CORRELATION OF MATERNAL CHARACTERISTICS AND BIRTH ASPHYXIA AT KENYATTA NATIONAL HOSPITAL AND PUMWANI MATERNITY HOSPITAL IN KENYA

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DECLARATION

I declare that this is my original work and has not, to the best of my knowledge, been presented anywhere else.

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CERTIFICATE OF APPROVAL

We certify that this thesis has not been submitted with our approval as the University supervisors

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DEDICATION

To my family, my loving parents Michael and Alice, my husband Simba and my son Ogamba for their support and love.

To my late grandparents Nashon Kemoni, Nathan Matundura and Maria Rosa Nyanchoka for their love, guidance and support

To all mothers and their families affected by birth asphyxia.

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To God almighty whose faithfulness is new every day

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To my dear husband; Simba and our son Ogamba for their love, support and understanding throughout my study period.

ABBREVIATIONS:

ANC	Antenatal care
Dr	Doctor
E.G	For example
HIE	Hypoxic- ischemic encephalopathy
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
KMs	Squire Kilometers
KNH	Kenyatta National Hospital
MDG	Millennium Development Goal
NBU	New Born Unit
PROM	Pre-labour ruptures of membranes
SD	Standard deviation
SDG	Sustainable Development Goal
SPSS	Statistical Package for Social Sciences
UON	University of Nairobi
USA	United States of America
WHO	World Health Organization

DEFINITION OF TERMS

Apgar score: It is a method for reporting the status of the newborn infant immediately after birth and the response to resuscitation if needed;

Cerebral ischemia: Diminished amount of blood perfusing the brain

Correlation: Factors that have a relationship

Fetal distress: Diagnosis made on basis of abnormal fetal heart rate (bradycardia of less than 100 beats per minute).

Grand multi-parity: Delivered more than four times

Hypoxemia: Diminished amount of oxygen in the blood supply

Low birth weight: Less than 2,500 kilograms

Maternal characteristics: Pre-pregnancy conditions, pregnancy related conditions, maternal decision making and labour characteristics.

Mild Asphyxia: An Apgar score of 4-7 at 5 min

Neonatal Death: Death during the first 28 days of life (0-27 days)

Neonatal encephalopathy: A clinically defined syndrome of disturbed neurological function in the earliest days of life in the infant, manifested by difficulty with initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness, and often by seizures

Newborn: A baby during the first month of life

Preterm: Less than 37 completed weeks of gestation

Prolonged labour: a) First stage of labour: Primigravidas or multigravidas > 12 hours of active phase

b) Second stage of labour: > 1 hour regardless of parity.

Severe Asphyxia: An Apgar score < 4 at 5 min

Term: 37 completed weeks of gestation

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ABSTRACT

Background: Birth asphyxia is a serious condition in the neonate worldwide. It is the second leading cause of neonatal mortality at 24% in the world. It is caused by events that have roots in the ante partum, intrapartum or post-partum periods and it accounts for an estimated 900,000 deaths each year. It therefore remains a severe condition leading to significant mortality and morbidity.

Objective: To identify the maternal risk factors associated with birth asphyxia.

Methods: A cross-sectional study was conducted at Kenyatta National Hospital and Pumwani Maternity hospital among 209 mothers with babies who had birth asphyxia. Purposive sampling was done and an interviewer guided questionnaire was administered. Statistical package for social sciences (SPSS) version 23 was used to analyze the data.

Results: A total of 209 mothers were interviewed, majority 57 % (n=121) had a medical condition in pregnancy while the rest 42.1% didn't have any medical condition (n=88) [x^2=6.71; df =1; p value=0.010]. Anemia was the leading cause of birth asphyxia 33.1% (n=40), prolonged labour 24.0 % (n=29), elevated blood pressure (14.9%), urinary tract infection 11.6% (n=14), bleeding (5%), HIV 4.1% (n=5). Meconium stained liquor was the most observed 66% (n=138), blood stained liquor 6.2 % (n=14). It was a significant risk factor for grade 1 asphyxia (16.2%) [x^2 value =31.90; p value=0.000].There was statistical significance between birth weight and asphyxia where underweight was significantly more among grade 1asphyxia (43.2%) than those with grade 2 or grade 3 asphyxia (20.0%) [x^2value=12.75; p value =0.002], the age group most affected was the age of 20 to 30 years old at 63.6% (n=133. Participants <20 years were 11.0% (n=23), 20-30 years 63% (n=133) and 31-42 years 25.4% (n=53). Number of babies delivered was significant [x^2 value= 6.93; df=1 p value= 0.048] and mode of delivery was also significant (p value= 0.023).

Conclusion: Anemia in pregnancy, prolonged labour, elevated blood pressure in pregnancy, urinary tract infections, chorioamnionitis, HIV and antepartum hemorrhage in pregnancy were the maternal medical conditions associated with a higher incidence of birth asphyxia. Secondary school education level and below, primiparity, delay in seeking healthcare services more than six hours and meconium stained liquor were other maternal risk factors for birth asphyxia. Neonates of male gender and birth weight above 3kgs were the fetal risk factors for birth asphyxia. This was additional information that was observed as the research was being carried out.

Recommendations: Identification of mothers who are at risk in early pregnancy, with improved ante partum, intrapartum and post-partum health services may reduce the incidence and neonatal mortality and morbidity caused by birth asphyxia. Judicious use of the partograph is encouraged. Introduction of sexual and reproductive health education at primary school level curricula will help in reducing birth asphyxia in the long-term.

CHAPTER ONE: INTRODUCTION

1.1 Background information

Birth asphyxia is defined by WHO as failing to initiate and sustain breathing at birth (Olga Edrich, 2017). Birth asphyxia is also defined as an intrapartum hypoxic-ischemic event that is sufficient enough to produce moderate to severe neonatal encephalopathy which subsequently leads to cerebral palsy and organ failure (Antonucci, Porcella and Pilloni, 2014).Birth asphyxia is a condition of impaired gaseous exchange in an individual which leads to progressive, hypercapnea and acidosis depending on the duration of this interruption (Matthew A. Rainaldi, 2016). According to the world health statistics globally, an estimated 5.9 million children under 5 years of age died in 2015, with a global under-five mortality rate of 42.5 per 1000 live births. Of those deaths, 45% were newborns, with a neonatal mortality rate of 19 per 1000 live births resulting in 2.7 million neonatal deaths in 2015.

Levels of child mortality are highest in sub-Saharan Africa, where 1 child in 12 dies before their fifth birthday, followed by South Asia where 1 in 19 dies before age five. The major causes of neonatal mortality in 2015 were prematurity (35%), birth-related complications (birth asphyxia) at 24% and neonatal sepsis at15% (WHO, 2016). In addition, incidences of birth asphyxia have been associated with Hypoxic ischaemic encephalopathy, seizures, epilepsy , cerebral palsy, cognitive impairment and chronic illnesses which are long term complications of birth asphyxia and they develop later in life(Repository, 2013). A study that was done in Karachi, Pakistan found out that, birth asphyxia was caused by events that have roots in antepartum, intrapartum or post-partum periods (Aslam *et al.*, 2014). While in developed countries antepartum causes account for a larger proportion of perinatal asphyxia. According to previous

studies almost all (99%) neonatal deaths, have been found to occur in Developing Countries, highest death rates in sub-Saharan Africa and South Central Asian Countries(WHO, 2010).

Due to limited unavailability of data, figures are likely to be underestimated on the real proportion of mortality and morbidity due to birth asphyxia. Majority of the world's neonatal deaths occur in the community settings where proportions of deliveries are conducted by unskilled birth attendants, than in hospital settings (Kuria, 2014). In Kenya, the neonatal mortality rate in 2015 was 22.2 per 1000 live births (WHO, 2016 report). Therefore, unless there is a reduction in neonatal mortality rates it will be impossible to achieve the Sustainable Development Goal (SDG 3) which says by 2030 we should end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births. However, if progress towards SDG 3 is to be accelerated then an urgent attention is required to reduce this deaths. Therefore, improving Women's health especially at child birth is a major determinant and prevention of early neonatal complications at birth (Joy *et al,* 2011). This study was carried out to establish factors that influence the occurrence of birth asphyxia and find out the association between birth asphyxia and maternal characteristics in Kenyatta National Hospital (KNH) and Pumwani Maternity Hospital, Kenya.

1.1 Definition and Diagnosis of Birth Asphyxia

Defining birth asphyxia is a challenge and cause difficulties in correcting accurate epidemiological data (Dilenge, 2001). Perinatal asphyxia may occur in utero, during labor and delivery, or in the neonatal period secondary to cardiovascular or

pulmonary disease (Renato, 2001). Asphyxia has been defined as a marked impairment of exchange of respiratory gases (oxygen and carbondioxide) leading, if prolonged, to progressive hypoxemia, hypercapnia, and significant metabolic acidosis (The American college of Obstetricians and Gynecologists, 2014). Asphyxia may also be defined as, impairment in gas exchange that results in both a deficit of oxygen and an excess of carbon dioxide in the blood, with ischemia to vital organs (Blackburn, 1998). There are many reasons for asphyxia in-utero, intrapartum, or immediately after birth (Majeed *et al,* 2007). Maternal medical conditions can cause hypoxemia; for example placental diseases and complications may prevent oxygen from circulating to the fetus or the baby may be unable to take the first breath. A mother may have medical conditions that can lower her oxygen levels; there may be a problem with the placenta that prevents enough oxygen from circulating to the fetus; or the baby may be unable to breath after delivery (Rehana *et al,* 2007). Apgar score was proposed by obstetric anesthesiologist, Dr Virginia Apgar in 1952 as an objective tool to measure five signs of physiological adaptation (Haider *et al*, 2006). Apgar score aim was to develop a scoring system to assess the clinical status of a neonate. It is done at 1 and 5 minutes after birth and in some cases the test may be done 10 minutes after birth.

1.2 Problem Statement

Several studies related to Birth Asphyxia have been carried out. However, limited attempts have been made to establish the association between maternal characteristics and birth asphyxia in Kenyan local health facilities. Since KNH is a referral facility for the whole country and Pumwani being the largest maternity hospital in the country and Sub-Saharan Africa, an increased number of Birth Asphyxia and high rate of

neonatal mortality is recorded. In the year 2015,784 newborns admitted in the newborn unit (NBU) at KNH had birth asphyxia and 332 of them died. In the year 2016, the number of asphyxiated newborns admitted in NBU in the same facility increased to 825 and out of this number 367 of them died.

1.3 Rationale/Justification of the study

Birth Asphyxia accounts for a large proportion of neonatal deaths in Africa and globally. While we neglect this challenge, 24% of neonatal deaths are reported to be caused by birth asphyxia. According to the World bank collection of development indicators in 2015 ,neonatal mortality rate was 22.2 per 1000 live births (World Bank, 2015). Several studies related to Birth Asphyxia have been carried out. However, limited attempts have been made to establish the association between maternal characteristics and birth asphyxia in Kenyan local health facilities. Therefore, this study topic was purposively chosen to establish Information on birth asphyxia and maternal factors that influence occurrence of birth asphyxia in KNH Teaching and Referral Hospital and Pumwani Maternity hospital. The data obtained will be used by clinicians to identify and prevent birth asphyxia and thereby contribute to the reduction of perinatal mortality and morbidity in the short term physical and mental disability in the long term.

1.4 Research Questions

I. What pre-pregnancy maternal medical and obstetric conditions are associated with birth asphyxia?

II. What is the relationship between maternal delay in seeking healthcare services and birth asphyxia?

III. What is the relationship between prolonged labour and birth asphyxia?

1.5 Broad Objective

To establish maternal factors associated with occurrence of birth asphyxia.

