PERINATAL FACTORS ASSOCIATED WITH BIRTH ASPHYXIA AMONG NEONATES IN MATERNITY WARD KAKAMEGA COUNTY REFFERAL HOSPITAL, KENYA

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A Research Thesis submitted in partial fulfillment for the requirements for the award of the degree of Masters of Science in Nursing in the school of Nursing and Midwifery of Masinde Muliro University of Science and Technology

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DECLARATION

This research Thesis is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

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DEDICATION

This dissertation is dedicated to my loving wife Catherine my children Emmanuel, Sidney, Epphy and Stephanie who have been by my side all the way. Thank-you all and God bless you

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ABSTRACT

Despite the important advances in perinatal care in the past decades, asphyxia remains a severe condition leading to significant mortality and morbidity. Perinatal asphyxia has an incidence of 1 to 6 per 1,000 live full-term births, and represents the third most common cause of neonatal death (23%) after preterm birth (28%) and severe infections (26%). Each year approximately 24% of neonatal deaths occur due to birth asphyxia with an equal number of survivors with serious neurological sequel, leading to detrimental long term consequences for both child and family. The objective of this study was to determine the risk factors associated with Birth asphyxia in order to identify preventive interventions to reduce neonatal morbidity and mortality. The study design was retrospective institutional based study which involved all neonates born at term diagnosed with and without birth asphyxia. Systematic random sampling to get subjects files, purposive method used for key informant interview. Data for analysis was captured via SPSS version 19 and summary descriptive statistics such as mean, percentages and standard deviations were generated. Inferential statistics Transformation of data was done to obtain appropriate categories for data analysis and logistics regression modeling for asphyxia against identified risk factors. To determine the risk factors of asphyxia, odds ratios (OR) at 95% CI were obtained together with their respective p-values results were set at < 0.05. Logistic regression modeling was done to determine the strength of association of the risk factors with asphyxia. Out of total 422 neonates, (29.1%) had birth asphyxia and rest (70.9%) were normal. Significant socio-demographic risk factors were maternal age (OR 3.0 CI 95% 1.9 – 4.9, <0.0001), education level (OR 3.8; CI 95% p-value <.0001) and parity (OR 1.8; CI 95% 1.0-3.0; p-value=0.0226). Significant Antepartum risk factors were birth interval (OR 3.8 CI 95% 2.4-6.0, p = <0.0001) gestation (OR 1.8; CI 95% 1.1-2.9; p<0.003). Significant intrapartum factors included mode of delivery and induction of labor (OR 6.7 CI 95% 2.5-17.9, $p < 0.0001$). Fetal risk factors included baby birth weight (OR 2.10 CI 95% 1.2-3.6, $p = 0.0073$). A number of risk factors have been identified in the current study. The study concludes that among the social demographics risk factors are mother's age, education level and parity. Antepartum risk factors included birth interval of the mothers and gestation while intrapartum risk factors include delivery mode and induced deliveries. Fetal risk factor of asphyxia was birth weight. The study makes recommendations based on the conclusions in terms of age of the mothers, counseling to be identified if they are at risk, education should be individualized to every mother of low education level. Mothers with short birth interval should be encouraged to space their births above 2 years and special care for low birth weight neonate on preventive measures.

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ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists
ARM	Artificial Rupture of Membranes
BA	Birth Asphyxia
BMV	Bag Mask Ventilation
BW	Birth Weight
DM	Diabetes Mellitus
FHR	Fetal Heart Rate
GA	Gestational Age
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
IUGR	Intrauterine Growth Retardation
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
LBW	Low Birth Weight
MDGs	Millennium Development Goals
NBU	New Born Unit
PPROM	Premature Pre-labor Rupture of the Membranes
PROM	Pre-Labor Rupture of the Membranes
RCOG	Royal College of Obstetrician and Gynecologists
SPSS	Statistical Package for Social Scientists
WHO	World Health Organization

CHAPTER ONE

1.0 Overview

This chapter present background information, statement of the problem, the objectives of the study, research questions, justifications, study limitations and conceptual frames work.

1.1 Background Information

Despite the important advances in perinatal care in the past decades, asphyxia remains a severe condition leading to significant mortality and morbidity. The term “asphyxia” is derived from the Greek and means “stopping of the pulse”. Perinatal asphyxia is a condition characterized by an impairment of exchange of the respiratory gases (oxygen and carbon dioxide) resulting in hypoxemia and hypercapnia, accompanied by metabolic acidosis, (Antonucc, Porcella, &Pilloni, 2014).

Globally, hypoxia of the newborn (birth asphyxia) or the fetus “fresh stillbirth” is estimated to account for 23% of the 4 million neonatal deaths and 26% of the 3.2 million stillbirths each year. An estimated 1 million children who survive birth asphyxia live with chronic neuro developmental morbidities, including cerebral palsy, mental retardation, and learning disabilities, (Lee, *et al*,. 2008).

Birth asphyxia is a serious clinical problem worldwide and contributes greatly to neonatal mortality and morbidity. Each year approximately 24% of neonatal deaths occurred due to birth asphyxia with an equal number of survivors with serious neurological sequelaes, such as cerebral palsy, mental retardation and epilepsy leading to detrimental long term consequences for both child and family. (Aslam *et al.,*2014).

The three major causes of neonatal deaths worldwide are infections (36%, which includes sepsis/pneumonia, tetanus and diarrhoea), pre-term (28%), and birth asphyxia (23%). There is some variation between countries depending on their care configurations (2010 to 2015 WHO report). Most developing countries have witnessed substantial declines in under 5 mortalities (UN Inter-Agency Group 2013). Neonatal deaths have remained stagnant with an estimated 3 million annual neonatal deaths occurring globally (Lawn, Manandhar, & Darmstadt, 2014). Recent estimates showed that annual reduction rate in neonatal mortality between 1990 and 2012 (2%) was much lower than that for children aged 1 - 59 months (3.4%). Birth asphyxia (BA) is one of the leading causes of newborn mortality (UN, 2013).

Three quarters of neonatal deaths occur within the first week of life and the highest risk of dying is within the first 24 hours. Almost all (99%) neonatal deaths occur in low and middle income countries. The top three causes of newborn death in Africa are severe infections (28%), Birth asphyxia (27%), and prematurity (29%) (KDHS, 2014).

Birth asphyxia is a major cause of neonatal death especially in developing countries and is defined as the inability of the newborn to initiate and sustain adequate respiration after delivery (Ezechukwu, Ugochukwu, Egbuonu, &Chukwuka, 2004). Of the 130 million neonates born every year globally, about four million die in the first four weeks of life- the newborn period (Iawn, Cousens, &Zupan, 2005). According to (KDHS 2014,) Western Kenya is leading in neonatal mortality rate at 122.5 per 1000 live births in Kenya this is where the Kakamega county hospital fall in. Currently, there is no documented data on determination on perinatal risk factors on birth asphyxia in Kakamega County referral hospital to the best knowledge of the

researcher; However, anecdotal report shows that New Born Unit (NBU) 50% of admissions in the unit are due to Birth Asphyxia .

1.2 Statement of the Problem

Globally, hypoxia of the newborn (birth asphyxia) or the fetus "fresh stillbirth" is estimated to account for 23% of the 4 million neonatal deaths and 26% of the 3.2 million stillbirths each year. An estimated 1 million children who survive birth asphyxia live with chronic neuro-developmental morbidities, including cerebral palsy, mental retardation, and learning disabilities (Lee *et al.,* 2008).

Neonatal mortality is a major contributor of infant mortality globally and also Kenya. It accounts for 43% of the infant mortality in Kenya and has been shown to account for about 50% of the infant mortality in the developing world. However, in developing countries accurate epidemiological data is scarce, and the exact burden of asphyxia is unknown. The causes of birth asphyxia are heterogeneous and most occur before or during labour and after delivery. (Chiabi *et al,.* 2013).

According to KDHS, 2014, western Kenya is leading in infant mortality rate at 122.5 per 1000 live births which is higher than the overall rate for Kenya, at 48/1000 live births. Prior to the study, the facility rates of infant mortality, birth asphyxia case fatality and stillbirths were unknown Currently, there is no documented data on asphyxia determination on perinatal risk factors on birth asphyxia in Kakamega county referral hospital .In this region, there is not much data available on the risk factors of birth asphyxia, hence studies are required to evaluate the risk factors of birth asphyxia so that interventions can be done to educate and guide people about the risk factors and management strategies.

1.3 Objectives

1.3.1 Main Objective

To determine the perinatal factors associated with birth asphyxia in Kakamega County Referral Hospital in maternity unit.

1.3.2 Specific Objectives

i. To evaluate the antepartum risk factors associated with birth asphyxia.
ii. To examine the relationship between intrapartum risk factors associated with birth asphyxia.
iii. To analyze the neonatal risk factors associated with birth asphyxia.

1.4 Research Questions

i. What are the antepartum risk factors associated with birth asphyxia?
ii. What are intrapartum risk factors associated with birth asphyxia?
iii. What are the Neonatal risk factors associated with birth asphyxia?

