

**DETERMINANTS OF ADVERSE MATERNAL AND FEOTAL OUTCOMES
AMONG WOMEN IN KAMWENGE DISTRICT, SOUTH WESTERN
UGANDA**

**IMMACULATE KICONCO
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DECLARATION

This dissertation is my original work and has not been presented for a degree in any other university.

Signature

Immaculate Kiconco

2016-MPH-RL-008

Institute of Public Health and Management

Date

APPROVAL

This dissertation has been submitted for examination with my approval as university supervisor.

Signature

Ms Kiconco Sylvia

Institute of Public Health and Management

Date

DEDICATION

To my long-time friend Dr Kalamya Julius, my mum Kabareebe Stella and son Mugisha Romeo for their encouragement, motivation and inspiration towards achieving this.

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DEFINITION OF KEY TERMS

- **Maternal death:** the death of a woman whilst pregnant or within 42 days of delivery or termination of pregnancy, from any cause related to, or aggravated by pregnancy or its management, but excluding deaths from incidental or accidental causes (The Lancet Global Health, 2014)
- **Still birth:** a baby born with no sign of life at or after 28 weeks of gestation
- **Adolescent pregnancy:** Pregnancy in girls aged 10-19 years.
- **Advanced maternal age:** 35 years and above
- **Parity:** Number of previous pregnancies with gestational age of more than 28 weeks
- **Nulliparous:** Zero parity
- **Multiparous:** parity of six and above
- **Obstructed labour:** Labour is considered obstructed when the presenting part of the foetus cannot progress into the birth canal, despite strong uterine contractions
- **Early neonatal death;** death of new-born within 6 days after birth
- **Late neonatal death;** death of a new-born 7 to 28 days after birth

LIST OF ACRONYMS

WHO-World Health Organisation

ART-Anti-Retroviral Therapy

UNAIDS-The Joint United Nations Programme on HIV and AIDS

CEMOC- Comprehensive Emergency Obstetric Care

DHO-District Health Office

MCH-Maternal and Child Health

MMR-Maternal Mortality Ratio

SGA-Small for Gestational Age

PPH-Post Partum Haemorrhage

LBW-Low Birth Weight

NND-Neonatal Death

SB-Still Birth

BA-Birth Asphyxia

PS-Puerperal Sepsis

PTMB-Preterm baby

E-Eclampsia

ABSTRACT

Adverse maternal and foetal outcomes like still births, preterm births, low birth weight, birth asphyxia, neonatal death, postpartum haemorrhage have continued to remain a challenge globally in spite of all the efforts that have been invested towards maternal and neonatal health. Although some factors that increase risk of women having adverse maternal and foetal outcomes have been reported and documented, more information is needed about the determinants of these adverse maternal and foetal outcomes particularly in Kamwenge district, South-western Uganda. A case-control study was done among women delivering at public health facilities in Kamwenge in order to identify the determinants of these outcomes in this area. Both qualitative and quantitative techniques were used. Data was obtained from 80 women using an interviewer-administered questionnaire. Expert information was obtained from midwives and medical officers attached to the maternity wards. Data was entered in CSDPRO version 6.0 and analysed using SPSS 20. A thematic analysis was done for the qualitative data. The study showed puerperal sepsis (39%) as the most prevalent adverse maternal outcome and low birth weight (44.7%), birth asphyxia (31.6%) and preterm births (26.3%) as the most prevalent foetal outcomes. Level income (OR=0.85, 95% CI 0.36-0.91), P=0.016) and distance to the health facility (OR=0.7195% CI 0.43-0.98, P=0.02) were reported to be the determinants of adverse maternal and foetal outcomes in Kamwenge. There is need for income generating interventions in Kamwenge and an increase on the number of public health facilities that are equipped to provide emergency obstetric and neonatal care so as to reduce risk of women suffering adverse maternal and foetal outcomes.

CHAPTER ONE

1.1 Background

Maternal and child health remains a Public Health concern. Maternal health refers to the health of a woman during pregnancy, childbirth and postpartum. Maternal outcomes include; haemorrhage, sepsis, eclampsia, maternal death, delivery with no complication. Child health is a state of physical, mental, intellectual, emotional and social wellbeing of a child not merely absence of disease which gives the child the opportunity to develop to their full potential. Foetal health is part of child health. Foetal outcomes include; live births, abortions, stillbirths, low birth weight babies, preterm babies, babies born with birth asphyxia and neonatal deaths.

Every single day, close to 830 women die worldwide because of preventable causes related to child birth and pregnancy (WHO, 2015). More than half of these deaths occur in Sub-Saharan Africa and one third in South Asia. Of these deaths, 99% happen in low income countries like Uganda (WHO, 2015). Women living in rural areas and in poor income communities have been found to be at high risk of maternal mortality (WHO, 2015).

In 2015, WHO reported that approximately 303000 women died due to pregnancy and child birth related causes and almost all deaths happened in low income countries. It also reported that maternal mortality ratio was at 239 per 100,000 births in developing countries and 12 per 100,000 births in developed countries. The proportion of mothers that do not survive child birth compared to those who do is still four times higher in developing countries than it is in developed ones (WHO, 2015). In 2010, a report by the Central Intelligence Agency, USA, ranked Uganda as 37th country in the world with a maternal mortality ratio of 310 per 100,000 births. In 2015, WHO also reported 2.7 million under five deaths and that 45% of these were of neonates, and approximately 1 million neonatal deaths occur on the day they are born and 2 million in the first week of life. The proportion of child deaths that occur in the neonatal period has increased in all regions over the last 25 years (WHO, 2015).

The commonest adverse pregnancy outcomes that contribute greatly to poor maternal health are still births and abortions. According to Lawn *et al*, there is a high correlation between still birth and maternal mortality. The countries with the highest still birth-rates also have the highest maternal mortality. Worldwide, approximately 36.7% of the estimated pregnancies end in still births and abortions (UN, 2009). More than three quarters of all the still births reported worldwide occur in Africa and South East Asia (WHO, 2010). Globally, the number

of still births reportedly declined by 19.4% from 2000 to 2015(WHO, 2015). The WHO has targeted a reduction of still births to 12 per 1000 or less by 2030. The WHO also reported that approximately 50% of all the still births that occur in the world happen in the intrapartum period. The still birth rate was reported to be 26.2 per 1000 live births and the abortion rate at 10.8 per 1000 women in reproductive –age in rural south western Uganda (Gershim Asiki *et al* ,2009-2013).

According to WHO reports, abortion is responsible for approximately 8% of the maternal deaths that occur worldwide. In 2012, approximately 7million women were treated for complications related to an unsafe termination of pregnancy(WHO, 2011). Studies on morbidity due to abortion are limited (Caron R Kim *et al*, 2016). Uganda has a slightly higher abortion rate than the other East African countries (Lancet, 2016). In 2013, approximately 314,300 abortions occurred in Uganda which is approximately 39 per 1000 women of reproductive age (Lancet, 2016). In a national survey of health facilities in Uganda, an abortion rate of 54/1000 with 20% of pregnancies lost as abortions was found. A report by the Ugandan Ministry of Health, 2010, indicated that approximately 8% of maternal deaths were caused by unsafe abortion. The abortion rates within Uganda vary per region with Kampala ranking highest at 77 per 1000 women 15-49 followed by Northern Region at 57 per 1000 women15-49, South-western region is at 34 per 1000 women 15-49 (Guttmacher Institute Report,February2017).

Puerperal sepsis, though preventable is among the leading causes of maternal morbidity and mortality (J Ayub Med Coll Abbottabad, 2010). Globally, it is reported to affect 4.4% of live births.

Globally, low birth weight is a significant public health problem. It is a great predictor of neonatal morbidity and mortality (WHO, 2014). Approximately 15% to 20% of total births worldwide are of low birth weight which is around 20million births annually (WHO, 2014). The prevalence of low birth weight varies within countries and across regions but the biggest percentage of low birth weight occurs in middle and Low income countries(WHO, 2014). Approximately 28% of the total global low birth weight occur in South Asia, 9% in Latin America and 13% in Sub Saharan Africa(WHO, 2014). However, the statistics on LBW may be underestimated as the data is unreliable and limited since most deliveries occur at home or in clinics and are not included in the official report. In East Africa, approximately, 11% of the

babies are born with LBW(WHO, 2014). According to reports by UNICEF, 2009, in Uganda, 14% of the infants are born with LBW.

The WHO reported that in 2015, 45% of the deaths of children under five years were neonates and that 75% of these occurred in the first 7days of life and approximately 25% died within 24hours after birth (WHO, 2014). Approximately 99% of all the neonatal deaths in the world occur in middle and low income countries especially South Asia and Africa. In 2016, UNICEF reported that new born deaths had declined from 5.1million in 1990 to 2.7million in 2015 and that worldwide neonatal mortality fell from 36 to 19deaths per 1000 live births in the same period. The neonatal mortality in Uganda is very high at 29deaths per 1000live births and has not gotten any better after 15 years (WHO, 2008). In Uganda, at least 45,000 new-borns die every year and most of these occur in Western and central regions (WHO, 2008).

According to WHO, approximately 15million babies are born premature every year and around 1million infants die annually because of complications of prematurity. Preterm births are responsible for 35% of the new born deaths in the world (The Lancet, 2012). India, at 3519100 preterm births has the greatest number of preterm births, and Malawi at 18.1 per 100 live births has the highest rate of preterm births (The Lancet, 2012). Uganda at 13.6 per 1000 live births is the 28th country in the world with the greatest preterm birth rates and 25% of all the neonatal deaths in Uganda are caused by preterm births.