1.6 Specific Objectives

I. To describe pre-pregnancy maternal medical and obstetric conditions associated with birth asphyxia

II. To determine the association between maternal delay in seeking healthcare services and birth asphyxia

III. To establish the association between prolonged labour with birth asphyxia.

1.7 Theoritical Framework

Sister Callista Roy Adaptation Model (Alligood, 2014)

This study was based on Sister Callista Roy adaptation model and in particular the physiological-physical mode of adaptation in an attempt to explain the maternal factors that may contribute to birth asphyxia. Sister Callista Roy described a human being as a component made of two coping subsystems; the cognator subsystem and the regulator subsystem. In addition she also described four adaptive modes; the physiological mode, self-concept mode, role function mode and the interdependence mode. Further she went ahead and described the levels of adaptation as integrated process, compensatory process and compromised process.

The **Cognator subsystem** talked about a major coping process involving four cognitive-emotive channels: perceptual and information processing, learning, judgment, and emotion.

She described the **regulator subsystem** as a basic type of adaptive process that responds automatically through neural, chemical, and endocrine coping channels. Further she explained that the regulator subsystem is influenced by different types of stimuli;

Focal stimuli: Those stimuli that are the proximate causes of the situation for example hypoxia in birth asphyxia.

Contextual stimuli: All other stimuli in the internal or external environment, which may or may not affect the situation. The external environment may include the maternal factors which may influence the occurrence of birth asphyxia.

Residual stimuli: These are the immeasurable and unknowable stimuli that also exist and may affect the situation.

The four adaptive Modes

Roy described the major role of a nurse (midwife) was to promote adaptation in each of the four modes. The modes include physiological-physical mode, Self-concept mode, Role function mode and interdependence mode. Among the four adaptive modes, the physiological-physical mode is the most relevant to birth asphyxia and it explains the physical and chemical processes involved in the function and activities of living organisms; the underlying need is physiologic integrity as seen in the degree of wholeness achieved through adaptation to changes in needs. In groups, this is the manner in which human systems manifest adaptation relative to basic operating

resources. The basic need of this mode is composed of the needs associated with oxygenation, nutrition, elimination, activity and rest, and protection. The complex processes of this mode are associated with the senses, fluid and electrolytes, neurologic function, and endocrine function.

The levels of adaptation

The compromised process explained that the modes and subsystems are not adequately meeting the environmental challenge (e.g. Hypoxia in birth asphyxia may lead to hypoxic ischemic encephalopathy and organ damage. The study therefore attempts to find out the maternal factors which are described in the contextual stimuli as the external factors that may influence the physiological adaptation of the newborn leading to birth asphyxia.

1.7. Conceptual Framework

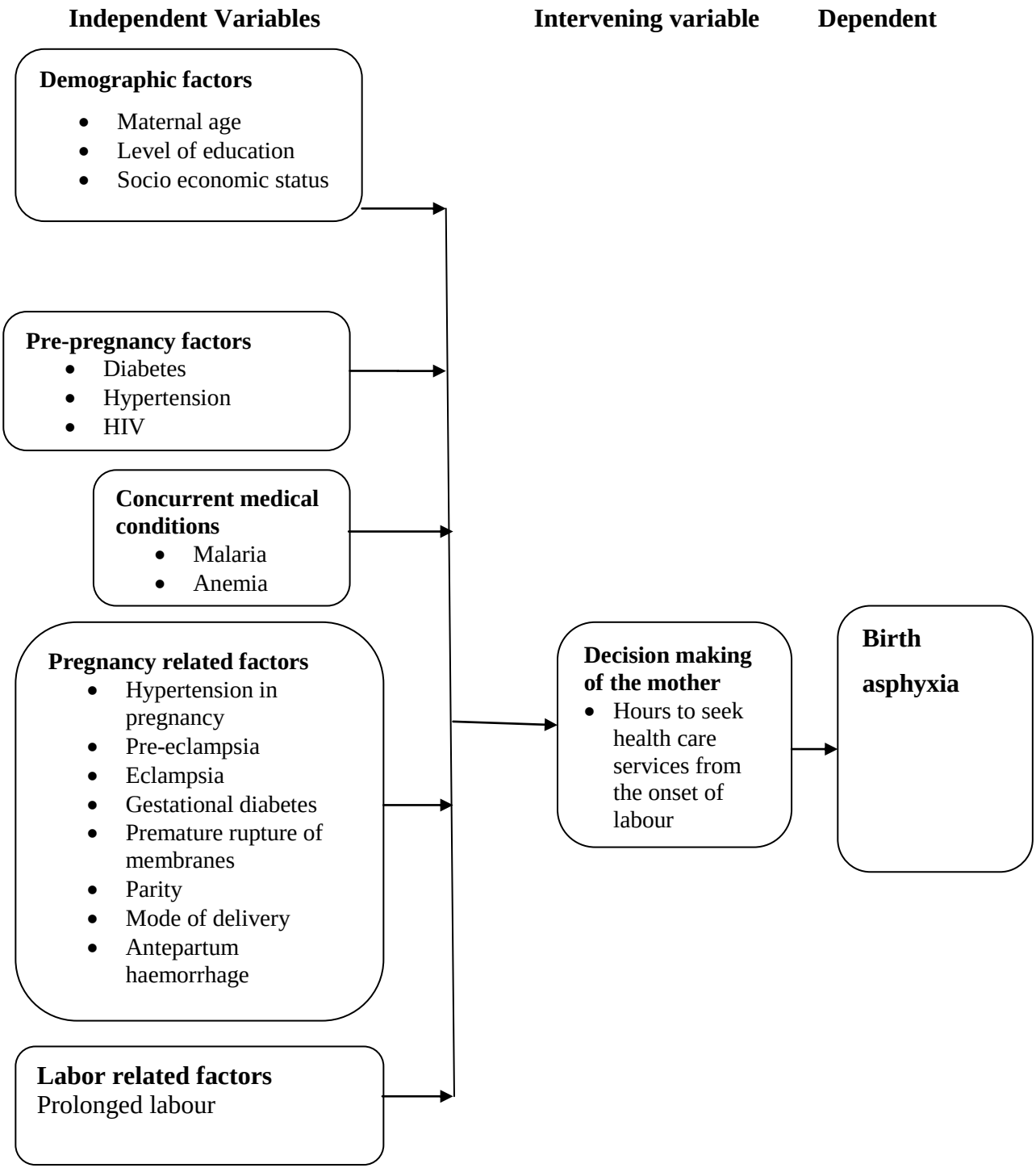

Figure 1 Conceptual framework

A flow diagram maternal factors that can relate to birth asphyxia

(Researcher designed (2017)

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Birth asphyxia refers to an impairment of the normal exchange of respiratory gases during parturition, and the ensuing adverse effects on the fetus. It is an important cause of fresh stillbirth and early neonatal death in Kenya. In a study done in rural areas of Malawi, Bangladesh, Nepal, rural and urban India using verbal autopsy (VA) data; prematurity, birth asphyxia and infections accounted for most neonatal deaths, but important sub-national and regional differences were observed. More than one-third of deaths in urban India were attributed to asphyxia, making it the leading cause of death in this setting .(Edward Fottrell, 2015).

2.1Literature on pre-pregnancy medical and obstetric conditions associated with birth asphyxia

In 2012, a study that was done in Pakistan among 240 neonates on fetal factors associated with birth asphyxia , it showed that the antenatal factors were maternal mean age of 24.22 years, with a maternal age distribution between 20-25 years, primigravity, pre-eclampsia and maternal fever contributed to birth asphyxia (Aslam *et al.*, 2014).In another study that was conducted in Cameroon; single matrimonial status, malaria preeclampsia, prolonged labour, arrest of labour, prolonged rupture of membranes and breech presentation were the significant factors for birth asphyxia (Chiabi *et al*, 2013). A study carried out in India between 2014- 2016 found out that antepartum hemorrhage, anemia in pregnancy, diabetes mellitus, multiple pregnancy, meconium particulates and mode of delivery were maternal risk factors for birth asphyxia (Murali and Padarthi, 2016). According to the national guidelines on quality

of obstetrics and neonatal care in Kenya, birth asphyxia accounts for 29% of neonatal mortality ((Kenya health situation and trends, 2010).

Another study done on perinatal asphyxia in the term newborn showed that preconception risk factors for asphyxia were maternal age ≥ 35 years, social factors, family history of seizures or neurologic disease, infertility treatment and previous neonatal death. Antepartum risk factors include maternal prothrombotic disorders and proinflammatory states, maternal thyroid disease, severe preeclampsia, multiple gestation, trauma and antepartum hemorrhage. Numerous intrapartum risk factors for asphyxia were recognized, including chorioamnionitis/maternal fever, uterine rupture and maternal cardiac arrest.(Announce *et al*, 2014). In a study carried out in Gusau in Nigeria on prevalence and risk factors for perinatal asphyxia a majority of the mothers were primiparous, they had not received antenatal care and they also had prolonged and obstructed labour (Ilah et al, 2015).

A study carried out in Naivasha district hospital; Kenya in 2012 on prevalence of asphyxia, readiness for neonatal resuscitation and associated factors showed that maternal oedema in pre-eclampsia contributed to birth asphyxia as a birth outcome(Gichongo, 2014). In 2010 a study on short term outcomes of term neonates admitted with perinatal asphyxia at KNH newborn unit showed that there was increased increase of severe outcome if the mother was unemployed, had an educational level below secondary school level, had less than two antenatal clinic visits, had prolonged labor and if she had delivered outside KNH (Maalim,2011).

In Naivasha, another study on perinatal morbidity and mortality showed that early neonatal mortality was associated with increasing maternal age, previous history of perinatal mortality, rupture of membranes longer than 12 hours and labor duration longer than 12 hours (Manyasi, 2014). Another study that was done in India on antenatal and intrapartum risk factors for perinatal asphyxia, maternal anemia, instrumental delivery, inadequate antenatal care and meconium stained amniotic fluid were the main factors associated with perinatal asphyxia. (Gane *et al*, 2013). A study on the relationship between severe anemia and neonatal outcome in India showed that severe anemia caused low Apgar score of 1 to 5 **(**Sangeeta and Pushpalatha, 2014). Similarly, another study that was done in Indonesia on maternal anemia of a term pregnancy and neonatal asphyxia showed that a mother who had anemia was at risk of having a baby with birth asphyxia (Kuala, 2013).

2.2Literature on delay in seeking health care services and birth asphyxia

Delay in seeking health care services can be due to socio-cultural barriers, failure to recognize danger signs, failure to perceive severity of the illness and cost consideration. Delay in seeking health care services has been shown to be a risk factor for birth asphyxia. In a study that was conducted in India on the causes of under-fives mortality, delay in seeking health care services from at home and on transit were associated with under five mortality. (Deshmukh *et al,*2016). Another study done by WHO on policy and practice in relation to global health emergency, delay in deciding to seek healthcare services and delay in Identification and transport to a medical facility. (Calvello *el al,* 2015).In India, a study done on social factors responsible for neonatal mortality showed that household and transport related delays were contributors to birth asphyxia and newborn mortality at large (Upadhyay *et al,*2013).

Similarly a prospective (Aslam *et al.,* 2014)e cohort study that was done in India on risk factors for perinatal mortality due to asphyxia among emergency obstetric referrals showed that delay in receiving appropriate intrapartum care can result in stillbirth or asphyxia (Rani & Chawla,2012).

