



**UNIVERSITY of  
RWANDA**

**IMMEDIATE OUTCOMES OF NEONATES DELIVERED BY MOTHERS  
WITH HYPERTENSION DISORDERS: A RETROSPECTIVE CROSS –  
SECTIONAL STUDY AT A REFERRAL HOSPITAL IN RWANDA.**

By

**UWIZEYIMANA Phoibe**

218000190

A dissertation submitted in partial fulfillment of the requirements for the degree of  
MASTERS OF SCIENCES IN NURSING COLLEGE OF MEDICINE AND HEALTH  
SCIENCES

**SEPTEMBER, 2019**

**KIGALI, RWANDA**



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NEONATOLOGY TRACK

SUPERVISOR: Dr Anita Collins

CO SUPERVISOR: Mrs Tengera Olive

**SEPTEMBER, 2019**

**KIGALI, RWANDA**

## **DECLARATION**

I, **UWIZEYIMANA Phoibe** hereby declare that this research entitled “*Immediate neonate outcomes of mothers with hypertension disorder at Butare University Teaching Hospital in*

*Rwanda*” submitted for partial fulfillment of the requirement for Master of sciences Degree in NEONATOLOGY of University of Rwanda, College of Medicine and Health Sciences is my original work and has not been presented for a degree in any other University or for any other award. I also declare that a complete list of references is provided indicating all sources of information quoted or cited.

Signed by **UWIZEYIMANA Phoibe**

September, 2019

## **DEDICATION**

I dedicate this work to Almighty God for His care and protection.

My husband NDAYISHIMIYE Leoanard

My beloved children, May family,

My supervisors,

My friends and colleagues

## **ACKNOWLEDGEMENT**

God is above all; first I am thankful to the Almighty God for blessing each day of my life more especially during my studies.

Highly appreciate the Government of Rwanda for its efforts in education for all people without borders.

Special thanks to the UR- College of Medicine and Health Sciences and CHUB who facilitated my study.

I am very thankful to my husband Leonard NDAYISHIMIYE, for the support, kindness love and patience. To my children Promesse NDAYISHIMIYE, El Elohe Jacob NDAYISHIMIYE, Hervin SANGWA NDAYISHIMIYE; Dasha Benjamin NDAYISHIMIYE; Asha Ella NDAYISHIMIYE. I love you all.

Profound gratitude to my Supervisor Mme Tengera Olive and Co-supervisor Dr Anita Collins

Thanks to my family and friends.

May God bless you all.

## **ABSTRACT**

**Background:** Globally, maternal and perinatal morbidity and mortality due to hypertension during pregnancy, is a significant public threat in both developed and developing countries. Hypertensive disorders in pregnancy are leading causes of maternal and perinatal mortality worldwide and complicate 5–14 percent of all pregnancies. There is a need to improve the management of neonates from mother with hypertensive disorders by reducing foetal and neonatal mortality.

The aim of this study is to assess immediate outcomes of neonates delivered by mother with hypertension disorders and associated maternal factors at University Teaching Hospital in Rwanda.

**Methods:** A retrospective quantitative study of patients' files was conducted for the period of January 2016 and March 2019 inclusive. A census sample of 114 files was used to collect data using a pretested checklist. Data were analyzed by SPSS 21. Descriptive statistics such as mean and standard deviation and frequencies tables were used to summarize the data. Chi-square was used to assess the association between maternal factors with neonatal outcomes

**Results:** The most neonatal outcomes of mothers with hypertension disorders were found; Low birth weight was found at 75.4%, prematurity at 59.6%, NICU admission at 50.4% was found, intra-uterine foetal retardation at 32.4%, neonatal death at 22.8%. Nearly two-third (62%) of the sample had pre-eclampsia. Gestational age, past medical history, mode of delivery, referral status, chronic hypertension, and GTPAL were found to be associated with the neonate's outcomes.

**Conclusion:** The present study concluded that there is a relationship between maternal factors and neonatal outcomes such as; birth asphyxia, low birth weight, prematurity, NICU admission, intra-uterine growth retardation and neonates death. Therefore early detection and management of hypertensive disorders is recommended.

**Keywords:** Neonatal outcomes and maternal hypertensive disorder of pregnancy (HDP).

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## LIST OF ACRONYMS AND ABBREVIATIONS

<b>ACOG:</b>	American Congress of Obstetricians and Gynecologists;
<b>ANC:</b>	Antenatal Care;
<b>BW:</b>	Birth weight
<b>CHUB:</b>	Butare Teaching university Hospital
<b>EDHS:</b>	Ethiopian Demographic Health Surveys;
<b>FMOH:</b>	Federal Ministry of Health;
<b>GTPAL:</b>	Gravida, term birth, preterm birth, abortion, living child
<b>HDP:</b>	Hypertensive Disorders of Pregnancy;
<b>ISSHP:</b>	International Society for the Study of Hypertension in Pregnancy
<b>IUGR:</b>	Intra Uterine Growth Retardation
<b>LBW:</b>	Low birth weight
<b>LMP:</b>	Last menstrual period
<b>NICU:</b>	Neonatal Intensive care unit
<b>PIH:</b>	Pregnancy Induced Hypertension;
<b>VLBW:</b>	Very Low Birth Weight
<b>WHO:</b>	World Health Organization

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## **CHAPTER ONE: INTRODUCTION**

### **1.1 INTRODUCTION**

This chapter describes the definitions of key concepts, background to the study, the problem statement, the aim and objectives of the study. It also highlights the research questions, as well as the significance of the study.

### **1.2 BACKGROUND**

Outcomes of neonates delivered by mothers with hypertensive disorders in pregnancy are mainly; prematurity, low birth weight, intrauterine foetal demise (IUFD), intrauterine growth retardation, respiratory distress, admission in neonatal intensive care unit, and neonatal deaths (Abera, and Demissie, 2019). It is estimated that 2.6 million stillbirths occur each year with 98% being recorded from low and middle-income countries and complicate 5 to 15 % of pregnancy (Melese, Badi and Aynalem, 2019).

Gudeta and Regassa, (2019 ) revealed that 15% of maternal deaths are attributable to hypertension in the United States, it is the second leading cause of maternal mortality and it increase the fetus risk from complications like neonatal death ,poor placental transfer of oxygen, growth restriction, preterm birth, placental abruption, and stillbirth. Study done in Jordan showed that low birth weight , prematurity and the neonatal mortality were the most neonatal outcomes in mothers with hypertensive disorders in pregnancy (Khader *et al.*,2018).

It is worth noting that the number of stillbirth rate in women with a hypertensive disorder in pregnancy was 21.9 per 1000 births than in mothers without hypertension disorders in China (Xiong *et al.*, 2018.). According to the World Health Organization (WHO 2017), in Latin America and in the Caribbean hypertensive disorders are the main cause of most maternal deaths (25.7%) and are, therefore, considered the most majors complications of pregnant in these areas (Wagnew *et al.*, 2016 ). The risk factors of hypertension disorders in pregnancy have been found as existing of hypertension before, null parity, obesity, multiparty, environment and social factors, maternal complications related to hypertension disorders and diabetics (Kahsay, *et al* 2018). Hypertensive disorders are classified into 4 categories gestational hypertension, chronic hypertension, pre-eclampsia/eclampsia and pre-eclampsia superimposed on chronic hypertension (Abera and Demissie, 2019).

The findings from a tertiary care maternity hospital of Delhi in India revealed that prematurity, still birth and low birth weight were the main foetal complications to hypertension disorders during pregnancy (Bramham, Parnell and Nelson-Piercy, 2014).

In Uganda in women with hypertension disorders the most immediate outcomes of neonates were preterm deliveries (Kiondo, *et al* 2014). In Tanzania neonatal death was found to 60-70% and was complicated from hypertensive disorders (Perry, *et al*, 2018).

In Rwanda, the Demographic Health Survey (RDHS), 2014-2015 showed that neonatal and post-neonatal mortality rates stood at 20 deaths per 1,000 live births and 13 deaths per 1,000 live births, respectively. The perinatal mortality rate was 29 deaths per 1,000 pregnancies (Rwanda Ministry of health, 2018.p.129). In this survey generally, neonatal outcomes are documented; however, these outcomes has been not reported in relations to mothers with hypertensive disorders. The scarcity of evidence about this area of study in Rwanda inspired the researcher to assess the neonatal outcome of mothers with hypertension disorders in order to improve the management of neonates from hypertensive disorders by reducing foetal and neonatal mortality by timely delivery and appropriate care.

