

**PREVALENCE AND FACTORS ASSOCIATED WITH PERINATAL ASPHYXIA
AMONG NEONATES HOSPITALIZED IN THE NEONATAL
INTENSIVE CARE UNIT OF FORT PORTAL
REGIONAL REFERRAL HOSPITAL**

BY

IKANG, BLESSING UMUTU

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DECLARATION

I declare that this research proposal has not been produced or submitted to any Institution for any purpose whatsoever.

Name; **IKANG, BLESSING UMUTU**

Date:.....

Signature:.....

APPROVAL

SUPERVISOR

DR ODONG RICHARD JUSTIN. MBChB (KIU 2011), MMED PAEDIATRICS AND CHILD
HEALTH (KIU 2017).

Signature;

Date;

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LIST OF ABBREVIATIONS

BMV	Bag Mask Ventilation
BW	Birth Weight
C/S	Caesarian Section
FHR	Fetal Heart Rate
FPRRH	Fort Portal Regional Referral Hospital
GA	Gestational Age
HIE	Hypoxic Ischemic Encephalopathy.
HIV	Human Immunodeficiency Virus
LBW	Low Birth Weight
MSL	Meconium Stained Liquor.
NICU	Neonatal Intensive Care Unit
SPSS	Statistical Package for the Social Sciences
SVD	Spontaneous Vaginal Delivery
V/E	Vacuum Extraction
WHO	World Health Organization.

DEFINITION OF TERMS

Prevalence: This is the ratio of the number of occurrence of a disease or event to the number of units at risk in the population. (Aslam *et al.*, 2014)

Antepartum: Period before labour (Mchaileet *et al.*, 2017)

Perinatal: It is the period shortly before and after birth (from 29 wks gestation to 4wks post partum) (LaRosa *et al.*, 2016)

Intrapartum: Period around delivery and birth (Mchaileet *et al.*, 2017)

Perinatal asphyxia, neonatal asphyxia or birth asphyxia is the medical condition resulting from deprivation of oxygen to a newborn infant that lasts long enough during the birth process to cause physical harm, usually to the brain (Aslam *et al.*, 2014)

Hypoxia: Is a condition in which the body or a region of the body is deprived of adequate oxygen supply at the tissue level (LaRosa *et al.*, 2016)

Neonate: A baby in the first 4 weeks after birth (Majeed *et al.*, 2017)

ABSTRACT.

Background; According to WHO 2015, it is estimated that approximately 3% of about 120 million neonates born each year in developing countries develop perinatal asphyxia and need resuscitation. This study was conducted to determine the prevalence and factors associated with birth asphyxia among neonates hospitalized in the neonatal care unit of fort portal regional referral hospital.

Methods; A hospital based retrospective and analytical study was done using data obtained from the records of the neonatal intensive care unit of fort portal regional from June 2016 to June 2017 of 100 neonates. Data was analyzed using STATA version 14. Ethical approval was obtained from KIU research ethics committee.

Results: The prevalence of perinatal asphyxia was high with a percentage of 21%. Immediate and short term complications of perinatal asphyxia in our study were hypoxic ischemic encephalopathy (57.14%), followed by infection (23.81%), seizure (14.29%), and death (4.76%).

Conclusion; It was recommended that FPRRH administration should train staffs in emergency obstetric care and also in resuscitation in order to reduce on the number of neonates with perinatal asphyxia.

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CHAPTER ONE:

INTRODUCTION

1.0 Background to the study

Birth asphyxia is defined as "the failure to initiate and sustain breathing at birth." (WHO, 2015). According to LaRosa *et al.*, 2016, Asphyxia is insufficient oxygen supply and can lead to severe hypoxic ischaemic organ damage in newborns followed by a fatal outcome or severe life-long pathologies. Although birth asphyxia is not always distinguishable as the cause of perinatal and postnatal death, its pronounced impact for the mortality in newborns is well-documented, representing profound deficits in current healthcare systems worldwide.

Mchaile *et al.*, 2017 states that, birth asphyxia is a leading cause of mortality and morbidity in neonates in developing countries, with an incidence of 100-250/1000 live births compared to 5-10/1000 live births in the developed world. It remains a significant cause of loss of life and adverse developmental outcome. The major causes of neonatal deaths globally were estimated to be infections (35%), preterm births (28%) and birth asphyxia (23%).

Various conditions can affect the fetus and neonate born with asphyxia. There are many reasons as baby may be not able to take enough oxygen before, during and after delivery (Aslam *et al.*, 2014). A mother may have medical condition that lowering the oxygen supply to the neonate such as preeclampsia, antepartum bleeding or some medicine; there may be some problem in the placenta such as insufficient placenta that may prevent oxygen to circulating in the fetus; difficulty during delivery process can proceed to the birth asphyxia (Aslam *et al.*, 2014)

Perinatal asphyxia is the fifth largest cause of under-5 deaths (8.5%) after pneumonia, diarrhea, neonatal infections and complications of preterm birth. Risk factors of birth asphyxia have been divided into antepartum, intrapartum and fetal (Majeed *et al.*, 2017) Risk factors include increasing or decreasing maternal age, prolonged rupture of membranes, meconium stained fluid, multiple births, non-attendance for antenatal care, low birth weight infants, malpresentation, augmentation of labour with oxytocin, antepartum haemorrhage, severe eclampsia and pre-eclampsia, antepartum and intrapartum anemia (Majeed *et al.*, 2017)