2.3Literature on prolonged labour and birth asphyxia

Prolonged labour occurs when first and second stage of labour is more than 20 hours. (JUSTICE, 2006).The Kenyan national guidelines on obstetrics and neonatal care define prolonged labour as active labour that is more than 12 hours. According to a study that was done in Karachi, India on risk factors for birth asphyxia showed that prolonged labour is a significant risk factor for birth asphyxia(Aslam *et al.*, 2014).In another study that was done in Cameroon on risk factors for birth asphyxia, prolonged labour was significantly associated with birth asphyxia. (Chiabi *et al.*, 2013).In the year 2014,a study on perinatal factors for birth asphyxia was done in Pakistan and it showed that prolonged second stage of labour was significantly associated with birth asphyxia (Kiyani *el al,*2014).A retrospective cohort study that was done in 12 clinic centres in United states on maternal and neonatal outcomes with prolonged second stage of labour showed that asphyxia was one of the outcomes (Laughon *et al,* 2014)

Apgar score is an acronym for**: A**ppearance, **P**ulse, **G**rimace, **A**ctivity and **R**espiration.

Table 1 APGAR SCORING (Obstetrics by ten teachers, 2012).

Apgar sign	2	1	0
Appearance (skin color)	Normal color all over(hands and feet are pink)	Normal color(but hands and feet are bluish)	Bluish-grey or pale all over
Pulse (heart rate)	Normal(above 100 beats per minute)	Below 100 beats per minute	Absent(no pulse)
Grimace (reflex irritability)	Pulls away, sneezes coughs ,or cries with stimulation	Facial movement only(grimace) with stimulation	Absent(no response to stimulation)
Activity (muscle tone)	Active spontaneous movement	Arms and legs flexed with little movement	No movement with ``floppy'' tone
Respiration (breathing rate and effort)	Normal rate and effort ,good cry	Slow or irregular breathing, weak cry	Absent(no breathing)

Any score lower than 7 is a sign that the baby needs medical attention. Apgar score is also called newborn scoring. However, there is weak relationship between low Apgar score and several indicators of perinatal asphyxia since Apgar score was not intended to measure perinatal asphyxia and the score alone should not be considered evidence

of or a consequence of substantial birth asphyxia (Haider & Bhutta, 2006). The use of umbilical cord blood gas analysis as the criterion for diagnosis of perinatal asphyxia is also not reliable. Some studies for example (King *et al,* 1998)) compared two groups of term or near-term newborns (acidemic newborns with pH less than or equal to 7.0 and controls with pH greater than or equal to 7.20), with 5th minute Apgar scores greater than or equal to 7.

There were no differences between the two groups as to the presence of clinical alterations in the neonatal period. Data from our services on the comparison of two groups of term newborns (one with umbilical cord blood pH less than 7.0, and the other with pH between greater than or equal to 7.0 and less than or equal to 7.20), showed that 16.7% and 53.8% of babies in the first and second groups, respectively, did not show any clinical alteration compatible with perinatal asphyxia in the neonatal period (King et al, 1998). Apgar score and umbilical cord blood gas analysis alone could not be used to define or diagnose birth asphyxia in isolation. Therefore America college of obstetricians and gynecologists together with America academy of pediatricians, use and abuse of the Apgar score (2001), define neonates as asphyxiated when umbilical cord arterial PH is less than 7, Apgar score of 0-3 for longer than 5 minutes, presence of neonatal neurological manifestations e.g. seizures, coma, or hypotonia and multisystem organ dysfunction.

World Health Organization in International Classification of Diseases (ICD)-10, uses the following conditions to describe severe birth asphyxia: Pulse less than 100 per minute at birth, falling or steady, absent or gasping respiration, Poor color, absent tone, and Apgar score 0-3 at 1 minute (Lincetto, 2007). This definition is appropriate

to screen and identify infants that need resuscitation and further care. However, Specificity and predictive value for death and neurological damage are limited and tend to over diagnose cases as opposed to definition, based on the observation of neonatal encephalopathy up to 8 times more (Lincetto, 2007).

2.2 Clinical Manifestation of Birth Asphyxia

Hypoxic-ischemic encephalopathy (HIE) is one of the most widely researched clinical manifestation of perinatal asphyxia. Clinical findings are nonspecific from other causes of brain injury and it is important to have access to antenatal history. In mild HIE, muscle tone may be increased slightly and deep tendon reflexes may be weak during the first few days. Transient behavioral abnormalities, for example poor feeding, irritability, excessive crying or sleepiness, may be observed (Zanelli *et al*, 2016).

By 3-4 days of life, the Central Nervous System (CNS) examination findings normalize. In severe HIE, the infant is lethargic, with significant hypotonia and diminished deep tendon reflexes. The grasping, Moro, and sucking reflexes may be sluggish or absent. The neonate may experience occasional periods of apnea. Seizures may occur within the first 24 hours of life (Zanelli *et al*, 2016). Full recovery within 1-2 weeks may occur and is associated with a better long-term outcome. An initial period of mild HIE may be followed by sudden deterioration, suggesting ongoing brain cell dysfunction, injury, and death; during this period, seizure intensity might increase. In severe HIE, stupor or coma is typical. The neonate may not respond to any physical stimulus, breathing may be irregular, and the infant often requires

ventilator support. Generalized hypotonia and depressed deep tendon reflexes are common (Zanelli *et al*, 2016).

Neonatal reflexes (e.g. sucking, swallowing, grasping, Moro) are absent in severe birth asphyxia. Disturbances of the eye movement may occur. Pupils may be dilated, fixed, or poorly reactive to light. Convulsions may occur early and often and may be initially resistant to conventional treatments. The seizures are usually generalized, and there may be increased frequency during the 24-48 hours after onset, correlating with the phase of reperfusion injury (Zanelli *et al*, 2016). As the injury progresses, seizures subside and the electroencephalogram becomes isoelectric or shows a burst suppression pattern. At that time, wakefulness may deteriorate further, and the fontanel may bulge, suggesting increasing cerebral edema. Irregularities of heart rate and blood pressure are common during the period of reperfusion injury, as is death from cardio respiratory failure (Rehana *et al*, 2007).

Sarnat and Sarnat (1976) have established several criteria for the classification of HIE as shown below:

Table 2 - Stages of hypoxic-ischemic encephalopathy (HIE)

Status	**Stage 1 (mild)**	**Stage 2 (moderate)**	**Stage 3 (severe)**
Level of consciousness	Hyper alert	Lethargic	Stuporose, comatose
Neuromuscular control	Over-sensitive to stimulation	Impairment of spontaneous movement	Impairment or Absence of spontaneous movement
Muscle tone	Normal	Mild hypotonia	Flaccid
Posture	Mild distal Flexion	Strong distal flexion	Intermittent deceleration.
Tendon reflexes	Overactive	Over reactive	Underactive or absent.
Myoclonia	Present	Present	Absent
Seizures	Absent	Frequent	Frequent
Complex	Normal	Suppressed	Absent
Reflexes Suction	Active or a little weak	Weak or absent Incomplete	Absent Absent
Moro reflexes	Over reactive	Strong	Weak or absent
Oculo-vestibular stimulation.	Normal	Strong Generalized.	Absent
Tonic neck reflexes.	Slight Generalized	Parasympathetic.	Bot system depressed.
Autonomic functions:	Sympathetic	Miotic, responsive	Average, slightly responsive
Pupils	Dilated responsive	Periodic	Anosocoria.
Breathing	Spontaneous, regular.	Bradycardia	Periodic, apnea
Heart rate	Normal or tachycardia	Increased	Variable, bradycardia
Airway secretions	Sparse	Profuse	Variable
Gastrointestinal motility.	Normal or decreased	voltage, periodic pattern(awake)2 to 14 days.	Periodic or isoelectric Hours up to some weeks
EEG	Normal< 24hrs	80% normal	50% of deaths
Duration of symptoms Follow up	100% normal	abnormal if symptoms persist for over 5 to 7 days	Then another 50% , severe sequelae

This scheme was later modified by Fenichel, who grouped the clinical features of what he termed HIE into three different patterns (mild, moderate and severe) as shown on table 2 below (Fenichel, 1983). The asphyxiated infant was not considered to progress through the grades but rather to exhibit the characteristic features and time course (of either deterioration or resolution) consistent with a particular grade. Whilst the Sarnat system continues to be used by investigators in specialized centers with neonatal EEG expertise, the Fenichel approach, or minor modifications thereof, has been widely adopted in clinical studies.

Table 3: Fenichel modifications of HIE (Adapted from (Fenichel, 1983)

Features	**Grade 1(mild)**	**Grade 2(moderate)**	**Grade 3(severe)**
Conscious level	Irritable/hyper alert	Lethargic	Comatose severely abnormal
Tone	either mildly abnormal	Moderately abnormal (hypotonic/dissociated)	(hypotonia) Absent
Suck	(hypo/hyper) abnormal or exaggerated	Poor	Absent
Primitive reflexes	Absent	Depressed or Present	Present
Seizures	Normal	Normal	Impaired
Brain stem reflexes Respiration	Tachypnea	Occasional apnea	Severe apnea

Adapted from (Fenichel, 1983), the features in bold are the main requirements for each grade. Features not in bold may be present but are essential for syndrome assignment. a/b: either abnormal tone or abnormal suck should accompany altered conscious level to assign grade 1.Several reasons may contribute to a baby not being able to take in oxygen before, during or just after birth. Insufficient antenatal care, inadequate nutrition, bleeding during pregnancy, and maternal toxemia has been shown to have a higher incidence of asphyxia (Majeed, *et al.* 2007).Another study done in Nepal, showed that factors such as increasing maternal age and decreasing maternal height, Primiparity, Inadequate antenatal care, multiple pregnancy and prolonged rupture of membrane were the risk factors for neonatal encephalopathy (Ellis et al,2000).

CHAPTER THREE: METHODOLOGY

3.1. Study design

This was a descriptive cross-sectional study done in a period of three months from 17th May 2017 to 1st August 2017 in Kenyatta National Hospital Teaching and Referral Hospital and Pumwani Maternity hospital newborn and maternity units.

3.2 Study area

The study was conducted at Kenyatta National Hospital Teaching and Referral Hospital newborn unit and Pumwani Maternity Hospital newborn unit. KNH is a regional and national referral hospital located in Nairobi County covering the whole country and part of (Kenya) and part of East Africa. It has a catchment area of about 3 million people within an area of 1317 square kilometers. In the year 2015,784 newborns admitted in the newborn unit (NBU) had birth asphyxia and 332 of them died. In the year 2016, the number of asphyxiated newborns admitted in NBU increased to 825 and out of this number 367 of them died. Pumwani Maternity hospital is a referral hospital located in Nairobi County and it is the largest maternity hospital in East Africa.

3.3 Study population

The study population consisted of all mothers admitted to labour ward and those admitted to the hostel due to hospitalization of their babies in the newborn units during the study period. The study was conducted from 17th May 2017 to 1st August 2017.

3.4 Sample size and selection

Purposive sampling method was used to recruit 209 mothers who had delivered babies with asphyxia in Kenyatta National Hospital Teaching and referral hospital labour ward and in Pumwani Maternity labour ward. Only those who consented to participate were included. Stratification of the sample between the two hospitals was affected because of the nurses strike and hence a reduced sample size from Pumwani. This was due the reduced number of clients visiting Pumwani for maternity and neonatal health care services.

3.5 Study Instrument

An interviewer guided structured questionnaire was administered as well as information from the patient files once they consented.

