RISK FACTORS FOR POST CESAREAN WOUND INFECTION AMONG MOTHERS AT MULAGO NATIONAL REFERRAL HOSPITAL – UGANDA

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DECLARATION

I Nansikombi Sarah declare that this is my original research study and I am submitting it to International Health Sciences University for award of a bachelor's degree in nursing.

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Date: _____

APPROVAL

The research was done under my supervision and approval as an institute supervisor

Signature: _____

MR. AFAYO ROBERT

Date: _____

DEDICATION

I dedicate this work to my mother Mrs. Bunnya Deborah and my children: Namatovu Irene and Nalubega Ephrance.

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OPERATIONAL DEFINITIONS

Cesarean Section: A Caesarean section (C -section) is a surgical procedure in which one or more incisions are made through a mother's abdomen (laparotomy) and uterus (hysterotomy) to deliver one or more babies, or, rarely, to remove a dead fetus

Wound Infection: for the purse of this study, wound infection will be restricted to only infections arising from surgical incision after cesarean section (CDC)

Indicators of wound infection: fever, pain, localized swelling, redness, heat, purulent discharge; wound dehiscence, abnormal smell coming from the wound site, bleeding granulation tissue despite appropriate care and management.

Mothers: for the purpose of this study mothers will refer to women of reproductive age 15-49 years according to WHO

LIST OF ACRONYMS

BMI	Body Mass Index
CDC	Centre for Disease Control
C- Section	Cesarean Section
HB	Hemoglobin
PROM	Pre- Mature Rapture of Membranes
SPSS	Statistical Package for Social Scientists
U.S	United States
WHO	World Health organization

ABSTRACT

Background: Post cesarean surgical wound infection has been identified as a major problem among women of child bearing age. In developing countries, the rate at which post cesarean mothers get surgical wound infection is still high'(Oliver et al., 2009). In Uganda many mothers who deliver by cesarean section get surgical wound infection that led to increased morbidity, mortality, prolonged hospital stay and increased medical costs

Objective: The aim of the study was to determine risk factor for post cesarean infection among mothers who had under gone cesarean section on ward 5B Mulago national referral hospital.

Methods**:** This was a case control study that involved post cesarean mothers who were admitted at Mulago national referral hospital between August and October 2015. A total of 186 (93 cases and 93 control) post cesarean mothers were enrolled into the study. Post-operative data was collected using a standardized questionnaire. A data bases was designed for data entry and there after the data set was transported to SPPSS for analysis

Results: Eight independent risk factors for post cesarean wound infection were identified in this study by multivariate analysis and these included; primary and tertiary level education (OR: 6.85, 95%CI:1.4-33.46, P =0.018 and OR: 22, 95%CI:4.57-108.6, P= 0.001 respectively), antenatal care attendance (OR 0.02, 95%CI: 0.003-0.12 , P < 0.001), diabetic mothers (OR: 0.004, 95%CI: 0.00-0.038, P < 0.001), pre-operative hemoglobin levels less than 7g/dl(OR: 0.12, 95%CI:, 0.03-0.497 P = 0.003) , Vertical type of skin incision(OR: 0.14, 95%CI: 0.03-0.624, P = 0.010) , duration of labor greater than 12 hours (OR:0.10, 95%CI:0.02-0.417, P = 0.002), senior surgeons performing the operation (OR: 47.78, 95% CI: 3.078-741.8, P =0.006) and spinal type of anesthesia.(OR:25, 95%CI: , 3.33-187.643 P =0.002) .

Conclusion: Post cesarean wound infection was associated with multiple factors which included primary and tertiary levels of education, antenatal care attendance, diabetes mellitus, pre-operative hemoglobin levels less than 7g/dl, vertical type of skin incision, duration of labor greater than 12hours, senior surgeons performing the operations and spinal type of anesthesia. The need to reduce post cesarean wound infection should currently receive considerable attention

and requires more research in order to reduce unnecessary morbidity, mortality and associated socio- economic consequences for the patient and her family.

Recommendations: Sensitization of the public on modifiable risk factors for post cesarean wound infection is need and senior surgeons need to perform surgeries more often than concentrating on administrative work.

CHAPTER ONE: INTRODUCTION

1.1 Background

The world over vaginal delivery is regarded as the normal delivery and is the natural way of delivering a baby. However, normal delivery is usually impended by natural complications that result into many women dying during child birth. To overcome this, elective and emergency cesarean sections have been devised to save the lives of numerous women who would die due to child birth related complications. It is noted that 24% of all first birth (1 in 4) are by cesarean section birth (Maureen,2005)

A Caesarean section (C -section) is a surgical procedure in which one or more incisions are made through a mother's abdomen (laparotomy) and uterus (hysterotomy) to deliver one or more babies, or, rarely, to remove a dead fetus. Ferdinand Adolf Kehrer, a German gynecologist, performed the first modern C-section in 1881. A C- section is often performed when a vaginal delivery would put the health or life the baby or mother life at risk. Many C- sections are also performed on request for childbirths that could otherwise have been vaginal.

Some of the indications of C- section include but no limited to prolonged labor, failure to progress , fetal distress, cord prolapse, uterine rupture, increased blood pressure in the mother or baby after amniotic rupture, tachycardia in the mother or baby after amniotic rupture, placental problems for example placenta Previa, placental abruption or placenta accreta, abnormal presentation like breech or transverse positions, big baby weighing >4000g , umbilical cord abnormalities like vasa previa, maultilobate including bilobate and succenturiate-lobed placentas, velamentous insertion and HIV infection of the mother.

Despite the World Health Organization's (WHO) recommendation that C- section rates should not exceed 15%, the high rates in some countries are cause for concern. For example, Italy, China, Mexico and Brazil all have rates higher than 36% with great variation within each nation (The need for C-section has probably increased for many reasons; including rising rates of obesity, diabetes and maternal age, but rates more than twice the WHO recommendation probably reflect more than medical necessity(Wenda., 2014)

Increased C-section rates have been noted worldwide. In 2012, the national U.S. cesarean rate was 32.8% which exceeds the WHO recommended C-section rate and Over performance of this procedure is associated with excess morbidity in babies and women and, total maternal-newborn costs are about 50% higher for cesarean compared with vaginal births for both commercial and Medicaid payers.(U.S. National Center for Health Statistics, 1989-2012). Increased rates of C-sections have been noted in other regions of the world as follows; China 46%, Vietnam 36%,Latin America 35%, Thailand 34%, India 18% and Cambodia 15%

In Sub- Saharan Africa, the frequency of C/s was 6.2% with a range 4.1-16.8% (Cortier et al, 2012).The C- section rates in Tanzanian referral Hospital ranged from 29.9% to 35.5% from 2005 to 2010(Ayabaet al, 2012).

1.2 Problem Statement

Ideally C- section is a sterile procedure where no infections are expected post operatively. In case of elective C- section, the mother is prepared pre –operative but by encouraging the mother to take nutritious food that can promote healing of the wound. The mother is also health educated on good personal hygiene that can prevent wound infection post operatively and the mother is also psychologically prepared for the operation. During the operation, aseptic techniques and sterile instruments are used by the qualified operating team. Post operatively, antibiotics are administered and the wound is cleaned with a disinfectant under aseptic techniques and using sterile instruments which prevent surgical wound infection after C- section. The mother is also encouraged to take nutritious foods post operatively with plenty of vitamin C which promotes quick healing of the wound.

Despite all the above endeavors to prevent wound infection, it has been noted that post caesarean wound infection is still a problem in Mulago hospital. In 2005, the rate of wound infection after cesarean section in Mulago hospital was 8.4%(Musa, 2005) and in 2012 the rate of wound infection following cesarean section was 7.03% (Daniel, 2012).It is not clear why these mothers get surgical wound infection post operatively and therefore the study will establish the reasons as to why mothers get wound infection following cesarean section in Mulago hospital

Post cesarean wound infection is associated with so many consequences including the physical discomforts that are experienced during wound infection, prolonged patient's stay in the hospital in need of the necessary treatments for wound infection. Prolonged hospital stay and prolonged treatment period probably implies increased hospitalization bills. Serious complications can also arise from a wound infection, for example necrotizing fasciitis, rupture of the fascia, and evisceration. Such complications would require another major operation, where recovery can take quite a length of time. Post cesarean wound infection may also result into maternal mortality which will consequently deprive the new born baby from breast feeding, parent love, hence malnutrition and psychological trauma

1.3 General objective (or purpose of the study)

To establish risk factors for post cesarean wound infection in mothers aged between 15-49 years admitted at Mulago hospital.

1.4 Specific objectives

i. To determine the socio- demographic factors associated with post cesarean wound infection among mothers aged between 15-45 years at Mulago Hospital.

ii. To establish maternal factors associated with post cesarean wound infection among mothers aged between 15 -49 ye at Mulago Hospital

iii. To determine obstetric factors associated with post cesarean wound infection among mothers aged between 15 -49 years at Mulago Hospital

iv. To identify health facility related factors associated with post cesarean wound infection among mothers aged between 15 -49 years at Mulago Hospital.