1.1 Problem Statement.

According to WHO 2015, it is estimated that approximately 3% of about 120 million neonates born each year in developing countries develop birth asphyxia and need resuscitation. Approximately 900,000 of these newborns die as the result of asphyxia. Asphyxia accounts for 23% of neonatal deaths globally, and 8% of all deaths in children under five years of age (Chiabi, *et al.*, 2013). Studies in East Africa are underway, one study in Tanzania by Mchaile *et al.*, 2017 showed that of the 1752 deliveries during the study period, 11.5% (n = 201) had birth asphyxia. Of the 201 newborns, 187 had hypoxic ischemic encephalopathy. Musooko *et al.* 2014 has also demonstrated increased incidence of neonatal mortality rates related to birth asphyxia in Uganda. In Fort Portal Regional Referral Hospital, as far as we are aware, such studies have not been done to determine the prevalence of and describe factors associated with birth asphyxia among hospitalized neonates in the neonatal intensive care unit which this study aimed to find out.

1.2 General Objective.

To determine the prevalence and factors associated with birth asphyxia among hospitalized neonates in the neonatal intensive care unit of FPRRH.

1.3 Specific Objectives.

The study was guided by the following objectives:

- 1) To determine the prevalence of birth asphyxia among neonates admitted in NICU of FPRRH.
- 2) To describe the complications associated with birth asphyxia among neonates admitted in NICU of FPRRH.
- 3) To describe the risk factors associated with birth asphyxia among hospitalized neonates in the NICU of FPRRH

1.4 Research Questions

The study was guided by the following:

- 1) What is the prevalence of birth asphyxia among neonates admitted in NICU of FPRRH?
- 2) What are the complications associated with birth asphyxia among hospitalized neonates in NICU of FPRRH?
- 3) Which is the risk factor associated with birth asphyxia among neonates hospitalized neonates in NICU of FPRRH?

1.5 Significance of the Study

The WHO has estimated that 4 million babies die during the neonatal period every year and 99% of these deaths occur in low-income and middle income countries. Three major causes account for over three quarters of these deaths. This includes; serious infection (28%), complication of preterm birth (26%), and birth asphyxia (23%).

The risk factors of birth asphyxia in this country are not well known and this implies that, there are newborns with birth asphyxia who probably die from the condition because of poor care or misdiagnosis especially in this resource constrained region. Therefore carrying out this research is an urgent need so that best informed decisions are taken.

Also, this is an academic research which plays an important role as a requirement for the award of a bachelor's degree in medicine and surgery.

1.6 Scope of Study

1.6.1 Time Scope: The study was limited to one month of data collection and report writing.

1.6.2 Geographical scope: The study was limited to FPRRH NICU

1.6.3 Content Scope: The study was limited to prevalence, factors and complications of birth asphyxia

CHAPTER TWO:

LITERATURE REVIEW

2.1 Introduction

This chapter consists of literature reviewed from journals, books and different websites. The information has been synthesized and discussed according to the objectives stated in chapter one

A neonate is said to be asphyxiated if the following conditions are fulfilled: (1) Umbilical cord arterial pH < 7; (2) Apgar score of 0 to 3 for longer than 5 minutes; (3) Neurological manifestations (e.g. seizures, coma, or hypotonia); and (4) Multisystem organ dysfunction, e.g., cardiovascular, gastrointestinal, hematological, pulmonary, or renal system (Mchaile *et al.*, 2017).

2.2 Prevalence of birth asphyxia

According to Durkan *et al.*, (2015), Perinatal asphyxia is a global neonatal problem which significantly contributes to both morbidity and mortality. It is the fifth largest cause of under-five mortality. Each year approximately 1–3 neonates in every 1000 suffer a period of oxygen (O₂) deprivation at birth. LaRosa *et al.* 2016. stated that asphyxia and hypoxia during labor or delivery is responsible for an estimated 1.2 million deaths each year, accounting for 29% of neonatal mortality.

Worldwide 56 million deaths occur every year, from that 10.5 million, i.e. 20% represent children aged below 5 years. In this group, the leading cause of death is perinatal complications. (Golubnitschaja *et al.*, 2015) Current statistical data considering epidemiology of prenatal, perinatal and postnatal pathologies worldwide have not been systematically analyzed; sometimes these data are even controversial as provided for single countries. The prevalence of birth asphyxia as per 1000 live births in selected countries were found to be highest in east Africa with Tanzania leading with 45.9% and Japan, a developed country with only 4 per 1000 live births and it therefore seems that development of birth asphyxia is directly related to income status of the country and is more pronounced in developing countries. (Golubnitschaja *et al.*., 2015)

One study was conducted to determine the prevalence of perinatal asphyxia in newborns seen in the Special Care Baby Unit. A retrospective study of newborns managed for perinatal asphyxia over a 1-year period was employed. All inborn babies with Apgar scores <6 at 5 min and out born babies with no Apgar score but with features of asphyxia were studied. Results according to

Ekwochi et al, 2014, showed that, of the 223 neonates admitted during the study period, 67 (30.1%) newborns had perinatal asphyxia, in this study, only 47 (70.1%) case files with complete data were retrieved, giving a prevalence of 21.1%.

Another prevalence study was done in Tanzania by Mchaileet *et al.*, 2017 and they showed that of the 1752 deliveries during the study period, 11.5% (n = 201) had birth asphyxia. Of the 201 newborns, 187 had HIE. Of these 187 with HIE; 39.0% had moderate HIE and 10.2% had severe HIE according to the Sarnat and Sarnat classification.