### **1.3 PROBLEM STATEMENT**

Globally, maternal and perinatal morbidity and mortality due to hypertension during pregnancy, is a significant public health threat in both developed and developing countries (Khaddar *et al.*, 2018). Approximately, worldwide 7 000 new-born die every day, on the first day about 1 million die and close to 1 million die within the next 6 days due to hypertension during pregnancy (Xiong *et al.*, 2018). Globally it is estimated that 42 000 mothers die each year due to hypertensive disorders of pregnancy and complicate the neonatal outcomes at 15%. Nearly all of these deaths occur in low-resource settings (99%), with death in high-income settings being very rare (Vousden *et al.*, 2019).

Several studies have reported similar complications related to neonatal outcomes and among women with hypertension disorder. A systematic review by King's College in London showed that neonatal outcomes such as preterm delivery, low birth weight and neonatal admission at neonatal intensive units were high in mothers with hypertensive disorders (Bramham 2014). Furthermore, a study from Netherlands confirmed that children from mothers with hypertension had an increased risk for admission to the neonatal intensive care unit compared with children from mothers with normal blood pressure (Gudeta and Regassa, 2017).

Ghana, Ethiopia and Tanzania showed that the most neonatal outcomes related to hypertensive disorders were likely to be low birth weight, prematurity, neonatal death and the high number was admitted in NICU (Brown *et al.*, 2015, Nathan *et al.*, 2018, Mitao *et al.*, 2016).

In Rwanda, study conducted by Musafili *et al.*, (2017) found that macerated stillbirths and flesh stillbirths were caused by hypertension during pregnancy. With the latter, a specific look at CHUB revealed high incidence of hypertensive disorders around 7.6 cases per month among all 350 patients admitted (CHUB, 2017). However, there is a limited study on immediate outcome of neonates delivered by mothers with hypertension mothers. It is in this regard; this study was conducted to assess the immediate outcomes of neonates from mothers with hypertensive disorders and associated maternal factors.

#### **1.4 AIM OF THE STUDY**

To assess immediate outcomes of neonates delivered by mothers with hypertension disorders, and associated maternal factors at University Teaching Hospital in Rwanda.

#### **1.5 RESEARCH OBJECTIVES**

1. To identify immediate parameters and status of neonates delivered by mothers with hypertension disorder at University Teaching Hospital in Rwanda
2. To determine the association between immediate outcomes of neonates and maternal factors with hypertension disorders at University Teaching Hospital in Rwanda

#### **1.6 RESEARCH QUESTIONS**

1. What are the immediate parameters and status of neonates delivered by mothers with hypertension disorder at University Teaching Hospital in Rwanda?
2. What is the relationship between maternal factors delivered by mothers with hypertensive disorder and immediate outcome of neonates at University Teaching Hospital in Rwanda?

#### **1.7 SIGNIFICANCE OF THE STUDY**

There is no local study regarding neonatal outcomes of mothers with hypertension done at CHUB. This study may benefit in improving quality of service provision in maternal and neonatal care in the following area:



## **Practice**

The results from this study may help in understanding the neonatal outcomes in mothers with hypertension disorder at CHUB and therefore set strategies to improve maternal and neonatal care and reduce neonatal morbidity and mortality from the mothers with hypertension disorders.

## **Education**

The findings of the study may help nurse educators to add a component that will equip students to understand the proper management to meet the demand for neonatal management in mothers with hypertension disorders at CHUB.

## **Research**

The findings of the study will be the bank of knowledge and baseline for further research in the domain of neonatology.

## **1.8. DEFINITION OF CONCEPTS**

**Neonatal outcome:** Refers to neonates who had at least one of the following complications: prematurity, , respiratory distress syndrome, low birth weight, birth asphyxia, large-for-gestational-age, macrosomia (delivery of an infant weighing >4000 grams), intra uterine growth retardation, small-for-gestational-age, intra uterine fetal demise and congenital malformations, admission to the neonatal intensive care unit, or perinatal death (Ahmed *et al.*, 2017)

**Immediate neonatal period:** Refers to a post-natal period from birth to 24 hours which is very critical period for new-born and mother (Asseffaid and Demissie, 2019).

**Hypertension disorders:** Define as the most common medical disorders during pregnancy when a blood pressure is 140mmHg systolic and 90mmHg diastolic or more and taken on two occasions at least 4 hours apart, or a rise in systolic blood pressure >30mmHg and or diastolic blood pressure >15mmHg above and are classified into 4 categories which are gestational hypertension, chronic hypertension, pre-eclampsia and eclampsia and pre-eclampsia superimposed with chronic hypertension (Abera, Id and Demissie, 2019).

**Gestational age** :is a measure of the age of a pregnancy which is taken from the woman's last menstrual period (LMP), or the corresponding age of the gestation as estimated by a more accurate method if available.(Ahmed *et al.*, 2017)

**Low birth weight (LBW):** is defined by the World Health Organization as a birth weight of an infant of 2,499 g or less, regardless of gestational age. (Ahmed *et al.*, 2017)

**Normal weight:** is define as 2500–4200 g (Obsa *et al.*, 2019)

**Small for gestational age (SGA):** newborns are those who are smaller in size than normal for the gestational age, most commonly defined as a weight below the 10th percentile for the gestational age (Khader *et al.*,2018).

**Large for gestational age (LGA):** is an indication of high prenatal growth rate. LGA: is often defined as a weight, length, or head circumference that lies above the 90<sup>th</sup> percentile for that gestational age. A baby is large for also gestational called” large for gestational age” if the weight is greater than the 90th percentile at birth (Khader *et al.*, 2018). **APGAR score:** It is a measure of the physical condition of a new born infant where the assessment of heart rate, respiration, muscle tone, reflexes, and skin coloration is done and a score of ten represents the best possible condition (Asseffaid and Demissie, 2019). **Birth asphyxia:** Is defined as a reduction of oxygen delivery and an accumulation of carbon dioxide (Ahmed *et al.*, 2017). **Perinatal:** It is a period immediately before and after, it starts at the 20<sup>th</sup> to 28<sup>th</sup> weeks of gestation and ends to 4 weeks after birth (World Health Organization, 2017).

## **1.9 STRUCTURE/ORGANIZATION OF THE STUDY**

This study was conducted at Butare University Teaching Hospital (CHUB) and it is made by six chapters. The first chapter is introduction include the introduction of chapter, background, problem statement, the aim of the study, research objectives, research questions, significance of the study, definition of the concepts, structure /organization of the study and conclusion. The second chapter is literature review include introduction of chapter, theoretical literature, conceptual framework. The third chapter is research methodology include introduction of chapter, research design, research approach, research setting, population, sampling, sample size, sample strategy, validity and reliability of research instrument, data collection, data analysis, ethical consideration, data management, data dissemination, limitations or challenges and conclusion of the chapter. The fourth chapter is results. The five is discussion and the six chapter is conclusion and recommendations.

## **1.10. CONCLUSION**

This chapter highlighted the definitions of key concepts, background of the study, the problem statement, aim and objectives, research questions, and the significance of the study.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1. INTRODUCTION**

This chapter summarizes the theoretical literature, empirical literature, critical review and identified the gaps and the conceptual framework utilized for this study.

This chapter gives a deep understanding of the previous literature related to the topic under study. The association of immediate outcomes of neonates, with maternal factors with hypertension disorders. The composition of this literature review is guided by the research objectives and revolves around identify neonatal parameters and determine the association between immediate neonatal outcome with maternal factors of mothers with hypertension disorders. The literature reviewed shed more light on the topical issues. The related literature focuses on the theoretical literature, empirical literature, and critical review /identified the gaps and the conceptual framework utilized for this study.

### **2.2. THEORETICAL LITERATURE**

Immediate parameters and status of neonates delivered by mothers with hypertension in this study refer to the one of the following: low birth weight, prematurity, intrauterine growth retardation, neonatal death, NICU admission, intra uterine foetal demise, stills birth, birth asphyxia.).These neonatal complications are due to hypertensive disorders, genetic factors, immunologic factors, and other maternal factors which cause placental hypoxia and dysfunction and leads to the release of anti-angiogenic factors and other inflammatory mediators (Stergiotou, 2014).

Intrauterine growth retardation is considered when the birth weight is less than 10th percentile for the gestational weight or less than that of 90% of babies of the same gestational age. The causes are individual genetics, placenta insufficient by reduction and nutrients to the baby, maternal factors like the hypertension, diabetics, malaria and others co morbidities. (Malhotra, et al. 2019) Intrauterine growth restriction IUGR can be classified as early- or late-onset, depending the gestational age. Early onset IUGR (<32 weeks gestation) newborns. With early-onset placental insufficiency are more likely to be preterm, with a high risk of morbidity or mortality. The second classification is late onset of IUGR 32 weeks of gestational age, and it presents growth restriction up to 80% of FGR cases. It is diagnosed by the measurements and the assessment by ultrasound and physical assessment (Malhotra, et al. 2019). The treatment is the prevention where 4 antenatal standards are respected, adequate nutrition, treatment of the co morbidities which are underlying cause Practice healthy lifestyle habits.