3.6 Training of Research Assistants

Four research assistants were selected from the nurses working in labour ward and neonatal units in each hospital giving it a total of eight research assistants. They were trained and orientated about the research and the research instrument.

3.7 Pretesting of the Instrument

The study instrument was pretested at Pumwani maternity hospital newborn unit and KNH newborn unit using a sample size of 10 mothers 5 from each hospital. The pre-testing results were used to improve the questionnaires to ensure validity and reliability.

3.8 Inclusion criteria.

1. Mothers with babies with gestational age of 34 weeks to 42 weeks
2. Mothers with babies with an Apgar score less than 7 at 5 minutes.
3. Mothers who consented.

3.9 Exclusion criteria.

1. Sick mothers in coma, stupor or physiologically compromised because they were not be in a position to give an informed consent
2. Mothers who did not consent
3. Mothers with babies <2000g
4. Gestational age less than 34 weeks and above 42 weeks because below 34 weeks surfactant production is not yet optimal to support normal breathing and this may contributes to birth asphyxia and above 42 weeks the fetus is compromised due to placental insufficiency which may cause asphyxia.
5. Mothers with neonates who had congenital anomalies involving central nervous or cardiovascular system, dimorphism (obvious chromosomal abnormalities) because the cardio-respiratory centers may already be compromised.
6. Newborn with neonatal meningitis or bleeding disorders because the central nervous system is compromised with these disorders.

3.10 Sample Size Calculation

The Cochrane's formula was used to calculate sample size for the mothers who participated in this study. It is outlined as below.

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

Where:

n = Sample size [where population> 10,000]

z = Normal deviation at the desired confidence interval. In this case it will be taken at 95%, Z value at 95% is 1.96.

p= estimated proportion of asphyxia, that is 240 babies out of 1000 total births.24% or 0.24 (WHO, 2015).

q = Variability. (1 – p) = 1 – 0.24= 0.76

d^2 = Degree of precision; margin of error will be taken to be 5% = 0.05

$$n = \frac{1.96^2 * 0.24 * 0.76}{0.05^2}$$

n = 280 (calculated sample size)

Adjust because our population is less than 10,000 using Fishers formula

nf = n /1 +n/N

Where:

nf = the adjusted sample size

n = Sample size calculated

N = The total study population (566 for Pumwani and 261 for KNH in the four month period of data collection)

$$nf = \frac{280}{1 + (280/827)}$$

$$= 280/1.3386$$

nf=209.17 mothers

= 209 mothers

Adjustment:

In KNH I expected a population of 261 for the four month period. This figure if from the population they received in 2016 during the month of May, June, July and August. In Pumwani I expected a population of 566 as per the number of clients they received in 2016 during the month of May, June July and August. Therefore the total population in the four months was expected to be 827 mothers in both hospitals.

3.11 Data Collection

Data was obtained by a trained researcher. Mothers with neonates who met the inclusion criteria were included in the study. The observations were entered on a standard proforma. A well designed questionnaire was administered, to assess maternal characteristics and neonatal presentation of asphyxia. Fenichel syndromic description of severity of neonatal encephalopathy was used to grade asphyxia (Fenichel, 1983). Birth asphyxia manifestation were noted as hypoxic ischemic encephalopathy grade 1,grade 2 and grade 3 Fenichel. Maternal data collected included: age, marital status, parity, gravidity, occupation, education status, HIV status Antenatal -"visits and ante partum medical disorders mode of delivery and delays in decision making to seek health care services. Intrapartum information regarding the conduct of labor was obtained by reviewing the case records after identification of babies. Data obtained included duration of labor, presenting part, meconium staining of liquor and grading, fetal condition (i.e. fetal distress or not), and mode of delivery. Other neonatal details obtained included: sex, birth weight, Apgar score at one and five minutes.

3.12 Study Variables

Independent Variables

Concurrent pre-pregnancy maternal medical conditions-These are the maternal conditions before she got pregnant and are still occurring with the pregnancy for example diabetes. Pregnancy related factors-These are conditions that occur in pregnancy that were not there before she got pregnant that may lead to birth asphyxia. Labour related factors-These are factors surrounding labour and labour process which could lead to birth asphyxia for example prolonged labour.

Intervening variables

Maternal decision making: These variable explained the time taken by the mother to seek medical help for example how much time she took to go to hospital from the onset of labour.

Dependent variable

Birth asphyxia is the dependent variable that may be as a result of the various maternal characteristics.

3.13. Data Management And Analysis

After interviewing the participants, data was coded and entered using Statistical Package for Social Sciences (SPSS) for windows version 23. Descriptive statistic was used quantitatively to analyze data, using. The final results were presented in graphs, pie charts and tables in narrative format. Hypothesis was tested at 95% confidence interval using ANOVA.

3.14 Ethical Consideration

The research proposal was submitted to KNH-UON research and ethical committee for clearance and approval. Further authorization was sort from KHN and Pumwani maternity ethics and research committees. Before executing any information, an informed consent from all respondents was obtained prior to their participation. The interviews were conducted once the mother has undergone counseling and she was stable enough to give information**.** Privacy and confidentiality for all respondents was guaranteed and the respondents had a right to or not to participate, no coercion or inducement was used. Inflicting pain and harm was avoided to those who consented to be interviewed. Privacy and confidentiality was maintained throughout the study ensuring identifiable information replaced by a serial number. No names were used and information was protected by password and only accessed by the principle investigator.

3.15 Dissemination of Research Findings

Data collected and processed will be published in a renowned journal; feedback will be given to KNH and Pumwani hospitals as well as the University of Nairobi. The participants of the study will also receive findings of the study on the maternal risk factors for birth asphyxia through mobile technology using their contact details in the patient files.

3.16 Limitations of The Study

The study was limited to maternal variables affecting perinatal birth asphyxia and excludes other variables such as, obstetric and neonatal factors that affect birth outcome. The study was also limited to those born after 34 completed weeks and less

than 42 gestational weeks.There was also financial constraints for this research. Further research is recommended to look into other variables that may contribute to birth asphyxia.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents results and analysis of the study findings. A total of 209 mothers with their babies were consented to participate in the study at Kenyatta National Hospital and Pumwani Maternity Hospital. The results are presented in frequency tables as well as in graph forms.

4.1 Demographic characteristics of the mothers who had babies with birth asphyxia

The distribution of selected socio-demographic characteristics among the mothers is illustrated in Table 4. The average age of the mothers was 26.7 years with standard deviation of 6.1. Majority of the mothers (63.6%) were within the age group of 20-30 years. Most (79.4%) of the mothers were married. Regarding level of education, more than half of the mothers (54.1%) attended secondary school followed by primary school (24.4%). The finding also shows that the highest percentage of the mothers (44.0%) were housewives.

Table 4 Demographic Characteristics of the Mothers

Variables	n=209	%
Age		
<20 years	23	11.0
20-30 years	133	63.6
31-42 years	53	25.4
Mean age (±SD) = 26.7(±6.1)		
Marital status		
Single	43	20.6
Married	166	79.4
Education level		
Not attended school	5	2.4
Primary school	51	24.4
Secondary school	113	54.1
College	33	15.8
University	7	3.3
Occupation		
Business woman	50	23.9
Employed	49	23.4
Student	18	8.6
Housewife	92	44.0

4.1.1 Total Number Of Children

As indicated in Figure 2, almost half of the mothers (50.7%) had one child and about a quarter (27.3%) had two children while the remaining 12.9% had three children and 9.1 had four and above children.

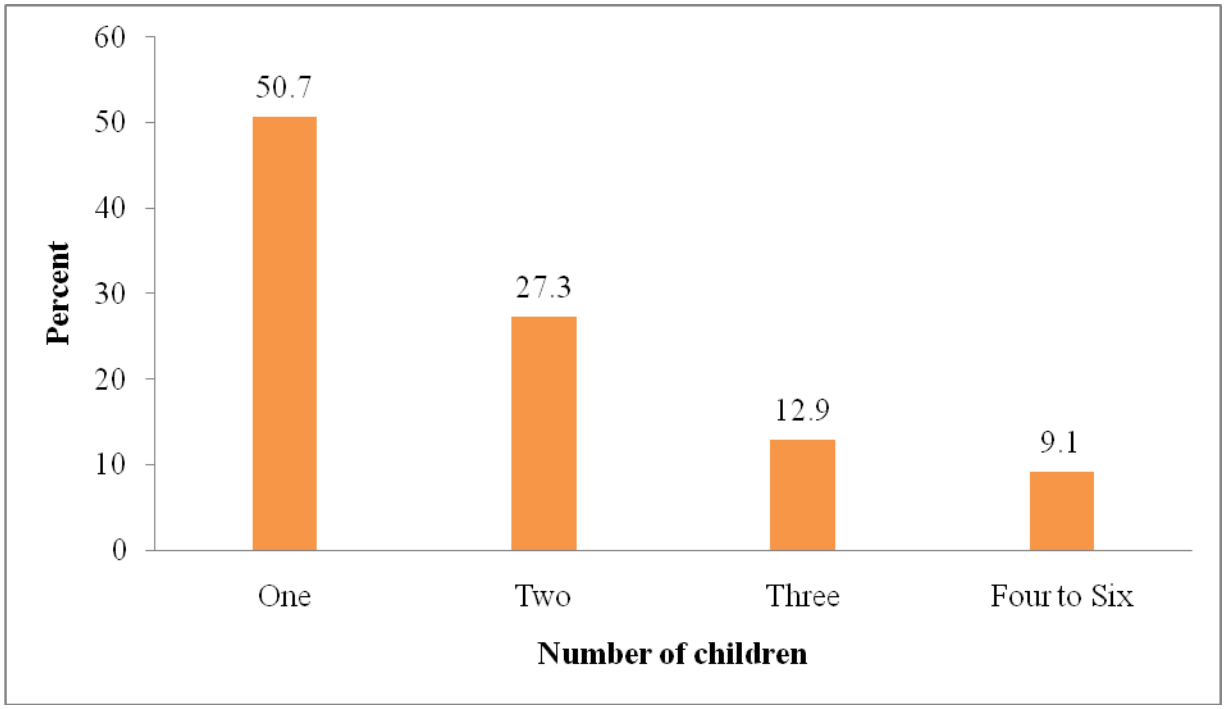

Figure 2 Total Number of Children

4.2 Pregnancy Related Factors Contributing To Birth Asphyxia

Analysis of factors related to pregnancy is demonstrated in Table 5. The findings show that majority (57.9%) were suffering from any medical condition during pregnancy whereas the remaining (42.1%) indicated otherwise. The main medical conditions during pregnancy were anemia (33.1%), prolonged labor (24.0%), elevated blood pressure (14.9%) and urinary tract infection (11.6%). The number of deliveries was also examined and large percentage of the mothers had one baby while the remaining (6.2%) had twins.

Table 5 Pregnancy Related Factors Contributing To Birth Asphyxia

Variables	n=209	%
Whether suffered from any medical condition during pregnancy		
Yes	121	57.9
No	88	42.1
***Type of the medical conditions during pregnancy**		
Elevated blood pressure	18	14.9
Anemia	40	33.1
Bleeding	6	5.0
HIV	5	4.1
Prolonged labour	29	24.0
UTI	14	11.6
Others	27	22.3
How many babies did you deliver		
Singleton	196	93.8
Twins	13	6.2

***Multiple response where the counts and percentages are more than the total**

4.3 Demographic Characteristics Of The Babies With Birth Asphyxia

Table 6 below shows the description of children by socio-demographic characteristics. The highest percentage of the babies (43.1%) had more than 3Kg birth

weight. Moreover, the proportion of underweight in this study was found to be 28.2%. The gender distribution among the babies indicates that majority were males (60.8%). Most (63.6%) of the babies were delivered through spontaneous vaginal delivery whereas the remaining (34.4%) were delivered by cesarean section and only (1.9%) were breech delivery. The color of liquor Amni when membranes ruptured was assessed and most (66.0%) had stained meconium and 6.7% had blood stained. There were only about a quarter (27.3%) with clear liquorAmni.

