

**MATERNAL MORTALITY AMONG WOMEN SEEKING
MATERNITY CARE AT KISII LEVEL 5 HOSPITAL,
KENYA BETWEEN JANUARY 2009-JUNE, 2010.**

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**Maternal Mortality among Women Seeking Maternity Care at Kisii
Level 5 Hospital, Kenya between January 2009-June, 2010.**

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the Degree of Doctor of Philosophy in Public Health in the Jomo
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DECLARATION

This PhD thesis is my original work and has not been presented in any other university

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DEDICATION

To my late daughter Davinah Osoro who became a victim of maternal mortality as I was finalizing my study, my family who have been a pillar of support and the giants who gave me support and allowed me to sit and learn under their feet.

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TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDICES	xi
DEFINITION OF OPERATIONAL TERMS	xii
LIST OF ACRONYMS AND ABBREVIATIONS	xiv
ABSTRACT	xvi
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background Information	1
1.2 Problem statement	2
1.3 Justification	3
1.4 Research Questions	4
1.5 Objectives.....	5
1.5.1 General Objective.....	5
1.5.2 Specific Objectives.....	5
1.6 Assumptions	5
1.7 Conceptual and theoretical framework	6
CHAPTER TWO	8

LITERATURE REVIEW.....	8
2.1 Maternal deaths among women of reproductive age	8
2.2 Prevalence of maternal mortality and morbidity in developed and developing Countries	12
2.3 Causes of maternal mortality and morbidity	15
2.4 Determinants of maternal mortality and morbidity.....	22
2.4.1 Household and Community Characteristics.....	23
2.4.2 Biological-demographic variables and risk factors for women	24
2.4.3 Malaria and HIV Infections	25
2.4.4 Malnutrition	26
2.4.5 Health Systems and its impact on maternal health.....	26
2.4.6 National policies and investments in maternal health.....	27
2.5 Key facts regarding maternal mortality.....	28
2.6 Progress towards improving maternal health.....	30
2.7 Lessons Learned.....	33
2.8 Interventions for maternal mortality	34
2.9 Safe Motherhood Initiative in Kenya.....	37
2.9.1 Use of antenatal care and skilled attendant	38
2.9.2 Kenya Government policy and current preventive strategies	40
2.10 Improving Emergency Obstetric Care: The Three Levels of Delay	44
CHAPTER THREE	50
MATERIALS AND METHODS	50
3.1. Study Area.....	50
3.1.1 Health facilities in Kisii County.....	51
3.1.2 Socio-economic activities of Kisii County	52
3.2 Study Design	52
3.3 Study Population	53

3.4 Data collection Tools	53
3.5 Inclusion Criteria.....	53
3.6 Exclusion Criteria.....	53
3.7 Sample Size Determination.....	53
3.8 Data variables.....	56
3.9 Training of Research Assistants.....	57
3.10 Data collection and management	57
3.10.1. Procedure for Data Collection and Data Collection Tools.....	57
3.10.2 Data analysis and presentation	60
3.11 Ethical Considerations	60
3.12 Significance of the study	61
CHAPTER FOUR.....	62
RESULTS	62
4.1 Socio-demographic characteristics	62
4.1.1 Emergency Obstetric care preparedness at the hospital.....	69
4.2 Factors associated with maternal mortality.....	74
4.2.1 Demographic profiling of significant independent variables in the study	74
4.2.2 Complications Associated with Maternal Mortality	78
4.2.3 Other Chi Square Test Results:	80
4.3 Multivariate Analysis.....	81
4.3.1 Demographic and maternal complications distribution and associations	81
4.3.2 Binary Logistics Regression:	86
CHAPTER FIVE.....	90
DISCUSSION	90
5.1. Outcomes of pregnancy and childbirth complications associated with maternal mortality	90

5.2 Individual level factors antecedent to maternal mortality.....	91
5.3 Facility factors associated with maternal mortality	95
5.4 Community level factors associated with maternal mortality.....	97
5.5 Complications associated with maternal mortality	98
CHAPTER SIX	99
CONCLUSIONS AND RECOMMENDATIONS.....	99
6.1 Conclusion	99
6.2 Recommendations	99
REFERENCES	102
APPENDICES	123

LIST OF TABLES

Table 4.1: Social demographic factors associated with maternal mortality	75
Table 4.2 : Maternal complications associated with maternal mortality	78
Table 4.3: Recommendations for improvement of maternal health outcomes	80
Table 4.4: Summarizes the demographic variables in the study.....	81
Table 4.5:Summary of maternal complication and labour and delivery health care seeking.....	83
Table 4.6: Age by visiting a doctor.....	84
Table 4.7: Marital status by the duration of the previous pregnancies	84
Table 4.8: Education and any complication experienced during labour and delivery..	85
Table 4.9: Education by bleeding in early pregnancy before 22 weeks.	85
Table 4.10: Occupation by bleeding in early pregnancy, before 22 weeks.	85
Table 4.11: Binary logistic regression on demographics by visit a doctor	86
Table 4.12: Binary logistic regression on demographics by duration of the previous pregnancies.....	87
Table 4.13: Binary logistic regression on education by complication(s) occurred.....	88
Table 4.14: Binary logistic regression on “demographics by Bleeding in early pregnancy before 22 weeks”.	89

LIST OF FIGURES

Figure 1.1: Conceptual framework	7
Figure 2.1: Leading Cause of maternal death in Kenya	19
Figure 3.1: Kisii County Map (Google Maps, 2018).....	50
Figure 3.2: Estimated number of deaths	54
Figure 3.3: Sources of risk factors for co-morbidity.....	58
Figure 4.1: Age distribution of the study subjects	62
Figure 4.2: Marital status of the study subjects	63
Figure 4.3: Level of education of the study subjects	63
Figure 4.4: Distribution of study subjects with regard to religion	64
Figure 4.5: Distribution of study subjects with regard to occupation.....	64
Figure 4.6: Distribution of study subjects to place of residence.....	65
Figure 4.7: Distributions of study subjects' by parity	65
Figure 4.8: Proportion of study subjects who reported planned pregnancy.....	66
Figure 4.9: Deceased study subjects' history in respect to previous pregnancy	66
Figure 4.10: Location of previous deliveries of study subjects	67
Figure 4.11: Persons who conducted delivery of study subjects.	68
Figure 4.12: Type of delivery.	68
Figure 4.13: Factors that influence the availability, quality and utilization of maternal services	71
Figure 4.15: Reasons cited for delay in reaching hospital (percentage)	72
Figure 4.16: Reasons for delay in receiving care.....	73
Figure 4.17: The proportion of subjects attended by professionals during delivery.....	76
Figure 4.18: Factors linked to maternal mortality	77
Figure 4.19: Complication antecedent to maternal mortality	79
Figure 6.1: Model for improving maternal health.....	101

LIST OF APPENDICES

Appendix 1a: Research Participation Consent Form.....	123
Appendix 1b: Translation Of Informed Consent Document Into Kisii Language.	127
Appendix 2: Confidential Questionnaire Of Household (Cqh)	131
Appendix 3a: Confidential Questionnaire For Female Death (Cqfd).....	134
Appendix 3b: Translation Of The Questionnaire To Kiswahili	158
Appendix3c: Questionnaire For Healthcare Workers.....	169
Appendix 4: Ethical Approval Protocol.....	171
Appedix 5 : Authorization Letter From Provincial Director Of Medical Services	172

DEFINITION OF OPERATIONAL TERMS

Maternal Death: Is “the death of a woman while pregnant or within 42 days of the end of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes” (WHO, 2016b)

A Skilled Provider: A doctor, nurse, or midwife who has been trained to proficiency in skills necessary to manage and care for a normal as well as abnormal pregnancy, labour, and delivery or diagnose and manage pregnancy complications when they arise. Skilled attendant must be registered and/or legally licensed to practice (WHO, FIGO, & ICM, 2004)

Emergency Obstetric Care: This is the urgent and immediate care provided for most common obstetric emergencies (i.e. sepsis, hemorrhage, pre-eclampsia, and retained placenta and abortion complications) as well as for neonatal care, including surgery and blood transfusion (WHO, 2009).

Maternal Health Services: This is the health of women during pregnancy, childbirth and the postpartum period. It encompasses the health care dimensions of family planning, preconception, prenatal and postnatal care in order to reduce maternal morbidity and mortality (WHO, 2010). The services are available and are provided by both public and private health facilities.

Maternal morbidity: Is a term used to describe pre-natal and post natal mothers who are ill and or have episodes of illness caused by or related to pregnancy, labour or childbirth (Priya Agrawal, 2015).

Sisterhood method: Scientific method (similar to snow- ball) that is used to identify subjects with similar variable or characteristics (Merdad, Hill, & Graham, 2013). The approach entails asking respondents about ever-married sisters: how many have died, and how many died while they were pregnant or during childbirth or six weeks following the end of the pregnancy.

LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired immune-deficiency syndrome
ANC	Antenatal care
CBS	Central Bureau of Statistics
CQFD	Confidential Questionnaire of Female Deaths
EmOC	Emergency obstetric care
HIV	Human immune-deficiency virus
ICD-10	International Classification of Diseases and related health problems
JKUAT	Jomo Kenyatta University of Agriculture Technology
KDHS	Kenya Demographic Health Survey
KNDC	Kenya National Demographic Census
MDG	Millenium Development Goals
MI	Motherhood initiative
MMR	Maternal mortality rate
NCPD	National council for population and development
NHSSP (II)	National Health Sector Strategic Plan II (NHSSP II)
NDHS	Nigeria Demographic Health Survey
PMTCT	Prevention of mother to child transmission
TBA	Traditional birth attendant
UKCEMD	The United Kingdom Confidential Enquiry into Maternal Deaths

UK	United Kingdom
UN	United Nations
UNFPA	United Nations Funds for Populations Activities
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

ABSTRACT

Approximately 600,000 women die each year from complications related to pregnancy and childbirth, 99% of them in developing countries. Kenya has a record of 488 deaths per 100,000 live births while in Kisii region has a maternal mortality of 500 per 100,000 live births. The objective of the study was to establish the determinants of maternal mortality among women seeking obstetric care in Kisii Level 5 Hospital. In this case control study, factors specifically studied were those that contributed to maternal mortality. A confidential female death questionnaire (CFDQ) was used to collect data from relatives of the 230 subjects with 72 subjects on the deceased arm. Study findings revealed that among those who died, 43 (60%) ranged between 15-25 years. Fifty-one (70.8%) of the deceased did not go to hospital promptly due to lack of money and delayed decision making process. Thirty-nine pregnancies (54%) were unplanned and the expectant mothers did not have a birth plan. Complications which led to maternal mortality were mainly bleeding /hemorrhage, swelling of hands, hypertension, heart diseases, and post-partum sepsis/infections. The women with a less than primary level of education were 7.46 times less likely to report bleeding as a complication that occurs to them as a result of abortion compared to females with a secondary and above level of education and mothers who were in business/formal employment are 7.25 times less likely to experience bleeding in early pregnancy before 22 weeks compared to those who are farmers/housewives. The study concludes that young women (15-30 years) of reproductive age either married or single are prone to maternal mortality. Unplanned pregnancies, abortion, home deliveries, delay in being attended while in hospital and preterm deliveries were the main contributory factors to maternal mortality. This study recommends that health education on antenatal care and birth-plan should be intensified targeting young women of reproductive age (15-30 years), single or married women. They should also be empowered economically. Again, scaling-up family planning and skilled deliveries should be encouraged. This will reduce maternal mortality and make significant progress towards achievement of Millennium Development Goal number 5. Again the study has revealed that verbal autopsy is a suitable method that can be used to collect useful data for research.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Globally, an estimated 287,000 maternal deaths occurred in 2010, with Sub-Saharan Africa and South Asia accounting for nearly 85% of the global burden (WHO, 2015d, 2016b). Indeed, while data estimating the levels of maternal mortality at a national level has been available, there has been paucity of data to study pregnancy related illness at a national level. As a consequence, this has not only led to negligence in studying complications related to childbirth (Hardee, Gay, & Blanc, 2012) but also to a “measurement trap” related to limited measurement techniques to facilitate data collection (Graham & Campbell, 1992; Sadana, 2000)

Globally, there is a glaring disparity between nations with developing countries taking the heaviest burden of maternal mortality. In Sub-Saharan Africa for instance, women have a one in 22 life-time risk of dying in either pregnancy or childbirth compared to a one in 7,300 risk for women in industrialized nations (WHO, 2015e, 2016b). The “Safe Motherhood Initiative” was launched in a Nairobi Conference by WHO and UNICEF in 1987 to improve the health of women and children around the world in an effort to achieve the Millennium Development Goal, four and five by reducing both maternal and infant mortality each by two-thirds by 2015 (Fathalla, 2017; UN, 2000). Efforts have been made by member states and international organizations to scale down maternal mortality rates but very little progress has been achieved especially in developing countries, particularly Sub-Saharan Africa (Hill et al., 2007; Kassebaum et al., 2014; South Africa Every Death Counts Writing Group, 2008). In most of these countries the available information is far less adequate to inform policy-makers to implement evidence-based practices which will scale down maternal deaths. Maternal

mortality is the most drastic of the consequences of unsafe obstetric practices, with lack of prenatal and postnatal care and unsafe fertility regulation have had significant contribution. Other, than mortality, there are other effects such as anemia, malnutrition and infections, which result to ill-health of mothers and children leading to widespread morbidity and suffering of women in the developing world. The most frequent causes of maternal deaths are: post-partum hemorrhages (often with anemia as an underlying or associated cause), sepsis and hypertensive disorders of pregnancy. Where maternity care is however readily available, the number of maternal deaths due to hemorrhage and toxemia can be sharply reduced. Maternal mortality is a major public health problem and continues to escalate in Kenya encouraging urgent decisions to be made at different levels of society. However, this will essentially require evidence-based strategies to inform policy-makers, healthcare workers and community members to reduce maternal mortality (Ameh et al., 2017; Say et al., 2014; Smith et al., 2017; UNFPA, 2014).

1.2 Problem statement

Globally, more than 287,000 women die each year from complications related to pregnancy and childbirth, majority in developing world. In other regions, maternal mortality adds up to 600,000 women each year in the world, this means that nearly every minute, at least one woman dies from complications of pregnancy and childbirth in the world. Sub-Saharan Africa (56%) and Southern Asia (29%) account for 85% of the global burden of maternal mortality (UNFPA, 2014; WHO, 2015d, 2016a). In Kenya, it is estimated that 488 women per 100,000 live births die as a result of childbirth sequel. This makes maternal death the leading cause of death among women of reproductive age and complications related to pregnancy and childbirth are among the leading causes of morbidity and mortality of Kenyan women (KNBS; ORC Macro, 2010). This is reflected in the appraisal report that was released in May, 2012 by the “Working Group” commissioned by WHO, UNICEF, UNFPA and the World Bank (2012) to assess individual country’s performance towards achieving the Millennium Development Goal

5 entitled “Trends in maternal mortality: 1990 to 2010. The report showed eleven countries where Kenya is included as making insufficient progress (WHO, UNICEF, UNFPA, & The World Bank, 2012). Again, this is indeed supported by maternal mortality rate of 414 per 100,000 live births by 2003 (Central Bureau of statistics, 2004) and five years later, a maternal mortality of 488 per 100,000 live births (KNBS; ORC Macro, 2010). This is in spite of the efforts made by the government towards scaling down maternal mortality to 170 per 100,000. The question is: “Why is the country not making significant progress towards curbing maternal mortality?” Bearing in mind that the International Conference on Safe Motherhood Initiative was launched here in Nairobi, in 1987 and the strategies which the conference recommended on maternal and reproductive and infant health were implemented. Further to this, the African Commission on reproductive health in which Kenya was a signatory to its implementation and the Kenya Vision 2030 does not seem to bear fruits in spearheading reduction in maternal death. This is a reflection that most countries in Sub-Saharan Africa where Kenya is included have not addressed policy issues, even where the policies have been shown to have significant influence on maternal mortality, mortality has not reduced (GOK, 2007; Kassebaum et al., 2014; WHO, 2015d).

A report by JICA (2008) estimated maternal mortality in Kisii of about 500 deaths per 100,000 live births, way above the national average. Maternal deaths are on the increase which requires comprehensive information to establish their determinants. This is what the study aimed at establishing (JICA; HANDS, 2008).

1.3 Justification

In Kenya, about 80% of maternal deaths are due to causes that are directly related to pregnancy and childbirth. The five major direct causes of maternal death; are hemorrhage, sepsis, hypertensive disorders, prolonged or obstructed labor, and unsafe abortion (NRC, 2000). Most of these conditions could be prevented with proper medical

monitoring, information and services. Understanding the causes and correlates of maternal mortality is crucial in confronting the challenge of unyielding high rates of maternal deaths. The trend of maternal mortality in Kenya is on the increase as shown by Kenya Demographic Health Survey (2008/09) which had 488/100,000 despite of efforts being made by the Government to scale it down. In Kisii, maternal mortality rate of 500 per 100,000 live births; again is way beyond the national average(JICA; HANDS, 2008; KNBS; ORC Macro, 2010). There is compelling evidence that the health of women of reproductive age in Kisii is poor and threatened with premature death, impacting negatively on the socio-economic status of the community, besides endangering the family's social fabrics. Orphaned children are often socially disadvantaged, vulnerable to malnutrition, poverty, ill-health, and even with impending death as a consequence of maternal death. This require urgent action, furthermore no further studies have been done in the area apart from that of JICA & HANDS (2008). This formed the basis for undertaking the study.

There are a number of complex issues surrounding maternal death that justify an in-depth investigation from individuals, community and possibly institutional level that need to be highlighted to make pregnancy and childbirth safe and wanted. Information gotten will inform individuals, community members, healthcare workers, and policy-makers of health system to re-position themselves and formulate useful strategies that can scale down maternal mortality.

1.4 Research Questions

- i. What are the health outcomes associated with pregnancy and childbirth among women of reproductive age seeking for obstetric care at Kisii Level 5 Hospital?
- ii. What are the individual level factors associated with maternal mortality among women seeking for obstetric care at Kisii Level 5 Hospital?

- iii. What are the facility level factors that are associated with maternal mortality among women of reproductive age seeking for obstetric care?
- iv. What are community level factors that are associated with maternal mortality?
- v. Which complications are associated with maternal mortality?

1.5 Objectives

1.5.1 General Objective

To determine factors contributing to maternal mortality among women of reproductive age seeking for obstetric services at Kisii Level 5 Hospital, from January 2009 to June 2010,

1.5.2 Specific Objectives

- i. To determine the outcomes of pregnancy and childbirth complications associated with maternal mortality at Kisii Level 5 Hospital from January 2009 to June 2010.
- ii. To determine the individual level factors associated with maternal mortality.
- iii. To determine facility level factors associated with maternal mortality.
- iv. To determine community level factors associated with maternal mortality
- v. To determine complications associated with maternal mortality.

1.6 Assumptions

- i. Records pertaining information on maternal mortality are available.
- ii. Health workers, family members and relatives will give useful and truthful information on the deceased subjects.

1.7 Conceptual and theoretical framework

Many mothers die either at home or even in the hospital as a result of pregnancy and childbirth-related complications. In the community there are factors that have a direct impact to maternal mortality which include; community structures (inadequate health institutions), socio-cultural milieu (how pregnancy is perceived in the cultural context), decision making process (e.g. person responsible for making decision regarding hospitalization), traditional versus conventional medicine (when persons are confronted with health problems where to they go to, or whom to the consult), transport network (availability of vehicles, passable roads and distance to be covered to the nearest health facility), are some of the factors which may impact on maternal mortality.

The pregnant women who get to the hospital may have risk factors which predispose them to health crisis. The hospital has its own limitations as a result of multifactorial problems which include; infrastructures (limited bed capacity and other supportive services), equipment and supplies (shortage of essential equipments and supplies for emergency obstetric care i.e. equipped theatre with anaesthetic drugs including oxygen, availability of blood for transfusion), and personnel (currently, health sector is faced with manpower crisis).The community itself may often have its own socio-cultural problems, such as reluctance to use the services of the healthcare workers versus those of traditional birth attendant, and communication problems. All these may have an impact on maternal mortality and morbidity. The pre-hospital, hospital and woman factors are independent variables while maternal mortality are dependent variable (figure 1.1).

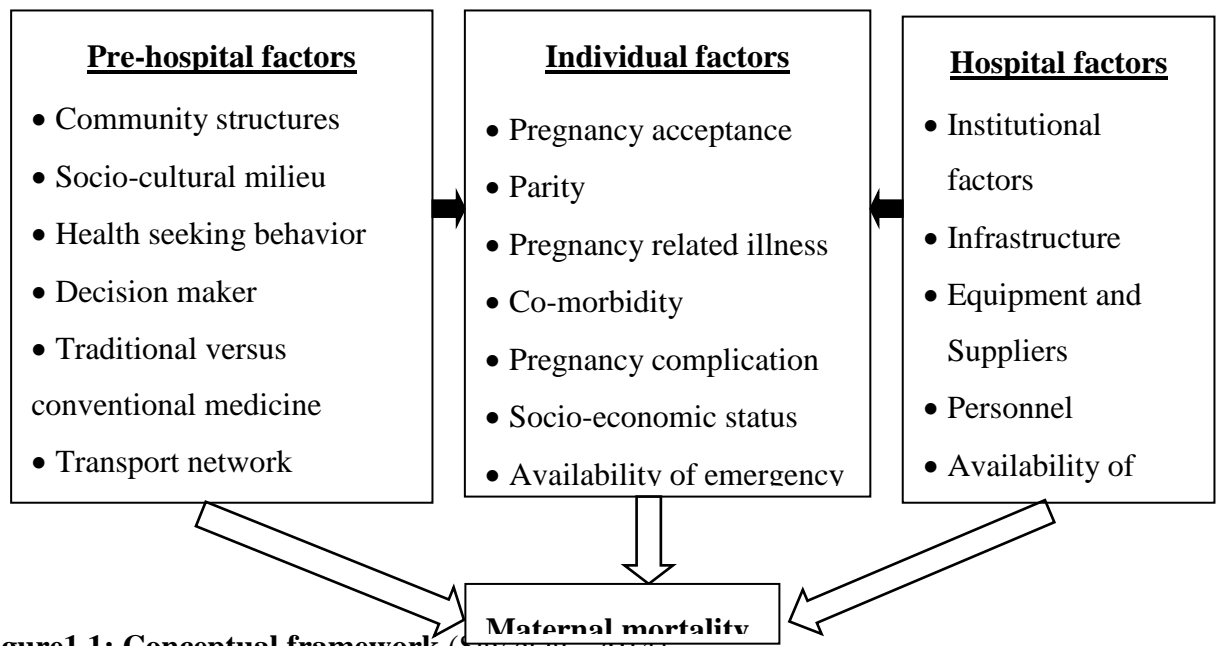


Figure 1.1: Conceptual framework (Say et al., 2014)

CHAPTER TWO

LITERATURE REVIEW

2.1 Maternal deaths among women of reproductive age

In 2000, the millennium development goals (MDGs) were launched, of which the fifth millennium aimed at reducing maternal mortality by two thirds by the year 2015 (was launched including other seven by WHOM, UNICEF, UNFPA and the World Bank). Globally, an estimated 287,000 maternal deaths occurred in 2010, with sub-Saharan Africa and South Asia accounting for nearly 85% of the global burden (Fathalla, 2017; WHO, 2015d). However, most developing countries in Sub-Saharan Africa, including Kenya, are far from achieving this goal. For instance, in Kenya (2008), there was an estimated 488 maternal deaths per 100 000 live births (KNBS; ORC Macro, 2010) and an estimated risk of maternal death of 1 in 19 (Pearson, deBernis, & Shoo, 2009; Ronsmans & Graham, 2006). However, causes of maternal mortality in the population as a whole remain relatively unknown. Indeed, while data estimating the levels of maternal mortality at a national level has been available, there has been paucity of data to study pregnancy related illness at a national level. As a consequence, this has not only led to negligence in studying complications related to childbirth Hardee et al., 2012 but also to a “measurement trap” related to limited measurement techniques to facilitate data collection (Graham & Campbell, 1992; Sadana, 2000)

Existing studies in developing countries have used various data sources to measure incidence and prevalence of maternal morbidity. This has included hospital-based case review (Pearson et al., 2009; Ronsmans & Graham, 2006); community based surveys (Adomako et al., 2016; Lassi, Kumar, & Bhutta, 2016; Mohammed, Elnour, Mohammed, Ahmed, & Abdelfattah, 2011; Say et al., 2014) and population-based studies (Filippi, Chou, Ronsmans, Graham, & Say, 2016; Lozano et al., 2012) including DHS national surveys (Souza, Parpinelli, Amaral, & Cecatti, 2008). Other studies have

used a combination of two data sources: hospital data and cross-sectional data (Vallely, Ahmed, & Murray, 2005). Data collection has used two main techniques to collect data: self-reported symptoms and medical diagnoses for hospital-based surveys. Self-reports have been based on direct questioning about symptoms of complications experienced during a recent or current pregnancy while the medical examination technique has been based on medical diagnosis including clinical and laboratory testing. The former technique has been used in cross-sectional studies and the latter in hospital-based studies. While hospital-based surveys have been advantageous as compared to population based surveys since data can be collected at multiple time points (Marcano Belisario et al., 2014), the main drawback has been the fact that estimated indicators do not reflect the true magnitude of the problem (Bhatia & Cleland, 1995) since in most developing countries a large proportion of women deliver at home.

The high rate of maternal mortality is a reality whereby, nearly eight million women globally suffer from complications of pregnancy and childbirth and approximately 600,000 women die while giving birth annually (Ambreen, Khurshid, Intasar, Khurshid, & Anwar, 2015; Jayaratne, Perera, Jayathilaka, & Agampodi, 2015; WHO, 2016a, 2017b). Globally, there is a glaring disparity between nations with developing countries taking the heaviest burden of maternal mortality. In Sub-Saharan Africa, women have a one in 22 life-time risk of dying in either pregnancy or childbirth compared to a one in 7,300 risk for women in industrialized nations (Africa Progress Panel; WHO, 2010; Lewis, 2008). However, efforts have been made by member states and international organizations to scale down maternal mortality rates and improve the health of women and children around the world in an effort to achieve the Millennium Development Goal, four and five by two-thirds by 2015 (Lozano et al., 2011; Rosenfield, Maine, & Freedman, 2006).

In developed regions with a well-developed health care system, maternal mortality rate is estimated to be 15-22 per 100,000 live births. In most developing countries the

available information is far less adequate (Jayaratne et al., 2015; WHO, 2016a). Maternal mortality has decreased throughout the world, with the sharpest decline in developed countries where maternal mortality rates are already low (15-22 per 100,000 live births). For instance, from 1960-1975 the average decline in annual maternal mortality in both Australia and Japan was 9% while in Middle and South America the decline was only 4%. Maternal mortality is the most drastic of the consequences of unsafe obstetric practices, with lack of prenatal and postnatal care and unsafe fertility regulation have had significant contribution (WHO, 2014b). Other, than mortality, there are other effects such as anemia, malnutrition and infections, which result to ill-health of mothers and children leading to widespread morbidity and suffering of women in the developing world (Filippi et al., 2016; Say et al., 2014)

The most frequent causes of maternal deaths are: post-partum hemorrhages (often with anemia as an underlying or associated cause), sepsis and hypertensive disorders of pregnancy. Where maternity care is however readily available, the number of maternal deaths due to hemorrhage and toxemia can be sharply reduced. In both Mexico and Sri Lanka, as in most other developing countries, hemorrhage remains an important cause of death. The numbers due to sepsis have declined as well. In the Netherlands, for example, this cause of death has completely disappeared. It is apparent that while the major causes of maternal death are generally the same throughout the world, the relative magnitude varies considerably (Filippi et al., 2016; WHO, 2017b)

Maternal mortality is a major public health problem in Kenya with a rise from 414 mortalities per 100,000 live births in 2003) to 488 per 100,000 live births in 2008/9, five years later (Central Bureau of statistics, 2004; KNBS; ORC Macro, 2010). These figures suggest that the health status of women of reproductive age has been deteriorating and threatened over the years. This is a worrying scenario, taking into consideration that “Safe motherhood Initiative” conference was launched in Nairobi by WHO and UNICEF in 1987 in which a very powerful statement was made that WHO- member

countries should implement strategies to scale down maternal mortality and morbidity in an effort to make every pregnancy safe and wanted. This was and has been the spirit of every member country including Kenya in attempting to put in place cost- effective strategies to address maternal mortality (Fathalla, 2017; Starrs, 2006).

The World Health Organization (WHO) maternal mortality is defined as death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to- or aggravated by- the pregnancy or its management, but not from accidental or incidental causes (WHO, 2016b). This WHO definition also distinguishes between the "direct obstetric" causes, resulting from natural obstetric complications or from obstetric interventions, and the "indirect obstetric" causes, resulting from previously existing diseases, or diseases that have developed during pregnancy independently from obstetric causes. Special provision for the ICD-10 for HIV/AIDS is made as well as obstetrical tetanus (normally coded among the infectious and parasitic diseases), and recommends to include them among the maternal deaths. In theory, HIV/AIDS should be included in the "indirect cause" category, and the obstetrical tetanus in the "direct cause" category, but this is not explicit in the ICD-10. According to the ICD-10 manual direct causes and indirect causes are published separately; however this is rarely done in practice in demographic surveys, or more generally in developing countries, except when the sources of data are medical certificates or special hospital investigations. The strict application of the WHO definition sometimes appears problematic, when highly lethal conditions, such as HIV/AIDS, tuberculosis or acute hepatitis, cause the death of a woman during the maternal period (Filippi et al., 2016; WHO, 2015a). The important consideration is; would the death have occurred at that time if the woman had not been pregnant or delivering?

In demographic censuses and surveys, when causes of death are not available, the practice is to include all deaths as during the maternal risk period as maternal mortality.

The ICD-10 refers to maternal mortality, as "Pregnancy-related deaths" to "all deaths of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death" (WHO, 2015a).

There are other factors which may or may not be included for example; the United Kingdom Confidential Enquiry into Maternal Deaths (UKMD) also classifies most deaths from suicide as indirect deaths as they were usually due to puerperal mental illness, although this is not recognized in the ICD coding of such deaths. In the USA, however, deaths from suicide during or in the year after the end of pregnancy are coded as being caused by pregnancy only if the relationship between pregnancy and the death is explicitly stated on the death certificate, for instance death due to postpartum depression (Priya Agrawal, 2015).

2.2 Prevalence of maternal mortality and morbidity in developed and developing Countries

Maternal mortality is regarded as a public health hazard and is a measure of the standard of health care of a given society. Statistics show that maternal mortality represents one of the most glaring gaps between the developed and developing countries, with 98% of all maternal deaths occurring in developing countries (WHO, 2014). In developed countries, there are approximately 27 maternal deaths per 100,000 live births each year. In developing countries, the average is 18 times higher at 480 deaths per 100,000 live births as shown in figure 3. In some developing countries, one woman in 10 dies from a pregnancy-related cause, while in industrialized countries; the chances are 1 in 400. Generally, each year, close to 600,000 women, more than one every minute die from complications related to pregnancy and child birth (WHO, 2014b, 2018). Overall each year close to 600,000 women die from complications related to pregnancy and childbirth. This is more than one death per minute (WHO, 2017b). Nevertheless, some DHS programs have integrated questions in the individual women questionnaire that has helped in assessing prevalence of maternal morbidity in various developing countries.

In the last two decades there has been growing understanding within the international community that increased efforts are needed to improve maternal health if progress is to be made in reducing maternal morbidity and mortality (Darmstadt et al., 2013; Moran, Naidoo, & Moodley, 2015; Temmerman et al., 2015). Globally, maternal morbidities occur more frequently than maternal death and they are the leading cause of maternal death and disability in developing countries (Zahr, 2003). Reports by USAID, (2015) indicate that over 350 women per 100 000 live births die of preventable maternal deaths more than 8 million women suffer pregnancy and childbirth related complications every year in the developing world.