Neurological signs that were observed during the study period were; weak/absent reflexes (46.0%), hypotonia (43.3%) and lethargy (42.2%). Mortality was 9.1% among the 187 newborns with HIE. Mortality was higher among newborns with severe HIE 84.2% (16/19) compared to those with moderate HIE 1.4% (1/73). On the 7th day after delivery, 17.1% (32/187) of the newborns did not show any change from the initial score at delivery. (Mchaileet *et al.*, 2017)

García-Alix *et al.*, (2017) conducted a study to examine the incidence and the prevalence of neonatal hypoxic-ischemic encephalopathy (HIE) in a tertiary Spanish center over a 9-year period, before the implementation of a hypothermia program. infants > or =34 weeks gestation, born between 2000 and 2008 with evidence of perinatal asphyxia and neonatal encephalopathy were identified. HIE was classified as mild, moderate or severe. Joinpoint regression model was used to identify changes in the trends of HIE incidences. Results showed that a total of 90,963 live infants were born in La Paz Hospital between 2000 and 2008, and 23.3% of them (21,228) were admitted to the Neonatal Unit. In addition, 200 infants were referred from other centers. A total of 110 infants had HIE, of which 90% were inborn. The overall incidence of HIE was 1.088 per 1,000 live births, and the incidence of clinically significant HIE (moderate and severe grades) was 0.49 per 1,000 live births. The incidence of HIE showed a linear downward trend throughout the study period (slope = -5.37; $P < 0.05$). Fifty-two neonates had moderate or severe HIE, this represents a prevalence of 2.42 per 1,000 infants admitted to the Neonatal Unit and means that 5-6 infants a year would have been candidates for therapeutic hypothermia. It was concluded that, Neonatal HIE, and in particular significant HIE, is an infrequent condition. (García-Alix *et al.*, 2017)

Another study was done to investigate the trend in birth asphyxia and perinatal mortality in the Netherlands for a decade. A nationwide cohort study among women with a term singleton pregnancy was used. Birth asphyxia was defined as a 5-minute Apgar score < 7 (any asphyxia) or

5-minute Apgar score <4 (severe asphyxia). Perinatal mortality was defined as mortality during delivery or within 7 days after birth. Multivariable analyses were used to adjust for confounding factors. Results showed that the prevalence of birth asphyxia was 0.85% and severe asphyxia 0.16%. Between 1999 and 2010 birth asphyxia decreased significantly with approximately 6% ($p=0.03$) and severe asphyxia with 11% ($p=0.03$). There was no significant change in perinatal mortality rate (0.98 per 1000 live births). Simultaneously the referral rate from primary to secondary care during labor increased from 20% to 24% ($p<0.0001$) and the intervention rate for fetal distress from 5.9% to 7.7% ($p<0.0001$). It was concluded that, In the Netherlands, a study conducted by Ensing et al, 2015 showed that the risk of birth asphyxia among term singletons has slightly decreased over the last decade without a significant change in perinatal mortality

Dongol *et al.*, (2010) conducted a study and the aim of this study was to assess the prevalence of birth asphyxia, identify the common obstetric and neonatal risk factors, and study the cause of death. All babies born in Dhulikhel Hospital (DH) from Jan 2007 to Oct 2009 with a diagnosis of birth asphyxia (5 min Apgar <7 and those with no spontaneous respirations after birth) were included in the study ($n=102$). Clinical information was collected retrospectively from maternal records (maternal age, gravida, type of delivery, presence of meconium, induced or spontaneous labour, and pregnancy complications). The NICU records provided additional information about new born infant (birth asphyxia, stages of birth asphyxia, birth weight, sex and subsequent mortality). Results showed that among the 3784 live births there were 102 babies with birth asphyxia prevalence of 26.9/1000 live births. Babies with Hypoxic ischemic encephalopathy (HIE) Stage 1 had a very good outcome but HIE III was associated with a poor outcome. Males, primipara and pregnancies with complications were associated with a higher rate of birth asphyxia. Septicemia, necrotizing enterocolitis, preterm delivery, convulsion and, pneumothorax were associated with higher mortality and morbidity. Conclusion: Birth asphyxia was one of the commonest causes of admission and mortality in NICU. Babies with HIE Stage III had a very poor prognosis. Birth asphyxia combined with other morbidities was associated with a higher mortality.

Athumani, (2008) conducted a study to determine the prevalence and immediate outcome of infant with hypoxic ischemic encephalopathy (HIE) admitted at the Neonatal ward of Muhimbili National Hospital. A Prospective cohort hospital based study at the neonatal unit of Muhimbili National Hospital (MNH) was employed. It involved neonates with either low apgar score (score \leq

7 at 5 minutes) and/or those young infants that were found to have symptoms and signs suggestive of HIE. Data were collected using a checklist, and analyzed using Epi-info computer program. Results of the study showed the prevalence of birth asphyxia at neonatal ward MNH to be 30.9% and among these, 92 neonates (82.1%) had HIE. Mortality due to HIE was 27.2%. Majority of neonates with mild HIE (92.3%) was discharged to their mothers while majority of those with severe HIE (51.6%) died. (Athumani,2008)

2.3 Risk factors of perinatal asphyxia

Risk factors seen in different studies were post maturity, low birth weight, and eclampsia. According to a study conducted at Neonatal Unit of King Chulalongkorn Memorial Hospital, Thailand; inappropriate antenatal care, post-maturity, vacuum extraction, male sex, prolapsed cord and 1 and 5-minute low Apgar scores, ($p < 0.0001$) were significant risk factors for hypoxic ischaemic encephalopathy (HIE).(Tritipwanit *et al.*, 2015).