If you drink alcohol, take drugs, or smoke. The neonates with IUGR increase the risk of neonatal death, long time in NICU, prematurity with long- or short-term consequences (Figueras, and Gratacos, 2017).

Preterm birth is defined as a n infant delivered at <37 weeks gestation, about 15 million babies are preterm (before 37 completed weeks of gestation) every year and , and it is the leading cause of death and about 1 million in 2015 die every year (Nathan *et al.*, 2018). Preterm birth is classified into 3 categories: extremely preterm (less than 28 weeks), very preterm (28 to 32 weeks) moderate to late preterm (32 to 37 weeks). The cause is unknown but there are the risk factors such as genetic, multiples pregnancy, chronic conditions, and infections. The complications of preterm birth include death, long and short-term sequences. The management is including prevention and treatment of the cause (Chambers et al, 2019).

Birth weight is categorized as normal birth weight, 2.5 to 4 kg, and low birth weight from 1.5 kg up to 2.5kg, Very low birth weight from 1kg up to 1.5kg, extremely low birth weight baby up to 1kg). The cause of low birth weight is prematurity and IUGR. The complications of low birth weight are prematurity, high neonatal intensive admission and death. The management is the prevention of risk factors of preterm birth, adequate nutrition and the treatment of any underlying cause (Chavkin, et al 2019).

Neonatal death refers to death occurs within the first 28 days; perinatal death refers to the death that occurs within the first 7 days of life and stillbirth is foetal define as death which occur at or after 20 to 28 weeks of pregnancy. It is also known as intra uterine foetal demise (Health, Gudeta and Regassa, 2017). The term is different from miscarriage which is an early pregnancy loss and live birth where the baby is born alive or dies after (Health, Gudeta and Regassa, 2017). The most neonatal deaths (75%) occur during the first week of life, in the first 24 hours and about 1 million new-born die. The mainly causes of neonatal death are preterm birth, intrapartum-related complications (birth asphyxia), infections, maternal co morbidities complications mainly hypertensive disorders. A retrospective cross-sectional study at Addis Ababa shows that the most common neonatal were stillbirths, which accounted for 363 (30.2% due to hypertension disorders (Wagnew *et al.*, 2016). The management is to strength the quality care given around the birth.

Birth asphyxia is defined as a lack of blood flow or gas exchange to the foetus in the pre, intra and after birth, this cause systemic and neurologic sequel to the foetus due decreased blood flow and/or oxygen.

In developing countries, the rate of birth asphyxia is 10 times higher and 15-20% die in the neonatal period, and up to 25% of survivors had permanent neurologic deficits. It is classified into 3 categories mild, moderate and severe birth asphyxia (Ibrahim, Muhye and Abdulie, 2017). In Rwanda birth asphyxia was found high and mortality rate due to birth asphyxia was 13 times higher than previously recorded (Uwingabire and Gowan, 2019). The risk factors of birth asphyxia include increasing or decreasing maternal age, severe eclampsia and pre-eclampsia, bleeding before delivery, induction or augmentation of labour, prolonged rupture of membranes, meconium stained fluid, multiple births, antenatal care, low birth weight infants, malpresentation, (Tewesa *et al.*, 2017). Prompt management of birth asphyxia is important to prevent it and to minimize the damaging effects of decreased oxygen to the baby (Ibrahim, Muhye and Abdulie, 2017).

Hypertension in pregnancy is defined as a systolic pressure  $\geq 140$  mmHg and/or a occasions at least 4 hours apart as the diagnostic criterion (Shrestha Pradhan *et al.*, 2018). It can be chronic hypertension which may start before 20 weeks up to 12 weeks in post-partum and it complicate 0.9-1.5% of pregnancies. The management is to measure 24 hour urine baseline and to monitor blood pressure every week in the third trimester, fetal growth assessment and antenatal checkup. Planed delivery must be at 37 weeks if requiring antihypertensive drugs if not go up to 38-39 weeks (Shrestha Pradhan *et al.*, 2018). Gestational hypertension which manifested after 20 weeks of gestation and resolves by 12 weeks postpartum, it progress to preeclampsia ~50% preeclampsia, 10% severe and increased maternal morbidity and mortality, early diagnosis and treatment of severe features it is recommended. Preeclampsia and eclampsia characterized by blood Pressure  $> 20$  weeks gestational age  $\geq 140$  systolic or 90 diastolic on two occasions at least 4 hours apart. If  $\geq 160/110$ , proteinuria/  $\geq 300$ mg/24 hours, protein/creatinine and convulsions in ratiocase of eclampsia  $\geq 0$ . The risk factors of having pre-eclampsia include past medical history of chronic hypertension or pre-eclampsia, primipara, extreme age, obesity, low socio economic, like comorbidities like diabetes. Magnesium sulfate may reduce the neurological complications and give steroids to the mother (Upadya and Rao, 2018 p. 676). The last classification of hypertensive disorder in pregnancy is pre-eclampsia superimposed on chronic hypertension this 20-50% occurs in women with chronic hypertension (Hassan *et al.*, 2015).

A cohort study at Danemark showed that having chronic hypertension increase the risk of hypertensive disorders of pregnancy which affect pregnancy and persists for more than 20 years. (Behrens *et al.*, 2017) In additional the study in India showed that among the etiology may be the first exposure to chorionic villi (in primiparity), or exposed to a superabundance of

chorionic villi (in case of hydatidiform mole or twins), with also with genetic exposure (Upadya and Rao, 2018). Delay in diagnosis, ineffective treatment and misdiagnosis are the contributions factors to increase the neonatal and maternal complications ( Obsa *et al.*, 2019). Early detection of hypertension, close monitoring, and health education may improve in proper management which include also antihypertensive treatment, timely decision of delivery, mode of delivery and availability of trained health care even after delivery (Nathan *et al.*, 2018). However, the delivery is recommended, regardless of severity, at this 37weeks because at this gestational age, fetal risks are outweighing potential benefits to the fetus. (Obsa *et al.*, 2019). Planned early delivery may prevent some of this complication and reduce the number of c/section, despite this planned delivery this leads to increase the number of late preterm or early term, so those neonates will have the long term or short consequences (Paulo *et al.*, 2017).

## **2.2 EMPIRICAL REVIEW**

### **2.2.1 Immediate outcomes of neonates delivered by mothers with hypertension disorders**

It has been estimated that 10-15% of pregnancies will be complicated by hypertension and cause preterm birth and perinatal death (Kheir, Ali and Kononna, 2014). Several studies showed that a retrospective cross-sectional study at Addis Ababa stillbirths was at 30.2%, prematurity at 32.8%, respiratory distress at 30.2% and low birth weight at 30, 2% .Moreover, babies delivered by mothers with preeclampsia were admitted in neonatal intensive care unit than those who have been delivered by mother without hypertension disorders. Studies from Ghana showed that adverse perinatal outcomes determinant includes neonate's admission to the Neonatal Intensive Care Unit, birth asphyxia, prematurity at 21.7% and neonatal complications like low birth weight, neonatal death, intra uterine growth retardation, and one and 5-minute APGAR scores <7 occurred 34.0%, and 14.7% neonates respectively (Adu-Bonsaffoh *et al.*, 2017).

According to the systematic review done in 3 years from 2013-2017 using the Pub med data base show that 70.67 of babies in mothers with hypertension disorders born by caesarean section compared to the 27% babies delivered by by mother without hypertension disorders and low birth weight was found at 63% (Paulo *et al.*, 2017).

## **2 2. 2. Relationship between immediate outcomes of neonates with maternal factors with hypertension disorders**

Several studies have concluded that neonatal outcomes associated with different types of hypertension were mostly prematurity of 52% babies ,the low birth weight of 53% and was significant correlated to types of hypertension 8.6% had birth asphyxia, neonatal death 22% (Kheir *et al.*,2014). A registry-based retrospective cohort study in Tanzania showed that associated maternal factors with neonatal outcomes were mothers with low birth weight infants were more likely to be single as compared to those who had normal birth weight 14.7% vs. 11.5%. In addition, mothers with neonates of low birth weight were more likely to have 4 more visits as compared to mothers with normal birth weight infants, and were also more likely to have higher parity as compared to women in the comparison group (Mitao *et.al.*, 2016).