Over the decades, reduction in maternal mortality has been witnessed in developed countries. It received national and global attention in developing countries in 1987, when the first international conference on ‘Safe Motherhood Initiative’ was launched in Nairobi, Kenya by WHO, UNICEF, UNFPA, The World Bank and other stakeholders (Starrs, 2006). Countries came up with a common stand of implementing strategies to scale down maternal mortality. Despite concerted efforts by these international organizations, governments, and NGOs, maternal mortality figures are rising in most developing countries, a typical example being Nigeria and Kenya where the most recent reports show a rising trend and unacceptably high maternal mortality figures of between 400 to over 600 deaths per 100,000 live births (Aboyeji, Ijaiya, & Fawole, 2007; Achem & Agboghroma, 2014; Okaro et al., 2001; Olatunji & Sule-Odu, 2001; WHO, 2015d)

Maternal mortality represents one of the widest health gaps between developed and developing nations, with 99% of all maternal deaths occurring in developing countries. That less than 1% of maternal deaths worldwide occur in developed countries indicates that maternal deaths could be avoided if proper health resources and services were available to women in developing countries. Almost two-thirds of pregnancy- related deaths occur after delivery (61%) in comparison to 24% during pregnancy and 16% during delivery . Over 42% of the 129 million women worldwide who give birth

annually experience some complications during pregnancy. Approximately 15% of these women develop potentially life-threatening complications, which include chronic pain, impaired mobility, damage to the reproductive system and infertility. In developing countries, pregnancy and complications arising from childbirth account for 18 percent of disease among females of reproductive age. Maternal mortality is a major cause of death among women of reproductive age in the developing world, especially in sub-Saharan Africa (Hardee et al., 2012; Hill et al., 2007; Jayaratne et al., 2015; Lewis, 2008; WHO, 2015d). Estimates of maternal mortality levels and trends are, however, uncertain because vital registration systems are incomplete in the most affected countries (Hogan et al., 2010). Most estimates for sub-Saharan countries, in particular, are obtained from so-called ‘sisterhood methods’ using data collected during adult mortality surveys (Filippi et al., 2016; Merdad et al., 2013; Trussell & Rodríguez, 2015).

Literatur reviewd showed that the MMR in developing regions (230) was 14 times higher than in developed regions which had (16). MMR is considered to be high if it is ≥ 300 –499 maternal deaths per 100 000 live births and extremely high if it is ≥ 1000 maternal deaths per 100 000 live births. While none of the MDG regions had extremely high MMR, Sub-Saharan Africa was the only MDG developing region with very high MMR (510), it accounted for 62% (179 000) of global deaths followed by Southern Asia at 24% (69 000). The adult lifetime risk of maternal mortality in women from Sub-Saharan Africa was the highest at 1 in 38, in sharp contrast to 1 in 3700 among women in developed countries. At the country level, the two countries that accounted for one third of all global maternal deaths are India at 17% (50 000) and Nigeria at 14% (40 000). The global MMR in 2013 was 210 maternal deaths per 100 000 live births, down from 380 maternal deaths per 100 000 live births in 1990. The MMR in developing regions (230) was 14 times higher than in developed regions (16). Sub-Saharan Africa has the highest regional MMR (510). Of the remaining MDG developing regions, five had low MMR: Eastern Asia (33); Caucasus and Central Asia (39); Northern Africa

(69); Western Asia (74); and Latin America and the Caribbean (85). Three had moderate MMR: South-eastern Asia (140); Southern Asia (190); and Oceania (190).

Sierra Leone is estimated to have the highest MMR at 1100. A further 15 countries (all in Sub-Saharan Africa) had very high MMR: Chad (980); Central African Republic (880); Somalia (850); Burundi (740); Democratic Republic of the Congo (730); South Sudan (730); Cote d'Ivoire (720); Guinea (650); Liberia (640); Niger (630); Cameroon (590); Guinea-Bissau (560); Nigeria (560); Mali (550); Malawi (510); and Kenya (500). Only two countries outside the sub-Saharan African region had high MMR: Afghanistan (400) and Haiti (380). In contrast, Cape Verde and Mauritius were the only two Sub-Saharan African countries that had low MMR at 53 and 73, respectively. Regarding the likelihood that an adult woman will die from maternal causes, Chad and Somalia had the highest lifetime risks at 1 in 15 and 1 in 18, respectively. The estimated lifetime risk for maternal mortality in high-income countries is 1 in 3400 in comparison to low-income countries where the risk is 1 in 52 (Jayaratne et al., 2015; Kassebaum et al., 2014; Lozano et al., 2011; Ronsmans & Graham, 2006; WHO, 2014b, 2015e, 2016b, 2017b, 2018).

Within the Sub-Saharan Africa, maternal deaths accounted for 6800 (91%) of the 7500 attributed to acquired immunodeficiency syndrome (AIDS) worldwide. The proportion of maternal deaths attributed to AIDS in Sub-Saharan Africa was 3.8%. Though the MDG regional aggregated proportions of maternal deaths attributed to AIDS were relatively small, they were substantial for countries with high HIV prevalence. Thirteen countries had a proportion of maternal deaths attributed to AIDS of 10% or more (WHO et al., 2012)

2.3 Causes of maternal mortality and morbidity

80% of of maternal deaths cases in Africa are mainly caused by obstetric hemorrhage, puerperal sepsis, pregnancy-induced hypertension (including eclampsia), obstructed labor and ruptured uterus, and complications of unsafe abortion (Ambreen et al., 2015;

Jayaratne et al., 2015; South Africa Every Death Counts Writing Group, 2008; WHO, 2017b). Three causes—hemorrhage, sepsis, and eclampsia—account for a vast majority of deaths, considering that even some cases of abortion or obstructed labor eventually succumb to either bleeding or sepsis. Indirect causes account for 20 to 25 percent of maternal deaths and are attributable to illnesses aggravated by pregnancy (Ambreen et al., 2015; Souza et al., 2008; Vallely et al., 2005). They include anemia; malaria; HIV/AIDS; diseases of the heart, lung, liver, or kidneys; and ectopic pregnancies. Physical violence and accidents are not included in this group. HIV has also contributed to 10% of maternal mortality. Out of the estimated 19,000 maternal deaths due to HIV globally, Sub-Saharan Africa contributes to 17,000 (91%) deaths annually (Ameh et al., 2017; Filippi et al., 2016; Graham & Campbell, 1992; UNFPA, 2014).

Bertozzi et al., (2006) reports on growing HIV/AIDS pandemic in Eastern and South Africa as also having a severe impact on women's health. The report shows that there were about 5 million new HIV infections in 2003, of which 40 percent were among women and 20 percent among children. Again in Eastern and Southern Africa, between 20 and 30 percent of pregnant women are infected with HIV and available evidence indicates that HIV/AIDS currently accounts for at least 18% of maternal deaths (Rogo, Ocho, & Mwalali, 2006). Death in this case results from opportunistic infections, puerperal sepsis, meningitis, tuberculosis, pneumonia, post abortion sepsis, encephalitis, and probably malaria. All these conditions contribute significantly to maternal mortality (Kendall et al., 2014; Myer, 2013; Zaba et al., 2013).

Unsafe abortion deserves special mention in Africa, the only region where complications of abortion are the most common cause of maternal mortality. Globally, unsafe abortion accounts for about 13% of maternal deaths compared with 30 to 50% in Sub-Saharan Africa. Of the estimated 46 million induced abortions globally every year, about 20 million are considered unsafe. It is estimated that 95% of unsafe abortions occur in the developing world estimated that there were about 5 million induced abortions in Africa

annually, whereas Rogo (1993), considered the results of several DHS surveys, assessed that there were 1.5 million induced abortions, most of which were unsafe. The tragedy of abortion-related mortality in Africa is that most of the victims are teenagers (Aboyeji et al., 2007; National Coordinating Agency for Population and Development NCAPD & Division of Reproductive Health. Ministry of Health (MOH), 2005; Rogo et al., 2006; WHO, 2016a).

The unsafe abortion practices in Africa begin with unprotected sex among teenagers who are ill-informed about their sexuality lead to an unwanted or ill-timed pregnancy. The practice is prevalent in countries where induced abortions are legally restricted, as result the young victims resort to back street abortionists or quacks. Crude methods used in the pregnancy termination, delay in seeking medical attention when and if there is a problem, and the poor quality of post-abortion care lead to a significant proportion of the victims sustaining serious injuries with life-threatening complications, subsequent death or disability. For survivors the psychological impact is immense and lifelong (Rogo et al., 2006; Ronsmans & Graham, 2006). The risk of maternal mortality is high for adolescent girls under 15 years old. Complications in pregnancy and childbirth are the leading cause of death among adolescent girls in most developing countries (National Coordinating Agency for Population and Development NCAPD & Division of Reproductive Health. Ministry of Health (MOH), 2005; Temmerman et al., 2015; WHO, 2016a, 2017b). Women in developing countries have on average many more pregnancies than women in developed countries and their lifetime risk of death due to pregnancy is higher (Ronsmans & Graham, 2006). A woman's lifetime risk of maternal death-the probability that a 15 year old woman will eventually die from maternal cause is 1 in 150 in developing countries (Fathalla, 2017; WHO, 2015d).

Approximately 20% of maternal deaths arise from pre-existing conditions that are aggravated by pregnancy, such as anaemia which is one of the primary indirect causes. Malaria, hepatitis, heart disease and HIV/AIDS are also important. The risk of maternal

mortality increases with each successful pregnancy and shorter intervals between births also cause health risks to rise. Likewise, adolescent girls are less likely to obtain prenatal care and other related assistance, and more likely to suffer from pregnancy – related disorders and complications. Furthermore, women aged 15 to 19 years are twice as likely to die from pregnancy and childbirth related causes as women in their twenties, while women ages 10 to 14 years are five times more likely to die than women of ages 20 to 24 years. This is due to immaturity of their reproductive organs which cannot handle pregnancy and delivery at this tender age (UNFPA, 2014; WHO, 2008a, 2015d).

These women die as a result of complications during and following pregnancy and childbirth. Most of these complications may exist before pregnancy but are aggravated during pregnancy. The major complications that account for 80% of all maternal death are: severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (pre-eclampsia and eclampsia), and unsafe abortion. The remainder are caused by or associated with diseases such as Malaria and AIDS during pregnancy. Maternal and child mortality is the most drastic of the consequences of unsafe obstetric practices, lack of prenatal and postnatal care, inaccessibility of safe fertility regulation as well as the effect of anaemia, malnutrition and infection. These causes are also the basis of widespread morbidity and suffering of women in the developing world. The most frequent causes of maternal deaths are: postpartum haemorrhage (often with anaemia as an underlying or associated cause), sepsis and hypertension disorders related to pregnancy (Filippi et al., 2016; Lewis, 2008; WHO, 2017a). In most developing countries, haemorrhage remains an important cause of death. It is apparent that while the major causes of maternal death are generally the same throughout the world, the relative magnitude varies considerably (De Lourdes De Souza et al., 2013; Neal et al., 2016). Figure 2.2. show a summary of causes of maternal deaths in Kenya, the major ones are: severe bleeding (24%), infections (15%), unsafe abortions (13%), eclampsia (12%), obstructed labor (8%), other direct causes (8%) and

indirect causes (20%) (Ameh et al., 2017; Fathalla, 2017; Smith et al., 2017; UNFPA, 2014).

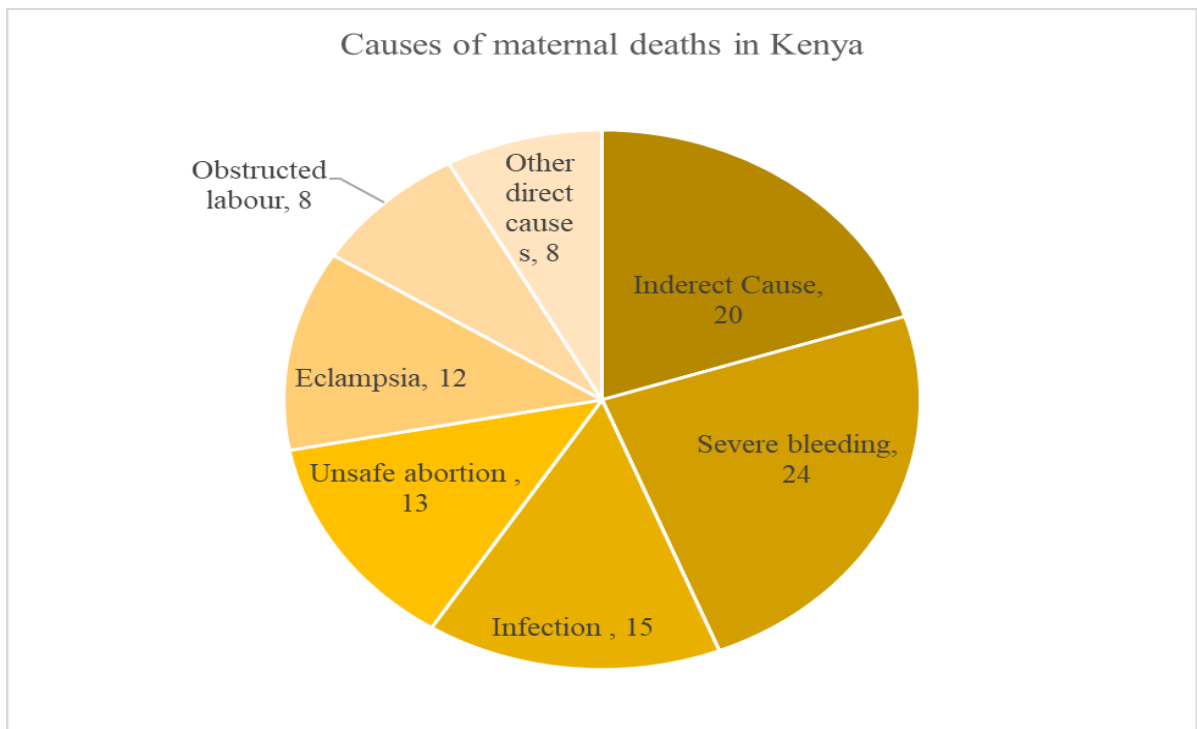


Figure 2.1: Leading Cause of maternal death in Kenya (NCPD, 2015).

Complications related to pregnancy are among the leading causes of morbidity and mortality of Kenyan women of childbearing age. Recent estimates suggest that there are 590 deaths per 100,000 live births, representing a 1 in 36 lifetime risk of dying from a maternal- related cause. Some Hospital based studies suggest that the majority of these deaths are due to obstetric complications including hemorrhage, sepsis, eclampsia and obstructed labour. Unsafe abortion practices alone are thought to cause at least a third of all maternal deaths. The remaining deaths are due to indirect causes, that is, the result of existing diseases aggravated by the physiological effects of pregnancy. Of these later

causes, anemia is amongst the most significant, although deaths from HIV/AIDS infection are becoming increasingly common (Myer, 2013; NCPD, 2015; Olatunji & Sule-Odu, 2001; UNFPA, 2014).

Maternal health and newborn health are closely linked. More than three million newborn babies die every year and an additional 2.6 million babies are stillborn (Darmstadt et al., 2013). The high number of maternal deaths in some areas of the world reflects inequities in access to health services, and highlights the gap between the rich and the poor (Ronsmans & Graham, 2006). Almost all maternal deaths (99%) occur in developing countries. More than half of these deaths occur in Sub-Saharan Africa and almost one third occur in South Asia. The maternal mortality ratio in developing countries is 240 per 100 000 births versus 16 per 100 000 in developed countries. There are large disparities between countries, with few countries having extremely high maternal mortality ratios of 1000 or more per 100 000 live births. There are also large disparities within countries, between people with high and low income and between people living in rural and urban areas (WHO, 2016a).

Women in developing countries have on average many more pregnancies than women in developed countries, and their lifetime risk of death due to pregnancy is higher. A woman's lifetime risk of maternal death – the probability that a 15 year old woman will eventually die from a maternal cause – is 1 in 3800 in developed countries, versus 1 in 150 in developing countries (Fathalla, 2017; Jayaratne et al., 2015).

Poor women in remote areas are the least likely to receive adequate health care. This is especially true for regions with low numbers of skilled health workers, such as Sub-Saharan Africa and South Asia. While levels of antenatal care have increased in many parts of the world during the past decade, only 46% of women in low-income countries benefit from skilled care during childbirth. This means that millions of births are not assisted by a midwife, a doctor or a trained nurse. In high-income countries, virtually all women have at least four antenatal care visits, are attended by a skilled health worker

during childbirth and receive postpartum care. In low-income countries, just over a third of all pregnant women have the recommended four antenatal care visits. Some factors that prevent women from receiving or seeking care during pregnancy and childbirth are: poverty, distance to the health facility, lack of information regarding safe and skilled delivery, inadequate services at the health institution and cultural practices (Ambreen et al., 2015; Merdad et al., 2013; WHO, 2016a).

However, different interactive factors may contribute to maternal morbidity and mortality. They include; the behavior of families and communities, social status, education, income, nutritional status, age, parity, and availability of health services. It is important to note that non-health sector activities, such as education, water and sanitation, roads and communication, agriculture, and internal security may also influence maternal outcome. In Sub-Saharan Africa, some of the highest MMRs have been recorded in countries that are in conflict or have large refugee populations, such as Angola and Sierra Leone (Rogo et al., 2006).

To improve maternal health, barriers that limit access to quality maternal health services must be identified and addressed at all levels of the health system (NCPD, 2015).

About 60% of the maternal deaths in Eritrea occur during childbirth and the immediate postpartum period; with 50% of these deaths occurring within the first 24 hours of delivery, while 16 percent occurring during pregnancy, 48 percent during childbirth, and 36 percent at postpartum period (Holzgreve, Greiner, & Schwidtal, 2012). This finding implies that the causes of the deaths in this critical period are either the result of labor or aggravated by labor and delivery. As noted earlier, the causes of maternal mortality have traditionally been classified as direct and indirect, although the distinction is not always easy to discern as they are closely linked with direct ones mostly pathogenic. Pathogenic causes are purely medical and therefore best determined by health professionals. Most of the information on pathogenic causes is derived from hospital studies; thus, data from health institutions will continue to be an important source of information for direct and

indirect causes of maternal deaths. Implicit is the need to educate health professionals on the ICD and provide updates whenever the ICD definition changes. As an example, the 10th revision of ICD has introduced a much broader definition of maternal death and has expanded on the categorization of the causes (WHO, 2015a). This makes analysis of trends increasingly difficult because data needs to be adjusted to accommodate the new definition in order to make them comparable with more recent data.

Availability and accuracy of data sources influence the study of causes and correlates. For instance, data from hospitals or health institutions are biased in accuracy and not representative in that medically certified deaths at these institutions involve only a small and selective fraction of total deaths. This limitation is greatest in Sub-Saharan Africa, where a large proportion of deliveries take place at home (AbouZahr, 2003; Aboyegi et al., 2007; Merdad et al., 2013)

2.4 Determinants of maternal mortality and morbidity

Determinants can be seen in terms of behavioural, community structures, healthcare institutional structures and co-morbidities which can impact on maternal mortality and morbidity. Available evidence indicates that there are several factors that predispose a woman to greater risk of maternal death. The common classification to the determinants of maternal morbidity and mortality is the biomedical classification. This is further explained by the seminal work by McCarthy and Maine (1992) which is credited with the conceptual model of analyzing determinants of maternal mortality that could be applied to research as well as programs. The concept grouped the determinants as: “distant or socio-economic factors; intermediate factors (health behavior and status, access to services, and unknown factors); outcomes (pregnancy, and the complications which subsequently lead to morbidity and mortality)”(McCarthy & Maine, 1992).

The McCarthy and Maine (1992) concept has since been modified, most notably by UNICEF (2012), into structural determinants of maternal health to facilitate strategic programming for maternal health (UNICEF, 2012). From the pediatric perspective, the

Mosley and Chen (2003) framework for the study of child survival in developing countries has also found, with various modifications, utility in the analysis of determinants of maternal morbidity and mortality. The original model proposed three levels of determinants of child mortality socioeconomic determinants, proximate and biological determinants, and outcomes expressed in terms of growth and death. Subsequent modifications have expanded the levels to five: household characteristics (behavioral), intermediate variables (behavioral and biological), risk factors (biological), malnutrition-infection syndrome, and demographic outcome (Mosley & Chen, 2003; Sartorius & Sartorius, 2014; WHO, 2015b). The Poverty Reduction Strategy approach developed by the World Bank and sector-wide approaches to the health sector have generated new interest for incorporating government policies and actions, within or outside the health sector, that focus on health outcomes. This has led to the review of previous models and introduced the macroeconomic evaluation of non-health sector policies that influence health (Naik et al., 2017; Vaillancourt, 2009).

These developments are relevant to maternal health and can be applied to generate a more comprehensive understanding of determinants and correlates of maternal health in Africa. The following modified framework by WHO (2015) is proposed as appropriate for discussing the correlates of maternal mortality in Africa: firstly, household and community characteristics (behavior, cultural-religious values, and income poverty) and secondly, biological-demographic variables and risk factors and thirdly, malnutrition-infection syndrome (including protein-energy malnutrition (PEM), micronutrient deficiencies, anemia, malaria, and HIV/AIDS), fourth, health systems and finally, health systems and national policies and related investments (health and non-health) (UNICEF, 2012; WHO, 2015b).

2.4.1 Household and Community Characteristics

Pregnancy outcome and maternal survival have strong correlations with household behavior and decision making. Enlightened communities value their mothers and seek

prompt attention at the earliest indication of problems. Low status of women in the household and society as a whole, as exemplified by inequality in education, employment, property ownership, participation, and decision making, is another important correlate to maternal mortality (Fawole & Adeoye, 2015). Gender-based violence is common in situations in which the status of women is low and legal protection inadequate, and in turn it is correlated with high rates of maternal mortality. Harmful traditional practices and religious beliefs also adversely affect maternal health. They vary from one ethnic group to another and cover a wide range of activities and practices; from the sexual or genitally linked ones, such as female genital cutting, to feeding and nutritional practices. In addition, a plethora of harmful beliefs and practices around pregnancy and childbirth affect health-seeking behavior during pregnancy and parturition. The disproportionately low use of health facilities for delivery care in societies where cultural habits are prevalent is testimony to the strength of these beliefs (Holzgreve et al., 2012).

Household poverty, allocation of resources, and the control of those resources also influence maternal mortality. Delivery of infants is not free of charge in many African countries. Indeed, it was never without cost in traditional societies either; it was often paid for in kind. Even in countries where delivery is declared to be free in public facilities, the cost of accessing care, both direct and indirect, can be prohibitive, quality notwithstanding. The relationship to poverty is bi-directional; complications of pregnancy are cited as one of the most common causes of household poverty (Pell et al., 2013; World Bank; WHO, 2005).

2.4.2 Biological-demographic variables and risk factors for women

Standard biological variables, such as age (too young), height (less than 5 feet), and parity (primipara= a woman who is pregnant for the first time and expecting her first child, and grand multipara= a woman who has had more than five previous pregnancies

both constitute risk factors), determine maternal mortality in Africa as elsewhere. In many countries of Sub-Saharan Africa, at least 50% or more of women will have started childbearing by age 19. Adolescents comprise about 20% of maternal deaths, most of which are due to complications of unsafe abortion. Early marriage and childbearing are associated with high parity and therefore higher risk of maternal death (Filippi et al., 2016; Holzgreve et al., 2012). Various indicators of maternal status during pregnancy and childbirth may also be predictors of maternal outcome, including edema, hypertension, and history of previous complications. Socio-demographic factors are correlates of maternal mortality. Marital status, first pregnancy, especially anatomical immaturity in adolescents and level of education are commonly cited (Brosens et al., 2017; Emelumadu et al., 2014; Palmsten, Buka, & Michels, 2010; Ramos et al., 2017; Zanette et al., 2014).

2.4.3 Malaria and HIV Infections

Malaria remains a major killer of women in pregnancy and a leading indirect cause of maternal mortality. There are effective interventions, such as intermittent preventive treatment and insecticide-treated bed nets that are affordable but often not available where they are most needed. The changing complexities of malaria chemotherapy and the rising cost of newer, more effective combinations pose new challenges, including safety in pregnancy (Bailey et al., 2015; McGready et al., 2012; Singh, Moran, Story, Bailey, & Chavane, 2014).

HIV/AIDS and its effect on maternal outcomes in Africa are grossly underreported. HIV is not regarded as a primary cause of death unless AIDS is diagnosed. A study in South Africa reported a 25% increase in seropositivity, from 50 to 75% between 1997–99 and 2000, in maternal deaths due to non–pregnancy-related sepsis in Pretoria. HIV infection in pregnancy is also associated with anemia and severe malaria infections (Moodley, 2003; Moran et al., 2015; National Committee on Confidential Enquiries into Maternal Deaths in South Africa, 2014).

2.4.4 Malnutrition

Both Protein Energy Malnutrition (PEM) and micronutrient deficiencies are prevalent in poverty stricken African women. Pregnancy aggravates the situation and increases vulnerability to any concurrent condition or opportunistic infection. Maternal anemia, however mild, also increases several-fold the risk of life-threatening postpartum hemorrhage (Christian, Mullany, Hurley, Katz, & Black, 2015; Rush, 2000)

2.4.5 Health Systems and its impact on maternal health

Poorly financed and unaccountable health systems, including weak referral systems, are a key determinant of maternal outcome. Another determinant is poor access to quality maternal health care services because of geographical terrain and poor roads. Maternal health care services are deemed to be of poor quality if, for example, they lack skilled health providers, the providers have negative attitudes, treatment guidelines and protocols are inappropriate, and they lack essential drugs, equipment, and supplies. A low health personnel-to-population ratio is a chronic issue in Sub-Saharan Africa. For instance, the health personnel-to-population ratio in Sub-Saharan Africa is reported as 1:23,540, ranging from 1:750 in South Africa to 1:72,000 in Rwanda. For nurses, the Sub-Saharan African health personnel-to-population ratio is 1:3,460, ranging from 1:600 in Zambia to 1:5,470 in Tanzania (Jamison et al., 2006).

Given that skilled birth attendants working within a supportive health system are the most important factor in keeping women healthy and safe in pregnancy, their inadequate numbers and distribution of human resources are major underlying causes of maternal mortality. Although skilled attendants at delivery increased significantly in the developing world as a whole, from 41 % in 1990 to 57 % in 2003, the greatest increase was in Southeast Asia and North Africa and the least in Sub-Saharan Africa (WHO, 2015d). A recent WHO (2018) report indicates an average of 45% in the Africa region, implying no change from the 1990 global average (WHO, 2018).

Although there is no specific comparative rate, in its global estimates on births attended by skilled personnel, reported 46.2% for Africa with the lowest rates in East and West Africa (32.5% and 39.7% respectively). Lack of or poorly functioning health management information systems with an ineffective feedback loop as well as weak supervision are further challenges influencing the quality of maternal services and MMRs (WHO, 2016b).

2.4.6 National policies and investments in maternal health

For any program or strategy on maternal health and safe motherhood to succeed, it must have the support of the highest level of national authority. Such support facilitates the allocation of adequate financial and human resources; improves the infrastructure and communications; and puts in place effective and implementable standards, policies, and protocols. Most countries in Sub-Saharan Africa have not addressed policy issues, even where the policies have been shown to have significant influence on maternal mortality. Romania provides the best example for the developing world of the impact of change in policy. In the 1950s and early 1960s, the law provided for access to abortion and was associated with relatively low mortality ratios. The restrictions on abortion that followed were associated with significant increase in the MMR in the 1980s. Immediately after the December 1989 revolution that overthrew President Nicolae Ceauescu, restrictions on contraceptives were removed and abortion legalized with a subsequent precipitous drop in abortion-related mortality, and MMR (Jamison et al., 2006). In this case, changing the abortion policy reduced maternal mortality by more than half in less than 10 years. In most Sub-Saharan African countries including Kenya, however, despite many international pronouncements, high-level support for maternal health and measures to reduce maternal mortality and unsafe abortion is weak or nonexistent. Therefore, by changing the underlying policy-related causes, Sub-Saharan African countries have the potential of achieving reductions in maternal mortality (WHO, 2015d; Zureick-Brown et al., 2013)

Inadequate financing and sustainability of the health sector in general and of reproductive health in particular, are other barriers. In most African countries, health expenditures have not increased commensurate to population increase while major problems in allocation efficiency and inequities still exist (Azétsop & Ochieng, 2015). With various competing priorities for a dwindling financial resource base, the health sector needs to lobby and reclaim its rightful share. Moreover, given the inadequate investment, the number of health personnel trained is often small, and once trained, immigrate to developed countries to earn a better living. This essentially makes their highly needed services inaccessible to the vulnerable women (Basu, Andrews, Kishore, Panjabi, & Stuckler, 2012).

2.5 Key facts regarding maternal mortality

An estimated 358,000 women died globally in 2008 as a result of pregnancy-related conditions. Although maternal mortality rates remain elevated in many areas, it decreased from approximately 526,000 pregnancy-related deaths globally in 1980 to 287,000 in 2010 (AbouZahr, 2003; WHO et al., 2012).

Declines in maternal mortality have been associated with improved access to education, higher incomes, increased availability of skilled birth attendants, and decreased pregnancy rates (AbouZahr, 2003).

Many studies report an increase in maternal mortality ratios in the United States: improved identification of pregnancy related deaths and changes in coding and classification may account for most of this rise (Filippi et al., 2016; WHO, 2015d).

In Sub-Saharan Africa, a number of countries have halved their levels of maternal mortality since 1990. In other regions, including Asia and North Africa, even greater headway has been made. However, between 1990 and 2010, the global maternal mortality ratio (that is the number of maternal deaths per 100 000 live births) declined by only 3.1% per year. This is far from the annual decline of 5.5% (WHO, 2015d).

However, increases in maternal age, body mass index, and co-morbidities have increased and may also account for part of this rise. Every day, approximately 800 women die from preventable causes related to pregnancy and childbirth; 99% of all maternal deaths occur in developing countries, maternal mortality is higher in women living in rural areas and among poorer communities, young adolescents face a higher risk of complications and death as a result of pregnancy than older women, skilled care before, during and after childbirth can save the lives of women and newborn babies (WHO, 2018).

Rates of maternal mortality are difficult to measure accurately. Deaths as a result of pregnancy or childbirth may not be captured in general purpose surveys or those with small sample sizes. Furthermore, maternal deaths may be underreported in countries that lack good administrative statistics or where many births take place outside of the formal health system (AbouZahr, 2003; Filippi et al., 2016).

Globally, it is estimated that around 70% of the world's poor are women; their health is often adversely affected by gender inequities that continue to divide many of the world's poorest countries. The level of avoidable sickness and death among poor women remains enormous. Over one third of the years of healthy life lost by women in developing countries are caused by reproductive health problems, especially those related to pregnancy and sexually transmitted diseases (Temmerman et al., 2015).

Between 1990 and 2010, maternal mortality worldwide dropped by almost 50%. However, maternal mortality is and has been unacceptably high, whereby about 800 women die from pregnancy- or childbirth-related complications around the world every day (Fawole & Adeoye, 2015; WHO, 2015d).

The high number of maternal deaths in some areas of the world reflects inequities in access to health services and highlights the gap between the rich and poor. Most maternal deaths occur in sub-Saharan Africa and almost one third occur in South Asia. The maternal mortality ratio in developing countries is 240 per 100,000 births versus 16

per 100,000 in developed countries. There are large disparities within countries, between people with high and low income and between people living in rural and urban areas (WHO et al., 2012). In 2010, 287 000 women died during and following pregnancy and childbirth. Almost all of these deaths occurred in low-resource settings, and most could have been prevented (WHO, 2018).

Globally, there were an estimated 289 000 maternal deaths in 2013, a decline of 45% from 1990. Developing countries account for 99% (286 000) of the global maternal deaths with Sub-Saharan Africa region alone accounting for 62% (179 000) followed by Southern Asia (69 000). Oceania is the region with the fewest maternal deaths at 510 (WHO et al., 2012).

2.6 Progress towards improving maternal health

Improving maternal health is one of the eight Millennium Development Goals (MDGs) adopted by the international community in 2000. Under MDG5, countries committed to reducing maternal mortality by three quarters between 1990 and 2015. Since 1990, maternal deaths worldwide have dropped by 47%. In Sub-Saharan Africa, maternal mortality has dropped by 41% in 20 years for the first time. The 1990 rates of 850 deaths per 100,000 live births declined to a regional average of 500 deaths per 100,000 live births by 2010. In other regions, including Asia and North Africa, even greater headway has been made. However, between 1990 and 2010, the global maternal mortality ratio thus, the number of maternal deaths per 100,000 live births declined by only 3.1% per year. This is far from annual decline of 5.5% required to achieve MDG5 (Ambreen et al., 2015; Lozano et al., 2011; Rosenfield et al., 2006; UN, 2000; WHO et al., 2012). A number of initiatives that commenced geared towards improving maternal health, most notably the launch of:

The Global Strategy for Women's, and Children's Health in 2010 by the United Nations (UN) Secretary-General. Subsequently, the high-level Commission on Information and Accountability for Women's and Children's Health was established to "determine the

most effective international institutional arrangements for global reporting, oversight and accountability on women's and children's health." One of the ten recommendations of the commission was specific to improving measurement of maternal (and child) deaths. This recommendation required that "by 2015, all countries have taken significant steps to establish a system for registration of births, deaths and causes of death, and have well-functioning health information systems that combine data from facilities, administrative sources and surveys"(Kassebaum et al., 2014; WHO, 2016a).

The first report of the independent Expert Review Group (iERG) established that reducing maternal mortality ratio (MMR) remains a challenge. Less than 40% of countries have a complete civil registration system with good attribution of cause of death, which is necessary for the accurate measurement of maternal mortality (WHO et al., 2012).