According to Pitsawong *et al.*, (2012) in a study to determine the risk factors for birth asphyxia using a retrospective case-control study design recruited 450 women who delivered at Phramongkutklao Hospital between January 1, and December 31, 2009 were recruited by consecutive selection. The study sample comprising of 150 women who delivered newborns with an APGAR score at 1 minute of 7 or less, while the control comprised 300 women who delivered newborns with an APGAR score at 1 minute more than 7. The risk factors for birth asphyxia included moderate to thick meconium (OR 5.51, 95% CI 2.58-11.77), breech presentation (OR 4.53, 95% CI 1.72-11.92), birth weight $< 2,500$ grams (OR 2.46, 95% CI 1.4-4.29), sedation with morphine or pethidine (OR 2.29, 95% CI 1.37-3.84) and preterm delivery (OR 2.08, 95% CI 1.24-3.51). (Pitsawong *et al.*,2012)

Sitthivuddhiet *al.*,(2016) also conducted a study to determine the risk factors for hypoxic-ischemic encephalopathy (HIE) in asphyxiated newborn infants. They used A retrospective study of 17,706 newborns, who were admitted to the Neonatal Unit of King Chulalongkorn Memorial Hospital, from July 2014 till the end of December 2015. 84 infants with perinatal asphyxia were enrolled in the present study. All of the possible risk factors that might have contributed to asphyxia were identified and recorded. HIE was diagnosed based on the Modified Sarnat-Sarnat Score for the diagnosis of neonatal encephalopathy. The clinical data of the HIE group were compared with those of the HIE negative group. Results showed that Inappropriate antenatal care (OR 9.4; 95%CI:

2.6-35.4), post-term gestation (OR 7.4; 95%CI: 1.4- 34.8), vacuum extraction (OR 5.4; 95%CI: 1.1-26.8), male (OR 4.8; 95%CI: 1.3-19.1), prolapsed cord ($p = 0.01$) and 1 and 5-minute Apgar scores, ($p < 0.0001$) were significant risk factors for birth asphyxia and subsequent HIE. (Sitthivuddhiet *al.*,2016)

According to Utomo, (2011), the risk factors of birth asphyxia identified in a retrospective study using data collected from medical record of pregnant women and neonate that was born in Dr Soetomo Hospital between 1 January 2009 to Desember 2009 including Data of the inborn neonate (birth weight, gestational age, Apgar score) and the data of pregnant mother (age, preeclampsia, antepartum bleeding, premature rupture of the membrane and mode of delivery) showed that the risk factors that associated with asphyxia were: antepartum bleeding, p 0.009, OR 2.607 (1.242-5.473), preeclampsia, p 0.000, OR 2.372 (1.688-3.333), prematurity p 0.000, OR 4.055 (2.939-5.595), post mature, p 0.001, OR 3.811 (1.637 – 8.872), low birth weight, p 0.000, OR 5.833 (4.245-8.016), and caesarian section, p 0.000, OR 3.778 (2.750-5.190). In conclusion, risk factors for asphyxia were antepartum bleeding, preeclampsia, low birth weight, prematurity, post date delivery and caesarian section. (Utomo, 2011).

Another Retrospective Case control study, conducted at Neonatal Intensive Care Unit of pediatric ward (I, II, III) and in Gynecology wards (I, II, III) of Civil Hospital Karachi, Dow University of Health Sciences to identify the risk factors of birth asphyxia. Study was conducted from January 2011-November 2012. Neonates diagnosed with birth asphyxia were considered as “cases” while neonates born either with normal vaginal delivery or by cesarean section having no abnormality were considered as “control”. Demographics of both the mother and neonate were noted and Questions regarding possible risk factors were asked from mother. Results showed that out of total 240 neonates, 123 were “cases” and 117 were “control”. Mean maternal age in “case” group was 24.22 ± 3.38 while maternal age of control group was 24.30 ± 4.04 . Significant antepartum risk factors were maternal age of 20–25 (OR 0.30 CI 95% 0.07-1.21), booking status (OR 0.20 CI 95% 0.11-0.37), pre-eclampsia (OR 0.94 CI 95% 0.90-0.98) and prim gravidity (OR 2.64 CI 95% 1.56-4.46). Significant Intrapartum risk factors were breech presentation (OR 2.96 CI 95% 1.25-7.02), home delivery (OR 16.16 CI 95% 3.74-69.75) and maternal fever (OR 10.01 CI95% 3.78-26.52). Significant Fetal risk factors were resuscitation of child (OR 23 CI 95% 31.27-1720.74), pre-term

babies (OR 0.34 CI 95% 0.19-0.58), fetal distress (OR 0.01 CI 95% 0.00-0.11) and baby weight (OR 0.13 CI 95% 0.05-0.32).

It was recommended that measures should be taken to prevent neonatal mortality with great emphasis on skilled attendance at birth and appropriate care of preterm and low birth weight neonates.(Aslam *et al.*, 2014)

Chiabi *et al.*, (2013) also in their study showed that the prevalence of neonatal asphyxia was 80.5 per 1000 live births. Statistically significant risk factors were the single matrimonial status, place of antenatal visits, malaria, pre-eclampsia/eclampsia, prolonged labor, arrest of labour, prolonged rupture of membranes, and non-cephalic presentation.

