DETERMINANTS OF POST-PARTUM COMPLICATIONS IN WOMEN ATTENDED TO AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU-KENYA

BY

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DECLARATION

I declare that this thesis is my original work and has not been presented to any other University or Institution for a degree or any other award.

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May God bless you!

DEDICATION

To my dear and loving wife, Millicent Otieno, my two lovely daughters, Gloria Otieno and Emmanuella Otieno. Be blessed.

ABSTRACT

United Nations Population Fund report (UNFPA, 2014) indicates that Kisumu County is amongst the 15 of the total 47 counties in Kenya accounting for 98.7% of total maternal deaths in the country most of which are related to pregnancy and child birth. This study was therefore conducted at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) to establish the determinants of postpartum complications among women of reproductive age (15-49 years old). JOOTRH was chosen since it is a major referral hospital in western Kenya receiving clients from more than 100 health facilities in the region. The specific objectives of the study were to identify the socio-demographic characteristics of women who experience postpartum complications and attended to at JOOTRH, to determine the influence of birth attendance to the occurrence of postpartum complications in women attended to at JOOTRH and to determine the influence of mode of delivery to the occurrence of postpartum complications among women attended to at JOOTRH. This was a cross sectional study in a hospital set up. A systematic sampling method was used to recruit women for the study from various service delivery points in the hospital. A total of 371 women were sampled and a structured questionnaire administered to them. Key Informant Interviews (KII) were also administered to 5 purposively identified service providers. The data was analyzed using SPSS (version 20). Proportions were determined using Chi square analysis. Independent variables, socio-demographic characteristics, birth attendance and mode of delivery were regressed against post-partum complications. Qualitative data were organized into themes based on specific objectives. Results demonstrate that out of 371 women 149 (40.2%) had postpartum complications. For those who could read, only 31.7% had complications compared to 68.3% among those who could not read. The women who had hospital delivery were 35% less likely to present with complications (OR=0.35, 95% CI=0.08-0.24, $P<0.0001$). The findings showed that socio-demographic status of women are predictors for post-partum complications. The post-partum complications identified were post-partum heamorrhage 63(42.3%), sepsis 37(34.8%), high blood pressure 13(8.7%), anaemia 12(8.1%) while the rest had others 21(16.1%). Vaginal delivery has higher risk of one developing postpartum complications even though CS also has a number of complications. It is recommended that all women should seek skilled birth attendance, there is need for effective health education on danger signs during pregnancy and delivery including high level of hygiene after vaginal or CS delivery. Results from the study can be used to re-examine the obstetric services offered within Kisumu County and beyond.

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LIST OF ABBREVIATIONS

ANC: Ante Natal care

BOC: Basic Obstetric Care

CS: Caesarean section

CEOC: Comprehensive Emergency Obstetric Care

GoK: Government of Kenya

ICPD: International Conference on Population and Development

JOOTRH: Jaramogi Oginga Odinga Teaching and Referral Hospital

KDHS: Kenya Demographic and Health Survey

MCH: Maternal and Child Health

MNH: Maternal Newborn Health

MCI: Millennium Cities Initiative

MoPHS: Ministry of Public Health and Sanitation

NRHS: National Reproductive Health Strategy

OPD: Outpatient Department

PID: Pelvic Inflammatory Disease

POC: Product of Contraception.

SSA: Sub-Saharan Africa

UNDP: United Nations Development Programme

USAID: United States Aid for International Development

WHO: World Health Organization

OPERATIONAL DEFINITIONS

For the purpose of this study, the following words were used:

Hypertension: Systolic blood pressure greater than or equal to 140mmHg or diastolic blood pressure greater than or equal to 90mmHg.

Maternal death: Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental cause.

Mode of delivery: will mean normal vaginal delivery or caesarian section.

Obstetric fistula: Abnormal opening between the vagina and the bladder or rectum with involuntary escape of urine or flatus and or faeces.

Pelvic Inflammatory Disease (PID): Bilateral lower abdominal and pelvic pain dull in nature, fever, lassitude, headache, abnormal vaginal discharge which becomes purulent and/or copious, nausea, vomiting and dyspareunia

Perineal tear: Injury to the perineum involving perineal muscle with or without anal sphincter involvement.

Post-partum complications: will refer to complications occurring during delivery and those occurring just immediately after delivery up to 42 days.

Post-partum hemorrhage: Excessive bleeding after child birth, usually loss of 500ml or more after vaginal birth and 1000 ml after cesarean birth.

Skilled birth attendant: Somebody with technical medical knowledge on how to prevent, detect and manage complications associated with child birth and can manage deliveries with at

most hygiene, usually trained midwife, nurse, clinical officer and doctors in medical field.

Uterine prolapse: uterus descending into vaginal canal with cervix as leading edge.

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CHAPTER ONE: INTRODUCTION

1.1 Background Information

Pregnancy and childbirth is one such normal physiological process that brings joy to individuals and families. Nonetheless, in many parts of Sub-Saharan Africa, pregnancy and childbirth is a perilous journey, a dangerous and potentially fatal experience for millions of women especially in developing countries where most deliveries are unskilled. In 2012 alone, approximately 40 million births took place in developing countries without skilled attendance which is considered key in improving maternal and new-born survival, yet the burden of maternal mortality is high in Sub-Saharan Africa with close to 500,000 deaths annually (Gitonga, 2017).The deaths happen in-spite of evidence which indicates that motherhood can be safer for all women if a set of life-saving measures that can work even in low resource settings are put in place (Shiffman, 2000).

The leading causes of maternal mortality in Sub-Saharan Africa (SSA) are obstetric complications such as severe bleeding, obstructed labor, infections, and hypertensive disorders. Other contributors also include indirect causes such as HIV/AIDS, malaria and anemia. Unsafe abortion, though poorly documented, is also a major factor which may account for up to 14% of all maternal deaths worldwide (Meghna, 2013). Many SSA countries such as Kenya would therefore benefit from having population based maternal data on morbidities related to child birth which this study endeavored to provide so that health service providers are able to prioritize and better focus their interventions to reduce maternal mortality. The risk of death in the first 28 days of life has been cited to be 1.77 per 1000 live births among women who had caesarian section compared to 0.62 per 1000 for women who had vaginal delivery (Shiffman, 2000).

The maternal mortality in Kenya is 362 per 100,000 live births way above the WHO rates which classify figures above 300 deaths per 100,000 live births as high (KDHS, 2014). Skilled birth attendance is one of the proven interventions that can reduce maternal mortality. Countries such as Sri-Lanka, Malaysia, Thailand and Egypt reduced by close to half the maternal mortality ratio within a span of ten years by increasing the level of skilled birth attendance which demonstrates the impact of skilled birth attendance (Gitonga, 2017). Close to half of the deliveries have been reported to result in one or more maternal morbidities related to pregnancies and deliveries and constitutes a substantial burden for women in Kenya (Ann, 2014).

The top five causes of maternal mortality in Kenya include haemorrhage, sepsis, hypertensive disorders of pregnancy, obstructed labour and complications of induced abortions (Chege, 2012). According to the study, postpartum haemorrhage (PPH) which is also known as obstetric hemorrhage, accounts for 25% of the total maternal deaths in Kenya. This condition is common among 56% of women who do not deliver in hospitals (Chege, 2012). There is thus a great need to deliver in hospital, an even a higher need for one to have a birth plan and attendance of ANC clinic often during pregnancy.

Hypertensive disorders (HPD) represent the most common medical complications of pregnancy. It is probably the reason why they are the second biggest killers after PPH in Kenya. The main cause of HPD is failure of expectant mothers to visit the clinic. It is estimated that 90% of pregnant women go for a first antenatal clinic, but the number reduces to 70% at the second visit and even lower in consequent visit (Chege, 2012).

Infection/sepsis is another major cause of death attributed to home deliveries and accounts for 15% of total maternal deaths in Kenya. Postpartum infections comprise a wide range of entities

that can occur after vaginal and caesarean delivery or during breastfeeding. In addition to trauma sustained during the birth process or caesarean procedure, physiologic changes during pregnancy contribute to the development of postpartum infections (Chege, 2012).

There are a number of socio-demographic characteristics of women that have direct influence on delivery outcomes. A study in Bangladesh intimated that older women of age 35 years and above have got higher chances of developing hypertension, hemorrhoids, and prolapse than those women below 20 years (Ferdous et al., 2012). The same studies indicated that women with higher parity are likely to suffer prolapse than those delivering for the first time. There was need for a study to establish how this relates to Kenya where total fertility rate is about 4 children per woman (KDHS, 2014). High incidence of anemia was also found to be common among the illiterate women. This contradicts a study in Burkina Faso which established that the higher the education, the higher the chances of adverse birth outcomes which includes preterm delivery (Prazuck et al., 1993). However, the socio-demographic characteristics of women who experience post-partum complications admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya remained unclear before the study. JOOTRH is a major referral hospital in Kisumu County established more than 100 years ago, it is serving more than 100 sub-county hospitals in about 10 counties in the western Kenya region. The hospital has maternity and new born unit with capacity of 60 beds and 20 labour wards (JOOTRH, 2016).

Women who deliver at home or without any skilled birth attendance have been found to suffer a number of post-partum complications such as perineal tears, prolapse and infections (Ferdous et al., 2012). However, the influence of birth attendance to the occurrence of postpartum complications in women admitted at JOOTRH remained unknown before the study. As such, the

current study determined the influence of birth attendance to the occurrence of post-partum complications in women admitted in this hospital.

Mode of delivery happened to influence birth outcomes. A number of studies have shown that there are a series of post-partum complications attributed to multiple repeat caesarean sections such as placenta accrete, bowel injuries, cystectomy, ureteral. Studies in Bangladesh brought out caesarian section as a strong protective factor for prolapse, perineal tears, incontinence and Urinary Tract Infections (Ferdous *et al*., 2012). There was need to perform a study to gather more evidence on this area. The influence of mode of delivery to the occurrence of post-partum complications in women admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya remained unknown. As such, this study determined the influence of mode of delivery to the occurrence of post-partum complications in women admitted at JOOTRH, Kisumu County, Kenya.

1.2 Problem Statement

Millennium Development Goal number 5 called for reduction of maternal mortality and morbidity by 75% by 2015. In Kenya 61% of live births are delivered in the health facility with 62% being assisted by a skilled health provider at the same time 37% of the births took place at home(KDHS, 2014). In Kisumu County 69.5% of women receive skilled birth attendance with 28.8% having home deliveries(KDHS, 2014).Women in Kisumu experience a lot of sexual and reproductive health challenges, for example, little access to reproductive health services, low quality services and deliveries attended by unskilled personnel (Maoulidi, 2011).

UNFPA (2014) report indicates that 15 of the total 47 counties in Kenya account for 98.7% of total maternal deaths in the country and Kisumu County is amongst the 15 counties. It was

therefore important to commission a study to establish the determinants of post-partum complications which have been identified to contribute to the high maternal mortality.

In 2010, Kisumu East Health District Office record indicated that pregnancies and childbirth-related deaths were 42 women in 2008, 41 women in 2009 and 39 women in 2010. This if computed represents 456, 434 and 405 maternal deaths per 100,000 live births. It also highlights salient and specific post-partum complications suffered by the women in Kisumu, however, it remained unknown how socio-demographic characteristics, birth attendance or mode of delivery influence post-partum complications.