1.5 Research questions

i. What socio- demographic factors lead to post cesarean wound infection among mothers aged 15-49 years at Mulago hospital?

ii. What maternal factors contribute to post cesarean wound infection among mothers aged between 15-49 years MulagoHospital?

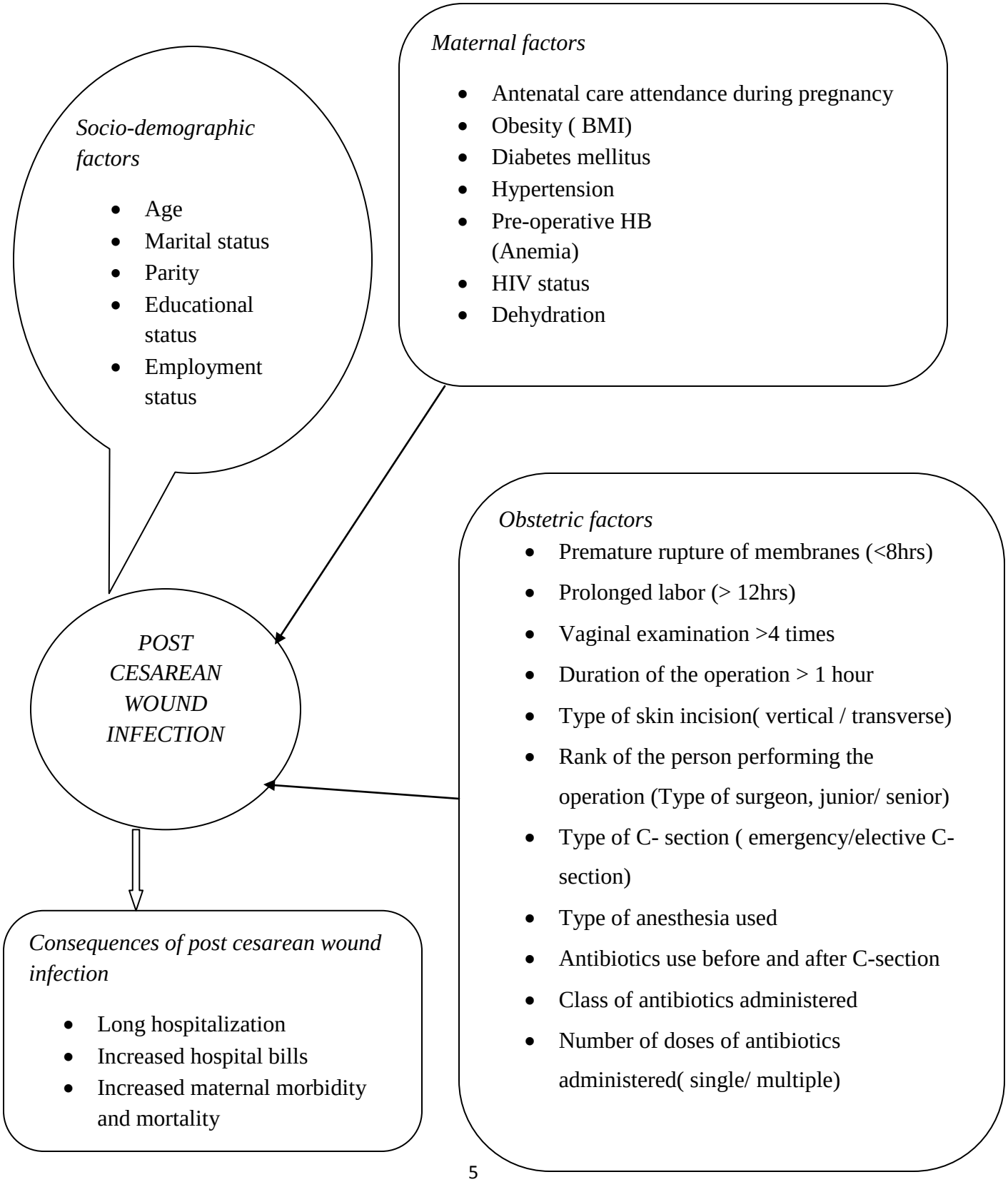
iii. What obstetric factors contribute to post cesarean wound infection among mothers aged between 15-49 years Mulago Hospital?

1.6 Significance/justification of the study

The study will generate knowledge on new risk factors that are specific to Mulago hospital which will lead to development of new strategies to prevent wound infection. Results from the study will be used to inform the authorities of Mulago hospital so that new policies to prevent post cesarean wound infection are established and with the establishment of the new policies, the rate of wound infection will reduce thus reducing on bed occupancy and the finances that the government will spend on treating wound infection.

Health workers in Mulago hospital will be equipped with new knowledge on the cause, treatment and prevention of surgical wound infection. The application of the new knowledge discovered from the study will lead to improved quality of care and hence reduction in maternal morbidity and mortality. The study will also lead to establishment of new public policy that will lead to improved health care service delivery and it will help the researcher to fulfill the requirement for a ward of a degree in nursing and in future the study will be used as a source of literature review for further studies. Therefore the purpose of this study is to establish the risks associated with wound infection in Mulago hospital.

1.7 Conceptual Frame Work about factors influencing post cesarean wound infection among mothers at Mulago National Referral Hospital – Uganda



1.8 Narrative of the conceptual frame work

In this conceptual frame work, the dependent variable is post cesarean wound infection and the independent variables are the socio-demographic factors, mother related factors, and facility or hospital related factors that lead to post cesarean wound infection. Some of the consequences of wound infection after cesarean section that are considered in this conceptual frame work include but not limited to long hospitalization, increased hospital bills and increased maternal morbidity and mortality.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter is to review and compare the available literature according to specific objectives of interest for the purpose of this study which include, socio-demographic factors, mother related factors and facility or hospital related factors.

2.1 Overview

A Caesarean section (C -section) is a surgical procedure in which one or more incisions are made through a mother's abdomen (laparotomy) and uterus (hysterotomy) to deliver one or more babies, or, rarely, to remove a dead fetus. A C- section is often performed when a vaginal delivery would put the baby's or mother's life or health at risk and many C- sections are also performed upon request for childbirths that could otherwise have been vaginal.

According to World Health Organization's (WHO), C- section rates are not supposed to exceed 15% but despite that recommendation, the high rates in some countries are cause for concern. Italy, China, Mexico and Brazil have been identified with C-section rates of 36% which is higher than what WHO recommends. Probably the need for C-section has increased because of many reasons including rising rates of obesity, diabetes and maternal age, but rates more than twice the WHO recommendation reflect more than medical necessity (Wenda.2014). In Sub- Saharan Africa, the frequency of C/s was noted at 6.2% with a range 4.1-16.8%. (Cortier., et al, 2012). In Tanzanian referral hospital, between 2005 to 2010, the Cesarean section rate ranged from 29.9% to 35.5% (Ayaba., et al., 2012)

Increased C/S rates is associated with excess morbidity in women and babies and for both commercial and Medicaid payers, total maternal-newborn costs are about 50% higher for cesarean compared with vaginal births (U.S. National Center for Health Statistics, 1989-2012). Among the maternal morbidity surgical site infections are a large risk for any person having an invasive procedure (Levi. et al., 2014) and are associated with prolonged hospitalization, increased hospital bills and maternal mortality.

According to the study done by Shrestha (2014) at dhulikhel hospital to determine the incidence and risk factors of surgical site infection following cesarean section , it was found out that,

incidence rate of surgical site infection was 82 (12.6%) out of 648 cases. In Kenya the overall post-caesarean wound infection rate was 19% (Koigi. et. al, 2005) and in Uganda, the incidence of postoperative wound sepsis by Sekirime (2008) had p- value 0.948

2.2 Socio-demographic factors

According to the case control study done by Tulio (2014) at Brazilian Women's Hospital on Risk factors for surgical site infection following cesarean section**,** young age and null parity were identified as independent socio demographic risk factors for surgical site infection after cesarean.

In prospective cohort study done by (Filbert., at el 2014), at Bugando medical center 340 pregnant women were serially enrolled into the study and younger maternal age of less than 30 years was associated with post caesarean wound infection where by women aged 30years or less than 30years were more likely to get wound infection following caesarean section compared to older women above 30 years (OR: 2.8, 95%CI (1.0-7.9), P= 0.055)but despite this trend, the association was not proven to be statistically significant and the rate of wound infection following caesarean section was 11.8%.