Hospital mortality was 6.7%, that 12.2% of them had neurologic deficits and/or abnormal transfontanellar ultrasound/electroencephalogram on discharge, and 81.1% had a satisfactory outcome and concluded that the incidence of birth asphyxia in this study was 80.5% per1000 live birth with a mortality of 6.7%. Antepartum risk factors were: place of antenatal visit, malaria during pregnancy, and preeclampsia/eclampsia. Whereas prolonged labor, stationary labor, and term prolonged rupture of membranes were intrapartum risk factors. Preventive measures during prenatal visits through informing and communicating with pregnant women should be reinforced. (Chiabi *et al.*, 2013)

According to Nayeri *et al.*, (2012), Asphyxia is a medical condition in which placental or pulmonary gas exchange is impaired or they cease all together, typically producing a combination of progressive hypoxemia and hypercapnia. Nayeri *et al.*, (2012), conducted a case-control study in which all neonates born from May 2002 to September 2005 in Vali-e-Asr Hospital were studied. 9488 newborns were born of which 6091 of the live patients were hospitalized in NICU. 546 newborns were studied as case and control group. 260 neonates (48%) were female and 286 neonates (52%) were male. Among the neonates who were admitted, 182 of them were diagnosed with asphyxia and twice of them (364 newborns) were selected as a control group. The variables consist of; gestational age, type of delivery, birth weight, prenatal care, pregnancy and peripartum complications and neonatal disorders.

Results showed that showed that 35 (19.2%) patients had mild asphyxia, 107 (58.8%) had moderate asphyxia and 40 (22%) were diagnosed as severe asphyxia. Mean maternal age was

34.23±4.29yr; (range: 23-38 years); and mean of parity was 2±1.2; (range: 1-8). Risk factors in this study included emergent Caesarian Section, preterm labor (<37w), low birth weight (<2500g), 5 minute Apgar (less than 6), need for resuscitation, nuchal cord, impaired Biophysical Profile, neonatal anemia, and maternal infertility. They concluded that all risk factors listed above play a role in asphyxia. The majority of these factors are avoidable by means of good perinatal care Nayeri *et al.*, 2012)

Another study was conducted to assess the risk factors for perinatal asphyxia among babies fulfilling the inclusion criteria and compared them with matched controls. Maternal or antepartum factors included were maternal age, gestational age, hypertension, diabetes mellitus and antenatal clinic (ANC) visits less than 3. Intrapartum factors included malpresentation, mode of delivery, meconium stained amniotic fluid, and Chorioamnionitis and Prolonged rupture of membranes. Factors independently associated with perinatal asphyxia using multiple logistic regression analysis were instrumental delivery, inadequate antenatal care, maternal anemia and meconium stained amniotic fluid. Identifying the risk factors and taking appropriate measure could help in reducing the incidence of perinatal asphyxia. (Gane *et al.*, 2013)

Birth asphyxia is an important cause of morbidity and mortality in neonatal period. This was the cross sectional study conducted in the tertiary care Centre of Ahmadabad on the full term babies with birth asphyxia to find the risk factors of birth asphyxia. Results showed that there was a total of 401 (6.6%) babies born with apgar score of less than 7 at one minute and among them, 320 (79.8%) were full term babies and 81 (20.2%) were preterm babies. Among the babies 52.5% were male, 56.9% were primigravida, and only 41.9% had antenatal care present, 42.2% had meconium stained liquor and 47.2% were small for date babies. Conclusion was made that, birth asphyxia is common in the babies of the mothers who had not received proper antenatal care. Maternal anemia, primipara, meconium stained liquor babies have more chances of getting birth asphyxia (Delal *et al.*, 2013)

2.4 Complications of perinatal asphyxia

According to West et al, outcome of birth asphyxia depends on apgar score at 5 minutes, heart rate at 90 seconds, time to first breathe, duration of resuscitation arterial blood gases and acid -base status at 10, and 30 minutes of age. It is measured as short-term (early) and long-term outcome.

The early outcome is either death/or presence of hypoxic ischaemic encephalopathy (HIE) grade I, II or III, according to Sarnat staging. According to a study done in Nepal incidence was 2.9 per 1000 live born of whom 20% had severe (Apgar score: 1-3) and 80% moderate birth asphyxia (Apgar score: 4-6). Staging of HIE was performed by Sarnat's staging and 30% were found with various stages of HIE with higher incidence in low Apgar score group. Most of the HIE cases presented with depressed neonatal reflexes, seizures, lethargy, and pupillary abnormalities. The common acid base disturbance was metabolic acidosis, observed only in babies with HIE-III (Ancora et al,2013)

Bouiller et al.,(2016) showed that Intrapartum asphyxia is a rare yet serious complication during labor with immediate consequences and possible long-term neurological impairment that results in cerebral palsy. This study was continued with the evaluation of hypoxia long-term consequences on the psychomotor development of these kids and especially the occurring of cerebral palsy and a lot of intellectual deficiencies including but not limited to global development delay