Globally, approximately 4million babies are born with asphyxia every year. Birth Asphyxia is a primary cause of neonatal mortality. Annually, around 24% of neonatal deaths are due to birth asphyxia. It's responsible for approximately 900,000neonatal deaths(UN 2013).

Postpartum Haemorrhage (PPH) is a leading cause of maternal death worldwide (Lancet, 2014). Its prevalence worldwide is approximately 6%, with the greatest burden being in developing countries (Sheldon *et al*, 2014). In Sub-Saharan Africa, the prevalence of Postpartum Haemorrhage is 10.5%.In Uganda, PPH accounts for 25% of all the maternal deaths (Carroli *et al*, 2008). In Uganda, 25% of maternal deaths are caused by postpartum haemorrhage. Approximately 30% of maternal deaths are caused by haemorrhage (David. A Miller, 2014).It occurs in 2-5% of pregnancies and leads to preterm births, low birth weight, congenital malformations, stillbirths and birth asphyxia in the new-borns(Dutta,2010).

In 2008, approximately 43million induced abortions were reported worldwide and close to half of these were unsafe because they were either done by an unskilled person or in an

environment that did not conform to minimum medical requirements or both(Lancet, 2014). Most of these unsafe abortions occur in developing countries where abortion is illegal. Uganda has been reported to have an unsafe abortion rate of 54 per 1000(Singh.S *et al*, 2009). In East Africa, unsafe abortions account for 20% of maternal deaths(Shah I, 2010, Singh *et al*, 2009).

Puerperal sepsis is the leading cause of preventable maternal morbidity and mortality not only in developing countries but also in developed countries (Shamshad *et al*, 2010). According to a study done at Mbarara University Teaching Hospital, Uganda (2011-2014), it was reported that puerperal sepsis accounted for 30.9% of the maternal mortality.

Every year, 10million women develop pre-eclampsia worldwide and approximately 76000 pregnant women die from preeclampsia and other related hypertensive disorders(Kuklina *et al*, 2009). In Africa, 4% to 18% of deliveries involve cases of severe preeclampsia and eclampsia. A woman in a low income country is 7times as likely to develop preeclampsia as one in a rich country and 10% to 25% end in maternal deaths (Preeclampsia Foundation, 2013).

Globally, maternal mortality ratio is 210maternal deaths per 100,000 live births(WHO,2012), 500maternal deaths per 100,000 live births in low income countries like those in Sub-Saharan Africa and 16maternal deaths per 100,000 live births in developed countries (Oliveira Jr, 2014). Maternal mortality is 15 times higher in developing countries than it is in developed countries (Lancet Global Health, 2014). Developing countries account for 99% of all the maternal mortalities that occur globally, with sub Saharan Africa accounting for 62% followed by South Asia at 24%. According to Uganda Bureau of Statistics, Uganda had a mortality ratio of 438 maternal deaths per 100,000 in 2012 (UBOS,2012).

According to a study in South-western Uganda, 15% of women have had at least one adverse pregnancy outcome in their lifetime, 87% were reported to have live births, 3% still birth and 10% abortions (Gershimet *et al*, 2015)

Goal three of the Sustainable Development Goals is '*To ensure healthy lives and promote well-being for all ages*'. One of the targets under this goal is to reduce the global maternal mortality ratio to less than 70 per 100,000 births ensuring no country has a maternal mortality rate that is more than twice the global average, reduce maternal modify and neonatal

mortality. The results from this study will be utilized in guiding interventions that will contribute towards the achievement of a healthy life for all ages.

1.2 Problem Statement

At the end of 2012, Kamwenge district was reported to have a maternal mortality ratio of 316 per 100,000 (CDC, 2014). Approximately 35% of the maternal deaths were reported to be caused by Obstetric haemorrhage, 18% by pre-eclampsia/eclampsia, 13% by unsafe abortion, 12% by sepsis and 11% by obstructed labour(CDC, 2014). A woman's life time risk of dying from childbirth or pregnancy related causes in Kamwenge is 1 in 47 (CDC, 2014).

An initiative named Saving Mothers, Giving Life(SMGL) was launched in 2012 to accelerate the reduction in maternal and new born deaths in Sub Saharan African countries with focus on Uganda and Zambia. In Uganda, the Ministry of Health collaborated with the Centres for Disease Control and Prevention (CDC) to support high impact interventions that were aimed at reducing maternal and neonatal mortality. Four districts of Kabarole, Kibaale, Kamwenge and Kyenjojo in Western Uganda were prioritised because they had higher maternal and neonatal mortality rates as compared to other parts of Uganda. The baseline assessment identified the main adverse maternal outcomes as prolonged and obstructed labour, haemorrhage, pre-eclampsia, complications of unsafe abortions, preterm births, and sepsis and birth asphyxia. According to the SMGL annual performance report, 2016, maternal mortality in Kamwenge was 352 per 100,000 live births and perinatal mortality was approximately 32 per 1000 live births. This is still below the target yet the initiative was implemented four years ago and may also suggest that there are other factors contributing to the different adverse maternal and neonatal outcomes that are not included in the SMGL initiative. In addition, there is limited literature regarding some of the determinants for the consistent adverse maternal and neonatal outcomes in the region(Gershim Asiki *et al*, 2015). Therefore this study is intended to establish risk factors associated with adverse maternal and foetal outcomes among women in Kamwenge.

1.3 Objectives of the study

1.3.1 General Objective

To establish the determinants of adverse maternal and foetal outcomes among women in Kamwenge District

1.3.2 Specific Objectives

1. To establish the level of adverse maternal and foetal outcomes among women in Kamwenge district.
2. To establish pregnancy related-risk factors associated with adverse maternal and foetal outcomes of women in Kamwenge district in 2017.
3. To identify socio-economic risk factors associated with adverse maternal and foetal outcomes of women in Kamwenge District in 2017.
4. To identify health facility- related factors associated with adverse maternal and foetal outcomes of women in Kamwenge District in 2017.

1.3.3 Research Questions

1. What is the level of adverse maternal and foetal outcomes among women in Kamwenge district?
2. What pregnancy related-risk factors associated with adverse maternal and foetal outcomes of women in Kamwenge district?
3. What socio-economic risk factors associated with adverse maternal and foetal outcomes of women in Kamwenge district?
4. What health facility- related factors associated with adverse maternal and foetal outcomes of women in Kamwenge district?

1.3.4 Justification of the study

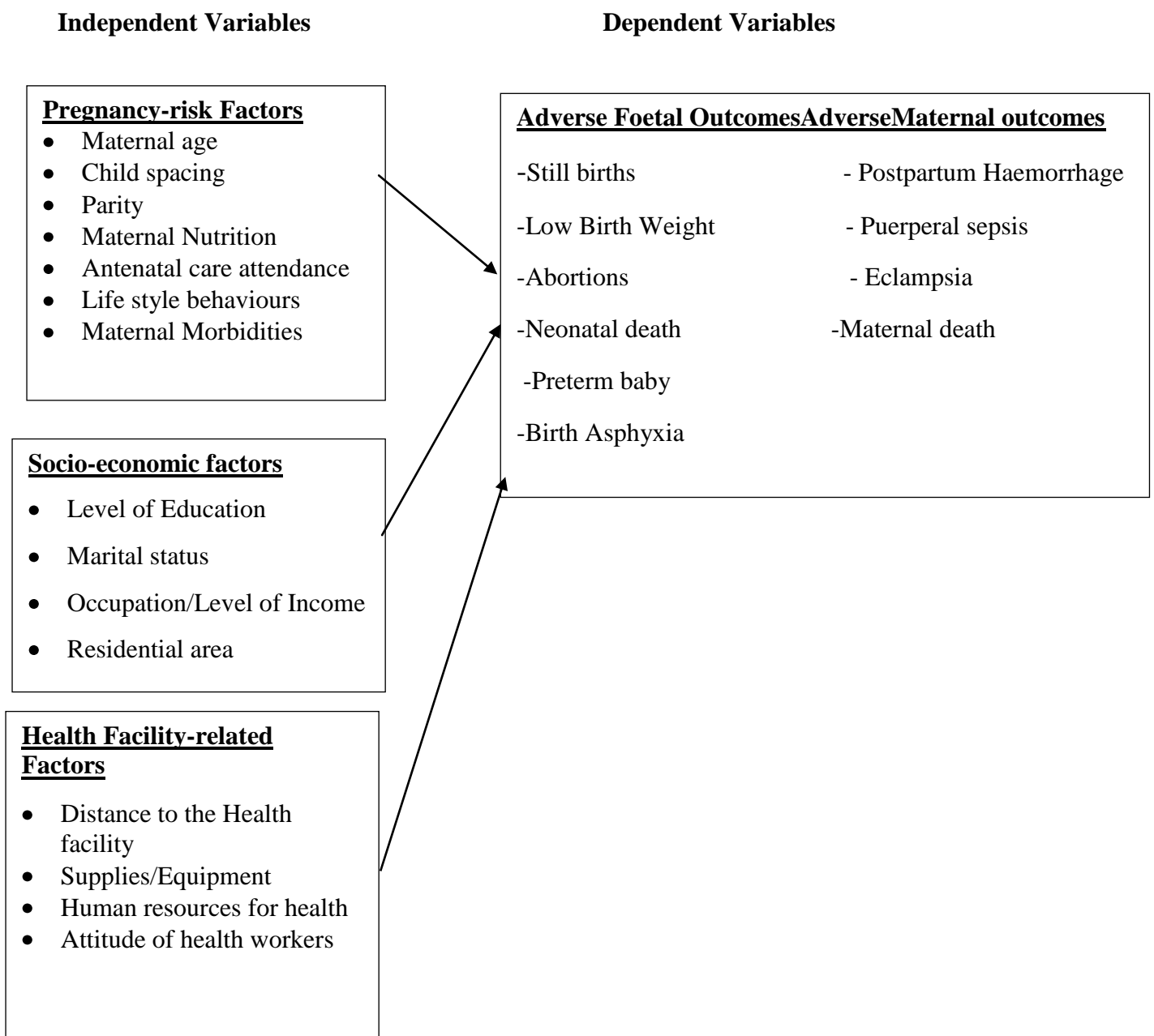
There is need for this study to be conducted so that appropriate interventions can be designed by Development partners, Kamwenge District Health Office and Ministry of Health to overcome adverse pregnancy outcomes in Kamwenge and other low income areas in Uganda. This will subsequently contribute to achievement of goal three of the Sustainable Development Goals that is to ensure healthy lives and wellbeing for all at all ages.