Additionally, successful strategies and policies related to safer motherhood, neonatal health, nutrition and gender are anchored in the principles of human rights. Improving the availability and quality of maternal death reviews provides an important tool for capturing maternal deaths, contributing to better estimates of maternal mortality, while also helping to initiate necessary actions to prevent deaths. WHO, UNICEF, UNFPA and The World Bank (2010) commissioned a committee to undertake a study on trends of maternal mortality and make the necessary recommendations. They finalized their recommendations that suggested that "by 2015, all countries would have taken significant steps to establish a system for registration of births, deaths and causes of death, and have well-functioning health information systems that combine data from facilities, administrative sources and surveys". Considering that only a third of countries are characterized as having a complete civil registration system with good attribution of cause of death, it is imperative that countries with incomplete civil registration systems take steps to strengthen those systems. This will tremendously improve the estimation of maternal mortality and monitoring of maternal health. This is to achieve two targets

thus; reducing maternal mortality ratio (MMR), and achieving universal access to reproductive health by 2015 (WHO, 2015d; WHO et al., 2012).

Globally, an estimated 287 000 maternal deaths occurred in 2010, a decline of 47% from levels in 1990. Sub-Saharan Africa (56%) and Southern Asia (29%) accounted for 85% of the global burden (245 000 maternal deaths) in 2010. At the country level, two countries account for a third of global maternal deaths: India at 19% (56 000) and Nigeria at 14% (40 000). The global MMR in 2010 was 210 maternal deaths per 100 000 live births, down from 400 maternal deaths per 100 000 live births in 1990. The MMR in developing regions (240) was 15 times higher than in developed regions (Hill et al., 2007; Hogan et al., 2010; WHO, 2015d).

Sub-Saharan Africa had the highest MMR at 500 maternal deaths per 100 000 live births, while Eastern Asia had the lowest among MDG developing regions, at 37 maternal deaths per 100 000 live births. The MMRs of the remaining MDG developing regions, in descending order of maternal deaths per 100 000 live births are Southern Asia (220), Oceania (200), South-eastern Asia (150), Latin America and the Caribbean (80), Northern Africa (78), Western Asia (71) and the Caucasus and Central Asia (46) (Filippi et al., 2016; WHO, 2015d).

In spite of slow progress in scaling down maternal mortality globally, there seems to be significant improvement in maternal health as well as reduction in maternal deaths. In over twenty years, the past 5 years has witnessed the biggest decline in women dying from pregnancy and childbirth-related complications. From 1990 to 1995, maternal death rate dropped slightly from 850 to 820 deaths per 100,000 live births. However, from 1995 to 2000, the decrease was greater, from 820 to 740 deaths per 100,000 live births. Again, from 2000 to 2005, the rate reduced by a further 110 per 100,000 live births. These rates did not affect East Africa and Kenya in particular. The biggest drop was recorded from 2005 to 2010 from 650 to 500 deaths per 100,000 live births (WHO, 2015d; WHO et al., 2012).

Improving maternal health is one of WHO's key priorities and works to reduce maternal mortality. The WHO strategy is important in providing evidence-based clinical and programmatic guidance, setting global standards, and providing technical support to "Member States". In addition, it advocates for more affordable and effective treatments, designs training materials and guidelines for health workers, as well as support for countries to implement policies and programmes and monitor progress (WHO, 2016a).

Demographers are interested in maternal health because of its influence on maternal mortality, as an indicator of the success of maternal health programmes and as a factor influencing sex differentials in mortality. Research has shown that adequate use of antenatal and delivery services can reduce cases of maternal deaths by between 10 and 45%, especially in the developing countries where maternal mortality is highest (Girum & Wasie, 2017).

Although maternal mortality rates have decreased throughout the world in recent years, the sharpest declines have been in the developed countries, where maternal mortality rates were already low. The average annual decline in both Australia and Japan was 4%, in both middle and South America, the decline was 4%. In most developing countries, the available information is far less adequate. However, evidence indicates that maternal mortality rates in excess of 500 per 100,000 live births are not exceptional. In both Africa and Southern Asia, rates of 1,000 and over have been reported (Azuh et al., 2017; Hogan et al., 2010; WHO, 2015d).

2.7 Lessons Learned

Preventive measures are known to prevent countries such as Sub-Saharan Africa and South Asia where the burden of maternal mortality is greatest and have the poorest data to inform global action. Some countries have managed to reduce maternal mortality during the 25 years. It is imperative that more efforts are employed to reduce maternal mortality. However, the following should be taken into account: (1) The timing of maternal deaths is clustered around labour, delivery, and the immediate postpartum

period. (2) However, obstetric haemorrhage is the main medical cause of maternal death. (3) Local variation can be important, with unsafe abortion carrying a huge risk in some populations and indirect causes, such as malaria, or HIV/AIDS, featuring prominently where background prevalence is high. (4) A substantial proportion of maternal deaths take place in hospital. (5) Inequalities in the risk of maternal death exist everywhere, both between and within countries (Hogan et al., 2010; NCPD, 2015; Ronsmans & Graham, 2006; Starrs, 2006). Therefore to scale down maternal deaths, “the most important strategy in health care is identifying and using interventions that have been shown by strong research evidence to achieve the best outcomes within available resources for everyone” (Gülmezoglu et al., 2016).

2.8 Interventions for maternal mortality

Most maternal deaths are avoidable, as the health-care solutions to prevent or manage complications are well known. All women need access to antenatal care in pregnancy, skilled care during childbirth, and care and support in the weeks after childbirth. It is particularly important that all births are attended by skilled health professionals, as timely management and treatment can make the difference between life and death (WHO, 2018).

Regarding various factors, severe bleeding after birth can lead to the death of a healthy woman within two hours if she is unattended. Injecting oxytocin immediately after childbirth effectively reduces the risk of bleeding. In addition, infection after childbirth can be eliminated if good hygiene is practiced and if early signs of infection are recognized and treated in a timely manner. Furthermore, pre-eclampsia: should be detected and appropriately managed before the onset of convulsions (eclampsia) and other life-threatening complications. Administering drugs such as magnesium sulfate for pre-eclampsia can lower a woman’s risk of developing eclampsia (WHO, 2016b). To avoid maternal deaths, it is also vital to prevent unwanted and early pregnancies. All women, including adolescents, thus need access to family planning, safe abortion

services to the full extent of the law, as well as quality post-abortion care (AbouZahr, 2003; Africa Progress Panel; WHO, 2010).

Thaddeus and Maine (1994) have shown that many of the maternal deaths can be attributed to the “Three Delays” conceptual framework. This is really a comprehensive approach in connecting the “pieces,” that is, the events and stories surrounding the deaths of these women. They assert that in most cases if prompt, adequate treatment is provided, adverse outcomes can be avoided. Moreover, they propose that pregnancy and childbirth- related mortality is overwhelmingly contributed to delays in three phases: The first is deciding to seek appropriate medical help for an obstetric emergency which is influenced by the actors involved in decision-making; socio-cultural factors; distance from the health facility; financial and opportunity costs. The second relate to reaching an appropriate obstetric facility, which depends on how far away the nearest facility is from her home in terms of distance and travel time; availability and cost of transportation; road conditions. The third and last is receiving adequate care when a facility is reached. Factors affecting the receipt and provision of care (includes; the adequacy of the referral system); shortages of supplies, equipment, and trained personnel; competence of available personnel, ineffective communication, and poor patient management (Thaddeus & Maine, 1994).

Though the interplay among these three phases is complex, they are not necessarily interdependent on each other. A delay in one phase may or may not exacerbate or prolong a delay in another. However, there is usually a combination of factors across the three phases that culminate in the woman’s death. By putting the pieces together, one can gain a better understanding of what actually happened. This is particularly true for cases in which women have either died en route to or upon arrival at the hospital, or when things have gone completely awry within the hospital itself. By gleaning clues from the various phases the information can assist health management with adapting or developing interventions that improve the healthcare delivery system and the quality of

care rendered. There is also a potential for empowering healthcare workers to examine their current practices and for communities to modify some of their cultural beliefs and behaviors (Combs Thorsen, Sundby, & Malata, 2012).

Most maternal deaths are avoidable, as the health care solution to prevent or manage complications are well known. All women need access to antenatal care in pregnancy, skilled care during childbirth and care and support in the weeks after childbirth. It is particularly important that all births are attended by skilled health professionals, as timely management and treatment can make the difference between life and death. Information exists on how to improve maternal health. These have led to the identification of key interventions for the reduction of maternal morbidity and mortality in the developing countries. They include “Safe Motherhood Initiative” with its “Pillars” and the Making Pregnancy Safer Program (Starrs, 2006). Identifying and investing in the most effective interventions for safe motherhood is of primary importance (AbouZahr, 2003; Ronsmans & Graham, 2006).

There is evidence of effective clinical interventions that save lives, but less is known about the best strategies of accelerating reduction of maternal mortality in developing countries especially in Africa and South Asia. The decline in maternal mortality in Malaysia and Sri Lanka in the first 50 to 60 years and the magnitude of health system expenditures on maternal health are relevant to Africa (Gülmezoglu et al., 2016; Temmerman et al., 2015).

Community based interventions are key to overcoming some of the existing factors influencing utilization of health facilities for maternal care. WHO’s making ‘pregnancy safer initiative’ recommends building on the inherent strengths in local communities, so that people have a sense of ownership of health development structures, rather than establishing new and separate ones which may have no local credibility. Partnership is also an essential element for the implementation of maternal and newborn programmes. Forging partnerships among organizations such as key ministries, international agencies,

NGOs, community-based organizations and private groups, at the local, national and international levels, is essential for sustainability and for scaling-up maternal and newborn health interventions (Africa Progress Panel; WHO, 2010; Gülmezoglu et al., 2016; WHO, 2015c)

Development or strengthening of mutual understanding between the health care workers and community health workers was found to be essential in promoting maternal health and care at community level. When training courses are conducted separately for health care workers and the community health workers, their capacity and skills might be built-up, but their mutual understanding and collaboration is not likely to be strengthened. However, when the training in- cooperates the local community health workers and women leaders as partners, there is good collaboration which strengthens mutual understanding and cements active community participation and assured sustainability of the programme (JICA; HANDS, 2008).

Nurses and midwives should assume a family-based approach in their clinical care of pregnant women and newborns and expand their scope of practice beyond the health care facility to include community health promotion and support for community-based women's support groups (Moran et al., 2015; WHO, 2015e; WHO et al., 2004).

2.9 Safe Motherhood Initiative in Kenya

In 1987, at a Nairobi meeting in Kenya, a group of international agencies (WHO, UNFPA and the World Bank) launched a global movement, the Safe Motherhood Initiative, whose aim was to reduce the burden of maternal death and ill-health in developing countries. It is through this forum that the Kenya government started safe motherhood initiative programme throughout the country. Maternal health services in Kenya began as part of an integrated Maternal and Child Health (MCH) programme in 1972. It was however not until the inauguration of the Safe Motherhood Initiative in Nairobi in 1987 that specific programmes to reduce maternal mortality and improve maternal health were established. Early efforts focused on training Traditional Birth

Attendants(TBAs) to screen and refer high-risk pregnancies for complications but are now directed towards providing women with access to care at the facility level. The specific programmes which the Kenya Government implemented included: encouragement of pregnant women to use antenatal care by using information, education and communication (IEC) strategy; and increasing the number of trained/skilled healthcare workers to meet the anticipated increase of the number of clients, implementation of government policy on reproductive health strategy and improvement of the existing infrastructural facility to cater for the expanding services and of necessity improving emergency obstetric care (Fathalla, 2017; NCPD, 2015; Starrs, 2006).

2.9.1 Use of antenatal care and skilled attendant

Compared with other African countries, utilization of maternal health services by Kenya's women is high (80%). The Kenya Demographic Health Survey (KDHS) found that 92% of women attend antenatal care at least once, 28% make two or three visits and more than 60% of women attend four or more times (Central Bureau of statistics, 2004). However, majority of these women start to attend ANC relatively late in pregnancy since the median gestation at first visit is 5.7 months. Delivery within a health facility or with a skilled attendant is much less common than antenatal care. Only 44% of women have a skilled attendant present at delivery, while slightly less than one-quarter of women deliver with a traditional birth attendant (TBA), one quarter deliver with a relative and nearly one-tenth of women deliver entirely alone. The majority of the deliveries with a skilled attendant occur mainly in hospitals with 30% in health centres, and 5% in private clinics. Wide regional disparities are included in these aggregate figures. Delivery at home, for example, is twice as common in rural areas as in urban areas, and the proportion of births with a skilled attendant ranges from 78% in Nairobi to only 33% in Western Province (KNBS; ORC Macro, 2010; NCPD, 2015).

There has been a shift away from doctors as delivery attendants (28% in 1998 versus 19% in 2003) towards nurses and midwives (64% in 1998 versus 71% in 2003).

Utilization of ANC services differs among the women. Higher parity women are more likely than lower parity women to skip antenatal care. Furthermore, rural women are less likely than their urban counterparts to get antenatal care from a doctor and more likely to get no care at all (MOH, 2016). Women's education is associated with antenatal coverage with proportion of women who get no antenatal care declining steadily as education increases. Women with higher education are more likely to receive care from a medical doctor than those with no education (24% versus 15%). The vast majority of women who obtain antenatal care went to government health institutions (71%), while private medical sources were used by only 28% (MOH, 2016; NCPD, 2015).

Health professional and providers recommend that the first antenatal visit occur within the first trimester of pregnancy and continue on a monthly basis through the 28th week of pregnancy and fortnightly up to the 36th week or until birth. This implies that 12- 13 visits should be made during the entire pregnancy. Antenatal care can be more effective in preventing adverse pregnancy outcomes when it is sought early in pregnancy and continues through to delivery. In this regard, early detection of problems in pregnancy leads to more timely referrals in case of women in higher risk categories or complications; this is particularly true in Kenya, where physical barriers such as well equipped health facilities and means of communication pose a challenge to health care delivery (Central Bureau of statistics, 2004; Ministry of Health, 2010; NCPD, 2015).

The objective of providing safe delivery services is to protect the life and health of the mother and her child. An important component or efforts to reduce the health risks to mothers and children is to increase the proportion of babies delivered under the supervision of health professionals. The 2008-09 KDHS however found that two out of five births are delivered at home where proper medical attention under hygienic conditions during delivery can reduce the risk of complications and infections that may cause death or serious illness either to the mother, baby or both. Urban women and those with more education are more likely to have been informed of pregnancy complications

than rural uneducated women. Similarly, the likelihood of a woman being told about pregnancy complications declines as parity increases. Women in the highest wealth quintile are twice more likely to receive information on pregnancy complications than those on the lowest quintile. The socio-economic characteristics that appear to be associated with the content of antenatal care include residence, wealth and level of education. Women in urban areas are more likely to receive all the specific components of antenatal care compared to less educated and poor women (KNBS; ORC Macro, 2010).

2.9.2 Kenya Government policy and current preventive strategies

The National Reproductive Health Strategy had two principle maternal health objectives: to reduce maternal mortality to 170 per 100,000 live births by the year 2010 and to increase professionally attended deliveries to 90% in the same time period. The main elements of the strategy include: improving institutional capacity at all levels to manage pregnancy-related complications, unsafe abortion and newborn care and establish a functional referral system (MOH, 2007). There hasn't been any significant change despite implementation of these strategies, instead maternal mortality trends continue to increase.

The government has crafted a number of policy guidelines to reduce health inequalities between regions and among different populations, also aimed at reversing the downward trends in health-related outcomes and impact indicators, as well as ensuring access to the Minimum Health Care Package for sexual and reproductive rights (NHSSP II). This is grounded in the MDGs, specifically MDG5. Such rights have also been recognized by the African Union (AU commission, 2015). In addition, other critical documents which echo the aspirations of Kenya's national health and population policy include "Kenya Vision 2030, The Kenya National Roadmap for Maternal and Newborn Health" (2010), the reproductive health policy paper "Enhancing Reproductive Health Status for All Kenyans" (2007), "National Reproductive Health Strategy" (1997-2010), Sessional

Paper No.1 on second National Population Policy for Sustainable Development (NPPSD, 2000) and Adolescent Reproductive Health and Development policy (MOH, 2014, 2016).

Some of the key issues in maternal and child health that require illumination include: increasing the number of health care providers across the country, especially in public health institutions. There are only 260 qualified paediatricians in Kenya, out of whom 170 operate in Nairobi. There are still a high number of births (60%) which occur in the country without a qualified birth attendant (Gitimu et al., 2015; Tomedi, Tucker, & Mwanthi, 2013). Kenya is grappling with the challenge created by the shortage of health workers currently estimated at 70,000. This has largely been caused by low pay and inefficiencies in the public health sector which have forced qualified staff to seek green pastures elsewhere (Miseda, Were, Muriangi, Mutuku, & Mutwiwa, 2017; Wakaba et al., 2014).

The Nursing Council of Kenya administers all public and private midwifery programs and a degree in this background can be received through direct entry or post-nursing programs. Midwives are required to attend continuous professional development courses and document their participation to maintain registration. While the midwifery training system appears to be of good quality there are innovations underway to strengthen it. Staff shortages and focused education geared towards promoting the use of obstetric services must be addressed (WHO, 2013a).

Improving households' livelihood and girls' access to education is of primary importance in improving maternal health. Adolescent girls, ages 15-19, represent 23% of all maternal deaths worldwide, and are at greater risk of death than women in their twenties due to malnutrition, body size, malaria, and lack of access to education about how to manage a pregnancy and birth (Temmerman et al., 2015; WHO, 2013b). Interventions that target girls—including conditional cash transfer (CCT) programs that give money directly to adolescent girls—increase school retention rates and lower the risk

of sexual activity, pregnancy, and HIV/AIDS (Haberland, McCarthy, & Brady, 2018; Khoza et al., 2018; Owusu-Addo, Renzaho, & Smith, 2018).

Increased service provision and effective management of obstetric equipment and supplies to clinics, health centres, and dispensaries is critical. These are good policies if they are implemented but they essentially lack the backing of political will to succeed. This is reflected in the appraisal report that was released in May, 2012 by the “Working Group” commissioned by WHO, UNICEF, UNFPA and the World Bank (2012) to assess individual country’s performance towards achieving the Millennium Development Goal 5 entitled “Trends in maternal mortality: 1990 to 2010. The report showed eleven countries where Kenya is included as making insufficient progress. Again, this is indeed supported by maternal mortality rate of 414 per 100,000 live births by 2003 and five years later, a maternal mortality of 488 per 100,000 live births. This is in spite of the efforts made by the government towards scaling down maternal mortality to 170 per 100,000 (Central Bureau of statistics, 2004; KNBS; ORC Macro, 2010; WHO et al., 2012). The question is: “Why is the country not making significant progress towards curbing maternal mortality?” Bearing in mind that the International Conference on Safe Motherhood Initiative was launched here in Nairobi, in 1987 and the strategies which the conference recommended on maternal and reproductive and infant health were implemented. Further to this, the African Commission on reproductive health in which Kenya was a signatory to its implementation and the Kenya Vision 2030 does not seem to bear fruits in spearheading reduction in maternal death. This is a reflection that most countries in Sub-Saharan Africa where Kenya is included have not addressed policy issues, even where the policies have been shown to have significant influence on maternal mortality, mortality has not reduced (AU commission, 2015; Cross, Bell, & Graham, 2010; GOK, 2007; Kyei-Nimakoh, Carolan-Olah, & McCann, 2016; Marquez, 2012).

For any programme or strategy on maternal health and safe motherhood to succeed, it must have the support of the highest level of national authority. Such support will facilitate the allocation of adequate financial and human resources; improves the infrastructure and communications; and puts in place effective and implementable standards, policies and protocols (Jamison et al., 2006).

For maternal health services to be effective, women need to be provided with a continuum of care throughout pregnancy, delivery, and the post natal period. These services should include antenatal care, delivery care, care of obstetric complications and postnatal period. It is particularly important that women are provided with effective emergency care since complications may affect up to 40% of women during pregnancy, delivery or in the immediate postpartum period, and for up to 15% women these complications may be life threatening (Kerber et al., 2007; Yohannes, Tarekegn, & Paulos, 2013).

The antenatal care should include services that monitor the progress of the pregnancy to assess fetal and maternal health, screen for and treat common medical problems (e.g., anaemia, malaria, sexually transmitted infections, etc.), provide preventive treatment such as immunization against tetanus or iron for anaemia and counsel women on a wide range of important health issues (such as the recognition of warning signs in, labour and when and where to seek care, etc.). Delivery care should include delivery with a skilled attendant, a person who can provide normal delivery care and recognize and manage pregnancy complications when they occur. Emergency care should include services that provide for the most common obstetric emergencies (i.e., sepsis, haemorrhage, pre-eclampsia and eclampsia, retained placenta and abortion complications) as well as for neonatal care, surgery and blood transfusion. At lower levels, health facilities should be able to provide first aid treatment and when necessary, refer to higher levels of care (Lassi et al., 2016). Postnatal care should include services that assess the physical, emotional and nutritional well-being of mothers and newborns provide information on

infant care (such as breast-feeding, immunization, etc.), provide information on maternal well-being (such as the recognition of complications), and provide preventive care (such as Family planning, etc.).

2.10 Improving Emergency Obstetric Care: The Three Levels of Delay

Accelerating the decline of maternal mortality in Sub-Saharan Africa and realization of the Millennium Development Goals will require the provision of a synergistic package of health and social services that reaches everyone, especially deprived populations. The framework model of three delays developed by McCarthy and Maine (1992) has been applied to analyze the constraints, opportunities, and systems required at different levels of a safe motherhood program. This framework serves as a useful planning tool for the actions required at every level of health care while emphasizing the need to link these levels through transport and communication, supervision, and community outreaches. Thus, community awareness and trust and better access to and quality of emergency transport reinforce each other to improve maternal outcome. In an integrated essential health care package, this network enhances provision of other services, such as family planning and immunization, while promoting emphasis on skilled attendance (McCarthy & Maine, 1992).

The “Three Levels of Delay Model” consist of the following:

Level 1 delay: decision making at community level—examines decision-making process on pregnancy and childbirth at household and community level, including birth preparedness. Level 2 delay: accessibility, transport to the healthcare facility to access services etc Level 3 delays: reaching appropriate care facility and receiving adequate care and whenever necessary timely referral.

Using a modified "Four Levels of Delay" approach to analyze maternal mortality in Eritrea, causes of death were attributed to the following processes:

Delay One: failure or delay in recognition of danger signs—33 percent of maternal deaths

Delay Two: delay in deciding to seek care—40 percent of the cases

Delay Three: delay in reaching appropriate care—19 percent of cases

Delay Four: delay in receiving appropriate care—52 percent of cases. (Holzgreve et al., 2012)

This simple framework appears ideal for Sub-Saharan Africa and Kenya in particular. It works well and supports local partners in finding tailor-made solutions to challenges posed in each specific setting and making service more responsive to local community needs. It can also be used to improve data collection and use at the local level (GBD 2015 Maternal Mortality Collaborators, 2016).

Primary health care involves several levels. The first level has a bottoms-up approach with active community involvement (men and women) and focused comprehensive development programs wherein reproductive health and safe motherhood are appropriately integrated into the district health system. The second level entails expanding access to quality services, including functional linkages between communities and health facilities in regard to transport and communication; while the final level addresses appropriate quality of services provided to clients on arrival at the health facility.

Studies in Tanzania, depicts a typical finding from most maternal mortality reviews in Africa, noted a large proportion of women die because of delayed decision making at home, lack of transport, and inappropriate care if they make it alive to a health facility. This confirms the observation that reduction of high maternal mortality demands a strong focus on each level of delay through creation of an effective system providing EmOC. Links between the different levels of the health care system, from community

through the basic health center (basic EmOC) to the referral hospital (comprehensive EmOC) are critical (Laddunuri, 2013; Pembe, Paulo, D'mello, & van Roosmalen, 2014).

Access to family planning has a great impact on maternal mortality with estimates that one in four maternal deaths could be prevented by family planning. An estimated 150 million women in developing countries would want to delay or stop childbearing, but do not use any family planning method. Unmet family planning needs continue to be a major problem among women of reproductive age particularly in rural areas. Access to contraceptives will reduce unplanned pregnancies and by extension reduce maternal mortality (Filippi et al., 2016; Starbird, Norton, & Marcus, 2016). Again access to skilled attendance is critical in reducing maternal mortality. Data on the proportion of births attended by skilled health personnel are indicative. In Latin America, where the proportion of births attended by skilled health care workers is high, maternal mortality is relatively low, while very high maternal mortality occurs in Africa, where skilled attendants are not readily available. Significant progress in reducing maternal mortality will however, require more than increasing the number of skilled birth attendants for deaths in children often involve complications such as hemorrhage that require fully equipped medical facilities. Maternal mortality ratio is thus an indication for the overall capacity of the health care system to meet the needs of the entire population (Amouzou, Ziqi, Carvajal–Aguirre, & Quinley, 2017).

The Safe Motherhood Initiative, launched by the United Nations Population Fund (UNFPA), the World Bank and WHO in 1987, is now further supported by the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the International Planned Parenthood Federation (IPPF), and the Population Council. The initiative incorporates many of the facets of comprehensive education, information, and preventive services, and follow-up care. This model requires collaboration at numerous levels, between general women's health and reproductive health practitioners, between community members and leaders. It is therefore

implemented to varying degrees in different locations (WHO, 2015d, 2018). It is likely to bear fruits.

The World Health Organization and World Bank (2010) analysis estimate that the entire safe motherhood package costs about \$3 per person per year in low- income countries and \$1 in middle- income countries. The comprehensive package includes: (1) Education and information services; comprise community education about safe motherhood, education about pregnancy, danger signs and complications, and reproductive health and family planning information and services for adolescents and adults, (2) Preventive services; include nutrition and vitamin supplement, counseling, prenatal and general health care and monitoring, and screening and treatment for sexually transmitted diseases, HIV and other infections, (3) Subsequent to skilled assistance during childbirth, follow-up care encompasses care for complications and emergencies, and postpartum care, and (4) Safe abortion and post-abortion services- are also components (WHO et al., 2012).

Safe motherhood and women's health initiatives have had great success. In Honduras, increased resources for maternal health contributed to a reduction of maternal mortality ratio (MMR), from 182 to 108 deaths per 100,000 live births between 1990 and 1997. Sri Lanka's nationwide health care expansion and improved midwifery skills, contributed to a dramatic decline in the maternal mortality. Although Sri Lanka has a low per capita income, over 94% of its births occur in hospitals, causing its MMR to decline from over 1,500 deaths per 100,000 in 1955- 1965, 95 per 100,000 in 1980 and finally, 30 deaths per 100,000 live births in 1999 (Nyamtema, Urassa, & van Roosmalen, 2011).

The United States, through the US- Agency for International Development (USAID), provides voluntary family planning and reproductive health services in over 60 developing countries. According to USAID, 50 million couples in developing world use family planning directly as a result of its efforts. The US, also contributes to UNFPA,

one of the founding organizations of the safe motherhood initiative (Nyamtema et al., 2011).

Since the launch of the global Safe Motherhood initiative in 1987, the general state for safe motherhood has changed dramatically. There has been improvement in the last two decades as indicated by the proportion of births attended by skilled birth attendants and several middle-income developing countries such as Honduras, Bolivia and Egypt have dramatically reduced their maternal mortality levels (Hardee et al., 2012; Starrs, 2006).

It is also true that safe motherhood is key in the fight to reduce poverty and advance human development. However, from 1987, safe motherhood has indeed achieved widespread attention and prominence in international agreements. The call for a reduction in maternal mortality has been echoed in major international conferences in the 1990s, and most recently in the Millennium Development Goals, it was defined as essential for poverty reduction and development. Again it is also recognized that maternal health has not achieved its due place in the global agenda (Lozano et al., 2011; Starrs, 2006).

Over the 18 years, the knowledge base for “safe motherhood” is more clearly articulated and understood. The technical interventions for preventing as well as treating the vast majority of obstetric complications are known, and have been identified as simple and cost-effective. There is broad agreement that good-quality maternal health services need to include skilled care for both routine and complicated cases, including emergency obstetric services for life-threatening complications (Fathalla, 2017; Starrs, 2006).

The 2005 report of UN Millennium Project Task Force on Child Health and Maternal Health called for strengthening the health system, particularly at the district level in an effort to achieve dramatic and sustainable progress in maternal health. A well-functioning health system can ensure the equitable and efficient delivery of safe motherhood information and services to the entire population, reaching them at home, in

the community and within health facilities at both primary and referral levels (Freedman et al., 2005; Rosenfield et al., 2006).

Programmatically, this implies implementing multiple, mutually supportive strategies that affect systems (e.g., human resources, education, and training, supplies and logistics, transportation and communication, etc.) with the aim of improving the use of availability of high-quality maternal health services. Both the supply side, (e.g. availability of drugs, supplies and equipment, adequately trained personnel), and the demand side (community behaviors and practices regarding care-seeking during pregnancy and childbirth) of the equation need to be addressed.

Despite the progress made in maternal health, women in the developing countries are still at extremely high risk of dying or being injured from pregnancy-related causes, with life-time risk of maternal mortality being as high as one in eight in some places. With the increasing focus on the MDGs, there is an extra-ordinary opportunity for accelerating progress and expanding efforts to improve maternal health worldwide.

Governments are being called on to clarify their policies, develop practical and achievable plans and identify the resources needed to achieve these goals. Civil society organizations can make a critical contribution to this process, in part by monitoring and evaluating the implementation of government programmes (Freedman et al., 2005).

CHAPTER THREE

MATERIALS AND METHODS

3.1. Study Area

The study was carried out at Kisii Level-5 Hospital's maternity and its catchment area. Kisii County which is the former greater Kisii District was one of the twelve districts of the former Nyanza Province in Southwest Kenya. The County came into being as per the new constitution (2010). Kisii County has a total population of 1,152,282 people, 245,029 households and covers an area of 1,3174, with the population density of 874.7 people per square kilometer and 51% of the population live below poverty line (KNBS; ORC Macro, 2010). It has five administrative divisions: Kiogoro which is the most densely populated division, Keumbu, Kisii Municipality, Mosocho and Marani division. It has 19 locations and 49 sub locations.

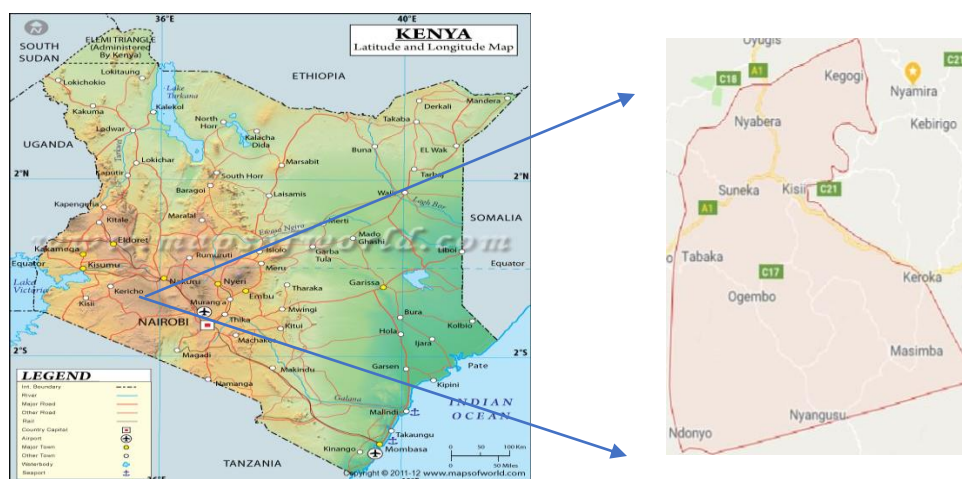


Figure 3.1 Kisii County Map (Google Maps, 2018)

The Kisii County lies on a highland, equatorial climate, and has such receives rain almost throughout the year. However, there are two main rainy seasons (March to May and October to November). The average rainfall is over 1500mm and is quite reliable, helping to support cash crops (such as coffee, tea and pyrethrum) and subsistence crops (maize, beans, millet, bananas and potatoes). It however, lack proper infrastructure like electricity, telecommunications and good roads with only 10% of roads are tarmacked.

The Kisii County is one of the most densely (874.7 people per square kilometer) populated county in Kenya, with around 50% of the population below the age of 15 years. The cause of high population growth is believed to be cultural practices of having many children for security in old age leading to low use of family planning methods (uptake is 60-65) as per the NCPD (2009). The high population may be due to availability of good nutrition derived from the food crops grown in the area. In most areas, the sex ratio is disproportionate with more females due to labor migration to other districts and urban areas. See Appendix 4 for the map of Kisii County (KNBS; ORC Macro, 2010).