Table 6: Demographic Characteristics of the Babies

Variables	n=209	%
Birth weight		
2-2.5 kg	59	28.2
2.5-3 kg	60	28.7
Above 3 kg	90	43.1
Sex/gender		
Female	82	39.2
Male	127	60.8
Mode of delivery		
Spontaneous vertex delivery	133	63.6
Breech delivery	4	1.9
Caesarean section	72	34.4
Color of liquor Amni when membranes ruptured		
Meconium stained	138	66.0
Blood stained	14	6.7
Clear liquor	57	27.3

4.3.1 Reasons For Caesarean Section

Figure 3 demonstrates reasons for caesarean section among those who delivered by caesarean section. The main reasons indicated were previous scars (19.4%), non-reassuring fetus (16.7%), fetal distress (12.5%), breech presentation (9.7%) and cephalopelvic disproportion (6.9%).

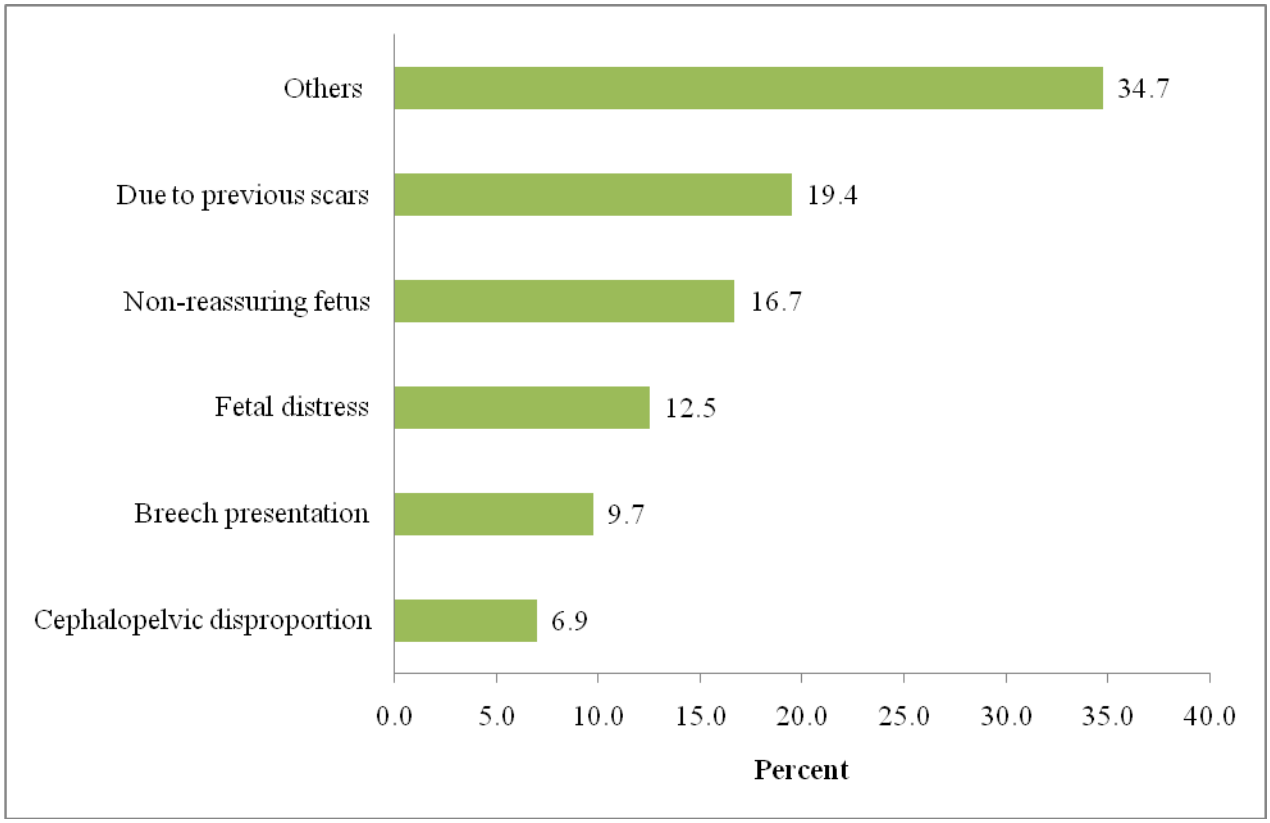

Figure 3 Reasons for Caesarean Section

4.4 Duration Between Experiencing Labor And Reaching Hospital

The mothers were asked about the time at which the labor started and the time they reached hospital and the highest percentage (42.6%) indicate more than 5 hours. Only one fifth (21.5%) took less than one hour. Moreover, the average time taken from experiencing labour and deciding to go to hospital was 6.01 hours (Table 7).

Table 7: Duration Between Experiencing Labor And Reaching Hospital

Variables	n=209	%
Time taken from experiencing labour and deciding to go to hospital		
< 1 hour	45	21.5
1 hour	17	8.1
2 hours	10	4.8
3 hours	15	7.2
4 hours	15	7.2
5 hours	18	8.6
6 hours and above	89	42.6
Mean (±SD) = 6.01(±6.03)		

4.5 APGAR Score and Grade of Asphyxia

Table 8 presents the APGAR score at 1 minute and 5 minutes as well as the grade of asphyxia. The highest proportion of the babies (38.8%) had 5 APGAR score at 1 minute followed by 26.3% with ABGAR score of 6. However, these APGAR scores had increased at 5 minutes where the highest percentage (41.6%) had 6 APGAR score followed by 24.4% with ABGAR score of 7. In addition, the grade of asphyxia was assessed and majority of the babies (61.7%) were with grade II asphyxia.

Table 8 APGAR Score And Grade Of Asphyxia

Variables	n=209	%
APGAR score at 1 minute		
Zero	1	0.5
One	7	3.3
Two	7	3.3
Three	13	6.2
Four	45	21.5
Five	81	38.8
Six	55	26.3
APGAR score at 5 minutes		
Two	6	2.9
Three	4	1.9
Four	15	7.2
Five	46	22
Six	87	41.6
Seven	51	24.4
Grade of Asphyxia		
Grade 1	74	35.4
Grade 2	129	61.7
Grade 3	6	2.9

4.6 Mean Score of APGAR at 1 and 5 Minute

Figure 4 below shows the average and standard deviation of APGAR score among the babies with asphyxia. The mean APGAR score at 1 minute was 4.67 but it was raised to 5.71 at 5 minutes.

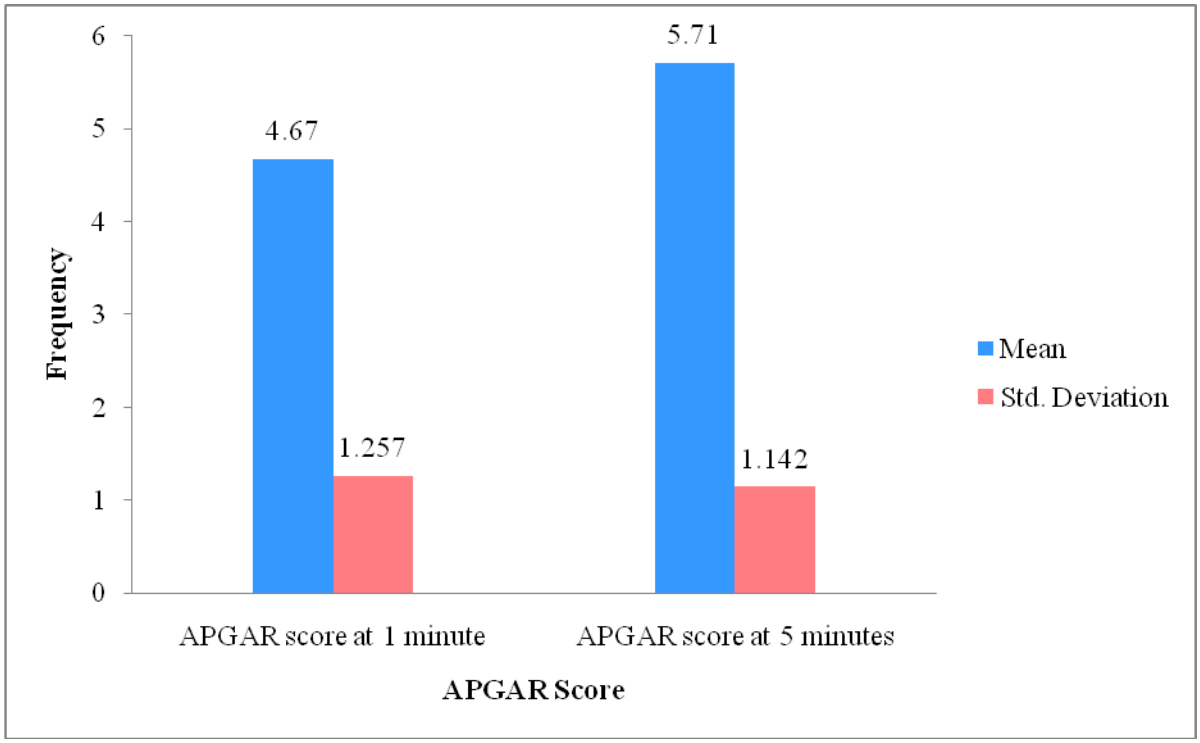

Figure 4 Mean Score of APGAR at 1 and 5 Minute

4.7: Comparison of APGAR Score and Socio-Demographic Characteristics of The Mothers

Independent *t* test or one way ANOVA test where applicable was used to compare the mean of APGAR score at 1 and 5 minutes among the socio-demographic characteristics of the mothers (Table 9). However, there was no statistically significant association observed between mean APRAGR score and socio-demographic characteristics of the mothers.

Table 9 Comparison of APGAR Score and Socio-Demographic Characteristics of The Mothers

Variable	Mean (Standard Deviation) of APGAR Score at 1 minute	Independent *t* test or ANOVA test (p value)	Mean (Standard Deviation) of APGAR Score at 5 minute	Independent *t* test or ANOVA test (p value)
Age				
<20 years	4.57(1.31)		5.57(1.16)	
20-30 years	4.68(1.24)	0.922	5.76(1.11)	0.669
31-42 years	4.68(1.29)		5.64(1.21)	
Marital status				
Single	4.77(1.15)	0.55	5.81(1/02)	0.497
Married	4.64(1.28)		5.68(1.71)	
Education level				
None or primary school	4.80(1.24)		5.86(1.18)	
Secondary school	4.65(1.18)	0.504	5.68(1.08)	0.461
College/University	4.5(1.48)		5.58(1.24)	
Occupation				
Business woman	4.62(1.50)		5.62(1.45)	
Employed	4.78(1.08)	0.917	5.76(1.01)	0.926
Student	4.67(1.24)		5.67(1.03)	
Housewife	4.63(1.22)		5.74(1.05)	
Total number of children				
One	4.53(1.31)		5.58(1.16)	
Two	4.82(1.14)	0.374	5.91(1.05)	0.190
Three	4.67(1.47)		5.59(1.42)	
Four to Six	4.95(0.91)		6.00(0.67)	

4.8: APGAR Score And Pregnancy Related Factors

Independent *t* test or one way ANOVA test where applicable was used to compare the mean of APGAR score at 1 and 5 minutes between pregnancy related factors as

indicated in Table 10. There was significant association between number of deliveries and APGAR score where babies born singly had significantly low APGAR score mean (5.67) compared to twins (6.31) (p=0.048). However, there was no statistically significant association observed between the other variables.