Unfortunately, as of February 2010 only 73% of health facilities in Kisumu provided basic Obstetric care (BOC), and a paltry 10% of all the facilities had the requisite capacity to provide Comprehensive Emergency Obstetric Care (CEOC) (Maoulidi, 2011).It remained unclear how women who cannot deliver vaginally were assisted and how this contributed to cases of postpartum complications. The high maternal mortality in Kisumu, are highly associated with obstetric complications like post-partum hemorrhage, obstructed labour, sepsis, and anemia (Maoulidi, 2011). All these complications can be managed or prevented through a cocktail of interventions if administered by a skilled health service provider armed with adequate and necessary supplies.

Low socio-economic status among women in Kisumu County was also a major factor that affect health seeking behavior including attending at least 4 Antenatal Care services, which would help in early detection of any pregnancy, related complications (KDHS, 2014). It is also worth noting that 43% of women in Kisumu County are not accessing post-natal checkup within the first six weeks after delivery, this makes it difficult to detect any complication arising post-partum (KDHS, 2014). However, the determinants of post-partum complications in women admitted at

Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya remained unknown. As such, this study assessed determinants of post-partum complications in women admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya.

1.3 Objectives

1.3.1 Main objective

To assess the influence of socio-demographic characteristics, birth attendance and mode of delivery on occurrence of post-partum complications in women attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya.

1.3.2 Specific objectives

1. To describe the socio-demographic characteristics of women who experience post-partum complications attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital.
2. To determine the influence of birth attendance to the occurrence of post-partum complications in women attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital.
3. To determine the influence of mode of delivery to the occurrence of post-partum complications in women attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital.

1.3.3 Research questions

1. What are the socio-demographic characteristics of women who experience post-partum complications being attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital?
2. What is the influence of birth attendance to the occurrence of post-partum complications in women attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital?

3. What is the influence of mode of delivery to the occurrence of the post-partum complications in women attended to at Jaramogi Oginga Odinga Teaching and Referral Hospital?

1.4 Significance of the Study

This research provides findings that can go a long way in filling the gap of knowledge on determinants of post-partum complications affecting women in Kisumu. These data would help health service providers to evaluate their work and improve accordingly. This study findings provide recommendations that can be adopted by health service providers, women and girls and communities in Kisumu County to ensure improved skilled birth attendance. It emphasizes the need to promote antenatal care which may help determine and manage pre-existing maternal morbidities or complications. The study findings demonstrate some of the post-partum complications women are likely to suffer when they deliver vaginally or when they undergo caesarean section.

CHAPTER TWO: LITERATURE REVIEW

2.1 Post-partum complications

Post-partum period is the period beginning immediately after the birth of a child and extending for about six weeks or 42 days. The World Health Organization (WHO) describes the postpartum period as the most critical and yet the most neglected phase in the lives of mothers and babies (WHO, 2010).

It is estimated that more than 300,000 women die from pregnancy and child birth-related complications, in addition it is estimated that 15% of all expectant women or about 20 million women suffer from acute obstetric complications ranging from haemorrhage to obstructed or prolonged labour to pre-eclampsia or eclampsia to puerperal sepsis and septic abortions (Valley *et al*., 2005). Some of these infections and disabilities may occur during delivery or in the first 1-2 weeks after delivery and might later turn chronic if not handled appropriately. Globally 15-20 million women suffer from post-partum complications annually (Vallely *et al*., 2005).

2.2 Socio-demographic characteristics of women in Kisumu

A study in Bangladesh clearly demonstrated that there was a close connection between socio-demographic characteristics of women and post-partum complications, older women of age 35 years and above were more likely to experience hypertension, hemorrhoids, prolapse and perineal tears as opposed to younger women below 20 years. (Ferdous *et al.*, 2012). This was also noted among women from richer households who were susceptible to hemorrhoids than poor women. Overweight women with Body Mass Index (BMI) of more than 25 were likely to suffer hypertension than underweight women (Ferdous *et al.*, 2012). It was therefore necessary to carry out a study among the women in Kisumu to be able to establish how these characteristics play a role amongst women in Kenya.

Morbidities related to pregnancy and child birth are the leading causes of deaths and disability among women of reproductive age (15-49 years) in Kenya. The five leading causes of maternal deaths include haemorrhage, obstructed or prolonged labour, pregnancy related hypertension, sepsis and unsafe abortion. The situation is compounded by interplay of factors which are social, cultural, economic and logistical factors such as parity, assistance at delivery, ethnicity and province of residence (Ann, 2014).

Despite the fact that education and occupation are usually believed to improve birth outcomes through increased women's status and access to information and services, a study in Burkina Faso indicated that the higher the education for women, the more likely they will be victims of adverse birth results since educated women majorly used motorized transport on bumpy roads leading to intrauterine vibrations resulting in preterm delivery (Prazuck et al., 1993). This finding provides the flip side of what many studies have demonstrated that the higher the literacy level of women the better the health seeking behavior. In fact, a study in Mariakani Sub-county hospital in Kenya also demonstrated that formal maternal education was protective for postnatal anaemia; this could be due to better health seeking behaviour in the group with education and therefore empowering women through formal education in addition to ANC visits should form part of the management in the preventive strategies to combat post-partum anaemia (Rukiya, 2015). It was only through a research that could clearly relate education with post-partum complications; the two studies seemed to give two different associations between education and post-partum complications such as anemia and preterm delivery.

An analysis of Kenya Demographic and Health Survey 2008-2009 indicated that physical access to health facilities through distance and/or lack of transport and economic considerations are important barriers to skilled birth attendance. Distance to the health facility has implications on

cost and time spent to the health facility. It is by extension influences the decision to deliver in a health facility or not (Gitonga, 2017). A study in Makueni County showed that women living within a distance of 1- 5 kilometers from a facility increased their likelihood of skilled birth attendance (Gitumu, Herr, Oruko, & Karijo, 2015). The same study also recommended that Health education and behaviour change communication strategies such as use of media can be employed to increase demand for skilled delivery. There are also many women who live far from a health facility and whether or not this was a barrier to access skilled birth assistance and subsequent post-partum outcomes could only be established through a research. It was therefore critical to establish how these socio-demographic and economic factors predispose the women in Kisumu County to post-partum complications due to failure to access skilled birth attendance.

There was a worrisome trend that 23% of Kisumu's women of reproductive age are between 15 and 19 years old (GoK, 2005). This had troubling implications for maternal mortality, because adolescents are less likely to seek reproductive health services and are more likely than older women to experience childbirth complications. Additional factors contributing to maternal mortality in Kisumu include malaria and anemia (GoK, 2005). Nonetheless very little information existed on salient socio-demographic factors that predisposed the women of reproductive age to post-partum complications. As such, this study sought to determine the socio-demographic characteristics of women who experienced post-partum complications admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya.

2.3 The influence of birth attendance to the occurrence of post-partum complications

Skilled birth attendance (SBA) is a process in which a midwife, physician, obstetrician, nurse, or other health care professionals provide basic and emergency health care services to women and their newborns during pregnancy, child birth and postpartum period. It involves an enabling

environment encompassing drugs and equipment, a functional referral system and enabling policies (Bettina, Adegoka, & Sia, 2012).

In Kenya, skilled birth attendant's definition is also restricted to doctors, nurses and midwives. Traditional birth attendants are excluded from this definition as most of them (80%) lack formal training on pregnancy and birthing related matters (Tawiah, 2007). It should be noted that skilled birth attendance is important when it comes to addressing maternal mortality, for instance the proportion of births attended by skilled health personnel was identified as a proxy indicator for tracking progress towards MDG 5. Ideally any life-threatening complication should be immediately recognized and managed, this can only be done if the pregnant mothers seek skilled birth assistance. Internationally there is a package of care known as emergency obstetric care (EOC) and divide into two; (1) Basic Emergency Obstetric Care (BEOC) which consists of seven signal functions- parenteral administration of antibiotics, oxytocics and anti-convulsants, manual removal of retained products of conception, assisted vaginal delivery and newborn resuscitation using bags and masks, (2) Comprehensive Emergency Obstetric Care (CEOC) which consists of the seven signal functions above plus cesarean section and blood transfusion (Bettina, Adegoka, & Sia, 2012).

Pursuant to United States Agency for International Development Demographic and Health Surveys (USAID-DHS) comparative report, many women in Cambodia, Indonesia, and Nepal obtained their first postpartum care at home, a confirmation of a functional community outreach and the accessibility of postpartum care services in South/Southeast Asia (USAID, 2006). Also, in Cambodia and Nepal, seven in ten providers of postpartum care for non-institutional births are TBAs, interestingly, this was not the case with Indonesia, where the majority of postpartum care, even at the community level, was provided by trained health personnel (USAID, 2006). In some

African countries and in Haiti, around one-fourth to one-third of postpartum care is provided at home, often by TBAs. In Haiti, nearly 40% of postpartum care for home deliveries is provided by TBAs, and an additional one-fourth is provided by other people, mostly unskilled workers, relatives, or friends (USAID, 2006).

The number of women dying from pregnancy and child birth-related complications remain unacceptably high. This is very common in low resource countries across Sub-Saharan Africa and south Asia where most women deliver at home or outside health facility without immediate access to emergency obstetric care or suitable birth attendant (Obstetrics, 2012).

A study in Bangladesh also indicated that 52% of women with post-partum complications happened to have delivered at home with no trained birth attendant. The women suffered a lot of perineal tears, prolapse and infections. These may also have been aggravated by improper intra-partum care (Ferdous *et al.,* 2012). However, information as to what causes maternal post-partum complications and deaths occurring even when deliveries are conducted in a health facility remained unknown. This therefore demanded that a research be conducted to point out the actual determinant of post-partum complications at the hospital level.

Parity (number of births) and the number of pregnancies have been found to be associated with skilled birth attendance (Gitonga, 2017). This may be linked to previous experiences since women who have had negative experiences and outcomes following health facility deliveries may choose to deliver at home (Gitonga, 2017). There is also a category of women who have had no complications following home deliveries and therefore may perceive home deliveries to be safer (Gitonga, 2017). This therefore called for a study to establish whether skilled or unskilled birth attendance has direct impact on post-partum complications in Kisumu County. Birth preparedness was also noted to be associated with skilled birth attendance. The various aspects

of birth preparedness could be associated with skilled birth attendance. For instance, saving money for delivery expenses and arranging for transport are expected to enable one to reach the health facility. Identifying a skilled birth attendant early enough can also ensure that one is attended to during delivery (Gitonga, 2017).

A study in Tanzania indicated that more than 90% of the pregnant women in Tanzania attended antenatal care at least once and about 62% attain four visits or even more, yet less than 5 in 10 accessed skilled birth attendance at the health facilities (Magoma *et al*., 2010). Some of the reasons for preference for home deliveries and lack of planning for delivery is said to be due to lack of consistent communication by health care providers concerning the value attached to skilled birth attendance and immediate post-partum care for all women when they come for their ANC visits (Magoma *et al.*, 2010). Husbands are very important people when it comes to making decision on reproductive health matters yet they are rarely encouraged to attend ANC sessions (Magoma *et al*., 2010).