3.1.1 Health facilities in Kisii County

Kisii General Hospital is a “Level 5” referral facility to the neighbouring sub-county hospitals which include Rachwonyo Sub-county of Homa-Bay County, Nyamira County, Gucha sub-county, Masaba sub-county, South Kisii sub-county, Transmara sub-county, Homa-Bay County and Migori County. The General Hospital has human resource capacity with at least one consultant in each of the core branches of medicine and surgery. It has nursing staff capable of providing services to the patients. It has among others; a maternity theatre and other three theatres for general surgeries. Referral facilities exist and the needy cases are referred to the Kenyatta National Hospital or Moi Teaching and Referral Hospital in Eldoret. It has a daily outpatient attendance of 400 people with a bed capacity of 500 inpatients. The hospital records an average of 12 deliveries and 3 caesarean operations per day (Kisii Level 5 Hospital Records, 2016).

3.1.2 Socio-economic activities of Kisii County

Due to high population density, almost all land in Kisii County is put to maximum agricultural use. Land is subdivided within families, meaning that plots have been gradually decreasing with the current average farm size being only 1.5 hectares (KNBS; ORC Macro, 2010). Intensive farming in hilly terrain has increased the rate of soil degradation and erosion, decreased soil fertility and productivity, increased use of application of farm chemicals that have polluted surface and groundwater sources. More than 90% of rural household energy needs come from wood, but the district is no longer self reliant and other sources such as biogas are being encouraged. Tea and coffee processing and soda bottling constitute Kisii County's manufacturing industry, but there is vibrant retail and wholesale trade in market centres. Brick- making, Soapstone curving, and Jua Kali are practiced to a lesser extent. The annual growth rate in paid employment is 3.5%, but this is barely keeping up with the current population growth rate (KNBS; ORC Macro, 2010).

Farming practiced in the district ranges from cash crop farming (tea, coffee and sugar cane) to food crops (maize, bananas, sweet potatoes and beans). Dairy farming, bee keeping as well as goat keeping is practiced at a small scale (KNBS; ORC Macro, 2010).

3.2 Study Design

This was a case control study for the period of January 2009 to June 2010 at Kisii Level 5 Hospital and its environs within Kisii County, Kenya. It investigated the factors associated with maternal mortality within the hospital and its community.

The country experienced post-election violence in 2007, and there was restlessness and displacement of some individuals within the country. It is during the 2009 period that there was relative peace that the study was feasible.

3.3 Study Population

The study population were women of reproductive age who sought for obstetric service at the Kisii Level 5 hospital and died.

3.4 Data collection Tools

The data collection tools included structured self administered questionnaire for the family of the deceased, Confidential Questionnaire of Female Deaths: 1, 2 and a questionnaire for healthcare workers. These tools were translated to Kiswahili and Kisii (the local language) for the illiterate respondents.

The sources of the data comprised hospital records, healthcare workers, as well as relatives of women who had died as a result of pregnancy and childbirth-related complications while seeking for healthcare services at Kisii Level 5 Hospital from January 2009 to June 2010.

3.5 Inclusion Criteria

In this case-control study, cases included regnant women who had sought obstetric care at Kisii Level Five hospital and died during the pregnancy and childbirth between January 2009 to June 2010, and whose complete records were available. Controls were mothers who sought obstetrical services at the same hospital and did not die.

3.6 Exclusion Criteria

Cases were excluded if their hospital records were incomplete, if their home or relatives could not be traced or if the living close relatives did not consent to participate in the study. The controls were excluded if they declined consent to participate in the study.

3.7 Sample Size Determination

Sample size determination was done by taking a census. Thus a census was taken whereby the files of all maternal deaths which occurred from January 2009 to June 2010 were used. They were sixty-seven in number, while the sister method netted another five

making a total of seventy-two. This was a convenient period because the relatives of the deceased were assumed to be able to recall the circumstances surrounding the death and the number of deaths during this recent period, and this reduced recall bias. One hundred and fifty-eight subjects who did not succumb to maternal mortality were selected as controls.

Based on available hospital records approximately 3-4 maternal deaths occur every month. Thus, it was assumed that 54-72 maternal deaths may have occurred during the proposed January 2009-June 2010 period. It was estimated that approximately 63 deaths may have occurred and 58 death files are expected to be complete. This is demonstrated in Figure 3

. For each family reviewed the sister method was used to determine other maternal deaths within the same locality.

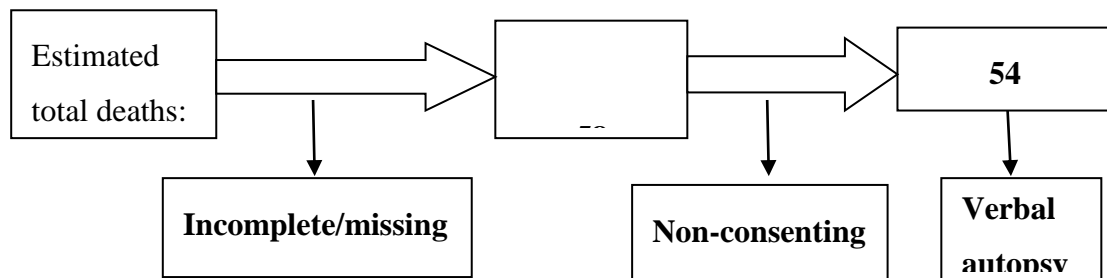


Figure 3.2 Estimated number of deaths

The mothers who sought obstetric care at Kisii Level 5 Hospital in the period January 2009 to June 2010. A control was obtained from the same records for subjects who sought obstetric care and did not die as a result of pregnancy and childbirth. Sampling was done to match with the deceased subjects.

Sample size determination used Fishers' et al., (1978) formulae, for which the following applies:

q – The proportion of pregnant mothers who survived from the burden of maternal mortality.

$$q = (1 - p) = 1 - 0.95 = 0.05$$

$$n = \frac{z^2 pq}{d^2}$$

$$n = \frac{1.96^2 \times 0.95 \times 0.05}{0.034^2} = 157.8$$

n= 158. This was the number of life subjects which was used.

3.8 Data variables

Socio-demographic variable included: Categorized age; 15-20, 21-25, 26-30, 31-35, and 36-45. Marital status: married, single, separated, widowed. Educational Levels: none (no formal schooling), primary, secondary, college/tertiary. Religious faith: catholic, protestant and others-SDA. Occupation: none, farmer, housewife, businesswoman, formal employment. Residence: rural, urban and peri-urban.

Underlying factors to maternal mortality (Complications): Spotting of blood, swelling of hands and legs, bleeding, hypertension, heart disease, convulsions, infections/sepsis, HIV/AIDS.

Risk factors antecedent to maternal mortality: Previous pregnancies planned, duration of previous pregnancies, abortion; **Previous pregnancy:** Term, pre-term, abortion, doubtful. **Delivery:** Normal, breech, surgery. Delivery conducted by: Doctor, nurse/midwife, traditional birth attendant, and self.

Place of birth: Public healthcare institution, private health facility or home.

Outcomes of pregnancy and childbirth complications antecedent to maternal death: Not seeking healthcare services promptly when labor/problem started, lack of transport in spite of availability of money, lack of money for payment, long distance to the healthcare facility more than 12 kilometers, no specific reason for not seeking prompt healthcare services.

The sisterhood method: Is an indirect measurement technique of the kind frequently used for a variety of demographic parameters which has been adapted to maternal mortality. It reduces sample size requirements because it obtains information by interviewing respondents about the survival of all their adult sisters. It is used to estimate levels of maternal mortality, it has strengths and weaknesses. The major advantages of the sisterhood method include its minimal data requirements (four questions) and

analytical simplicity, as well as its lower sample size requirements relative to other estimation procedures.

Questionnaire: The basic sisterhood method questions used were identical to those in the previous household-based study: 1) How many sisters have you ever had who were born to your mother and who reached the age of 15 years? 2). How many of these sisters who reached the age of 15 are still living? 3). How many of these sisters who reached the age of 15 have died? 4) How many of these dead sisters died while pregnant, in childbirth or in the 6 weeks after a pregnancy ended?

To assess the comparability of the household-based and health facility-based study populations, questions were included to evaluate the socioeconomic status of the health facility users.

The study sample availed the opportunity to identify why some of these women entered the hospital with increased risk of co-morbidity which exposed them to death.

3.9 Training of Research Assistants

Three research assistants were trained for one week prior to commencement of the study. The training included; the purpose of the study, community approach skills, use of the research tools, basic counseling skills, administration of consent forms and data collection questionnaires.

3.10 Data collection and management

3.10.1. Procedure for Data Collection and Data Collection Tools

The study used a socio-epidemiological assessment approach of pre-hospital, hospital and post-hospital risks factors which exposed the women to the health crisis. Figure 3.2 shows the likelihood sources of risk factors leading to co-morbidities.

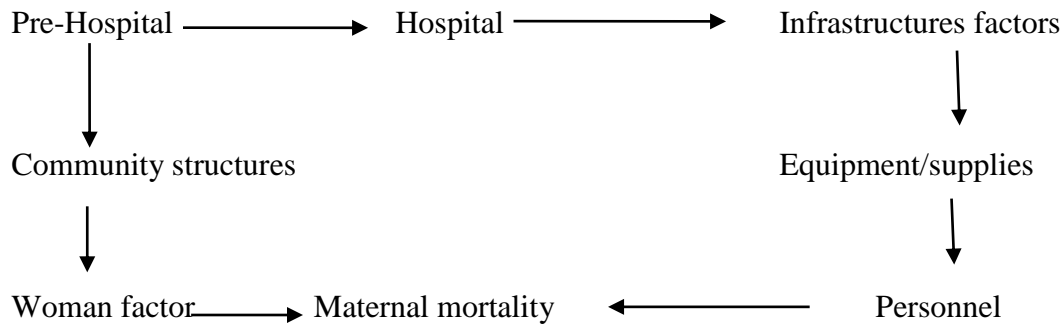


Figure 3.3: Sources of risk factors for co-morbidity

A list of all maternal deaths that occurred during the study period from gynaecological, and maternity ward was made. This list was used to trace the deceased women's files from the hospital's medical records department. All files of maternal deaths which occurred during the study period were sorted out and recorded in an entry list in the order which they occurred. A systematic review was carried out; in sorting them to their respective causes. Desk review of records of maternal deaths was done. A checklist was used to evaluate the care/management given to individual deceased women. A consultant obstetrician and gynaecologist reviewed each of them assessing the management documented, to establish any anomaly pertaining to their management. The information was entered in the appropriate spaces to co-relate with the questionnaire on classified diseases. A Confidential Questionnaire of Maternal Mortality (CQMM): Q-2 was used to enter the information about misclassified causes of maternal death and declared (definitive underlying cause of maternal death) maternal deaths at the hospital (Appendix 2).

The list then was updated as necessary to include details of the home area/village and address of the deceased woman. The family was thereafter traced through the office of the area chief, sub- chiefs and village elders and once located; they were requested to participate in the study. For families who could not be traced, the immediate next of kin if available were requested to give informed consent and then asked to provide information. The researcher introduced himself to the family of the deceased, expressing

condolences for the death of a beloved wife/sister, daughter-in-law, daughter or sister-in-law who had died as a result of pregnancy or childbirth- related complications.

The purpose of the visit was then explained to the relatives of the deceased woman. This was stated as to try and establish the circumstances which led to her death. An interview was then conducted in their home with all the consenting families. Information of her condition prior to her death was sought. It was explained that the information they give was important and will be used to prevent others like her from dying in similar circumstances. This would stop further tragic happenings. The family interview was based on structured questionnaire administered to the immediate family member, who was actually present at home, on the material day and attended to the deceased woman. A Confidential Questionnaire of Household (CQH-Q3) – based on verbal autopsy technique, was used to interview and collect information from relatives (husband, mother or mother-in-law or sister-in-law) or significant others associated with the deceased women (Appendix 3a). In addition, a Confidential Questionnaire of Female Deaths-CQFD: 3 (Chandramohn *et. al.*, 1998) was used in conducting verbal autopsies (Appendix 3) to determine the probable cause of death. The purpose of the two questionnaires was to link the diagnosis then list and classify the underpinning causes and determinants of maternal mortality.

For each family visited and reviewed, the sister method was used to investigate whether a sister or any other woman in the locality had died as result of pregnancy and childbirth related causes. This was meant to capture additional maternal deaths occurring within the community that may not have been captured at the hospital records department. The families of the deceased mothers (husband, mother, or mother-in-law or sister-in-law) identified in the neighborhood were also approached and requested for participation in the study in a family interview as described earlier using the same tool (Chandramohan, Maude, Rodrigues, & Hayes, 1998).

The aim of interviewing the healthcare workers was to establish the ability of the hospital in providing emergency obstetric care, the state of preparedness of the staff to cope up with the workload and emergency situations, and the availability of referral facility. The questionnaire for health workers (Appendix 4.) was structured to capture this critical information. It was conducted in maternity ward of the hospital. Since the healthcare workers were only 15, they were all included in the interview.

The data collection centre was located at Kisii Level 5 Hospital for easier management and administration purposes.

3.10.2 Data analysis and presentation

The data was entered in Statistical Package for Social Scientist (SPSS) software (Version 16.0). Data was cleaned and then analyzed. They were explored using descriptive statistics (histogram, stem and leaf, cross-tabs) to check for inconsistencies. Coding was verified to only correspond to what was possible. Descriptive analysis was done in which percentage was used to describe factors associated with maternal mortality; results were presented in a table and bar graphs. Binary logistic regression was performed to determine the odds ratios of the factors associated with maternal mortality.

3.11 Ethical Considerations

The risk which pertained to the subjects who participated in this research study was minimal or non-existent. Respect for persons was observed strictly and volunteers who participated in this study were assured confidentiality of their identity; and if there could be any psychological or emotional issues arising, the researcher was to arrange for counseling intervention within the `research team as well as arrange for follow-up counseling in the counseling unit at the hospital. Confidentiality and privacy of subjects was strictly maintained. A room with no movement of people was identified in which

the researcher carried out the interviews. Furthermore, to ensure absolute confidentiality, data was coded and once collected was placed under lock and key while waiting entry, cleaning and analysis.

Informed consent was sought prior to completing the questionnaire. Research assistants were also required to sign a confidentiality agreement form before carrying out data collection.

Permission for undertaking the study was sought from the Ministry of Public Health and Sanitation. The National Ethical Committee Clearance was obtained from the scientific steering committee and Ethical Research Committee from Kenya Medical Research Institute (KEMRI), Protocol No.1851 of November 2010. The board of post graduate committee at Jomo Kenyatta University of Agriculture and Technology approved the study.

3.12 Significance of the study

The results of this study was to determine factors contributing to maternal mortality among women of reproductive age seeking for obstetric services at Kisii Level 5 Hospital, as well as provide recommendations to be used by stakeholders to scale down maternal deaths. The benefits therefore range from the individual mothers, the community and the healthcare facilities within the district. These findings together with those from other areas can be used at the County and National level for policy formulation and strategy implementation in addressing the national burden of maternal mortality, to improve the health of the mothers of this country.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics

Figure 4.1 summarizes the demographics of the study subjects. There were 72 (31.3%) cases of maternal deaths. They ranged in age between 15 and 45 years. Twenty-nine (40.3%) subjects were between 21 to 25 years of age, whereas 26 to 30 years were 21 (29.2%), and 15 to 20 age groups were 14 (19.4%). Subjects between 31 to 40 years of age were 8 (11.1%).

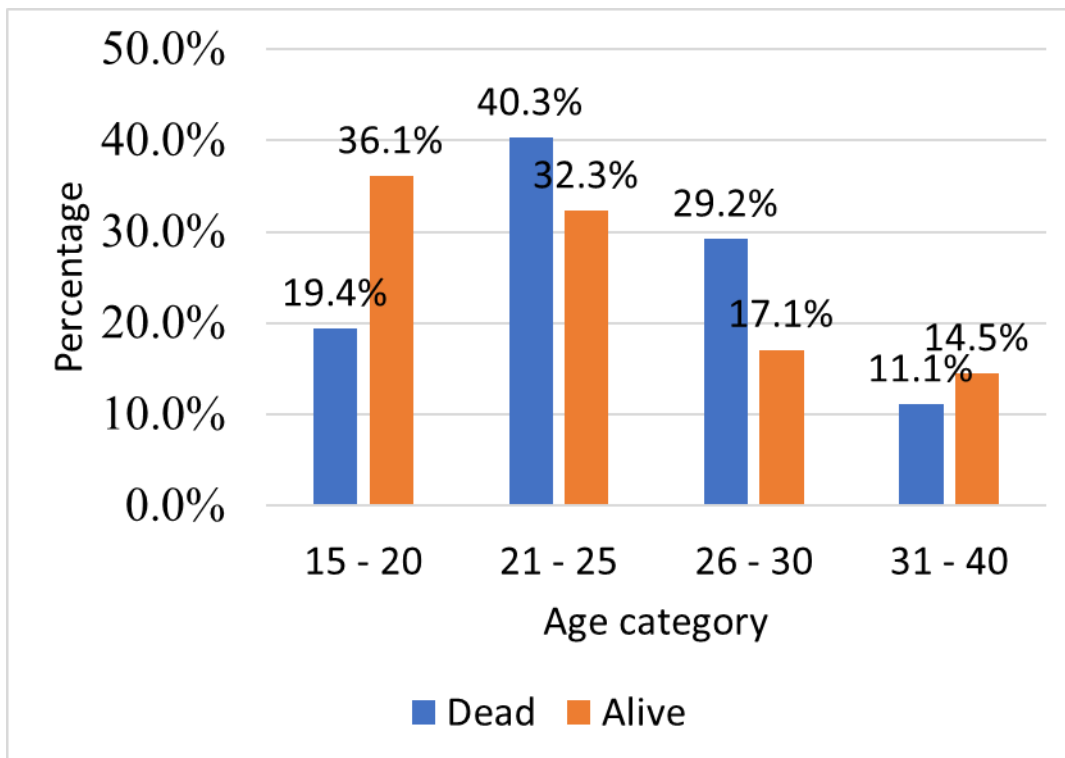


Figure 4.1: Age distribution of the study subjects

Figure 4.2 shows marital status of the subjects. Out of 72 subjects, 48 (66.7%) were married, whereas 21 (29.2%) were single. The rest 3 (4.2%) were either separated or widowed.

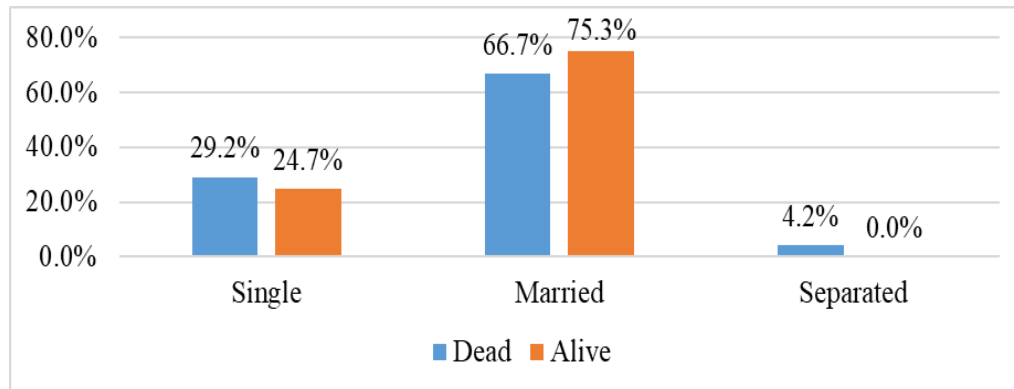


Figure 4.2: Marital status of the study subjects

Figure 4.3 summarizes the level of education of the subjects. Twenty-eight (38.9%) subjects had secondary education, while 5 (6.9%) had no formal education. Thirty-three (45.8%) subjects; had primary education, and 6 (8.3%) college/tertiary level education, as reported by relatives and confirmed by hospital records.

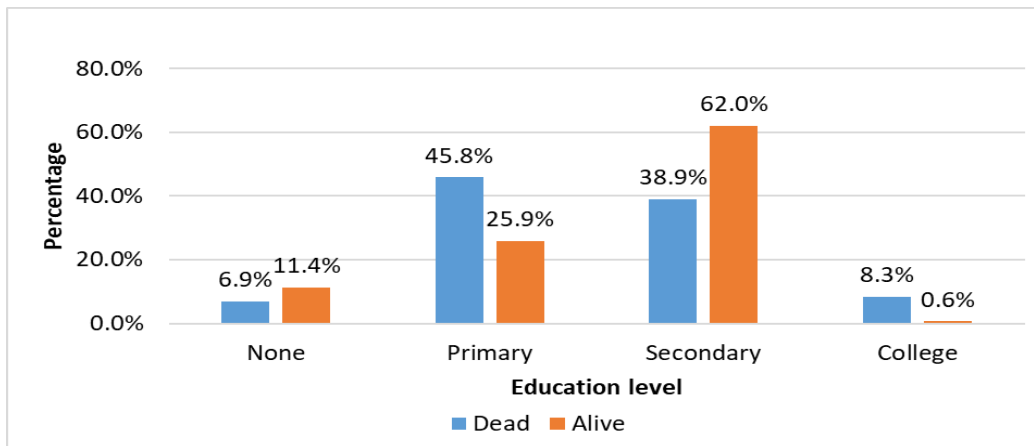


Figure 4.3: Level of education of the study subjects

Figure 4.4 shows the distribution of subjects by religion. Catholics were 46%; Protestants 45.8% and SDA were 5.6%.

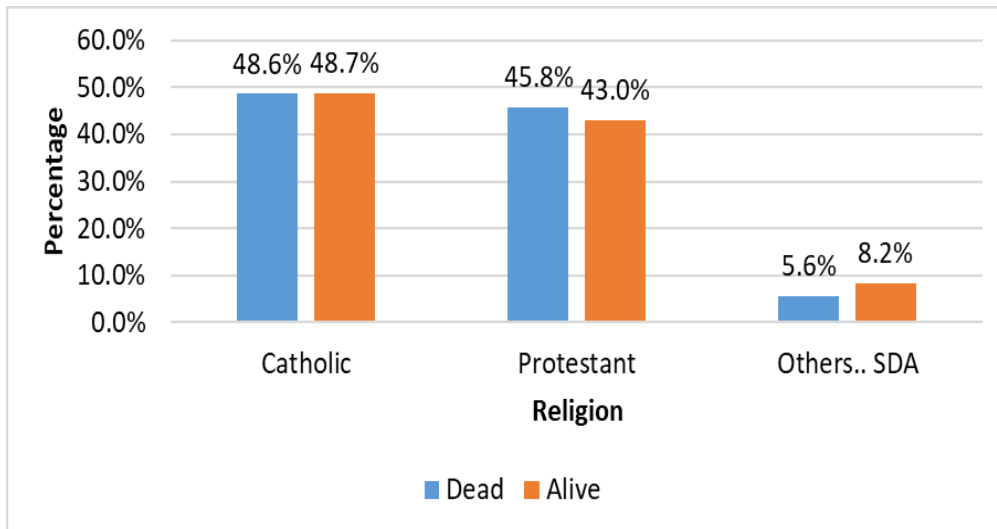


Figure 4.4: Distribution of study subjects with regard to religion

Figure 4.5 summarizes the distribution of the subjects by occupation. Twenty-nine (40%), were housewives with no formal occupation, 18 (25%) were engaged in business and 19 (26.4%) were farmers and only 2 (2.8%) did not have any engagement.

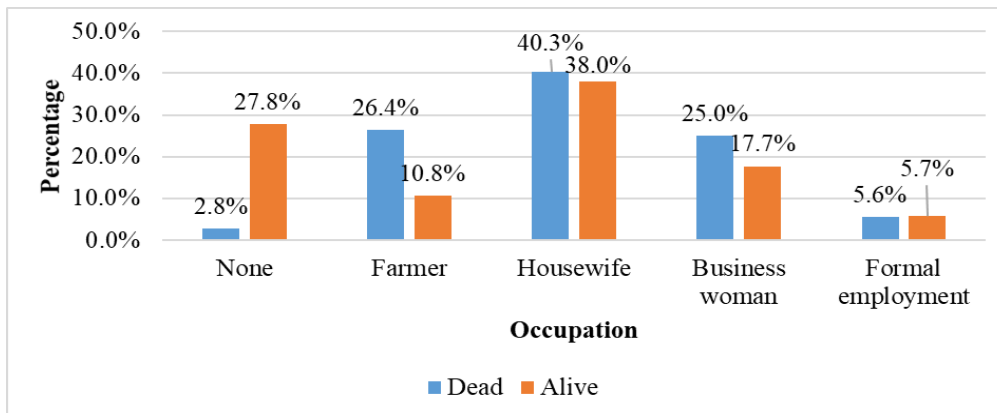


Figure 4.5: Distribution of study subjects with regard to occupation

Figure 4.6 shows the distribution of subjects by place of residence. Sixty-nine percent (69%) live in the rural area, 21% urban and 10% peri-urban area.

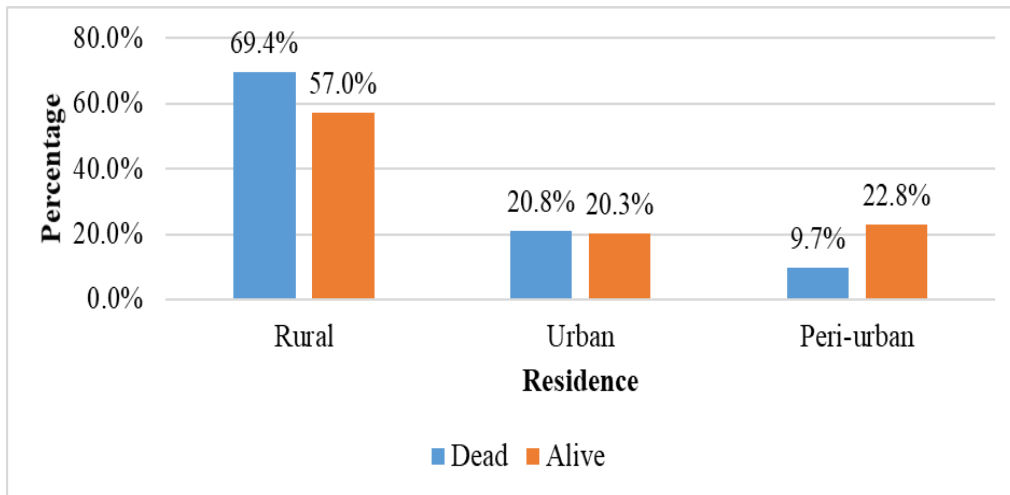


Figure 4.6: Distribution of study subjects to place of residence

Figure 4.7 shows the distribution of subjects' parity. Sixty-nine percent (n=50) had no previous child, 20.8% (n=15) had between 1 to 2 children and 7 (9.7%) had 3 to 4 children which indicates maternal mortality rate decrease with an increase in the number of children.

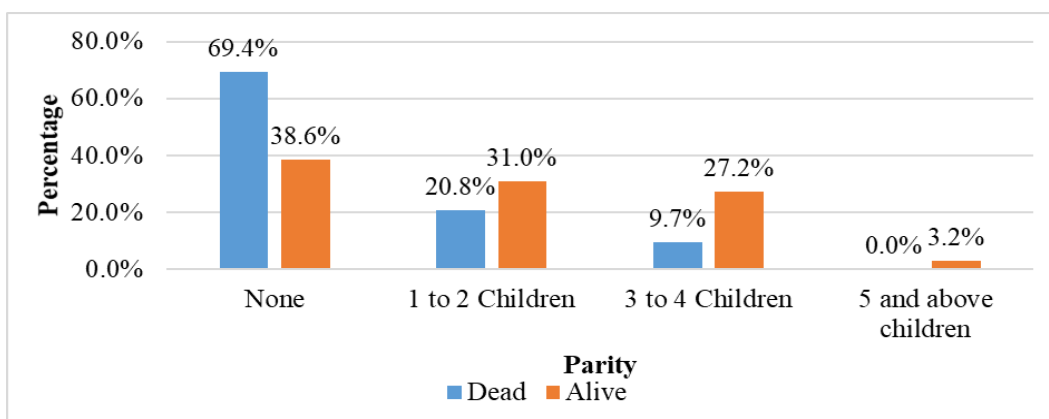


Figure 4.7: Distributions of study subjects' by parity

Figure 4.8 shows the proportions of subjects that planned their pregnancies. One hundred and twenty five (70%) had not planned their pregnancies, while seventy five (30%) had planned their pregnancies.

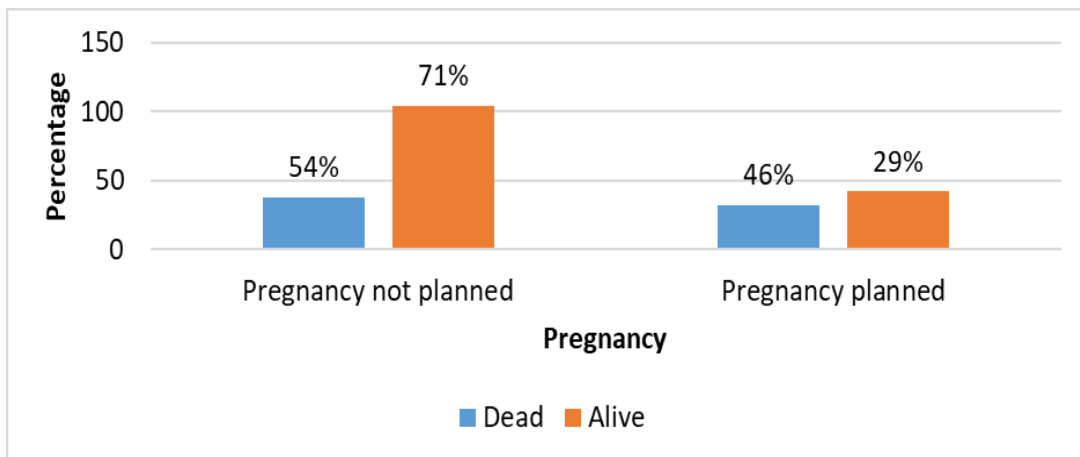


Figure 4.8: Proportion of study subjects who reported planned pregnancy

The study investigated the deceased's history in respect to previous pregnancies. Using records as well as relatives, it showed that 41 (56.9%) subjects were multigravida, 17 (23.6%) had pre-term labour, and 14 (19.5%) had no previous pregnancy. See figure 4.9.

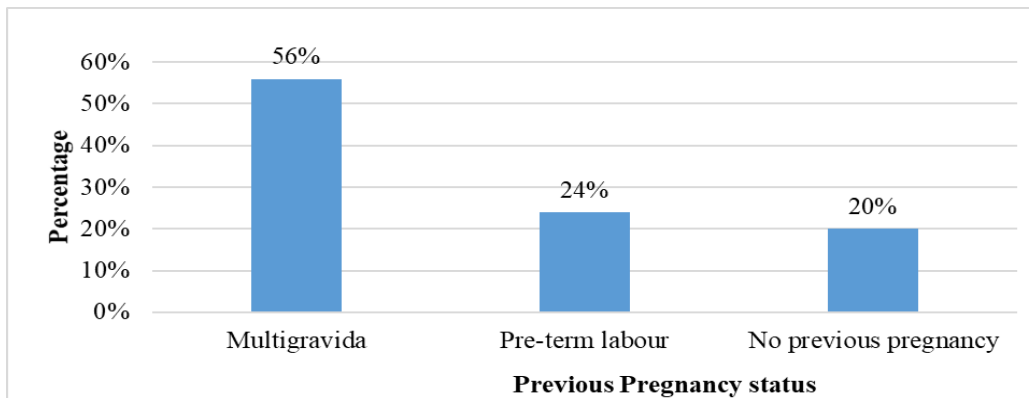


Figure 4.9: Deceased study subjects' history in respect to previous pregnancy

Figure 4.20 summarizes the location of previous deliveries. Overall 72.5% and 76% delivered previously at a healthcare facility while 34.7% and 24% delivered at home for the deceased and alive respondents respectively.

