA
Academic Registrar

Cc:

Min @ PPS
Pls forward to ~~MDD~~ MDHS Lekma and Krowo municipality
Thanks.
01/04/2020

In case of reply the number and date of this letter should be quoted.

My Ref. No. ***GHS/GARHD/007/19***

Your Ref. No.

GHANA HEALTH SERVICE
REGIONAL HEALTH DIRECTORATE
GREATER ACCRA
P. O. BOX 184
ACCRA

Tel: +233-0302-234225/226203/
0208140751
E-mail:c_brako@yahoo.com

2nd April, 2020

THE MUNICIPAL DIRECTOR OF HEALTH SERVICE
- LEDZOKUKU MUNICIPAL HEALTH DIRECTORATE
- KROWOR MUNICIPAL HEALTH DIRECTORATE

2/4/20
11:30am

LETTER OF INTRODUCTION –
KORLE COLLINS MARKWEI (STUDENT IDENTIFICATION NUMBER: 187100135)

This is to introduce to you **Korle Collins Markwei** a second year student of the Master of Public Health (MPH) degree programme of the Ensign College of Public Health – Kpong), who has approval from the Regional Health Directorate to undertake a research on the topic: ***"Factors Contributing to Surgical Site Infection in Ledzokuku Krowor Municipality, Greater Accra, Ghana"*** in your Facility as per the attached documentation.

You are kindly entreated to provide the needed assistance.

Thank you.

DR. (MRS.) CHARITY SARPONG
REGIONAL DIRECTOR OF HEALTH SERVICE
GREATER ACCRA

(3) Attn Ag Med Supt
fgng
JS 4/5/2020

@Attn Ddn Mgr
to discuss
with
student
JS 3/4/2020

In case of reply the number
and the date of this
letter should be quoted

My Ref No. GHS/LEKMAH/G-65

Your Ref. No.....

LEKMA HOSPITAL
GHANA HEALTH SERVICE
PRIVATE MAIL BAG
TESHIE – ACCRA

7th May, 2020

TO WHOM IT MAY CONCERN

INTRODUCTORY LETTER

RE: MR. KORLE COLLINS MARKWEI

I write to introduce the bearer of this letter who is a Second year student of the Master of Public Health (MPH) at Ensign College of Public Health, Kpong. He wants to do four (4) weeks Data collection at the facility on the **Topic: "FACTORS CONTRIBUTING TO SURGICAL SITE INFECTION IN LEDZOKUKU MUNICIPALITY, GREATER ACCRA GHANA" Kindly** assist him with the necessary support that he may need to enhance his academic work.

Thanks for your co-operation.

IN-SERVICE TRAINING UNIT
LEKMA HOSPITAL
PRIVATE MAIL BAG (P.M.B)
TESHIE-ACCRA

Pauline Hayeh

Training Coordinator

For Med. Supt

APPENDIX II: CLIENT CHECKLIST FOR PRE-OPERATIVE PREPARATION

Folder & Tel. Number	Age	Sex	Informed consent form signed	Laboratory. Investigations before 24 hours to time of surgery	History and Physical Examination By Doctor or Clinician	Anesthetic review and Risk assessment	Antibiotic prophylactic	Type of Surgery
1								
2								
3								
4								
5								
6								
7								
8								
=153								

APPENDIX III: CLIENT CHECKLIST FOR POST OPERATIVE PROCEDURE

Folder Number	All abdominal layers sutured	Antibiotics given after surgery	Was wound discharging	What day was client discharged	Was client diagnosed of SSI?	Does client go for regular wound dressing	Underlying medical condition	Complications during or after surgery
1								
2								
3								
4								
5								
6								
=153								

APPENDIX IV: RESEARCH QUESTIONNAIRE

Questionnaire on causes of Surgical Site Infection (SSI) at LEKMA Hospital

Name of Interviewer……. Data:…./…../……

Respondent ID……

INTRODUCTION

Dear Sir/Madam,

My name is Collins Markwei Korley. I am a student of Ensign College of Public Health, Kpong. I am conducting a research on Prevalence of Surgical Site Infection (SSI) in this facility. Data collected from you will be used for academy purpose and a database for policy formulation. I will be grateful if you would spare some time to answer this questionnaire. Any answer you provide will be confidential and anonymous. You can choose not to answer or withdraw from this research at any point in time without any offense or hindrance.

Thank You.

Question	N1	N2	N3
What are the causes of SSI			
What do you do to prevent SSI			
Are SSI common in the ward?	YES……. NO……	YES……. NO…..…….	YES…… NO……..