1.4 Conceptual Frame work

This shows the relationship between the dependent variables and the independent variables. The figure below shows the independent variables which include; pregnancy-risk factors, socio-economic factors and health-facility related factors. The pregnancy-risk factors include; maternal age, child spacing, maternal nutrition, antenatal care attendance, life style behaviours and maternal morbidities. The socio-economic factors include; level of education, marital status, occupation/level of income and residential area. The health facility related factors include; supplies, human resource, attitude of health workers and distance to the

health facility. The figure also shows the dependent variables which are adverse foetal and maternal outcomes. Adverse Foetal outcomes include; still births, low birthweight, abortions, neonatal deaths, preterm baby and birth asphyxia. Adverse Maternal outcomes include; postpartum haemorrhage, puerperal sepsis, preeclampsia/eclampsia and maternal death.

Figure1.1: Conceptual framework



CHAPTER2: LITERATURE REVIEW

2.0 Introduction

This chapter presents literature regarding findings from other studies in relation to the study objectives. Therefore, it offers insights into the prevalence of the adverse maternal and foetal outcomes under study. It also talks about the pregnancy risk factors, socio-economic factors and the health facility related factors that influence adverse maternal and foetal outcomes among women in different study settings by different investigators.

2.1 Level of adverse maternal and foetal outcomes

Maternal and foetal outcomes are closely associated. When the mother does not survive through pregnancy and child birth, there are minimal chances that the foetus will survive (Cheptum, 2012). According to a study done by Gershim Asiki *et al* (2009-2013), it was found that a third of women in reproductive age (15-49years) in rural south western Uganda reported at least one adverse pregnancy outcome during their life time and that one out of ten pregnancies reported ended in a still birth or an abortion.

According to a study done in South Western Uganda, a still birth rate of 26.2 per 1000 was reported (Gershim Asiki *et al*, 2013).

A study by Onesmus Maina *et al*, 2014, done in Olkalou district in Central Kenya reported a high prevalence of Low Birth Weight at 12.3%. It also reported that babies born premature and female new-borns were very likely to have a low birth weight.

From a study done in Western Nigeria by Mustafa Adelaja, 2015, 23% of the study population was reported to have had one or more previous abortions. The number of induced abortions was reported to be 22.0 per 100 pregnancies according to a study done in rural Anhui, China. (Guo-Peng, 2014).

A study done in Eastern Uganda reported a new-born mortality rate of 27 per 10000 live births (Bua John *et al*, 2014). According to another study in Uganda, a neonatal mortality rate of 34 per 1000 live births was reported (Ronald M. Kananura, 2016).

A case control study done in India reported a proportion of 5.8% preterm births (Chythra. Rao *et al*, 2014). A Brazilian Multicentre study reported preterm births to have a prevalence of 12.3 % (Renato Passin Jr *et al*, 2014).

A study in Pakistan reported that 16.5% of all hospital admissions were due to birth asphyxia and that it was responsible for 21% of infant deaths (Rahim *et al*, 2008).

According to a study done among rural women in Uganda, prevalence of Post-Partum Haemorrhage was reported to be at 10.8% which is higher than the global prevalence (Sam Onoge *et al*, 2016).

According to WHO, puerperal sepsis responsible for 15% of all direct maternal deaths. A study done in Pakistan showed that puerperal sepsis was responsible for 1.7% of all obstetrical admissions, 34.4% of all postpartum complications and 14.2% of maternal mortality. Another study in Zambia showed that 34.8% of the total admissions were due to puerperal sepsis. According to a study done at Mbarara Regional Referral Hospital, puerperal sepsis was reported to be responsible for 30.9% of maternal deaths in Uganda (Joseph Ngozi *et al*, 2015).

2.2Pregnancy-risk factors that determine maternal and foetal outcomes

2.2.1 Maternal Age

According to a cross-sectional analysis of facility-based data from a WHO multi country survey on maternal and new born health in 29countries between 2010 and 2011, it was reported that adolescent pregnancy was associated with higher risk of adverse maternal and foetal outcomes(at 95% confidence and using crude odds ratio). Adolescent mothers aged 10-19 years were at higher risk of having adverse foetal and maternal outcomes like puerperal endometritis, eclampsia, systemic infections, low birth weight, preterm delivery and other severe neonatal conditions than young women (20-24years)(Ganchimenget *al*, 2011).Many other studies have also reported high incidence of adverse perinatal and maternal outcomes like low birth weight, preterm birth, cephalo-pelvic disproportion, perinatal death and maternal death among adolescents(Ganchimenget *al*, 2013). A multi-country research by Fernando Althabe *et al*, 2015 reported that preterm birth, Low Birthweight and still birth rates were higher among adolescents (15-19) as compared to older women (RR 1.17, 1.08, 1.1 respectively, 95% C.I). Among adolescents below 15years, relative risks of preterm birth (RR=2.070 and Low Birth Weight (RR=1.81, 95% CI) were reported to be higher.

According to a retrospective cohort study at three UK hospitals by A Khalil *et al*, 2013, it was reported that advanced maternal ageis also associated with adverse maternal and foetal outcomes like abortion(odds ratio=2.32, 95% CI), pre-eclampsia(Odds Ratio=1.49,95% CI) and SGA(Odds Ratio=1.46,95% CI)(Akhali *et al*,2013).

2.2.2 Parity

A retrospective study by Japarath Prechapanch *et al* at Siriraj Hospital, Thailand in 2009 reported that nulliparous and multiparous women were at a higher risk of pregnancy complication and adverse maternal and foetal outcomes. The study reported that nulliparous women were at higher risk of pre-eclampsia (odds ratio=2.43, 95% CI), preterm birth (Odds ratio=1.91, 95% CI), operative delivery (Odds ratio=11.2, 95% CI) and neonatal phototherapy (Odds ratio=2.1, 95% CI)(Euranong Tongtub, 2007). This study also reported that grand multiparous women were associated with risks of malpresentation, haemorrhage, anaemia, uterine rupture plus complications of chronic diabetes and hypertension. According to a study done in Eastern Uganda (Ronald M. Kananura, 2016) women with a parity of 5+ were reported to be associated with new-born deaths (adjusted RR=2.53, 95% C.I) and low birth weight (adjusted RR=3.10, 95% C.I). According to a study in Pakistan, Primiparous women were reported to be associated with risk of birth asphyxia (OR=2.64, 95% C.I).

2.2.3 Child Spacing

Although timing may not be everything, the American Medical Association recommends that better pregnancy spacing is likely to dramatically improve maternal and foetal outcomes. Women who get pregnant too quickly after having baby or wait too long between pregnancies are at great risk of complications like preterm birth, low birth weight at delivery (Journal of the American Medical Association, 2008). Research has shown that babies born less than six months after previous delivery are 40% likely to be born premature and 61% likely to have low birth weight as compared to those born 18 months or two years later. Babies born five years or more after the mother's previous child are 20% to 43% at increased risk of being born premature, having low birth weight or being too small for gestational age (Journal of The American Medical Association, 2008). An inter-pregnancy period of more than 5 years was independently associated with increased risk of pre-eclampsia (Conde-Aquedelo, 2008).

2.2.4 Maternal Morbidities

There are a number of maternal conditions that pregnant women suffer from that are likely affect the maternal and/ or foetal outcomes. These include; gestational diabetes, Malaria, HIV, high blood pressure. All these conditions increase the risk of adverse maternal and foetal outcomes if not appropriately managed.

Pregnant women are highly susceptible to certain infections. This is because of the increased risk as a result of increased immune tolerance in pregnancy. They are most severely affected

by influenza, malaria, HIV/AIDS. Some of these are vertically transmittable so they can affect the foetus and cause abortions, still births and neonatal deaths. Prematurity, low birth weight and foetal death may be related to the maternal HIV status. Pregnant women with HIV especially the asymptomatic ones are at higher risk of having these outcomes. A study done in India, Chythra (Rao *et al*, 2014) reported that women with pregnancy induced hyper tension were very likely to have a preterm birth (OR=4.5, 95% C.I).

