THE PREVALENCE AND ASSOCIATED FACTORS OF SURGICAL SITE INFECTIONS AMONG PATIENTS IN SURGICAL WARD OF JINJA REGIONAL REFERRAL HOSPITAL

BY

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DECLARATION

I declare that this research report is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references, and that this work has not been submitted before for any other degree at any other institution.

Signature……

RIMAYE AMINU HAMISU

(Research student)

APPROVAL

This is to certify that this student did his research titled ‘The prevalence and associated factors of surgical site infections among patients in surgical ward of Jinja regional referral hospital’ under my supervision.

…… ……

MR. ABASS ALAO SAFIRIYU **Date**

(Supervisor)

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DEDICATION

Special thank goes to Almighty God for keeping me alive to witness the end of this program. I dedicate this work to my parents, ALH. HAMISU ABU SUKUNTUNI and HAJ. HASSANA HAMISU ABU SUKUNTUNI for contributing to my life and my studies and for always being there for me. I pray God to reward you in a special way too.

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
HAIs	Healthcare-Associated Infections
JRRH	Jinja Regional Referral Hospital
NHSN	National Healthcare Safety Network
SPSS	Statistical Package for Social Sciences
SSI	Surgical Site Infection
USA	United Status of America
WHO	World Health Organization

ABSTRACT

Background: World over, surgical site infections (SSIs) are one of the most commonly encountered complications after surgery. No study had been done in Jinja regional referral hospital (JRRH) regarding SSIs. Therefore, this study was intended to determine the prevalence and risk factors associated with surgical site infections among patients in surgical ward at JRRH.

Methods: A retrospective cross-sectional was done. A pretested checklist was used to collect data from 120 files of patients who had been admitted and operated on surgical ward 6 months preceding the study. Collected data was entered and analyzed using IBM SPSS version 25. Chi square test was done to determine the relationship of SSIs and risk factors. Results were presented in tables and charts.

Results: The mean age was 34.6±9.9 (standard deviation) years with majority (70%) being males (N=120). The overall prevalence of SSI was 40%. Age of the patient (X^2=13.32; P=0.010), wound class (X^2=15.98; P=0.001), and type of surgery (X^2=15.43; P=0.009) were found statistically significant.

Conclusion and recommendation: The overall prevalence of SSI was 40%. The risk factors associated with SSI were: older age of the patient above 51 years, dirty wound class, and small bowel surgery. It is important to early recognize the risk of developing SSI in patients undergoing surgery, so that preventive measures can be adopted with the aim of reducing infection rates.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Surgical site infections (SSIs) are infections of the incision or organ or space that occur after surgery typically within 30 days (CDC, 2015).SSIs are directly related to surgical procedures, and are currently one of the most important among the Healthcare-Associated Infections (HAIs) (CDC, 2015).

World over, SSIs are one of the most commonly encountered complications after surgery (Dumville et al., 2015). In a study of the National Healthcare Safety Network (NHSN) involving 850,000 general surgeries performed in the USA, it was found that overall incidence of SSI was 1.9%(Leaper & Edmiston, 2017). In Brazil, data on the incidence of SSI range from 1.4% to 38.8%(ANVISA, 2013; Franco, Ercole, & Mattia, 2015).

SSI leads to grave consequences, including increased costs due to its treatment(Anderson et al., 2014) and increased length of hospital stay (Karanika, et al, 2016). Mortality in patients with SSI is increased when compared to those who do not develop an infection (Nussbaum et al., 2018).

The serious consequences levied on patients who develop SSI determine the need for efforts to create policies for the prevention of this infection. In this sense, identification of risk factors for SSI can contribute to the early adoption of interventions that aim to minimize this type of postoperative complication.

Several risk factors have been reported as predisposing to SSI. Wound class, duration of Surgery, Body Mass Index (BMI), smoking, blood transfusion, and pre-existing chronic diseases (Dumville et al., 2015; Korol et al., 2013; Tanner et al, 2016; World Health Organization, 2015) are identified as associated with SSI.

In Uganda, few studies have been conducted pertaining SSIs among surgical patients. Studies have reported rates of SSI ranging from 9.6%-36.4%(Dlamini et al., 2015; Moses, 2016).This makes it difficult to estimate the national SSI rates and the identification of risk factors associated with infection.