It was also true that in Nyanza where Kisumu is situated, had high prevalence of violence against women at 57%, the highest in the country, perhaps an indication that men make decisions on access to health services including place of delivery and as a result there was need for a research to link post-partum complications to birth attendance (KDHS, 2009).

In Kenya, the national proportion of births attended to by health professional and those delivered in the health facility stands at 44% and 43%, respectively (KDHS, 2009). This called for a study that could clearly bring out the strong association between birth attendance and the occurrence of post-partum complications and recommendations that may be used by the health service providers and the policy makers to address the situation.

A study in Tharaka Nithi to establish the level of skilled birth attendance and the associated factors demonstrated that Skilled birth attendance was associated with age, level of education, average family income, parity, distance to the health facility, timing of initiation of antenatal care, level of facility attended during pregnancy, and birth preparedness (Gitonga, 2017). Other studies have also shown that TBAs are ineffective due to limited life-saving skills, lack of supportive supervision, and lack of emergency back-up systems (Adegoke & Van-denbroek, 2009).

A retrospective case control study conducted in western Kenya to establish the role of birth attendance and the magnitude of obstetric complications demonstrated that the occurrence of obstetric complications was higher among women who were attended to by skilled providers in health facilities than those who delivered at home (Liambila & Kuria, 2014). This is a total departure from what many studies have shown; that women are safer when they deliver under the watch and support of a skilled health personnel, it was therefore imperative to establish the influence of birth attendance and occurrence of postpartum complications.

Most expectant women in Kisumu were not completing the four recommended antenatal care visits before delivery, and the situation was compounded by many women not delivering in hospitals (GoK, 2009). According to the 2008-2012 Kisumu East District Development Plan, 71% of women accessed health facilities for ANC and merely 33.3% of births took place in a health facility (GoK, 2009) These figures in Kisumu were much lower than the 92% antenatal coverage and the 44% health facility deliveries registered in Kenya in 2008 (GoK, 2010). Nonetheless it was not clear whether all cases of post-partum complications were among the women who did not deliver at the health facility. As such, this current study determined the

proportions of those who have post-partum complications based on those who deliver in a health facility against those who did not deliver in facility (Neil & Murhy, 2015).

One of the reasons for the low levels of antenatal visits by women in Kisumu is the poor quality of antenatal services (Parise *et al.,* 2003). To ensure that all expectant mothers receive quality health services, the government has abolished user fees in all public maternity hospitals and clinics. Moreover, in August 2010, the MoPHS launched the Maternal and Newborn Health (MNH) Road Map, which seeks to reduce maternal and newborn morbidity and mortality. However, the influence of birth attendance on the occurrence of post-partum complications in women in Kisumu remained unknown. As such, this study determined the influence of birth attendance on the occurrence of post-partum complications in women in Kisumu.

2.4 Influence of mode of delivery to the occurrence of post-partum complication

Mode of delivery refers to either vaginal delivery or delivery through cesarean section. Vaginal delivery is the natural method of birth. Cesarean section is the use of surgery to deliver one or more babies and it is normally preferred when vaginal delivery would put the baby or mother at risk. There is an increased rate of CS globally beyond the recommended rate of 15% of all the deliveries yet there is considerable body of evidence showing an increased maternal morbidity and mortality associated with CS (Mwangi, 2012)

Knowing the possible outcomes and benefits of all modes of birth can help one make truly informed decisions. It's also important to remember while vaginal birth does have risks, in many situations, it is low-risk when compared to a C-section, which is major abdominal surgery. A C-section is used as an emergency procedure when there is more risk to the mother and baby (Maria, 2016).

In the United States, nearly one-third of all deliveries are caesarean deliveries and compared to spontaneous vaginal deliveries (Jeffry & Quinlan, 2015). CS is associated with increased maternal and neonatal morbidity and mortality and the most common reasons for CS in North America include dystocia, malpresentation, fetal distress and elective repeat Cesarean deliveries (Jeffry & Quinlan, 2015). The same study in North America also presented some of the post-caesarean delivery complications to include pain, endomyometritis, wound separation/infection, gastrointestinal problems, urinary tract infection, deep venous thrombosis and septic thrombophlebitis (Jeffry & Quinlan, 2015).

There are numerous maternal morbidities attributed to multiple repeat caesarean section deliveries, they include placenta accreta, bowel injury, ileus, cystotomy, ureteral damage, need for postoperative ventilation, intensive care unit admission, hysterectomy, blood transfusion with 4 or more units and increased hospital stay (Silver *et al.*, 2006).

The study in Bangladesh brought out caesarean section delivery as a strong protective factor for prolapse, perineal tears, incontinence and UTIs despite other adverse effects such as adhesion of internal organs and lower back pain associated with it. In fact, 78% of women with dystocia are said to have averted serious complications having undergone caesarean delivery (Ferdous *et al*., 2012). However little information existed in Kisumu on the postpartum complications brought about by caesarean section despite the rise in caesarean section. Caesarean section deliveries are highly linked with the age of the mother, parity, birth interval, and family size, age at first birth, desired family size and marital status. This has been seen among single mothers and among mothers who had their first birth at 20 years old (Monica, 2011). Place of delivery is significantly associated with the nature of delivery. Complications at the time of delivery will always increase subsequent complications during the post-partum period (Bari *et al*., 2002). A cross sectional

study in three clinics in Palestine indicated that the use of post-natal care was high among women who had experienced problems during their delivery, had caesarean section delivery or had instrumental vaginal delivery than among women who had spontaneous delivery (Enas *et al*., 2008).

A study at Webuye District Hospital showed that more than 80% of the neonates were delivered by CS for featal distress yet only 44% of these met the diagnostic recommendations for the operation owing to the numerous risks especially in the developing countries such as Kenya (Mwangi, 2012)The study is an indication of an increased rate of CS which is not medically recommended and therefore it would be necessary to establish the influence of the operation on postpartum complications among women attended to at JOOTRH, Kisumu County.

It is very clear that there are numerous risks involved in caesarean section deliveries, however many women in urban areas of Kenya prefer caesarean section raising questions as to whether it is due to health reasons or it is just driven by the fact that caesarean section is a cash cow for many doctors and hospitals these days. It is believed that there is a great worry that doctors and hospitals take advantage of caesarean section because it is highly profitable than vaginal deliveries (Monica, 2011). Very little information existed concerning the post-partum complications suffered by women who undergo caesarean section in Kisumu. There are also women in Kenya who opt for caesarean section since they perceive it as a painless delivery despite the enormous complications associated with it. Others in the riskiest scenario prefer having many children through caesarean sections in spite of the fact the doctors putting the limit of safe operations at three. The higher the number of operations the more the complications with subsequent pregnancies including high infant mortality. The risk of death in the first 28 days of life has been cited to be 1.77 per 1000 live births among women who had caesarean section

compared to 0.62 per 1000 for women who had vaginal delivery(Monica, 2011).However, the influence of mode of delivery on post-partum complications in JOOTRH in Kisumu County remains unknown. As such, the current study determined the influence of mode of delivery to the occurrence of post-partum complications in women admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya.

2.5 Conceptual/Operational framework

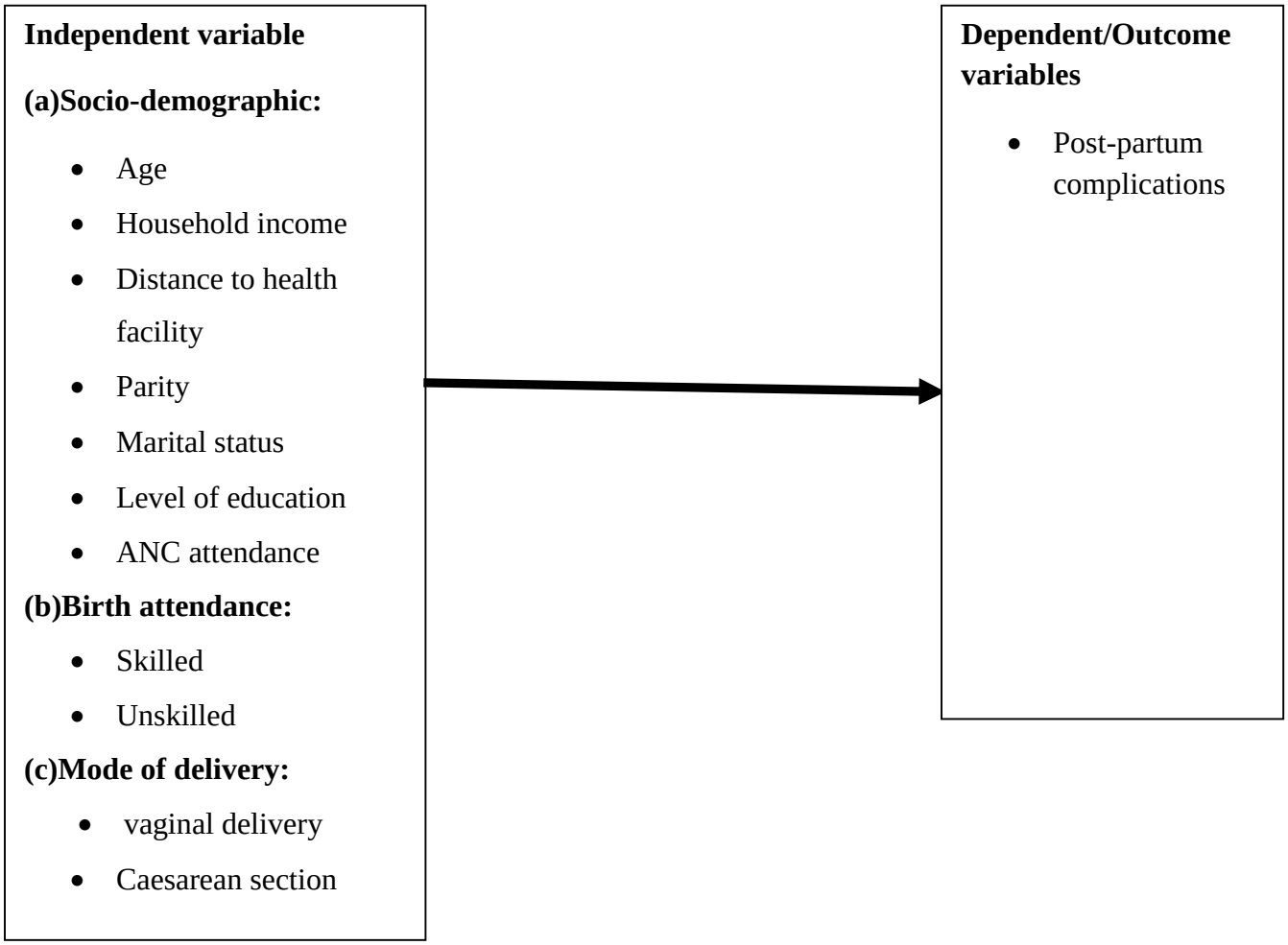

Figure 2.5 The Conceptual Framework of the study. The conceptual framework for this study was based on (McCarthy & Maine, 1992) framework.