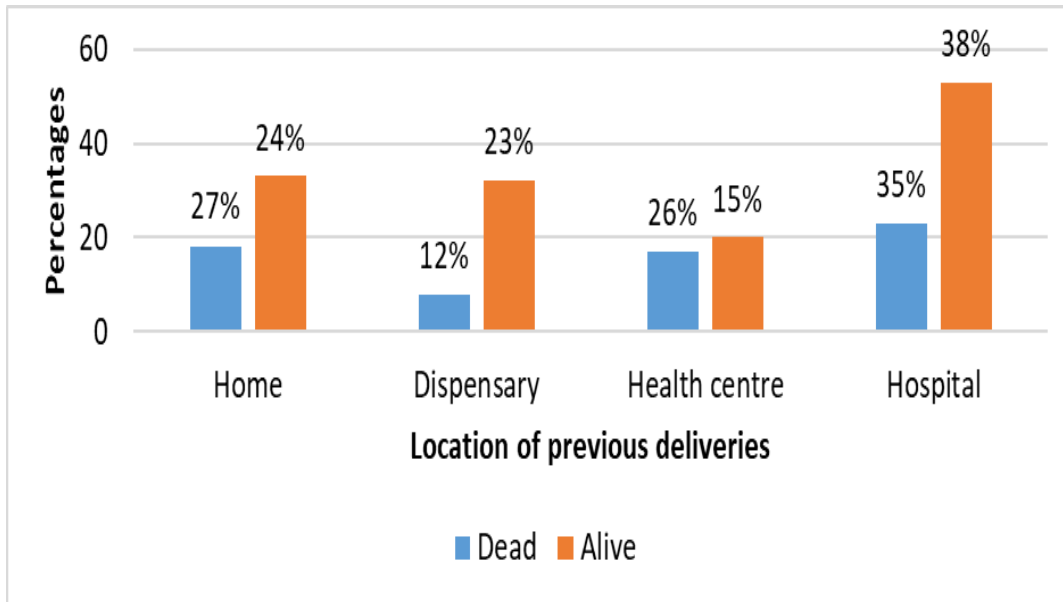


Figure 4.10: Location of previous deliveries of study subjects

Figures 4.11 give a summary of the people who assisted in the current delivery. Sixty three (28%) deliveries were conducted by a doctor, 75 (34%) by a nurse/midwife and 28 (13%) were assisted by traditional birth attendants (TBA), while 3 (1%) deliveries were conducted by a lay relative and 38 (17%) delivered without any assistance. The term none/self means no one assisted the delivery, she delivered by herself.

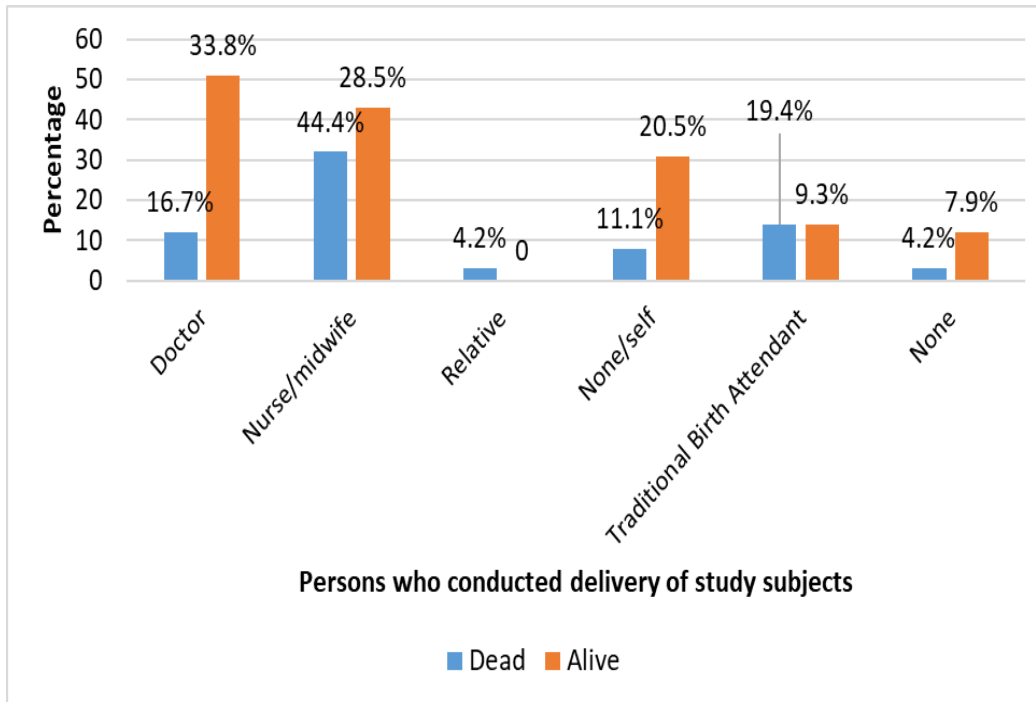


Figure 4.11: Persons who conducted delivery of study subjects.

Figure 4.12 shows the type of immediate delivery. Fifty seven subjects (84%) and 122 (77%) had normal delivery; 11 (16%) and 36 (23%) had caesarian section for dead and live subjects respectively. The term immediate delivery is used to denote; the current mode of delivery normal vaginal delivery and through operation.

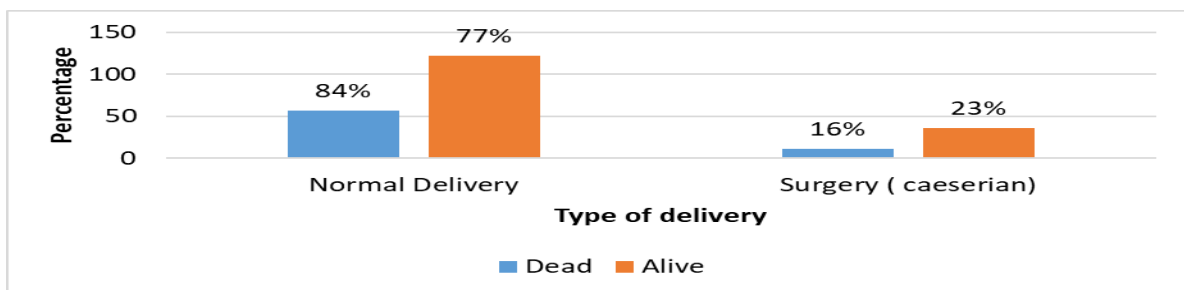


Figure 4.12: Type of delivery.

4.1.1 Emergency Obstetric care preparedness at the hospital

This information was collected from 32 midwives, two clinical officers, two resident doctors and a consultant obstetrician and gynaecologist at the hospital. Their mean working years in maternity unit was six. Additional training relevant to maternal care was one week following basic training except for the consultant who had post-graduate specialist university degree in obstetrics and gynaecology (i.e., Master of Medicine in Obstetrics & Gynaecology).

Figure 4.13 gives a summary of the critical information pertaining to the mothers as obtained from the staff. Four main themes emerged from interviewing these health workers. Lack of awareness by mothers on the value of antenatal care in respect to pregnancy and delivery outcome, access to maternal health services, availability of skilled attendants and policy and legal framework regarding maternal health and abortion.

The interviewees reported that expectant mothers neglected to attend antenatal clinics. This they linked it to limited awareness on the value of the clinics' contribution to safe labour and delivery. The mothers are unable to detect danger signs of threatening pregnancy, have no birth plans and are unprepared for responding to complications of delivery. They also do not have birth- partner and partner support.

They too reported that the mothers should be given health education on the importance of attending antenatal clinics including detection of danger signs of pregnancy so that they can detect impending complications and prepare to seek care promptly. As a corollary, the healthcare system should boost capacity to quickly respond and deliver services. The interviewees pointed to the low staffing levels at the facility, negative attitude of the available healthcare workers. They should be informed on the importance of skilled attendance along with birth partner at delivery.

They also recommended the importance of prompt antenatal clinic attendance, in which risk factors can be identified and corrective measures implemented. This requires the services of committed healthcare workers with the right attitude and behavior which can be acquired through continuing medical education and current updates. It emerged that many antenatal mothers do not have access to maternal health services as a result of cost implications; which include user fees, transport costs, distance to the health facility, and lack of infrastructure and shortages of skilled attendants at the time of delivery. Abortion issues arose as a contributor to maternal mortality. A concern was raised that, the government should be under pressure to legalize abortion to curb maternal deaths. Now that mobile phones are easily available, the network should be connected to the hospitals and ambulance services so that all pregnant women who face transport problems can be collected from their homes to access skilled delivery and avert complications which may occur. In areas with poor infrastructure, there is a dire need to have a mobile antenatal clinic that can be used by the mothers.

In terms of emergency obstetric care preparedness, it emerged that inadequate equipments and supplies were hindering delivery of service to patients. Shortage of staff and poor working environment were cited as some of the contributing factors to poor service delivery.

Congestion in the ward, working environment was not conducive, since there were few staff looking after the mothers, they tended to over-work and often had burnouts, which is not a conducive working condition. This made it to look like they were not doing their work of assisting the mothers. Lack of adequate equipments, supplies and staff had led to poor quality of service delivery and reduced utilization of the facility. Delayed referrals from the neighboring health facilities, due to lack of transport was cited as a major challenge.

Figure 4.13 below shows the summary of remarks reported by the healthcare workers in both gynaecology and maternity unit of the hospital. The same was reported by the relatives of the deceased women.

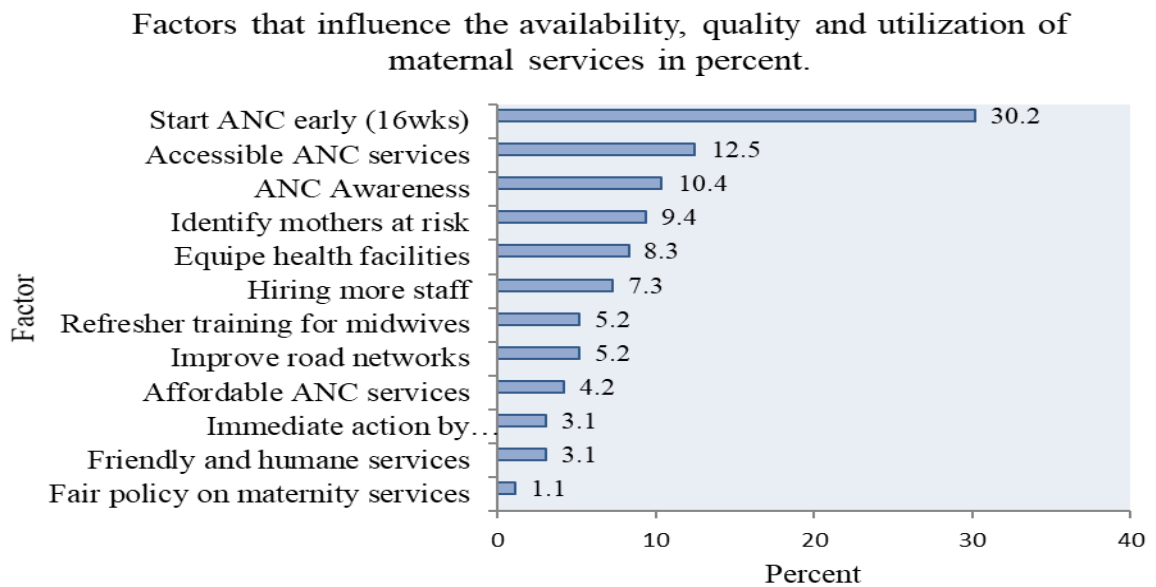


Figure 4.13: Factors that influence the availability, quality and utilization of maternal services

Figure 4.14 shows proportion of subjects and their response to visit the hospital at the onset of labour signs; 71% of the subjects delayed to seek services, while 29% went to the hospital promptly.

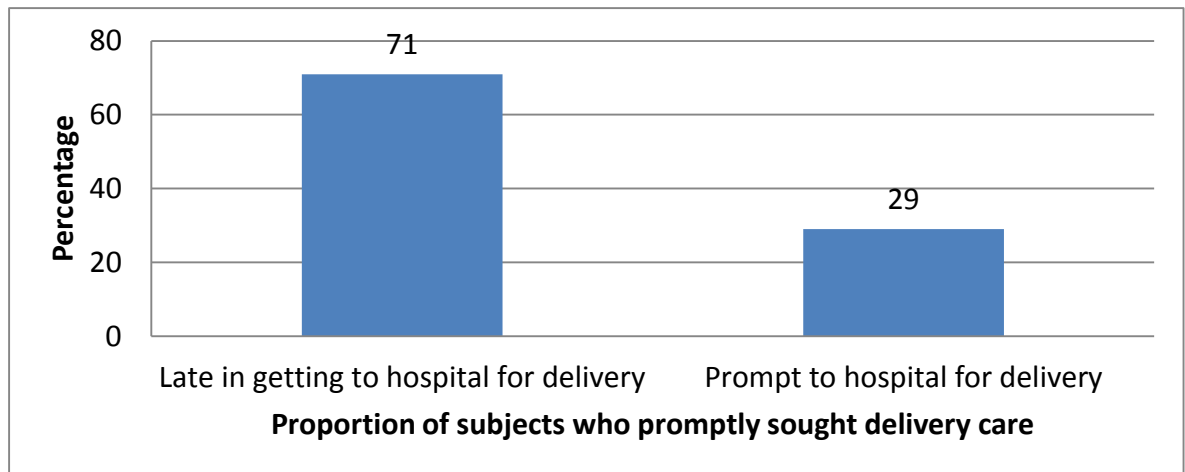


Figure 4.14: Proportion of subjects who promptly sought delivery care at the hospital.

Figure 4.15 gives a summary of the reasons cited by relatives for delay in reaching the hospital. Lack of transport; lack of money and long distance to the hospital were the main reasons cited for not seeking prompt health care as reported by the subject's relatives. Forty (16%) subjects reported hospital being inaccessible due to distance, 31% lacked money, while 35% of the subjects' relatives reported that they lacked transport (vehicle) while 15% reported that none was available to take the mother to the hospital and 37.5% reported that there was delay in being attended to at the hospital. However, 4.0% subjects' relatives cited that the subjects lacked information to seek prompt healthcare.

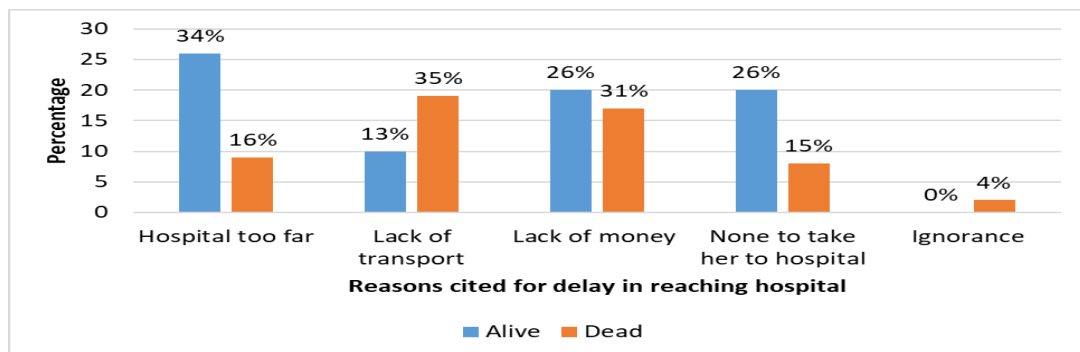


Figure 4.15: Reasons cited for delay in reaching hospital (percentage)

The term “No reason”, the subjects did not give any explanation as to why they did not seek healthcare services.

Figure 4.16 present a summary of the reasons given by relatives for delay in receiving care at the institution: Delay in accessing healthcare services from the healthcare providers was reported by 14 (19.4%) subjects, while 18 (25%) reported lack of blood for transfusion following severe bleeding, Operating Theatre not ready for EmOC, 28 (38.9%), and 12 (16.7%) had no money for purchasing prescription drugs.

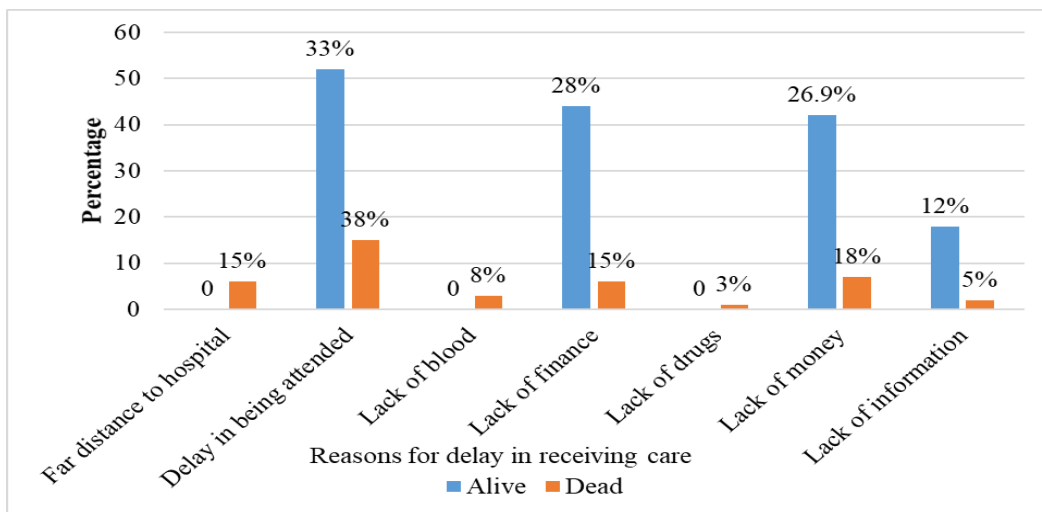


Figure 4.16: Reasons for delay in receiving care

Outcome of pregnancy and childbirth complications antecedent to maternal death

The indirect causes of maternal mortality as reported by the adult kin of the deceased and collaborated by the obstetrician were; pre-eclampsia (21.6%), bleeding 64.4%), postpartum sepsis (43.1%), pregnancy-induced hypertension (21.6%) and heart disease (43.5%).

Persons who conducted the deliveries included: doctor (16.7%), nurse/midwife (44.4%), traditional birth attendants (23.6%) and relative (4.2%). There were 8 (11.1%) women who delivered unaided. Taking into consideration persons who conducted the delivery

and the nature of ensuing complications, in the event that interventions were not prompt, maternal death would be inevitable.

4.2 Factors associated with maternal mortality

4.2.1 Demographic profiling of significant independent variables in the study

Table 4.1 indicates a statistically significant socio-demographic chi – square association with the maternal health outcome status of the targeted subjects at 5% level of significance with age at (Chi-square value=9.235 df=3 sig. = 0.26), marital status (Chi-square value=9.235 df=2 sig. =0.24), education (Chi-square value=21.526 df=3 sig. <0.0001), occupation (Chi-square value=24.642 df=4 sig.<0.0001) and parity (Chi-square value=20.828 df=3 sig.<0.0001).

Table 4.1 Social demographic factors associated with maternal mortality

		Outcome		Pearson Chi-Square		
		Dead	Alive	value	df	sig.
Age	15 -20	14 (19.4%)	57 (36.1%)	9.235 ^a	3	0.026
	21 -25	29 (40.3%)	51 (32.3%)			
	26 - 30	21 (29.2%)	27 (17.1%)			
	31 -40	8 (11.1%)	23 (14.6%)			
Marital status	Single	21 (29.2%)	39 (24.7%)	7.474 ^a	2	0.024
	Married	48 (66.7%)	119 (75.3%)			
	Separated	3 (4.2%)	0 (0.0%)			
Education	None	5 (6.9%)	18 (11.4%)	21.526 ^a	3	0.000
	Primary	33 (45.8%)	41 (25.9%)			
	Secondary	28 (38.9%)	98 (62.0%)			
	College	6 (8.3%)	1 (6.0%)			
Religion	Catholic	35(48.6%)	77 (48.7%)	0.566	2	0.754
	Protestant	33 (45.8%)	68 (43.0%)			
	Others (SDA)	4 (5.6%)	13 (8.2%)			
	None	2 (2.8%)	44 (27.8%)			
Occupation	Farmer	19 (26.4%)	17 (10.8%)	24.642 ^a	4	0.000
	Housewife	29 (40.3%)	60 (38.0%)			
	Business woman	18 (25.0%)	28 (17.7%)			
	Formal employment	4 (5.6%)	9 (5.7%)			
	Peri-urban	7 (9.7%)	36 (22.8%)			
	None	50 (69.4%)	61 (38.6%)			
Parity	1 to 2 Children	15 (20.8%)	49 (31.0%)	20.828 ^a	3	0.000
	3 to 4 Children	7 (9.7%)	43 (27.2%)			
	5 and above children	0 (0.0%)	5 (3.2%)			
Residence	Rural	50 (69.4%)	90 (57.0%)	5.788	2	0.055
	Urban	15 (20.8%)	32 (20.3%)			
	Peri urban	7 (9.7%)	36 (22.8%)			

Figure 4.1 indicates that 149 (65%) of the subjects were attended by professionals. Twenty one (29%) of the subjects' who were attended by professionals died. A higher proportion of mothers who were not attended by professionals died at 51 (71%) of mothers.

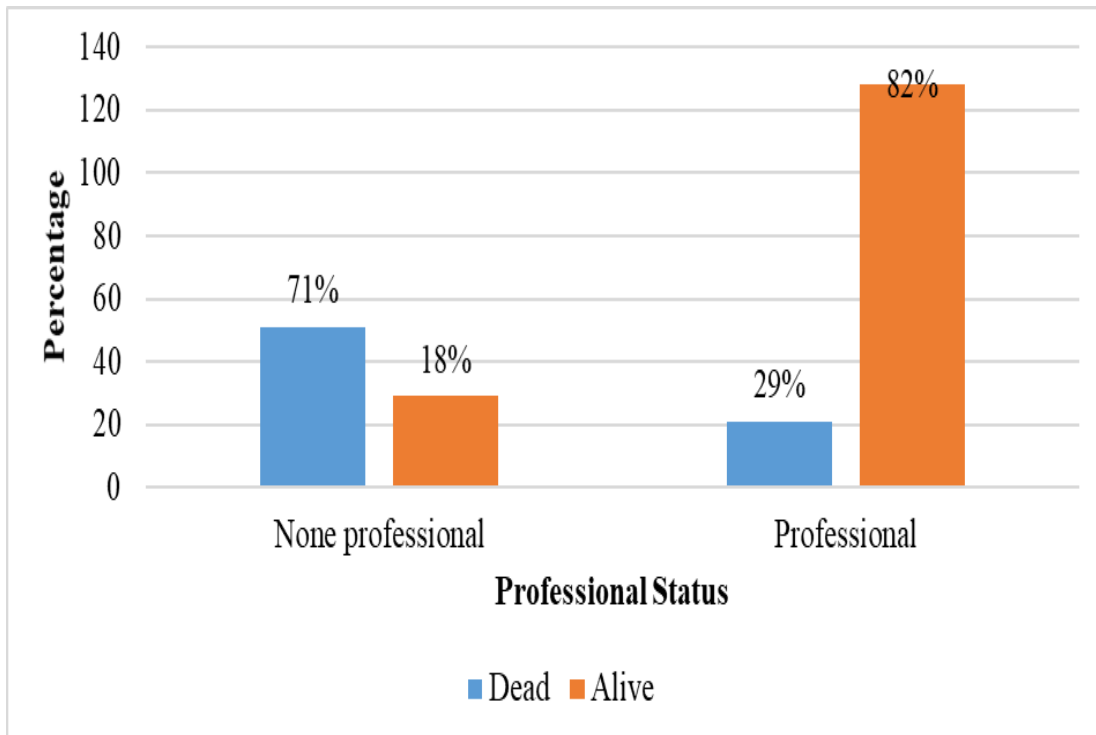


Figure 4.1: The proportion of subjects attended by professionals during delivery

Figure 4.18 presents a summary of risk factors antecedent to maternal mortality. The most frequent risk factor revealed by the study and confirmed by the relatives; were delayed service delivery (65%), complications of pregnancy (47%), unplanned pregnancies and inability to be seen by a doctor (2.9%). Others were pre-term delivery, unspecified complications and abortion. Breech delivery means baby coming out with legs first

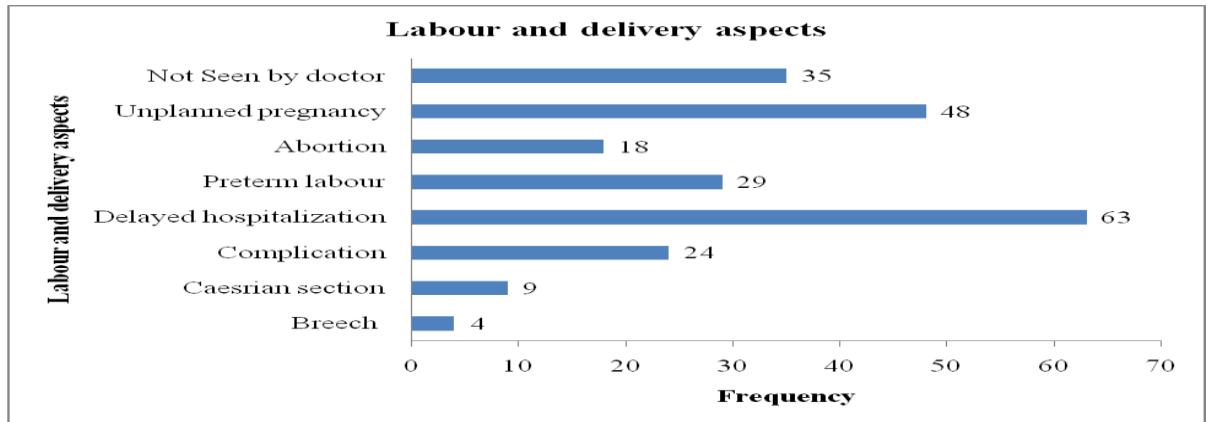


Figure 4.18: Factors linked to maternal mortality

Explanation of Terms: The terms that appear in figure 4.2 can be explained as:

A Breech birth: is the birth of a baby from a breech presentation, in which the baby exits the pelvis' birth canal with the buttocks or feet first as opposed to the normal head first.

Caesarian operation: is a type of surgery used to deliver a baby who cannot be delivered normally due to a variety of reasons. It involves making a surgical incision in the mother's abdomen and another in the uterus to extract the baby.

Complications of birth: They include- fetal distress, maternal distress, hypertension disorders- pre-eclampsia, miscarriages, slow progress of labour, multiple pregnancy, malaria and anaemia.

Preterm birth: Also known as premature birth is the birth of a baby before 37 weeks of gestation.

Unplanned pregnancy: Also known as unintended pregnancy is a pregnancy that is mis-timed, or unwanted at the time of conception. An unplanned pregnancy can be overwhelming for a mother-to-be.

Table 4.2 below indicates that the mothers who had spotting complications were 57 (27%) and those who died were 37 (51%), had a statistically Chi- square dependency at Pearson value=31.834, df=1 and Sig. <0.0001, 7 (3%) of the mothers who had

successful delivery were 120 (58%) and 40 (33%) of the mothers who died were statistically significant, association at Pearson value=13.676, df=2 and Sig. =0.001, labour hours was significant determinant of delivery outcome at Pearson value=1.217, df=1 and Sig.=0.013 and Pearson value=31.945, df=1 and Sig.<0.001 with maternal mortality outcome status at 95% confidence interval.

Table 4.2 Maternal complications associated with maternal mortality

		Outcome		Pearson Chi-Square		
		Dead	Alive	value	df	sig.
Complications	Spotting	28 (80.0%)	17 (94.4%)	1.935	1	0.164
	Swelling	7 (20.0%)	1 (5.6%)			
Spotting	No	35 (48.6%)	116 (85.3%)	31.843	1	<0.001
	Yes	37 (51.4%)	20 (14.7%)			
Bleeding	No	38 (74.5%)	79 (71.8%)	0.127	1	0.721
	Yes	13 (25.5%)	31 (28.2%)			
Hypertension	No	39 (90.7%)	84 (95.5%)	1.140	1	0.286
	Raised blood pressure	4 (9.3%)	4 (4.5%)			
Cardiac	No	47 (85.5%)	111 (89.5%)	0.607	1	0.436
	Heart disease	8 (14.5%)	13 (10.5%)			
SEPSIS	No	31 (58.5%)	88 (64.7%)	0.632	1	0.427
	Infection of reproductive health	22 (41.5%)	48 (35.3%)			
Delivery outcomes	Unsuccessful	25 (34.7%)	55 (40.7%)	13.676	2	0.001
	Successful	40 (55.6%)	80 (59.3%)			
Labour hours	Non response	7 (9.7%)	0 (0.0%)	6.217	1	0.013
	Less 18 hours	48 (80.0%)	24 (57.1%)			
Complicated labour	More than 18 hours	12 (20.0%)	18 (42.9%)	31.945	1	<0.001
	No	39 (54.9%)	129 (89.0%)			
	Yes	32 (45.1%)	16 (11.0%)			

4.2.2 Complications Associated with Maternal Mortality

Figure 4.19 presents a summary of complications antecedent to maternal death, some appears twice to three times in one mother. The highest was spotting and bleeding (80%, 64.4%) and the lowest was hypertension (21.6%). The study also showed that 43.5%

had pre-existing heart disease, 41.5% had convulsive disorders, while 43.1% had postpartum infections as per the records.

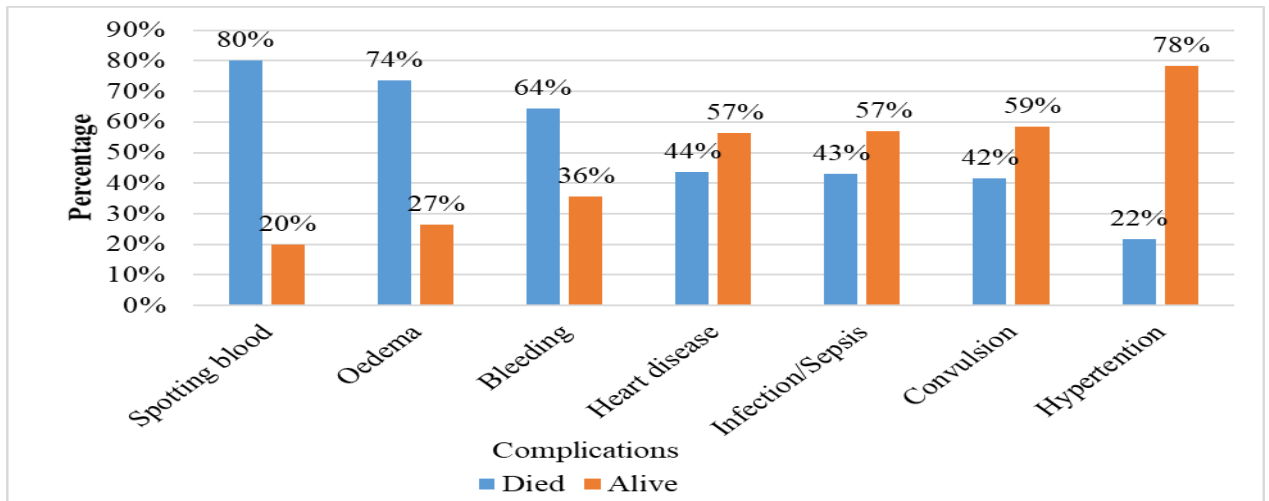


Figure 4.19: Complication antecedent to maternal mortality

Majority of the respondents recommended pregnant mothers should attend ANC once they realize they are pregnant at 27 (37.5%), improve infrastructures, accessibility, equip the hospital, hire enough staff and all mothers to attend ANC clinic 7 (9.7%) and maternity services should be accessible and affordable 7 (9.7%). Mothers should be given education on the importance of hospital delivery and early detection of complications 3 (4.2%) if present so as to intervene in good time.

Table 4.3 Recommendations for improvement of maternal health outcomes

Recommendations	Frequency	Percentage
Employ and deploy more qualified staffs	6	7
Availability of supplies and equipments	17	19
Delivery should be done in a hospital set-up by qualified staff	3	3
Educate traditional birth attendants on how to conduct deliveries	1	1
Education of the midwife to be more pro-active in maternal health care provision	3	3
Education on the importance of Hospital delivery and early detection of complications	3	3
Emergency preparedness for labour and delivery	4	4
Focused antenatal care	34	37
Family Planning	1	1
Government to ensure accesible maternity services	3	3
Early idenfication and followup plan for mothers at risk	4	4
In-service training for medical personnel,	2	2
Provide humane mother and baby friendly services.	5	5
Financial empowerment of women and free Medical Insurance for Maternal Health	4	4
Developing prolicy to improve maternal health care delivery	1	1

4.2.3 Other Chi Square Test Results:

The results revealed significant association differences at 5% level of significance on age by subject visiting a doctor Chi- square dependency at Pearson value=4.45, df=1 and Sig. =0.035, marital status by the duration of the previous pregnancies at Pearson value=7.09, df=1 and Sig. =0.008, education by complication experienced during labour and delivery at Pearson value=4.26, df=1 and Sig. =0.039 education by complication(s) occurred at Pearson value=5.59, df=1 and Sig. =0.018 and occupation. Bleeding in early pregnancy before 22 weeks at Pearson value=4.50, df=1 and Sig. =0.034.

4.3 Multivariate Analysis.

4.3.1 Demographic and maternal complications distribution and associations

From Table 4.4 shows that majority of the mothers had 25 and below years of age at 151 (66%), the married mother had higher proportion compared to single mothers at 179 (75%), secondary and above formed the majority of mothers who respondent at 133 (58%), rural residents formed a higher proportion of respondents at 140 (60%). Farmer/housewife employment was the common occupation among the mothers at 125 (54%). The catholic religion had a higher proportion at 112 (53%) compared to protestants at 101 (47%).