1.5 Justification

According to WHO, (2012), 4 million deaths yearly occurred due to birth asphyxia, representing 38% of all deaths of children under 5 years of age. In low-income countries 23% of all neonatal deaths occurred due to birth asphyxia. According to a survey conducted by WHO in 2015, it is also one of the leading causes of neonatal deaths within first week of life (Aslam *et al.*, 2014). Perinatal asphyxia is a common clinical problem with a high morbidity and mortality rate and could lead to cerebral sequelae with a subsequent socio-economic burden on the families. It could be prevented to a large extent by informing and educating pregnant women on the follow-up of pregnancy and delivery and appropriate management of pathological

disorders during pregnancy and deliver (Chiabi, *et al.,* 2013). With high infant mortality rate in western Kenya, which could probably be contributed to birth asphyxia the study findings would be used for prevention of birth asphyxia.

The results will be utilized by the hospital, and Ministry of Health, where they may use it to review the management protocol on birth asphyxia. The results will also contribute to the body of knowledge on birth asphyxia and can be utilized by other researchers.

1.6 Limitations

Main limitation in this study was that it is conducted in one tertiary care hospital Kenya where mostly patients belong to the low middle class and data may not be generalized predict the overall situation in the country.

The research design was a retrospective hence previous data collected was not for purposes of research but for routine use hence may not be complete

Definitions of birth asphyxia designed for use in hospital-based settings require evaluation of neonatal umbilical cord pH, Apgar scores, neurological clinical status, and markers of multi-system organ function, which were not feasible in the maternity unit, for this case only Apgar score was only used in this study to determine asphyxia hence compromising the results

1.7 Conceptual Framework

The conceptual framework was used in this study to provide a framework for quality outcome between variables, it has both dependent variable in this case is birth asphyxia and independent variable (risk factors of asphyxia). The independent variables are divided into social demographics which includes age of the client,

marital status, parity, education level, Antepartum risk factors(care during pregnancy period) which includes birth history, abortion history, medication used during pregnancy Intrapartum risk factors (care during labour and delivery) delivery outcome, labour duration, medications used; and Fetal characteristic risk factors which include age at birth, Apgar score, birth weight, resuscitation and sex. In this study this model looks at the relationship between dependent and independent variables.

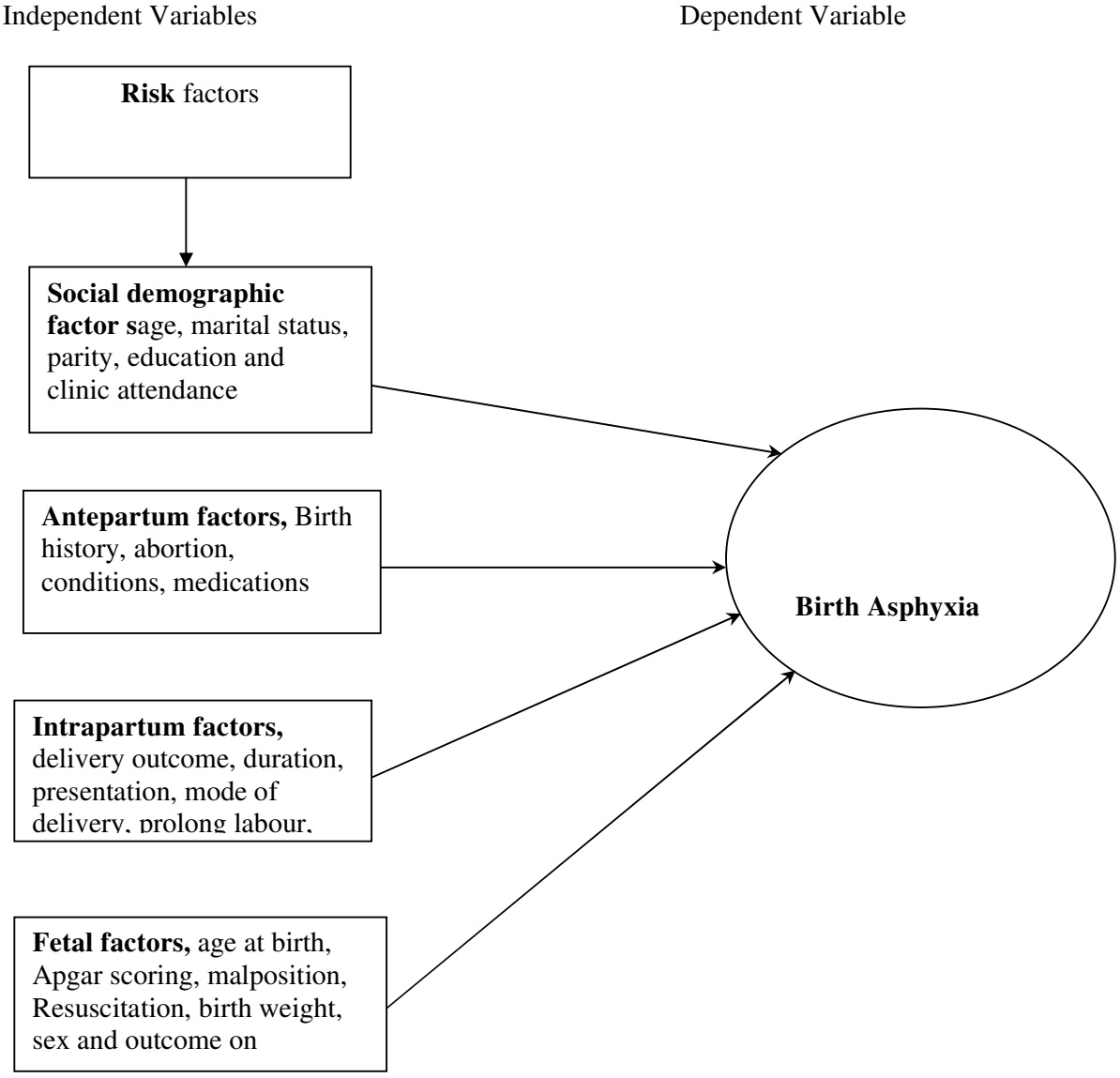

Figure 1.1 Conceptual Framework

1.8 Operational Definition Of Terms

Asphyxia: The failure of a neonate to initiate and sustain respiration at birth

Antepartum: Care given to a pregnant woman after conception until labour

Apgar score Method of assessing fetal wellbeing immediately after delivery

Caesarean delivery- Method of delivery of a baby through surgery

Gestation - The period in weeks of fetal development from conception till that time of examination

Intrapartum: Care given to woman during labor and delivery.

Maternal complication- undesired results experienced by women during labor and delivery such as laceration and need for uterotonic agents, hysterectomy, and ICU admission.

Parity- Number of viable births, 28 weeks and above

Post- term - Pregnancy that last more than 42-week gestation

Pre- labor rupture of membranes- is rupture of membranes at 37 weeks and beyond and before the onset of labour

Spontaneous vaginal delivery- Normal delivery through birth canal

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This present both conceptual and theoretical literature on this study it describes the social demographic, antenatal, intrapartum and fetal risk factors associated with birth asphyxia.

2.2 Perinatal Factors Affecting Birth Asphyxia

Birth asphyxia can be caused by events that have their roots in the antepartum, intrapartum, postpartum periods or combinations thereof. A recent review suggests that asphyxia is probably primarily antepartum in origin in 50% of cases, intrapartum in 40%, and postpartum in the remaining 10% of cases. Definitions of birth asphyxia designed for use in hospital-based settings require evaluation of neonatal umbilical cord pH, Apgar scores, neurological clinical status, and markers of multi-system organ function, which are not feasible in community settings. Therefore, it is difficult to identify the causes of birth asphyxia in the community due to lack of a consistent definition (Tabassum *et al*., 2014).

Asphyxia is a condition that occur when there is an impairment of blood-gas exchange, resulting in hypoxemia (lack of oxygen) and hypercapnia (accumulation of carbon dioxide). The combination of the decrease in oxygen supply (hypoxia) and blood supply (ischemia) results in a cascade of biochemical changes inside the body, whose events lead to neuronal cell death and brain damage. Prolonged asphyxia will also lead to multiple organ systems dysfunction. Causes of perinatal birth asphyxia may be maternal or fetal. Those who survive asphyxia at birth may develop

neurological complications including epilepsy, cerebral palsy and developmental delay. Risk factors of birth asphyxia has been divided into antepartum, intrapartum and fetal. Risk factors include increasing or decreasing maternal age, prolonged rupture of membranes, meconium stained amniotic fluid, multiple births, non-attendance for antenatal care, low birth weight infants, malpresentation, augmentation of labour with oxytocin, ante partum hemorrhage, severe eclampsia and pre-eclampsia, ante partum and intrapartum anemia. The prognosis and severity of the symptoms of child with birth asphyxia depend on the risk factors and management of the patient (Aslam *et al.,*2014).