According to a study done in Uganda by Pierre De beaudrap *et al* (2013), women with HIV infection were reported to be at higher risk of stillbirth/abortion(OR=2.7, 95% C.I) and preterm birth(OR=2.3,95% C.I). This study reported that women with low haemoglobin in pregnancy were associated with Low Birth Weight and that malaria infection in pregnancy was associated with high risk of still birth(adjusted OR=1.91, 95% CI) and preterm birth(Adjusted OR=2.84, 95% CI). A study in Birderm Hospital by Sijani TT *et al*, 2014 that reported 24% of all women with gestational diabetes had adverse maternal outcomes and 34% had adverse foetal outcomes.

2.2.5 Antenatal Care

According to Alderliesten (2009), timely and adequate antenatal care is an effective in preventing adverse maternal and foetal outcomes. The antenatal period therefore presents opportunities to reach the pregnant women with a number of interventions that are vital in preventing adverse outcomes. Blood pressure measurement, urinalysis, and tests for anaemia, syphilis, malaria, bacteriuria and provision of tetanus toxoid during the prenatal period improves pregnancy outcomes (Damstardt, 2008).

Approximately a half of maternal deaths are caused by pre-eclampsia, eclampsia and antepartum haemorrhage which are directly associated with inadequate care during pregnancy (WHO, 2011). According to a study by WHO (2011), in West Africa, a third of pregnant women were reported to experience illnesses during pregnancy and 3% of them needed hospitalization(WHO, 2011). Certain conditions like malaria, HIV/AIDS, anaemia and malnutrition have been reported to become more severe during pregnancy (WHO, 2011). In Sub-Saharan Africa, approximately 900,000 still births occur in the last 12weeks of pregnancy and antepartum still births account for two thirds of all still births in the world, most of which are caused by maternal infections which would be managed during antenatal care(WHO,2011).Early initiation of prenatal care is key in preventing/treating obstetric and other medical complications or infections (Ziyou, 2009). According to Heaman *et al*, 2008, late or inadequate antenatal attendance is closely related with poor foetal outcomes like

preterm labour, low birth weight. Women who have late or no prenatal care are more likely to have babies who have low birth weight, still born or die in their first year of life (Lule *et al*, 2009).

2.2.6 Maternal Nutrition

According to a study by Safaa Salem *et al* (2016), in Egypt there is a significant relation between maternal malnutrition and adverse maternal and foetal outcomes. A baby's weight is an important indicator of maternal nutrition and health. Inadequate nutrition in terms of quantity and quality during pregnancy can have a negative effect on the mother and her baby. According to a study done in Egypt, maternal malnutrition was reported to be associated with increased risk of hypertension, gestational anaemia, miscarriage, macerated still births, preterm birth, low birth weight, foetal intrauterine growth retardation and even maternal mortality(Safaa Salem *et al*, 2016).

2.2.7 Life Style behaviours

Today, a huge percentage of humanity is faced with two main epidemics; the sedentary lifestyle and the obesity epidemic. Obesity during pregnancy has been reported to increase the risk of adverse pregnancy outcomes like pre-eclampsia, hypertension, gestational diabetes, caesarean births(Lee *et al*, 2011):

According to a past study(Cnatingius S *et al*, 2008), maternal smoking during pregnancy is associated with adverse pregnancy outcomes like preterm birth, low birth weight, foetal growth retardation and it also seems to increase chances of obesity in the offspring.

According to a study done by the American College of Obstetricians and Gynaecologists,2013, up to 50% of women continue to drink alcohol during pregnancy despite many bodies recommending otherwise. It also reported that alcohol consumption is associated with an increased risk of spontaneous preterm delivery, pre-eclampsia, small for gestational age neonates, reduced birth weight neonates and neurocognitive outcomes of children exposed to alcohol as foetuses.

2.3 Socio-economic factors that determine adverse maternal and foetal outcomes

2.3.1 Level of Education

Maternal level of education influences her food choices and nutrition patterns, therefore pregnant women with low education are more likely to suffer from malnutrition (Auge *et al*, 2008). According to a study done in Germany by Elke Raum *et al*, 2011, low maternal

education was found to be associated with adverse maternal and foetal outcomes. The more educated pregnant women were found to start antenatal care earlier than less educated ones. More women with high education were found to be nulliparous than less educated ones. Also this study showed that a higher percentage of pregnant women with low education smoked as compared to the pregnant women with higher education. Pregnant women with very low level of education were at a significantly higher risk of giving birth to an SGA baby as compared to pregnant women with higher education (OR=2.58, 95% CI). A population study by Zhong-Cheng Luo *et al*, 2009) reported that women with low level of education were more likely to have a still birth (OR; 1.54, 95% CI), preterm birth (Adjusted OR: 1.48, 95% CI) or SGA birth (OR: 1.86, 95% CI). A study done in a tertiary care hospital in Uttar, India reported that women with no education were more likely to have babies with Low Birth Weight.

2.3.2 Marital Status

Although human reproduction is biological process, social factors like marital status influence maternal and foetal outcomes. Even in the 21st century, an unmarried status is a stress factor to pregnant women. Unmarried pregnant women are associated with adverse maternal and foetal outcomes. According to a study in Austria by Kirchengast *et al*, 2008, rates of preterm births and low birth weights were significantly higher among unmarried pregnant women as compared to married women (using crude OR, 95% CI). Generally babies born to unmarried women were reported to weigh less than those born to married one. Single mothers are generally associated with poverty, material hardship and low income status which are negatively related to health status and with adverse maternal and birth outcomes (Joan Rosen *et al*, 2009). According to a study by Joan Rosen *et al* (2009), a high percentage of pregnant women in poor relationships with the spouse reported had high rates of drug use (OR:1.34, 95% CI) and antenatal cigarette smoking (OR:1.36, 95% CI). A study done in Western Nigeria showed that unmarried women were more likely to seek for an abortion than the married ones.

2.3.3 Occupation/Level of income

When spencer *et al* analysed British birth registration data, they found that 30% low birth weights were attributed to the mother's social class. These were explained by high rates of maternal smoking, poor nutrition and infections among pregnant women with low income.

According to *Kramer et al*, preterm birth is significant among low income pregnant women due to chronic stress, unemployment, crowded homes and financial problems.

Adverse foetal outcomes are influenced by the kind of occupation and environmental exposures in the work environment. According to a population based study by Parvez Ahmed *et al* (2008), women working in factories, construction and mining are at higher risk of having new-borns with SGA(adjusted OR:1.53, 95% CI) or low birth weight(adjusted OR: 3.66, 95% CI) but not preterm delivery(Adjusted OR: 0.64, 95% CI) as compared to new-borns of housewives. Then among women who are farmers or forestry workers, there is reportedly an increased risk of LBW (Adjusted OR: 2.86, 95% CI), preterm delivery (Adjusted OR: 2.38, 95% CI) and SGA (Adjusted OR: 1.51, 95% CI). For women who are office based, service workers or non-manual, the risk was slightly lower that is preterm delivery(OR:1.18, 95% CI), LBW(OR:1.62, 95%CI) and SGA(OR:1.45,95%CI).

2.3.4 Residential Area

According to a study by Sarka Lisonkova *et al*, 2016, it was reported that there was a significant association between rural residence and maternal mortality and severe maternal morbidity (adjusted OR 1.15, 95% CI). Women living in rural areas were reported to be more likely to suffer from eclampsia (adjusted OR 2.70, 95% CI), uterine rupture (adjusted OR 1.96, 95% CI) than those living in urban areas. This study also reported high rates of neonatal morbidity in rural areas (adjusted OR1.14, 95%CI), preterm births (adjusted OR 1.06, 95%CI) than in the urban areas. Women living in rural areas have difficulty in accessing prenatal care, advanced and emergency obstetric and neonatal care hence the increased risk of perinatal and maternal morbidity (Sarka Lisonkova *et al*, 2016).

2.4 Health-facility related Factors that determine adverse maternal and foetal outcomes.

2.4.1 Distance/Travel Time to the health facility

According to a study done in British Columbia by *Grzybowski et al* 2011, higher rates of still births and neonatal deaths were reported among women who lived more than four travel time from maternal services than women living within an hour from a health facility with obstetric maternity care services including caesarean section (Adjusted OR 3.17, 95% CI).According to a study in Wales by Paranjothy *et al*, 2014, for every fifteen minute increase in travel time to the actual health facility of delivery, there was a significant increase in the Odds ratio of the adverse maternal and/ or foetal outcome. This study reported a significant association

between travel time and stillbirth plus neonatal death combined (OR 1.13, 95% CI), late neonatal death (OR 1.15, 95% CI) and early neonatal death (OR 1.13, 95% CI).

In order to study the impact of distance on adverse maternal and foetal outcomes, some studies used straight line distance while others used distance by road. According to a French study by Blondel *et al*, 2015, there was increased rate of out of hospital deliveries with increase in distance from the nearest maternity centre. For every 5km increase in the distance from the nearest maternity unit, the odds of adverse outcomes increased.

On average a woman living in rural parts of Uganda has to travel a minimum of 13km on foot in order to get to the nearest public health facility and if they need emergency care, the distances are even longer(CDC, 2014).

2.4.2 Supplies and Equipment

The Ugandan health care system is structured in such a way that different health facilities at different levels offer different services. The lowest level is the Village Health Team and the national referral hospital is the highest level of health care. Comprehensive emergency services are only available at health centre fours, regional referral hospitals and national referral hospital. The Ugandan government has been trying to increase availability of emergency obstetric service countrywide by ensuring that health centre fours are able to provide comprehensive emergency obstetric services assuming that it was in easy reach by the catchment population. However, according to a study by Mbonye *et al*, 2005 only 13% of the health centre fours in Uganda were able to offer blood transfusion and 9%, a caesarean section. Although there aren't any published studies to show the most current status on availability of emergency obstetric services, anecdotal information show that most HCIVs are unable to provide these services because of shortage of essential medicines, medicalsupplies,equipment, water and electricity. According to a study by Medicines Transparency Alliance, 2014, the availability of medicines at public health facilities was found to be at 63%, availability of laboratory supplies at 54% and that of medicine sundries at 75%.