Null parity according to Filbert (2014), had an association with wound infection following cesarean section (OR: 1.3, 95% CI (0.7-2.6), P=0.393 although the association was not statically significant

More to that in a case control study done in Oman regional referral hospital on post cesarean wound infection, 211 cases and 220 controls were randomly selected to participate in the study. Results of this study showed that wound infections occurred in 211 (2.66%) cases and were confirmed by positive bacteriology in 164 (77.72%) and women who had had more than six children were 1.4 times more likely to get wound infection following cesarean section compared to those who were delivering for the first time or had one child (OR:1.4, 95% CI: 0.79-2.37) although the association between wound infection and parity was not significant with the p-value of 0.077 (Hansa.,et al., 2014)

Morhason (2009) in his study that aimed at identifying the determinants of post-caesarean wound infection at the University College Hospital Ibadan Nigeria, it was found out that the post-

caesarean wound infection rate was 16.2% and lower educational status was among the identified risk factors for wound infection following C-section. Women with up to primary school were 20 times more likely to get surgical site infection than those with secondary education following logistic regression and the odds ratio was 1.8 to 2.5

In a study done in Kiambu a district hospital in the central province of Kenya to establish the incidence of wound infection after cesarean section, it was found out that, the rate of caesarean delivery was 7.8%, the overall wound infection following C-section was 19% and the incidence among single women was 32% as compared to 16% among married women although the difference was not statistically significant (Koigi- Kamau., et al., 2005)

2.3 Maternal and obstetric factors

In a case control study done at Brazilian Women's Hospital on risk factors for surgical site infection following cesarean section, cases and controls were matched according to comorbidities and factors like parity**.** Independent risk factors for wound infection following C-cesarean as described in the scientific literature that included multivariate analysis, were hypertension or preeclampsia, diabetes mellitus and prenatal visits that are less than seven **(**Tulio., 2014).

Filbert., at el (2014), found out that, hypertension(HR:2.2, 95%CI:(1.1-4.7), p= 0.031), obesity an(HR; 1.3, 95% CI (0.4-3.6), p=0.647) and positive HIV status (HR:1.8,95%CI (0.6-5.1), p= 0.295)had an effect on post cesarean wound infection although the Obesity and HIV effect were not statically significant.

To add on that, Multiple vaginal examinations of greater than 4 times (HR: 3.3, 95%CI: (1.7-6.5) ,p=0.001), prolonged duration of surgical procedure (longer than 60 minutes)(HR: 3.0, 95% CI (1.5-6.0) p=0.002) and duration of rapture of membranes greater than 8 hours (HR:2.7, 95% CI: (1.3-5.8), p=0.011) were found to be independent factors which increase the risk of SSI at Bugando medical centre (Filbert.et al., 2014).

In addition to that, haemoglobin levels less than 11g/dl was found to have no effect on post caesarean wound infection (HR: 1.0, 95%CI: (0.5-2.1), p= 0.960) however severe anaemia of

haemoglobin levels less than 7g/dl was associated with post caesarean wound infection at multivariate analysis (HR:3.8, 95% CI: (1.2-12.4) p=0.028) Filbert et al., (2014)

More to that Filbert at el.,(2014) found out that mother who got Vertical skin incision were at higher risk of developing wound infection following caesarean section than those who had transverse skin incision (HR: 3.6,95%CI: (1.1-11.8), p= 0.034)

According to Hansa.,et al, (2014) , diabetes mellitus(OR: 3.09, 95%CI: 1.55-1.69,P= 0.001),Premature rapture of membranes six hours and above(OR:4.46, 95%CI: 2.16-9.20, p<0.001), severe anaemia (OR:5.09,95%CI:1.8-23.88,p=0.0035) and hypertension or pre-eclampsia (OR:3.19, 95%CI:1.30-7.70,p=0.007) were identified as independent risk factors for post caesarean wound infection.

In addition to that, Hansa.,at el., 2014 also found out that women BMI of above 35 were three times more likely to develop post cesarean wound infection compared to none obese (OR:2.853, 95%CI:1.16-6.94, p=0.018)

According to Fathia, (2012), diabetes mellitus was found not to be associated with post cesarean wound infection in 11.2%cases and 9.7% controls (OR:1.17, 95%CI: 0.57-234, p = 0.713).However BMI >30kg/m^2 was associated with post cesarean wound infection at multivariate analysis (OR: 2.1, 95% CI: 1.72–2.15 and P= 0.005)

In case control study done at King Fahad hospital, Al Khobar by Fathia (2012), 107 cases and 340 controls that underwent lower segment cesarean section were enrolled into the study, controls were randomly selected to find out the incidence and risk factors for post cesarean wound infection. In this study, un booked category of mothers / no antenatal visits was identified as a risk factor for post cesarean wound infection (OR: 2.46, 95%CI: 1.37-4.408, P=0.004) in 23 (21.5%) cases and 34(10.0%) controls.

Obstetric factors that were significant in Fathia's study included: Duration of operation> 12hours (OR: 3.2, 95%CI: 1.6-5.44, p= 0.003+), operating time > 1hour (OR: 2.16, (95%CI: 1.42-4.35, p=0.016+).However obstetric variable like PROM>8 hours(OR: 0.3, 95%CI: 0.2-1.65, p =

0.241) and vaginal examination> 4 times (OR: 0.736, 95% CI: 0.12-4.54, p = 0.741) were not significant in in this study.

Gang (2012) in nested case control study carried out in Guangdong Province of China also identified obesity, low hemoglobin levels preoperatively and premature rapture of membranes as risk factors for wound infection after C- section. Leth (2011) also found out that obesity can increase the risk of post-cesarean wound infections and diabetes strengthens this association further with Odds Ratio 2.06.

In the study done in Uganda on outcome of cesarean section in asymptomatic HIV-1 infection, it was found out that asymptomatic HIV-1 was not associated with increased postoperative morbidity after emergency lower segment cesarean section. Citation

Ghuman (2009) in his endeavor to identify the rate and risk factors for surgical wound infection after cesarean section, he found out that elevated BMI of > 30 was one of the risk factors for wound infection following C-section. BMI of > than 25 was also identified as one of the independent risk factor for wound infection after C-section (Oliver at el., 2009).

According to Oliver.,et., al (2009), it was found out that the proportion of participants with BMI> 25 was significantly higher among the subjects with wound infection (53.3%) than in participants without wound infection (33.9%) with OR: 2.34, (95% CI: 1.12-4.23

Morhason (2009) found the rate of wound infection following C-section at 16.2% and he identified multiple pelvic examinations as one of the risk factors for post cesarean wound infection

However, postoperative morbidity was associated with poor general condition on admission, preoperative clinical anemia and dehydration (Sekirime et al., 2009). Kamau (2005) also found out that the incidence of wound infection after C-section does not appear to be significantly affected by HIV status

On the other hand, Grinde (2007) found out that 29% of women with operating time greater or equal to 38minutes had post cesarean wound infection compared to 9.6% of women who had

operating time less than 38minutes although other factors like BMI were considered in relation to the operating time.

It was also found out by Koigi (2005) that, the incidence of wound infection was 33%, among the 35% of women who labored for more than 12 hours as compared to 15% of those who labored for 12 hours or less and rupture of membranes exceeding 12 hours was associated with high incidence of wound infection than among women in whom rapture of membranes was 12 hours or less.

More to that, according to Koigi (2005), duration of operation that exceeds 60 minutes appeared to be associated with much higher incidence of post cesarean wound infection (71%) as compared to when the operation lasted 60 minutes or less (16 and $p < 0.001$).

According to Filbert (2014) operations carried out by an intern or junior doctors were associated with increased risk of SSI at Bugando medical centre (HR: 4.0; 95% CI, 1.7-9.2; $P = 0.001$). He also established that single dose antibiotic (HR: 0.8, 95%CI: (0.4-1.8), P=0.608) was protective compared to multiple doses of antibiotics (HR: 1.0)

More to that, general anaesthesia according to Filbert at el, was associated with post caesarean wound infection (HR: 1.5, 95%CI: (0.4-6.5),p=0.551) although this association was not statically significant

In an epidemiological population based study done in Taiwan, data was collected on all records of deliveries in hospitals and obstetric clinics(303 834) between January 2002 and December 2006 to ascertain whether general anesthesia was associated with increased risk of surgical site infection following cesarean delivery compared with neuraxial anesthesia. Results from this study showed that general anesthesia was associated with increased risk of surgical site infection compared to spinal anesthesia (OR: 4.21: 95% CI: 3.45–5.14 and OR: 2.35, 95%CI: 2.04–2.70) respectively and both had a P- value of less than 0.001. (Tsai, et al., 2011)

However the likely would of getting surgical wound infection following cesarean section was significantly higher in that group that received epidural anesthesia as compared to spinal anesthesia ($P< 0.001$)

In the timing of prophylactic antibiotic at cesarean section, a double-blinded randomized trial, where cefazolin / clindamycin and a placebo (saline) were given to participants before 30-60minutes of skin incision or after cord clamping. , it was established that timing of antibiotic administration had no significantly effect on any maternal infection rates postpartum (Francis at el., 2013).

Gang (2012) also found out that, lack of prophylactic antibiotics before cesarean section was highly associated with surgical wound infection after cesarean section.

In a randomized controlled trial done in Mulago hospital were2006mother were enrolled in the study.105 was allocated to open dressing arm and 101 were allocated to closed dressing arm. Among the 206 mothers 185 mothers completed the study. The overall wound infection was 7.03%. The rate of wound infection among mothers who received open dressing was 11.22% compared to 2.3% among those who received closed dressing. (Daniel, 2012).