Table 4.4: Summarizes the demographic variables in the study.

Age	Frequency	Percent	Religion	Frequency	Percent
25 and below years	151	66	Protestant	101	47
26 and above years	79	34	Catholic	112	53
Marital	Frequency	Percent	Occupation	Frequency	Percent
			None	46	20
Single	60	25	Farmer/Housewife	125	54
Married	179	75	Business/Formal employment	59	26
Education	Frequency	Percent	Residence	Frequency	Percent
Primary & below	97	42	Rural	140	60
Secondary & above	133	58	Peri-urban	47	20
			Urban	43	20

The mothers who had ever aborted were 39 (20%), the pregnant mothers who had experienced complications included spotting 45 (85%), swollen hands were 8 (15%), Swollen hands and feet were 44 (27%), experienced hypertension proportion 8 (6%), Cardiac disease 21 (12%), P. Sepsis 70 (37%). The previous pregnancies, were planned 74 (34%), successful pregnancy/pregnancies overall proportion was at 120 (61%), duration of labour of the last delivery had 18 and below hours were 72 (71%), those who had previous deliveries take place at a health facility were 153 (70%) compared to home deliveries. The subjects who went to hospital promptly for delivery, when labour started were at 160 (78%), attended/assisted during their last delivery by a doctor were 63 (28%), nurse/midwife 75 (34%), relative 3 (1%), no one or self 39 (18%) and those assisted by traditional birth attendant were 43 (19%). The condition of the neonate after delivery revealed the following conditions: dead 9 (4%), good 145 (64%), fair 46 (20%) and poor 26 (12%). The proportion of pregnant mothers who experienced postpartum problems were 81 (19%) (Table 4.5) below.

Table 4.5: Summary of maternal complication and labour and delivery health care seeking

Variable	Grouping	Frequency	Percent
Aborted	Yes	39	20
	No	154	80
Spotting	Yes	8	15
	No	45	85
Swelling of hands and feet	Yes	44	27
	No	117	73
Bleeding in early pregnancy before 22 weeks	Yes	57	27
	No	151	73
Hypertension	Yes	8	6
	No	123	94
Heart Condition	Yes	21	12
	No	158	88
Sepsis	Yes	70	37
	No	119	63
Planned previous pregnancies	Yes	74	34
	No	142	66
Pregnancy outcome	Successful	120	61
	Unsuccessful	87	39
Duration of Labour	More than 18 hours	30	29
	18 and below hours	72	71
Where previous deliveries took place	Health facility	153	70
	Home	51	30
Went to Hospital immediately labour started	Yes	160	78
	No	44	22
Attendant for the last delivery	Doctor	63	28
	Nurse/Midwife	75	34
	Relative	3	1
	None/self	39	18
	TBA	43	19
Immediate Neonatal condition	Good	145	64
	Fair	46	20
	Poor	26	12
	Dead	9	4
Experienced Post Partum complication	Yes	81	19
	No	182	42

Visiting a doctor in relation to the respondent's age indicated that a majority of the mothers at 84 (56%) who had visited a doctor were 25 and below years. Mothers who were 26 and above years had the least proportion of mothers who had not visited a doctor at 23 (30%) and among or the respondent subjects the mothers who had visited a doctor were 54 (70%) in 26 and above years and those 25 and below years of age who had not visited a doctor were 65 (44%) as indicated in table 4.6 below.

Table 4.6: Age by visiting a doctor

Age	No	Yes
25 and below years	65 (44%)	84 (56%)
26 and above years	23 (30%)	54 (70%)
Total	88 (39%)	138 (61%)

Marital status in relation to the duration of the previous pregnancies 98 (48%) and had term deliveries. Among the mother who had term deliveries and married were at 73 (49 %) with 25 (45 %) being single mothers. Thirty-one (55%) of the mothers had preterm deliveries and were single mothers as indicated in Table 4.7 below.

Table 4.7: Marital status by the duration of the previous pregnancies

Marital status	Preterm	Term
Single	31 (55%)	25 (45%)
Married	77 (51%)	73 (49%)
Total	108 (52%)	98 (48%)

Table 4.8 indicates any form of complications experienced during labour and delivery in respect to the level of education. Thirty eight (32%) had experienced complications during labour and delivery and among those who experience any complications during labour and delivery 15 (28%) had primary and below level of education while the proportion that had not experienced any complication during labour and delivery were 82 (68%).

Table 4.8: Education and any complication experienced during labour and delivery

Education	No	Yes
Primary & below	38 (72%)	15 (28%)
Secondary & above	44 (66%)	23 (34%)
Total	82 (68%)	38 (32%)

Table 4.8 shows bleeding complication and education level. Forty four (27%) had experienced bleeding and among those who experience bleeding 18 (27%) had primary and below level of education while the proportion that had not experienced any complication 26 (27%).

Table 4.9: Education by bleeding in early pregnancy before 22 weeks.

Education	No bleeding	Bleeding
Primary & below	48 (73%)	18 (27%)
Secondary & above	69 (73%)	26 (27%)
Total	117 (73%)	44 (27%)

Table 4.9 indicates that the proportion of mothers who experience bleeding in early pregnancy before 22 weeks were 44 (27%). Business/Formal employment 19 (43%) had experienced early pregnancy bleeding before 22 weeks and 25 (57%) who were in the same occupation had not experienced bleeding.

Table 4.10: Occupation by bleeding in early pregnancy, before 22 weeks.

Occupation	No	Yes
Farmer/Housewife	92 (79%)	25 (21%)
Business/Formal employment	25 (57%)	19 (43%)
Total	117 (73%)	44 (27%)

Table 4.10 indicates that the proportion of mothers who experience bleeding in early pregnancy before 22 weeks were 44 (27%). Farmer/Housewife 92(79%) had experienced early pregnancy bleeding before 22 weeks and Business/Formal employment 19 (43%), while 25 (57%) who were in the same occupation had not experienced bleeding.

4.3.2 Binary Logistics Regression:

The data for the binary logistic regression had to pass the Omnibus tests of model coefficient, the Hosmer and Lemeshow test, the model summary -2Log likelihood, the Cox & Snell R square, and the Nagelkerke R square. A 5% level of significance was considered significant for all analysis. All the dependent and the independent variables that revealed significant results were coded either (1 or 0) to allow for the determination of the odds ratios.

After investigating the question “*did she visit a doctor?*” using marital status, age, education, occupation and residence as covariates, the final model improved from 61.1% to 69.4%. The Omnibus tests of model coefficient of our final model was $\chi^2= 6.18$, $df=5$ and $Sig. = 0.289$. The Hosmer and Lemeshow test was $\chi^2= 9.47$, $df=8$ and $Sig. = .304$. The model summary had -2Log likelihood 90.05, Cox & Snell R square .082, and Nagelkerke R square 0.112. The binary logistic regression Table 4.8 results indicated that the odds ratio on age was 3.33 (95 % CI, 1.13 to 9.82) times higher for respondents with over 26 years than those who had less than 25 years, a statistically significant effect $Wald \chi^2= 4.77$, $df=1$ and $p = 0.029$. The codes used (over 26 years =1, less than 25 years =0). Thus women over 26 years are 3.33 times more likely to visit a doctor after abortion than those who are below 25 years (table 4.11)

Table 4.11: Binary logistic regression on demographics by visit a doctor

Variable	<i>B</i>	<i>S.E.</i>	<i>Wald χ^2</i>	<i>p value</i>	<i>Exp(B)</i>	<i>95% C.I.</i>
Age	1.204	0.551	4.77	0.029	3.333	1.131-9.818
Marital	-0.316	0.544	0.337	0.562	0.729	0.251-2.118
Education	-0.211	0.572	0.136	0.712	0.81	0.264-2.485
Occupation	-0.498	0.627	0.63	0.427	0.608	0.178-2.077
Residence	-0.488	0.557	0.767	0.381	0.614	0.206-1.829
Constant	0.817	0.781	1.093	0.296	2.264	

A Variable(s) entered on step 1: Age, Marital, Education, Occupation, and Residence.

After investigating the question “*what was the duration of the previous pregnancies?*” using marital status, age, education, occupation and residence as covariates, the final model improved from 70.5% to 75.4%. The Omnibus tests of model coefficient of our final model was $\chi^2 = 8.88$, $df=5$ and $Sig. = 0.114$. The Hosmer and Lemeshow test was $\chi^2 = 3.76$, $df=8$ and $Sig. = 0.879$. The model summary had -2Log likelihood 65.128, Cox & Snell R square .136, and Nagelkerke R square .193. The binary logistic regression Table 4.12 results indicated that the odds ratio on marital status was 5.08 (95 % CI, 1.46 to 17.65) times higher for married respondents than those who were single, a statistically significant effect $Wald \chi^2 = 6.54$, $df=1$ and $Sig. = 0.011$. The codes used (married =1, single=0). Thus married women are 5.08 times more likely to carry their pregnancies to term than those who are single.

Table 4.12: Binary logistic regression on demographics by duration of the previous pregnancies

	<i>B</i>	<i>S.E.</i>	<i>Wald χ^2</i>	<i>p value</i>	<i>Exp(B)</i>	<i>95% C.I.</i>
Step 1a						
Age	0.355	0.63	0.317	0.573	1.426	0.415-4.904
Marital	1.625	0.635	6.54	0.011	5.079	1.462-17.647
Education	0.912	0.755	1.458	0.227	2.49	0.566-10.945
Occupation	0.718	0.825	0.758	0.384	2.051	0.407-10.333
Residence	-0.159	0.691	0.053	0.819	0.853	0.220-3.308
Constant	-1.154	1.059	1.187	0.276	0.315	

A Variable(s) entered on step 1: Age, Marital, Education, Occupation, and Residence.

After investigating the question “*Education by what complication(s) occurred?*” using marital status, age, education, occupation and residence as covariates, the final model improved from 68.2% to 72.7%. The Omnibus tests of model coefficient of our final model was $\chi^2 = 8.88$, $df=5$ and $Sig. =0.114$. The Hosmer and Lemeshow test was $\chi^2 =$

6.874, df=8 and Sig. =0.550. The model summary had -2Log likelihood 47.24, Cox & Snell R square 0.162, and Nagelkerke R square 0.228. The binary logistic regression Table 4.13 results indicated that the odds ratio on marital status was 7.46 (95 % CI, 0.027 to 0.656) times less for respondents who had an education level of primary school and below compared to those who had a secondary and above level of education, a statistically significant effect Wald $\chi^2 = 6.158$, df=1and Sig.=0.013. The codes used (primary and below=1, secondary and above=0). Thus women with a less than a primary level of education are 7.46 times less likely to report bleeding as a complication that occurs to them as a result of abortion compared to females with a secondary and above level of education.

Table 4.12: Binary logistic regression on education by complication(s) occurred

Variable	B	S.E.	Wald			Exp(B)	95% C.I.
			χ^2	p value			
Age	-0.274	0.752	0.132	0.716	0.761	0.174-3.323	
Marital	-0.178	0.795	0.05	0.823	0.837	0.176-3.974	
Education	-2.008	0.809	6.158	0.013	0.134	0.027-0.656	
Occupation	-1.095	0.935	1.372	0.241	0.335	0.054-2.09	
Residence	-0.547	0.792	0.478	0.489	0.579	0.123-2.731	
Constant	3.077	1.299	5.612	0.018	21.699		

A Variable(s) entered on step 1: Age, Marital, Education, Occupation, and Residence

After investigating the question “*Residence * Bleeding in early pregnancy before 22 weeks*” using marital status, age, and education, as covariates, the final model did not improve much but it remained at 64.4%. The Omnibus tests of model coefficient of our final model was $\chi^2 = 11.09$, df=5 and Sig= 0.050. The Hosmer and Lemeshow test was $\chi^2 = 12.59$, df=7Sig= 0.083. The model summary had -2Log likelihood 65.73, Cox & Snell R square 0.171, and Nagelkerke R square 0.235. The binary logistic regression Table 4.14 results indicated that the odds ratio on residence was 5 (95 % CI, 0.045 to

0.891) times less for respondents who resided in urban compared to those who resided in the rural, a statistically significant effect Wald $\chi^2 = 4.456$, $df=1$ Sig=0.035. The codes used (Urban=1, Rural=0). Thus women residing in urban places are 5 times less likely to experience bleeding in early pregnancy before 22 weeks compared to those who reside in rural places. The binary logistic regression results on “*Occupation by Bleeding in early pregnancy before 22 weeks*” indicated that the odds ratio on occupation was 7.25 (95 % CI, .028 to.678) times less for subjects who were on Business/Formal employment compared to those who were Farmer/Housewife, a statistically significant effect Wald $\chi^2 = 5.95$, $df=1$ Sig. =0.015. The codes used (Business/Formal employment=1, Farmer/Housewife=0). Thus women who were in business/Formal employment are 7.25 times less likely to experience bleeding in early pregnancy before 22 weeks compared to those who are Farmers/Housewives.

Table 4.14: Binary logistic regression on “demographics by Bleeding in early pregnancy before 22 weeks”.

Variables	<i>B</i>	<i>S.E.</i>	<i>Wald χ^2</i>	<i>p value</i>	<i>Exp(B)</i>	<i>95% C.I</i>
Age	0.715	0.656	1.189	0.276	2.044	0.565-7.392
Marital	-0.552	0.658	0.703	0.402	0.576	0.158-2.092
Education	-0.326	0.709	0.211	0.646	0.722	0.18-2.9
Occupation	-1.983	0.813	5.946	0.015	0.138	0.028-0.678
Residence	-1.61	0.763	4.456	0.035	0.2	0.045-0.891
Constant	1.426	0.977	2.129	0.144	4.163	

CHAPTER FIVE

DISCUSSION

5.1. Outcomes of pregnancy and childbirth complications associated with maternal mortality

The study investigated factors contributing to maternal mortality among women of reproductive age attending Kisii Level-5 Hospital, a referral facility and its catchment area. Majority of women 18 (55%) who succumbed to maternal mortality were young adults (15-25 years), had attained primary education some of them died as a result of abortion, postpartum haemorrhage, cardiac diseases and puerperal sepsis. This study agrees with others done previously that reported that adolescent girls between the age of 15-24 years are vulnerable to maternal death because of immature reproductive organs and none use of antenatal care (Berhan & Berhan, 2014; Nour, 2008). Likewise, Hilber (2016) documented that continuing high levels of mortality in mothers and babies is a global collective failure by governments and international agencies (Hilber et al., 2016). The study showed that 65.3% of the subjects were married, while 29.2% were single with the probability of not prepared for pregnancy. Of these, 59.7% had attained secondary and college education. Housewives formed 40%, while 25% were engaged in business activities. This shows that the community is losing young women in their prime age, crucial for society, since they had the potentials to contribute to socio-economic development and sustain the next generation. This group makes up more than half the workforce in a general population.

Majority of the subjects 50 (69%) live in rural areas while 21% came from urban and peri-urban areas respectively. A study done in Ghana demonstrated that those who hail from rural areas of developing countries have limited access to skilled delivery (Adomako et al., 2016). This is because they do not have access to the doctor, or nurse

/midwife who can attend to them during pregnancy or delivery. Out of 72 deceased subjects, 34.7% had previously delivered at home, while 65.7% had had their delivery at the health institution (Lassi et al., 2016). The study revealed that 61.1% accessed skilled delivery, while 23.6% were attended by traditional birth attendant and 15.3% were attended by relatives. Similar studies in Nigeria and Zambia reported that large proportion of mothers deliver at home. This is a risk factor which predisposes mothers to birth complications leading to maternal mortality (Ebuehi & Akintujoye, 2012; Sialubanje, Massar, Hamer, & Ruiter, 2015).

5.2 Individual level factors antecedent to maternal mortality

The study revealed that the social demographic factors that were depended with the maternal health outcome status of the targeted subjects were aged 25 years and below, 151(66%) being the majority. Majority 179 (75%) of the subjects being married, education 133 (58%) having secondary education and above, occupation 125(54%) being farmer/housewife and 111(48%) having no child. The study also revealed that the complications that had statistical significance were subjects who had spotting at 45 (85%).

The study revealed that females with over 26 years are 3.33 times more likely to visit a doctor after abortion than those who are below 25 years. Married women were 5.08 times more likely to carry their pregnancies to term than those who are single. The subject's education revealed that women with a less than a primary level of education are 7.46 times less likely to report bleeding as a complication that occurs to them as a result of abortion compared to females with a secondary and above level of education, and mothers who were in business/formal employment are 7.25 times less likely to experience bleeding in early pregnancy before 22 weeks compared to those who are farmers/housewives.

The study revealed that many deliveries take place at home without skilled assistance and are brought to the hospital too late; this exposes the women to maternal deaths. However, this indeed shows that maternal deaths take place in both hospitals and rural homes. Mothers seek healthcare services when they are (at risk) in bad obstetric or health condition that it become almost impossible for the healthcare workers to reverse the situation. There are a number of reasons for this happening. Young women are not supposed to be involved in delivery for it is believed that a central spirit of the mother would be ashamed of assisting the delivery attendants to push the baby out (Kumbani, Bjune, Chirwa, Malata, & Odland, 2013). Another reason is that many women believe that hospital deliveries have to be accompanied by episiotomies which are traumatic to them. Most of the women deliver at home to escape the operation thus exposing them to greater risk of death (Lindgren, Brink, & Klinberg-Allvin, 2011). It is imperative that such women should be educated on the importance of some operations that happens mostly during childbirth. This would make them change their attitude towards hospital delivery. In a study done in Ghana, it was reported that in developing countries, a large proportion of women deliver at home. The study revealed that some women did not seek healthcare services in time (71%), while some had no reason at all of not seeking for the services (23.6%) (Aryeetey, Aikins, Dako-Gyeke, & Adongo, 2015). These may be attributed to lack of independence in decision- making process on key issues affecting their own lives. This was a concern reported by some relatives. For example, decision-making process is influenced by the husband, mother-in-law and occasionally by family members regarding where a woman can deliver. The study agrees with a similar one done in Bangladesh, India and Pakistan, it was noted that the women who deliver at home because their husbands or other family members forbade hospital delivery and or need permission to visit a health facility or must be escorted when husband is away from home. Some women rarely use even nearby health services (Gorain, Barik, Chowdhury, & Rai, 2017; Mir, Wajid, & Gull, 2012; Sarker et al., 2016). The study revealed that women are not empowered in decision-making process especially when faced with life-

threatening situations. For instance, 11.1% were waiting for someone to take them to the health facility.

The study revealed that majority of the subjects affected came from the rural areas. This confirm with other studies done which shows that poor women in remote areas are the least likely to receive adequate healthcare. This is especially true for regions with low numbers of skilled healthcare workers, such as Sub-Saharan Africa and South Asia (Filippi et al., 2016; Hogan et al., 2010; Kumbani et al., 2013). While levels of antenatal care have increased in many parts of the world, during the first decade, only 46% of women in low-income countries benefit from skilled care during childbirth. This means that millions of births are not assisted by a midwife, a doctor, or a trained nurse. In high income countries, virtually all women have at least four antenatal care visits, are attended by a skilled healthcare worker during childbirth and receive postnatal care. In low-income countries, just over a third of all pregnant women have the recommended four antenatal care visits (Basu et al., 2012; Haberland et al., 2018).

The study showed that subjects lacked money to pay for prescription drugs, money for transport cost as well as health facility being far. Studies elsewhere have also documented that some of the factors that prevent women from receiving or seeking care during pregnancy and childbirth are poverty, distance, lack of information, inadequate services and cultural practices (Ambreen et al., 2015; Combs Thorsen et al., 2012; Filippi et al., 2016; Finlayson & Downe, 2013; Gitimu et al., 2015; Kitui, Lewis, & Davey, 2013). It can be deduced that maternal death is a public burden and a measure of the standard of healthcare of a given society (Lincetto, Mothebesoane-Anoh, Gomez, & Munjanja, 2013). Therefore to improve maternal health, barriers that limit access to quality maternal health services must be identified and addressed at all levels of the healthcare system (Fathalla, 2017; Marquez, 2012; WHO, 2015c).

In addition, the report of international meeting of national mortality in November 1998, quoted that poor women are unlikely to have formal education and good health than wealthy women. This is likely due to the fact that women could not afford to pay cost-sharing fees. They face financial hardships. Therefore they rely on traditional birth attendants (TBAs), relatives or deliver themselves. However, this is not only endangering their lives but also the lives of the newborn babies. This collaborates with similar studies (Shaikh, Khan, Maab, & Amjad, 2014; Titaley, Hunter, Dibley, & Heywood, 2010). Again, the study revealed that many women (69.4%) live in rural areas and have no access to skilled attendants, most skilled attendants-doctors and nurse/midwives prefer working in urban areas, citing rural setting, lacking infrastructure, incentives, and having high workload, with poor safety measures and professional isolation. The study revealed that some women preferred the services of the TBAs (23.6%) rather than the skilled nurse/midwife. The reasons given are that some of the skilled attendants have bad attitude that although they are trained, many women feel that they have insufficient and inadequate skills (Mannava, Durrant, Fisher, Chersich, & Luchters, 2015). Other studies collaborate the findings of the current study that it is true, there is lack of up-dating of skills specifically for those few in the rural areas (Graves, 2012; Panagariya, 2014).

Many mothers do not plan their pregnancies. Unplanned pregnancies as revealed by the study would have been addressed through access to contraceptives. Family planning is known to be a cost effective strategy to enhance maternal and newborn health, reduction of maternal and newborn mortality and is one of the prongs of PMTCT. However in Kenya, a study done by KDHS (2003) reported that contraceptive prevalence stands at 39%, family planning unmet needs among married women aged 15-49 stands at 24% and the total fertility rate is 4.9. Family planning utilization is poor among adolescents. Consequently, almost a quarter (23%) of Kenyan adolescents aged 15-19 are either pregnant with their first child or already mothers (Central Bureau of statistics, 2004).

5.3 Facility factors associated with maternal mortality

The study showed that there were few health workers at the health facility who were busy with other mothers as they waited for their turns. It can be argued that although many healthcare workers have been trained and some with obstetric and midwifery specialization, they have relocated to urban centres and some have migrated to other countries who are giving better salaries and packages including provision of safety measures. This has created a gap in availing appropriate and prompt service. This was evident in the delay in accessing services promptly. Emergency obstetric care was lacking. This was demonstrated by the maternity theatre lacking essential equipments and supplies, unavailability for blood for transfusion and drugs. Thus relatives were asked to buy some drugs. Some of the relatives did not have money to buy prescription drugs and this cost the mother's life. Healthcare facilities are few and spread far apart with poor rural road network that are impassable during rainy season. It may be inconvenient for the woman to use those roads when she is in labour, again institutional problems such as shortage of essential equipments and supplies, and lack of blood for transfusion is common in health institutions. McCarthy and Maine (1992) has ably shown a conceptual model of analyzing determinants of maternal mortality as a distant or socio-economic factors thus intermediate factors (health behavior and status, access to health services, and unknown factors); outcomes (pregnancy, and the complications which subsequently lead to mortality and morbidity), demonstrate a multi-factorial causes of maternal mortality in the community which should be looked into to safeguard the life of mothers, in improving access to health care services (Filippi et al., 2016; Hogan et al., 2010; McCarthy & Maine, 1992)

Maternal health care depends primarily on the socio-economic and cultural milieu in which a woman lives. If MCH care programmes are to be effective, they must concern themselves not only with immediate causes of morbidity and mortality, but with the social organisations and values that characterise populations. This is because pregnancy

and childbirth in Africa is entrenched in individuals, family and community beliefs and customs that affect health and health care sought (Benova, Campbell, Sholkamy, & Ploubidis, 2014; Hernandez & Blazer, 2006)

The current study revealed that some mothers did not have money to enable them access health services in good time. Financial resources availability both to the individual, family and community may influence the access that women have to maternal health care services. In addition, the cultural set up also influences health care behaviour and use of health services. Thus, although modern maternal health care services may be available, culture may prohibit some practices, women may not make use of such services. The study is in consensus with others and expert panels' opinions that poorly financed and unaccountable health systems, including weak referral systems, are a key determinant of maternal outcome (Africa Progress Panel; WHO, 2010; Pearson et al., 2009; USAID, 2015). Another determinant is poor access to quality maternal health care services because of geographical terrain and poor roads. This is indeed typical of Kisii highlands where the study took place. Maternal health care services are deemed to be of poor quality if, for example, they lack skilled health providers, the providers have negative attitudes, treatment guidelines and protocols are inappropriate, and they lack essential drugs, equipment, and supplies. Again, a low health personnel-to-population ratio is a chronic issue in Sub-Saharan Africa. WHO has concluded that the health personnel-to-population ratio in Sub-Saharan Africa is reported as 1:23,540, ranging from 1:750 in South Africa to 1:72,000 in Rwanda. For nurses, the Sub-Saharan African health personnel-to-population ratio is 1:3,460, ranging from 1:600 in Zambia to 1:5,470 in Tanzania. This reveals a shortfall in health manpower distribution (WHO, 2015c, 2018).

Furthermore, women in developing countries often lack the economic resources and education to make informed decisions about their health and nutrition. Some women are denied or lack access to reproductive health information and services because of

logistical social and or cultural barriers. Lack of decision-making power, excessive physical labour and poor nutrition also affect maternal mortality. Additional factors that prevent women in developing countries from receiving the life-saving health care they need include distance from health services, costs, poor quality of available services, and sub-standard treatment by health providers (Hogan et al., 2010; Papiernik, 1989; WHO, 2015d). In this regard, they may not get proper medical attention and hygienic conditions during delivery that can reduce the risk of complications and infections. Given that 15% of pregnant women experience life-threatening complications and 40% of pregnancies require special care, it is necessary to increase the births in medical facilities with trained attendees. WHO (2015) documents that it is only 53% of deliveries in developing nations which are attended by health professionals and only 40% take place in a hospital or health centre. Similarly, training skilled attendants who are able to detect, manage and prevent obstetric complications as well as provide equipment, drugs and other supplies is the single most important factor in preventing maternal deaths. Inadequate use of prenatal care has also been associated with increased risk of maternal mortality. However, in developing countries, 70 percentages of births are preceded by at least one antenatal visit while 38 million women receive no antenatal care as reported by (WHO, 2015d). similar studies have pointed out the importance of improving maternal health through access to health services at all levels (AbouZahr, 2003; Gülmezoglu et al., 2016).

5.4 Community level factors associated with maternal mortality

The study showed that some women did not go promptly to hospital as a result of lack of money. Limited access to financial resources is a major limiting factor in women control over their lives. In situations where women have no control over their own or their family income, their ability to use maternity services especially where fees is involved are further constrained. It is reported too that in Ethiopia, Kenya and Tanzania women who delivered at home cited their husbands' refusal to meet their medical expenses as

the main reason. Therefore, the economic independence of a woman seemed to have a direct effect on their lives for it would hinder the use of maternity care service facilities even when available (Pfeiffer & Mwaipopo, 2013; Roro, Hassen, Lemma, Gebreyesus, & Afework, 2014).

5.5 Complications associated with maternal mortality

The major complications identified by the study included; spotting, bleeding (hemorrhage), raised blood pressure, heart disease, convulsive disorders, post-partum infections/sepsis and HIV infection. The study revealed that a quarter of the pregnancies ended in abortion and this correlated with WHO (2008) report that 13% of all maternal deaths occur among adolescents mainly as a result of complications of unsafe abortion (WHO, 2008b). The study revealed young women died as a result of abortion. Similar studies revealed that young women of 15 to 19 years of age are twice likely to die mainly as a result of unsafe abortion which is a common cause of maternal mortality (Brosens et al., 2017; Haberland et al., 2018; Neal et al., 2016).

As revealed by the relatives of the subjects', communication poses a major. These are equally common conditions (Lindgren et al., 2011; Mannava et al., 2015). Again, maternal deaths tend to occur around labour, delivery and the immediate post-partum period, with obstetric hemorrhage, being the main medical cause of death. Local variation can be important, with unsafe abortion carrying huge risk in some populations. WHO (2017) reports that over 42% of the 129 million women worldwide who give birth annually experience some complications during pregnancy, likewise 15% of these women develop potentially life-threatening complications, which include chronic pain, impaired mobility, damage to the reproductive system and infertility (WHO, 2017b). Again complications arising from childbirth account for 18 percent of morbidity among females of reproductive age thus a major cause of death among women of reproductive age in the developing world, especially in Sub-Saharan Africa (WHO, 2014a, 2018).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The study revealed that young women (15-30 years) of reproductive age, single and married are victims of maternal mortality. Unplanned pregnancies, abortion, home deliveries, inability to access skilled attendants and poor decision-making process are antecedent factors which are attributed to maternal mortality.

Again the study has revealed weak healthcare system is a major determinant for maternal mortality.

The study also showed that the complications which led to maternal mortality were mainly; bleeding/post-partum hemorrhages, swelling of hands, hypertension, heart diseases, and post partum infections.

Lack of transport, lack of money, hospital being far, and poor health seeking behavior contributed to delay in accessing healthcare promptly. Lack of blood for transfusion, lack of money for prescription drugs contributed to delay in receiving appropriate and quality care while in the hospital.

6.2 Recommendations

The study recommends that health education should be intensified targeting young women of reproductive age (15-30 years), single, married and house wives, on the importance of attending ante natal clinic and have a birth-plan. They should also be empowered economically to facilitate them financially as well as empower them in decision-making in matters pertaining to their health. There is a need to scale-up family planning and skilled deliveries to reduce unmet family planning needs and improve on skilled deliveries.

In order to tackle complications, the study suggest, that focused antenatal care should be intensified using out-reach programmes. Community involvement in the reduction of maternal deaths is imperative through community strategy approach.

The study recommends that there should be continuous medical education to enhance skills such as pathogram to identify complications earlier so as to institute emergency obstetric care. In situations necessitating frequent vaginal examinations and early rupture of membrane, the study suggests that antibiotic should be give to combat post-partum infection/sepsis.

A study should be launched to establish the kind of care provided by the traditional birth attendant that is client/ pregnant mothers' friendly but skilled attendant is limited to offer.

Traditional birth attendants play a key role in attending deliveries, and their knowledge and skills should be improved so that they can recognize complications earlier and refer the women in time to reduce risks of maternal deaths.

There is need to improve and strengthen the weak healthcare system, particularly availability of adequate resources for emergency obstetric care as well as referral system from tertially health care facilities.

Health system alone cannot adequately address the issue of maternal mortality if it cannot involve these important community resource people who understand the community dynamics. Here is a model developed based on the above result to improve maternal health in order to curb maternal deaths (Figure 5.1).

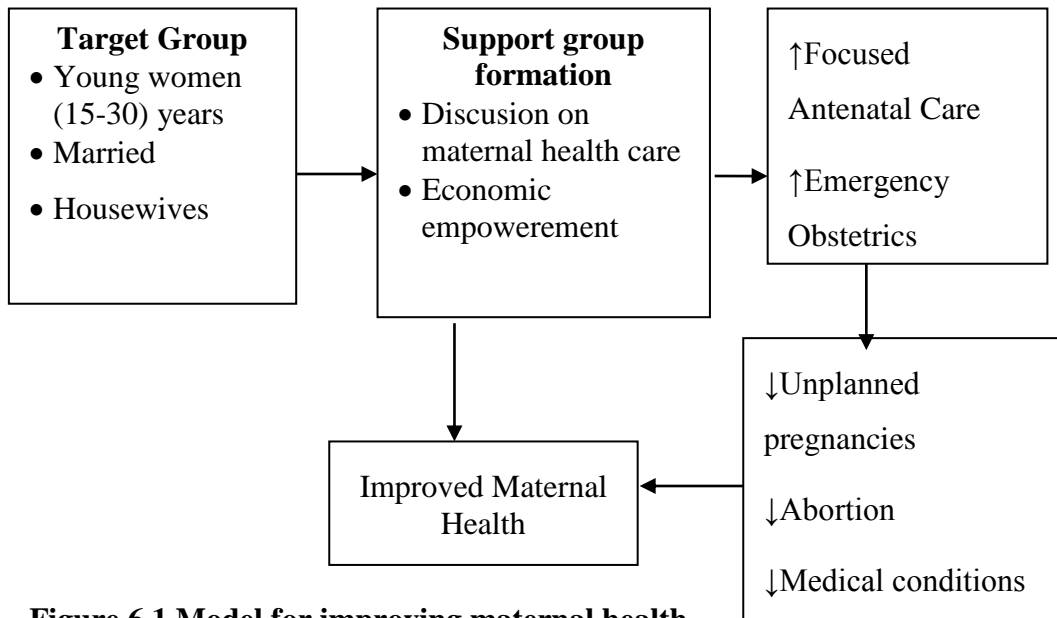


Figure 6.1 Model for improving maternal health.