Table 10 APGAR Score and Pregnancy Related Factors

Variable	Mean (Standard Deviation) of APGAR Score at 1 minute	Independent *t* test or ANOVA test (p value)	Mean (Standard Deviation) of APGAR Score at 5 minute	Independent *t* test or ANOVA test (p value)
Frequency of ANC visit				
1st visit	4.33(1.22)		5.67(1.00)	
2nd visit	4.88(1.05)	0.648	5.88(1.05)	0.795
3rd visit	4.80(1.30)		5.83(1.22)	
4th visit	4.63(1.30)		5.66(1.14)	
Whether suffered from any medical condition during pregnancy				
Yes	4.62(1.25)	0.543	5.66(1.22)	0.487
No	4.73(1.27)		5.77(1.17)	
How many babies did you deliver				
Singleton	4.62(1.26)	0.057	5.67(1.15)	**0.048**
Twins	5.31(1.11)		6.31(0.85)	

4.9: Comparison of APGAR Score Mean And Babies' Demographic Characteristics

Independent *t* test or one way ANOVA test where applicable was used to compare the mean of APGAR score at 1 and 5 minutes between babies' demographic characteristics (Table 11). The mean APGAR score was significantly lower among babies delivered spontaneous(4.5) and breech (4.5) than to those babies delivered by caesarean section (4.97) at 1 minute (p = 0.037). Similarly, at 5 minutes the mean APGAR score was significantly lower among babies with breech delivery (5.25) than to those babies delivered by caesarean section (6.00) (p = 0.023). Surprisingly, the mean APGAR score at 1 minute was significantly high among babies who had blood stained Amni during rupture of the membrane (5.64) compared to babies with meconium stained (4.49) or clear liquor (4.86) (p=0.002) . Likewise, the mean of APGAR score at 5 minutes was significantly more among babies who had blood stained Amni during rupture of the membrane (6.71) compared to babies with meconium stained (5.52) and clear liquor (5.91) (p=0.000) .

Table 11 Comparison of APGAR Score Mean And Babies' Demographic Characteristics

Variable	Mean (Standard Deviation) of APGAR Score at 1 minute	Independent *t* test or ANOVA test (p value)	Mean (Standard Deviation) of APGAR Score at 5 minute	Independent *t* test or ANOVA test (p value)
Birth weight				
2-2.5 kg	4.88(1.07)		5.92(0.99)	
2.5-3 kg	4.48(1.36)	0.221	5.62(1.19)	0.259
Above 3 kg	4.64(1.29)		5.63(1.19)	
Sex/gender				
Female	4.63(1.34)	0.776	5.73(1.14)	0.811
Male	4.69(1.20)		5.69(1.14)	
Mode of delivery				
Spontaneous vertex delivery	4.5(1.26)	**0.037**	5.56(1.15)	**0.023**
Breech delivery	4.5(2.38)		5.25(2.22)	
Caesarean section	4.97(1.12)		6.00(1.00)	
Color of liquor Amni when membranes ruptured				
Meconium stained	4.49(1.30)		5.52(1.20)	
Blood stained	5.64(0.63)	**0.002**	6.71(0.61)	**0.000**
Clear liquor	4.86(1.14)		5.91(0.91)	

4.10: Comparison of APGAR Score Mean And Time Taken From Experiencing Labour To Hospital

One way ANOVA test was used to compare the mean of APGAR score at 1 as well as 5 minutes and time taken from experiencing labour to hospital (Table 12). However, there was no statistically significant association observed.

Table 12 Comparison of APGAR Score Mean And Time Taken From Experiencing Labour To Hospital

Variable	Mean (Standard Deviation) of APGAR Score at 1 minute	Independent *t* test or ANOVA test (p value)	Mean (Standard Deviation) of APGAR Score at 5 minute	Independent *t* test or ANOVA test (p value)
Time taken from experiencing labour and deciding to go to hospital				
< 1 hour	4.80(1.32)		5.80(1.24)	
1 hour	4.24(1.39)		5.24(1.20)	
2 hours	4.40(0.97)		5.60(0.69)	
3 hours	4.40(1.29)	0.390	5.6(1.06)	0.553
4 hours	4.27(1.33)		5.47(1.12)	
5 hours	4.72(1.44)		5.72(1.27)	
6 hours and above	4.81(1.15)		5.82(1.11)	

4.11: Association Between Demographic Characteristics Of Mothers And Asphyxia Grade

Chi-square test was used to establish association between socio-demographic characteristics of the mothers and asphyxia grade among the babies. However, there was no association between socio-demographic characteristics of the mothers and asphyxia grade (Table 13).

Table 13 Association Between Demographic Characteristics Of Mothers And Asphyxia Grade

Variables	Grade 2 or 3, (N=135)		Grade 1, (N=74)		Chi square value	degree of freedom	p value*
	n	%	n	%			
Age							
<20 years	14	10.4%	9	12.2%			
20-30 years	88	65.2%	45	60.8%	0.41	2	0.815
31-42 years	33	24.4%	20	27.0%			
Marital status							
Single	28	20.7%	15	20.3%	0.01	1	0.936
Married	107	79.3%	59	79.7%			
Education level							
None or primary school	32	23.7%	24	32.4%			
Secondary school	75	55.6%	38	51.4%	2.03	2	0.363
College/University	28	20.7%	12	16.2%			
Occupation							
Business woman	32	23.7%	18	24.3%			
Employed	35	25.9%	14	18.9%	1.60	3	0.659
Student	12	8.9%	6	8.1%			
Housewife	56	41.5%	36	48.6%			
Total number of children							
One	74	54.8%	32	43.2%			
Two	36	26.7%	21	28.4%	7.76	3	0.051
Three	18	13.3%	9	12.2%			
Four to Six	7	5.2%	12	16.2%			

4.12: Association Between Pregnancy Related Factors And Asphyxia Grade

Chi-square test was used to establish association between pregnancy related factors and asphyxia grade among the babies (Table 14). Mothers who suffered from any medical condition during pregnancy had significantly more babies with grade 2 or 3 asphyxia (64.4%) than grade 1 asphyxia (45.9%) [χ^2 value = 6.71; df =1; P value = 0.010]. Twins was significantly more among babies with grade 1 asphyxia (12.2%) [χ^2 value = 6.93; df =1; P value = 0.008] compared to those babies with grade 2 or 3 asphyxia (3.0%).

Table 14 Association Between Demographic Characteristics Of Mothers And Asphyxia Grade

	Grade 2 or 3, (N=135)		Grade 1, (N=74)		Chi square value	degree of freedom	p value*
Variables	**n**	**%**	**N**	**%**			
Frequency of ANC visit							
1st visit	6	4.4%	3	4.1%			
2nd visit	9	6.7%	8	10.8%	1.10	3	0.776
3rd visit	23	17.0%	12	16.2%			
4th visit	97	71.9%	51	68.9%			
Whether suffered from any medical condition during pregnancy							
Yes	87	64.4%	34	45.9%	6.71	1	**0.010**
No	48	35.6%	40	54.1%			
How many babies did you deliver							
Singleton	131	97.0%	65	87.8%	6.93	1	**0.008**
Twins	4	3.0%	9	12.2%			

4.13 Association Between Babies' Demographic Characteristics And Asphyxia Grade

Chi-square test was used to establish association between babies' demographic characteristics and asphyxia grade among the babies (Table 15). There was statistically significant association between birth weight and asphyxia grade where underweight was significantly more among babies with grade 1 asphyxia (43.2%)than those with grade 2 or 3 asphyxia (20.0%) [χ^2 value = 12.75; df =2; P value = 0.002]. Babies who had blood stained Amni during rupture of the membrane were significantly more among babies with grade 1 asphyxia (16.2%) [χ^2 value = 31.90; df =2; P value = 0.000] compared to babies with grade 2 or 3 asphyxia (1.5%).However, meconium stained Amni was significantly more among babies with grade 2 or 3 asphyxia (78.5%)compared to babies with grade 1 asphyxia (43.2%)

Table 15 Association Between Babies' Demographic Characteristics and Asphyxia Grade

Variables	Grade 2 or 3, (N=135)		Grade 1, (N=74)		Chi square value	degree of freedom	p value*
	n	%	n	%			
Birth weight							
2-2.5 kg	27	20.0%	32	43.2%			
2.5-3 kg	43	31.9%	17	23.0%	12.75	2	**0.002**
Above 3 kg	65	48.1%	25	33.8%			
Sex/gender							
Female	50	37.0%	32	43.2%	0.77	1	0.380
Male	85	63.0%	42	56.8%			
Mode of delivery							
Spontaneous vertex delivery	92	68.1%	41	55.4%	3.43	2	0.180
Breech delivery	2	1.5%	2	2.7%			
Caesarean section	41	30.4%	31	41.9%			
Color of liquor Amni when membranes ruptured							
Meconium stained	106	78.5%	32	43.2%			
Blood stained	2	1.5%	12	16.2%	31.90	2	**0.000**
Clear liquor	27	20.0%	30	40.5%			

4.14: Association Between Grade of Asphyxia And Time Taken From Experiencing Labour To Hospital

Table 16 shows association between grade of asphyxia and time taken from experiencing labour to hospital. However, there was no statistically significant association observed at 5% significance level.

Table 16 Association between demographic characteristics of mothers and asphyxia grade

Variables	Grade 2 or 3, (N=135)		Grade 1, (N=74)		Chi square value	degree of freedom	p value*
	n	%	n	%			
Time taken from experiencing labour and deciding to go to hospital							
< 1 hour	29	21.5%	16	21.6%			
1 hour	11	8.1%	6	8.1%			
2 hours	6	4.4%	4	5.4%			
3 hours	10	7.4%	5	6.8%	2.33	6	0.887
4 hours	12	8.9%	3	4.1%			
5 hours	10	7.4%	8	10.8%			
6 hours and above	57	42.2%	32	43.2%			

Correlations between the socio-demographic characteristics of the mothers

Table 17 shows the correlations between the socio-demographic characteristics of the mothers. There were positive correlations between age and marital status of the respondents. However, there was negative correlation between age and type of main occupation.

Table 17 Correlations between the socio-demographic characteristics of the mothers

Pearson correlation		Age in years	Marital status	Highest level of education	Main occupation
Age in years	Correlation	1	.286**	.004	-.248**
	Sig. (2-tailed)		.000	.959	.000
	N	209	209	209	209
Marital status	Correlation	**.286****	1	-.111	.041
	Sig. (2-tailed)	**.000**		.111	.560
	N	209	209	209	209
Highest level of education	Correlation	.004	-.111	1	-.070
	Sig. (2-tailed)	.959	.111		.311
	N	209	209	209	209
Main occupation	Correlation	**-.248****	.041	-.070	1
	Sig. (2-tailed)	**.000**	.560	.311	
	N	209	209	209	209

****Correlation is significant at the 0.01 level (2-tailed)**

Correlations between the maternal characteristics

Table 18 shows the correlations between the maternal characteristics. There were positive correlation between Frequency of ANC visit and suffering from any medical condition during pregnancy.