In a prospective study performed at a single institution to determine the effect of interventions in reducing the rate of post cesarean infection, two eras were used. The first era, included all cesarean deliveries that were performed between September 2006 and August 2010. During this period, antibiotics were given prophylactically to only women who underwent elective CD. In era 2 which was from July 2009 through June 2010, antibiotics were prophylactically given to all women who underwent C/S.

In addition to that medical personnel underwent an education program, refresher course, and retraining in scrub and aseptic techniques. The primary outcome of the study included any infectious morbidity related to the cesarean delivery within 30 days from the operation time. Among the 1,616 cesarean deliveries analyzed, 751 performed in era 1 and 865 in era 2, the incidence of any infectious morbidity dropped from 6.4% in era 1 to 2.5% in era 2 (P = .001). The incidence of any infectious morbidity in women undergoing elective cesarean delivery also dropped from 5.3% to 0.9% (P = .001). Among women undergoing non elective cesarean delivery, the difference between the first and second eras did not appear to be statistically significant (7.5% vs. 4.5%; P = .09). However, the rate of incisional surgical site infection dropped significantly, from 4% in era 1 to 1.5% in era 2 (P = .05). In this study, it was concluded

that, the interventions implemented at institution led to a considerable decline in post cesarean delivery infectious morbidity (Salim., et al., 2011)

On the other hand Filbert, at el., (2014) showed that, the type of anesthesia had no effect on wound infection following C-section

In the study done on controlling caesarean-site infection.(Collaboration between the obstetric and hospital hygiene departments), it was found out that close cooperation between the obstetrics and hospital hygiene departments led to a dramatic reduction in SSI rates, to 2.6% (similar to the national rate) from 7.4% in 2000 (Pambou., et al 2011). The incidence of infectious complications after C- section, decreased from 20.7% to 8.5% after a policy of administering preoperative antibiotics was instituted (Thurman et al., 2010)..

In a multicenter randomized controlled trial done on prevention of post cesarean wound infection in Mulago hospital and Kaworo hospital by Musa (2005), 236 patients were enrolled in the study.117mothers were randomly allocated to single ceftriaxone arm which was given immediately after cord clamping and 119 mothers were allocated to multiple drug chemoprophylaxis arm which was started one hour post operatively where x-pen 2MU were given 6hourly for 48 hours followed by three days' amoxicillin and metronidazole to make five days. The mothers were followed daily and wound infection was determined at the time of discharge. Results of this study showed that multiple drug chemotherapy reduced post cesarean wound infection by 42% whereas single dose ceftriaxone reduced post cesarean wound infection by 100%. Patients in the multi-drug chemo- prophylactic arm were more likely to stay longer in the hospital compared to those in the ceftriaxone chemo- prophylactic arm ($p < 0.0001$, OR 3.98, 95% CI 2.21-7.19)

According to Koigi.,et al,(2005), the incidence of post-caesarean wound infection also appeared not to be significantly affected by the type of C- section, that is to say, whether caesarean delivery was an emergency or elective operation. This was similar to what Filbert.,et al., (2014) and Fathia (2014) found out too

CHAPTER THREE: METHODOLGY

3.0 Introduction

This chapter discussed the methodological aspects which the study employed and these chronologically included; the study design, source of data, study population, sample size calculation, sampling procedure, study variables, data collection techniques, data collection tools, plan for data analysis, quality control issues, plan for dissemination and ethical issues.

3.1 Study design

A case control study design was adopted. Post cesarean mothers with wound infection were the cases and post cesarean mothers without post cesarean wound infection on the same post natal ward, with the same age and with the same exposure like the cases were the controls. A case control study was designed to determine the association between an exposure and an outcome thus conditions like age, marital status, parity, hypertension and HIV status of the mother among other things were examined to find out if they had an association with wound infection among the post cesarean mothers. The design was appropriate for this study because it is cheap, time saving, generally requires few study subjects and it could be used to study multiple risk factors for a particular disease

3.2 Source of data

The primary source of data was from post cesarean mothers who were receiving post-operative care on ward 5B- Mulago hospital. The secondary source of data was got from the files of the participants where information about pre- operative hemoglobin, duration of labor before cesarean section, time at which the membrane raptured to rule out premature rapture of membranes, duration of the operation, type of anesthesia that was used, type of cesarean section, use of antibiotics before and after cesarean section and the rank of the person performing the operation was got from the files and used to answer some of the questions in the questioner

3.3 Study setting

The study was conducted on ward 5B Mulago hospital Kampala district. Mulago Hospital is a National Referral and Teaching Hospital with a bed capacity of 1500 beds. It provides specialist

services in Surgery, Internal Medicine, Paediatrics, Obstetrics and Gynaecology, Oncology, Radiology with computerized Tomography (CT scan), Intensive Care , Renal Dialysis, Dentistry and Oral Surgery, Orthopaedics including limb fitting, Ear, Nose and Throat (ENT), Dermatology, Genital/Urinary (urology) medicine, Neurosurgery, Cardiology and Cardiothoracic surgery and Accident and Emergency among others.

It has key hospital departments which include accident and emergency, department of anesthesia, department of surgery, department of internal medicine, department of obstetrics and gynecology, laboratory department, pharmacy department, physiotherapy department, occupational therapy unit, radiology department, radiotherapy department, nuclear medicine department and department of support service.

The department of Obstetrics and Gynecology is well established, with three fully fledged maternity and gynecological facilities in upper Mulago (ward 14), Lower Mulago (5th floor) and in the private patients Wing (ward 6D&E). The department delivers over 30,000 mothers each year. It has its own dedicated theatre on the 5th floor while private patients are handled in the private patients' theatre

Ward 5B, is a post natal ward were mothers after vaginal and cesarean delivery are cared for and Within this very ward, there is also a unit were mother who get post cesarean wound infection are isolated and cared for.

The study setting was favorable for the researcher because it offers free cesarean operations where the researcher could get respondents because of high turn up numbers of pregnant mothers in search for free health services.

3.4 Populations

3.4.1 Target population

All post cesarean mothers in Kampala District

3.4.2 Accessible population

Cases: These included all post cesarean mothers with post cesarean wound infection receiving post-operative care at Mulago hospital

Controls: These included all post cesarean mothers without post-operative wound infection receiving post-operative care at Mulago hospital with the same age, admission and operative dates, same exposures like hypertension diabetes mellitus, obesity, HIV status among other things like the cases.

3.4.3 Study population

All post cesarean mothers receiving care at Mulago hospital on ward 5B who were eligible and consented to participate in the study.

3.5 Eligibility criteria

3.5.1 Inclusion criteria for the cases

Post cesarean mothers from 15- 49 years diagnosed with post cesarean wound infection on ward 5B Mulago hospital Kampala District. Infection must have occurred 30 days within the operation period and the wound should have at least one of the following:

- Purulent drainage from the incision
- At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat
- Wound dehiscence
- Presence of an abscess

- Diagnosis of incisional SSI made by a surgeon or attending physician.

3.5.2 Inclusion criteria for controls

Post cesarean mothers from 15- 49 years without post cesarean wound infection on ward 5B Mulago hospital Kampala.

3.5.3 Exclusion criteria for the cases

Post cesarean mothers with wound infection who could not consent to participate in the study for reasons best known to themselves and post cesarean mothers with wound infection that occurred after 30 days from the operating time

Post cesarean mothers with wound infection who were very sick

3.5.4 Exclusion criteria for controls

Post cesarean mothers without wound infection who could not consent to participate in the study for reasons best known to them selves

Post cesarean mothers without wound infection who were very sick.

3.6 Sample size calculation

This was got using Olive at., el (2009)

Formula for calculation of sample size:

$$n = \frac{(r + 1)\,(p)\,(1 - p)(Z_{\beta} + Z_{\alpha/2})^2}{2\qquad (P_1 - P_2)^2}$$

n = sample size in the case group

r = ratio of controls to cases (r = 1)

Z_{β} = Desired power (typically Z_{β} = 0.84 for power = 80%)

$Z_{\alpha/2}$ = level of statistical significance ($Z_{\alpha/2}$ = 1.96)

P = measure of viability

$(P_1 - P_2)^2$ = Effect size

P cases exposed (p_1) = OR * P controls exposed

P controls exposed * (OR-1) + 1

$\dot{P} = (P_1 + P_2)/_2$

P_2= 33.9%, OR = 2.34 (Fathia., at., el 2009)

P1 = 2.34*0.339

0.339*(2.34-1) + 1

=0.793/1.454

P1= 0.545

$\dot{P}$ = (0.545+ 0.339)/2

$\dot{P}$ =0.442

n=2 (0.442) (1-0442) (7.84)

$(0.545- 0.339)^2$

n= 2 *1.934

0.042

n=2*46

n= 92

Sample size = 92+92= 184

The sample size of 184 was an average sample size that would be a basis for making inferences on the whole population.