2.4.3 Human resources for maternal health

Poor access to skilled delivery services especially in developing countries has been cited as one of the hindrances to reducing adverse maternal and foetal outcomes. In most low income countries, a half of new-born deaths and a third of maternal deaths can be prevented by increasing on the coverage of skilled care at birth (Lancet, 2014). With an increase in

coverage of midwifery interventions in maternal health, new-born health and family planning, 57% of all deaths would be prevented because of a reduction in fertility and number of pregnancies. These interventions would also prevent approximately 83% of all neonatal deaths, still births and maternal deaths (Lancet, 2014).

2.4.4 Attitude of health care providers

According to a study in Kenya by Chimaraoke, 2010, most women were very willing to use modern delivery and maternity services but they always suffered from poor treatment by health care providers. The health care providers were reported to be very inhospitable. It was also reported that the poor health seekers were often abandoned or ignored by the health care providers each time they presented in a modern health unit. Health care providers acted as if the poor health seekers were smelling, they only paid attention when the poor client was dying or fainted in their pool of blood or water in the waiting line. Pregnant women delivering in health units where health workers have a poor attitude towards patients are very likely suffer adverse maternal and foetal outcomes (P. Manna *et al*, 2014).

CHAPTER THREE: METHODOLOGY

3.0 Introduction

The chapter presents the study design, sources of data, study population, data collection, sample size and plan for data analysis that were used in identifying the determinants of adverse maternal and foetal outcomes in Kamwenge District.

3.1 Study Design

A case control study was carried out to identify the determinants of adverse maternal and foetal outcomes in Kamwenge District.

3.2 Study Area

The study was carried out in Rukunyu HCIV and Rwamwanja HCIII in Kamwenge District. Currently, there is no district hospital in Kamwenge district. Approximately 60% of the deliveries in Kamwenge public health facilities occur in these two sites (DHIS2, 2017). Rukunyu HCIV is 7km away from Kamwenge town. It offers emergency obstetric and neonatal care and receives referrals from across the whole district. Rwamwanja HCIII is around 40km away from Kamwenge town. It has been given capacity to also provide emergency obstetric and neonatal care although it is at level of HCIII. This because it serves a catchment population of approximately 660,000 most of its catchment population is made up of refugees. Kamwenge is one of the seven districts of Rwenzori Region. Its neighbours are Kasese to the west, Kabarole to the Northwest, Kyenjojo to the North and Kyegegwa to the Northeast, Kiruhura to the East, Ibanda to the SouthEast and Rubirizi to the Southwest. The main local tribes in Kamwenge are; batooro, bakiga, and batagwenda but there are also other tribes with origin from other regions like bakonzo, bafumbira and refugees from the Democratic Republic of Congo, Rwanda and Burundi in Rwamwanja Refugee Resettlement. The main economic activities are farming, livestock and fishing at the shores of Lake George. Kamwenge population is approximately 446,551.

3.3 Sources of data

In this study, both primary and secondary sources of data were utilised.

3.3.1 Primary sources of data

Data was obtained from women who had given birth at Rukunyu HCIV and Rwamwanja HCIII in August 2017. In cases where the woman was too ill to respond, her caretaker

(mother, spouse or anyone else close to her) was interviewed. Also health workers at the maternity wards of Rukunyu HCIV and Rwamwanja HCIII provided expert information on the prevalence and determinants of adverse maternal and foetal outcomes.

3.3.2 Secondary sources of data

The birth register was used to obtain/ confirm the category of adverse maternal and foetal outcomes for the cases in the study.

3.4 Study Population

The study included women who had delivered in Rukunyu HCIV and Rwamwanja HCIII in Kamwenge District for the period of August 2017 and were able to consent to an interview. The cases included women that had at least one adverse maternal or foetal outcome within the month of August 2017. And the controls included women that had no adverse maternal or foetal outcome in August 2017.

3.4.2 Exclusion criteria

The study excluded women below 12 years and above 49 years and also women that had delivered at Rukunyu HCIV and Rwamwanja in a period outside August 2017. Also disabled women, mentally ill women and those who refused to consent to the interview were excluded from the study.

3.5 Sample size calculation

Assuming $\alpha=0.05$, $\beta=0.2$, proportion of controls, $P_1=0.5$, proportion of case, $P_2=0.5$, Odds Ratio=4 and $r=1$, Using Sample size calculator-Unmatched case-control study, sample size for cases using Kelsey formula, $N_{Kelsey}=40$, therefore, sample size for controls = 40. An additional 4 cases and 4 controls were included in case some selected respondents declined to respond to the interview.

Therefore a sample of 88 women was taken, 44 cases and 44 controls.

3.6 Sampling Procedures

The cases were purposively sampled. All the women that had an adverse maternal or foetal outcome were interviewed until the required number of cases was obtained. 22 cases were sampled in Rukunyu HCIV and 22 cases in Rwamwanja HCIII.

The controls were selected using systematic sampling following the birth register. 22 controls were sampled from Rwamwanja HCIII and 22 controls from Rukunyu HCIV. The principal investigator interviewed every n th woman as recorded in the birth register where n =average number of deliveries occurring in the health facility per month/required number of controls. If the n th position was taken by a woman who had an adverse maternal or foetal outcome, that position was skipped. Every month, on average, Rukunyu HCIV conducts 190. So $n=190/22$, giving $n=9$. So every 9th woman documented in the birth register was sampled until 22 controls were obtained. Rwamwanja HCIII on average conducts 260 deliveries per month, $n=260/22$ giving $n=12$ therefore every 12th woman documented in the birth register was interviewed until 22 controls were obtained.

3.7 Study Variables.

The independent variables were the different determinants of adverse maternal and foetal outcomes that were considered in this study. They were categorised into pregnancy-risk factors, socio-economic factors and health-facility related factors. The pregnancy-risk factors were; maternal age, child spacing, parity, maternal nutrition, Antenatal attendance, life style behaviours and maternal morbidities. The socio-economic factors were; level of education, marital status, occupation/level of income and residential area. Health-facility factors were; distance/travel time to the health facility, supplies/equipment, human resources for health and attitude of health care providers.

The dependent variable was adverse maternal and foetal outcomes, measured by preterm births, still births, live births, low birth weight, birth asphyxia, neonatal deaths, abortions, haemorrhage, puerperal sepsis, pre-eclampsia/eclampsia and maternal deaths. These were defined as follows;

- Still birth was defined as a baby born with no sign of life at or after 28 weeks of gestation weighing ≥ 100 grams or body length ≥ 35 cm.
- Abortion was defined as loss of a foetus before 28 weeks of gestation.
- Low Birth Weight (LBW) was defined as weight at birth of less than 2500 grams.
- Neonatal death was defined as a death of a baby between 0 to 28 days after birth.
- Preterm birth was defined as a live birth before 37 weeks of pregnancy
- Birth Asphyxia was defined as a baby's failure to initiate and sustain breathing at birth, a baby with an Apgar score of less than 6/10.

- Postpartum Haemorrhage was defined as excessive bleeding from the genital tract within 24 hours after delivery
- Puerperal sepsis was defined as the condition of developing bacterial infection in women after birth or during breastfeeding
- Eclampsia was defined as a serious condition where high blood pressure leads to seizures during pregnancy
- Maternal death was defined as death of a woman when pregnant or within 42 days after termination of the pregnancy.

3.8 Data Collection Techniques

Researcher-administered interviews and key informant interviews were utilised for this study. They were designed according to the objectives of the study.

3.9 Data Collection Tools

A researcher administered questionnaires and Key informant guide were used to capture data for this study.

A semi-structured questionnaire was administered by a research assistant in order to obtain the following information from the woman; adverse maternal and foetal outcome and the determinants of these outcomes.

For the key informant guide, a self-administered un-structured questionnaire was used to obtain expert information on adverse maternal and foetal outcomes from a midwife and medical officer attached to the maternity ward at Rukunyu HCIV and Rwamwanja HCIII plus the in-charge of the maternity ward.

3.10 Quality Control Issues

The data collection tool was reviewed by at least three public health research experts before piloting it in order to ensure that it was reliable.

A research assistant was a trained midwife working within the district, who understood and spoke the local dialect was selected and trained on how best to administer the questionnaire.

The questionnaire was piloted in Kamwenge HCIII before the actual data collection to ensure that the tool was valid.

The principal investigator reviewed the questionnaires as soon as they were submitted to ensure accuracy and completeness.

3.10 Data Analysis

Data was analyzed using CPRO version 6.0, Microsoft Excel and SPSS 11.0. Frequency distribution of the variables was run to describe the data and cross-tabulations were done in order to look for associations between variables. Inferential method of analysis was used to obtain determinants of adverse maternal and foetal outcomes. This was done by conducting Chi-square tests to determine whether there was association between independent variables and adverse maternal or foetal outcomes at 0.05 level of significance. Multivariate analysis was then conducted to establish the magnitude of association using logistic regression at the same level of significance.

For qualitative data, thematic content analysis was used to analyse data obtained from key informants.

3.11 Data Dissemination

A copy of the report on the findings of the study was shared with Kamwenge, office of the DHO, the Main Implementing partner in Maternal and New-born Care services and the Institute of Public Health, IHSU.