A study was conducted to determine the frequency of birth asphyxia and short-term (early) outcome in relation to age at admission and place of delivery using a descriptive cross-sectional study, a study was done in the Pediatric Department, Neonatal Ward of Liaquat University Hospital (LUH) Hyderabad from January to December 2009. All babies received at nursery or delivered in LUH with birth asphyxia were included, while babies having major congenital abnormalities, with birth weight < 1800 gm or preterm were excluded. After consent and enrollment their detailed history including peri-natal history, Apgar score, resuscitation measures, problems and outcome were recorded on a pre-designed study proforma. Short-term outcome was measured after 7 hours as clinically improved, developed neurological disability (Hypoxic Ischemic Encephalopathy stage II or III) or death. Results showed that the frequency was (n = 600; 25%) of LUMHS born and (n = 310; 61.63%) were received within 6 hours, (n = 272 45% were LUMHS born and n = 7 7% were out born), (n = 37; 38.95%) within 24 hours and (n = 9; 10.3%) after 24 hours. On initial neurological evaluation (n = 90; 15%) were normal while clinical signs of HIE were present in 85%, with (n = 180; 30%) in stage I, (n = 210; 35%) in Stage II and (n = 120; 20%) in stage III of HIE. Outcome was measured after 72 hours, around 53.3% (320) were normal, 31.6% (190) developed neurological disability, while 15% (90) babies expired. It was

concluded that early recognition of birth asphyxia and timely referral to tertiary center can reduce morbidity and mortality.(Memon *et al.*,2012)

Yelamali *et al.*, (2014) carried out the study to identify the outcome of newborn with birth asphyxia and also the factors responsible for outcome of asphyxiated newborns. This was a retrospective study on newborns with the diagnosis of birth asphyxia at SNMC and HSK hospital and research centre, Bagalkot. 163 consecutive asphyxiated neonates who were admitted in neonatal unit and fulfilled the inclusion criteria were fully studied. Clinical information was collected retrospectively from maternal records, NICU records and referral notes.

Results of this study showed that of the total 1842 admissions, 163 (8.8%) babies were asphyxiated. There were more males than females 106(65%) and 57(35%) respectively. In our study, 72.39% of babies were admitted to neonatal ward within 4 hours, 17.17% between 4 to 24 hours and 10.42% between 24 to 72 hours of delivery. Early admission to NICU had better outcome compared to late admission. Among the total 163 newborns of birth asphyxia that fulfilled the inclusion criteria, 33(20.24%) newborns died. Of which, there was no mortality in HIE stage I, mortality in HIE stage II were 3(1.84%) and HIE stage III were 30(18.4%). The recovery rate of HIE stage I, HIE stage II and HIE stage III were 98.36%, 75% and 32.85% respectively. Mortality and morbidity were more common in out born babies compared to inborn babies. It was concluded that birth asphyxia is the commonest cause of hospital admission of a newborn to NICU. Early referral has better outcome (Yelamali *et al.*,2014)

CHAPTER THREE:

METHODOLOGY

3.1 Study design.

A hospital based descriptive retrospective and analytical study to determine the prevalence of, describe the complications and risk factors associated with perinatal asphyxia among hospitalized neonates in the neonatal intensive care unit of Fort Portal Regional Referral Hospital.

3.2 Study site.

The study was conducted in the neonatal intensive care unit of fort portal regional referral hospital, in Kabarole district, fort portal municipality. It is 295 kilometers from Kampala the capital city of Uganda, along Kampala, Mityana, Mubende and Kyenjojo highway in the south west part of the country. FPRRH has about 500 beds. The hospital has a well-organized NICU admitting about a 5 neonates a day (NICU records. 2017) including preterm babies. The unit has phototherapy machines and well regulated warmers

3.3 Study population.

The study populations were neonates admitted in the NICU. It is reported that about 60 patients are admitted on monthly basis in NICU giving a total of 720 patients annually.

3.4 Inclusion Criteria.

All neonates hospitalized in the neonatal intensive care unit of FPRRH during the study period were included.

3.5 Exclusion Criteria.

Neonates whose files were with incomplete data were excluded.

3.6 Sample size determination.

Samples size consisted of neonates admitted from June 2016 to June 2017 since it was retrospective data.

3.7 Sampling procedure.

Non random sampling technique used, where all neonates admitted from the study period were included into the study.

3.8 Data collection.

3.8.1 Data collection instrument.

The researcher used a data check list.

3.8.2 Data collection procedure.

Data was collected by use of a check list. The records office was the source of files which were sorted. The researcher ticked or filled in check list against the data in the selected files.

3.9 Data analysis.

Data was electronically analyzed using a computer program STATA version 14. It was initially entered and coded in Microsoft excel version 2016 prior to importation to STATA version 14 for analysis. Analysis was done per objective and then summarized and displayed into a table, graph and pie charts.

3.11 Data presentation.

Data was presented in form of tables, graphs and pie charts.

3.12 Data quality control.

The quality of data was enhanced by using well-structured data check list

3.13 Limitations of the study.

- (i) **Financial constraints;** stationery and typing. This was minimized by soliciting some funds from my parents and my sponsors.
- (ii) **Incomplete files:** This was mitigated by including those files that are complete.

3.14 Ethical consideration.

The researcher observed all relevant ethical and legal considerations that are applicable to scientific research. Approval was sought from KIU-Research committee. After approval of the proposal, the researcher presented it together with introduction letter to the Hospital Director to seek permission. Then proceeded to the ward for data collection. The researcher obtained written consent from the records assistant to access the data of patients. All information obtained in the

course of this study was treated with utmost confidentiality and was not used outside the scope of the study.

3.15 Dissemination of results

Copies of the report were forwarded to;

- (i) KIU-Faculty of clinical medicine and dentistry.
- (ii) FPRRH administrator to be shared among the staff and will act as feedback.
- (iii) A copy to the NICU of FPRRH.
- (iv) Personal copy for future reference.

CHAPTER FOUR:

PRESENTATION AND INTERPRETATION OF RESULTS

4.0: The socio-demographic characteristics of study participants.