In Jinja regional referral hospital (JRRH), the prevalence of SSIs was not known due to paucity of data. Therefore, this study was intended to identify the prevalence and risk factors for SSI among patients in surgical ward of JRRH.

1.2 Problem statement

SSI remains one of the most important post-operative complication, contributing approximately 38.8% of all cases (Pellegrini et al., 2017). There is no doubt that SSIs substantially contribute to prolongation of hospital stay and increase costs. However, it has been difficult to establish the extent SSI contributes to attributable mortality. Nussbaum et al., (2018) found that the likelihood of death for patients with SSI is twice that for patients without SSI.

Although the situation of SSI in Uganda is inadequately documented, few reports indicate that the situation is not any better (Lubega, Joel, & Justina Lucy, 2017; Moses, 2016). Reports from studies done in Tanzanian and some of the Kenyan hospitals are in harmony that the situation warrants more attention(Tanner et al., 2016; Dumville et al., 2015). Despite other overwhelming and relatively severe conditions burdening the patients in resource strained countries like Uganda, it is evidently clear that SSI is a problem and needs to be attended to (Childs & Murthy, 2017). To understand the prevalence and risk factors of SSIs among surgical patients in JRRH, this study was done.

1.3 Objectives of the study

1.3.1 General objective

The study was to determine the prevalence and risk factors associated with surgical site infections among patients in surgical ward at JRRH.

1.3.2 Specific objective

1. To determine the prevalence of surgical site infections among patients in surgical ward at JRRH.
2. To identify the risk factors associated with surgical site infections among patients in surgical ward at JRRH.

1.4 Research questions

1. What is the prevalence of surgical site infections among patients in surgical ward at JRRH?
2. What are the risk factors associated with surgical site infections among patients in surgical ward at JRRH?

1.5 Justification of the study

Despite Surgical site infection being a relatively serious problem among surgical patients, there are scanty published reports in our local hospitals. The sporadic reports from the public sector hospitals are mainly from the Microbiology laboratory records which may not show the complete clinical picture.

Scarcity of published data on the risk factors involved in SSIs has impacted negatively on management of patients particularly in the resource strained set up. This study sought to determine specific risk factors that are associated with surgical site infection in the local setting. Results from this study can be used by policy makers to make informed decisions on issues of infection control pertaining to surgical wound sepsis.

1.6Study scope

1.6.1 Geographical scope

The study took place in Jinja regional referral hospital, Jinja district, Eastern Uganda.

1.6.2 Content scope

The study determined the prevalence and risk factors associated with surgical site infections among patients in surgical ward at JRRH.

1.6.3 Time scope

The study took place in September 2018.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Surgical site infection

Infection may be defined as invasion and multiplication of microorganisms in body tissues, which may be clinically unapparent or result in local cellular injury because of competitive metabolism, toxins, intracellular replication, or antigen-antibody response (Childs & Murthy, 2017). These series of events lead to progressive tissue destruction and eventual death of the host if wounds are left unchecked (Dumville et al., 2016).

The Centers for Disease Control and Prevention (CDC) in developed criteria for defining SSIs, which have become the international standard and are widely used by surveillance and surgical personnel (CDC, 2015). These criteria defined SSIs as infections related to the operative procedure that occurs at or near the surgical incision within 30 days of an operative procedure or within one year if an implant is left in place.

The clinical criteria used to define an SSI included any of the following:

- A purulent exudate draining from a surgical site.
- A positive fluid culture obtained from a surgical site that was closed primarily.
- The surgeon's diagnosis of infection.
- A surgical site that requires reopening

2.2 Prevalence of surgical site infection

Globally, rates of SSIs for individual procedures vary widely depending upon the patient population, size of hospital, experience of the surgeon, and methods used for surveillance (Nussbaum et al., 2018). Tertiary hospitals generally have the lowest rates of SSI compared to small (<500 beds) or large (>500 beds) teaching hospitals (4.6 versus 6.4 and 8.2 percent, respectively) (Webster & Alghamdi, 2015).