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APPENDICES

Appendix 1A: Research Participation Consent Form

INFORMED CONSENT AND EXPLANATION FORM

STUDY TITLE: DETERMINANTS OF MATERNAL MORTALITY AMONG WOMEN OF REPRODUCTIVE AGE ATTENDING FOR MATERNITY SERVICES AT KISII LEVEL 5 HOSPITAL, KISII, KENYA.

PART A

Introduction

I am Alfred A. Osoro, a public health student at Jomo Kenyatta University of Agriculture and Technology (JKUAT). We are working with my colleagues on the project named above. We would like to collect information regarding determinants of maternal mortality among women of reproductive age in Kisii. We request that you read this form and ask any question you may have before agreeing to participate in the study.

Purpose of the study

Maternal mortality is becoming a major public health problem worldwide, mainly in the developing countries which contribute 98% of maternal deaths. About 600,000 mothers die during pregnancy or childbirth, which can be translated to a woman dying every minute somewhere in the world. In Kenya 414 women per 100,000 die as a result of complications arising from pregnancy and childbirth. Again in Kisii 580 women per 100,000 live births die and this does not portend well with the government's effort to reduce maternal mortality by 75% by the year 2015, which is the 5th millennium development goal. No much information is available as to the factors within the

community and the hospital which contribute to maternal deaths. The purpose of the study is to investigate the determinants, so that concerted efforts are taken in an effort to control these deaths.

Procedure

If you agree to participate in this study by signing the section at the end of this form, you will be asked questions about yourself, your family and the situation in which the deceased mother met her death, and if the circumstances surrounding the mother's death would have been prevented, so that similar action can be taken to prevent such occurrence.

Precautions

There are no risk factors involved in this study.

Benefits

This study is expected to come up with factors within the community and at the hospital which contribute to maternal deaths. It will recommend strategies which if implemented, will reduce mothers dying from complications arising during pregnancy and childbirth. This will also reduce the agony and tremendous loss experienced by families.

Study costs

Taking part in this study will not involve any payment.

Research related injury

There are almost no chances of you getting an injury in the course of our study.

Voluntary nature of the study

Participation in this study is voluntary. If you decide to participate, you are free to do so and again if you decide to withdraw from the study at any time, you are equally free at any time.

Confidentiality of the records

Any records relating to your household information and the deceased will be maintained in confidence. Your names and the name of the deceased will not appear in any of the reports from this study. No identity of specific individual will be disclosed and any public reports or publications.

Obtaining additional information

You are encouraged to ask any questions to clarify any issues at any time or ask questions anytime during your participation in this study. If later think you need more information or to give more information you may call cell phone number 0733921530. If you have any concerns regarding the study and you would like to talk to any other person other than the researcher you are encouraged to contact:

The director, institute of tropical medicine and infectious diseases (ITROMID),

Jomo Kenyatta University of agriculture and technology

P.O Box 62000-00200 Nairobi.

Tel. 067-52711,

Email: itromid@nairobi.minicom.net

Or

The secretary,

Kemri, National Ethical Review Committee

P.O Box 59840-00200

Nairobi.

Tel: 0722-205901

Email: info@kemri.org

You will be given a copy of this form to keep for your records.

Note: One copy of this form will be signed by the person giving information before being interviewed.

Participant's Name

.....

Participant's Signature Date.....

Witness's Name

.....

Witness's SignatureDate

Appendix 1B: translation of informed consent document into kisii language.

Ogwancherana gosoa omoroberio bw' obotuki (research).

Amasomo: Egento gekogera abasubati be-miaka yokonyora abana bagosiria obogima ekeru bagochia konyorabana ase enyagitari enene ya Kisii.

Ensemu Entangani: A

Introduction (Ase obwenge- omochakano)

Erieta riane Alfred A. Osoro, nigongosoma Jomo Kenyatta University of Agriculture and Technology (JKUAT). Ntore amo nabande kobwaterana emeroberio yogotaka komanya ninki gekogera abasubati bemiaka yokonyora abane bagenderete gosiria obogima bwabo chingaki chiogochia konyora omwana aiga enyagitari ya Kisii. Nigo togokoboria koranche osome efomu eye onyeigwe erio korabe namaswari ande onsi oborie nyuma otarancha gosoa ase omoroberio oyo bwobotuki gose erisachi.

Purpose of the study (Egango ye erisachi)

Abasubati abange nigo bagenderete gasiria obogima bwabo ase ense enigma engaki bebwateranetwie na bagochia konyora abana. Chinse chikogenderera nachio chigosiria abasubati abange ekerengo kia 98%. Ange abasubati 600,000 nigo bagosiria obogima bwobo engaki bare morito gose engaki bagochia konyora abana. Kobwatekana nenamba eye, nigo omosubati oyomo agosira kera etageka eyemo ase rikuko ensengima. Aiga Kenya, abasubati 414 ase 100,000 bagonkirie nigo bagosiria obogima bwobo kobwatekana nobokongu bwokonyora omwana. Aiga bosongo (Kisii) nigo ekageire abasubati 580 gati ya baria 100,000 bakonyora abana nigo bagosiria obogima bwobo. Eyeteri kogenda amo nemeroberio ya eserekari, yogokeyia ogosiria abasubati ekerengo kia 75% goika omwaka bwe' 2015, eyio ere emepango ya gatano ya amagenderero yensengima (Millenium Development Goal Number 5). Ase engaki eye, esababu teiyo

eisaine ekorokia ogosiria abasubati aba. Egango enene yerisachi eye nigo egochia korigereria na ninki gekogera abasubati bagenderete gosiria obogima engaki bebwateranetie gose engaki yogochia konyora omwana, erio emeroberio ebekwe yogotanga agokeyia amakweri ya abasubati.

Procedure (Omoroberio)

Koranche gosoa ase omoroberio bwe' risachi, nigo orabeke ekiara (gose esiginicha) ase omoerio bwefomu eye, ekiagera noboribwe amaswari aye bweka omonyene amo nenyomba yao, na nekiagerete nyagosira gosiria obogima bwayeengaki arenge morito/ ebwateranetie gose engaki arenge kogonkia.

Precaution (Ekoko)

Binto binde gose bitango tibiri birakorenterere ase ogosoa gose gotobwatesia erisachi eye twatiekire gokora.

Benefits (Obuya bw' erisach)

Egango yerisachi eye nigo erengete gati yechinka na nyagitari ase engaki yokobereka gose yokonyora omana, esababu enene nereri ekogera abasubati bagosiria obogima bwabo?. Ekero richibu riamanyekanire, emeroberio nebekwe yogotanga amakweri ya abasubati ayio akorenta obororo, amagombo na ogweitia nomoichano ase eamate yaye.

Study costs (Enengo yogosoa ase research)

Gosoa ase omoroberio bw' erisachi, garama ende teiyo ekoborigwa. Ogosoa mbosa na kende tikeri ogwakanwa.

Research related injury (Chingoma)

Tekageiri ng'a ng'oma chinde gose bokongu bonde mbobe kobwatekana na erisachi eye.

Kerabe riyianda gose ebiregererio mbisareke, rirario, notomwease omonyagitari bwe birengererio erio akwane naye.

Voluntary nature of the study (Okwerwa ase risachi)

Nigo okwerwa ase ogosoa ase erisachi eri. Nakwerwe gosoa, naboigo nore nobosibore bwogotagenderera gose gotiga koreng'ana buna ebiregererio biao birakoe ng'aki ende yonsi.

Confidentiality of records (Obobisi bw' echirekoti)

Emeroberio, gose amangana onsi gose kende gionsi kerakwanwe igoro yenyomba yao, gose igoro ya nyagosira nigo ayio onsi arabe ayabobisi mono. Nonya naamariata ao gose ayanyagosira, takorikwa ase eripoti eye. Tobase koba na tangu tangu ende yonsi na ase onde bwensi korika eripoti ya erisachi eye.

Obtaining additional information (Okoganiakoboria gose koinyora ingana rinde rionsirire ase omoyo)

Nore nobosibore bwokoboria ngana ende yonsi oratware ase omoyo oo ngaki ende yonsi ekero ore ase omoroberio bw' erisachi. Koraganie koboria gose gokwana gose konyora eripoti ende aseobotambe, gose koranyore ing'a nobwate engana ebwenerete komanywa, nabo oratome engana eyio ase enamba yesimi 0733 921530. Boigo, kerabe natake gokwana gose komanyia omotaerekita omonene, nabokorika ase:

The Director, Jomo Kenyatta University of Agriculture and Technology, P.O.BOX.62000-00200.Nairobi, Kenya. Tel.067-52711. E-mail itromid@nairobi.minicom.net or The secretary, Kenya Medical Research Institute, National Ethical Committee, P.O BOX. 59840- 00200, Nairobi, Kenya. Tel.0722-205901. E-mail info@kemri.org.

Noegwe ekobi yefomu eyemo bwegachere.

Inyora inga ekobi ya efomu goika eichoribwe nyuma yoriaokorwa amaereso.

Participant's *Name*
(Erieta).....

Participant's *Signature* *(Okobeka ekiara)*.....
Date.....

Witness's *Name*
(Kirori).....

Witness's *Signature* *(Okobeka*
ekiara).....*Date*.....

Appendix 2: Confidential Questionnaire of Household (CQH)

Working Classification of Causes of Adult Deaths

- 1. Communicable Diseases
 - 1.0. Unspecified communicable diseases*
 - 1.1. Acute Febrile Illness
 - 1.1.0. Unspecified acute febrile illness
 - 1.1.1. Malaria
 - 1.1.2. Meningitis
 - 1.1.3. Hepatitis
 - 1.1.4. Pneumonia
 - 1.1.9. All other specified acute febrile illnesses*
 - 1.2. Tuberculosis/AIDS
 - 1.2.0. Unspecified TB/AIDS*
 - 1.2.1. Pulmonary Tuberculosis
 - 1.2.2. AIDS
 - 1.2.3. AIDS + Pulmonary Tuberculosis
 - 1.2.9. All other forms of tuberculosis*
 - 1.3. Diarrhoeal diseases
 - 1.4. Tetanus
 - 1.5. Rabies
 - 1.9. All other specified communicable diseases*

- 2. Direct Maternal Causes
 - 2.0. Unspecified direct maternal causes
 - 2.1. Abortion
 - 2.2. Eclampsia
 - 2.3. Ante/postpartum haemorrhage
 - 2.4. Obstructed labour
 - 2.5 Puerperal sepsis
 - 2.9. All other specified direct maternal causes*
 - 3. Non-communicable diseases
 - 3.0. Unspecified non-communicable diseases*
 - 3.1. Cardiovascular Disorders
 - 3.1.0. unspecified cardiovascular disorders*
 - 3.1.1. Congestive Cardiac Failure
 - 3.1.2. Ischaemic Heart Disease
 - 3.1.3. Cerebrovascular Disease
 - 3.1.9. All other specified cardiovascular disorders*
 - 3.2. Chronic Obstructive Pulmonary Disease
 - 3.3. Liver cirrhosis
 - 3.4. Acute abdominal conditions
 - 3.5. Diabetes
 - 3.6. Neoplasms
 - 3.6.0. Unspecified neoplasms*

- 3.6.1. Carcinoma breast
 - 3.6.2. Carcinoma cervix/uterus
 - 3.6.3. Hepatoma
 - 3.6.4. Carcinoma of gastrointestinal tract
 - 3.6.9. All other specified neoplasms*
 - 3.7. Renal disorders
 - 3.8. Central Nervous System disorders*
 - 3.9. All other specified non-communicable diseases*
 - 4. Symptoms, signs, syndromes not elsewhere classified
 - 4.1. Anaemia
 - 4.9. All other specified symptoms, signs and syndromes*
 - 5. External Causes
 - 5.0. Unspecified external causes*
 - 5.1. Unintentional Injuries
 - 5.2. Intentional Injuries
 - 6. Undetermined
- * diagnostic criteria for these categories of causes of death are not available in the proposed hierarchical algorithm

Appendix 3a: Confidential Questionnaire for Female Death (CQFD).

<p>Confidential Questionnaire for Female Death (CQFD). Confidential Questionnaire for Female Death (Q 3) (Based on verbal autopsy technique for relatives): With Kisii Translation in italics Section 1: Signs associated with Pregnancy Ensem01: Ebiorokio biokwebwaterania</p>				
CODE	Question	Yes (Ee)	NO (Ya ya)	Don't Know (Tima nyeti)
1	Was she pregnant at the time of death? <i>Nebwateranetie engaki asirete?</i>			
2	How long was she pregnant? Weeks _____ Months _____ <i>Nebwateranetie engaki engana ngaki? Emekubio Emetienyi _____</i>			
3	How many pregnancies had she had including this one? Pregnancies _____ <i>Konye obeire na amarito arenga amo nobo? Amarito _____</i>			
4	During the last 3 months of pregnancy, did she suffer from any of the following illness? <i>Ase emetienyi etatoyaetire narwarete namarweire aya akobwatia?</i>			
	a. Vaginal bleeding? <i>Ngotitiboka arenge korwa oroiboro rwaye?</i>			
	b. Smelly vaginal discharge? <i>Narenge nobogundo korwa ase oroiboro rwaye?</i>			
	c. Puffy face? <i>Obosio mbwabimbete?</i>			
	d. Headache? <i>Ngwatibwa erege nomotwe?</i>			

	e. Blurred vision? <i>Nigo are korora orotutu?</i>			
	f. Convulsions? <i>Namagagete?</i>			
	g. Febrile illness <i>Riberera rinene?</i>			
	h. Severe abdominal pains <i>Okoromwa mono kwenda?</i>			
	i. Pallor and shortness of breath (both present) <i>Okoererwa kwa amanyinga na gosinywa kweyana</i>			
	j. Did she suffer from any other illness? (Specify) <i>Nabwate borwaire bonde? (buna borori)</i>			
5	Did she die during labour, but undelivered? <i>Nigo asirete ekeru arekobin,nyumaataragonkia?</i>			
6	Did she give birth recently? <i>Konye onyorire omwana bwango iga?</i>			
7	How many days after giving birth did she die? <i>Amatuko arenga airete agasira korwaengaki anyorete omwana?</i>			
8	Was there excessive bleeding when labour started? <i>Natitibogete amanyinga amange engaki achagete kobina?</i>			
9	Was there excessive bleeding during labour before delivering the baby? <i>Narweti amanyinga amange engaki arekobina nyuma ataranyora omwana?</i>			
10	Was the excessive bleeding after delivering the baby? <i>Narwete amanyinga amange ekeru anyorire omwana?</i>			
11	Did she have difficulty in delivering the placenta? <i>Nabwete omochando bwokorwa kwomogoye bwomwana?</i>			

12	Was she in labour for unusually long (more than 24 hrs)? <i>Nabinete engaki entambe monogoetania (goetania ritukoerimo)</i>			
13	Was it a normal vaginal delivery? <i>Nanyorete omwana buya?</i>			
14	What type of delivery was it? <i>Nkonyora omwana kuokwo kwarenge?</i>			
15	Did she have foul smelling vaginal discharge? <i>Ogotioka nkorwa kwarenge aseoroboro riaye?</i>			
16	Where did she give birth? Home [Y] [N] Hospital [Y] [N] <i>Ngai agonkeretie/ anyorerete omwana? Inka [Y] [N] Nyagitari [Y][N]</i>			
17	Who conducted the delivery? Traditional birth attendant [Y] [N] Health care worker [Y] [N] <i>Ningo omokonyete ase okonyora omwana? Omoibori bwegenka [Y][N] Nyagitari [Y][N]</i>			
18	Did she experience an abortion recently? <i>Oborito mbwarwete bwongo iga?</i>			
19	Did she die during the abortion? <i>Nigo asirete engaki oborito bware korwa?</i>			
20	How many days before death did she have the abortion? Days _____ <i>Amatuko arenga aetete korwa oborito korwa nere gosira? Amatuko _____</i>			
21	How many months pregnant was she when she had the abortion? Months _____ <i>Oboriti nigo bwarwete bwemetienyi erenga? Emetienyi _____</i>			
22	Did she have any heavy bleeding after the abortion? <i>Narwete amanyinga amange ekero oborito bwarwete?</i>			
23	Did the abortion occur by itself spontaneously? <i>Oborito nigo bwarwete bwoka igo botachegiri?</i>			

24	Did she take the medicine or treatment to induce? <i>Nanywete mariogo andeonsiri yokorusia oborito?</i>			
	Section 2: Signs and Symptoms Noted During the Final Illness <i>Ensemo 2: Ebiorokererio Bioborwire engaki yomoerio Yoborweire</i>			
1	For how long was she ill before she died? Days _____ Months _____ <i>Nengaki engana naki arwarete nyuma ataracha gosira? Amatuko _____ Emetwenyi _____</i>			
2	Did she have any fever? <i>Nabwate riberera?</i>			
3	For how long did she have the fever? Days _____ Months _____ <i>Nengaki engana naki abete neriberera? Amatuko _____ Emetienyi _____</i>			
4	Was the fever continuous or on and off? Continuous ____ On and Off ____ <i>Riberera nigo riagenderete gose riare gocha na kogenda? Riagenderete</i>			
5	Did she have fever only at night? <i>Igo aregotwara riberera botubo rioka?</i>			
6	Did she have chill/ rigor? <i>Nkoba arenge neriberera nabokendu?</i>			
7	Did she have a cough? <i>Ngokorora erenge?</i>			
8	For how long did she cough? Days..... Months.... <i>Nengaki engana naki abete kagokorora? Matuko.....Emetienyi.....</i>			
9	Was the cough severe? <i>Ogoesibwa, nigo kwarenge okonene mono?</i>			
10	Was the cough productive with sputum? <i>Ogoesibwa nkorusia kwarenge rikororo?</i>			
11	Did she cough out blood?			

	<i>Rikororo ndiasangaine amanyinga?</i>			
12	Did she have night sweats? <i>Ngotwara arenge neriberera botuko</i>			
13	Did she have breathlessness? <i>Nkoba arenge gasinywa koeyana?</i>			
14	For how long did she have breathlessness? Days... Months... <i>Nengaki engana naki atwarete obokongu bwokoeyana? Amatuko..... Emetienyi...</i>			
15	Was she unable to carry out daily routines due to breathlessness? <i>Nasinyetwe gokora egasi ya botambe kobwatekana nobokongu bwokoeyana?</i>			
16	Was she breathless while lying flat? <i>Nigo aregosinywa koeyana ekero araire boronge?</i>			
17	Did she have wheezing? <i>Ngotogota arenge ekero giokoeyana?</i>			
18	Did she have chest pain? <i>Ngwatibwa arenge negekuba?</i>			
19	For how long did she have chest pain? Days.....Months... <i>Nengaki engana naki aregwatibwa negekuba? Amatuko... Emetienyi...</i>			
20	Did chest pain start suddenly or gradual? Sudden_____ Gradual _____ <i>Ogwatibwa egekuba nigo gwachagete mobasokano gose ngorangora? Mobasokano... Ngora ngora</i>			
21	When she had severe chest pain, how long did it last? Less than half an hour_____ Half an hour _____ Longer than half an hour _____ <i>Chinsa irenga are koiri ekero arekoromwa egekuba mono? Inse yenusu saa.... Enusu saa Goetania enusu saa</i>			
22	Was the chest pain located below the breast bone (sternum)?			

	<i>Egebuba nigo kiarenge komoroma riugariengerekero?</i>			
23	Was the chest pain located over the heart and did it spread to the left arm? <i>Ogwatibwa egekuba igokwarenge ange nenkoro na kogenderera gichia okoboke okobee?</i>			
24	Was the chest pain located over the ribs (sides)? <i>Ogwatibwa egekuba nigo kwarenge ase chimbaru?</i>			
25	Was the chest pain continuous or on and off? Continuous On and off <i>Ogwatibwa kwegekuba nigokwarenge abo rioka gose nigo kwarenge gocha nagosira? Nigo kwarenge oo rioka Kwarenge gocha na gosira</i>			
26	Did the chest pain get worse with the coughing? <i>Ogoesibwa nkwamentente mono ogwatibwa kwegebuba?</i>			
27	Did she have palpitations? <i>Ngotwomwa arenge nenkoro?</i>			
28	Did she have diarrhea? <i>Ngosaa arenge?</i>			
29	For how long did she have diarrhea? Days Months <i>Engaki engana naki asaete?</i>			
30	Was the diarrhea continuous or on and off? Continuous On and off <i>Ogosaa nigo kwagendererete gose nigo kwaregocha nagotiga? Nigo kwagendererete Nigo kwaregocha nagotiga</i>			
31	At any time during the final illness was there blood in the stool? <i>Ase engaki yoborwaire, amabi aye nabete akoburukana namanyinga?</i>			
32	When the diarrhea was most severe, how many times did she pass stools in a day? _____ <i>Engaki ogosaa kwamentente, nkarenga aregosaa ase rituko? Mara.....</i>			

33	Did she vomit? <i>Nkoroka arenge?</i>			
34	For how long did she vomit Days..... Months..... <i>Engaki engana naki atwarete riroki?</i> <i>Amatuko..... Emetienyi.....</i>			
35	Did the vomit look like a coffee coloured fluid or bright red/ blood or some others?Coffee coloured Bright red/ blood Others <i>Riroki ndiarengere erangi yeekagwa/ gose namanyinga arekoroka? Erangi yekagwa Amanyinga asanganete Namaroki ande</i>			
36	When the vomiting was severe, how many times did she vomit in a day? Number... <i>Ekerokoroka kwamentege, nkarengarengere koroka ase rituko? Mara.....</i>			
37	Did she die during pregnancy, labour, abortion or postpartum? <i>Ngaki ki asiretee, ekero arengere morito gose ekero arengere kobina, gose ekero oborito bwarete, gose engaki yomotimoko bwoboibori bwomwana?</i>			
38	Did she have abdominal pain? <i>Nkoromwa arengere enda?</i>			
39	For how long did she have abdominal pain? Days... Months ... <i>Nengaki engana naki arometwe enda?</i> <i>Amatuko..... Emetienyi...</i>			
40	Did she have abdominal distension? <i>Enda yaresaine?</i>			
41	For how long did she have abdominal distension? Days..Months..... <i>Nengaki engana ngaki enda yaresanete?</i> <i>Amatuko.... Emetienyi..... Tinkomanya</i>			
42	Did the distension develop rapidly within days or gradually over months? Rapidly Within days [] Gradually over months []			

	<i>Enda nigo yaresanete ase engaki enke gose nigo yagendererete ngora ase emetienyi? Yabete bwango mono Yairete koresana ase engaki yemetienyi emenge ?</i>			
43	Was there a period of a day or longer during which she did not pass any stool? <i>Ngaki nere airete rituko rigima gose goetania rituko atachiete gwekonya echo enene?</i>			
44	Did she have any mass in the abdomen? <i>Nabwate okobimba/ ekemuma ase enda?</i>			
45	How long did she have the mass in the abdomen? Days.....Months..... <i>Engaki engana naki abwata okobimba/ ekemuma ase enda? AmatukoEmetienyi...</i>			
46	Where in the abdomen was the mass located? Right[] Left[] Upper[] Lower[] All over [] <i>Nsemo kii yenda arenge nokobimba/ ekemuma? Ekengiringicha [] Endanke [] Enda yonsi []</i>			
47	Did she have difficulty or pain while swallowing solids? <i>Nabwate obokongu gose okoigwa boror ekeru akomera endagera?</i>			
48	For how long did she have difficulty or pain while swallowing solids? Days.....Months..... Don't know			
49	Did she have difficulty or pain while swallowing liquids? <i>Ngotwara arenge obokongu gose okoigwa bororo engaki yokomera endagera ya amache</i>			
50	For how long did she have difficulty or pain while swallowing liquids? Days.... Months..... <i>Engaki engana naki abete nobokongu bwokomera endagera yamache gose koigwa bororo? Amatuko Emetienyi</i>			
51	Did she have headache? <i>Ngwatibwa arenge omotwe?</i>			
52	For how long did she have headache? Days...			

	Months.... <i>Nengaki engana naki abete kagwatigwa omotwe? Amatuko Emetienye....</i>			
53	Was the headache severe? <i>Nigo arenge gwatigwa omotwe mono?</i>			
54	Did she have a stiff or painful neck? <i>Ebigoti mbiabenogete na komoroma mono?</i>			
55	For how long did she have a stiff or painful neck? Days.... <i>Nengaki engana naki, ebigoti biabenogete an komoroma mono? Amatuko.....</i>			
56	Did she have mental confusion? <i>Nabete kagotantana ebirengererio?</i>			
57	For how long did she have mental confusion? Days...Months...Don't know <i>Engaki engana naki atantanete asebirengererio? Amatuko.... Emetienyi...</i>			
58	Did the mental confusion start suddenly, quickly within a single day, or slowly over many days? Suddenly.....Within days slowly..... <i>Ogotantana kwebirengererio nigo gwachagete engora gose mbwango, gose gora ase amatuko amange?Gwachagete nekerundo Engora Ngora ngora ase amatuko amange</i>			
59	Did she become unconscious? <i>Nagiregete?</i>			
60	For how long was she unconscious? Days... Months... <i>Nagiregete engaki engana naki? Amatuko..... Emetienyi.....</i>			
61	Did the unconsciousness start suddenly, quickly within a single day or slowly over many days? Suddenly Within a day (fast) Slowly (many days) <i>Okogireka gwachagete ngora, gose okorindokeria rimo, gose ngora ngora ase engaki entambe? Okorindokerwa rimo</i>			

	<i>Gwachagete ngora ngora</i>			
62	Did she have convulsions? <i>Namagagete?</i>			
63	For how long did she have convulsions? Days..... Months..... <i>Okomagaka nkwairete engaki engana naki?</i> <i>Amatuko..... Emetienyi....</i>			
64	Was she unable to open the mouth? <i>Nasinyetwe koigora omonwa?</i>			
65	For how long was she unable to open the mouth? <i>Engaki engana naki airete gotaigora omonwa?</i>			
66	Did she have stiffness of the whole body? <i>Omobere bwensi nomagagete?</i>			
67	For how long did she have stiffness of the whole body? Days.... Months..... <i>Nengaki engana naki amagagete omobere bwensi? Amatuko.... Emetienyi...</i>			
68	Did she have paralysis of one side of one side of the body? <i>Nabete nogataigwa obororogose ogotakorera meremo ensemu eyemo yomobere?</i>			
69	For how long did she have paralysis of one side of the body? Days Months..... <i>Nengaki engana naki airete gotaigwa bororo gose gokorera emeremo ensemu eyio yomobere?</i> <i>Amatuko..... Emetienyi</i>			
70	Did the paralysis of one side of the body start suddenly, quickly within a single day or slowly over many days? Suddenly within a day (fast) Slowly (many days) <i>Ogotagwa gose ogotakorera emeremo ensemu eyemo yomobere nige yamorindokerete gose yachete engora, gose nigo ngora nakoira engaki entambe? Oborwaire nigo bwamorindokerete Bwachagete engara Bwachagete ngora</i>			

	<i>rakini bwairire engaki entambe tinkomanya</i>			
71	Did she have paralysis of the lower limbs? <i>Nabete noboremaru bwamagoro?</i>			
72	How long did she have paralysis of the lower limbs? Days..... Months..... <i>Nabete noboremaru bwamagoro ase engaki engana naki? Amatuko... Emetienyi...</i>			
73	Did the paralysis of the lower limbs start suddenly, quickly, within a single day or slowly over many days? Suddenly, within a day (fast) slowly (many days)			
	<i>Oboremaru bwamagoro nigo bwamorindokerete, gose mbwairite rituko , gose nigo bwachagete ngora ngora ase amatuko amange? Bwamorindokerete rimo Mbwairite rituko Bwachagete ngoora bokaira engaki entambe</i>			
74	Was there any change in colour of urine? <i>Amasinyoro nachenchetwe erangi?</i>			
75	For how long did she have the change in colour of urine? Days... Months <i>Amasinyoro achenchetwie erangi ase engaki engana naki? Amatuko... Emetienyi...</i>			
76	During the final illness, did she ever pass blood in urine? <i>Engaki yomoerio yoborwaire, naetie amasinyoro asangaine amanginga?</i>			
77	For how long did she pass blood in urine? Days..... Months..... <i>Nengaki engana naki aiterete amasinyoro asangaine namanyinga? Amatuko... Emetienyi...</i>			
78	Was there any change in the amount of urine she passed daily? <i>Ekerengo kiamasinyoro inkiachenchetwie ase ogoitera kera rituko?</i>			

79	For how long did she have the change in the amount of urine passed daily? Days..... Months... <i>Nengaki engana naki amasinyoro are goitera kera rituko achenchetie? Amatuko... Emetieny..</i>			
80	Did she pass too much, too little, or no urine at all? Too much[] Too little[] No urine at all [] <i>Nigo are goitera amasinyoro amange, amasinini, gose tareng gosinyora nonyamake? Are gosinyora amange mono [] Gosinyora amake mono[] Tare gosinyora nonya make[]</i>			
81	During the illness that led to death did she have any skin rash? Days <i>Ase oborwaire obo bwamoirete, mbwaonchorete risangwa riomobere oye? Ase amatuko...</i>			
82	Was the rash on the: <i>Oborwaire bwerisangwa riomomere nigo riareng ensemo ya:</i>			
	a. Face. <i>Obosio</i>			
	b. The trunk <i>Omobere</i>			
	c. The arms <i>Amaboko</i>			
	d. Other places (specify).... <i>Ase-andee gete (otebe)</i>			
83	What did the rash look like? Measles rash [] Rash with clear fluid[] Rash with pus[] <i>Oborwaire bwerisangwa, naki bwareng kororekana? Buna omokururo[] Bogotora amache [] Bokorwa amaira []</i>			
84	Did she have red eyes? <i>Amaiso naonchogete akaba amabariri?</i>			
85	Did she have bleeding from the nose, mouth or anus?			

	<i>Nkorwa arenge amanyinga korwa chimworo, gose monwa, gose ase aakoruseria obonyira?</i>			
86	Did she ever have shingles/ herpes zoster? <i>Nabwate omokururo bwogotonyaamache bwerisangwa?</i>			
87	Did she have weight loss? <i>Nagusweete chiratiri (ogosusa)?</i>			
88	For how long did she have weight loss? Days..... Months..... <i>Ase engaki engananaki abete aseokoguswa chiratiri? Amatuko... Emetienyi..</i>			
89	Did she look very thin and wasted? <i>Narorekanete omoreu monosana?</i>			
90	Did she have mouth sores or white patches in the mouth or on the tongue? <i>Nabwate amaote aseomonwa, gose omonwa bwomwana (amanta)?</i>			
91	Did she have any swelling? <i>Nabwate obobimba ande onsi aseomobere oye?</i>			
92	For how long did she have the swelling? Days..... Months..... <i>Engaki engana naki abete nokobimba okwo? Amatuko.... Emetwenyi...</i>			
93	Was the swelling on the face; the joints the ankles the whole body? <i>Okobimba nigo kwarenge ase obosio; chinengo ebitarenge gose omobere bwensi?</i>			
94	Did she have any lumps? <i>Nabwate enyama emerete ase omobere?</i>			
95	For how long did she have the lumps? Days Months..... <i>Enyama eyio yamerete ase omobere, konya yairire engaki engana ngaki? Amatuko... Emetienyi..</i>			
96	Were the lumps on; the neck the armpit the groin any other place?			

	<i>Enyama eyio nigo yamerete ase: ebigoti entigitigi ebachuume aseande gete?</i>			
97	Did she have the discolouration of the eyes? <i>Erangi yamaiso aye yachenchetie?</i>			
98	Did she look pale (thinning/ lack of blood) or have pale palms, eyes or nail beds? <i>Nabete omorosu bwokoremmerwa amanyinga (amaboko, amaiso, bosio bwebiara, bionsi bire ebirabu)</i>			
99	For how long did she look pale or have pale palms, eyes or nail beds? Days ... <i>Engaki engana naki abete omorosu bwokoremmerwa amanyinga ase okororekana amaboko, amaiso, ebichara? Amatuko..... Emetienyi....</i>			
100	Did she have an ulcer, abscess, sore anywhere in the body? <i>Nabwate riote, rigumba, gose ekebera andeonsi ase omobere?</i>			
101	For how long did she have the ulcer, abscess or any sore? Days..... <i>Engaki engana naki arenge neriate, rigumba, gose ekebera ase omobere? Amatuko... T</i>			
102	What was the location of the ulcer, abscess or sore? Specify <i>Nsemo ki yomobere riote, rigumba, gose ekebera kiarenge?..... ereesa ango.....</i>			
Section 3: Treatment and Health Service use for the Final Illness				
103	Did she receive any treatment for the illness that led to death? Yes No don't know <i>Naetwe amariogo yokobwenia oborwaire obo bwachete komosiria obogima? Ee Yaya Tinkomanya</i>			
104	Can you please list the drugs she was given for the illness that led to her death from the prescription or discharge notes if available.			