Table 18 Correlations between the maternal characteristics

		Frequency of ANC visit	Any medical condition during pregnancy	Number of deliveries	Time taken from experiencing labour and deciding to go to hospital(hours)
Frequency of ANC visit	Correlation	1	.171*	.024	.015
	Sig. (2-tailed)		.013	.735	.830
	N	209	209	209	209
Any medical condition during pregnancy	Correlation	**.171***	1	.061	.066
	Sig. (2-tailed)	**.013**		.378	.345
	N	209	209	209	209
Number of deliveries	Correlation	.024	.061	1	-.106
	Sig. (2-tailed)	.735	.378		.127
	N	209	209	209	209
Time taken from experiencing labour and deciding to go to hospital(hours)	Correlation	.015	.066	-.106	1
	Sig. (2-tailed)	.830	.345	.127	
	N	209	209	209	209
*. Correlation is significant at the 0.05 level (2-tailed).					

Correlations between the socio-demographic characteristics of the babies

Table 19 shows the correlations between the socio-demographic characteristics of the babies. There was negative correlation between weight of the baby and color of liquor Amni when membrane ruptured as well as weight and grade of asphyxia. However, there were positive correlations between APGAR score after 1 minuet and after 5 minutes, grade of asphyxia APGAR score after 1 minute and grade of asphyxia APGAR score after 5 minutes.

Table 19 Correlations between the socio-demographic characteristics of the babies

Pearson correlation		Weight of the baby	Sex of the baby	Mode of delivery	Color of liquor Amni when ruptured	APGAR score at 1 minute	APGAR score at 5 minutes	Grade of Asphyxia
Weight of the baby	Correlation	1						
	Sig. (2-tailed)							
	N	209						
Sex of the baby	Correlation	.132	1					
	Sig. (2-tailed)	.058						
	N	209	209					
Mode of delivery	Correlation	-.079	-.103	1				
	Sig. (2-tailed)	.257	.138					
	N	209	209	209				
Color of liquor Amni when ruptured	Correlation	**-.260****	.025	.036	1			
	Sig. (2-tailed)	**.000**	.724	.601				
	N	209	209	209	209			
APGAR score at 1 minute	Correlation	-.067	.020	.176*	.155	1		
	Sig. (2-tailed)	.334	.776	.011	.065			
	N	209	209	209	209	209		
APGAR score at 5 minutes	Correlation	-.096	-.017	.178	.177	**.943****	1	
	Sig. (2-tailed)	.168	.811	.080	.080	**.000**		
	N	209	209	209	209	209	209	
Grade of Asphyxia	Correlation	**-.216****	-.061	.123	**.302****	**.557****	**.576****	1
	Sig. (2-tailed)	**.002**	.382	.077	**.000**	**.000**	**.000**	
	N	209	209	209	209	209	209	209
**Correlation is significant at the 0.01 level (2-tailed).								
*Correlation is significant at the 0.05 level (2-tailed).								

CHAPTER FIVE:DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

In this chapter, the study findings in terms of maternal characteristics related to birth asphyxia are discussed and conclusion drawn from the findings. Recommendations have also been made based on the study findings and conclusions.

5.1. Discussion

This was a cross sectional study carried out in the newborn unit at Kenyatta national hospital and Pumwani maternity hospital both in Nairobi County. The objective of this study was to determine maternal risk factors for birth asphyxia. Mothers who had babies with birth asphyxia were eligible to participate in the research. In the study, the average age of the mothers was 26.7 years, with the majority of the mothers (63.6%) were within the age group of 20 to 30 years. This is consistent with the findings in a study done in Karachi on risk factors of birth asphyxia which reported a maternal mean age of 24.22 ±3.38 and a significant maternal age of 20-25 years (Aslam et al, 2012). However in a similar study that was done in India showed that a maternal age of less than 20 years was a significant risk factor for birth asphyxia with a p-value of <0.000.This could be explained by socio-demographic dynamics of Kenya which may be slightly different from those in India. Nevertheless, another study on maternal risk factors for birth asphyxia showed that increased maternal age above 35 years was a significant risk factor for birth asphyxia (Chiabi et al,2013).This could be explained by the physiological changes that occur with increased maternal age that may contribute to birth asphyxia.

A number of factors were found to be significantly associated with birth asphyxia. In this study there was an association between having a medical condition in pregnancy and birth asphyxia. The findings showed that more than half of the participants n=121 (57.9%) were suffering from any medical condition during pregnancy whereas the remaining (42.1%) indicated otherwise. Findings from this study show that the main medical conditions during pregnancy were anemia, prolonged labour, elevated blood pressure, and urinary tract infection. Mothers who suffered from any medical condition had significantly more babies with grade 2 or 3 asphyxia than grade1 asphyxia. A numbers of studies support these findings. In a study done in India, maternal anemia, antepartum hemorrhage, chorioamnionitis and prolonged rupture of membranes were significant risk factors for birth asphyxia (Gane et al, 2013). Another study on the effect of maternal anaemia on fetal outcomes in Bangladesh strongly supported the findings of this study that anaemia in pregnancy is significantly associated with birth asphyxia as a fetal outcome(Akhter S, Momen MA, Rahman MM, Perveen T, 2010).A similar study on maternal anemia and its impact on perinatal outcome observed that the prevalence of birth asphyxia was higher in anemic mothers than in non-anemic mothers which strongly supports the findings of this study (Goswami *et al.*, 2014).This is also supported by a study that was done in Cameroon in which pre-eclampsia and eclampsia, prolonged labour and prolonged rupture of membranes were some of the significant risk factors for birth asphyxia (Chiabi et al, 2013).Findings from a study that was done on term neonates also showed that prothrombotic disorders such as deep venous thrombosis, preeclampsia, multiple gestation, antepartum hemorrhage, and chorioamnionitis were the maternal risk factors for birth asphyxia(Announce *et al,* 2014).

Findings from this study show that there is significance between the number of babies delivered and birth asphyxia (p-value=0.048). Twin babies were significantly more among babies with grade 1 asphyxia compared with those babies with grade 2 or 3 asphyxia. The possible explanation for this is that most twin pregnancies are born prematurely less than 37 completed weeks of gestation. Due to their low birth weight and prematurity, they have decreased metabolic demands hence decreased acidosis compared with the babies with a birth weight of more than 3 kilograms. This explains the reason for more grade 1 asphyxia among twins compared to grade 2 or 3 asphyxia which were more among the singletons. Nevertheless, findings from a study done in India showed that multiple pregnancy was a risk factor for birth asphyxia (Murali & Padarthi, 2016) and this is similar to the findings in this study.

There was statistical significance between birth weight and asphyxia where underweight was significantly more among grade 1 asphyxia than those with grade 2 or 3 asphyxia. Those babies above 3 kilograms were the majority. This findings were similar to those of a study that was done in Brazil in which a majority of the newborns with birth asphyxia were above 3kilograms (Souza *et a*l, 2016).However the observations in this study differ from the findings of a study that was carried out in Pakistan in 2013 that showed that a birth weight of ≤ 2.5 had a higher risk for birth asphyxia (Hafiz et al, 2014). This could be due to placental insufficiency that is associated with a gestation of above 40 week in which a majority of mothers with babies above 3 kilograms presented with.

Mode of delivery was significantly associated with birth asphyxia, the mean Apgar score was significantly lower among babies delivered by spontaneous vertex delivery

and breech than those delivered by caesarean section at 1 minute. Similarly, at 5 minutes the mean Apgar score was significantly lower among babies born with breech delivery than those babies delivered by caesarean section. This differs from the findings of another study that was carried out in 2013 in Ethiopia which showed that children born through CS had a significantly lower first-minute Apgar score than those in the vaginal delivery group (Eyowas *et al,* 2013).This could be explained by the fact that the national nurses strike was going on during data collection and the labour ward theatres were overwhelmed and only those who were lucky were delivered via C-section. The rest of the mothers continued to labour and some of them delivered before they could be taken to theatre even though they their babies had fetal distress. Study findings from another study that was comparing the occurrence of birth asphyxia between spontaneous vertex delivery and caesarean section explained that there was reduced meconium aspiration in caesarean section than in spontaneous vertex delivery (Ramachandrappa & Jain, 2008).This could also explain the lower Apgar score in spontaneous vertex deliver than in caesarean section.

It was observed in this study that a majority of the mothers had meconium stained liquor. This is similar to several studies done on risk factors for birth asphyxia. A study that was done in Hyderabad showed that meconium stained liquor was a risk factor for birth asphyxia (Majeed *et al,* 2007).This observation is also supported by a study that was done in Nepal on risk factors for neonatal encephalopathy which showed that meconium stained liquor was a significant risk factor for birth asphyxia(Edward *et al,* 2015).However the mean APGAR score at 1 minute was significantly high among babies who had blood stained liquor during rupture of membranes compared to babies with meconium stained or clear liquor. Likewise the mean of

Apgar score at 5 minutes was significantly more among babies who had blood stained liquor during rupture of membranes compared to babies with meconium stained and clear liquor. The presence of meconium most of the time indicates fetal distress which may result to birth asphyxia. Nevertheless, both blood stained liquor have significantly been shown to increase the risk of birth asphyxia (Majeed *et al*, 2007). In another study done on antepartum and intrapartum on risk factors for neonatal encephalopathy; Primiparity, non-attendance for antenatal care, multiple births, breech presentation, rupture of membranes more than 18 hours, meconium particulates and induction of labour with oxytocin (Tan and Wu, 2016).

A study that was done among the Swedish urban population, single mothers and primigravidas were the maternal risk factors for birth asphyxia ("Influence of maternal, obstetric and fetal risk factors on the prevalence of birth asphyxia at term in a Swedish urban population - - 2002 – Acta Obstetriciae). This is similar to the research findings of this study which illustrate that primigravidas had increased risk of birth asphyxia as well as single mothers who were at even though the majority of the participants were married. Nevertheless, the same study showed that maternal age was not related to birth asphyxia contrally to the findings in this study which showed that the most affected age group was between 20 to 30 years. In addition, a study done in Pakistan in 2012 on fetal risk factors for birth asphyxia showed that maternal age, primigravity, pre-eclampsia and chorioamnionitis contributed to birth asphyxia (Hafiz *et al*, 2014) which is in line with the findings of this study which showed that primigravity, elevated blood pressures (pre-eclampsia) and maternal fevers (chorioamnionitis) contributed to birth asphyxia. Elevated blood pressure contributed to birth asphyxia similar to observations made in several other studies. In a Kenyan study carried out in Naivasha district hospital; Kenya in 2012 on prevalence of

asphyxia, showed that maternal oedema in pre-eclampsia contributed to birth asphyxia as a birth outcome (Gichongo, 2014).

5.3 Conclusions

It is observed in this study that a significant proportion of mothers with babies who had birth asphyxia had anemia in pregnancy, prolonged labour, elevated blood pressure HIV, chorioamnionitis and antepartum hemorrhage among other medical conditions. These are some of the maternal medical conditions that are risk factors for birth asphyxia. Primiparity, being a house wife, secondary school level of education and below and age of between 20 to 30 years were the demographic and socioeconomic factors that were observed to have significant association with birth asphyxia. The babies' socio-demographic factors that were associated with birth asphyxia were birth weight above 3kg and male gender. Other factors associated with birth asphyxia were meconium stained liquor and seeking healthcare services after six hours and above.