In Sub Sahara Africa, different reports show different prevalence and incidence rates of SSIs (Mawalla, Mshana, Chalya, Imirzalioglu, & Mahalu, 2014). One study among322 children surgical patients in Nigeria reported high SSI rate of 25.8%in emergency procedures in contrast to 20.8% in elective procedures, although the association was not statistically significant (Korol et al., 2013). Also, a similar study in South Africa documented high rate of SSI in dirty surgery (60%) compared with contaminated (27.3%), clean contaminated (19.3%) and clean surgery (14.3%), the association being statistically significant (Dramowski, Whitelaw, & Cotton,

2016).Studies have shown that introduction of minimal invasive surgery like laparoscopic surgery has resulted in decrease in incidence of SSI.

2.3 Classification of SSIs

The CDC describes 3 types of surgical site infections(CDC, 2015):

- Superficial incisional SSI. This infection occurs just in the area of the skin where the incision was made.
- Deep incisional SSI. This infection occurs beneath the incision area in muscle and the tissues surrounding the muscles.
- Organ or space SSI. This type of infection can be in any area of the body other than skin, muscle, and surrounding tissue that was involved in the surgery. This includes a body organ or a space between organs.

Although organ/space SSIs account for only one-third of all SSIs, they are associated with 93% of deaths related to SSIs. Organ/space SSIs are also vastly costlier to treat and manage than incisional SSIs (Berríos-Torres et al., 2017).

2.4 Risk factors associated with surgical site infection

These factors include patient or operation features which, although associated with SSI development, and are not necessarily independent predictors. These risk factors as has been documented in Western studies are either patients' or procedure related (Ban et al., 2016).

Fan et al., (2016) in a study of risk factors for postoperative infections, categorized risk factors of SSI into three main divisions; namely pre-operative, intra-operative, and post-operative. Age, height, loss of weight exceeding 10% of the patient's ideal weight, diabetes mellitus, cirrhosis, ascites, are some of the risk factor he identified. Other factors identified as influencing healing include corticosteroid therapy, chemotherapy, or both during the last 6 months before surgery(Leaper & Edmiston, 2017). Previous abdominal-pelvic radiotherapy (irrespective of the interval since the end of treatment), anticoagulant therapy (preventive or curative dosage), emergency surgery, or a deferred emergency because of the clinical reasons, are all risk factors for surgical site infections.

According to Webster & Osborne (2015), intra-operative risk factors include the following: type of abdominal incision, incision on a preexistent abdominal scar, associated surgical treatment of an abdominal hernia or defect, parietal protection (i.e., sterile drape, dry fields, antiseptic-soaked fields, or skirt) and pre-existence of a skin infection (i.e., inflammation,

abscess, or necrosis, and gangrene). Opening of the bowel in the digestive tract, degree of intra-operative contamination (subjective evaluation by the surgeon as being absent, minimal, moderate, or major), placement of a suture or having an anastomosis of the bowel in the digestive tract, surgical excision for cancer (i.e., curative, palliative, or extensive), having a peritoneal or cutaneous closure, type of cutaneous closure and reinforcement (total number of stitches), having intra-abdominal or intra-parietal drainage (i.e., by blade, tube, or other) and the length of operative time are all intra-operative risk factors.

Allegranzi et al., (2016) also categorized the SSIs risk factors into three main groups. These are patient factors, environmental factors and treatment factors. Physical activity level; present and past smoking history; and previous experience with anesthetic agent are also important risk factors (Sawyer et al., 2015). Smoking is a risk factor for SSIs that should be screened for in the pre-admission phase. Pre-operative smoking cessation is recommended to prevent wound dehiscence.

CHAPTER THREE: METHODOLOGY

3.1 Study design

The study utilized cross-sectional retrospective.

3.2 Study area

The study was conducted in surgical ward at Jinja regional referral hospital, Jinja district.

3.3 Study population

The study involved patients who were admitted and operated on in the last six months preceding the study.

3.3.1. Inclusion criteria

- Patients admitted on surgical ward in the last six months before the study.
- Patients operated on.

3.3.2. Exclusion criteria

- Admitted but not operated

3.4. Sample size determination

This will be determined by using Kish's formula (Li, Su, & Shyr, 2013) which states that,

$$\mathbf{N} = \frac{Z^2(p(1-p))}{\varepsilon^2}$$

Where;

N = the required sample size

p= Prevalence of SSIs (8.6%) as reported by a recent study in St. Francis Hospital Nsambya(Moses, 2016).