CHAPTER THREE: METHODOLOGY

3.1 Study area

The study was conducted at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) in Kisumu County. Kisumu Countyis in the western parts of Kenya near Lake Victoria. It borders Vihiga County to the north and Kericho County on the eastern side (see appendix1). It covers an area of approximately 2,085 square kilometers. It comprises 7 constituencies, Kisumu Town East, Nyando, Muhoroni, Nyakach, Seme, Kisumu Town West and Kisumu central. Economic activities in Kisumu involves fishing using fishing nets and small boats, agriculture, sugar factories and rice plantations are the major employers in the county.

In addition to the high burden of maternal mortality in Kisumu County, JOOTRH was also chosen since it was the only teaching and referral hospital to which the county hospitals across Nyanza and Western regions refer maternal users besides Moi Teaching and Referral Hospital in Uasin Gishu County. JOOTRH also being a public health facility, it serves clients from both low and middle socio-economic status and this diversity is necessary to make objective analysis on matters related to determinants of postpartum complications.

JOOTRH has an out-patient department (OPD), maternity (Ante natal care, post-natal care) and ward 4 (gynecological) all receiving female patients. The main mandate of JOOTRH is to provide curative, preventive, promotive and rehabilitative health services. It offers specialized clinical services in various disciplines. It serves as a center for research activities, training for medical students and health workers. The hospital has a total of 880 staff: consisting of 492 regular staff, 107 from partners, 140 casual/contract, 141 outsourced services (JOOTRH, 2016). The predominant economic activities around JOOTRH's catchment area include sugarcane and rice farming, fishing, *Jua kali* sector, service sector (including public servants), business

community and industrial manufacturing. In spite of these economic activities, poverty levels in Western Kenya region that exceed 60 percent continue to be among the highest in the country (The national level is 50%) (JOOTRH, 2016).

3.2 Study population

The study population involved women aged 15-49 years having developed complications within the 42 days after delivery or those without complications but are seeking post-natal care at JOOTRH.

Kisumu County has 1,059,733 population, 545,895 females, 518,944 males, (KDHS, 2009). According to Kisumu East Health records 2013, the population of women of child bearing age (15-49 years) is 135,989 (26.0%) and expected pregnancies is 20,923 (4.0%).

3.3 Study design

This was cross-sectional study design conducted at JOOTRH in Kisumu County. The study involved the use of structured questionnaire to conduct interviews with the women who had just delivered regardless of whether they had post-partum complications or not. Targeted were women at the maternity, those at the post-natal clinics and those attending gynecological clinics. A total of 371 women were interviewed. Key Informant Interviews (KII) were administered to 5 health service providers within the hospital to get more information on the women and other information relevant to the study. The study design was arrived at after proper understanding of the problem, study population and having considered that that the evidence to be generated should enable the principle researcher to address the research problem logically and clearly (Deavaus, 2001).

3.3.1 Inclusion criteria

i. Women of reproductive age – those between 15- 49 years old.

ii. Women who have suffered from obstetric complications during child birth and are being attended to at JOOTRH

iii. Consent- ability to provide written informed consent to participate in the study.

3.3.2 Exclusion criteria

i. Women with post-partum complications due to abortion.

ii. Those who declined to provide informed consent.

3.4 Sample Size Calculation

Fisher formula was applied to get the sample size (Fisher *et al*., 1998) which is given as follows:

$$n = \frac{Z^2 Pq}{d^2}$$

Where;

n= The desired sample size (assuming the population is greater than 10,000)

z = The standard normal deviation, set at 1.96, which corresponds to 95% confidence level

P = The proportion in the target population estimated to have a characteristic. Since there was no reasonable estimate on the prevalence of postpartum complications, then it is recommended to use 50 percent (the study used 0.50).

q= 1.0 – p

d= the degree of accuracy desired, here set at 0.05 corresponding to the 1.96.

$$n = \frac{(1.96)^2 x0.5x (1-0.5)}{(0.05)^2}$$

=384

For a population less than 10,000 the formulae would be as follows at 95% confidence level. Since n is less than 10,000 the alternative formulae was used to determine the sample size. In 2013 the numbers of women being attended to at JOOTRH for various conditions were 2731 (DHIS2).

$$e = \frac{n}{1+n/N}$$

where N= 2731, e= sample size required after adjustment since the population size <10,000

$$= \frac{384}{1+384/2731}$$

=337

10% was added to take care of spoilt questionnaire and non-response as follows:

10% of 337

= 34

=337+34

=371 participants

3.5 Sampling Design

Systematic sampling method was applied in this study. This is probability sampling method in which sample members from a larger population are selected according to a random starting point and a fixed periodic interval called the sampling interval, is calculated by dividing the

population size by the desired sample size. In this case the women population attended to at JOOTRH being 2731 were divided by 371 (2731/371) giving the sampling interval of 7.

3.6 Research procedure

Structured questionnaires were applied in which women of reproductive age being attended to at JOOTHR were interviewed. A research assistant would get to the PNC clinic and randomly decide to begin sampling from either side of the queue, get the first woman, and after every 7th woman she picked the next woman. In average the two research assistants and the principle researcher combined would interview 20 women in a day for five days in a week. The entire exercise took four weeks. The Key Informant Interviews (KIIs) were administered to 5 purposively selected service providers which included the 2 MCH nurses, nurse at the maternity, the hospital matron and the resident gynecologist.

3.7 Data collection tools

The structured questionnaires were divided into three sections; section (A) which was focusing on socio-demographic characteristics of the women, and which specifically focused on maternal age, education levels, household economic status, distance to the nearest health facility, ethnic community, religion. The section (B) was focusing on birth attendance whether skilled or unskilled and the occurrence of post-partum complications. Section (C) covered the mode of delivery and associated post-partum complications. The KIIs were also designed to cover themes around the three specific objectives.

3.8 Pre-testing of data collection tools for validity and Reliability

According to (Mugenda & Mugenda, 1998) validity is the accuracy and meaningfulness of inferences which are based on research results. On the other hand, Saunders, Lewis and Thornhill, (2009) defined reliability as a measure of the degree to which a research instrument yields consistent results after repeated trials.

Pre-testing of the instruments was carried out at Kisumu Sub-County hospital a week before the actual data was collected to appraise the tools and check their feasibility in collecting the right information. During pretesting a sample of 20 respondents were systematically selected and the tools administered. The results were then reviewed for any variations in the data captured, omissions and typographical errors. This helped to ensure that the questions were clear to the respondents, acceptable and reasonable time taken to administer the tools.

3.9 Data collection

Research assistants were stationed at different service delivery points in the hospital, these included ward 4 of JOOTRH where women with severe cases of complications were admitted, maternity where real time deliveries took place, the PNC clinic and the gynaecological clinic which operated only on Thursdays. Two female research assistants were involved in this study. One was a registered nurse while the other was a registered clinical officer both of which were also practicing health service providers but not at JOOTRH. The two health service providers were engaged in this research work due to the sensitivity of the questions and they were also to ensure that the questions are translated effectively while at the same time capable of taking a good history of the clients and accordingly classify them.

The training of research assistants took three days where they were taught on the importance of being courteous when approaching the respondents, confidentiality and the importance of proper grooming. Quality assurance was adhered to minimize potential errors through training of research assistance and close supervision of the same to ensure compliance with the data collection procedures.

3.10 Data management

Filled questionnaires were crosschecked by the principal researcher for completeness, clarity and accuracy on daily basis.

The data collected during the study were entered into a computer. The data collected was protected using a strong password employing operating system password policy, length and complexity requirement.

Hard copies from the field are kept under lock and key in a safe that can only be accessed by the principal investigator.

3.11 Data analysis

The data obtained from the field were entered into a Microsoft Excel spreadsheet in a computer and later exported into a Statistical Package for Social Sciences (SPSS) version 20. All the structured questionnaires (hard copies) were coded before entry for analysis. Statistical analysis of data was done by descriptive statistics; logistic regression analysis of data was used to explore the determinants for post-partum complications among women of reproductive age. Logistic regression was chosen since it can quantify the strength of the association adjusting for other variables (removing confounders). In addition, chi-square ($\chi 2$) analysis was used to determine proportionality between categorical variables and to measure and compare frequencies. Test of significance was measured at $P \leq 0.05$. Qualitative data were analyzed by summarization and categorization according to themes and study objectives.

3.12 Description of Variables

3.12 1Dependent variable

The dependent variable was occurrence of postpartum complications.

3.12.2 Independent variable

The independent variables were classified into socio-demographic characteristics (Age, household income, distance to health facility, parity, marital status, level of education, ANC Attendance), Birth attendance (skilled or unskilled) and mode of delivery (vaginal or cesarean section).

3.13 Ethical Considerations

Approval for this study was obtained from Maseno University School of Graduate Studies (Appendix IV) while ethical approval was obtained from Maseno University Ethical Review Committee (Appendix V) Authorization to access hospital data and study respondents was sought from the hospital administration (Appendix VI). Written consent from the study participants was sought at the beginning of every interview.

In addition, every respondent was assured of confidentiality of the shared information, and was made aware of the freedom to withdraw from the study if she so wished. For the respondents found to have special needs, immediate assistance was provided by the researcher or by research assistants. There was no actual medical examination of the study participants.

The rights and welfare of the vulnerable study participants was assured and respected by interviewing only those who are willingly and voluntarily agreed to participate in the study.

The entire study was guided by all ethical procedures and protocols involving human participants aimed at upholding beneficence.

3.14 Limitations of the study

There were limitations recognized in this study. For instance, it was possible that not all women with post-partum complications were able to participate in the study or some of them may have given incomplete information either because of lack of proper memory of medical history. This was addressed by administering additional questionnaire to cushion against non-response and incomplete data. Women who had normal births at home and eventually admitted at JOOTRH may have not provided proper medical information about their conditions at home before and during delivery. This lack of prior health status is recognized as a limitation of the study since certain post-partum morbidities such as prolapse, hemorrhoids, hypertension and anemia could

have manifested before the last delivery. There is a possibility of misclassification of certain severe and less-severe post-partum complication since the study heavily relied on oral information from the respondents. This was controlled by review of the individual health records of the patients and by engaging the nurses attending to the women.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic Characteristics of the women

A total of 371 women of reproductive age who visited Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) were interviewed in this study. A total of 222 (59.8%) did not develop postpartum complications while 149 (40.2%) reported to have developed various postpartum complications (Table 4.1).

Amongst those who attended school, a total of 143 (39.8%) presented with postpartum complications while 216 (60.2%) did not present with post-partum complications (Table 4.1). For those who could not read, 71 (68.3) developed complications while only 33 (31.7%) of the women did not develop complications (Table 4.1). Conversely, for those who could read only 45 (21.6%) women had postpartum complications while 163 (78.4%) did not develop complications. Postpartum complications amongst married women were 109 (39.4%) while majority who were married did not present with post-partum complication 168 (60.8%) (Table 4.1).

For those below 20 years old, majority 6(60%) presented with complications just as it is for those above 40 years old where 13 (86.7%) of women also presented with postpartum complications and only 2 (13.3%) did not have complications (Table 4.2). Conversely, those between ages 25-29 years old, only 24 (17.4%) presented with complications while 115 (82.7) did not show any postpartum complication (Table 4.2). On monthly income levels per household, those who had income at Kenya shillings 4500 and below 55 (58.5%) presented with postpartum complications unlike for those women whose household income levels were Kenya shillings 9000 and above where only20 (15.0%) presented with postpartum complications (Table 4.2).