3.12 Ethical Considerations

Approval of this study from the Research Ethics Committee at IHSU and also from the District Health Office of Kamwenge was obtained. Informed consent was also obtained from the women before conducting an interview. The data collection tools did not capture full names of the respondents. Also, the final report contains generalised data/information that does not provide any respondent's details.

CHAPTER FOUR: STUDY FINDINGS

This chapter presents the results as collected from the respondents and from key informants in the study area.

4.1 Socio-demographic characteristics of the study participants

The total number of respondents was 80. Of these, Cases constituted 50 % (40 women) and controls constituted 50 % (40 women). As shown in table 1 below, majority (59%) of the participants were aged 25-35 years. Most of the women that participated in the study were married (87%) and living in rural areas of Kamwenge district (94%). Also, 75% of the participants had attained primary education as their highest level of education.

Table 1: Socio-demographic characteristics of the study participants

Variable	n (%)
Age	
15-24	23(29%)
25-35	47(59%)
>35	10(12%)
Level of Education	
None	6(8%)
Primary	60(75%)
Secondary	8(10%)
Tertiary	6(7%)
Marital status	
Married	70(87%)
separated	10(13%)
Residential area	
Rural	75(94%)
Urban	5(6%)

n is the number of participants

4.2 Level of the adverse maternal and foetal outcomes in Kamwenge.

The adverse maternal and foetal outcomes were more prevalent in Rukunyu HCIV compared to Rwamwanja HCIII since it receives referrals of all the complicated obstetric and neonatal cases from all across the district including Rwamwanja HCIII.

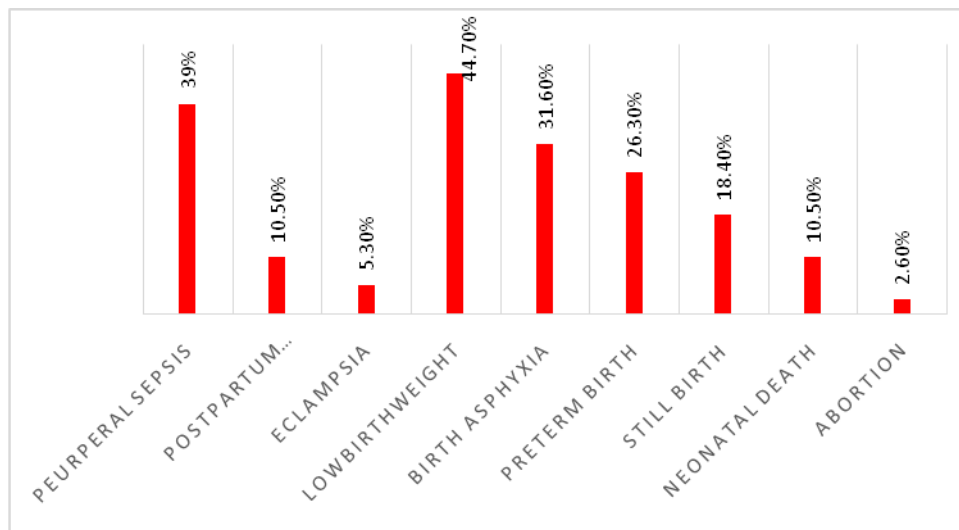
Overall, a total of 74 adverse outcomes were reported. Some women had both adverse maternal and foetal outcomes, while others had only one adverse outcome. Of the total adverse outcomes, 30% were adverse maternal outcomes and 70% adverse foetal outcomes. Majority of the women interviewed as cases had been treated for puerperal sepsis. Puerperal sepsis at a prevalence of 39%, was followed by postpartum haemorrhage as the second most prevalent adverse maternal outcome at 10.5%. Eclampsia was the least prevalent at 5.3%.

In this study, the most prevalent foetal outcome was Low Birth Weight at 44.7%, followed by birth asphyxia at 31.6%, then preterm birth at 26.3%, still birth at 18.4% and neonatal death at 10.5%. Abortion was the least prevalent adverse outcome at 2.6%.

Table 2: Level of adverse maternal and foetal outcomes in Kamwenge district

Adverse outcome	n (%)
Maternal	21(30%)
Puerperal sepsis	15(39%)
Postpartum Haemorrhage	4(10.5%)
Eclampsia	2(5.3%)
Foetal	53(70%)
Low Birth Weight	18(44.7%)
Birth Asphyxia	13(31.6%)
Preterm birth	10(26.3%)
Still birth	7(18.4%)
Neonatal Death	4(10.5%)
Abortion	1(2.6%)

Figure 1: A graph showing the level of adverse maternal and foetal outcomes in Kamwenge



4.3 Pregnancy related-risk factors that determine adverse maternal and foetal outcomes in Kamwenge district.

As shown in table 3, factors that were significantly associated with adverse maternal and foetal outcomes include, woman's age ($p=0.059$), parity ($p=0.020$) and child spacing ($p=0.023$). Whether the women had maternal co-morbidities and life style behaviours like alcohol consumption showed no significant association with adverse maternal and foetal outcomes.

Table 3: Bivariate analysis results for Pregnancy-risk factors that determine adverse maternal and foetal outcomes in Kamwenge

	Cases n (%)	Controls n (%)	Chi-square(df)	P-Value
MATERNAL AGE			10.6(5)	0.059
15-24	12(30%)	10(25%)		
25-35	23(58%)	25(63%)		
>35	5(12%)	5(12%)		
PARITY			18.1(8)	0.020
Less or equal to three	24(60%)	21(53%)		
Greater than four	16(40%)	19(47%)		
HAD CO-MORBILITES			0.345(1)	0.557
Yes	17(43%)	4(10%)		
No	23(57%)	36(90%)		
CHILD SPACING			17.8(8)	0.023
Less or equal to two	31(78%)	35(88%)		
Greater than two	19(22%)	5(12%)		
ALCOHOL CONSUMPTION			0.39(1)	0.532
Yes	13(33%)	4(10%)		
No	27(67%)	36(90%)		

Cases* All women that suffered at least one adverse maternal and/ or foetal outcomes

Controls* All women that did not suffer from any adverse maternal and/ or foetal outcomes

4.4 Socio-economic determinants of adverse maternal and foetal outcomes in Kamwenge district

Among the socio-economic factors that were investigated in this study (table 3), only the woman's total family monthly income was reported to be significantly associated with the adverse maternal and foetal outcomes ($p=0.031$). The association between adverse maternal and foetal outcomes with Level of education, marital status and residential area was found to have an insignificant association with adverse maternal and foetal outcomes.

Table 4: Bivariate Analysis results for socio-economic determinants of adverse maternal and foetal outcomes in Kamwenge district

Variable	Cases No. (%)	Controls No. (%)	Chi-square (df)	P-Value
Level of Education			1.14(3)	0.767
None	2(5%)	4(1%)		
Primary	35(88%)	25(63%)		
Secondary	2(5%)	6(15%)		
Tertiary	1(3%)	5(12%)		
Marital status			0.2(1)	0.654
Married	36(90%)	34(85%)		
separated	4(1%)	6(15%)		
Total monthly income			2.2(3)	0.031
<1000ugx	6(15%)	1(2.5%)		
1000-5000ugx	24(60%)	1(2.5%)		
5000-10000ugx	5(12.5%)	30(75%)		
>10000ugx	5(12.5%)	8(20%)		
Residential area			0.94(1)	0.53
Rural	38(95%)	37(93%)		
Urban	2(5%)	3(7%)		

4.5 Health-facility related factors determining adverse maternal and foetal outcomes.

As shown in table 5, the study reported that there was a significant association between distance travelled to the health facility and adverse maternal and foetal outcomes ($p=0.013$). The attitude of health workers showed no association with the adverse maternal and foetal outcomes.

Table 5: Health-facility related factors that determine adverse maternal and foetal outcomes in Kamwenge

Variable	Cases No. (%)	Controls No. (%)	Chi-square(df)	P-Value
Distance to Health facility			10.76(3)	0.013
<1KM	9(23%)	11(28%)		
1-5KM	10(25%)	14(35%)		
More than 5KM	21(52%)	15(37%)		
Attitude of health workers			3.65(3)	0.301
extremely good	31(77%)	29(73%)		
Good	7(18)	11(27%)		
Fair	2(5%)	0		

4.5.3Supplies/ equipment

In this study, information from midwives and medical officers working at the maternity wards of Rukunyu HCIV and Rwamwanja HCIII showed that the medical supplies provided by the government of Uganda were inadequate to cover the volume of clients served by these health facilities. *'We greatly rely on development partners like Baylor College of Medicine to provide a buffer stock of essential medicines and other medical supplies like gloves, cannulas'* said one of the medical officers in the maternity ward. *'The cases of sepsis among women are high and neonatal illness due to sepsis is high because sometimes women deliver on the floor while others share beds'* said a health worker at Rwamwanja HCIII. *'Rwamwanja HCIII does not have equipment to care for sick new-borns, so they always refer sick new-borns to Rukunyu HCIV which is sometimes too full as it receives referrals from all across Kamwenge district. This results in neonatal deaths'* said the District Health Officer-Kamwenge. *'The government of Uganda does not provide an alternative source of electricity in cases where UMEME does load shedding. Had it not been for Baylor college of Medicine that bought us a generator and routinely provided fuel to Rukunyu HCIV, the adverse maternal and foetal outcomes occurring here would be tenfold'* said a health worker attached to maternity ward at Rukunyu HCIV.