ε = margin of error on p (set at 5%)

z= standard normal deviate corresponding to 95% confidence level (=1.96)

$$\mathbf{N} = \frac{1.96^2(0.086(1-0.086))}{0.05^2} = \textbf{approximately, 120.}$$

3.5 Sampling technique

The study used systematic probability sampling method where the researcher used admission register. Every 4thpatient in the admission register was taken for the study.

3.6. Data collection methods

This study used a questionnaire checklist which collected information on demographic characteristics, SSI prevalence, and risk factor.

3.7. Data Processing and analysis

Collected data was entered in IBM SPSS version 25. Categorical variables were presented in tables of frequencies for descriptive statistics. A Chi-square test was computed to test the relationships between risk factors and prevalence of SSI. A p-value of ≤0.05 was considered significant.

3.8 Quality control

The questionnaire checklist for data collection was pre-tested to ensure that questions are clear and allow gathering of information needed for the study. The questions that showed ambiguity during pre-testing were revisited and modified as required.

3.9. Ethical considerations

Ethical approval was sought from Kampala international university western campus Faculty of clinical medicine in form of introduction letter after approval of the proposal. Permission to collect data was sought form the hospital administrator.

3.10 Study Limitations

Some information was missing in some files. However, the researcher considered patient files which well filled.

CHAPTER FOUR

RESULTS

4.1 Patient profile

The mean age was 34.6±9.9 (standard deviation) years with majority (70%) being males.