For the women who have had 1-4 pregnancies in their life time, 83(28.9%) developed postpartum complications while for those who had 5 pregnancies and more 66 (78.6%) presented with postpartum complications (Table 4.2). The women interviewed presented with various post-partum complications, the most common being post-partum hemorrhage (PPH) at 63(42.3%), this was followed by sepsis at 37(24.8%), there were also cases of high blood pressure at 13(8.7%), cases of anaemia being 12(8.1), cases of perineal tears were 9(6.0%) while other complications such as fistula, incontince, depression comprised of 15(10.1) cases (Table 4.3).

Table 4.1 Socio-demographic characteristics of the women interviewed

Variable	Classification	No complications N (%)	With complications N (%)	*p*-value
School attendance	Yes No	216 (60.2) 6 (50.0)	143 (39.8) 6 (50.0)	0.009
	Total	**222**	**149**	
Ability to read	Cannot read Can read partly Can read fully	33 (31.7) 26 (44.1) 163 (78.4)	71 (68.3) 33 (55.9) 45 (21.6)	<0.0001
Religion	Catholics Protestants Christians Muslims	89 (56.0) 18 (78.3) 105 (64.0) 10 (40.0)	70 (44.0) 5 (21.7) 59 (36.0) 15 (60.0)	0.023
	Total	**222**	**149**	
Ethnicity	Luo Luhya Kisii Others	123 (69.1) 41 (45.6) 33 (62.3) 25 (50.0)	55 (30.9) 49 (54.4) 20 (37.7) 25 (50.0)	<0.0001
	Total	**222**	**149**	
Marital status	Married Widowed Separated Single Other	168 (60.6) 20 (80.0) 0 (0.0) 29 (49.2) 5 (100.0)	109 (39.4) 5 (20.0) 5 (100.0) 30 (50.8) 0 (0.0)	0.001
	Total	**222**	**149**	
Decision maker	Self Husband Others	48 (65.8) 159 (59.3) 15 (50.0)	25 (34.2) 109 (40.7) 15 (50.0)	0.317
	Total	**222**	**149**	

4.2 Socio-demographic characteristics of the women

Table 4.2; Socio-demographic Characteristics of the women interviewed

Variable	Classification	No complications N (%)	With complications N (%)	*p*-value
Ever experienced miscarriage/abortion	Yes No	34 (42.5) 188 (64.6)	46 (57.5) 103 (35.4)	<0.0001
	Total	**222**	**149**	
Age at current birth	15-19 20-24 25-29 30-34 35-39 40+	4 (40.0) 45 (56.3) 115 (82.7) 48 (49.5) 9 (30.0) 2 (13.3)	6 (60.0) 35 (43.7) 24 (17.3) 49 (50.5) 21 (70.0) 13 (86.7)	<0.0001
	Total	**222**	**149**	
Resumption of sex after delivery	Days Weeks Months Don't know Not yet	0 (0.0) 13 (29.5) 5 (100.0) 10 (52.6) 194 (66.2)	10 (100.0) 31(70.5) 0(0.0) 9(47.4) 99(33.8)	<0.0001
	Total	**222**	**149**	
Income levels	Less than 4500 4500-9000 More than 9000	39(41.5) 70 (48.6) 113 (85.0)	55 (58.5) 74 (51.4) 20 (15.0)	<0.0001
	Total	**222**	**149**	
Gravida	1-4 pregnancies 5 and more	204 (71.1) 18 (21.0)	83 (28.9) 66 (78.6)	<0.0001
	Total	**222**	**149**	

Table legend: N (%)- Number and proportion

4.3 Complications by participant's characteristics

Table 4.3: Complications by participant's characteristics

Postpartum complication	Frequency (N)	Percent (%)
High Blood pressure (HBP)	13	8.7
Post-partum Hemorrhage (PPH)	63	42.3
Sepsis/infections	37	24.8
Perineal tears	9	6.0
Anaemia	12	8.1
Others	15	10.1
Total	**149**	**100**

Table legend: N-Number of cases, %- Proportion

4.4 Influence of birth attendance to the occurrence of post-partum

From a logistic regression analysis on the influence of birth attendance to the occurrence of post-partum complications, it was evident that the women who delivered from a health facility were 36% less likely to develop a post-partum complication compared to those who delivered through TBAs (OR=0.36, 95% CI=0.08-0.24, *P*<0.0001) while those who delivered through TBAs were 3.05 more likely to develop a post-partum complication (OR=3.05, 95% CI=1.03-5.15, *P*<0.0001) (Table 4.4).

Women who lived closer to health facility had 16% less likelihood of developing post-partum complication compared to those who lived away from a health facility (OR=0.16, 95%CI=0.07-0.39, *P*<0.0001). On who makes the decision where a woman delivered, the analysis showed that the women whose husband made the decision had 85% less likely to develop post-partum complications (OR=0.85, 95% CI=0.51-2.67, *P*<0.0001) (Table 4.4).

The analysis further shows that the women who reported progress of labour of between 1-8 hours had 21% less chance of developing complications (OR=0.21, 95% CI=0.04-0.22, *P*<0.0001) unlike those whose labour took more than 8 hours who had 1.1 likelihood of developing postpartum complications (OR=1.10, 95% CI=0.10-0.43, *P*<0.0001) (Table 4.4).

From the logistic regression analysis, it is clear that women who had a birth plan prior to delivery were 41% less likely to develop postpartum complications (OR=0.41,95%CI=0.28-1.45, *P*<0.0001) (Table 4.4).

Table 4.4 Birth attendance and occurrence of post-partum complications

Variable	Characteristic	OR	95% CI	*P*-value
	Reference	1.00		
Where one first visited during labour	TBA (RC) Health facility	0.07 -	0.03-0.16 -	<0.0001 -
Where one delivered	Health facility (RC) TBA	0.36 3.05	0.08-0.24 1.03-5.15	<0.0001 <0.0001
Birth attendant in the health facility	Medical officer (RC) Registered nurse	1.03 3.11	0.27-3.88 1.78-5.43	0.966 <0.0001
Distance between health facility and residence	1-5Km (RC) More than 5 Km	0.16 -	0.07-0.39 -	<0.0001 -
Mode of transport used to reach health facility	Motor bicycle (RC) Other means	0.28 0.23	0.18-0.45 0.10-0.55	<0.0001 0.001
Who made decision on where to deliver	Husband (RC) Wife/personal Other relative	0.85 0.60 0.56	0.51-2.67 0.37-0.98 0.29-1.11	<0.0001 0.041 0.096
Presence of health care worker in health facility near ones residence	Yes (RC) No Don't know	0.87 0.87 0.73 -	0.52-1.46 0.52-1.46 0.41-1.31 -	0.593 0.593 0.293 -
Presence of labour in the current delivery	Yes (RC) No	- 0.31	- 0.10-0.92	- 0.035
Progress of labour in the current delivery	1-8 hours (RC) More than 8 hours Don't know	0.21 1.10 -	0.04-0.22 0.10-0.43 -	<0.0001 <0.0001 -
Put in place a birth plan	Yes (RC) No	0.41 1.28	0.28-1.45 0.19-0.51	<0.0001 0.08

Legend: OR- Odds Ratio, 95% C.I- Confidence interval set at 95%, RC-Reference category, *p-value*-statistical significance determined by logistic regression tests

4.5 The mode of delivery and occurrence of post-partum complications

Logistic regression analysis shows that women who attended ANC generally were 22% less likely to develop post-partum complications (OR=0.22, 95%CI=0.12-0.39, *P*<0.0001), however, those who did not attend any ANC visits were 1.37 more likely to develop postpartum complications (OR=1.37, 95% CI= 0.53-0.87, *P*< 0.0001) (Table 4.5).

Further analysis shows that, those who had 4 visits and below had 11.5 likelihood of getting post-partum complications (OR=11.48, 95% CI=5.53-23.84, *P*<0.0001) (Table 4.5).Generally, women who had vaginal delivery had 3.16 likelihood of getting post-partum complication (OR=3.16, 95% CI=1.18-8.56, *P*<0.0001) (Table 4.5).

The number of caesarean sections a woman undergoes also determined occurrence of post-partum complications. For the women who had only one CS, they were 12% less likely to develop postpartum complications (OR=0.12, 95% CI= 0.43-1.21, *P*<0.0001). Conversely, for those who had more than one CS, they were 1.30 more likely to develop post-partum complications (OR=1.30, 95% CI=1.53-1.79, *P*<0.0001) (Table 4.5).

Table 4.5 The mode of delivery and occurrence of post-partum complications

Variable	Characteristic	OR	95% CI	*p*-value
	Reference	1.00		
ANC visits	Yes (RC) No	0.22 1.37	0.12-0.39 0.53-0.87	<0.0001 <0.0001
Number of visits	4 visits and below (RC) More than 4 visits	11.48 2.73	5.53-23.84 1.34-5.57	< 0.0001 0.006
Pregnancy complication during ANC	Pre-eclampsia/ Eclampsia (HBP) (RC) Anaemia Placenta previa	1.51 0.51 -	0.66-3.42 0.25-1.03 -	0.327 0.061 -
Progress of cervical dilation during the last labour	Progressive (RC) Stagnant Did not have labour hence no cervical dilation	0.73 1.52 -	0.44-1.22 0.08-39.3 -	0.234 0.713 -
Mode of delivery	Vaginal delivery (RC) Caesarean section	3.16 0.62	1.18-8.56 0.38-1.02	<0.0001 0.061
Number of caesarean sections	One (RC) More than one	0.12 1.30	0.43-1.21 1.53-1.79	<0.0001 <0.0001
Choice on CS	Elective None Elective	1.27 1.54	0.51-3.22 0.41-5.7	0.59 0.51

Legend: OR- Odds Ratio, 95% C.I- Confidence interval set at 95%, RC- Reference category, *p-value*-statistical significance determined by logistic regression tests.

4.6 Results from the Key Informant Interviews (KIIs)

The Key informant interviews were administered to the nurse in charge of the Maternal and Child Health clinic (MCH), the matron, the resident gynecologist and the maternity nurse. The responses were grouped into themes.

4.6.1 Maternal characteristics

During the KIIS, it was noted that there are a number of factors which are largely socio-demographic in nature predisposing women to post-partum complications. These include the age of the mother;

'Most of the cases of postpartum complications are related to the age of the mother. Most young girls below 20 years are referred to this facility from the lower level facilities which are ill prepared to handle severe complications, especially when the girls are delivering for the first time'.

The most common postpartum complications recorded in JOOTRH are postpartum hemorrhage. Cases of anaemia are also high. The number of women coming for the first ANC was reported to be high, however, most of them do not complete at least the 4 recommended ANC visits;

'*These women become anaemic due to severe loss of blood during delivery or present with anaemia during pregnancy, however a lot of them also do not attend ANC services as recommended to receive the iron and folic acid supplements*.'

4.6.2 Birth attendance and postpartum complications

During the KII session, it was reported that most women who developed the infection after hospital deliveries may have failed to maintain their hygiene at their homes;

'Mothers who have had spontaneous vaginal deliveries in this facility are released after 8 hours of delivery. We ensure high standards of sterile techniques in all processes. It's then the

responsibility of the mother to keep herself clean during the healing process. Some of these women develop the infection at their homes only to come back to the hospital for treatment. This also applied to women who undergo CS who do not take good care of the wounds emanating from surgery'.