2.2.1 Social Demographic Factors Associated with Birth Asphyxia

Birth asphyxia was found to be significantly associated with mother and father education levels. Maternal literacy decreased the risk of mortality with birth asphyxia (OR 0.5, 95% CI: 0.3 - 0.7) while father's higher education levels had protective effect on mortality (OR 0.5, 95% CI: 0.3 - 0.9 (Tabassum *et al.,* 2014) The other risk factor in this study that was significantly associated with the development of perinatal asphyxia was being a mother without partner (OR=2.56); this factor represents a state of vulnerability for the mother-fetus dyad. Being a single mother, not being affiliated to the social security system and having a low level of education were also associated with birth asphyxia, greater proportion among mothers of cases in the multiple correspondence factorial analysis, indicating that social difficulties can endanger the normal development of pregnancy. In an investigation by Milson, *et al.,(*n,d*)* in Sweden , being single was found to be a risk factor associated with the development of perinatal asphyxia

According to the study by Raatikainen *et al.*, (2003). Single status constitutes a risk factor for asphyxia and low birth weight during pregnancy, according to Houndjahoué (2004), he found that mother's age less than 20 years, unemployment, and low level of education are other risk factors in addition to the marital status. On the other hand, (Rehana *et al.*,2007), noted that the risk of asphyxia increased with the mother's age above 35 years, unemployment of the mother, or performing an intense physical activity.

Studies identified maternal education as one of the factors associated with BA mortality. Similar patterns were reported by other studies conducted in rural areas of Southern Nepal and Mexico City. Another hospital based study conducted in Bangladesh did not find association of maternal education with BA. Maternal illiteracy is a very broad indicator of poor socio-economic conditions associated with consequent malnutrition, frequent pregnancies and also influences care seeking during antepartum period. Same data also suggests that history of stillbirths is significantly associated with increased risk of birth asphyxia mortality and this finding is concordance with the findings from studies conducted in similar settings from less developed countries, moreover, there was no any association between birth asphyxia related mortality and maternal age. These findings were also consistent with other studies (Tabassum *et al.,* 2014).

According to findings, the first delivery exposes to clinical birth asphyxia and subsequent newborn death when a nuchal cord is observed. (Rhoades *et al.,*2006). The study reported an association between an increased risk of nuchal cord and primiparity in USA, while (Ghi *et al., 2007).* The study also found that primiparity was significantly associated to a second stage of labor lasting more than 30 minutes, which

itself was a significant exposure to clinical birth asphyxia and subsequent newborn death. These findings are similar to those of (Ogueh *et al.,* 2006), who found a significant association between primiparous with tight nuchal cord and prolonged second stage of labor in Canada. Therefore, prolonged second stage of labor can explain the role of primiparity as a risk factor of birth adverse outcome in birth asphyxia. Other studies reported no association among the literacy level or socioeconomic status of mothers and incidence of birth asphyxia in their finding (Babu ,*et al*,. 2014).

2.2.2 Antepartum Factors Associated with Birth Asphyxia

Prenatal visits in primary health facilities significantly influenced the occurrence of asphyxia. This could be explained by the fact that the women who go to health centers are poorly followed up due to lack of qualified staff, and referrals are done only in case of complications. Although most of the pregnant women (91.1%) had at least 4 antenatal consultations as recommended by (WHO, 2010), this number is higher than that reported in the Demographic Health Survey in Cameroon in 2014, which stood at 83%. This goes to support the premise that what matters is not the number of consultations, but the quality of the care offered during the consultations. Malaria and preeclampsia/eclampsia were the main maternal risk factors identified.

Placental malaria, pre-eclampsia/eclampsia both lead to a decrease in placental blood flow, loss of placental integrity, and damage of endothelial cells. In placental malaria, in particular there can be an intervillous accumulation of inflammatory and infected red blood cells. All these phenomena can lead to an inadequate foeto-placental blood flow with foetal hypoxia causing growth retardation and birth asphyxia (Brahim, 2005).

According to (Tabassum *et al.*, 2014), antepartum complications (including smelly or excessive vaginal discharge and anemia or pallor) were the most important factors related to increased risk of BA mortality Spacing children at least 36 months apart reduces the risk of infant death.

In Kenya, the median birth interval is 36.3 months. neonates born less than two years after a previous birth have neonatal mortality rates. Neonatal mortality is highest among neonates whose previous birth interval is less than two years, at 83 deaths per 1,000 live births. In comparison, children born three years after a previous birth have a neonatal mortality rate of only 42 deaths per 1,000 live births. Eighteen percent of births in Kenya have a birth interval of less than two years, putting them at additional risk of childhood death (KDHS, 2014).

Longer birth interval, greater than 60 months is also associated with adverse perinatal outcome. women that delivered with birth interval 59 months and beyond had their babies delivered via caesarean section. This agree with other by (Norton, 2005). This might be because pregnancies help mothers gain growth supporting capacities, such as increase, uterine blood and other physiological and anatomical adaptations of the reproductive system. After delivery these capacities may gradually decline and with prolonged birth interval women physiological characteristics may be similar to those of Primigravida with risk of caesarean section. Short birth interval was found to be significantly associated with lower five minutes Apgar score in that study (Gordon *et al.,* 2003). This may be due to the fact that the fetus may not be having good reserves due to depletion of maternal nutritional reserves and therefore easily became asphyxiated with rigours of labour.

2.2.3 Intrapartum Factors Associated with Birth Asphyxia

Prolonged labor, arrest of labor, prolonged rupture of membranes, cesarean section, and non-vertex presentation were the major statistically significant factors found in our study. These factors were also reported by other authors, Other studies reported abnormal amniotic fluid (foul smell, meconium stained, yellowish) to be strongly associated with asphyxia, whereas (Monebenimp *et al.*, 2005), only found a correlation between meconium-stained liquor and asphyxia. There was also a strong relationship between emergency caesarian section and neonatal asphyxia. This could be explained by the fact that most of the indications for the emergency cesarean sections were due to conditions which compromise adequate oxygen delivery to the foetus as prolonged labor, arrest of labor, hypertensive disorders in pregnancy, and cephalo-pelvic disproportions. found elective cesarean to be a risk factor for neonatal asphyxia and postulated that this might be due to some risk factors, which are not identified early in pregnancy, and which might cause acute foetal distress and consequently lead to asphyxia (Chiabi *et al.,*2013).

Presence of fever (indicative of infection), prolonged labor, breech delivery and cord around child's neck were found to be associated with high BA mortality. These findings are consistent with other studies; There was no association of BA mortality with convulsions and vaginal bleeding. Other studies conducted in resource limited settings have reported similar results (Tabassum *et al.*,2014).

Studies in Africa have shown that of the women who are referred to hospitals for deliveries, many have severe or life threatening complications and the evidence that Newborn deaths are higher in cases where best practice for newborn care is limited (Yego. *et. al,* 2013), Other studies reported fever (RR: 3.30; 95% CI: 2.15–5.07); vaginal bleeding (RR: 2.00; 95% CI: 1.23–3.27); swelling of the hands, face, or feet (RR: 1.78; 95% CI: 1.33–2.37); convulsions (RR: 4.74; 95% CI: 1.80–12.46); prolonged labor (RR: 1.31; 95% CI: 1.00–1.73); and prolonged rupture of membranes (RR: 1.83; 95% CI: 1.22–2.76) were significantly associated with increased risk for birth asphyxia mortality. Multiple births (twin or triplet) were strongly related to birth asphyxia mortality (RR: 5.73; 95% CI: 3.38–9.72). Infants with "green" (presumably meconium-stained) amniotic fluid had a non-significant greater risk of birth asphyxia (RR: 1.32; 95% CI: 0.19–2.16 (Lee *et al.,* 2008).

2.2.4 Fetal Factors Associated with Birth Asphyxia

A breath of air is vital from the start of life out of mother's womb. Deprivation of oxygen after birth leads to impairment of various organs of our body. For community use, Birth asphyxia is defined as the failure to initiate and sustain breathing at birth. Globally, it accounts for an estimated 900,000 deaths each year and is one of the primary causes of early neonatal mortality (Gupta *et al.,* 2014).

In sub-Saharan Africa, 14 percent of neonates are born with low birth weight (LBW), or a weight at birth of less than 2,500 grams. Neonates are born small for two main reasons. Poor growth in utero –neonates are born after the full number of weeks of gestation (term births) but are smaller than expected (small for gestational age). This may be due to a number of causes, including small maternal size, obstetric causes

(such as twins or multiple pregnancy, hypertension in pregnancy), infections (notably malaria, HIV and STIs) or poor maternal nutrition or overwork. It is rare for babies who are full term to die directly because of being small – probably (hypoglycaemia), and low body temperature (hypothermia) and have approximately twice the risk of death compared to normal sized babies. However, most will survive. Longer term problems with growth and development are possible less than one percent of newborn deaths. These babies are at an increased risk of infections, low blood sugar (WHO, 2017).

Asphyxia is a condition that occur when there is an impairment of blood-gas exchange, resulting in hypoxemia (lack of oxygen) and hypercapnia (accumulation of carbon dioxide). The combination of the decrease in oxygen supply (hypoxia) and blood supply (ischemia) results in a cascade of biochemical changes inside the body, whose events lead to neuronal cell death and brain damage. Continuous asphyxia will also lead to multiple organ systems dysfunction. BA is a serious clinical problem worldwide and contributes greatly to neonatal mortality and morbidity (Lawn *et al*., 2005).