4.5.4 Human resources for health

From information obtained from key informants, low staff levels in health facilities is associated with adverse maternal and foetal outcomes. For example the DHO-Kamwenge said *'the staffing level in public health facilities of Kamwenge district is at 84%. This increases the waiting time at these health facilities. For some health facilities, one midwife has to attend to four labouring mothers at the same time especially in Rwamwanja HCIII. With inadequate staffing, women are at risk of having adverse maternal and foetal outcomes'*. In Rukunyu HCIV, 50% of the staff attached to the maternity ward are not on the government payroll. They are paid Baylor College of Medicine (one of the implementing partners in Kamwenge). The maternity ward's staffing level is not at 100%, this is one of the contributing factors towards the adverse maternal and foetal outcomes in this health facility, said the head of maternity ward at Rukunyu HCIV.

Key informants pointed out late referral by lower health facilities as one of the factors influencing adverse maternal and foetal outcomes in Kamwenge district. *'One of the causes of adverse maternal and foetal outcomes is late referral by lower health facilities. Most women who get adverse outcomes are those that take long to arrive at the referral site. They arrive when it is too late to save the baby'* said a health worker attached to the maternity ward at Rwamwanja HCIII. *Most women who suffer from adverse maternal and foetal outcomes are those that come in 2nd stage of labour. Some remain home until their condition is too bad and it becomes difficult to save the baby. Sometimes even the woman's life is lost,* said a health worker at Rukunyu HCIV.

4.7 Results from a multivariate analysis for determinants of adverse maternal and foetal outcomes.

All the factors that had a P-value of less than 0.05 in the bivariate analysis were included in the multivariate analysis. These were; maternal age, parity, child spacing, total monthly family income and distance to the health facility. As shown in table 6 below, this study reported the factors that had a significant association with adverse maternal and foetal outcomes to be the total family monthly income and the distance travelled by the woman to the health facility. Women with a total family monthly income of more than 1000Ugx were reported to be 0.85 times less likely to suffer adverse maternal and foetal outcomes as compared to women with a total family income of less than 1000Ugx (P-value, 0.016 95% C.I. 0.36-0.91). Also women who travelled less than 1KM in order to access a health facility

were found to be 0.71 times (P-value 0.02 95% C.I.0.43-0.98) less likely to suffer adverse maternal and foetal outcomes than women who travelled more than 1KM in order to access a health facility. Maternal age, child spacing and parity did not determine whether women developed adverse maternal and foetal outcomes.

Table 6: Multivariate analysis results for determinants of adverse maternal and foetal outcomes

	OR	95% C.I	P-value
MATERNAL AGE			
15-25	0.459	0.41-1.70	0.48
>25(reference)			
PARITY			
<=3	1.2	0.34-2.61	0.57
>4(reference)			
CHILD SPACING			
<=2(reference)			
>2	0.71	0.23-1.42	0.26
Total monthly income			
<1000ugx(reference)			
>1000ugx	0.85	0.36-0.91	0.016
Distance to the Health facility			
<1KM	0.71	0.43-0.98	0.02
>1KM(reference)			

CHAPTER FIVE: DISCUSSION OF FINDINGS

This chapter provides a summary of the findings of the study, the conclusion from the study and recommendations according to the study.

5.1 The level of adverse maternal and foetal outcomes in Kamwenge

According to this study, puerperal sepsis is the highest ranked adverse maternal outcome in Kamwenge district at 39%. These results are similar to those of a study that was done in Zambia where puerperal sepsis was also the most prevalent adverse maternal outcome (Joseph N *et al*, 2015). It was reported to account for approximately 34.4% of the total admissions. The similarity in findings could be because both studies were conducted in a rural setting.

Unlike a study that was done in rural China that reported a high prevalence of abortion, 22% (Guo-Peng, 2014), this study showed a very low prevalence of abortion at 2.6%. This could be explained by the fact that all the women that participated in this study had attended antenatal care at least once which was not the case in the study done in China.

According to a study done in South Western Uganda, a still birth rate of 2.62 per 100 was reported (Gershim Asiki *et al*, 2013). Contrary to this, the study done in Kamwenge reported a prevalence of 18.4%. This could be explained by the fact that most of the participants in this study were from rural areas where as for the study by Asiki *et al*, the study was done in an urban setting.

This study reported the prevalence of LBW to be at 44.7% however, a study by Onesmus Maina *et al*, 2014, done in Olkalou district in Central Kenya reported a prevalence of Low Birth Weight at 12.3%. The variation in these studies could be because the study in Kenya covered three health facilities while the one done in Kamwenge covered only two health facilities.

This study reported the prevalence of birth asphyxia to be at 31.6% where as a study that was done in Pakistan reported prevalence of birth asphyxia to be at 16.5% (Rahim *et al*, 2008). The variation in the findings could be because the study in Pakistan was cross-sectional while the one in Kamwenge was a case-control study.

A Brazilian Multicentre study reported preterm births to have a prevalence of 12.3 % (Renato Passin Jr *et al*, 2014). The results from the study done in Kamwenge reported a

prevalence of preterm births at 26.3% which is almost double the prevalence reported in the Brazilian Multicentre study. This could be because Brazil is a developed country while Uganda (where Kamwenge is located) is a developing country.

According to a study done among rural women in Uganda, prevalence of Post-Partum Haemorrhage was reported to be at 10.8% (Sam Onoge *et al*, 2016). The study done in Kamwenge district reported similar results with Post-partum haemorrhage at a prevalence of 10.5%. The similarity in the findings could be explained by the fact that both studies were done among rural women of Uganda.

According to another study in Uganda, a neonatal mortality rate of 3.4 per 100 live births was reported (Ronald M. Kananura, 2016). However this study done in Kamwenge district in Uganda reported neonatal mortality rate 10.5 per 100 live births. The difference in these results could be because the study by Ronald Kananura was cross-sectional and covered three districts (sample size of 2237 women) where as the one in Kamwenge was case-control and covered one district(sample size of 80women).

This study reported a maternal mortality ratio of zero which is contrary to a report by Uganda Bureau of Statistics that Uganda had a mortality ratio of 438 maternal deaths per 100,000 (UBOS,2012). This could be because this study covered a very small proportion of Uganda as compared to the UBOS report.

5.2 Pregnancy-related risk factors that determine adverse maternal and foetal outcomes in Kamwenge district

In this study, women with an advanced age (>35years) were reported to be associated with adverse maternal and foetal outcomes. These results are similar to those from a study by Akhali *et al* (2013) where by women who were above 35years were reported to be at risk of having adverse maternal and foetal outcomes.

A study done in Eastern Uganda (Ronald M. Kananura, 2016) reported thatwomen who had a high parity (>4) were found to be more likely to suffer from adverse maternal and foetal outcomes. Similarly, the study in Kamwenge district reported that women with a high parity were more likely to suffer from adverse maternal and foetal outcomes than women with a lower parity.

Women who get pregnant too quickly after having baby are at great risk of complications like preterm birth, low birth weight at delivery (Journal of the American Medical Association, 2008). The study done in Kamwenge affirmed this because it reported that women who spaced their pregnancies by more than 2years were 0.71 times less likely to suffer from

adverse maternal and foetal outcomes as compared to women that spaced their pregnancies by less than two years.

According to a study done in Uganda by Pierre De beaudrap *et al* (2013), Women with comorbidities were reported to be at higher risk of stillbirth/abortion, LBW and preterm birth. On the contrary, the study in Kamwenge reported that there was no significant association between whether or not the woman had maternal comorbidities and adverse maternal and foetal outcomes. This could be explained by the fact that all the women that participated in the study done in Kamwenge had all attended antenatal care so women with any comorbidities were properly managed during antenatal visits.

A study by the American College of Obstetricians and Gynaecologists (2013) reported that alcohol consumption is associated with an increased risk of spontaneous preterm delivery, pre-eclampsia. However, the study done in Kamwenge reported no significant association between alcohol consumption and adverse maternal and foetal outcomes. The variation in results could be explained by the fact that the women in the Kamwenge study who drank alcohol during pregnancy did so once in a while whereas those in the study by the American College of Obstetricians drunk alcohol routinely during pregnancy.

5.3 Socio-economic factors that determine adverse maternal and foetal outcomes in Kamwenge

According to Kramer *et al* (2011), adverse foetal outcomes were significant among low income pregnant women, these findings were not different from those from the study done in Kamwenge district where by women with a low monthly family income were found to be more likely to suffer from adverse maternal and foetal outcomes as compared to those with a higher family income.

The study in Kamwenge reported insignificant association between maternal level of education and adverse maternal and foetal outcomes. However, a study done in Germany by Elke Raum *et al* (2011) reported that low maternal education was found to be associated with adverse maternal and foetal outcomes. This could be explained by the fact that most (88%) of the women who participated in the Kamwenge study had a low level of education unlike those in the study in Germany.

According to a study in Austria by Kirchengast *et al* (2008), rates of preterm births and low birth weights were significantly higher among unmarried pregnant women as compared to married women. The study in Kamwenge reported no significant association between marital status and adverse maternal and foetal outcomes. The difference in these findings could be

explained by the fact that only 10% of the women who participated in the Kamwenge study were unmarried.

Women living in rural areas were reported to be more likely to suffer from adverse maternal and foetal outcomes than those living in urban areas (Sarka Lisonkova *et al*, 2016). However the study done among women in Kamwenge reported no significant association between residential area and adverse maternal and foetal outcomes. This could be explained by the fact that 94% of the women that participated in this study were living in a rural area and generally Kamwenge is a rural area.