The study also revealed that the women had poor health-seeking behavior and that's why most of them presented with major complications such fistula, or bacterial infections. Most of these are women who deliver at home;

"…Most of the women with Puerperal sepsis related symptoms seek for health care services when they are in critical condition'.

From the KIIs it was noted that the hospital conduct audits of all cases of maternal deaths in the hospital, including all cases of still births. Routine supportive supervision is also conducted by the health management team conducted quarterly.

4.6.3 Mode of delivery and postpartum complications

Most women in JOOTRH deliver vaginally, however, it was noted that the cases of CS are also on the rise even though they recommend not more than three cesarean sections. Most of the women who undergo Cs present largely with infections due to improper management of the incision point, while those who delivered vaginally had infections related to retained products of conception.

'We recommend a maximum number of C-section considered safe for a mother to be three, however some of them risk having more than three. Some of these become medically necessary due to complications arising from previous C-sections. These women should avoid high risk pregnancies'.

CHAPTER FIVE: DISCUSSION

This chapter covers the discussion in relation to the findings from the analysis. It is evident that the demographic characteristics the women, the attendance of birth by either skilled on unskilled personnel and the mode of delivery all have influence on the occurrence of post-partum complications.

5.1 Socio-demographic Characteristics of the women

There were variations in the occurrence of post-partum complications for some selected socio-demographic characteristics. From the analysis, it is evident that education is important for women since 68% of those who could not read developed postpartum complications unlike only 21.6% amongst those who were able to read. This is in line with a study conducted in Mariakani Sub-County hospital in Kenya which also demonstrated that formal maternal education was protective factor for postnatal anaemia (Rukiya *et al*., 2015). When women are educated they get empowered and able to access information on danger signs around pregnancy and childbirth and need for proper nutrition during pregnancy.

Young women below 19 years old and older women above 40 years were at a higher risk of developing post-partum complications as opposed to those between ages 20-39 years old. From the analysis, 60% of those between ages 15-19 years old developed postpartum complications. Similarly, 86.7% of the women of ages 40 years and above presented with postpartum complications. Conversely, for the women aged 25-29 years old only 17.3% had postpartum complications. These findings are concurrent with a study in Bangladesh that intimated that older women of age 35 years and above have got higher chances of developing hypertension, hemorrhoids, and prolapse (Ferdous *et al*., 2012). The complications in younger women are due to the fact that biologically their bodies are not yet well developed to support pregnancy and

child birth while for the older women it might be attributed to continuous stresses on muscles of the birth canal leading to complications such as prolapse (Ferdous *et al*., 2012).

The number of pregnancies a woman had in her lifetime had direct influence on the occurrence of post-partum complications. From the current study, only 28.9% of the women who had 4 children and below developed post-partum complications unlike 78.6% post-partum cases amongst women who had 5 and more pregnancies as at the time of the study. The women who had more than four pregnancies were more susceptible to complications such as prolapse than those with fewer pregnancies. This is consistent with a previous study indicating that there are many complications linked to deliveries among women and many reports on maternal morbidity show significant association with parity, assistance at delivery, ethnicity and province of residence (Ann, 2014).

The most common post-partum complication amongst women attended to at JOOTRH is postpartum haemorrhage (PPH), in which women bleed a lot during delivery and this makes it one of the leading cause of deaths in women, from the analysis 42.3% of the women presented with PPH followed by sepsis at 24.8%. Infections are common due to poor hygiene practices by women after delivery as illustrated by the KIIs. This is also confirmed by a previous study (Chege, 2012) which indicated that postpartum hemorrhage (PPH) which is also known as obstetric hemorrhage accounts for 25% of the total maternal deaths in Kenya and it is common among 56% of women who do not deliver in hospitals.

Household income is also important since for the women with household income above Kenya shillings 9000 and above only 15% developed complications compared to those with low income.

5.2 Birth attendance and the occurrence of post-partum complications

There were variations to the occurrence of post-partum complications when associated birth attendance. From the logistic regression analysis, it was clear that women who delivered in the health facility were 36% less likely to develop post-partum complications as compared to those who sought assistance of TBAs to deliver. This is because TBAs have been identified to be ineffective due to limited life-saving skills, lack of supportive supervision, and lack of emergency back-up systems (Adegoke & Van-denbroek, 2009). However, contrary to the current findings, a community-based retrospective case-control study conducted in western Kenya showed that the risk of occurrence of obstetric complications were higher in facility-based deliveries as compared home deliveries assisted by TBAs(Liambila & Kuria, 2014**).**Differences in the current versus previous study likely could have arisen due to the fact that the previous study relied on reports provided by the women long after birth and did not verify data from the health record thus predisposing the previous study to a recall bias

Women who lived closer to a health facility had less risk of developing post-partum complications compared to those who lived far away from the health facility. From the analysis, those who lived close to the health facility were 16% less likely to develop complication. Concurrently a study in Makueni County showed that women living within 1- 5 kilometers from a facility increased their likelihood of skilled birth attendance (Gitumu, Herr, Oruko, & Karijo, 2015). When women live closer to health facilities, they can easily access basic obstetric care including management of emergencies that could otherwise worsen post-partum if not addressed in good time. Thus, it is easier to coordinate referral and many post-partum complications could be averted.

From the regression analysis it was clear that women with a birth plan ahead of delivery were 41% less likely to develop postpartum complications. Birth preparedness was also noted to be associated with skilled birth attendance. For instance, saving money for delivery expenses and arranging for transport are expected to enable one to reach the health facility. Identifying a skilled birth attendant early enough can also ensure that one is attended by one during delivery (Gitonga, 2017).

The current study also indicated that the women whose husbands made decisions were less likely to present with post-partum complications as opposed to when the women themselves or other relatives made decisions.

5.3 Mode of delivery and the occurrence of Post-partum complications

Mode of delivery also had an impact on the post-partum outcomes. The current study indicated that women who attended ANC were generally less likely to develop post-partum complications as compared to those who did not. Further analysis indicated that women who had more than 4 ANC visits were less likely to develop post-partum complications than those who had less than 4 visits. This is because some pre-existing conditions can be identified and addressed early enough than when left unattended to. When major obstetric complications are identified in good time and properly managed, women's lives can be saved (Adegoke & Van-denbroek, 2009). A study in Mariakani Sub-County hospital showed that mothers are at higher risk of post-partum anaemia if they were anaemic during the third trimester of pregnancy, experienced post-partum haemorrhage or had multiple gestations delivery with pre-natal anaemia all acting as strongest predictor of post-partum anaemia. This therefore calls for ANC visits for all the pregnant mothers and skilled birth attendance (Rukiya *et al*., 2015).

The study also indicated that women who delivered vaginally were more likely to develop post-partum complications than those who went through cesarean delivery. A study in North America also presented some of the post-caesarean delivery complications to include pain, endomyometritis, wound separation/infection, gastrointestinal problems, urinary tract infection, deep venous thrombosis and septic thrombophlebitis (Jeffry & Quinlan, 2015). However, consistent with the current findings, a previous study in Bangladesh brought out caesarean section delivery as a strong protective factor for prolapse, perineal tears, incontinence and UTIs despite other adverse effects such as adhesion of internal organs and lower back pain associated with it. In fact, 78% of women with dystocia is said to have averted serious complications having undergone caesarean delivery (Ferdous *et al.,* 2012).

From the current study it was established that women who undergo more than one cesarean section were 1.54 more likely to develop postpartum complications than those who had only one CS who were 12% less likely to experience postpartum complications. There are numerous maternal morbidities attributed to multiple repeat caesarean section deliveries, they include placenta accreta, bowel injury, ileus, cystotomy, ureteral damage, need for postoperative ventilation, intensive care unit admission, hysterectomy, blood transfusion with 4 or more units and increased hospital stay (Silver *et al.,* 2006).

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CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSION& RECOMMENDATIONS

6.1 Summary of findings

In summary, the above findings suggest that socio-demographic status of a woman is a risk factor and strong predictor for some short and long term post-partum complications. From a logistic regression analysis, it is evident that women who delivered in a health facility were less likely to sustain post-partum complication compared to those who sought the services of TBAs. From the current study, women who deliver vaginally are at higher risk of developing post-partum complication. However, there are also a number of complications associated with caesarean section delivery.

6.2 Conclusion

1. Socio-demographic characteristics have direct influence on the occurrence of post-partum complications among women of reproductive age visiting Jaramogi Oginga Odinga Referral Hospital in Kisumu County.
2. Birth attendance by either skilled or non-skilled birth service provider has direct influence on occurrence of post-partum complications among women of reproductive age visiting Jaramogi Oginga Odinga Teaching and Referral Hospital in Kisumu County.
3. The mode of delivery has potential influence on the occurrence of post-partum complications among women of reproductive age admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital in Kisumu County.

6.3 Recommendations from the current study

1. Since there are socio-demographic characteristics that can predispose women to postpartum complications, there should be effective health education programmes targeting all pregnant women. All women and girls who are either too young should consider delaying pregnancy while those at advanced age should avoid high risk births. Consider providing Family Planning commodities to the women for both birth spacing and for limiting to mitigate high risk births.
2. All pregnant women should seek skilled birth attendance as this can help improve access to post-partum care including timely and appropriate management of obstetric complications or to stabilize a woman before or during referral.
3. Women should be urged to maintain high level of hygiene including limiting contact with water specifically at the site of incision for those who have undergone CS to prevent infections.

6.4. Recommendations for future research

1. The determinants for preference for home deliveries among women of reproductive age in Kisumu County despite free maternity services by the Ministry of Health.

2. The role of abortion or miscarriage in the occurrence of post-partum complications in subsequent pregnancies among women of reproductive age in Kisumu County.