In the absence of circulation or breathing, the interventions required for resuscitation may include the maintenance of respiration using artificial ventilation and the maintenance of an artificial circulation using chest compressions. The combination of chest compressions with artificial ventilation is called cardiopulmonary resuscitation or CPR. Occasionally, when the situation warrants it, additional measures may be required, including the use of artificial airways, defibrillation (almost unheard of inneonates), and the administration of fluid or drugs (Whakahauora *et al.,* 2014)

According to a survey conducted by WHO in 2005, it is also one of the leading causes of neonatal deaths within first week of life (Lawn, 2005). It is strongly associated with 1.1 million intrapartum stillbirths and is responsible for long-term neurological disability and impairment (Bryce *et al.,* 2007). Causes of perinatal birth asphyxia may According to WHO classification of diseasesICD10, Severe birth asphyxia is when the APGAR score at 1 min is 0-3. Mild and moderate birth asphyxia is when Apgar score at 1 min is 4-7 (Pitsawong, & Panichkul, 2012).

Five factors are used to evaluate the baby's condition and each factor is scored on a scale of 0 to 2, with 2 being the best score: appearance (skin coloration) pulse (heart rate) grimace response (medically known as "reflex irritability"), activity and muscle tone respiration (breathing rate and effort), A score is given for each sign at one minute and five minutes and 10 minutes after the birth. If there are problems with the baby an additional score is given at 15 minutes. A score of above 8 is considered normal, while 6-7 has mild asphyxia, 4-5 has moderate asphyxia and any score below 4 has severe asphyxia and needs immediate resuscitative interventions (Apgar 1952).

Table 2.1 Apgar score 1952

SCORE	0	1	2
APPEARANCE	Bluish, grey all over the body	Normal colour with blue extremities	**Normal colour all extremities are pink**
PULSE	Absent (no pulse)	Pulse present but below 100	**Normal pulse above 100 and per minute**
GRIMACE	(Absent no response to stimulation)	Facial movements (grimace)with stimulation	**Pulls away, sneezes, coughs or cries with stimulation**
ACTIVITY	No movement (floopy tone)	Arms and left flexed with little movement	**Active spontenous movement**
RESPIRATION	**Absent (No breathing**	**Slow or irregular breathing, weak cry**	**Normal rate and effort good cry**

Adapted from Apgar score 1952

The major consequence of perinatal asphyxia is hypoxic ischaemic encephalopathy (HIE). Diagnosis of HIE requires abnormal findings on neurological examination the day after birth. The clinical spec-trum of HIE is described as mild, moderate or severe according to the Sarnat stages of HIE. Infants can progress from mild to moderate and/or severe encephalopathy over the 72 hours following the hypoxic-ischaemic insult. The death of an infant as a result of perinatal asphyxia is devastating and frequently avoidable (Yadav, & Damke, 2017).

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter describes the methodology used in this study and it describes the research design, study area, target population, sampling procedure, sample size calculation, data management, data analysis and ethical consideration.

3.2 Study Design

The study design mixed research methods, retrospective used in collecting clients file, qualitative method in using key informant interview. The records of clients that is the mother and neonates were retrieved from records department. The information collected had reduced bias since it involved looking back to the care given to the subjects and the advantage was that there was no manipulation of variables since the care was past

3.3 Study Area

The study site was in Kakamega general hospital former western provincial referral hospital. It is situated along Webuye-Kisumu road. It serves as a referral hospital for Kakamega County. The facility is a training institution for nurses, clinical officers, medical officers (for internship). The catchment population is approximately 100,000 people, most occupants of this area are farmers, businessman and those employed in government and nongovernmental organization. The hospital is a 500 bed capacity; the study took place in maternity unit i.e. labor ward and newborn unit. The number of deliveries conducted in a month is averagely 600 per month. Deliveries are conducted by trained midwives and Doctors on obstetric emergencies who are competent in

handling obstetric and neonatal emergencies. The newborn unit was well supplied with necessary equipment for resuscitation for instance Ambu bag, warm resuscitative, face mask, oxygen and CPAP machine.

3.4 Study Population and Target Population

Study population was all new born neonates delivered through normal delivery and abnormal delivery diagnosed with and without birth asphyxia during the time of data collection. The target population was about 7200 neonates per year.

3.5 Sample Size Determination

The sample size was determined using the following formula: (Fisher *et al.,* 1998)

$$n=1.96^2 \times p(1-p)$$

$$d^2$$

$$n= 1.96^2 \times 0.50(1-0.50)/ 0.05^{2=}384.16$$

$$n=384$$

Description:

n = required sample size

1.96 = confidence level at 95% (standard value of 1.96)

p = estimated prevalence birth asphyxia 0.50,

d = margin of error at 5% (standard value of 0.05)

According to the records in Kakamega County hospital maternity unit 600 deliveries were conducted per month. Therefore, the target population in a year was 600x12 months =7,200.

Because estimated population was less than 10,000, the following adjustment factor was used;

Nf= n/1+ (n/N) (Mugenda & Mugenda, 2003)

Where: Nf= desired sample size for population less than 10,000

n= sample size for population greater than 10,000 which is 384.16 as per the above calculation of sample size

N = estimated population size=7200

Therefore, the desired sample was

Nf = n/1+n/N

= 384/1+384/7200= 384.053(10/100x384.064=38.4

384+38.4=422.4

3.6 Sampling Procedure

Systematic random sampling was used to determine the sample. This involved the selection of subjects from an ordered sampling frame, progression through the list was treated circularly. The sampling started by selecting an element from the list at random and then every k^{th} element in the frame was selected, where *k*, the sampling interval

$$k = \frac{N}{n}$$

Where *n* is the sample size, and *N* is the population size. In the facility the number of deliveries in a month is averagely 600.Therefore the whole year was 600x 12= 7200

Therefore, for this case

K =7200/422=17

K^{th}=17

Therefore, every 17th subject from the first one was used for study. Both neonates with birth asphyxia and without had equal chances in the study.

3.7 Development of Research Instruments

The instrument was developed using the available literature review and considering the study objectives of the study. Transcription form was filled on each section. The form constituted four sections, first section comprised of social demographic data of the mother that is age, marital status, parity, educational level. Second section comprise of antepartum details. It consists of any illness during pregnancy, type of pregnancy, history of diabetes, preeclampsia, anemia and any previous history of birth asphyxia third section comprised intrapartum status for instance presentation of fetus, mode of delivery, type of assisted vaginal delivery, anesthesia received during C-section, history of prolong labor, place of delivery, any emergency complication face by mother and history of sedation. Last section was regarding fetal characteristic. It comprised of questions from, which consisted of gestational age at birth, history of cry and seizure, about resuscitation, mode of resuscitation and birth weight. Information about the date and time of birth, gender, birth weight and result of Apgar score at 1, 5 and 10 minutes were recorded the inform.

3.8 Implementation of the Instruments

Pilot Study

The pre-testing of data collection tool was done at Webuye District hospital because the study population had the same characteristics. The purpose was to test the feasibility of the study and necessary corrections to be undertaken. The researcher asked for permission from administration to access past patients' records. The researcher picked one file randomly per month for 12 months. This did not create bias

as this is evenly distributed in the whole year. The information was filled in the transcription form. Areas which were not well understood were revised to make it easy for final data collection.

3.9 Eligibility Criteria

Asphyxia was defined as Apgar score of less than 7 after five minutes or baby did not cry immediately after birth. The severity was classified as mild, if the Apgar score at five minutes is 6-7 or required just suctioning to establish a cry. It was moderate if the five minute Apgar score was 4-5, or required stimulation and oxygen administration before a cry and severe if the score is 0-3 and or required major intervention or was associated with seizures central cyanosis or coma, or opisthotonic posture.

3.9.1 Inclusion Criteria

Files of mothers whose delivered between may 2015-April 2016

Files of neonates with or without birth asphyxia born between same period

3.9.2 Exclusion Criteria

Exclusion Criteria included:

a) Birth weight less than 1500 g

b) Opium or Anesthesia related Low APGAR score.

c) Babies with lethal anomalies like hydrops, cyanotic congenital heart defects, congenital or chromosomal anomalies and congenital infections

d) All newborn babies born outside Kakamega general hospital

e) Incomplete information in files

3.10 Data Collection Procedure

Since the study method was retrospective, the researcher sought for records from Systematic random sampling by selecting every k^{th} record comprising of the details of the mother and the newborn. The information such as socio-demographic factors of the mother and the new born were extracted from the maternity records and recorded into the transcription form. This was done repeatedly until the sample of the study was arrived at. The selected records were either neonates with and without birth asphyxia.

3.11 Data Management

Data was collected using a transcription form. The information was coded to make the data entry easy. All raw data was reviewed by the principal investigator and cross-checked to ensure completeness; any clarifications to be made were sought out immediately. The filled forms were kept in a safe and confidential place that was accessible only to the principal investigator, ready for the data entry.

After cross checking the information in the form for any missing entries a database was designed in SPSS which allowed the researcher to set controls and validation of the variables. On completion of the data entry exercise summaries were used in SAS version 9 to obtain bivariate and logistic regression

3.12 Data Analysis

Analysis of data involved descriptive statistics i.e. frequency distribution, means, standard deviations, proportions and cross tabulations. The data collected and analyzed using odds ratio (OR) to determine the risk factors significant for contributing to BA, and modeling was done using logistic regression. Significant risk factors were determined by rejecting or not rejecting at significance level of 0.05 (95% CI).

- Qualitative analysis- Content/thematic analysis: Data collected from key informant interview in themes.