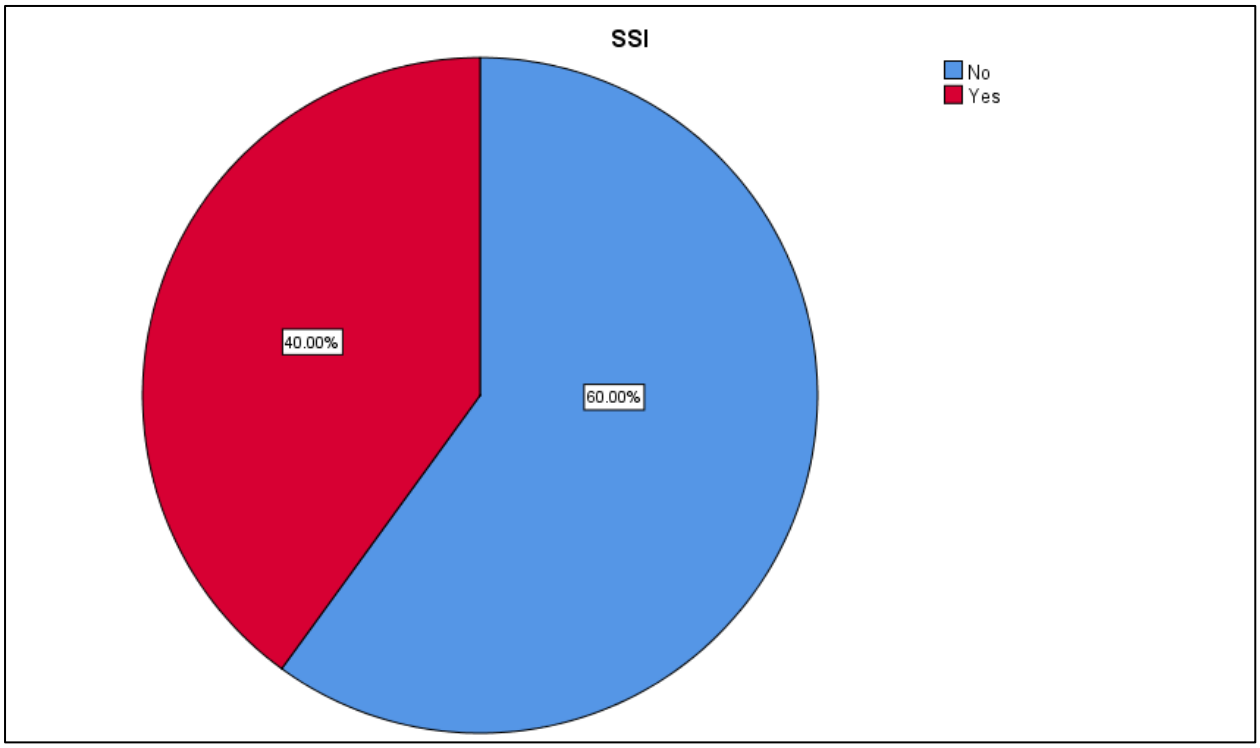
Table 1: Patient profile

Variables	Frequency	Percent
Age		
≤20	6	5.0
21-30	46	38.3
31-40	36	30.0
41-50	22	18.3
>51	10	8.3
Total	120	100.0
Gender		
Female	36	30.0
Male	84	70.0
Total	120	100.0
Duration of stay		
<10 days	84	70.0
≥10 days	36	30.0
Total	120	100.0
Type of surgery		
colon surgery	12	10.0
small bowel surgery	36	30.0
herniorrhaphy	24	20.0
appendicectomy	24	20.0
laparotomy	12	10.0
gastric surgery	12	10.0
Total	120	100.0
wound classification		
clean	12	10.0
clean contaminated	33	27.5
contaminated	12	10.0
Dirty	63	52.5
Total	120	100.0

4.2 Prevalence of SSI

The prevalence of SSI was 40% as shown in figure 1 below.

Figure 1: Prevalence of SSI



4.3 Risk factors of SSI

4.3.1 Relationship of Age and SSI

The results show a significant relationship between SSI and age of the patient (X^2=13.32; P=0.010). table 2.

Table 2: Relationship of Age and SSI

Value		SSI		Total	Chi square (X^2)	P value
		No	Yes			
Age group	≤20	5	1	6		
		83.3%	16.7%	100.0%		
	21-30	21	25	46		
		45.7%	54.3%	100.0%		
	31-40	29	7	36	13.32	0.010
		80.6%	19.4%	100.0%		
	41-50	13	9	22		
		59.1%	40.9%	100.0%		
	>51	4	6	10		
		40.0%	60.0%	100.0%		
Total		**72**	**48**	**120**		
		60.0%	**40.0%**	**100.0%**		

4.3.2 Relationship of sex and SSI

No significant relationship was found between Sex of the patient and SSI (X^2=1.91; P=0.167).

Table 3: Relationship of sex and SSI

Variable		SSI		Total	Chi square (X^2)	P value
		No	Yes			
Sex	female	25	11	36		
		69.4%	30.6%	100.0%		
	male	47	37	84	1.91	0.167
		56.0%	44.0%	100.0%		
Total		**72**	**48**	**120**		
		60.0%	**40.0%**	**100.0%**		

4.3.3 Relationship of SSI and duration of stay on the ward

The duration of stay on the ward was not found statistically significant (X^2=3.49; P=0.061).

Table 4: Relationship of SSI and duration of stay on the ward

Variable		SSI		Total	Chi square (X^2)	P value
		No	Yes			
Duration on the ward	<10 days	55	29	84		
		65.5%	34.5%	100.0%		
	>10 days	17	19	36	3.49	0.061
		47.2%	52.8%	100.0%		
Total		**72**	**48**	**120**		
		60.0%	**40.0%**	**100.0%**		

4.3.4 Relationship of SSI and wound classification

Wound classification was found to be statistically associated with SSI (X^2=15.98; P=0.001).

Table 5: Relationship of SSI and wound classification

Variables		SSI		Total	Chi square (X^2)	P value
		No	Yes			
Wound classification	Clean	9	3	12		
		75.0%	25.0%	100.0%		
	Clean-contaminated	28	5	33		
		84.8%	15.2%	100.0%	15.98	0.001
	Contaminated	7	5	12		
		58.3%	41.7%	100.0%		
	Dirty	28	35	63		
		44.4%	55.6%	100.0%		
Total		**72**	**48**	**120**		
		60.0%	**40.0%**	**100.0%**		

4.3.5 Relationship of SSI and type of surgery

There was a significant relationship between type of surgery and SSI (X^2=15.43; P=0.009).