3.7 Sampling procedure

Post cesarean mothers with and without wound infections were selected using convenience sampling from ward 5 B Mulago hospitals. Simply, a convenience sample is one where the units that are selected for inclusion in the sample are the easiest to access. It was advantageous in that the relative cost and time needed to carry out a convenience sample was small compared to probability sampling technique. This would allow the researcher to achieve the targeted sample size in a relatively first and inexpensive way.

3.8 Identification and definition of Cases

The cases were identified through daily visit to ward 5B Mulago hospital. Mothers from 15- 49 years with post cesarean wound infection were considered for inclusion in the study. Data was collected directly from the patients and from the patient's files by the research assistant

3.9 Identification and definition of controls

The control with the same environmental conditions on the ward and other related exposures like the cases were conveniently selected until the target number was reached and they were followed up to look out for exposure.

3.10 Study variables

3.10.1 Dependent variable

The dependent variable in this research study was surgical wound infection

3.10.2 Independent variables: These include the following

Socio-demographic factors which included

- Age
- Marital status
- Parity
- Educational status
- Employment status
- Monthly income

Maternal factors which included;

- Antenatal care attendance during pregnancy
- Obesity (BMI)
- Diabetes mellitus
- Hypertension
- Pre-operative HB (hemoglobin)
- HIV status
- Dehydration

Obstetric factors which included;

- Premature rupture of membranes (<8hrs)
- Prolonged labor (> 12hrs)
- Vaginal examination >4 times
- Duration of the operation > 1 hour
- Type of skin incision(vertical / transverse)
- Rank of the person performing the operation (Type of surgeon, junior/ senior)
- Type of C- section (emergency/elective C-section)
- Type of anesthesia used
- Antibiotics used before and after C-section
- Class of antibiotics administered
- Duration of antibiotics (single/ multiple)

3.11 Data collection techniques and instruments

A structured questioner, prepared in line with the objectives of the study was employed to collect primary data from the respondents. Secondary data in the questioner was filled in by the research assistant after checking for the required information from the participants' files. An English pre

tested questioner was used to collect data from the study participants and consisted of closed ended questions to which participants in the study would respond. The decision by the researcher to use a questioner was due to the ease with which a questioner could be administered to the respondents and generation of data within. Participants who were literate were given self-administered questioners and those who are illiterate were interviewed in vernacular using the same questioner. The purpose of data collection techniques and instruments was to measure the degree of constancy in responses hence establishing the reliability of the instruments.

Pre-test

Pre testing of the questioner was done on seven post cesarean mothers on ward 5B Mulago hospital to determine reliability and improve clarity of the instrument. This would help the researcher to ensure appropriateness in gathering the required data that could be used to determine the content validity. The researcher also carried out the study with vigor to eliminate inaccuracies and bias in data.

The researcher used the guidance and expertise of the university supervisor to ensure validity of the research instrument which would answer the objectives of the study.

3.12 Data management

The researcher managed the data to ensure confidentiality and its security. Questioners were checked for mistakes and missing data before leaving the study site and the participants were requested to correct the mistakes or fill in the missing data. Questioners were coded too for easy checking and also to prevent losses. Training and supervision of research assistants was done to ensure collection of quality data.

Data that was analyzed was tabulated to show the statistics and the relationship between the study variables. The relationship between factors associated with post cesarean section was analyzed by use of bivariate and multivariate analysis. Odds ratio and precision determined the strength of association. To ensure accuracy and reliability of data that was collected, data was exported to SPSS software.

Reliability

Reliability is the dependability or trust worthiness of the research results or the degree to which the measuring instrument consistently measures what is supposed to be measured (Amin, 2005)

3.13 Plan for data analysis

3.13.1 Descriptive analysis

Numerical data was summarized and presented as mean, standard deviation, median and interquartile (IQR) range. Categorized data was summarized in proportions and percentages presented in tables

3.13.2 Bivariate analysis

The relationship between independent and dependent variables was determined by logistic regression and the effect was odds ratio. The significance of the relationship was determined at $\alpha = 0.05$ and the relationship with $p<0.05$ was considered significant (having a relationship with post cesarean wound infection)

3.13.3 Multivariate analysis

Factors that were significant at bivariate analysis were carried to multivariate analysis where logistic regression analysis was used to assess the relationship between an independent variable and dependent variable for post cesarean wound infection while keeping other factors constant. The measure of association was the odds ratio and level of precision around the odds ratio was 95% CI.

Data was analyzed using the SPS'S 16.0, software package for Windows. Continuous variables were expressed as mean ± standard deviation. Results were, presented using bar graphs, pie charts and frequency tables.

3.14 Quality control issues

The major focus was the content validity. Content validity of the instruments was ensured through criticisms of 3 colleagues with extensive expertise and experience in questioner construction

Reliability of the instruments was improved through piloting and pre testing on post cesarean mothers who were not part of the respondents.

Reliability and validity of the results was achieved through member checks to assist indicate whether the findings appeared to match with the perceived authenticity. This limited the distorting effects of random errors on the findings

Pre testing and training of research assistants was done to ensure quality control.

3.15 Ethical issues

Permission to carry out the study was sought from International Health Sciences University and thereafter from Mulago Hospital research committees.

Before initiating the research, an informed consent was sought from respondents clearly stating the advantages and disadvantages of participating in the study. Participants were informed that participating in the study was voluntary and they could withdrawal from the study any time if they wish. Names or personal identification numbers were not reflected on the questioner except the questioner numbers which were reflected for the purpose of data identification during data analysis and interpretation

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This chapter represents results that were analyzed from the data collected from 63 cases and 93 controls using semi - structured questionnaires. The purpose of the study was to identify risk factors for post cesarean wound infection. Results are summarized and presented according to the study objectives.

4.1 Socio- demographic Characteristics

Table1: Socio-demographic Characteristics of Mothers

Variable	Category	N	Percent
Age (years)			
	15-24	63	33.9
	25-34	83	44.6
	35-44	40	21.5
Marital status			
	Single	16	8.6
	Married	146	78.5
	Divorced	23	12.4
	Widowed	1	0.5
Parity			
	≤3	131	70.4
	>3	55	29.6
Education level			
	None	45	24.2
	Primary	67	36.0
	Secondary	12	6.5
	Tertiary	62	33.3
Occupation			
	Unemployed	16	8.6
	Peasant	136	73.1
	Civil servant	34	18.3
Monthly income			
	≤100,000	115	66.1
	>100,000	59	33.9

The study looked at key socio-demographic characteristics like age, marital status, parity educational level, occupation and monthly income. According to study findings shown in table:1,

most of the mothers who were interviewed were aged between 25 and 34 44.6% (83/186),78.5 % (146/186) were married, most of them had three children or less, 36% (67/186) had attained education up to primary level, 73% (136%) were peasants and 66.1% (115) had income level of ≤100,000 shillings

4.2 Socio-demographic characteristics associated with post cesarean wound infection

Table 2: Relationship between socio-demographic factors and Post cesarean wound infection at Bivariate

Variable	Case	Control	χ^2	P-value
Age (years)				
15-24	18(19.4)	45(48.4)	31.18	**<0.001**
25-34	41(44.1)	42(45.2)		
35-44	34(36.6)	6(6.5)		
Marital status				
Single	8(8.6)	8(8.6)	3.57	0.312
Married	77(82.8)	69(74.2)		
Divorced	8(8.6)	23(12.4)		
Widowed	0	1(0.5)		
Parity				
≤3	65(69.9)	66(71.0)	0.026	0.872
>3	28(30.1)	27(29.0)		
Education level				
None	31(33.3)	14(15.1)	15.293	**0.002**
Primary	37(39.8)	30(32.3)		
Secondary	5(5.4)	7(7.5)		
Tertiary	20(21.5)	42(45.2)		
Occupation				
Unemployed	4(4.3)	12(12.9)	5.088	0.079
Peasant	69(74.2)	67(72.0)		
Civil servant	20(21.5)	14(15.1)		
Monthly income				
≤Sh. 100,000	69(74.2)	46(56.8)	5.851	**0.016**
>Sh. 100,000	24(25.8)	35(43.2)		

At bivariate analysis, socio- demographic factors that were found to be significantly associated with post cesarean wound infection included: age ($\chi^{2:}$ 31.18, P< 0.001), education level

(χ215.29, P = 0.002) and Monthly income (χ^2 5.85, P=0.016) as shown by table 2. The rest of the social demographic factors were not significantly associated with post cesarean wound infection.