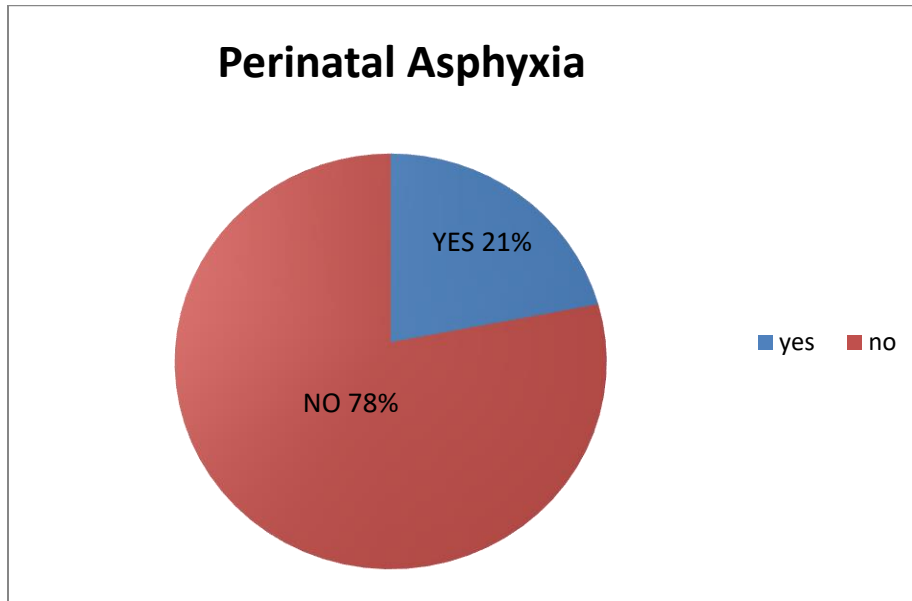
The socio economic characteristics of the study population are shown in Table 1. Majority of mothers were in the age range of 15-20 years 42(42.42%), most were primiparous 46 (46.46%) and gravidity was 42 (42.42%). Majority of mothers had infections as the obstetric conditions at the time of delivery were 25(25.5%). Majority of the peasants were 64 (64.66%). 55(55.56%) of mothers had their ANC from a health centre.

Table 1: Socio-demographic characteristics of study participants.

Characteristics	Frequency(N)	Percentage (%)
Maternal Age		
15-20 years	42	42.42
21-25 years	22	22.22
26-30 years	23	23.23
Above 30 years	12	12.12
Parity		
Po	46	46.46
P1	25	25.25
P2	8	8.08
P5	4	4.04
Above P 5	16	16.6
Gravidity		
G1	42	42.42
G2	29	29.29
G3	8	8.08
Above G5	20	20.20
Obstetric conditions		
APH	23	23.47
Pre eclampsia	10	10.20
Malaria	19	19.39
Anemia	10	10.20
GDM	7	7.14
Infection	25	25.51
None	4	4.08
Occupation		
Peasant	64	64.66
Business	8	8.08
Formal employment	27	27.27
Place of ANC		
Hospital	33	33.33
Health centre	55	55.56
None	11	11.11

4.1 Prevalence of perinatal asphyxia.

The study (figure 1) showed that 21(21%) of neonates in the NICU had perinatal asphyxia.



4.2 Table 2: Complications of perinatal asphyxia among hospitalized neonates in NICU of FPRRH

Complication of asphyxia	Frequency	Percentage (%)
HIE	12	57.14
Infection	5	23.81
Seizure	3	14.29
Death	1	4.76

The result showed that hypoxic ischemic encephalopathy was the highest complication of perinatal asphyxia 12(57.14%), followed by infections 5(23.81%), with death 1(4.76%) as the least of the complication of perinatal asphyxia among hospitalized neonates.

Table 3: Bivariate logistic regression analysis for factors associated with perinatal asphyxia in neonate in the NICU of FRRH.

Variable	Perinatal Asphyxia		cOR	95% CI	P-Value
	No(78)	Yes(21)			
Maternal age					
15-20years	33	09	1.00		
21-25years	17	05	1.08	0.31-3.73	0.91
26-30years	20	03	0.55	0.13-2.27	0.41
>30years	08	04	1.83	0.45-7.50	0.40
Parity					
P0	40	6	1.00		
P1	17	8	3.13	0.94-10.4	0.062
P2	6	2	2.22	0.36-13.7	0.389
P5	2	2	6.67	0.78-56.6	0.082
P>5	13	3	1.54	0.34-7.03	0.579
Gravidity					
G1	36	6	1.00		
G2	21	8	2.29	0.69-7.49	0.17
G3	6	2	2.00	0.32-12.33	0.46
G>5	15	5	2.00	0.53-7.57	0.30
No. of ANC					
None	8	3	1.00		
2	5	1	0.53	0.43-6.65	0.63
3	62	15	0.65	0.15-2.72	0.55
>3	3	2	1.78	0.19-16.5	0.61
Place of ANC					
Hospital	27	06	1.00		

Health centre	43	12	1.26	0.42-3.74	0.68
None	08	03	1.69	0.34-8.31	0.52
Occupation					
Peasant	49	15	1.00		
Business	06	02	1.09	0.19-5.97	0.92
Permanent Employment	23	04	0.57	0.17-1.90	0.36
Obstetric condition					
APH	19	04	1.00		
Malaria	14	05	1.69	0.38-7.49	0.49
Anemia	07	03	2.03	0.36-11.48	0.42
GDM	04	03	3.56	0.56-22.54	0.17
Infection	20	05	1.18	0.28-5.09	0.81
None	03	01	1.58	0.13-19.42	0.72
WOA					
Term	54	16	1.00		
Pre-term	24	05	0.70	0.23-2.14	0.54

cOR= Crude odds ratio CI= confidence Interval.