3.13 Ethical Considerations

Ethical approval from hospital research and ethical committee and National Commission for science and Technology (NACOSTI) was requested. Confidentiality of the subjects was ensured. To observe the observe the principle of beneficence researcher ensured that patient particulars had no harm by using coded serial numbers so that does not bear patient names, integrity involved using people who have knowledge on research and also involving the key supervisors who ensured that things are done and no harm to the subjects.

Principle of humanity were dealt with respect so that no comments on every patient particular be commented in reference to any particulars, and dignity of the subjects was ensured by ensuring that patient particulars were dealt with human dignity.

Anonymity were observed since there were no links of clients to their data. Client particulars were coded to ensure that there was no relationship between their particulars and their names.

Permission from the Director of the Hospital and the Director, Reproductive Health services were obtained to carry out the study. The information obtained from the patient file was used only for the purpose of this study, the findings from study the study will add information on existing knowledge on management of maternal and childcare.

CHAPTER FOUR

RESULTS

4.1 Overview

This chapter deals with results presentation, and interpretation of the data collected in the study. The study had sought to determine the perinatal factors associated with birth asphyxia. Primary data was extracted from transcription forms available from the registry of clients attending Kakamega county and referral hospital. Analysis was done using portable version 9 of SAS. Presentation was done using frequency tables. The above activities were guided by the research objectives and the research questions.

4.2 Demographic Information of Mothers

This part presents the demographic characteristics of the respondents including age, marital status, education level and employment status mean age of the mothers seeking health delivery services was 24.01±7.90 years. The maximum age was at 49 years while the minimum was at 15 years. A higher proportion 324 (76.8%) of the mothers were married. This was followed by those who were single 61 (14.5%) while the rest were widowed 37 (8.8%).

Fifty-two-point-nine percent 223 (52.9%) of the mothers who attended ANC had secondary or tertiary level of education.199 (47.1%) of mothers were with none or primary education (Figure 4.1).

The mothers who sought delivery services 218 (51.6%) of the were not employed. This included a proportion of 135 (31.9%) who were housewives (Table 4.1).

Table 4.1 Socio-demographic Characteristics of Mothers

Demographic information	**category**	**n**	**%**
Age in years	15-19	21	5
	20-24	39	9.2
	25-29	33	7.8
	30-34	109	25.8
	35-39	98	23.2
	40-44	58	13.7
	45-50	64	15.2
Total		**422**	**100**
Minimum=15 years			
Maximum=49 years			
Mean= 24.01 years			
Marital Status	Married	324	76.8
	Single	61	14.5
	Widowed	37	8.8
Total		**422**	**100**
Education Level	None	71	16.8
	Primary	128	30.3
	Secondary	129	30.6
	Tertiary	94	22.3
Total		**422**	**100**
Employment Status	Employed	64	15.1
	Unemployed	83	19.7
	Self employed	140	33.2
	Housewife	135	31.9
Total		**422**	**100**

4.3: Demographic Information of the Neonates

During the study period (May 2015 to April 2016), 422 cases of the new born babies fulfilled the inclusion criteria. Out of these 422, male neonates were (53.3%) and females were (46.7%). With regard to birth weight, (75.8%) of the neonates weighted 2600-3500 gms and (24.2%) of the neonates' weight 1500-2500gms. There was a higher proportion of the newborns whose birth ages were term (91.0%) compared those who were post-term (9.0%). Over seventy percent (70.9%) of the new born had no birth asphyxia while the rest of (29.1%) had asphyxia (Table 4.2).

Table 4.2 Demographic Information of the Neonates

Demographic	**Categories**	**Frequency**	**Percent**
Gender	Male	225	53.3
	Female	197	46.7
Birth Weight	1500-2500gms	102	24.2
	2600-3500gms	320	75.8
Birth Age	Term	384	91.0
	Post term	38	9.0
Asphyxia Status	No Asphyxia	299	70.9
	Asphyxia	123	29.1
Total		**422**	**100.0**

4.4: Socio-demographic Risk Factors

Mothers aged less than 30 years were 3 times more likely to give birth to newborn babies with birth asphyxia than their younger counterparts (OR: 3.0; 95%CI: 1.9 – 4.9; p <0.0001) than those of mothers who were older. Mothers who had no or primary education were about 4 times more likely to give birth to neonates with birth asphyxia than their counterparts with at least secondary education (OR: 3.8; 95%CI: 2.4 – 6.0; p <0.0001).

There was a significant relationship between the parity of the mothers and birth asphyxia (OR 1.8, CI 95% 1.08-3.02, p = 0.02), suggesting that neonates of mothers with a parity of 3 or less were about two-times more likely to deliver neonates who suffer from birth asphyxia compared with those of para 3 and above. Being employed (OR 1.31, CI 95% 0.86-2.00, p = 0.2) and married (OR 1.3 CI 95% 0.70-2.45, p = 0.4) were not significantly associated with risk of birth asphyxia since they reported almost similar frequencies (Table 4.3).

Table 4.3 Socio-demographic Risk Factors of Asphyxia

Serial No	Category	Asphyxia n = 123	No asphyxia n = 299	OR	95% CI	p-value
Age	Less or equal to 30yrs	45 (48.4%)	48(51.6%)	3.0	1.9 – 4.9	**<0.0001**
	More than 30 yrs	78 (23.7%)	251 (76.3%)			
Marital Status	Married	108(29.9)	253(70.)	1.3	0.7-2.4	0.3971
	Not Married	15(24.6)	46(75.4)			
Education level	None or primary	86(43.2)	113(56.8)	3.8	2.4-6.0	**<.0001**
	Secondary or Tertiary	37(16.6)	186(83.4)			
Employment	employed	58(32.4)	121(67.6)	1.3	0.8-2.0	0.2066
	Not employed	65(26.8)	178(73.3)			
Parity	Less than or equal to 3	31(39.7)	47(60.3)	1.8	1.0-3.0	**0.0226**
	More than 3	92(26.7)	252(73.3)			

4.5 Antepartum Risk Factors

Birth interval is significantly associated with birth asphyxia, with those mothers having a birth interval of less than 2 years were four times more likely to deliver neonates with birth asphyxia (OR 3.83 CI 95% 2.44-6.00, p = <0.0001) compared with their counterparts with birth interval of 2 years and above. Gestation was highly associated with birth asphyxia (OR 1.8 CI 95% 2.20-9.40, p = <0.0001) with those mothers with gestation period above 41 weeks two times more likely to give birth to neonates who were asphyxiated than those with gestation period less than 41 weeks.

Past Incidences of still birth or live baby seemed not a significant factor to asphyxia (OR 1.35 CI 95% 0.43-4.23, p = 0.6). Therefore, a history of still birth shouldn't be something to worry about. Medication (OR 1.24 CI 95% 0.33-4.66, p = 0.7484) and place of delivery (OR 1.03 CI 95% 0.43-4.23, p = 0.9184) were not a risk factor of asphyxia (Table 4.4).

Table 4.4 Antepartum Risk Factors of Asphyxia

Serial No	Category	Asphxia n= 123	No Asphxia n = 299	OR	95% CI	p-value
Abortion history	None	288(71.1)	117(28.9)	1.3	0.4-3.7	0.5691
	Abortion	11(64.7)	6(35.3)			
Birth Interval	Less than_2years	186(83.4)	37(16.6)	3.8	2.4-6.0	**<.0001**
	Above _2years	113(56.8)	86(43.2)			
Gestation	>37-41 weeks	81(19.2)	234(55.5)			
	>41 weeks	42(9.9)	65 (15.4)	1.8	1.2-2.9	**<.003**
Birth history	Stillbirth_ or	13(76.5)	4(23.5)	1.3	0.4-4.2	0.6029
	Live baby	286(70.6)	119(29.4)			
Medication in pregnancy	Medicated	9(75.0)	3(25.0)	1.20	0.3-4.7	0.7484
	None	290(70.7)	120(29.3)			
Place of delivery	Private	67(71.3)	27(28.7)	1.03	0.6-1.7	0.9184
	Public	232(70.7)	96(29.3)			

4.6 Intrapartum Risk Factors

There was significant association between the delivery mode and asphyxia (OR 5.8 C I 2.7167-12.3998, p<0001). The foetus presentation, whether cephalic or breech was not a risk factor of asphyxia (OR 1.05 CI 95% 0.46-2.35, p <0.9150). Deliveries of mother's that were induced using Syntonicon or Prostaglandine were about seven times more likely to develop asphyxia than those that were not induced (OR 6.78 CI 95% 2.57-17.9, p <0.0001). Duration of labour OR 4.3CI 2.72-17, p value <,.0001, Women who had labour more than 12 hours were about 4 times likely to deliver neonates with asphyxia than those who had labour for less than 12 hours. condition in labour (OR 1.39 CI 95% 1.24-1.55, p=0.5349) were not a risk factor of asphyxia (Table 4.4). A Doctor who was a key informant reported use of syntocinon and poor partograph documentation to be key cause of birth asphyxia though in this study documentation on the partograph were not part of the independent variable.