4.3 Mother related factors associated with post cesarean wound infection

Table 3: Relationship between maternal factors and Post cesarean wound infection bivariate analysis

Variable	Case	Control	χ^2	P-value
Attend ANC				
Yes	13(14.0)	54(58.1)	39.216	**<0.001**
No	80(86.0)	39(64.0)		
BMI				
Underweight	5(5.4)	2(2.2)	3.068	0.381
Normal weight	51(54.8)	44(47.3)		
Overweight	27(29.0)	33(35.5)		
Obese	10(10.8)	14(15.1)		
HIV status				
Negative	81(87.1)	74(79.6)	1.897	0.168
Positive	12(12.9)	19(20.4)		
Diabetes mellitus patient				
Yes	68(73.1)	88(94.6)	15.897	**<0.001**
No	25(26.9)	5(5.4)		
Hypertensive patient				
Yes	49(52.7)	59(58.1)	2.208	0.137
No	44(47.3)	78(41.9)		
Pre-operative Hb				
<7mg/dl	28(30.1)	16(17.2)	11.458	**0.003**
7-11mg/dl	34(36.6)	57(61.3)		
>11mg/dl	31(33.3)	20(21.5)		

Similarly, maternal factors that had an association with post cesarean wound infection at bivariate analysis were: antenatal care attendance (χ^2 39.126, P<0.001), diabetes mellitus (χ^2 15.897, P<0.001) and pre- operative hemoglobin level (χ^2 11.458, P= 0.003) as shown in table: 3

4.4 Obstetric factors associated with post cesarean wound infection

Table 4: Relationship between Obstetric factors and Post cesarean wound infection at bivariate analysis

Variable	Case	Control	χ^2	P-value
Duration of operation				
>1 hour	20(21.5)	18(19.4)	0.132	0.716
≤1 hour	73(78.5)	75(80.6)		
Type of incision				
Vertical	11(11.8)	26(28.0)	7.591	**0.006**
Transverse	82(88.2)	67(72.0)		
Duration of rapture of membrane				
≤8 hours	65(69.9)	68(73.1)	0.237	0.626
>8 hours	28(30.1)	25(26.9)		
Duration of labor				
≤12 hours	64(68.8)	84(90.3)	13.229	**<0.001**
>12 hours	29(31.2)	9(9.7)		
Number of vaginal exams				
≤4	74(79.6)	87(93.5)	7.810	**0.005**
>4	19(20.4)	6(6.5)		
Rank of surgeon				
Junior	11(11.8)	2(2.2)	6.699	**0.01**
Senior	82(88.2)	91(97.8)		
Type of cesarean section				
Elective	69(74.2)	75(80.6)	1.107	0.293
Emergence	24(25.8)	18(19.4)		
Type of anesthesia				
General	23(24.7)	5(5.4)	13.622	**<0.001**
Spinal	70(75.3)	88(94.6)		
Antibiotic use before CS				
Yes	7(7.5)	6(6.5)	0.083	0.774
No	86(92.5)	87(93.5)		
Class of antibiotic administered				
Penicillin	36(38.7)	14(15.1)	13.947	**0.001**
Aminoglycoside	0	1(1.1)		
Cephalosporin	57(61.3)	78(83.9)		

Among the obstetric factors, the type of incision (χ^2 7.591, P= 0.006), duration of labor (χ^2 13.229, P<0.001), rank of the person performing the operation (χ^2 6.699, P=0.01), Type of anesthesia (χ^2 13.622, P<0.001) and type of antibiotics administered before and after cesarean section (χ^2 13.947, P= 0.001) were found to have an association with post cesarean wound infection at bivariate analysis

4.5 Socio- demographic, maternal and obstetric factors significantly associated with post cesarean wound infection

Table 5: Factors associated with Post cesarean section wound infection among mothers at multivariate analysis

Variable	Case	Control	OR(95%CI)	P-value
Education level				
None	31(33.3)	14(15.1)	1	
Primary	37(39.8)	30(32.3)	6.85(1.4-33.46)	0.018
Tertiary	20(21.5)	42(45.2)	22.26(4.57-108.6)	<0.001
Attend ANC				
Yes	13(14.0)	54(58.1)	1	
No	80(86.0)	39(64.0)	0.02(0.003-0.12)	<0.001
Diabetes mellitus patient				
Yes	68(73.1)	88(94.6)	1	
No	25(26.9)	5(5.4)	0.004(0.00-0.038)	<0.001
Pre-operative Hb				
<7mg/dl	28(30.1)	16(17.2)	1	
7-11mg/dl	34(36.6)	57(61.3)	0.12(0.03-0.497)	0.003
>11mg/dl	31(33.3)	20(21.5)	0.11(0.02-0.634)	0.013
Type of incision				
Vertical	11(11.8)	26(28.0)	1	
Transverse	82(88.2)	67(72.0)	0.14(0.03-0.624)	0.010
Duration of labor				
>12 hours	64(68.8)	84(90.3)	1	
≤12 hours	29(31.2)	9(9.7)	0.10(0.02-0.417)	0.002
Rank of surgeon				
Junior	11(11.8)	2(2.2)	1	
Senior	82(88.2)	91(97.8)	47.78(3.078-741.8)	0.006
Type of anesthesia				
General	23(24.7)	5(5.4)	1	
Spinal	70(75.3)	88(94.6)	25(3.33-187.643)	0.002

All the variables at bivariate analysis that were less than 0.05 were carried to multivariate analysis where they were assessed for interaction and confounding. The factors that had little or no effect on post cesarean wound infection in presence of other variables were thrown out of the model and the factors that remained in the model were associated with post cesarean wound infection as indicated in table: 5

Mothers who had attained education up to primary level were 6.8 times more likely to get wound infection following cesarean section (OR: 6.85, CI: 1.4-33.46, p =0.018) and those who had attained tertiary level were twenty two times more likely to acquire post cesarean (OR: 22.26 CI: 4.57-108.6, P<0.001) when compared with those who had not gone to school.

Mothers who had no diabetes mellitus were less likely to get post cesarean wound infection after cesarean section when compares with those who had diabetes mellitus (OR: 0.004, CI: 0.00-0.038, P<0.001).

Mothers with pre-operative hemoglobin of 7-11g/dl and > 11g/dl were less likely to get wound infection following cesarean section than those with<7g/dl (OR: 0.12, CI: 0.03-0.497, p=0.003 and OR: 0.11, CI: 0.02-0.634, P = 0.013) respectively.

Transverse type of skin incision was protective against post cesarean wound infection as compared to vertical skin incision(OR:0.14, CI: 0.03-0.624, P=0.010) and mothers who labored for 12 hour or less were less likely to get wound infection following cesarean section than those who labored for more than 12 hours (OR:0.10 CI: 0.02-0.417 P =0.002)

Mothers who were operated up by the senior surgeons were 47 times more likely to get post cesarean wound infection compared to those who were operated upon by the juniors.(OR: 47.78, CI: 3.078-741.8, P=0.006) and spinal anesthesia was found to be significantly associated with post cesarean wound infection (OR:25, CI: 3.33-187.643, P =0.002)

CHAPTER FIVE: DISCUSSION OF RESULTS

5.0 Introduction

In this chapter, the findings of this study are discussed in comparison with literature of the previous scholar and implications stated.

5.1 Social demographic characteristics associated with post cesarean wound infection

This study found out that primary and tertiary levels of education were significantly associated with post cesarean wound infection which was partially in line with the study done in Ibadan Nigeria by Morhason (2009) who found out that mothers up to primary level of education are 20 times more likely to get post cesarean wound infection than those with secondary level of education however it did not establish any association between post cesarean wound infection and tertiary level of education. This may be linked to poor adherence, self-medication and the tendency of people with high education level to claim that they" know more" to the extent that sometimes they don't take the drugs that are prescribed to them by the doctors but instead buy drugs of their own choices and preferences. Results from this study may also be attributed to failure of the highly educated people to strictly follow instructions regarding their care at the time they are hospitalized and after discharge hence ending up with infection before and after discharge

To add on that people who are highly educated tend to have sedentary life that predisposes them to obesity and hypertension that may affect wound healing after cesarean section. This may be worsened by the feeding habits of the highly educated. . On the other hand those who have not gone to school strictly follow the" Dos and Don'ts" concerning their health care and they always eat natural foods hence reduced morbidity.

The findings imply that there is need to sensitize the public especially the highly educated about poor adherence, self-prescription/ medication, feeding habits sedentary life style and the dangers of strictly not following orders from the medical personnel because ideally high levels of education are supposed to impact on health positively and not negatively as shown by the study findings.

According to this study, young age and null parity had no influence on post cesarean wound infection as Tulio (2014) discovered. Koigiet.,al (2005) also established that post cesarean

wound infection was common among single mothers yet this study did show any association between marital status and post cesarean wound infection. This may be explained by the under representation of the young and single mothers in the current study.

5.2 Maternal factors associated with post cesarean wound infection

As far as maternal factors are concerned, wound infection was associated with those who were diabetic which is in agreement with what previous scholars like Hansa.,et al, (2014) and Gang (2012) found out. These findings may be attributed to diabetes being a multisystem disorder that lowers the body's immunity hence affecting wound healing process due to physiological changes that take place in tissues and cells that may delay wound healing and it may also be linked to complications of diabetes for example neuropathy and ischemia that will compromise with oxygen supply to the incisional site that is necessary for metabolism hence affecting the process of wound healing. The implication of this is that, extra care should be given to diabetic mothers after cesarean section and blood sugar level should be controlled within the normal ranges to prevent wound sepsis and complications of diabetes which might worsen wound healing further.