None of the variables was found to be statistically associated with perinatal asphyxia at Bivariate binary logistic regression analysis. Variables with p-values < 0.2 were subjected together to a multivariate binary logistic regression analysis to identify factors that were independently

associated with perinatal asphyxia in the neonates. They were parity, gravidity and obstetric conditions, but none remained independently associated with perinatal asphyxia in the neonates.

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Discussion

Perinatal asphyxia continues to be a major problem in health care, and this is especially so in many developing countries where there is still poor access to health care and the facilities available are substandard. According to Durkan *et al.*, Perinatal asphyxia is a global neonatal problem which significantly contributes to both morbidity and mortality.

5.2 Prevalence of perinatal asphyxia.

The prevalence of perinatal asphyxia from our study was 21%. A similar study done by WHO, 2015 to determine prevalence of birth asphyxia showed that approximately 3% of about 120 million neonates born each year in developing countries develop perinatal asphyxia and need resuscitation.

Another prevalence study done in Tanzania by Mchaile *et al.*, 2017 showed that of the 1752 deliveries during the study period, 11.5% had birth asphyxia, while results according to Ekwochi *et al.*, 2014 showed a 21.1% prevalence from the 223 neonates admitted during the study period.

The result from our study showed a prevalence rate similar to that of Ekwochi *et al.*,

The variation in the prevalence rate may be attributed to different variables explored in the other studies. The lower rates from other studies may also be due to a more improved health care system, better trained and skilled health workers and better new born care and resuscitation.

5.3 Complications of perinatal asphyxia.

Immediate and short term complications of perinatal asphyxia in our study were hypoxic ischemic encephalopathy (57.14%), followed by infection (23.81%), seizure (14.29%), and death (4.76%). A similar study done by Yelamali *et al.*, (2014) showed that 20.24% had HIE. Another study done by Mchaile *et al.*, 2017 in Tanzania showed that 42.2% of the neonates had HIE as a complication.

The difference in the results from the different researches done can be attributed to the differences in study settings, facilities, and sample size.

5.4 Conclusion

The prevalence of perinatal asphyxia was high in our neonatal intensive care unit. Hypoxic ischaemic encephalopathy was the leading complication of perinatal asphyxia in our NICU.

5.5 Recommendations

We therefore recommend the following.

- FPRRH administration should train staffs in emergency obstetric care and also in resuscitation in order to reduce on the number of neonates with perinatal asphyxia.
- A more thorough and focused antenatal care program which is aimed at educating the mother on the risks of perinatal asphyxia and preventing perinatal asphyxia.

5.6 Areas of further research

From this study following areas are recommended for future research

- Assessment of the knowledge and attitude of health workers towards neonatal care and resuscitation
- To assess the standard of care received by neonates in the neonatal intensive care unit and its relation to the development of perinatal asphyxia related complications

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APPENDICES

APPENDIX I: Check list for data collection

Section A: Maternal details

1. Age
 - A. 15-20 years []
 - B. 21-25 years []
 - C. 26-30 years []
 - D. Above 30 years[]
2. Parity.....
3. Gravidity

Section B: Prevalence of birth asphyxia

1. Total number of birth from June 2016 to June 2017.....
2. Total number of patients that had birth asphyxia from 2016 to June 2017.....

Section C: Risk factors of birth asphyxia

1. Number of antenatal care.
 - A.None []
 - B.Two []
 - C.Three []
 - D.More than three[]
2. Place of antenatal care
 - A. Hospital []
 - B. Health centre []
3. Occupation.....
4. Medical/obstetric condition during labor (e.g.pre eclampsia, malaria and anemia etc).....
5. Date in weeks of the baby at delivery
6. Mode of delivery
 - A. SVD []

B. C/S []

7. Weight of the baby at delivery

8. Gender of the baby

A. Male[]

B. Female[]

9. Delivery related complications documented(breech presentation, cord prolapsed etc).....

10. Sedation used

A. Yes []

B. No []

11. State any other risk factor otherwise stated in the file

.....
.....
.....

Section D: Complications (outcome) of birth asphyxia

Please specify both immediate and late complications/outcome of newborns with birth asphyxia

1. Baby died(immediate outcome)

Yes []

No []

2. In the space below specify the complications the survivors developed (reviewed from follow up registers) e.g. HIE, cerebral palsy and epilepsy etc

.....
.....
.....

End

APPENDIX (II): WORK PLAN

ACTIVITY	OCTOBER				NOVEMBER				DECEMBER			
CHOSING TOPIC												
PROPOSAL WRITING												
DATA COLLECTION												
REPORT WRITING												
DISSEMINATION OF RESULTS												

APPENDIX (III): BUDGET

ACTIVITY	UNIT COST	SUBTOTAL
Proposal Writing		70,000
Stationary	50,000	
Consultation	20,000	
Data collection		
Transport	3 weeks(each week	75,000
Lunch	25,000)	75,000
Stationary	25000 each week	25,000
	25,000	
Report writing		
Data analysis		
Consultation	50,000	50,000
	50,000	50,000
TOTAL		345,000

APPENDIXE (IV): MAP OF UGANDA SHOWING THE LOCATION OF KABAROLE DISTRICT



KABAROLE DISTRICT

APPENDIX (V): MAP OF KABAROLE DISTRICT SHOWING THE LOCATION OF STUDY AREA.



FORTPORTAL REGIONAL REFERRAL HOSPITAL