The study conducted in Botswana in mothers with severe hypertension disorders found that there is an increased risk of stillbirth, preterm birth, prematurity at 35.4%, neonatal death 30.8, low birth weight 39.4%, Intra uterine growth retardation at 8.5% and low APGAR score at 38.4%. About 15.8% of newborns needed resuscitation and 40.1% were admitted in NICU admission (Terefe *et al.*, 2015).

In India, the incidence of low birth weight was found at 57.6% in mothers with hypertension who did not accomplished 4 antenatal care visit and these contributed towards a greater number of stillbirths (Saini, et al.,2019).Several studies such as ;Nigeria, Ethiopia, Botswana ,Ghana, Southern Africa showed the associations between immediate outcomes of neonates and maternal factors delivered by mothers were mainly prematurity, low birth weight, intrauterine foetal demise (IUFD), intrauterine growth retardation, respiratory distress, admission in neonatal intensive care unit, and neonatal deaths (Johsonet *al.*,2018; Browne *et al.*, 2015 & Okey *et al.*,2016).

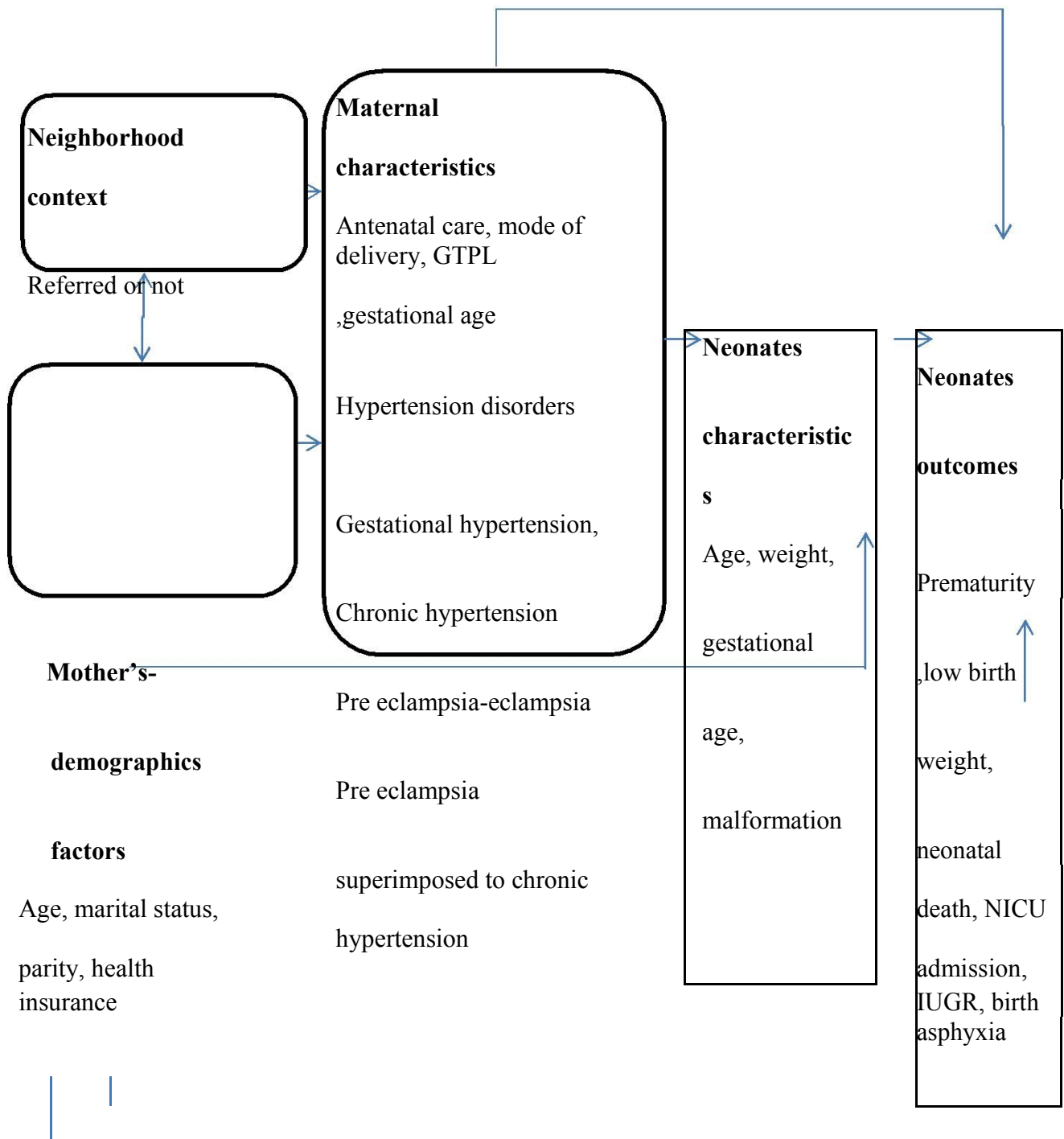
### **2.3 CRITICAL REVIEW AND IDENTIFIED THE GAPS**

Through the review of literature numerous researchers highlighted neonatal outcomes of hypertensive mothers globally, even in Sub-Saharan Africa. In addition the literature showed that, early diagnosis, timely delivery, right decision and effective management are needed to reduce maternal and neonatal morbidity and mortality in mothers with hypertension disorders. Nevertheless, these neonatal complications from mothers with hypertension are still high. Despite the listed complications of hypertensive disorders to the maternal and neonatal death, in Rwanda there is a limited study conducted on immediate outcomes of neonates delivered by mothers with hypertension disorders. There is a need of more research in this area to contribute in reduction of this big number of these maternal and neonatal deaths as well as strengthening maternity and neonatal intensive care unit.



## 2.4. CONCEPTUAL FRAMEWORK

This study uses framework adapted from Conceptual framework for adverse birth outcomes Describes by Balojoko Olusanya. (Olusanya and Ofovwe, 2010 p.409-415).



**Figure 1:** Study conceptual Framework for neonatal Birth Outcomes adapted Olusanya and Ofovwe, 2010 p.409-415)\*.

\*Adapted from Olusanya and Ofovwe, 2010 p.409-415)

All variables are derived from the literature. According to this framework, the neighborhood context affects and is affected by socio and demographics factors. The maternal obstetrics characteristics factors affect the health outcomes of infant. In this study neighborhood context refers to referred or not, maternal socio demographics factors refer to mother's, health insurance, marital status, gravida, para, abortions, living (GTPAL), pregnancy, past medical history, gestation age, use of antenatal care services, and the mode of delivery. The maternal obstetrics characteristics refers to hypertensive disorders including gestational hypertension, chronic hypertension, pre-eclampsia –eclampsia, pre-eclampsia surimposed on chronic hypertension.

Neonatal outcomes include preterm birth, prematurity, low birth weight, death, intra-uterine foetal demise, growth retardation, and birth asphyxia. Furthermore, this study aimed to identify neonatal parameters and status and assess the link between neonates 'health factors outcomes characteristics with and the hypertensive disorders. This conceptual framework showed the relations between the independent and dependent variables.

## **2.5 CONCLUSION**

This chapter highlighted the theoretical literature, empirical literature. In addition, the study conceptual framework utilized is presented. In the following chapter is research methodologies, data collection methods along with the sample population and the fundamental philosophies that underpin this research. The aim is to find a clearer insight into the matter at hand. The next chapter provides details on the research design and methodology.

## **CHAPTER THREE RESEARCH METHODOLOGY**

### **3.1. INTRODUCTION**

This chapter outlines the research design, the research method, the population under study, the sampling procedure, and the method that was used to collect data. The pre-test of the research instrument are addressed. Ethical considerations pertaining to the research are also discussed. This chapter further presents details of data management, data dissemination, limitations and challenges.

### **3.2. RESEARCH DESIGN**

A retrospective cross-sectional study design of mothers 'records/files was used to determine immediate outcomes of neonates delivered by mothers with hypertension from January 2016 to March 2019.

### **3.3 RESEARCH APPROACH**

Non-experimental approach, quantitative crosses sectional retrospective approach

### **3.4. RESEARCH SETTING**

This study was conducted at Butare University Teaching Hospital (CHUB). It is one of referral hospitals in Rwanda. CHUB is located in Ngoma Sector, Huye District, and Southern Province. CHUB has a capacity of 500 beds. CHUB receives patients from district hospitals from southern province (Kabutare, Kibilizi, Gakoma, Kabgayi, Kigeme, Kaduha, Bushenge, Gihundwe, Ruhango, Nyanza etc). The study was carried out in maternity departments of CHUB. This maternity has five unit which are labor ward, theatre, and gynecology. Obstetrics and outpatient unit. In labor ward there is 3 deliveries tables, 2 waiting rooms, 2 immediate post-partum, an admission and emergency ward. It is not having neonatology inside it is outside in pediatrics department.