	<i>Norike orota yamariogo arekoegwa yoborwaire obo bwachete komosiria...Ekobi yamakaratasi arikeretwe amarioge nerego ndigirerie.</i>			
105	What type of treatment did she receive? <i>Mbobwenigwa kii aetwe?</i>			
	a. oral rehydration salts/ and or intravenous fluids (drip) treatment? <i>amache arekoegwa gose igo abekeire ase omoki?</i>			
	b. blood transfusion? <i>amanyinga abekeretwe?</i>			
	c. treatment/ food through a tube passed through the nose? <i>nabekeire omobira ase emioro ase ogoeteria amariogo gose endagera?</i>			
	d. any other treatment ors/ drip treatment; through the nose; other... (specify)..... <i>otatiga amariogo, endagera amo namache omoki, goetera emioro, kende nkerego aetwe? ... getebe angog... ..</i>			
106	Please tell me which of the following places/ facilities she received treatment during the illness that led to her death. <i>Koranche intebieongo gati ya aba ngichia gokwana aiga,ngai nyagosira anyorete ogokonywa (korwarigwa) ase oborwaire obo bwamoirote?</i>			
	a. Home? <i>Inka?</i>			
	b. Traditional healer? <i>Omorwaria bwegenka?</i>			
	c. Government clinic? <i>Ekiriniki kie serekari?</i>			
	d. Government hospital? <i>Enyagitari ye serekari?</i>			
	e. Private clinic? <i>Ekiriniki kiomonyene?</i>			
	f. Pharmacy, drug seller, store?			

	<i>Enyomba ya amariogo, abaonia bamariogo, gose esito?</i>			
107	The month before death, how many contacts with formal health services did she have? Number of contact <i>Ase omotienyi bwomoerogwanyagosira, chingaki nirenga achiete korwarigwa chinyagitari? Chintunda irenga.....</i>			
108	Did a healthcare worker tell you the cause of death? <i>Omonyagitari gose omosisita nagotebetwe mborwaire kii bwamoitete?</i>			
109	What did the healthcare worker say?..... <i>Omonyagitari gose omosisita ninki atebete?.....</i>			
110	Did she have any operation for the illness? <i>Nabaretwe kobwatekana noborwaire bwaye?</i>			
111	How long before death did she have the operation? Days..... Don't know <i>Nyuma ataracha gosira, amatuko arenga aetete korwa abaretwe? Amatuko.... Tinkomanya</i>			
112	On what part of the body was the operation? Abdomen Chest Head Others Specify..... <i>Nsemo ki yomobere abaretwe? Enda Egekuba Omotwe Aseande....</i>			
Section 4: Risk Factors				
113	Did she drink alcohol? <i>Nkonywarenge amarwa?</i>			
114	How long had been she drinking? Years... Don't know Record "oo" if less than one year <i>Engaki engana naki abeire akonwa amarwa? Emiaka..... Tinkomanya Rika "oo" onye ere inse yomwaka oyomo.</i>			
115	How often did she drink alcohol? Daily[] Frequently (weekly)[] Once in a while[]			

	<i>Nechintunda orange konwa amarwa? Kera rituko Botambe ase echuma Rimo igo Tinkomanya</i>			
116	Did she stop drinking? <i>Nachete agatiga konywa?</i>			
117	How long before death did she stop drinking? Months[] Record “oo” if less than one month <i>Nengaki engana naki atigete konwa nyuma ataracha gosira Emetienyi Tinkomanya Rika “oo” onye ere inse yomotienyi oyomo</i>			
118	Did she smoke tobacco (cigarette, cigar, pipe etc)? <i>Nkonywa arenge etumbato (chisigara, ekebwesi, gose etumbato yokobeka chimioro)</i>			
119	How long had she been smoking? Record “oo” if less than one year. <i>Engaki ki anyure etumbato? Rika “oo” onye ere inse yomwaka</i>			
120	How many cigarette did she smoke? Number of cigarettes..... <i>Chisigara nirenga are konywa? Irenga.....</i>			
121	Did she stop smoking before death? <i>Natigate nyuma ataracha gosira?</i>			
122	How long before death, did she stop smoking? Record “oo” if less than one month. Months..... Don’t know <i>Nyuma atacha gosira nairete engaki engana naki gotiga konywa esigara? Rika “oo” onye ere inse yomotienyi oyomo. Emetienyi..... Tinkomanya</i>			
Section 5: Data abstracted from death certificate				
1	Do you have a death certificate for the deceased? <i>Nobwate esatibiketi yogosira?</i>			
2	Can I see the death certificate? <i>Nindigererie esatibiketi yogosira?</i>			

3	Copy DAY; MONTH; YEAR of ISSUE OF DEATH CERTIFICATE:DD []MM[]YR[] <i>Kobia (Bwekania) rituko; omotienyi; nomwaka esatibiketi yarwetwe: Rituko Omotienyi Omwaka</i>			
4	Record the cause of death from the first (TOP) Line of the Death Certificate. <i>Ichoria oborwaire bwamoitete (korwa igoro) Eraini yesatibiketi</i>			
5	Record the cause of death from the second Line of the Death certificate (if any). <i>Ichoria ekiagerete agacha gosira eraini yakabere Eraini yesatibiketi</i>			
6	Record the cause of death from the third Line of the Death certificate (if any). <i>Ichoria ekiagerete agacha gosira eraini yagatato Eraini yesatibiketi yogosira</i>			
7	Record the cause of death from the fourth Line of the Death certificate (if any). <i>Ichoria ekiagerete agacha gosira ase eraini ya kane Esatibiketi onye kereo</i>			
Section 6: Data abstracted from other health records <i>Ensemu 6: Amaereso korwa ase erekoti yobogima oboronge</i>				
1	Other health records available? Chirekoti chiobogima oboronge?			
2	For each type of health record, summarize details for last 2 visits (if more than 2) and record date of issue. <i>Ase erekoti yobogima oboronge, rika obwenge chintunda ibere ekero aroretwe</i>			
3	Burial permit (cause of death)..... <i>Ebamiti yogotuguta omobere (mborwaire ki bwamoitete).....</i>			

4	Postmortem results (cause of death)..... <i>Eriboti yoboringori bwogokwa (egento kiamoitete)</i>			
5	MCH/ANC card (Relevant information)..... <i>Ekati ye kiriniki (ebwate amaereso)</i>			
6	Hospital prescription (Relevant information)..... <i>Ekaratasi yokorikerwa eriogo</i>			
7	Treatment card (Relevant information)..... <i>Ekati ya amariogo</i>			
8	Hospital Discharge (Relevant information)..... <i>Rirube rikomoigorera korwa nyagitari</i>			
9	Laboratory Results (Relevant information)..... <i>Amachibu korwa enyomba yogobima</i>			
10	Other Hospital documents..... (Specify).....			

	Chiriboti chinde chianyagitari.....			
11	Record the time of the end of the interview. Hours..... Minutes..... <i>Rika ekero gwakoro amangana aborigwe Chinsa..... Chitageka</i>			
	Interviewer's observations <i>Amangana ande arora oyio orange koboria amaswari</i>			
	To be filled after completing interview <i>Ensemo eye nigo egoichorigwa ekero amaboria aerire</i>			
	Comment on Specific Questions <i>Karwe ebirengereri biao ase amaswari ande</i>			
	Supervisor's Observations <i>Eriboti yomoteneneri</i>			
	Name of the Supervisor..... Date <i>Erietariomoten.....</i> <i>Chitariki.....</i>			
Section 7: Confidential questionnaire of household				
Socio-demographic information				
1	Gender Female [Omosubati]			
2	Age in years (Emiaka yokobiarwa [10-14] [15- 20] [21-25] [26- 30] [31-35] [36-40] [41- 45]			
3	Marital status: single married separated widowed			

	<i>Okobaaseenka Tanywomiri Nanywomire Batiganete nomogaka Omoburaka</i>			
4	Level of education: None Primary Secondary College/tertiary <i>Amasom: Tachiete sukuru Asomete buremari Esekendari Ekorechi/Eyunibasiti</i>			
5	Religion: Catholic Protestant Muslim Others (specify) <i>Etini ki arenge Omokatoreki Omoburotesitanti Omoisiramu Omonyanhwa</i>			
6	Occupation: Farmer Housewife Businesswoman Formal employment <i>Meremo ki arenge gokora? Oboremi Egasi ya nyomba Omonyabiasara Okorikwa</i>			
7	Residence: Rural Urban Peri-urban <i>Okomenya: Risabu Etaoni enene Ange netaoni</i>			
8	How many children had she had prior to her death? None [] 1-2 [] 3-4 [] 5 and above []			
9	Did she have any complications such as:			
	a. Sporting, <i>Okorwa amanyinga make make</i>			
	b. Swelling of hands and feet, <i>Okobimba amagoko na amagoro</i>			
	c. Bleeding in early pregnancy before 22 weeks, <i>Okorwa amanyinga nyuma yemetienyi etanoyoborito</i>			
	d. Raised blood pressure (hypertension), <i>Enkoro gwaka amanyinga igoro mono</i>			
	e. Heart disease, <i>Oborwaire bwenkoro</i>			
	f. Convulsion disorders, <i>Okomagaka</i>			
	g. Infection of the reproductive organs? <i>Oborwaire bworoiboro</i>			

10	<p>Did she a doctor? <i>Naroretwa nomonyagitari?</i></p> <p>If the answer is yes, was medication prescribed? <i>Onye ororetwe nomonyagitari, namorikerete amariogo?</i></p>			
11	<p>Regarding the previous pregnancies, were they planned? <i>Ase amarito (chinda chiomwana) chiaetire, nchiabwate omoroberio?</i></p>			
12	<p>What was the duration of the previous pregnancies? Term [] Preterm [] <i>Chinda tintanga'ni chiaetire ngoikerania chiarenge engaki yabo? Ee emetienyiyonsi Tarenge goikerana</i></p>			
13	<p>How was/were the pregnancy/pregnancies overall? Successful Unsuccessful <i>Enda/chinda chietire ngaki chiakorerete? Nchiaigete nagokorera buya Nchiakorete buya</i></p>			
14	<p>What was the duration of labour of the last delivery? Less 18hours More than 18 hours <i>Engaki engana naki airete konyora omwana?Inse ye chinsa 18 Aetanetie chinsa 18</i></p>			
15	<p>Was there any complication experienced during labour and delivery?If the answer is yes, what complication(s) occurred?.... <i>Bokongu bonde mbwabete engaki are konyora omwana?Onye nanyorete obokongu botebe ango...</i></p>			
16	<p>Where did the previous deliveries take place?At home[] Dispensary[] Health centre[] Hospital [] <i>Chinda chintangani,ng'ai are konyorera abana? Inka Nyagitari enke Nyagitari enene</i></p>			
17	<p>Did she go promptly to hospital for delivery, when labour started?</p>			

	<p>If the answer is No, what was the reason for the delay? Hospital too far Lack of transport Lack of money for transport None to take her to hospital Any other (specify).....</p> <p><i>Nachiete bwango nygitari ekeru obororo bwomwana bwachagete? Onye tachiete, ninki kiagerete? Enyagitari yabete are Chibesa chiaremete Chigari chiaborete Onde tarenga inka erio amoire Tebaegento kende kiagerete.....</i></p>			
18	<p>Who attended/assisted her during her last delivery? Doctor [] Nurse/midwife [] Relative None/self [] Traditional birth attendant []</p> <p><i>Ningo omokonyete engaki are kogonkia? Omotogita [] Omosisita [] Omosani/omwamate [] Tari onde/nere bweka [] Omobiari bwegenka []</i></p>			
19	<p>What type of delivery/birth was it? Normal delivery [] Surgery (caesarian operation)[]</p> <p><i>Nagonketie buya? Agonketie buya [] Abaretwe omwana akarusigwa []</i></p>			
20	<p>What was the condition of the neonate after delivery? Good [] Fair [] Poor [] Dead []</p> <p><i>Omwanana onyoretwe naki arenge? Omuya akoeyana buya [] Tareng buya mono [] Tare koeyana buya [] Anyaretwe atabwati obogima []</i></p>			
21	<p>Was there any postpartum problems experienced? If the answer is yes, state the problem.....</p> <p>...</p> <p><i>Nanyorete bokongu bonde bwensi engaki eria arenge nomwana? Ee Yaya Onye nabwate obokungu, botebengo.....</i></p>			
22	<p>What problems if any, did she encounter which affected the availability, quality and utilization of maternal services availed to her?.....</p>			

	<p><i>Nonyare kweresa obokongu anyorete bwagerete takonywa, engaki yokonyora omwana? Eresango.....</i></p> <p>.....</p>			
23	<p>As a way forward, give suggestions as to what you would like to be done which can improve maternal health service.</p> <p><i>Korengana nemeroborio ya bosio, tebaango mbirengererio ki oragania birachang'eranie ase okogendereria bosio obogima bwabaswati bakonyora abana? Eresaango...</i></p>			

Appendix 3b. Translation of the Questionnaire to Kiswahili

Translation of the Questionnaire to Kiswahili Maswali ya Kisiri kuhusu kifo cha mwanamke mwenye mimba (Haya maswali yatajibiwa na wenyeji wa karibu sana)				
	Section 1: Dalili inausikana na mimba	Ndi	L	Sij
		o	a	ui
1	Alikuwa na mimba wakati aliaga?			
2	Alikuwa na mimba ya miezi mingapi?			
3	Mbeleni ameshika mimba mara ngapi pamoja na hii ya sasa? Mimba mara...			
4	Baada ya miezi mitatu ya kwanza ya mimba, aliwahi kuwa na aina ya magonjwa kama haya?			
	a. Kutokwa na damu kwa njia ya uzazi?			
	b. Harufu mbaya ya maji kutoka kwa uzazi?			
	c. Kufura uso?			
	d. Kuumwa sana na kichwa?			
	e. Kuona giza machoni?			
	f. Kupooza?			
	g. Kuwa na joto mwilini?			
	h. Maumivu mazito ya tumbo?			
	i. Macho meupe na kushindwa kupumua pumzi?			
	j. Aliugua na ugonjwa wowote? (yani washwa?)			
5	Aliaga katika harakati za kuzaa?			
6	Alijifungua hivi karibuni?			
7	Ni baada ya siku ngapi aliaga baada ya kuzaa? Baada ya siku.....			

8	Alitokwa na damu nyingi wakati uchungu wa kuzaa ulipoanza?			
9	Alivuja damu nyingi wakati alipoendelea na uchungu wa kuzaa kabla mtoto hajatoka?			
10	Kuvuja damu nyingi kulitokea baada ya kijifungua mtoto?			
11	Alikuwa na shida ya kuzaa mabaki na utunzi wa mimba baada ya kuzaa mtoto?			
12	Alichukua muda mrefu kabla hajajifungua mtoto (zaidi ya masaa 24)?			
13	Alizaa kawaida kutoka kwa uzazi?			
14	Ilikuwa aina gani ile ali ya kujifungua?Kawaida			
15	Alikuwa anatokwa na maji ya harufu mbaya kutoka kwa njia ya uzazi?			
16	Alizalia wapi? Nyumbani Hospitalini Sijui			
17	Ninani alimzalisha? Mkunga wa kienyeji[] Mke mwenza[] Muuguzi daktari []			
18	Kuna wakati aliavya mimba hivi karibuni?			
19	Aliaga baada ya kuaribika kwa mimba?			
20	Ni muda gani alichukua halafu akaaga baada ya kuharibika kwa mimba? Siku.....			
21	Wakati mimba ilipoharibika na kutoka ilikuwa ya mwezi mingapi? Mwezi.....			
22	Alivuja damu nyingi baada ya kuharibika kwa mimba?			
23	Mimba iliharibika na kutoka yenyewe?			
24	Alitumia madawa ili kutoa mimba?			
	Section 2: Dalili alionyesha mara ya mwisho kabla hajaaga			

1	Aliugua kwa muda gani kabla hajaaga? Siku..... Miezi.....			
2	Alikuwa na joto nyingi kwa mwili?			
3	Mwili ulikuwa na joto nyingi kwa muda gani? Siku..... Miezi.....			
4	Hali ya joto ilikuwa inakuja na kupotea au ilikuwa inaendelea? Kuja na kupotea inaendelea	=		
5	Alikuwa na joto usiku peke?			
6	Alikuwa anahisi baridi na joto pamoja?			
7	Alikuwa na kikohozi?			
8	Alikohoa kwa muda gani?			
9	Kikohozi kilikuwa kikali?			
10	Wakati wa kukohoa, alikuwa anatoa makohozi?			
11	Kikohozi kilikuwa kinachanganyika na damu?			
12	Alikuwa anatokwa na jasho usiku?			
13	Alikuwa na shida ya kupumua?			
14	Alikuwa na shida ya kupumua kwa muda gani? Siku.....Mwezi.....			
15	Alikuwa hawezi kufanya kazi ya kawaida kwa sababu ya kushindwa kupumua?			
16	Alikuwa anashindwa kupumua wakati analala kifudifudi chini?			
17	Alikuwa anashindwa kupumua wakati wa baridi?			
18	Alikuwa akiumwa na kifua?			
19	Aliumwa na kifua kwa muda gani?			
20	Kuugua kifua kulianza ghafula ama kulianza pole pole? Ghafula [] Pole pole []			

21	Alipougua kifua, uchungu ulikuwa kwa muda gani?Chini ya nusu saa nusu saa zaidi ya nusu saa []			
22	Kuumwa na kifua kilikuwa chini ya mfupa wa titi?			
23	Kuumwa na kifua kilikuwa katika sehemu ya roho na kuenea pande za mkono wakushoto?			
24	Uchungu wa kifua ulikuwa sehemu ya mbavu?			
25	Uchungu wa kifua ulikuwa unaendelea ama unapotea tena unarudi baada ya muda? Ulikuwa unaendelea [] Ulikuwa unapotea tena unarudi baadaye []			
26	Uchungu ulikuwa unaongezeka wakati wa kukohoa?			
27	Moyo ilikuwa inamdunda?			
28	Aliharisha/aliendesha?			
29	Aliharisha kwa muda gani?			
30	Kuharisha kulikuwa na hali ya kuendelea ama kunaacha tena kunaendelea? Kuliendelea [] Kuliacha na tena kunaendelea []			
31	Kuna wakati wa mwisho wa ugonjwa ambaye damu ilionekana kwa kinyesi ya haja kubwa?			
32	Wakati kwalisa kuliendelea saidi, alikuwa analisa safari ngapi kwa siku? Mara.... kwa siku			
33	Alikuwa anatapika?			
34	Alitapika kwa siku ngapi? Siku..... Miezi			
35	Matapiko yalikuwa nyeusi kama kahawa, ama ilichanganyika na damu? Ilikuwa nyeusi kama kahawa Ilichanganyikana na damu			
36	Wakati kutapika kuliongezeka sana, alikuwa anatapika mara ngapi kwa siku? Mara....kwa siku Sijui			

37	Alihaga wakati alikuwa mjaa mzito, ama wakati wa harakati ya kuzaa, ama wakati wa kuharibika kwa mimba, ama baada ya kuzaa?			
38	Alikuwa anumwa na tumbo?			
39	Aliumwa na tumbo kwa muda gani?			
40	Tumbo ilikuwa imefura?			
41	Kwa muda gani ilikuwa amefura tumbo? Siku..... Miezi.....			
42	Kufura kwa tumbo kulianza pole pole ama ghafula? Ghafula Miezi.....Sijui			
43	Kuna wakati ambao ilipita siku kabua hajaenda haja kubwa?			
44	Alikuwa na uvimbe kwa tumbo?			
45	Uvimbe ulikuwa naye kwa muda mgani? Siku..... Miezi.....			
46	Ni sehemu gani katika tumbo ilikuwa na uvimbe? upande wa kulia wa tumbo [] upande ya kusoto ya tumbo [] upande chini ya tumbo [] Unatawanya tumbo yote []			
47	Alikuwa na shida ya kumeza chakula?			
48	Ni muda gani alikuwa na shida ya kumeza chakula? Siku..... Miezi.....			
49	Alikuwa anasikia uchungu wakati akimeza chakula ya maji maji ama maji?			
50	Alikuwa na uchungu wa kumeza vyakula vya maji ama maji kwa siku ngapi? Siku..... Miezi...		-	
51	Alikuwa anumwa na kichwa?			
52	Aliumwa na kichwa kwa siku ngapi? Siku..... Miezi.....			
53	Maumivu ya kichwa ilikua kali sana?			
54	Aliumwa na shingo?			

55	Alikuwa na maumivu ya shingo kwa muda gani? Siku.....			
56	Alichanganyikiwa na akili?			
57	Hali ya kuchanganyikiwa ilichukwa muda gani? Siku..... Miezi.....			
58	Kuchanganyikiwa kwa akili kulitokea kighafula, ama kwa siku chache, ama imendelea kwa muda mrefu? Iianza ghafula [] Ilijitokezea pole pole [] Imechukua muda []			
59	Alipoteza ufahamu?			
60	Ni muda gani alipoteza ufahamu? Siku..... Miezi..... Sijui			
61	Kupotea ufahamu kulitokea ghafula, ama mara moja, ama pole pole kwa masiku? Ghafula [] Pole pole kwa siku nyingi []			
62	Alipoteza ufahamu na kuteta?			
63	Kupoteza ufahamu ya kuteta, ilichukua muda gani? Siku..... Miezi...			
64	Alikuwa na shida ya kufungua mdomo?			
65	Shida ya kufungwa mdomo ilichukua muda gani? Siku..... Miezi.....			
66	Mwili ulikauka?			
67	Kukauka mwili kulichukwa muda gani? Siku Miezi.....			
68	Alikufa ganzi sehemu moja ya mwili?			
69	Kufa ganzi sehemu moja ilichukua muda gani? Siku..... Miezi.....			
70	Kufa ganzi ilitokezea ghafula, ama pole pole kwa masiku kadhaa?Ilitokea ghafula []Imechukua muda			
71	Alikufa ganzi sehemu ya viungo vya chini (miguu)?			

72	Kufa ganzi kwa miguu, ilichukua muda gani? Siku Miezi Sijui			
73	Kufa ganzi miguu, kulianza ghafula ama pole pole kwa siku kadhaa? Gafula [] pole pole kwa siku kadhaa []			
74	Mkojo ulibadilisha rangi?			
75	Ni muda gani mkojo umebadilisha rangi? Siku..... Miezi.....			
76	Wakati wa mwisho wa ugonjwa, alikojoa mkojo uliochanganyika na damu?			
77	Alikojoa damu kwa muda gani? Siku..... Miezi.....			
78	Kiasi cha mkojo aliokuwa anatoa kilipungua?			
79	Mabadiliko ya mkojo yalichukua muda gani? Siku..... Miezi.....			
80	Alikuwa anakojoa mkojo mwingi ama kidogo sana, ama alikuwa anakojoa mkojo yoyote? Mkojo nyingi [] Mkojo kidogo sana [] akuwa anakojoa kamwe [] Sijui			
81	Hali ya ngozi ya mwili ilibadilika na kuambatana na huu ugonjwa uliosababisha kifo?			
82	Kubadilika kwa ngozi ya mwili ilionekana pali gani:			
	a. Uso			
	b. Mwili			
	c. Mikono			
	d. Pali nyingine (thibitisha sehemu).....			
83	Kubadilika kwa ngozi (ugonjua wa ngozi) ilionekana? Ukambi [] Wenye maji maji [] Wenye usaa []			

84	Alikuwa na macho mekundu?			
85	Alikuwa anatokwa na damu kutoka kwa mapua, mdomo, ama pahali pa haja kubwa?			
86	Alikuwa na ugonjua wa ngozi wa kuchoma ama kuwasha na vidonda vya maji?			
87	Uzito ulipungua?			
88	Kwa muda gani uzito ulipungua? Siku..... Miezi.....			
89	Alikuwa ameisha kabisa (kukonda sana)?			
90	Alikuwa na vidonda mdomoni na kwa ulimi?			
91	Alikuwa amefura mwili?			
92	Kufura kumekaa kwa muda gani? Siku..... Miezi.....			
93	Sehemu gani ulikuwa amefura? Joints za mikono [] Joints za miguu [] Mwili mzima []			
94	Alikuwa na uvimbe?			
95	Alikuwa na uvimbe kwa muda gani? Siku Miezi.....			
96	Ni pali gani alikuwa na uvimbe? Ndani ya mkono [] Ndani ya paja [] Pahala ingine []			
97	Rangi ya macho ilibadilika?			
98	Alikuwa anaonekana mwenye mwili mweupe, amekonda, ambaye ana nguvu?			
99	Alionekana mwenye hali kama huyo kwa muda gani? Siku..... Miezi.....Sijui			
10	Alikuwa na vidonda na majivu mwilini?			

0				
10 1	Alikuwa na vidonda na majivu kwa mudha gani? Siku..... Miezi..... Sijui			
10 2	Hivyo vidonda na majivu yalikuwa pahali gani kwa mwili?(thibitisha)			
	Section 3: Matibabu aliyopata kutokana na ugonjwa wake			
10 3	Alipata matibabu ya ugonjwa kabla hajaaga dunia?			
10 4	Unaweza kutoa orodha ya madawa marehemu aliyatumia kabla hajaaga? Ama hebu karatasi alizoandikiwa madawa?			
10 5	Ni matibabu gani alipokea?			
	a. Dawa ya maji alipatiwa kwa mdomo au kupandishiwa maji ya mshiba			
	b. Kuwekewa damu			
	c. Madawa na chakula ya maji maji kupitia mulija bwaani			
10 6	Tafadhali, niambie ni wapi alipata tiba ya ugonjwa kabla hajaaga dunia? Nyumbani [] Daktari wa kienyeji [] Kiliniki ya serikali [] Hospitali ya serikali [] Kiliniki ya kibinafsi [] Duka ya kuhusa madawa Rumu ya madawa []			
10 7	Kabla marehemu hajaaga, ni vitwo ngapi za afya alitembelea ilikipokea madawa? Numbari.....			
10 8	Ulipata kuelezwa ni kitu gani kilimuua?			

10	Daktari alikuambia ni nini kilichosababisha kifo chake?.....			
11	Alifanyiwa upasuaji kwa matibabu?			
11	Ni muda gani alifanyiwa upasuaji kabla hajaaga dunia? Siku..... 1 Sijui			
11	Ni pahali gani ya mwili alifanyiwa upasuaji? Tumbo [] Kifua [] 2 Kichua [] Paali ngine (thibitisha).....			
Section 4: Madala yanao sababisha Hatari				
11	Alikuwa anakunywa pombe?			
11	Alikuwa amekunywa pombe kwa muda gani? Miaka 4 Sijui			
11	Ni mara ngapi alikuwa anakunywa pombe? Kila siku [] Mara 5 kwa mara kwa wiki moja [] Wakati mwingine akipenda			
11	Aliacha kunywa pombe?			
11	Ni muda gani aliacha kunywa pombe, kabla hajaaga dunia? 7 Miezi..... Miaka Sijui			
11	Alikuwa mvutaji sigara ama kiko?			
11	Alikuwa amevuta sigara ama kiko kwa muda gani? Miezi... 9 Miaka..... Sijui			
12	Alikuwa anavuta sigara ngapi kwa siku? Numbari..... Sijui 0			
12	Aliacha kuvuta sigara kabla hajaaga dunia?			


1				
12	Ni muda gani aliaja kufuta sigara kabla hajaaga dunia?			
2	Miezi..... Miaka..... Sijui			
Section 5: Repoti imeandikua katika cheti cha kifo				
1	Uko na cheti cha kifo ya marehemu?			
2	Ningependa kuiona, tafadhali. Copy: Tarehe Siku Mwaka			
3	Copy: Siku; Mwezi; Mwaka cheti kilitolewa			
4	Sababu ya kifo cha marehemu, msitari wa kwanza wa cheti			
5	Kilichsababisha kifo, msitari wa pili wa cheti			
6	Kingine kilijo sababisha kifo kama kmeandikwa, kwa msitari mwingine.			

Appendix3c: Questionnaire for Healthcare Workers

Questionnaire for Healthcare Workers						
1	Gender	Male	Female	Yes	No	Don't Know
2	Age 20-25 [] 26-30 [] 31-35 [] 36-40 [] >41 []					
3	Designation					
	a) Nurse/Midwife					
	b) Clinical Officer					
	c) Resident Doctor in obstetrics/gynaecology					
	d) Consultant Obstetrician/Gynaecologist					
4	Period you have worked in maternity unity?.....months/years.					
5	Have you had any additional training in reproductive health apart from your basic training (medicine; obstetrics; midwifery)?.....					
6	What are the leading causes and determinants of maternal mortality among patients attending Kisii General Hospital, in order of frequency? (Please list them).....					
7	Amongst the women who succumbed to the above listed conditions given by you; Have they been attending the antenatal clinic regularly?					
8	In what general state of health did these women present at the time of admission?					
	i) Excellent					
	iii) Satisfactory					
	iv) Poor and pathetic					
9	How many trained staff are working with you at the moment?.....					
10	What is the current ratio of staff to patient?					

1 1	How many would you comfortably manage with?			
1 2	Are there enough equipments and supplies for conducting deliveries as well as carrying an emergency caesarian section? If the answer is NO, what measures have been put in place to rectify the situation?			
1 3	Are facility conditions and working environment adequate and favourable for deliveries? If your answer is No, please give your reasons.....			
1 4	Are their operational referral facilities?			
1 5	Please identify in order of priority the problems of the health facility, which affect the availability and utilization of quality childbirth services by expectant women. _____ _____			
1 6	As a way forward, please give suggestions you consider will improve maternal health both in the hospital and the community which will reduce maternal mortality. _____ _____			

Appendix 4: Ethical Approval Protocol


KENYA MEDICAL RESEARCH INSTITUTE

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Tel: (254) (020) 2722541, 2713349, 0722-205901, 0733-400003; Fax: (254) (020) 2720030
E-mail: director@kemri.org info@kemri.org Website:www.kemri.org

KEMRI/RES/7/3/1 3rd November, 2010

TO: MR. Alfred A. Osoro (PRINCIPAL INVESTIGATOR) *forwarded 3/11/10*

THRO': DR. Yeri Kombe,
THE DIRECTOR, CPHR,
NAIROBI

RE: SSC PROTOCOL NO. 1851 (*RE-SUBMISSION*): Determinants of
maternal mortality among women of reproductive age attending
Kisii General Hospital PI Alfred A. Osoro (CPHR)

Make reference to your letter dated 2nd November, 2010 received on 3rd November, 2010. Thank you for your response to the issues raised by the Committee. This is to inform you that the issues raised during the 183rd meeting of KEMRI/National Ethical Review Committee held on 12th October, 2010, have been adequately addressed.

Due consideration has been given to ethical issues and the study is hereby granted approval for implementation effective this 3rd day of November 2010, for a period of twelve (12) months.

Please note that authorization to conduct this study will automatically expire on 2nd November, 2011. If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by 29th September, 2011.


You are required to submit any amendments to this protocol and other information pertinent to human participation in this study to the ERC prior to initiation. You may embark on the study.

Yours sincerely,
R. C. Kithinji
R. C. KITHINJI,
FOR: SECRETARY,
KEMRI/NATIONAL ETHICS REVIEW COMMITTEE

Appendix 5 Authorization Letter from Provincial Director Of Medical Services

MINISTRY OF MEDICAL SERVICES

Telegrams: "PROV.(MED)"
Telephone: Kisumu 254-057 2020105
Fax: Kisumu 254-057-2023176
E mail: pdmsyanza@gmail.com



PROVINCIAL MEDICAL HEADQUARTERS
NYANZA PROVINCE
P.O. BOX 721
KISUMU

When replying please quote

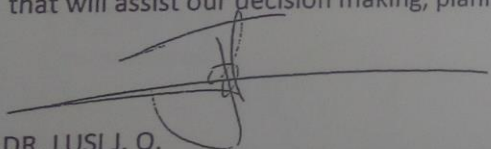
Ref: DS. 26 VOL.I/ (35) 7th January, 2011

The Medical Superintendent
Kisii (Level 5) Hospital
P.O. Box 92,
KISII

RE: AUTHORITY TO CONDUCT RESEARCH ON DETERMINANTS OF MATERNAL MORTALITY AT KISII (LEVEL 5 HOSPITAL).

Mr. Alfred A. Osoro is a PHD student at Jomo Kenyatta University of Agriculture and Technology's Institute of Tropical Medicine and infectious Diseases (ITROMID) seeking to conduct the above study at Kisii Level 5 Hospital.

His research topic is relevant to us, as a Province as well as Health sector. He already has the relevant ethical approval documents for the said study. I therefore grant him the authority to carry out the study at the hospital between January 2011 to 2nd November 2011. We look forward to sharing the results that will assist our decision making, planning and intervention.



DR. LUSI J. O.
PROVINCIAL DIRECTOR OF MEDICAL SERVICES – NYANZA

C.C – DMSO – Kisii Region.