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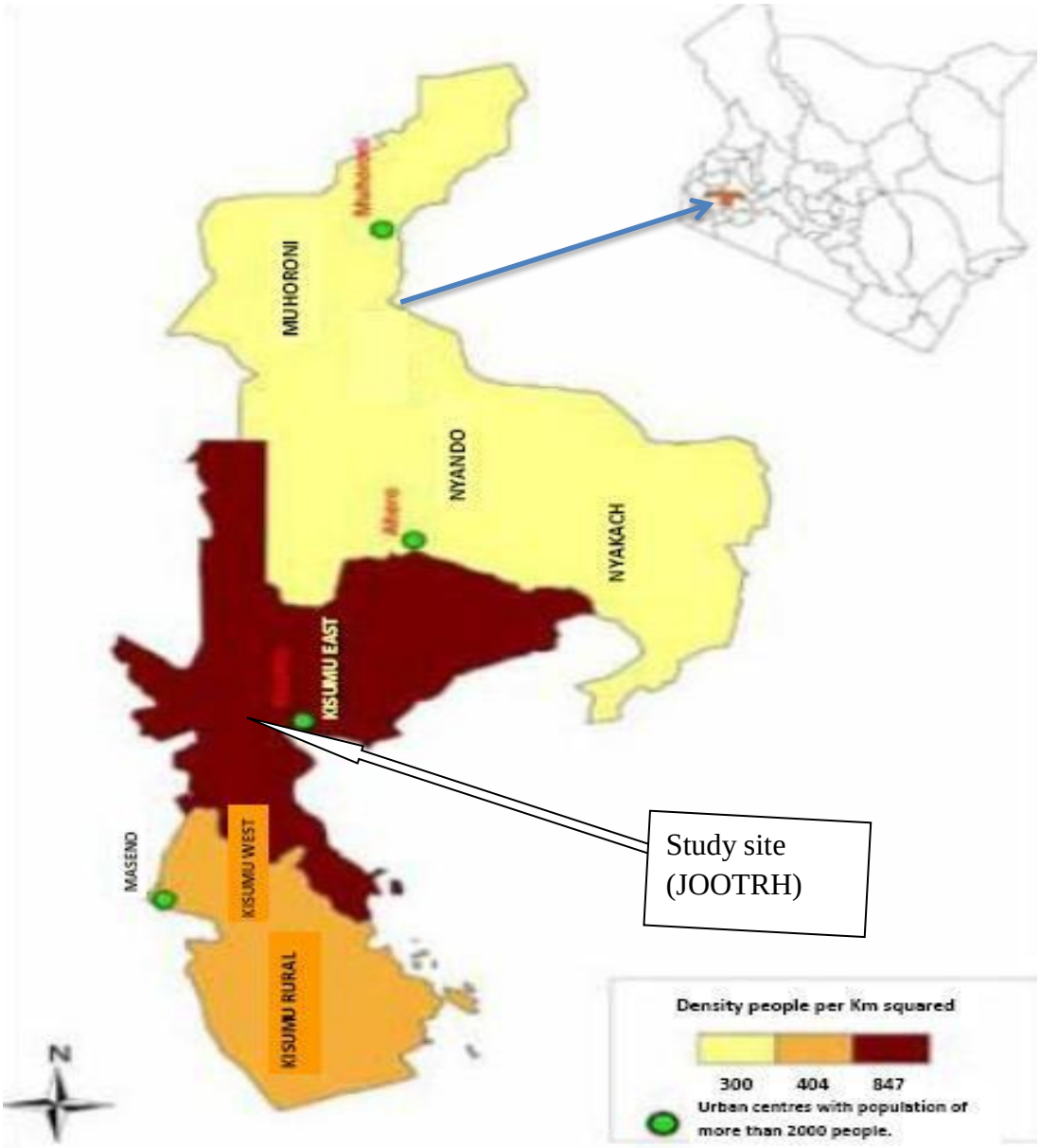
APPENDICES

Appendix I: Map of Kisumu County



Appendix II: Questionnaire administered to Women of Reproductive Age

Administered to women of reproductive age admitted at Jaramogi Oginga Odinga Teaching and referral hospital

1.0 Identification

Code…….Date of interview……

Respondent name/number ……

1.1 Introduction

My name is …….....I am a postgraduate student undertaking Masters in Public Health at Maseno University. I am carrying out a study whose aim is to assess the determinants of post-partum complications among women of reproductive age (15-49 years) visiting Jaramogi Oginga Odinga teaching and referral hospital, Kisumu.

1.2 Benefits

The information from this study strictly be for learning purposes. It may also be of relevance to support the Ministry of health at national and county levels in their efforts to improve service delivery and policy formulation on maternal health.

1.3 Basis for participation

Your participation is purely voluntary. It will take 20-30 minutes to respond to the question. The information you will provide will be treated with utmost confidentiality. Your honest and true response will contribute to the achievement of the aim of this research.

Respondents signature……Date……

Section A: socio-demographic factors of women who experience post-partum complications

Thank you for agreeing to participate in this study. To begin, we are going to ask you some background questions about yourself.

Q1. When did you deliver your current child?

(*Probe for date of delivery and possible date of onset of complication if any. If not within 12 months, stop the interview and proceed to next respondent*)

Within 12 months……...1 More than 12 months…..2

Q2. How old were you on your last birth day?

(*Compare and correct Q1 and/or Q2 if inconsistent*)

Age in complete years……

Q3. Have you ever attended school? Yes ……...1 No…….2

If yes

Q4 What is the highest level of school you attended?

Primary ……1 Post-primary/vocational….2 Secondary/O or A level…..3

College (middle level)……4 University……5 N/A……6

Q5. Now I would like you to read for me a sentence on this card

(*Provide the respondent with a card containing a sentence in English*)

Cannot read at all……1 Able to read only part of the sentence……..2

Able to read the whole sentence…3

Q6. What is your religion? Catholic…1 Protestant….2 Christian….3

Muslim…..4

No religion……...5 Other (*specify*)……..……6

Q7To what degree do your religious beliefs influence the decisions you make about child birth?

Never…1 Some-what….2 Often/ frequently…….3 Always……4

Q8. What is your ethnic group?

Luo …1 Luhya….2 Kalenjin....3 Kisii…4 Kikuyu....5 Meru…6

Other (*specify*).7

Q9What is your marital status?

Married …1 Widowed…2 Separated…3 Single….4

Q10. *If married*

What is the highest level of school attended by your spouse?

Primary …1 Post-primary/vocational….2 Secondary/O or A level…..3 College (middle level)……4 University…5 N/A……..6

Q11. Who is the head/decision maker in your household?

Wife (self)……..……1 Husband……..2 Others (*specify*)……..3

Q12. What is the occupation/main source of income to your household?

Salary....1 Self-employment…2 Petty business …3 Casual work….4

Farming……..5 Others (*specify.*)……6

Q13. Approximately, how much money does the household spend per day?

(Calculate the amount quoted for 30 days to get monthly expenditure)

< 4500/- …….1 4500- 9000/-…..2 >9000/-……..3

Q14. How many pregnancies have you ever had in your life? (*record exact number*)

One…1 Two….2 Three……3 Four….4 Five….5 More than five….6

Q15. How many boys and girls have you ever given birth to? (*consider every child born alive or dead*) Boys…….1 Girls …….2

Q16. How old were you when you got pregnant for the very first time?

Less than 15 years……1 15-19 years……2 20-24 years…….3 25-29 years…….4

30-34 years…….5 35-39 years….6 40 above years….7

Q17. How old were you when you delivered your current child?

15-19 years…1 20-24 years….2 25-29 years…..3 30-34 years…4 35-39 years….5

40 -44 years…6 45-49 years….7 50 and above…8

Q18. How long did you wait between your current child and the immediately preceding pregnancy/child? (*specify if possible*)

Months….1 Years……2 don't know…3 N/A…..4

Q19. In the past 12 months from whom or where have you seen or heard about complications associated with child birth?

Radio ….1 TV …2 Newspaper….3 Magazines…4 Billboards....5

wall painting....6 Poster….7 Other (*specify*)….8 Has never seen….9

Q20. After delivering this your current child, how long did you take before you resumed sexual intercourse? *Probe for reasons for early resumption* (*record exact duration*)

Days…1 Weeks …2 Months …….3 Don't know…4 Not yet…….5

Section B: Birth attendance

Q21. Where or from whom did you first go to when you were in labour?

TBA……..1 Health facility…….2

Q22. Where did you deliver your current child?

Public sector

Government hospital…..…..1 Government health center…2

Government dispensary…....3 Other (*specify*)……..4

Private medical sector

Faith-based, church, mission..6 Hospital/clinic……7

Private hospital/clinic……8 Nursing/maternity home……9

Traditional Birth attendant..10

Q23. If delivered in health facility who attended to you during delivery?

Obstetric/gynecologist……..1 Medical officer…..2 Clinical officer…3 Registered Nurse...4 N/A……5

Q24. What is the approximate distance between your residence and the nearest health facility?

<1km ……1 1-5km ……....2 More than 5km ……..….3

Q25. Which mode of transport did you use to reach the health facility?

Vehicle..1 Motor bike….2 Bicycle….3 Wheelbarrow…4 Tuktuk…5 Other (*specify*)...6

Q26. Who made decision on where to seek delivery?

Husband……1 Wife/personal.…2 Friend…..3 Other relative (*specify*)….4

Q27. Is there a health care worker assigned to and present at the facility near your residence at all times (24 hours a day) for emergencies.

Yes….1 No….2 Don't know…..3

Q28. Did you have labour in this current child birth?

Yes ……..1 No…...…2

Q29. *If yes.* How long did it take between when the labour started and actual delivery?

1-8 hours …..1 more than 8 hours……..2 don't know…..3 N/A…..4

Q30. What complication do you present with?

High blood pressure..1 Post-partum heamorrhage..2 Sepsis…3 perineal tears…4 fistula…5 prolapse..6 Anaemia…7 incontinence…8 other……9 None…..10

Q31 What do you think might have led to the post-partum complications you currently experience? Mistake caused by TBA…..1 Mistake caused by Health attendant..2

Delay in seeking PNC….3 Previous infection…..4 Other (*specify*)…5 Don't know….6 N/A….7

Q32. Did you have any birth plans before delivery? Yes----1 No……2

Section C: Mode of delivery

Q33. At any time during this last pregnancy, did you go for antenatal check-up?

Yes…….1 No……..2

Q34. *If yes.* How many visits? Less than 4visits..1 4 visits ..2 More than four visits..3 N/A…..4

Q35. Which pregnancy related complication was diagnosed during the ANC visits?

Multiple responses allowed : record all mentioned

Pre-enclampsia/enclampsia (high blood pressure)…..1 Anaemia….2 Placenta previa…..3

Infection…….4 foetus in wrong position..5 Other (*Specify*)…6 None…7

Q36. What was the progress of cervical dilation during this last labour?

Progressive……...1 Stagnant……2 Other (*specify*)……..3

Q37. How did you deliver the latest child?

Vaginal…….1 Caesarean section……...2

Q38. If caesarean section, was it? Elective….1 Non-elective (emergency).....2 N/A….3

Q39. How many caesarean section deliveries you have had in your life time?

One……1 Two…..2 Three…3 Four……..4 More than four..…5 None…….6

Q40. After your last delivery, how long did you take to go for post natal checkup?

<6 weeks…1 More than 6 weeks……2 Did not go…….3 Don't know…...4

Appendix III: Key informant interview guide for the health service providers

Administered to health service providers dealing with reproductive health at Jaramogi Oginga Odinga Teaching and referral hospital (JOOTRH)

1.0 Identification

Code…….Date of interview……

Respondent name/number ……

1.1 introduction

My name is …….....I am a postgraduate student undertaking Masters in Public Health at Maseno University. I am carrying out a study whose aim is to assess the determinants of post-partum complications among women of reproductive age (15-49 years) visiting Jaramogi Oginga Odinga teaching and referral hospital, Kisumu.

1.2 Benefits

The information from this study strictly be for learning purposes. It may also be of relevance to buttress the Ministry of health at national and county level in their efforts to improve service delivery and policy formulation on maternal health.