### **3.5. POPULATION**

According to Polit & Hungler (1999:37), the population is defining as a totality of all the members and objects that conform to a set of specifications. The population in this study is all neonates delivered by mothers with hypertension disorder admitted at CHUB from January 2016 to March 2019.

### **3.6. SAMPLING METHOD**

We utilized census method to collect the data from mothers 'files with hypertension disorders during pregnancy in archives. We accessed the maternal department register and identified the number of mothers who had hypertension disorder during pregnancy. Relevant Patient file numbers / codes were recorded for further identification of individual files to extract the information. In total 114 files were eligible and selected for the past study.

#### **3.6.1 Sample size**

In total 114 neonates were eligible and selected for the past study .All neonates delivered by mothers with hypertensive disorders from January 2016 to March 2019 with inclusion criteria were used as sample size ,

#### **3.6.2 Sampling strategy**

A purposive strategy was used and a census sampling method (also known as complete enumeration) was used. The data were collected from all available patients 'files delivered by mothers with hypertensive disorders with the inclusion criteria in the study period. The census sampling was chosen due to its relevance of this study since the method is suitable for studies that consider gathering data on every member of the population for the period and the condition under review. In this view, a total 114 files were eligible and selected for the past study

##### **3.6.1.1 Inclusion**

These criteria specify the characteristics that people in the population must possess in order to be included in the study (Polit & Hungler 1999:278). The eligibility criteria in this study were that the participants had to be neonates delivered by mothers with hypertension disorder during pregnancy, (gestational hypertension, pre-eclampsia, eclampsia or pre-eclampsia, eclampsia superimposed on chronic hypertension) in the period of study between January 2016 to march 2018.

##### **3.6.1.2 Exclusion criteria**

Neonates delivered by mothers with hypertension with others co morbidities like diabetes

### 3.7. VALIDITY AND RELIABILITY

Validity has been defined as the degree to which the research tool measures what it is intended to measure ((Polit & Hungler 1999:279) There is content validity and face validity For the content validity the check list were obtained from the public domain in published journals in the literature to ensure that all content regarding immediate neonatal outcomes were well covered. This inclusion ensured that the research tool had content validity

#### Content validity

Objectives	Components of conceptual framework	Components into research instrument
To identify neonatal outcomes of mothers with hypertension disorders in pregnancy	Infants parameters and neonatal outcomes	Third Part
To identify the association between neonatal outcomes with maternal factors of hypertensive disorders in pregnancy	Socio demographic , obstetrics maternal factors maternal factors and neonatal outcomes	First, Second and third part

Face validity refers to the degree to which a test appears to measure what it supposed to measure.( Polit & Hungler 1999:279). Face validity was considered and achieved through structuring the check list into three separate parts from the public domain. Every part had valid items related to the variable under study.

Reliability of a research instrument refers to its ability to generate the same results when used under the same conditions. (Polit & Hungler 1999:278).In this study for reliability refers to that .The data collection checklist was pretested on ten patients ‘files that were not included in the final data. The results of this pre-test suggested minor correction of the checklist before final data collection. Items that were removed are included in appendix B. These corrections concerned the drop out of the item on antenatal booking, occupation of the mother and the level of educational attainment. These items were cancelled because they were not documented in patients ‘files.

### **3.8. DATA COLLECTION PROCEDURE**

After getting ethical clearance from IRB and permission from CHUB research and ethics committee the data was collected by principal investigator and two well-trained researcher assistants. The principal research and two assistants visited the Hospital archives and selected the patient's numbers corresponding to the records of mother with hypertensive disorders. All retrieved files were kept alone for exploration of neonates and maternal parameters.

#### **Data Collection instruments**

Data collection was done by using a check list. All variables of interest and relevant to the maternal and neonate were retrieved.

Data regarding the demographic parameters of the mothers like antenatal check-up, gestational age type of maternal hypertensive disorder of pregnancy, obstetric, mode of delivery have recorded from the files. Neonatal parameters like sex, gestational age, birth weight, and status of neonates like stillbirths, respiratory distress syndrome, , meconium aspiration syndrome, perinatal asphyxia, admission in neonatology were recorded.

Check list items have used emanated from the public domain and has been developed from the published literature. The checklist consisted of 3 parts: the first part concerned the socio-demographics retrieved from the study done on perinatal outcomes of hypertensive disorders in pregnancy at a tertiary hospital in Ghana (Endeshaw and Berhan, 2015) from in Cohort study done in South Africa (Nathan *et al.*, 2018) and from also in the study done by (Asseffaid and Demissie, 2019), the second one was the types of hypertension disorders in pregnancy retrieved from study done on immediate outcome with maternal hypertensive disorders of pregnancy in neonatal intensive care unit done (Hassan *et al.*, 2015); the third part was neonatal parameters and status were retrieved from study in Wolaita zone, Southern Ethiopia (Asseffaid and Demissie, 2019), from the study (Shrestha Pradhan *et al.*, 2018) and from (World Health Organization, 2017).

### **3.9. DATA ANALYSIS**

The data collected were coded and entered in SPSS 21. Descriptive statistics such as mean, standard deviation and frequencies tables were used to summarize the data. Chi square test was used to assess the association between maternal factors sociodemographic variables with the neonatal outcomes parameters prematurity, intrauterine growth retardation, respiratory distress, death, neonatal, NICU admission.

### **3.10 ETHICAL CONSIDERATIONS**

The study was approved by the IRB (Institutional review board of the college of medicine and health sciences at the University of Rwanda) in addition CHUB Research and Ethics Committee granted permission to use archives and collect the data. We used individual patients 'number/codes to ensure anonymity of the study participants.

### **3.11. DATA MANAGEMENT**

Completed checklists were kept in the research's office and then entered into SPSS version 21, in the investigator's laptop. The data were then cleaned, and some variables were transformed for a sound analysis.

### **3.12. DISSEMINATION OF FINDINGS**

The results of this study should be published in order to be accessible to the user in need and the researcher will provide feedback to the study setting in order to facilitate them to set strategies to prevent the neonatal complications from the mothers with hypertension disorder and to improve the management.

### **3.13. LIMITATIONS AND CHALLENGES**

There are two main limitations in this study that could be addressed in future research. First, the method used in this study is retrospective this could not find the quality of care given to this neonates and some missing data were not retrieved in the files, the second limitation was the time constraint and small sample size.

### **3.14 CONCLUSION**

This chapter highlighted Research design, research approach, research setting population, sampling, sampling strategy (inclusion criteria, exclusion criteria) sample size, data collection, data collection instruments, data collection procedure, data analysis, ethical considerations, data management, data dissemination, and limitations and challenges.

## **CHAPTER FOUR: RESULTS**

### **4.1 INTRODUCTION**

The present study assessed the immediate neonatal outcomes among mothers with hypertension disorder at Butare University Teaching Hospital (CHUB). The study considered 114 neonates from maternity department from January 2106 until March 2019.

This chapter the neonate and mothers characteristics of the study sample. The chapter also presents the findings about the association of mothers and neonate characteristics with neonate outcome as admission to neonatal intensive care unit, and neonate death. Chi square test was used to assess the association of the above-mentioned variables and they are presented from Table 3 to Table 7.