Table 4.5 Intrapartum risk factors of birth asphyxia

Serial No	Category	Asphyxia= n= 123	No asphyxia n = 299	OR	95% CI	p-value
Delivery mode	Normal vaginal	213(50.5)	115(27.3)	5.8	2.7-12.3	**<.0001**
	Abnormal	8(1.9)	86(20.4)			
Foetus presentation	Cephalic	278(70.9)	114(29.1)	1.05	0.4-2.3	0.9150
	Breech	21(70.0)	9(30.0)			
Induction	Syntocinon	15(71.4))	6(28.6)	6.8	2.6-17.9	**<.0001**
	None	108(26.9)	293(73.1)			
Labour duration	Less equa12 hours	114(27.0.)	278(65.9.)	4.4	2.7-1.7	**<.0001**
	More12 hours	11(2.6)	19(4.5.)			
Referral	Referral	31(72.1)	12(27.9)	1.1	0.5 2.1	0.8503
	Not refer	268(70.7)	111(29.3)		2.7 12.4	

4.7 Fetal Risk Factors

Neonates born with a birth weight of 1500-2500g were 3 times more likely to develop birth asphyxia than those with a higher weight of 2600-to >3500g (OR 2.10 CI 95% 1.21-3.65, p = 0.0073) The sex of the neonate was not a risk factor (OR 1.35 CI 95% 0.88-2.06, p = 0.1681) as was resuscitation (OR 1.29 CI 95% 0.68-2.46, p = 0.43). Birth age was not significantly associated with birth asphyxia (OR 1.01 CI 95% 0.48-2.10, p = 0.9774). (Tables 4.6). A nurse in new born unit reported delayed second stage, difficult delivery and use of syntocinon during labour were the most causes of birth asphyxia.

Table 4.6 Fetal risk factors of asphyxia

.Serial No	**Category**	**Asphyxia n = 123**	**No Asphyxia n = 299**	**OR**	**95% CI**	**p-value**
Birth weight	w1500-2500g	83(81.4)	19(18.6)	3.6	2.10-1.2	**0.0073**
	w2600-3500g	104(32.5)	216(67.5)			
Sex	Female	146(74.1)	51(25.9)	1.3	0.8 -2.0	0.1681
	Male	153(68.0)	72(32.0)			
Birth age	Postterm	27(71.1)	11(28.9)	1.01	0.4 -2.1	0.9774
	Term	272(70.8)	112(29.2)			

4.8 Logistic Regression Models

Significant risk factors for birth asphyxia were further analyzed by logistic regression model. The regression model gives the unit change in the log of odds when there is unit change in the independent variable. Factors that were independently associated with birth asphyxia included maternal age (OR: 3.0; 95% CI: 1.8 – 7.8; p <0.0001), education level (OR: 3.8; 95%CI: 2.4 – 6.0; p <0.0001), parity (OR 1.8, CI 95% 1.08-3.02, p = 0.023), birth interval (OR 3.0 CI 95% 2.4-6.00, p = <0.0001), gestation (OR 4.5. CI 95% 2.2-9.3, p = <0.0001), birth weight (OR 2.10 CI 95% 1.21-3.65, p = 0.0087) mode of delivery (OR 5.80 CI 95% 2.72-12.4, p < 0.0001), induction of labour (OR 6.7 95% CI 2.566-17.29, p <0.0001) and Duration of labour (OR 1.4 95% CI 0.651-3.061,p 1.4). These factors were modeled to give a complete equation that defined the relationship between the risk factors and the birth asphyxia. however, Duration of labour did not come out to be significant risk factor. The Table 4.7 depicts the results of the bivariate model.

Table 4.7 Model Summary for significant risk factors of asphyxia

Parameter	**Estimate**	**OR**	**CI**	**p-value**
Age of the mother	1.1	3.1	1.9-7.9	**<0.0001**
Education level	1.3	3.8	2.4-6.0	**<0.0001**
Parity	0.6	1.8	1.0-3.0	**0.0237**
Birth interval	1.3	3.0	2.4-6.0	**<0.0001**
Gestation	1.5	4.5	2.2-9.3	**<0.0001**
Delivery mode	1.8	5.8	2.7-12.6	**<0.0001**
Induction of labor	1.9	6.7	2.6-17.3	**<0.0001**
Duration of labour	0.3	1.4	0.7-3.1	**0.3824**
Birth Weight	0.7	2.1	1.2-3.6	**0.0087**

CHAPTER FIVE

DISCUSSION

5.1 Overview

This chapter presents discussions on risk factors of birth asphyxia based on relevant objectives. The study's objective was to determine the perinatal risk factors of Birth asphyxia in Kakamega County referral hospital. Socio-demographic risk factors were mother's age, education level and parity. Antepartum risk factors of birth asphyxia included birth interval and gestation while intrapartum risk factors were delivery mode of delivery, induction and labour duration. Fetal risk factors birth weight only emerged as a risk factor.

5.2 Social-demographic Risk Factors Associated with Birth Asphyxia

The findings in this study indicate that young mothers of 30 years and below were three times more likely to have increased cases of neonates with asphyxia than their older counterparts , which is supported in studies by(Pitsawong & Panichkul, 2012 lee *et al.,* 2008, Onyearugha, & Ugboma, 2012). This findings contradicts similar studies by (Shireen *et al.,* 2009) which reported that maternal age was not significant risk factor, other studies which contradicts this results were (Laopaiboon *et al.,*2015) found in their study that Advanced Maternal Age (35 years or older) was associated with increased cases of APGAR score < 7 at 5 minutes which is an indicator for birth asphyxia ,this could be due to the methodology used or due to the sample size used or the nature of setting where the study was conducted.

Most Mothers of this age bracket have either their first born or second born babies at that age bracket. Women uterus have tough uterine muscle whereby during labour the uterus contract strongly and vigorously predisposing the fetus to a lot of hyphoxia which will lead to birth asphyxia.

Gestation also emerged as a risk factor in this study which showed that it was highly associated with birth asphyxia (OR 1.8 CI 95% 1.17-2.97, p = <.0.003) with those neonates with gestation period more than 41 weeks two times more likely to be asphyxiated than their counterparts between 37 and 41 weeks. Neonates above 41 weeks tend to have compromised blood circulation. The placenta will be highly calcified hence compromised supply to the fetus therefore during labour the fetus will have compromised oxygen supply hence asphyxia. The outcome always depend on facilities interventions because with good interventions most neonates will improve. It was difficult however to confirm the gestation by age because last menstrual period which in most cases may not be accurate.

Education level of the mother also emerged as risk factor Mothers who has no or primary education were 4 times likely to give birth to newborn babies with birth asphyxia than their counterparts with at least secondary education (OR: 3.8; 95%CI: 2.4 – 6.0; p <0.0001). The study findings are similar to (Tabassum *et al.,*2014), who indicated that maternal education was a risk factor to birth asphyxia. Similar patterns were reported by other studies conducted in rural areas of Southern Nepal and Mexico City by (lee *et al.,* 2008). Another hospital based study conducted in Bangladesh contradict similar studies that found association of maternal education with BA by (Shreen *et al.,* 2009).

Maternal illiteracy is a very broad indicator of poor socio-economic conditions associated with consequent malnutrition, frequent pregnancies and also influence care seeking during antepartum period. With good education clients tend to seek health care services early hence improving. the outcome during and after delivery.

There was a significant relationship between the parity of the mothers and birth asphyxia (OR 1.8, CI 95% 1.08-3.02, p = 0.02), suggesting that neonates of mothers with a parity of 3 or less were about two times more likely to deliver neonates who suffer from birth asphyxia compared with those of their counterparts of para 3 and above, those mothers who delivered their first babies and subsequent pregnancies their babies suffered birth asphyxia which is supported in studies by (Ogueh *et al.,* 2006, Rhoades *et al.,*2006 & Ghi *et al.,* (1999). who noted that primiparous are often ignorant of the demands of pregnancy and often neglect regular attendance to antenatal care. This may result in complications that lead to perinatal asphyxia.

Most primigravida clients end up in induction of labour hence expose the neonates to asphyxia , other reasons could be due to compression of nuchal cord which exposes the fetus to lack of oxygen in labour hence birth asphyxia. In the Kenyan settings, most mothers have higher parities and past deliveries have taken place at home, which other studies found to be a risk factor for causing birth asphyxia (Rani *et al*., 2012).

Reduction of the risk factors of causing birth asphyxia in rural Kenya and many developing countries may not be an easy task due to certain reasons as described by a key informant who indicated;

uneducated young mothers who are also in most cases are not fast learners and tend to forget a lot the during health education offered in the department. There is also the component of lack of awareness on the part of MOH to sensitize the mothers of child bearing age. In order to reduce the burden of birth asphyxia, Women need to be educated from preconception, antenatal, i ntrapartum and postnatally this would increase knowledge hence reduction in mortality rate (Person 2)

The other aspect is single motherhood which is a new reality**.** The number of increasing mothers who are single is on the rise and indeed marital status was a risk factor of asphyxia. The study revealed that there were more cases of reported asphyxia in mothers who are not married than those who are married. There is still evidence of more cases of asphyxia in unemployed mothers despite the fact that it was not a significant risk factor of asphyxia in this study. Other studies like those of (Tabassum *et al.,* 2014), quite indicated that income or employment is a risk factor and this seem to have been watered down by government interventions such as offering free maternity services to mothers (Lee *et al.,* 2008).