Table 6: Relationship of SSI and type of surgery

Variables	SSI	Total	Chi square	P value

		No	Yes		(X^2)	
Type of surgery	colon surgery	7	5	12		
		58.3%	41.7%	100.0%		
	small bowel surgery	13	23	36		
		36.1%	63.9%	100.0%		
	herniorrhaphy	16	8	24		
		66.7%	33.3%	100.0%	15.43	0.009
	appendicectomy	17	7	24		
		70.8%	29.2%	100.0%		
	laparotomy	11	1	12		
		91.7%	8.3%	100.0%		
	gastric surgery	8	4	12		
		66.7%	33.3%	100.0%		
Total		**72**	**48**	**120**		
		60.0%	**40.0%**	**100.0%**		

CHAPTER FIVE
DISCUSSION

5.1 Prevalence of SSI

The current study observed that the overall prevalence rate of SSI at JRRH was 40%. The findings of this study on SSI prevalence rate are higher than the 15% reported by Webster & Alghamdi, (2015). Mawalla et al., (2014), reported the SSI prevalence rate of 26% at Bugando Medical Centre in Northwestern Tanzania. A Ugandan study on SSI prevalence at the Nsambya Hospital Kampala reported a prevalence of 8.6% (Surg & Moses, 2016). The difference in reported prevalence could be due to difference in study setting and study design. However, a study in South Africa, reported a higher prevalence (60%) than for this study (Dramowski et al., 2016).

5.2 Risk factors of SSI

The risk factors for SSI identified in this study were: age of the patient (X^2=13.32; P=0.010), wound class(X^2=15.98; P=0.001), and type of surgery(X^2=15.43; P=0.009). These risk factors were also identified in researches conducted with a larger number of patients and involving general surgeries(Fan et al., 2016; Leaper & Edmiston, 2017; Berríos-Torres et al., 2017).

Regarding age of the patient, age >51 years had more risk of developing SSI and this shows that 60% of those who were aged above 51 years actually developed SSI. The high prevalence of SSI in elderly patients may also be related to low immunity associated with old age. However, age has not been found a risk factor in specific surgeries such as orthopedic operations as reported by Webster & Osborne, (2015).In addition, older age is associated not only with increased SSI rates, but also with other clinical and post-surgical complications such as wound dehiscence, development of Urinary Tract Infection and even septic shock(Allegranzi et al., 2016).

Another variable that showed a statistically significant association with SSI was the type of surgery. In this study, small bowel surgery had a 63.9% prevalence of SSI (p=0.009). The type of surgery was reported as a risk for SSI in other studies (Bhangu et al., 2018; Dumville et al., 2016). It is inferred that this may be related to a greater exposure of the incision site to pathogens and/or a greater chance of breach of the aseptic technique in the procedure(Tanner et al., 2016).

The variable class of wound was also statistically associated with SSI (p=0.001). Dirty wounds, had a higher prevalence (55.6%) compared to clean wounds (25%) of SSI. The wound class is reported in several literatures as a risk factor associated with SSI(Childs & Murthy, 2017; Dramowski et al., 2016; Berríos-Torres et al., 2017).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The overall prevalence of SSI was 40%. The risk factors associated with SSI were: older age of the patient above 51 years, dirty wound class, and small bowel surgery.

6.2 Recommendations

It is important to early recognize the risk of developing SSI in patients undergoing surgery, so that preventive measures can be adopted with the aim of reducing infection rates.

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APPENDICES

Appendix i: Patient data collection sheet.

1. file code:……
2. Weight:…….
3. Age:……..
4. Sex:……
5. Date Admitted:……
6. Date Discharged:……
7. Co-morbidities:……..….
8. Type of surgery/surgical procedure

9. Preoperative Diagnosis:……

10. Preoperative Medication:

……

11. Post operative Diagnosis:……

Post operative medication……

12. Surgical Site Infected? Yes ( ) No ( )

13. Postoperative period infection was detected……

14. Type of infection: a. superficial ( ) b. Deep incisional ( ) c. organ space ( ) d. unknown ( )
15. Signs of surgical site infection or post operative infection

a) Fever Yes ( ) No ( )

b) Swelling of sight Yes ( ) No ( )

c) Erythema Yes ( ) No ( )

d) Pain or tenderness Yes ( ) No ( )

e) Serous discharge or pus from site Yes ( ) No ( )

f) Separation of the deep tissues Yes ( ) No ( )

g) Diagnosis was by clinical of culture and sensitivity

clinical ( ) culture and sensitivity ( )

Appendix ii: Map of Uganda showing location of Jinja district