### **4.2 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS**

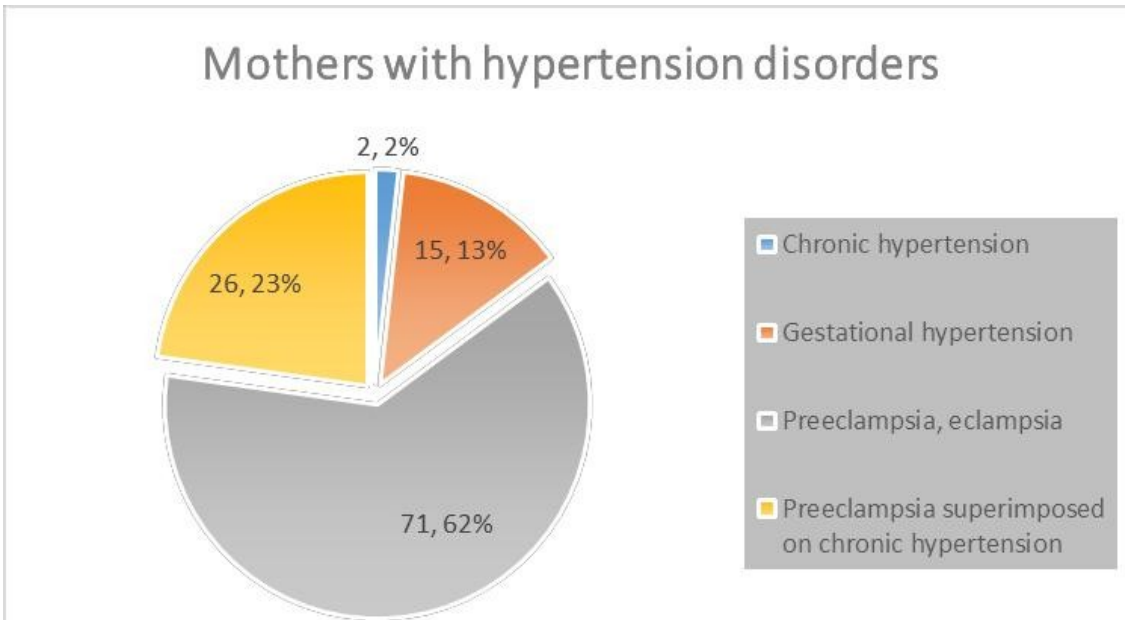
#### **4. 2. 1 Demographic and clinical details of mothers**

The current study shows that the mean age of participants was 29.6 years. The highest proportion of mothers had health insurance 112 (98.2); 74 (64.9) were referred from the district hospitals from district hospitals in the southern province. A big number of pregnant women 92 (80.7) were legally married. The past medical history of hypertension was among 34 while other diseases represent 49. Over two third of pregnant women achieved standard four ANC visits. C-section and spontaneous vaginal delivery were represented in nearly equal halve proportions with the later slightly more (51.8). Around two third of the sample had preeclampsia and eclampsia. Preeclampsia superimposed on chronic hypertension was among 22.8 (See Table 1).



**Table 1: Maternal demographic and clinical details**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Maternal age (Mean=29.6 years, SD:6.7)</b>		
<b>Health insurance</b>		
Had health insurance	112	98.2
No health insurance	2	1.8
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Referral</b>		
Referred	74	64.9
Not referred	40	35.1
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Marital status</b>		
Single	21	18.4
Married	92	80.7
Divorced	1	0.9
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>GTPAL</b>		
Primipare	46	40.4
Paucipare	38	33.3
Multipare	30	26.3
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Pregnancy</b>		
Singleton	106	93.0
Twin	8	7.0
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Past medical history</b>		
HTN (Chronic hypertension, preeclampsia)	39	34.2
Intra Uterine Fetal Demise (IUFD)	19	16.7
Others	56	49.1
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Antenatal visit</b>		
Less or =3 ANC visits	24	21.1
4 Standard ANC visits	90	78.9
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Mode of delivery</b>		
Spontaneous vaginal delivery	59	51.8
Cesarean section	55	48.2
<b>Total</b>	<b>114</b>	<b>100.0</b>



**Figure 2: Distribution pregnant women according to hypertension disorder**

#### **4. 2 DISTRIBUTION OF MOTHERS ACCORDING TO CLASSES OF HYPERTENSION DISORDERS**

Nearly two third (62) of the sample had preeclampsia and eclampsia during pregnancy. Preeclampsia superimposed on chronic hypertension was the second class of hypertension with a proportion of 22.8.

##### **4. 2. 2 Immediate parameters and status of neonates delivered by mothers with hypertension disorders**

The female neonate was 55 (50.5). A relatively big number of neonates were premature 68 (59.6), and the term was into less proportion 34(29.8). 32.4 of neonate had intrauterine growth retardation. The APGAR at 1-minute shows that 30.7 of neonate had severe asphyxia, 30.7 at 5 minutes, and 28.9 at 10 minutes. Neonates who had no asphyxia were 34.2, 43.9, and 50.0 at the 1<sup>st</sup>, 5<sup>th</sup>, 10<sup>th</sup> minutes respectively. Over half (50.4) of the neonates were admitted in NICU, and 26 (22.8) died.

**Table 2: Immediate parameters and status of neonates**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Sex of neonate</b>		
Female	55	50.5
Male	54	49.5
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Gestational age</b>		
Abortion	12	10.5
Premature	68	59.6
Term	34	29.8
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Intrauterine growth retardation</b>		
Yes	36	32.4
No	75	67.6
<b>Total</b>	<b>111</b>	<b>100.0</b>
<b>Congenital malformation</b>		
Yes	7	6.4
No	102	93.6
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Meconium aspiration syndrome</b>		
Yes	19	17.4
No	90	82.6
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>APGAR at 1minute</b>		
Severe asphyxia	44	38.6
Moderate asphyxia	20	17.5
Mild asphyxia	11	9.6
No asphyxia	39	34.2
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>APGAR at 5 minutes</b>		
Severe asphyxia	35	30.7
Moderate asphyxia	15	13.2
Mild asphyxia	14	12.3

No asphyxia	50	43.9
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>APGAR at 10 minutes</b>		
Severe asphyxia	33	28.9
Moderate asphyxia	10	8.8
Mild asphyxia	14	12.3
No asphyxia	57	50.0
<b>Total</b>	<b>114</b>	<b>100.0</b>

**Table 3: Immediate parameters and status of neonates (*Cont'd*)**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Neonate weight</b>		
<2500 g (Low Birth Weight)	86	75.4
2500-4000 g (Normal weight)	28	24.6
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>NICU admission</b>		
Admitted	57	50.4
Not admitted	56	49.6
<b>Total</b>	<b>113</b>	<b>100.0</b>
<b>Respiratory distress</b>		
Mild Respiratory Distress	15	13.2
Moderate Respiratory Distress	14	12.3
Severe respiratory distress	14	12.3
TTN	17	14.9
No respiratory distress	54	47.4
<b>Total</b>	<b>114</b>	<b>100.0</b>
<b>Neonate death</b>		
Died	26	22.8
Not died	88	77.2
<b>Total</b>	<b>114</b>	<b>100.0</b>

### 4.2.3 Association of maternal factors and neonate weight at birth

Gestational age was found to be associated with neonate weight at birth. P-value: 0.001<0.05

**Table 4:** Association of maternal factors and neonate weight at birth

Variables	Neonatal weight at birth		Total	P-value
	LBW n (%)	Normal weight n (%)		
<b>Maternal age groups (in years)</b>				
<25	22(78.6)	6(21.4)	28(100)	0.414
25-30	20(87.0)	3(13.0)	23(100)	
30-35	14(70.0)	6(30.0)	20(100)	
>35	30(69.8)	13(30.2)	43(100)	
<b>Total</b>	86(75.4)	28(24.6)	114(100)	
<b>Referral</b>				
Referred	22(64.7)	12(35.3)	34(100)	0.089
Not referred	63(79.7)	16(20.3)	79(100)	
<b>Total</b>	85(75.2)	28(24.8)	113(100)	
<b>Pregnancy</b>				
Singleton	78(73.6)	28(26.4)	106(100)	0.094
Twin	8(100.0)	0(0.0)	8(100)	
<b>Total</b>	86(75.4)	28(24.6)	114(100)	
<b>Past medical history</b>				
HTN	29(74.4)	10(25.6)	39(100)	0.618
IUFD	16(84.2)	3(15.8)	19(100)	
Other	41(73.2)	15(26.8)	56(100)	
<b>Total</b>	86(75.4)	28(24.6)	114(100)	
<b>GTPAL</b>				
Primipare	36(78.3)	10(21.7)	46(100)	0.188
Paucipare	31(81.6)	7(18.4)	38(100)	
Multipare	19(63.3)	11(36.7)	30(100)	

<b>Total</b>	86(75.4)	28(24.6)	114(100)
<b>Antenatal visits</b>			
≤ 3 ANC visits	19(79.2)	5(20.8)	24(100)
4 Standard ANC visits	67(74.4)	23(25.6)	90(100) 0.633
<b>Total</b>	86(75.4)	28(24.6)	114(100)
<b>Mode of delivery</b>			
Spontaneous vaginal delivery	42(71.2)	17(28.8)	59(100)
Cesarean section	44(80.0)	11(20.0)	55(100) 0.275
<b>Total</b>	86(75.4)	28(24.6)	114(100)
<b>Gestational age</b>			
Abortion	12(100.0)	0(0.0)	12(100)
Premature	60(88.2)	8(11.8)	68(100) 0.000***
Term	14(41.2)	20(58.8)	34(100)
<b>Total</b>	86(75.4)	28(24.6)	114(100)

#### 4.2.4 Association of maternal factors and neonate asphyxia

Both past medical history and mode of delivery were both associated with neonate asphyxia with P- values of 0.006 and 0.005 respectively.