5.3 Antepartum Risk Factors Associated with Birth Asphyxia

Birth interval is significantly associated with birth asphyxia, with those mothers having a birth interval of less than 2 years were four times more likely to deliver neonates with birth asphyxia (OR 3.83 CI 95% 2.44-6.00, p = **<0.0001**) compared with their counterparts with birth interval of above 2 years. . The study findings agree with (KDHS, 2014) which reported Under-five mortality is highest among neonates whose previous birth interval is less than two years, at 83 deaths per 1,000 live births.

Short birth interval was found to be significantly associated with lower five minutes Apgar score in that study (Gordon *et al.,* 2003). This may be due to the fact that the fetus may not be having good reserves due to depletion of maternal nutritional reserves and therefore easily became asphyxiated with rigours of labour. The study findings is supported which is by (Geidam *et al.*, 2015) who noted that short birth interval was significantly associated with birth asphyxia, though in this study low Apgar score was not significant risk factor but it reflects the same outcome Longer birth interval, greater than 60 months is also associated with adverse perinatal outcome.

The study findings agree with (Norton, 2005). This might be because pregnancies helps mothers gain growth supporting capacities, such as increase, uterine blood and other physiological and anatomical adaptations of the reproductive system. After delivery these capacities may gradually decline and with prolonged birth interval women physiological characteristics may be similar to those of Primigravida with risk of caesarean section on contrary History of abortion, conditions in pregnancy, medications and place of delivery are risk factors to birth asphyxia but in this study it was not significant this could be because of missing data on documentation.

5.4 Intrapartum Risk Factors Associated with Birth Asphyxia

Regarding mode of delivery (OR 5.8 CI 2.7167-12.3998, p value <.0001) The study findings indicate that most of the deliveries were delivered by normal vaginal delivery, this findings are similar with that of two studies conducted in Pakistan, 2012 on same issue and (Bibi, 2012).In this case the study did not look at the relationships between several modes of delivery which would in one way compromise the outcome of the results.

Labour duration was another important risk factor of asphyxia. Studied by (Ugwu 2012), indicated that prolonged labour was the commonest cause of asphyxia. The study concurred with studies done by (Shireeni *et al*., 2009) which reported that the major cause of asphyxia Neonatorum is prolonged labour. Those mothers who had labour duration more than 12 hours, were about three times more likely have neonates suffering from birth asphyxia than those mothers who have less than 12 hours. Prolonged labour is active labour with regular uterine contractions and progressive cervical dilatation, it lasts for more than 12 hours in both multiparas and primigravidas labour. when labour goes beyond 12 hours it predisposes a woman to a lot of distress which brings about compromised oxygen supply to the fetus hence birth asphyxia. First stage management should be well managed using partograph so that early deviation are detected hence reducing chances of birth asphyxia.

Deliveries of mother's that were induced using Syntonicon were about seven times more likely to develop asphyxia than those that were not induced (OR 6.78 CI 95% 2.57-17.9, p <0.0001). This study finding is supported by (Tabassum *et al.,*2014) which reported Delivery augmented with medicine significantly predict increased chances of birth asphyxia mortality As indicated from the study findings, This was supported too by a key informant who said that;

> *asphxia can be caused by irregular regulation of a drops of syntocinon by the midwife or accidentally running fast which will causes strong uterine contractions compromising the fetal status, this may lead to severe asphyxia and poor partograph documentation because it is difficult to diagnose deviations on time. (*Person 4**)**

Same information was reported by a nurse who was working in the newborn unit who mention induction with syntocinon being very key cause of birth asphyxia. Induction by syntocinon is a vasopressin in structure, and therefore has an antidiuretic effect when given in high dosages thus, water intoxication is a possibility in prolonged inductions. Uterine hyper stimulation and uterine rupture can also occur. prolong use or mismanagement during first stage brings about uteroplacental insufficiency and fetal hypoxia hence birth asphyxia.

5.5 Fetal Characteristics Associated with Birth Asphyxia

Babies born with a birth weight of 1500-2500g were 3 times more likely to develop birth asphyxia than those with a higher weight of 2600-to >3500g (OR 2.10 CI 95% 1.21-3.65, p = 0.0073) this results are is supported with studies done by (Aslam *et al.,* 2014, lee *et al., 2014 &* Tabassum *et al.,2014)*, who reported that small size at birth was associated with increase in birth asphxia mortality. In low birth weight neonates posses same characteristics like the premature counterparts who are more prone to a lot of problems experienced by premature babies. Third world countries lack good equipment for managing the mother before, during and after delivery this leads to lack of sufficient care given to these neonates hence suffer a lot of asphyxia after birth. a key informant reported a differently from this finding and said: -

> "*most infants born with asphyxia are in most cases caused by delayed second stage of labour, difficult delivery and use of syntocinon in labour you will find infants very sphyxiated" .(*Person 8)

The study findings is supported with studies done by (Pitsawong, & Panichkul, 2012), who reported that this could be the fact that mothers of low birth weight babies often

related to complications such as maternal hypertension and diabetes that present pre-conception or antepartum and not diagnosed, (WHO,2017).

However, in this study conditions during pregnancy were not significantly associated with birth asphyxia but in most cases women who get sick during antenatal period were likely to develop such complications especially if antenatal profile was missed or done during the last trimester without interventions.

However, studies done by (Tabassum *et al.,* 2014) contradicts with the above findings. He reported that small size at birth was associated with increased risk of birth asphyxia mortality (OR 2.5, 95% CI: 1.5 - 4.1) whereas being large at birth had twice more risk of mortality due to birth asphyxia (OR 4.1, 95% CI: 2.0 - 8.3). though in his findings he did not mention the weight, however, this findings could be true because being born large could be associated with other complications like neonates born of diabetic mothers who are large hence causes cephalo pelvic disproportion of whom will have difficult second stage.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Overview

This chapter present the summary of the study, conclusion which has been made from the findings, discussions and subsequent recommendations made based on conclusion. The purpose of this study was to establish perinatal factors associated with birth asphyxia.

6.2 Conclusion

This study identified age of the mother, Non or Low education level and Parity as demographic characteristics. Birth interval, gestation and parity were key leading among antepartum factors, mode of delivery, induction with syntocinon and duration of labour contributed due to intrapartum factors and birth weight of less than 2500g respectively as fetal characteristics.

6.3 Recommendations

Several recommendations have been drawn from the study conclusions and study objectives

- More attention of young mothers in terms of counselling if the they are risk group individualized health message for all women with low education level
- More attention to women with short birth intervals through health educations.
- The hospital to identify areas that needs attentions on caring of clients during intraparum period.
- More attention given to Low birth weights neonates at birth through providing good environment for delivery.

- Further study using large sample size in different settings to demonstrate the true associations in the population so that the findings can be generalized.

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APPENDICES

APPENDIX I: TRANSCRIPTION FORM

STUDY TOPIC: PERINATAL FACTORS ASSOCIATED WITH BIRTH ASPHYXIA AMONG NEONATES AT COUNTY AND REFFERAL HOSPITAL KAKAMEGA, KENYA

TRANSCRIPTION FORM NO _____

A. SOCIAL DEMOGRAPHIC CHARACTERISTICS ASSOCIATED WITH BIRTH ASPHYXIA

Serial Number	**Client identity**	**Name (initials)**	**Age**	**Marital status** 1=married 2=single 3=widowed 4=separated	**Parity** 1= para 1 2=para 2 3= para 3 4= more than 3	**Education level** 1=literate 2=illiterate	**Spouse education level** 1=literate 2=illiterate	**Employment Status** 1=Employed 2=unemployed	**occupation**	**Clinic attendance** 1=0nce 2=twice 3=thrice 4=four		**Place for clinic attendance** 1=public 2=private 3=faith based	**illness** 1=TB 2=Asthma 3=Anaemia 4=others specify

B. ANTEPARTUM FACTORS ASSOCIATED WITH BIRTH ASPHYXIA

Serial number	**Client identity**	**Name (Initials)**	**Mothers birth history** 1=still birth 2=child death 3=live baby	**Abortion history** 1=once 2=twice 3=more than 3 4= none	**Birth interval** 1=1 year 2=2years 3=more than 2 years	**Conditions in pregnancy** 1=Hypertention 2=Diabetes 3=Anaemia 4=preeclampsia 5=APH 6= UTI 7= HIV 8= others specify	**Medications in pregnancy** 1=Glucocorticoids 2=Diuretics 3=Antimalarials 4=Antihypertensive 5=Anti diabetes 6=others specify	**Gestation at first clinic attendance** 1=below 16 weeks 2=16-28 weeks =28-32 weeks 4=32-40 weeks 5=None	

APPENDIX II: TRANSCRIPTION FORM

Serial number	**Client identity**	**Client name (initials)**	**Duration of labour** 1=12 hrs 2= more than 12 hrs	**Presentation of fetus** 1= cephalic 2=breech	**Mode of delivery** **1**=normal vaginal 2=elective c/s 3=emergency c/s 4=Assisted vaginal delivery	**Outcomeof delivery** 1=single 2=multiple	**Type of assisted delivery** 1=ventous delivery 2= forceps delivery	**Prolong labor** 1=1 hr 2=hrs 3= more than 3 hours	**Referral** 1=yes 2=no	**Reffering facility** 1= public 2=private 3= FBO	**Duration for refferal** 1=30mins 2=1hr 3=more than 2hrs	**Conditions during labour** **1**= cord prolapse 2=CPD 3=PROM 4=Fetal distress 5=others	**Sedative/analgesia** **1=pethidine 2=morphin 3=others**	**Induction** **1=syntocinon 2=prostaglandin E** **3. others specify**