1.3 Basis for participation

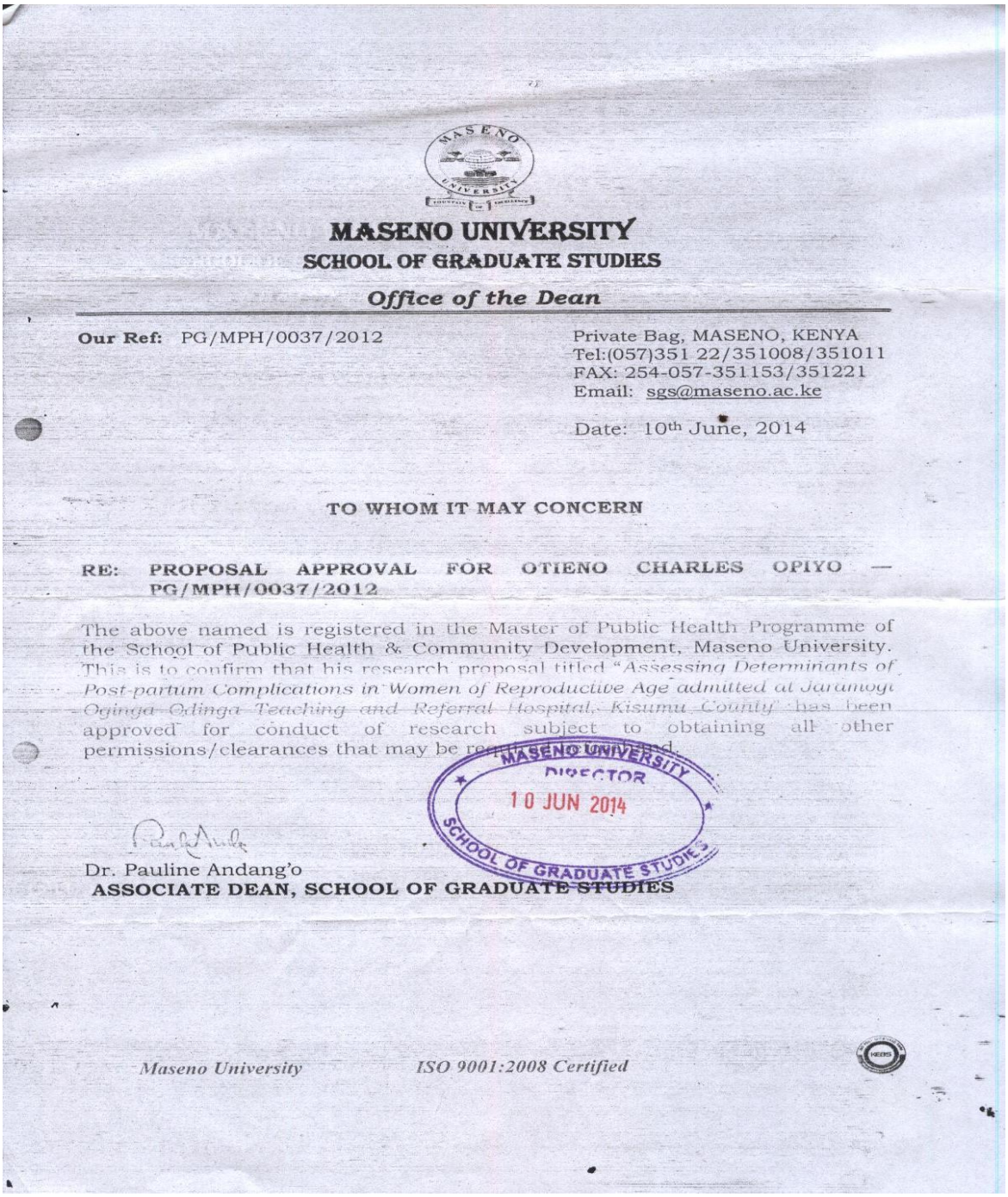
Your participation is purely voluntary. It will take 20-30 minutes to respond to the question. The information you will provide will be treated with utmost confidentiality. Your honest and true response will contribute to the achievement of the aim of this research.

Respondents signature……Date……

1. How many women with complications have been admitted or visited this facility in past 12 months?
2. How many home deliveries were conducted and referred to this facility for further management in the past 12 months?
3. Can you share with me some of the post-partum complications presented by these women (*probe in terms of the most common to the least common*)
4. In your opinion how many Cs deliveries do you recommend for a woman in her life time?
5. Does this facility routinely carry out quality assurance activities? By this I mean some formal review system to a standard. An example –facility wide review of maternal mortality.
6. Are there any meetings when labour and deliveries are discussed with staff from this facility, such as looking at changes in pattern or other items relevant to client service? (*Request if you can access*)
7. Are all maternal deaths in this facility audited? What are the major causes of death as per the audit report?
8. When was the last time a supervisor from outside this facility came here to visit?
9. What are some of the causes or predisposing factors to the occurrence of post-partum complications?

10. In your opinion why do you think caesarean section deliveries are common these days?
11. What is the prevalence of the 4th ANC in this facility?
12. What are some of the complications that are associated with vaginal delivery? What about those related to CS?

Appendix IV: Approval letter from the School of the Graduate Studies



MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: PG/MPH/0037/2012

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 10th June, 2014

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR OTIENO CHARLES OPIYO — PG/MPH/0037/2012

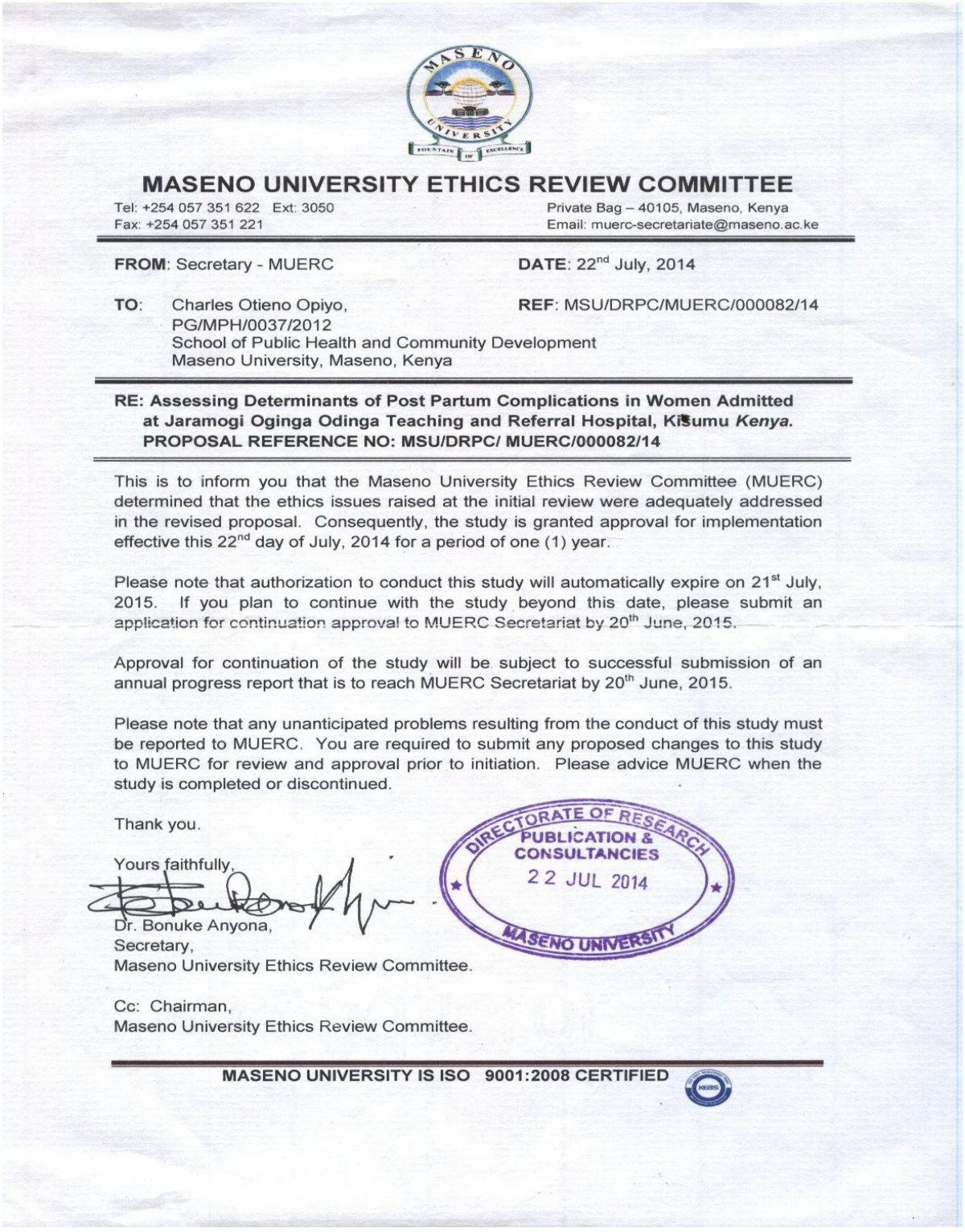
The above named is registered in the Master of Public Health Programme of the School of Public Health & Community Development, Maseno University. This is to confirm that his research proposal titled "*Assessing Determinants of Post-partum Complications in Women of Reproductive Age admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County*" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required.

MASENO UNIVERSITY DIRECTOR 10 JUN 2014 SCHOOL OF GRADUATE STUDIES

Dr. Pauline Andang'o
ASSOCIATE DEAN, SCHOOL OF GRADUATE STUDIES

Maseno University *ISO 9001:2008 Certified*

Appendix V: Ethics Review Committee approval letter



MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 22nd July, 2014

TO: Charles Otieno Opiyo,
PG/MPH/0037/2012
School of Public Health and Community Development
Maseno University, Maseno, Kenya

REF: MSU/DRPC/MUERC/000082/14

RE: Assessing Determinants of Post Partum Complications in Women Admitted at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu *Kenya.*
PROPOSAL REFERENCE NO: MSU/DRPC/ MUERC/000082/14

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 22nd day of July, 2014 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 21st July, 2015. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 20th June, 2015.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 20th June, 2015.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,

DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES 22 JUL 2014 MASENO UNIVERSITY

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED

Appendix VI: Approval by Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) Ethical Review Committee

MINISTRY OF HEALTH

Telegrams: "MEDICAL", Kisumu
Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail: ercjootrh@gmail.com
When replying please quote

JARAMOGI OGINGA ODINGA TEACHING & REFERRAL HOSPITAL
P.O. BOX 849
KISUMU

Ref: ERC.1B/VOL.I/133

Date 26th September, 2014

Charles Otieno Opiyo,
School of Public Health and Community Development,
MASENO UNIVERSITY.

Dear Charles,

RE: FORMAL APPROVAL TO CONDUCT RESEARCH TITLED: *"ASSESSING DETERMINANTS OF POST PARTUM COMPLICATIONS IN WOMEN ADMITTED AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU - KENYA"*

The JOOTRH ERC (ACCREDITATION NO. 01713) has reviewed your protocol and found it ethically satisfactory. You are, therefore, permitted to commence your study immediately. Note that this approval is granted for a period of one year (26th September, 2014 to 26th September, 2015). If it is necessary to proceed with this research beyond the approved period, you will be required to apply for further extension.

Upon this approval, you **MUST** consult with the chief administrator's office through writing stating clearly your intention before commencement of data collection.

Also note that you will be required to notify the committee of any protocol amendment(s), serious or unexpected outcomes related to the conduct of the study or termination for any reason.

Finally, note that you will also be required to share the findings of the study in both hard and soft copies upon completion.

The JOOTRH ERC takes this opportunity to thank you for choosing this institution and wishes you the best in your endeavours.

Yours sincerely,

WILBRODA MAKUNDA,
For: **SECRETARY – ERC,**
JOOTRH – KISUMU.