**Table 5:** Association of maternal factors and neonate asphyxia

Variables	Neonate asphyxia		Total	P-value
	Asphyxia n (%)	No asphyxia n (%)		
<b>Maternal age groups</b>				
<25	11(39.3)	17(60.7)	28(100.0)	
25-30	10(43.5)	13(56.5)	23(100.0)	
30-35	10(50.0)	10(50.0)	20(100.0)	0.889
>35	20(46.5)	23(53.5)	43(100.0)	
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>Referral</b>				
Referred	16(47.1)	18(52.9)	34(100.0)	
Not referred	35(44.3)	44(55.7)	79(100.0)	0.787
<b>Total</b>	<b>51(45.1)</b>	<b>62(54.9)</b>	<b>113(100.0)</b>	

<b>Marital status</b>				
Single	11(52.4)	10(47.6)	21(100.0)	
Married	40(43.5)	52(56.5)	92(100.0)	0.505
Divorced	0(0.0)	1(100.0)	1(100.0)	
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>Pregnancy number</b>				
Singleton	48(45.3)	58(54.7)	106(100.0)	
Twin	3(37.5)	5(62.5)	8(100.0)	0.669
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>Past medical history</b>				
Hypertension	16(41.0)	23(59.0)	39(100.0)	
IUFD	3(15.8)	16(84.2)	19(100.0)	0.006**
Other	32(57.1)	24(42.9)	56(100.0)	
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>GTPAL</b>				
Primipare	23(50.0)	23(50.0)	46(100.0)	
Paucipare	12(31.6)	26(68.4)	38(100.0)	0.130
Multipare	16(53.3)	14(46.7)	30(100.0)	
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>Antenatal visits</b>				
≤ 3 ANC visits	14(58.3)	10(41.7)	24(100.0)	
4 Standard ANC visits	37(41.1)	53(58.9)	90(100.0)	0.132
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	

**Table 6: Association of maternal factors and neonate asphyxia (cont'd)**

<b>Mode of delivery</b>				
Spontaneous vaginal delivery	19(32.2)	40(67.8)	59(100.0)	
Cesarean section	32(58.2)	23(41.8)	55(100.0)	0.005**
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	
<b>Gestational age</b>				
Abortion	3(25.0)	9(75.0)	12(100.0)	
Premature	36(52.9)	32(47.1)	68(100.0)	0.083
Term	12(35.3)	22(64.7)	34(100.0)	
<b>Total</b>	<b>51(44.7)</b>	<b>63(55.3)</b>	<b>114(100.0)</b>	

#### 4.2.5 Association of mothers factors with NICU admission

The findings from Table 7 show that the medical history, gestational age and delivery mode were strongly associated with Neonatal intensive care unit admission. P-value:  $0.001 < 0.05$ , P-value:  $0.006 < 0.05$ , and P-value:  $0.003 < 0.05$  respectively.

**Table 7: Association of maternal factors with NICU admission**

Variables	NICU admission			P-value
	Yes, n(%)	No, n(%)	Total	
<b>Maternal age groups (in years)</b>				
<25	16(57.1)	12(42.9)	28(100.0)	0.849
25-30	12(52.2)	11(47.8)	23(100.0)	
30-35	9(45.0)	11(55.0)	20(100.0)	
>35	21(48.8)	22(51.2)	43(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Referral</b>				
Referred	15(44.1)	19(55.9)	34(100.0)	0.378
Not referred	42(53.2)	37(46.8)	79(100.0)	
<b>Total</b>	<b>57(50.4)</b>	<b>56(49.6)</b>	<b>113(100.0)</b>	
<b>Marital status</b>				
Single	14(66.7)	7(33.3)	21(100.0)	0.176
Married	44(47.8)	48(52.2)	92(100.0)	
Divorced	0(0.0)	1(100.0)	1(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Pregnancy number</b>				
Singleton	53(50.0)	53(50.0)	106(100.0)	0.495
Twin	5(62.5)	3(37.5)	8(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Past medical history</b>				
Hypertension	16(41.0)	23(59.0)	39(100.0)	0.000***
IUFD	3(15.8)	16(84.2)	19(100.0)	
Other	39(69.6)	17(30.4)	56(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	



<b>GTPAL</b>				
Primipare	24(52.2)	22(47.8)	46(100.0)	
Paucipare	18(47.4)	20(52.6)	38(100.0)	0.865
Multipare	16(53.3)	14(46.7)	30(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Antennal visits</b>				
≤ 3 ANC visits	16(66.7)	8(33.3)	24(100.0)	
4 Standard ANC visits	42(46.7)	48(53.3)	90(100.0)	0.082
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Mode of delivery</b>				
Spontaneous vaginal delivery	22(37.3)	37(62.7)	59(100.0)	
Cesarean section	36(65.5)	19(34.5)	55(100.0)	0.003**
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	
<b>Gestational age</b>				
Abortion	4(33.3)	8(66.7)	12(100.0)	
Preterm	43(63.2)	25(36.8)	68(100.0)	0.006**
Term	11(32.4)	23(67.6)	34(100.0)	
<b>Total</b>	<b>58(50.9)</b>	<b>56(49.1)</b>	<b>114(100.0)</b>	

#### 4.2.6 Association of maternal factors with gestational age

Maternal factors were not linked to gestational of the neonate except referral which showed association with neonate age at birth. P-value=0.002<0.05

**Table 8: Association of maternal factors with gestational age**

<b>Gestational age</b>				
<b>Variables</b>	<b>Preterm, n(%)</b>	<b>Term, n(%)</b>	<b>Total</b>	<b>P- value</b>
<b>Maternal age groups (in years)</b>				
<25	20(74.1)	7(25.9)	27(100.0)	0.092
25-30	9(47.4)	10(52.6)	19(100.0)	
30-35	10(55.6)	8(44.4)	18(100.0)	
>35	29(76.3)	9(23.7)	38(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	
<b>Referral</b>				
Referred	14(45.2)	17(54.8)	31(100.0)	0.002**
Not referred	54(76.1)	17(23.9)	71(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	
<b>Marital status</b>				
Single	14(70.0)	6(30.0)	20(100.0)	0.350
Married	54(66.7)	27(33.3)	81(100.0)	
Divorced	0(0.0)	1(100.0)	1(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	
<b>Pregnancy number</b>				
Singleton	61(64.9)	33(35.1)	94(100.0)	0.193
Twin	7(87.5)	1(12.5)	8(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	
<b>Past medical history</b>				
Hypertension	23(63.9)	13(36.1)	36(100.0)	0.493
IUFD	12(80.0)	3(20.0)	15(100.0)	
Other	33(64.7)	18(35.3)	51(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	

<b>GTPAL</b>				
Primipare	26(63.4)	15(36.6)	41(100.0)	
Paucipare	23(69.7)	10(30.3)	33(100.0)	0.840
Multipare	19(67.9)	9(32.1)	28(100.0)	
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	
<b>Antennal visits</b>				
≤ 3 ANC visits	14(70.0)	6(30.0)	20(100.0)	
4 Standard ANC visits	54(65.9)	28(34.1)	82(100.0)	0.724
Total	68(66.7)	34(33.3)	102(100.0)	
Mode of delivery				
Spontaneous vaginal delivery	31(63.3)	18(36.7)	49(100.0)	
Cesarean section	37(69.8)	16(30.2)	53(100.0)	0.484
<b>Total</b>	<b>68(66.7)</b>	<b>34(33.3)</b>	<b>102(100.0)</b>	

#### 4.2.7 Association of maternal factors and neonatal death

Mother's mode of delivery, gestational age, and past medical history were strongly associated with neonatal death. P-value:  $0.001 < 0.05$  for each association. Other variables that showed some association with neonatal death include GTPAL with a P-value of 0.038