C.INTRAPARTUM FACTORS ASSOCIATED WITH BIRTH ASPHYXIA

Serial number	**Client identification**	**Client name (initials)**	**Sex** 1=male 2=female	**Condition diagnosed in pregnancy** 1=multiplepregnancy 2= polyhydramnious 3. meconeum stain liqour 4= IUGR	**Apgar score in** 1min= 5min= 10min **=**	**Resuscitation** 1=yes 2=no	**Method of resuscitation** 1=sunctioning 2=bag n mask 3=CPAP 4=medications 5=vascular resuscitation	**Age at birth** 1=term 2=preterm 3=postterm	**Cry at birth 1**=yes 2=No	**Birth weight** 1=1500-2500gms 2=2600-3500gms 3=above 3500gms	**Discharge** 1=2days 2=4days 3=6days 4=more than6 days	**Conditio non discharge** 1= Alive 2=dead

APPENDIX III: PARTICIPANT INFORMED CONSENT FORM

TITLE: Determining Perinatal risk factors associated with birth asphyxia at the county and referral hospital Kakamega, Kenya

Introduction

I am a postgraduate student at Masinde Muliro University of Science and Technology school of Nursing and Midwifery pursuing a master's degree, undertaking the study on determining perinatal risk factors associated with birth asphyxia

Objectives of the study

The main objective of the study is to determine Perinatal factors associated with birth asphyxia at the county and referral hospital Kakamega, Kenya

Benefits

The benefits of the study are that the results may be used by the hospital and ministry of health to come up with ways to identify areas with gaps and will need urgent attention in perinatal factors associated with birth asphyxia.

Risks

There is no direct or indirect risk for being included in the study

Procedure

The procedure involves identification of subjects delivered and developed birth asphyxia after delivery and selecting them randomly. All subjects have an equal chance of being selected. Data will then be collected using checklist that will be filled by the researcher, group discussions done and information from key informant sort. Information collected will not bear subjects names but instead it will be coded.

Kindly you are free to ask questions concerning the subject. You may conduct the following in case of a concern;

Erick Kiptui Kibai

Principal Researcher

Masinde Muliro University of science and technology School of Nursing and Midwifery

Phone: 0723893438

Email: erickkibai@yahoo.com

APPENDIX IV: KEY INFOMANT INTERVIEW

My name is Erick Kiptui Kibai. I am a postgraduate student attending Muliro University of science and Technology school of Nursing and midwifery pursuing a master's degree, undertaking the study on determining perinatal risk factors associated with birth asphxia. The specific objectives of the study are to determine the social demographic, intrapartum, maternal and fetal factors associated with birth asphxia The benefits of the study are that the results may be used by the hospital and ministry of health to come up with ways to improve the management of mothers antenatal, intrapartum, and managing neonates after delivery to improve their outcomes

I would like to ask you a few questions about your experiences in this intervention factors associated with asphyxia. I believe there is no right or wrong answer, the answers you give here will be confidential and whatever you say will not be linked or associated with you. In addition, only the people participating on this study will have access to the information from this discussion.

Type of health worker:

Nurse

Doctor

Initials: _____ Date: _____

1. Social demographic factors associated with birth asphyxia?

    Identify the mothers who are predisposed to deliver neonates that suffer birth asphyxia_____

    _____

    _____

    explain_____

    _____

    _____

a. Which mode of delivery is most common with birth asphyxia and why?

b. In terms of number of deliveries who are more likely to deliver neonates prone to asphyxia _____

c. explain_____
_____
_____

2. Antepartum factors associated with birth asphyxia?

a. explain how child spacing is related to birth asphxia _____

b. How is gestation related to birth asphyxia _____

3. Intrapartum risk factors associated with birth asphyxia?

List situations that put neonates at risk of asphyxia during labour and explain why

_____
_____
_____

4. Fetal risk factors associated with birth asphyxia?

Explain the fetal factors that could predispose a neonate to birth asphyxia and explain why_____
_____
_____

KEY IN FORMANT INFORMATION

SERIAL No:	CADRE	SEX	AGE	COMMENTS
1	Nurse	F	34	
2	**Midwife**	**F**	**42**	
3	Midwife	M	40	
4	**Nurse**	**F**	**36**	
5	Medical officer	M	44	
6	Midwife	M	46	
7	Nurse	F	38	
8	**Paediatrician**	**M**	**48**	

APPENDIX V: ETHICAL APPROVAL TO CONDUCT RESEARCH

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

Tel: 056-31375
Fax: 056-30153
E-mail: rel@mmust.ac.ke
Website: www.mmust.ac.ke

P. O. Box 190
Kakamega
50100
Kenya

Institutional Ethics Review Committee (IERC)

MMU/COR: 403009(33) — 7th April, 2016

Erick Kiptui Kibai
Registration No. HNR/G/02/14
Masinde Muliro University of Science and Technology
P. O. Box 190-50100
KAKAMEGA

Dear Kiptui,

RE: ETHICAL APPROVAL TO CONDUCT RESEARCH

The IERC received your proposal titled *"Determinants of Perinatial Factors Associated with Birth Asphyxia among Term Neonates in Maternity Ward Kakamega County Referral Hospital, Kenya"* for review. Having reviewed your work, the committee has given ethical clearance for you to conduct research as proposed.

On behalf of IERC and the University Senate, my congratulations. We wish you success in your research endeavour.

Yours faithfully

Dr. Gordon Nguka
Ag. Chairman, Institutional Ethics Review Committee

Copy to:

- The Secretary, National Bio-Ethics Committee
- Vice Chancellor
- DVC (PR&I)
- DVC (A & F)
- DVC (A&SA)

APPENDIX VI: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MR. ERICK KIPTUI KIBAI
of MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY, 190-50100 Kakamega,has been permitted to conduct research in *Kakamega County*

on the topic: *PERINATAL FACTORS ASSOCIATED WITH BIRTH ASPHYXIA AMONG TERM NEONATES IN MATERNITY WARD KAKAMEGA COUNTY AND REFERRAL HOSPITAL -KENYA*

for the period ending:
9th June,2017

.....
Applicant's Signature

Permit No : NACOSTI/P/16/00953/11540
Date Of Issue : 9th June,2016
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

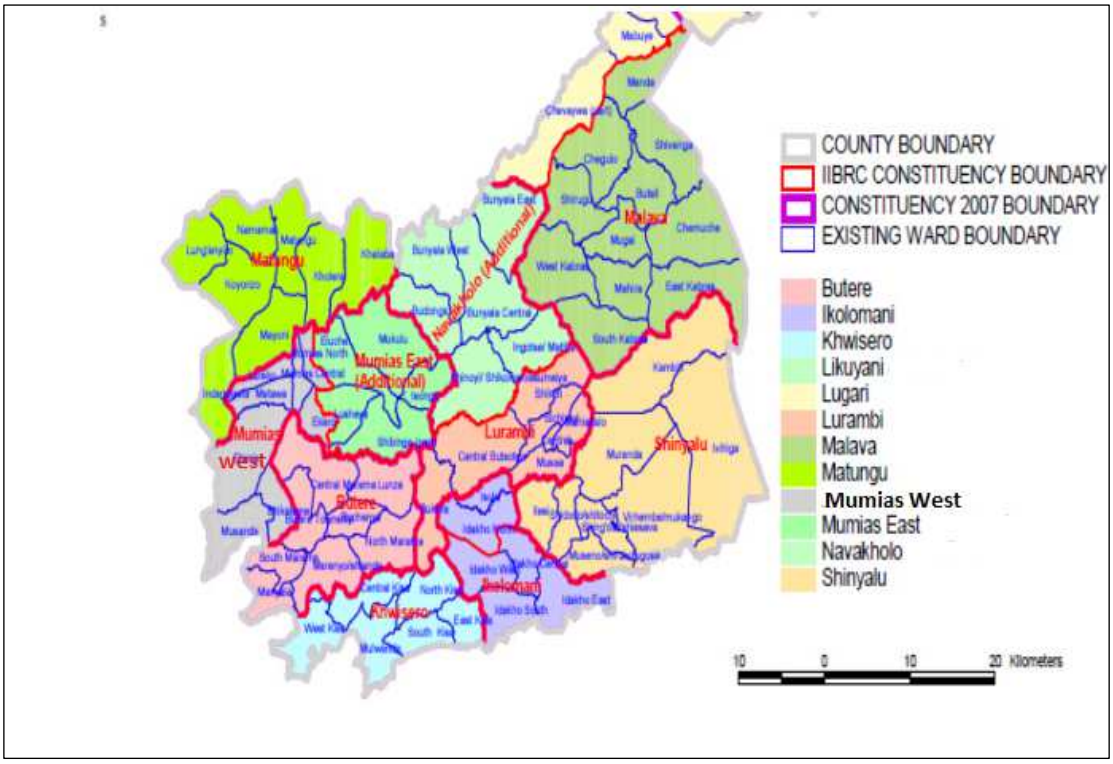
National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 9453

CONDITIONS: see back page

APPENDIX VII: MAP OF KAKAMEGA COUNTY WITH TWELVE SUB COUNTIES



Adapted from county government of Kakamega profile