5.4 Recommendations

Actions Recommendations

1. Judicious use of the partograph is encouraged.
2. Education about preconception care and nutrition during pregnancy should be emphasized in order to prevent anemia in pregnancy which is a major risk factor for birth asphyxia as well as prevent congenital anomalies which are now on the rise
3. Specialized training and in-service training for the midwives and other healthcare providers on emergency obstetrics to keep them abreast of latest developments in

prevention of birth asphyxia. The seriousness of birth asphyxia as a medical condition should be emphasized.

4. High quality labour ward management practices should be implemented and policy recommendation on staffing, equipment and supplies, communication and research to improve maternal and neonatal outcome.
5. Counseling and psychotherapy for mothers who have babies with birth asphyxia due to poor prognosis and long term complications.
6. Health education to the general public on danger signs of pregnancy and the importance of seeking healthcare services as early as possible to improve pregnancy outcomes
7. Further research is recommended to establish the relationship between use of antiretroviral therapy in pregnancy and twin pregnancy which may lead to asphyxia due to prematurity.

Policy Recommendations

1. Since a majority of the mothers who had babies with birth asphyxia were secondary school and primary school leavers, the Ministry of Education needs to introduce sexual and reproductive health and rights education in the primary school curricula.
2. The ministry of health needs to declare pre-eclampsia and eclampsia a national disaster among women due to the increased number of maternal mortalities caused by this condition it should move fast to save the lives of the mothers.

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APPENDICES

APPENDIX I: BUDGET

ITEM	DETAILS	UNIT COST	NUMBER	DAYS	TOTAL
Proposal writing	Typing and printing concept paper,	1000	4	1	4000
	Literature review, typing and printing	1000	4	5	20000
	Supervisors final copies of the proposal	1000	3	1	3000
ERC review	Down-loading, typing and printing ERC forms	3000	3	1	9000
	Fees for ERC review	2000	1	1	2000
	Typing and printing corrections from ERC review	2000	3	5	30000
External disk	For information storage	10000	1		10000
Training of interviewers	Daily allowance for the principal investigator	5000	2	1	10000
	Daily allowance for the trainees	3000	10	1	30000
	Venue charges	4000	2	1	8000
	Stationeries	3000	1	1	3000
Pre-testing	Daily allowance of trainees	3000	10	1	30000

questionnaire	Daily allowance of principal investigator	6000	1	5	30000
Conducting research	Daily allowance of principal research officer(transport and lunch)	6000	1	10	60000
	Daily allowance of trainees	1000	10	120	1200000
Data processing and analysis	Daily allowance of principal research officer	4000	1	14	56000
	Stationeries(calculator, pens rubber, pencils)	2000	1		2000
Reporting of research findings	Binding the research books	5000	8	1	40000
	Informing the participants the finding of the study(Credit)	50	209	5	10450
	Publication fee	50000	2	1	100000
TOTAL(Ksh)					1627450
TOTAL(USD)					15,800

APPENDIX II:WORK PLAN

MONTHS ACTIVITIES	DEC 2016	JAN 2017	FEB 2017	MAR 2017	APR 2017	MAY 2017	JUN 2017	JUL 2017	AUG 2017	SEP 2017	OCT 2017	NOV 2017
Problem identification												
Proposal writing												
Proposal submission to the ERC												
Training of research assistants and pre-test of the questionnaire												
Data collection												
Data analysis												
Preliminary report writing												
Study presentation												
Publication												

APPENDIX III: INFORMED CONSENT INFORMATION

My name is Nyanchama Julie Nyamao from the University of Nairobi. I am inviting you to participate in a research on Correlation of maternal characteristics and birth asphyxia at Kenyatta National Hospital and Pumwani maternity hospital in Kenya. The objective of this research project is to determine relationship between maternal characteristic and birth asphyxia. It will be conducted in labour ward and newborn units Kenyatta National Hospital Teaching and Referral Hospital and Pumwani Maternity Hospital targeting mothers with asphyxiated newborns.

There is no risk if you decide to participate in the study. There is no cost for participating (information provided will help to understand maternal risk factors associated with birth asphyxia). If you chose to participate, do not write your name on the questionnaire, this study is anonymous. Your participation is voluntary. If you choose to participate please complete the questionnaire as honestly as possible. There will be a researcher to guide you through the questionnaire.

Benefits

There is no monetary benefit to participating in this research study. The results obtained will be used to add knowledge on how neonatal mortality a result of birth asphyxia can be reduced.

If you have any concerns as complaint, contact the Principal Research Officer,

Nyanchama Julie Nyamao

Mobile no. 0726640778

OR

KNH/UON Ethics committee

P.O.Box 20723-00202

Telephone-020725272

CONSENT AGREEMENT

I……., participant confirm that I have understand the relevant part of the study and hereby give consent to participate.

Sign Date

…….. …….

APPENDIX IV: CHETI CHA KIBALI KUSHIRIKI UTAFITI

Jina langu ni Nyanchama Julie Nyamao kutoka chuo kikuu cha Nairobi, Idara ya masomo ya uzalishaji wa akina mama wajawazito. Ningependa kufanya utafiti kuchunguza jinsi kutopumua vizuri kwa motto baada ya dakika tano anapozaliwa ikiwa kunaweza kusababishwa na afya ya mama au kipindi kirefu cha uchunguwa uzazi katika hospitali ya Kenyatta na ile ya Pumwani. Hii itakuwa katika chumba cha akina mama kujifungua na wodi za watoto wasio zidi umri wa mwezi mmoja.

Ninakualika kushiriki katika utafiti juu ya kuzaliwa kwa mtoto aliye na shida ya kupumua hata baada ya dakika tano baada ya kuzaliwa/kuzaliwa asphyxia.

Lengo la mradi huu ni kuamua uhusiano kati ya tabia ya uzazi na ukosefu wa hewa kwa mtoto aliyezaliwa. Utafiti huu utafanyika katika wodi ya wazazi na vitengo vya watoto wachanga katika hospitali ya Kenyatta National Hospital Teaching and Referral Hospital na Pumwani Maternity Hospital ikilengaakina mama wenye watoto wachanga waliokosa hewa baada ya kuzaliwa.

Uhifadhi wa Siri

Hakuna habari zako binafsi au jina lako zitakazotumika wakati wa kutayarisha ripoti ya utafiti.Ile namba ya kukutambulisha itakayotumiwa itajulikana tu na wahusika wa utafiti huu.

Malipo

Hakuna pesa au zawadi zitakazo tolewa kwa kushiriki katika utafiti huu lakini kutakuwa na manufaa katika kuhimarisha huduma kwa akina mama wajawazito

haswa waliona tahadhari ya kupata watoto wanaoshindwa kupumua hata baada ya dakika tano.

Madhara

Hakuna madhara yoyote kwa akina mama kushiriki kwa utafiti huu. Kutopeana ruhusa au kutoshiriki hakuta adhiri huduma ya afya kwako au kwa mtoto wako. Utafiti huu ni wa kujitolea na unawezakujitoa kwa wakati wowote.

Shida au Maswali

Ukiwa na maswali yoyote unaweza kuyaelekeza kwa mtafiti mkuu-

Nyanchama Julie Nyamao

Sanduku la Posta 869-40200 Kisii

Simu-0726640778

Ama Kwa,

KNH/UON Ethics Committee

S.L.P:20723-00200, Nairobi

Simu-020725272

CHETI CHA KIBALI CHA RUHUSA YA MAMA

Mimi….....nimeelezwa kwa kina juu ya utafiti huu. Nimepata ufahamu juu ya yale nimeelezwa na maswali yangu yamejibiwa kikamilifu.

Nina fahamu yakwamba ninaweza kujitoa katika utafiti huu pasipo na madhara yoyote kwangu au kwa mtoto wangu.

Sahihi ya mshiriki **Tarehe**

……..…… ……

APPENDIX V: QUESTIONNAIRE

Research Study Title: Correlate's of birth asphyxia and maternal characteristic-Kenyatta National Hospital Teaching and Referral Hospital and Pumwani Maternity Hospital, Kenya.

Participant unique identity _____

Date of data collection _____

INSTRUCTIONS:

Please tick in the boxes representing the most appropriate response and answer all the questions.

I assure that all information's will remain confidential.

SECTION I: Maternal Profile

1. Year of birth
2. What is your marital status
    a) Single ☐
    b) Married ☐
    c) Divorced ☐
    d) Window ☐
    e) Separated ☐
3. What is your main occupation
    a) Farmer ☐
    b) Employed ☐

c) Student ☐

d) Housewife ☐

e) Others (specify)……

4. What is your highest level of education

a) Not attended school ☐

b) Primary school ☐

c) Secondary school ☐

d) College ☐

e) University ☐

5. Total no of children……..

6. Did you visit ANC clinic? Yes ☐ No ☐

If yes, how many times

a) 1st visit ☐

b) 2nd visit ☐

c) 3rd visit ☐

d) 4th visit ☐

7. Did you suffer from any medical condition during pregnancy?

Yes ☐ No ☐

If yes state,

a) Elevated Blood Pressure ☐

b) Anaemia ☐

c) Bleeding ☐

d) Others (specify)……

8. How many babies did you deliver?

a) Singleton

b) Twins

c) Others (specify) …….

SECTION II: NEWBORN PROFILE

9. What was the Apgar score?

a) 1minute ☐

b) 5minutes ☐

10. What was the weight of the baby?

a) Between 2kg-2.5kg ☐

b) Between 2.5kg-3kg ☐

c) Above 3kg ☐

11. What was the sex of the baby

a) Female ☐

b) Male ☐

12.Grade of Asphyxia

Tick the correct grade on the box provided.

Status	**Grade 1**		**Grade 2**		**Grade 3**	
Conscious level	irritable/hyperated		Lethargic		comatose	
Suck Reflex	Abnormal/hyper		Poor		absent	
Primitive reflex	Exaggerated		Depressed		absent	
Seizures	absent		Present		present	
Respiration	Tachypnea		Present		severe apnea	
Apex beat	above 100		Below 100		absent	
Tone	normal		Mild		flaccid	

SECTION III: Labor and information

13. At what time did you start to experience labour pain.....?

14. When did you decide to come to hospital…….?

15. What was the color of LiquorAmni when membranes ruptured

a) Meconium stained ☐

b) Blood stained ☐

c) Clear liquor ☐

16. What was the mode of delivery?

a) Spontaneous vertex delivery ☐

b) Breech delivery ☐

c) Caesarean section ☐

If by Caesarean section, what was the reason (specify)…….

……

APPENDIX VI: ETHICAL APPROVAL

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

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KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
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Telegrams: MEDSUP, Nairobi

KENYATTA NATIONAL HOSPITAL APPROVED 10 MAY 2017 KNH/UoN-ERC P.O. Box 20723-00202 NBI

Ref: KNH-ERC/A/160

10th May 2017

Julie Nyamao Nyanchama
Reg. No.H56/80718/2015
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Julie

REVISED RESEARCH PROPOSAL – CORRELATION OF MATERNAL CHARACTERISTICS AND BIRTH ASPHYXIA AT KENYATTA NATIONAL HOSPITAL AND PUMWANI MATERNITY HOSPITAL IN KENYA (P117/03/2017)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above revised proposal. The approval period is from 10th May 2017 – 9th May 2018.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.`
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website **http://www.erc.uonbi.ac.ke**

Protect to discover

Yours sincerely,

PROF M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Assistant Director, Health Information, KNH
The Chair, KNH-UoN ERC
The Director, School of Nursing Sciences, UoN
Supervisors: Dr.Sabina Wakasiaka, Dr.Emmah Matheka