Hemoglobin levels less than 7g/dl was also found to be associated with post cesarean wound infection. This is congruent with Filbert (2014) who also found out that mothers who had severe anemia (<7g/dl) were 3.8 times more likely to get post cesarean wound infection (HR: 3.8, 95% CI: 1.2-12.4, p = 0.028). High hemoglobin levels also mean high carriage of oxygen to the incisional site that is needed for metabolism that is very important in the process of wound healing. This implies that medical personnel should health educate the mothers during antenatal care and within the community about foods that are rich in iron that mothers must take during pregnancy and should also provide ferrous tablets to pregnant mothers during antenatal visits.

More to that, finding from this study showed that mothers who did not attend antenatal care clinics were less likely to get wound infection following cesarean section than those who attended antenatal care clinics. On contrary, Fathia (2012) found out that category of mothers with no antenatal visits were more likely to get post cesarean wound infection compared to those who attended antenatal care clinics. Reasons for this controversy are not clearly known but it may be due to under representation of the mothers who did not attend antenatal care clinic because mothers who don't attend antenatal care clinics are less like to deliver from hospitals

and hence may not undergo cesarean section. This calls for other research studies from nurses and doctors to establish the reasons why not attending antenatal care clinics may be protective.

5.3 Obstetric factors associated with post cesarean wound infection

Among obstetric factors, transverse type of skin incision was found to be protective against post cesarean wound infection and this is in line with Filbert et al. (2014) who also found out that mothers who had vertical skin incision were at higher risk of getting post cesarean wound infection compared to those who had transverse type of skin incision. ($p = 0.034$) This may be explained this type of skin incision that is used in cases of cesarean sections that parallels the course of the segmental nerves that are cut hence minimizing muscle parenthesis and paralysis post operatively that may result into reduced activity of the muscle and reduced blood supply to incision site hence delayed healing and wound infection. Implication of these results is that surgeons should adopt transverse type of skin incision for cesarean section as it is protective against post cesarean wound infection.

To add on that, wound infection was common among mothers who labored for more than 12 hours. This concurs with Fathia (2012) and Koigi (2005) who also found out that labor of 12 hours or less was protective against post cesarean wound infection. This is not surprising because prolonged labor of greater than 12 hours may be associated with premature rapture of membranes and increased number of vaginal examination (exceeding the four times that are recommended) hence putting the mother at risk of acquiring infection. This implies that early detection of labor dystocia by the mid- wives and surgeons is necessary to reduce the time of exposure to infections prior to cesarean section.

In addition to that, mothers who were operated upon by senior doctors/ surgeons were more likely to get wound infection following cesarean section than those who were operated upon by the juniors. On contrary, Filbert and colleagues (2014) established that being operated upon by the senior surgeon was protective against wound infection after cesarean section. This difference may be explained by the prospective cohort study design that Filbert adopted. Findings from this study may also be attributed to senior managerial and administrative positions that doctors/ surgeons tend to attain as they become more senior which makes them loose skills over time as they rarely perform operations. There is also a tendency of the seniors to instruct the juniors on

all issues concerning patients care hence the juniors end up becoming more skillful than the seniors as they are regularly directly in contact with the patients. This is worsened by the tendency of senior doctor to manage patients post operatively through telephone calls directing nurse and junior doctors on how to manage the patients.

This study also established a negative association between spinal anesthesia and post cesarean wound infection. On contrary, Tasi et al. (2011) found out that spinal anesthesia was protective against wound infection after cesarean section and Filbert (2014) found out that the type of anesthesia had on effect on wound infection following cesarean section. This controversy may be attributed to the epidemiological population based study and the prospective cohort study design that were adopted by Tasi et al. (2011) and Filbert et al. (2014) respectively. The finding may also be linked to several needle pricks that the mother may experience in the process of introducing the spinal needle into the spinal space for administration of the local anesthesia that that may predispose them to infection. This calls for more resource studies to establish evidence about this trend.

5.4 Methodological issues

Information bias was still possible where research assistants did not ask questions correctly to get clear answers making some factors not to be significant and also some information generated from the next of kin could not have measured accurately what this study intended to measure.

Recall bias could have occurred where the cases could have been more associated with the risk factors than controls that were more likely not to be associated with the risk factors probably leading to over estimation of the effect measure (strength of association)

Selection bias might have occurred since the controls and cases where selected from the same hospital. In this case the controls may not be comparable in regard to some factors. This could have resulted in either under or over estimation of the effect measure

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.0 General conclusion

According to this study several factors have been noted to be associated with post cesarean wound infection. Among the socio-demographic factors, Primary and tertiary level of education were found to be associated with post cesarean wound infection. Being a diabetic, antenatal care attendance and hemoglobin levels of less than 7g/dl were identified as maternal independent risk factors for post cesarean wound infection. Obstetric factors that were found to be associated with post cesarean wound infection included; labor greater than 12 hours, being operated upon by a senior surgeon, vertical type of skin incision, and spinal anesthesia.

6.1 Recommendations for practice and future research

The following recommendations are based on factors that were found to be associated with post cesarean wound infection as shown in table 5.

To cub the negative impact that high education level had on health, health workers should sensitize their clients during hospital visits for example in antenatal clinics, outpatient clinics and during admission about dangers of not following doctor's orders and self-prescription, poor adherence and negative effects of sedentary life on health

Health workers should make sure that blood sugar levels of diabetic patients are controlled to prevent complications that may increase the risk of morbidity in these people who already immune compromised.

Further studies need to be done to explore why people who don't attend antenatal care clinic are less likely to get wound infection as this study put it up.

Mothers should be health educated about iron giving food before pregnancy, during pregnancy and after pregnancy about the need to take food that are rich in iron to boost the hemoglobin levels. During antenatal, health works should provide iron and folic acid to pregnant mothers and consequences of not taking these drugs should be clearly stated to the mothers

Senior surgeons at Mulago national referral hospital need to practice surgery more often and may need refresher course prevent to keep their skills up to date.

There is need to adopt planned cesarean section because it has less risk for cesarean section compared to cesarean section that is done after prolonged labor and early detection of labor dystocia will reduce the risk of infections that may be acquired during prolonged labor.

Transverse skin incision should be adopted by surgeon all surgeons during cesarean section as it is protective against post cesarean wound infection.

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APPENDIX I: CONSENT FORM

We are asking you to participate in a research study at Mulago national referral hospital. We will first explain the why we are doing this study , the good and bad about it and what will be asked of you if you agree to participate in the study.

If you decide to participate in the study, we will ask you to sign this consent form or make your mark in front of wittiness. We will give you a copy of the signed consent form. This consent form might contain some word that you don't know. Please ask us to explain anything that you don't understand.

Purpose of the study

Ideally C- section is a sterile procedure where no infections are expected post operatively. In case of elective C- section, the mother is prepared pre –operative but by encouraging the mother to take nutritious food that can promote healing of the wound. The mother is also health educated on good personal hygiene that can prevent wound infection post operatively and the mother is also psychologically prepared for the operation. During the operation, aseptic techniques and

sterile instruments are used by the qualified operating team. Post operatively, antibiotics are administered and the wound is cleaned with a disinfectant under aseptic techniques and using sterile instruments which prevent surgical wound infection after C- section. The mother is also encouraged to take nutritious foods post operatively with plenty of vitamin C which promotes quick healing of the wound.

Despite all the above endeavors to prevent wound infection, it has been noted that post caesarean wound infection is still a problem in Mulago hospital. In 2005, the rate of wound infection after cesarean section in Mulago hospital was 8.4%(Musa, 2005) and in 2012 the rate of wound infection following cesarean section was 7.03% (Daniel, 2012).

Post cesarean wound infection is associated with so many consequences including the physical discomforts that are experienced during wound infection, prolonged patient's stay in the hospital in need of the necessary treatments for wound infection. Prolonged hospital stay and prolonged treatment period probably implies increased hospitalization bills. Serious complications can also

arise from a wound infection, for example necrotizing fasciitis, rupture of the fascia, and evisceration. Such complications would require another major operation, where recovery can take quite a length of time. Post cesarean wound infection may also result into maternal mortality which will consequently deprive the new born baby from breast feeding, parent love, hence malnutrition and psychological trauma

It is not clear why these mothers get surgical wound infection post operatively and therefore the study will generate knowledge on new risk factors that are specific to Mulago hospital which will lead to development of new strategies to prevent wound infection. Results from the study will be used to inform the authorities of Mulago hospital so that new policies to prevent post cesarean wound infection are established and with the establishment of the new policies, the rate of wound infection will reduce thus reducing on bed occupancy and the finances that the government will spend on treating wound infection.

Health workers in Mulago hospital will be equipped with new knowledge on the cause, treatment and prevention of surgical wound infection. The application of the new knowledge discovered from the study will lead to improved quality of care and hence reduction in maternal morbidity and mortality. The study will also lead to establishment of new public policy that will lead to improved health care service delivery and it will help the researcher to fulfill the requirement for a ward of a degree in nursing and in future the study will be used as a source of literature review for further studies. Therefore the purpose of this study is to establish the risks associated with wound infection in Mulago hospital.