5.4 Health facility- related factors that determine adverse maternal and foetal outcomes in Kamwenge district

According to this study, women in Kamwenge that had to travel more than 5KM to access the health facility were found to be at risk of having adverse maternal or foetal outcomes. Similarly, in a study done in British Columbia by Grzybowski *et al*(2011), higher rates of still births and neonatal deaths were reported among women who lived more than an hour from a health facility with obstetric maternity care services.

According to a study by Medicines Transparency Alliance (2014), the availability of medicines at public health facilities was found to be inadequate. Similarly, the study done in Kamwenge reported that the supply of medicines in public health facilities was inadequate to manage the clients attending these health facilities.

In most low income countries, a half of new-born deaths and a third of maternal adverse outcomes can be prevented by increasing on the coverage of skilled care at birth (Lancet, 2014). The study in Kamwenge reported the similar results as the DHO-Kamwenge and other Key informants pointed out low staffing levels as one of the causes of adverse maternal and foetal outcomes in Kamwenge district.

Pregnant women delivering in health units where health workers have a poor attitude towards patients are very likely suffer adverse maternal and foetal outcomes (P. Manna *et al*, 2014). The study in Kamwenge found that there was no significant association between attitude of health workers and adverse maternal and foetal outcomes. This could be because none of the women that participated in this study reported that any health worker had poor attitude. All the women in the study reported that the health workers were good to them.

5.5 Limitations of the study

Since the study was based at the health facility, women that had adverse outcomes sometimes got too emotional during the interview. In such a case, the interviewer gave the woman ample

time to recover from the emotional breakdown and also clearly explained the importance of this study.

Patient record keeping was not very good in the selected public health facilities. This was overcome by referring to the patient charts in cases where there was information missing in the birth register. The health worker on duty was also consulted for clarification in case of incomplete documentation in the birth register.

The other limitation was that none of the women had an antenatal care card or book as proof. Of antenatal care attendance. Although they all claimed to have attended antenatal care.

5.5 Conclusion

Overall, 30% of the total adverse outcomes in the study were maternal outcomes whereas 70% were foetal outcomes. Puerperal sepsis and Low birth weight are the most prevalence adverse maternal and foetal outcomes in Kamwenge district.

According to this study, none of the pregnancy-riskfactors (maternal age, parity, child spacing, maternal comorbidities and life style behaviours) was reported to determine adverse maternal and foetal outcomes in Kamwenge district.

Among the socio-economic factors, level of income was reported to determine adverse maternal and foetal outcomes in Kamwenge district. The study reported that the woman's level of education, marital status and residential area did not determine adverse maternal and foetal outcomes in Kamwenge.

This study reported distance to the health facility, supplies and human resource as the health facility related factors that determine adverse maternal and foetal outcomes in Kamwenge district. It reported that attitude of health workers did not determine adverse maternal and foetal outcomes.

5.6 Recommendations

Basing on the findings of this study, below are the recommendations at different levels:

At national level

- To ensure more health facilities are adequately staffed and equipped with the necessary equipment and medical supplies to manage obstetric complications and sick new-borns in order to improve on the access to emergency obstetric and new born care with a reduced travel distance.

- To introduce income generating interventions especially those involving women in Kamwenge so as to improve on the income levels which will eventually improve on the maternal and foetal outcomes among women.

At district level

- Advocate for more staff so that all health facilities in Kamwenge have 100% of the staff requirements.
- Make a formal request to the Ministry of Health to supply medicines and other medical sundries basing on the number of clients served per health facility rather.

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APPENDIX 1: INFORMED CONSENT

This was read to the woman before the interview.

My name is..... I am collecting data on behalf of Kiconco Immaculate, a student of Public Health at International Health Sciences University. She is carrying out a study to identify the determinants of adverse maternal and foetal outcomes in Kamwenge district. I will ask you questions about your pregnancy and other issues that are assumed to influence the outcomes. All the information you provide will be kept strictly confidential Feel free to stop this interview if you change your mind about participating or if you feel uncomfortable answering any questions. The results of this study will help the district to plan better in reducing adverse maternal and foetal outcomes.

Do you have any questions?

May I proceed and ask you the questions relating to this study?

I agree to take part in the above study (Tick) []

Name of Respondent----- Signature: -----

----- Date: ----- Name of Researcher-----

----- Signature: ----- Date: -----

APPENDIX II: QUESTIONNAIRE

Serial _____ No. _____

Facility _____

REPORTED/CONFIRMED OUTCOME

A) Maternal Outcome

- i) Post-Partum Haemorrhage
- ii) Puerperal Sepsis
- iii) Eclampsia
- iv) Death
- v) None of the above

B) Foetal outcome

- i) Still birth(Fresh still birth and Macerated still birth)
- ii) Low Birth Weight(<2.5kg)
- iii) Abortion
- iv) Neonatal death
- v) Preterm baby
- vi) Birth Asphyxia
- vii)None of the above

PREGNANCY RELATED FACTORS

1. Age of the woman

- a) <15
- b) 15-24
- c) 25-30
- d) 31-35
- e) 35-45
- f) >45

2. Parity-----

3. Gestation at birth

- a) Below 20 weeks
- b) 20 – 28 weeks
- c) 28 – 37 weeks
- d) Above 37 weeks

4. When was she last pregnant before this delivery?

5. Antenatal care

I. Did you attend ANC during your recent or current delivery?

- a) Yes
- b) No

If yes, which facility did you attend? a) Public facility b) Private facility c) TBA

d) Other (Specify).....

I. How many ANC Visits did you attend?

iv. When did you start attending ANC?

- a) First trimester
- b) Second trimester
- c) Third trimester

v. Did you have any medical conditions during pregnancy?

- a) Yes
- b) No

If Yes, which ones?

- a) Diabetes
- b) Hypertension
- c) Malaria
- d) HIV/AIDS
- e) Malnutrition
- f) Anaemia
- g) Others (Specify)

Were you on treatment for the medical condition?

- a) Yes
- b) No

If yes, for how long?

- a) Less than one year
- b) 1 – 5 years
- c) 5 – 10 years
- d) More than 10 years
- e) Others (specify).....

6. Did you smoke during this pregnancy?

- a. Yes

b. No

If yes, how many cigarettes did you smoke per day?

7. Did you drink alcohol during this pregnancy?

a. Yes

b. No

If yes, how many times did you drink in a day?

8. What was the mode of recent delivery?

a. Normal Vaginal delivery

b. Vacuum delivery

c. Caesarean Section

9. Who assisted you during delivery?

a. Nurse/Midwife

b. doctor

c. Alone

d. others (Specify)

10. If complications, what was the nature?

a. Obstructed labour

b. Preterm birth

c. Birth Asphyxia

d. Others (Specify)

11. Immediately after delivery, did any of the following occur to you?

a. Heavy bleeding from the Vagina

b. Infection (sepsis)

c. Malaria

12. What was the weight of the baby at birth?

a. Below 2500g

b. 2500g – 3500g

c. 3500g and above

SOCIO ECONOMIC FACTORS

4. Marital status

a) Married

- b) single
- c) separated
- d) widowed
- e) Others (Specify)

5. Residence

- a. Urban
- b. Rural
- c. Others (Specify)

6. Education

- a. None
- b. Primary
- c. Secondary
- d. College/University

7. Occupation

- a. Unemployed
- b. Farmer
- c. Casual job (e.g. house maid)
- d. Salaried job

8. Total monthly family income

- a. Less than 1000 UGsh
- b. 1000 – 5000 UGsh
- c. 5000 – 10 000 UGsh
- d. Above 10 000 UGsh

HEALTH FACILITY FACTORS

9. What type of health Facility did you attend?

- a. District hospital
- b. Health centre IV
- c. Health centre

10. What services were you going for?

- a. ANC
- b. Delivery

- c. FP
- d. postnatal

11. Did you receive all the services you were looking for?

- a. Yes
- b. No

If No, why? a) Service was Unavailable b) Lack of staff c) Lack of equipment d) others (specify)

12. What is the distance from your home to the health facility?

- a. Less than 1KM
- b. 1 – 5KM
- c. More than 5KM

13. How long would it take to walk on foot from your home to this Health facility?

14. What do you think of the health facility staff?

- a. Extremely good
- b. Good
- c. Fair
- d. Bad
- e. Extremely bad

15. How long did it take for you to be attended to at the health facility?

- a. Less than 30 minutes
- b. 1 – 2 hours
- c. More than two hours?

To be answered by only women who had adverse outcomes

41) Do you think the outcome of this delivery could have been better? If yes, why? If no, end the interview.

APPENDIX III: KEY INFORMANT INTERVIEW GUIDE

1. How is the staffing in your facility?
2. On average, monthly, how many clients do you receive in this health facility who have adverse pregnancy outcomes?
3. Are the clients referred early enough before developing complications?
4. What is the state of the clients as they arrive in your facility?
5. What is the state of the referring health facilities?
6. What proportion of women who experience obstetric emergencies are referred to your facility?
7. How equipped are you to handle obstetric emergencies as they arise?
8. In your own opinion what can be done to help women have safe deliveries and minimize adverse pregnancy outcomes in this district at:
 - a. Community level
 - b. Facility level?

APPENDIX III: AUTHORIZATION LETTER FROM INTERNATIONAL HEALTH SCIENCES UNIVERSITY



APPENDIX III: AUTHORIZATION FROM KAMWENGE DISTRICT HEALTH OFFICE