Your participation is voluntary

Before you learn about the study procedure, it is important that you know about the following:

- You don’t need to be in this study if you don’t want to.
- You may decide to participate in the study and you may with draw from the study at any time. If you withdraw from the study, you will continue to get the necessary medical care.
- If you decide not to participate in this study, you can still join another study later if one is available and you qualify.

Study procedures

If you decide to be in the study you will be asked to read, discuss and sign or make your mark on this form and the following will be done;

- Your weight and height will measured and recorded
- You will be asked some few questions by the research assistant and the answers will be recorded in the questioner accordingly
- Information will be extracted from your hospital file to answer some questions in the questioner.

Risks

There is no risk to you for participating in this study, except fo r loss of time. However the study staff may ask you some questions about your life that are personal and may cause some discomfort.

Benefits

You may not receive any direct benefit by participating in the study. However you and others may benefit in future from what is learned in this study.

Costs to you

There is no cost to you for being in the study.

Reimbursement

You will not receive any payment you agree to participate in the study.

Participant rights

Participation in this study is voluntary. You have the right to refuse to participate in the study and this decision will not affect your treatment at Mulago national referral hospital. If you choose to participate in this study, you have the right to withdraw from the study at any time

Confidentiality

Efforts will be made to keep your personal information confidential. Your names or other information that may be used to identify you will not appear on the questioners. The questioners will be coded or given serial numbers for the purpose of data management.

Problems or questions

Nansikombi Sarah or her designee will explain this study to you. If you have any question, you may contact:

Nansikombi Sarah

International Health Sciences University

P.O. Box7782, Kampala

Email: nansarah2000@yahoo.co.uk

Telephone: 0772406260

I have read this form or had it read for me. I have discussed the information with the study staff. My questions have been answered. I volunteer to take part in the study. I have been told that my decision whether or not to participate in the study is voluntary and I can withdraw from the study at any time if wish too. By signing this form, I don't give any legal rights that I have as a research assistant.

Name of the participant/ thumb print if illiterate signature of the participant

Date: ———————

Name of person administering consent. Signature of person administering consent

Date: ———————

Name of person witnessing consent Signature of person witnessing consent

Date: ———————

APPENDIX II: QUESTIONAIRE

I am Sarah Nansikombi, a student of Health Sciences University pursuing a bachelor's degree in nursing. This questioner is to help the researcher to find out risk factors for post cesarean wound infection among child bearing mothers at Mulago national referral hospital. All the information that will be given by the respondents will remain confidential and will be used for only this study

Instructions:

Please tick the appropriate answer and fill in the blank space where necessary.

Status of the respondent

1. Case ☐
2. Control ☐

Section A: Socio- demographic questions

1. What is your age (in complete years?) ☐☐
2. Marital status
    1. Single ☐
    2. Married/ cohabiting ☐
    3. Divorced/ separated ☐
    4. Widowed ☐

3. How many children do you have?
    1. ≤ 3 ☐
    2. > 3 ☐

4. Highest level of education
    1. None ☐

2. Primary ☐
3. Secondary ☐
4. Tertiary ☐

5. Occupation/employment

1. Unemployed ☐
2. Peasant farmer ☐
3. Civil servant/ self employed ☐

6. What is your monthly income?

1. ≤ 100,000/= ☐
2. > 100,000/= ☐

Section B: Maternal questions

7. Weight (kg) ☐☐☐
8. Height (cm) ☐☐☐
9. Did you attend ante-nantal clinics during pregnancy?

1. Yes ☐
2. No ☐

10. If yes to question 9, how many times did you attend ante-nantal clinic?

1. < 4 visits ☐
2. ≥ 4 visits ☐

11. BMI

1. Under weight (<18.5) ☐
2. Normal weight (18.5-24.9) ☐
3Over weight (25-29.9) ☐

4. Obese (≥30)

12. HIV status

1. Negative
2. Positive
3. Unknown

13. Are you a known patient of diabetes mellitus?

1. No
2. Yes

14. Are you a known hypertensive patient?

1. No
2. Yes

15. Pre-operative heamoglobin levels

1. < 7g/dl
2. 7g/dl - 11g/dl
3. > 11g/dl

Section C: Obstetric questions

16. Duration of the operation

1. > One hour
2. ≤ One hour

17. Type of skin incision experienced durind cesarean section.

1. Vertical
2. Transverse

18. Duration of Rapture of membranes before labor onset

1. ≤ 8 hours

2. >8 hours ☐

19. Duration of labor

1. ≤ 12 hours ☐

2.>12hours ☐

20. Number of Vaginal examination done

1. ≤ 4 times ☐

2.>4 times ☐

Section D: facility related questions

21. Rank of the surgeon who performed the operation

1. Junior ☐

2. Senior ☐

22. Type of cesarean section

1. Emergence ☐

2. Elective ☐

23. Type of anesthesia given

1. General anesthesia ☐

2. Spinal anesthesia ☐

24. Antibiotic use before cesarean section.

1. Yes ☐

2. No ☐

25. Antibiotic use after cesarean section

1. Yes ☐

2. No ☐

26. If the answer is yes for question 24 and 25, which class of antibiotic was administered?

1. Penicillin ☐

2. Aminoglycosides ☐

3. Cephalosporin ☐

4. Others ☐

specify)……

27. How many doses of antibiotics were given?

1. Single dose ☐

2. Multiple doses ☐

APPENDIX III: MAP SHOWING THE STUDY AREA

KEY

- Study area (New Mulago Hospital)

APPENDIX IV: INTRODUCTORY LETTER

IHSU INTERNATIONAL HEALTH SCIENCES UNIVERSITY
Sanitas per scientiam

making a difference in health care

Office of the Dean, School of Nursing

Kampala, 27th August 2015

THE RESEARCH COMMITTEE
MULAGO NATIONAL REFERRAL
HOSPITAL
P.O BOX 7051

Dear Sir/Madam,

RE: ASSISTANCE FOR RESEARCH

Greetings from International Health Sciences University.

This is to introduce to you **Nansikombi Sarah** Reg No. **2012-BNS-TU-013** who is a student of our University. As part of the requirements for the award of a Bachelors degree in Nursing of our University, the student is required to carry out research in partial fulfillment of her award.

Her topic of research is: **Risk factors for post cesarean section among mothers at Mulago National Referral Hospital**

This therefore is to kindly request you to render the student assistance as may be necessary for her research.

I, and indeed the entire University are grateful in advance for all assistance that will be accorded to our student.

Sincerely Yours,

IHSU
Mrs. Wafula Elizabeth
DEAN SCHOOL OF NURSING
P. O. Box 7782, Kampala - Uganda

The International Health Sciences University
P.O. Box 7782 Kampala – Uganda
(+256) 0312 307400 email: aagwang@ihsu.ac.ug
web: www.ihsu.ac.ug

APPENDIX V: CORRESPONDENCE

TELEPHONE: +256-41554008/1
FAX: +256-414-5325591
E-mail: admin@mulago.or.ug
Website: www.mulago.or.ug

IN ANY CORRESPONDENCE ON THIS SUBJECT PLEASE QUOTES NO...

THE REPUBLIC OF UGANDA

MULAGO NATIONAL REFERRAL HOSPITAL
P.O. Box 7051
KAMPALA, UGANDA

31st Aug, 2015.

Nansikombi Sarah
Principal Investigator
School of Nursing
International Health Science University

Dear Nansikombi,

Re: Approval of Protocol MREC: 857: Risk factors for post cesarean wound infection among mothers at Mulago national referral hospital.

The Mulago Hospital Research and Ethics Committee reviewed your proposal referenced above and hereby grant approval for the conduct of this study for a period of (1) year from 31st Aug, 2015 to 31st Aug, 2016.

This approval covers the protocol and the accompanying documents listed below;

- Consent form
- Questionnaire

This approval is subjected to the following conditions:

1. That the study site may be monitored by the Mulago research and ethics committee at any time.
2. That you will be abide by the regulations governing research in the country as set by the Ugandan National Council for Science and Technology including abiding to all reporting requirements for serious adverse events, unanticipated events and protocol violations.
3. That no changes to the protocol and study documents will be implemented until they are reviewed and approved by the Mulago Research and Ethics Committee.
4. That you provide annual progressive reports and request for renewal of approval at least 60 days before expiry of the current approval.
5. That you provide an end of study report upon completion of the study including a summary of the results and any publications.
6. That you will include Mulago hospital in your acknowledgements in all your publications.

I wish you the best in this Endeavour.

APPROVED
APPROVAL DATE 31 AUG 2015 EXPIRY DATE 31 AUG 2016
MULAGO RESEARCH ETHICS COMMITTEE
IRC

DR.NAKWAGALA FREDERICK NELSON
CHAIRMAN- MULAGO RESEARCH & ETHICS COMMITTEE.

Vision: "To be the leading centre of Health Care Services"