**Table 9: Association of maternal factors and neonatal death**

Variables	Neonate death			P-value
	Yes, n(%)	No, n(%)	Total	
<b>Maternal age groups (in years)</b>				
<25	6(21.4)	22(78.6)	28(100.0)	0.789
25-30	6(26.1)	17(73.9)	23(100.0)	
30-35	3(15.0)	17(85.0)	20(100.0)	
>35	11(25.6)	32(74.4)	43(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>Referral</b>				
Referred	4(11.8)	30(88.2)	34(100.0)	0.062
Not referred	22(27.8)	57(72.2)	79(100.0)	
<b>Total</b>	<b>26(23.0)</b>	<b>87(77.0)</b>	<b>113(100.0)</b>	
<b>Marital status</b>				
Single	4(19.0)	17(81.0)	21(100.0)	0.169
Married	21(22.8)	71(77.2)	92(100.0)	
Divorced	1(100.0)	0(0.0)	1(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>Pregnancy number</b>				
Singleton	24(22.6)	82(77.4)	106(100.0)	0.878
Twin	2(25.0)	6(75.0)	8(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>Past medical history</b>				
Hypertension	8(20.5)	31(79.5)	39(100.0)	0.000***
IUFD	15(78.9)	4(21.1)	19(100.0)	
Other	3(5.4)	53(94.6)	56(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>GTPAL</b>				
Primipare	8(17.4)	38(82.6)	46(100.0)	0.038**
Paucipare	14(36.8)	24(63.2)	38(100.0)	
Multipare	4(13.3)	26(86.7)	30(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>Antenatal visits</b>				
≤ 3 ANC visits	4(16.7)	20(83.3)	24(100.0)	0.420
4 Standard ANC visits	22(24.4)	68(75.6)	90(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	

**Table 10: Association of maternal factors and neonatal death (cont'd)**

<b>Mode of delivery</b>				
Spontaneous vaginal delivery	23(39.0)	36(61.0)	59(100.0)	
Cesarean section	3(5.5)	52(94.5)	55(100.0)	0.000***
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	
<b>Gestational age</b>				
Abortion	9(75.0)	3(25.0)	12(100.0)	
Preterm	14(20.6)	54(79.4)	68(100.0)	0.000***
Term	3(8.8)	31(91.2)	34(100.0)	
<b>Total</b>	<b>26(22.8)</b>	<b>88(77.2)</b>	<b>114(100.0)</b>	

## **CHAPTER FIVE: DISCUSSION**

### **5.1 Introduction**

This chapter discusses the main findings of this study. A retrospective study of mothers records from neonatal department over a period of 2 years and 3 months from 2016 to March 2019, at CHUB. The main purpose of the study was to assess immediate outcomes of neonates from mothers with hypertension disorders the maternal (demographic and clinical factors); and the association between neonate outcomes among mothers with hypertensive disorder. Six neonate outcomes (neonate weight at birth, asphyxia, NICU admission, gestational age, and neonate death) were considered for this study.

### **5.2 Immediate parameters and status of neonates from mothers with hypertension disorders**

The analysis of neonates' parameters showed that the APGAR scores revealed that 50% of neonates had asphyxia, and 50.4% were admitted to NICU. In addition, 75.4% had low birth weight and 22.8 % died.

Similar findings have been reported in many studies where low birth weight was common in a quarter of neonates born from mother with hypertension died. The same study further reported an APGAR score below 7 among 38.6% of neonate at 5 min. (Doddamani, 2014) (Hassan et al., 2015) (Ahmed et al., 2017).

The study done in Ethiopia (by Asseffaid and Demissie, 2019) showed that still birth, low birth weight , abortion ,preterm birth and low APGAR score were the most neonatal outcomes in mothers with hypertension disorders. Abortion and preterm delivery were into the proportions of 10.7% and 31.4% respectively Similar studies from both developing and developed world also revealed that children from mothers with hypertension disorders had an increased risk for admission to the neonatal intensive care unit as compared with children from normotensive mothers. Also, our findings quite concur with those from another study on effect of pregnancy induced hypertension on mothers and their babies.

The study concluded that there was higher number of preterm, Intra-Uterine Growth Restriction (IUGR) and Small for Gestational Age (SGA) babies among the infants from hypertensive mothers. The same study further suggested that pregnancy induced hypertension (PIH) or hypertensive disorders are one of the most common causes of both maternal and neonatal morbidity (Bramham.K.2014).

### **5.3. Outcomes of neonates from mothers with hypertension disorder and associated maternal factors.**

In this study, past medical history of hypertension shows a strong association with the NICU admission (P-value:  $0.001 < 0.05$ ), neonate asphyxia (P-value:  $0.006 < 0.05$ ), neonate death (P-value:  $0.001 < 0.05$ ). Other factors that show a linkage with the admission include gestational age and mode of delivery (P-values: 0.006, and 0.003 respectively), they both show a significant association with neonate death (P-value:  $0.001 < 0.05$ ).

Many studies reported that hypertension during pregnancy increases the risk of maternal and perinatal, morbidity and mortality. Of all neonatal deaths from mother with eclampsia and other hypertensive disorders, birth asphyxia contributes around 52% of all neonatal deaths. Comparable findings were observed in a study from Queen Elizabeth Central Hospital (QECH) neonatal ward records where 36.5% of neonates admitted in the ward from April to September 2012 had birth asphyxia (Tewesa *et al.*, 2017).

A study by Siva and colleagues revealed that a variation in frequency of perinatal asphyxia vary from 9% to 22% in different studies (Ahmed *et al.*, 2017). In this study, delivery mode was also linked birth asphyxia (P-value:  $0.005 < 0.05$ ). Likewise, Eric found out that linkage and the association between those two variables was strong (Eric Kibitui, 2017). It is also important to remember that in the management of with hypertensive disorder, an emergency caesarean section must be done to save maternal and foetal health. This has also implication for NICU admission since the baby may have, low birth weight, intra uterine growth retardation, prematurity, low APGAR score ( $< 7$ ) and birth asphyxia as was observed in half of our study sample group. Asphyxia also predisposes neonate to death. Our results about gestational age are in support with the findings from a Tertiary Care Centre from India which concluded that 54.67% neonates born to hypertensive mothers were low birth weight and over 63% new-born were preterm born (Siromani *et al.*, 2015). Another study also confirmed the increase in neonatal mortality in hypertensive pregnancy. They further mentioned that the cause of neonatal mortality is due to prematurity and low birth weight. The same authors added that NICU admission and duration of stay in neonatal department was high in the study sample (Doddamani. 2014).

Some hospital based prospective and retrospective studies from Nepal and Ethiopia showed that respective proportions of 13% and 30.2 % of babies were delivered premature. These are in line with our findings though reported proportions of prematurity were comparatively low. This discrepancy resides in the methods and enrolled pregnant women into research studies. In our study, hypertension disorders were mainly preeclampsia, eclampsia and chronic hypertension.

This has also been the reason of high proportion in neonatal outcomes as compared to other studies which considered pregnancy induced hypertension and did not consider those with chronic hypertension as for our study (Wagnew *et al.*, 2016; Shrestha Pradhan *et al.*, 2018).



## **CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS**

### **6.1. INTRODUCTION**

This chapter presents the conclusion of this study and as well as recommendations based on the findings.

### **6.2. CONCLUSION**

The present study concluded that there is a relationship between neonatal outcomes as birth asphyxia, low birth weight, prematurity, NICU admission, intra uterine growth retardation and mortality of neonates born of mothers who had hypertension disorders during pregnancy.

### **6.3 RECOMMENDATIONS**

Based on the findings of this study, we recommend the following to:

#### **CHUB:**

- ✓ To ensure early detection of maternal hypertensive disorders and close follow up and monitoring for prevention of negative neonate outcomes. This can be achieved through quality care services in maternity and neonatology departments.
- ✓ To improve the patients records through completion of all patient details for follow up.
- ✓ To conduct more research on immediate neonatal outcomes from mothers with hypertension disorders and associated factors.

#### **Health centers and districts hospitals**

- ✓ To ensure early identification of women at risk and ensure effective management and referral to the Hospitals where they can access advanced care services. In this endeavor, the Community Health Workers and health care providers in maternal health should work together and save the lives of both neonate and mother.

#### **Ministry of Health:**

- ✓ To strengthen the system for management of mothers with hypertensive disorder during pregnancy and therefore prevent poor neonatal outcomes

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# **APPENDICES**

## ANNEX 1: PROJECT ACTIVITY PLAN

### Activity by months from the start to the end of the project 2018-2019

Activity	Personnel	May- July 2018	Aug- Sept 2018	Oct – Nov 2018	Jan- Feb 2019	Mar 2019	Apr- May 2019
1. Proposal and Data collection development	1						
2. Ethical clearance	1						
3. Recruitment and training of research assistants	1						
4. Conducting a pilot study	2						
5. Recruitment of study participants	2						
6. Data collection	3						
7. Data analysis	2						
Report writing and findings							
8. disseminating	2						

**ANNEX 2: PROJECT BUDGET**

<b>Item</b>	<b>Number</b>	<b>Unit Cost (RWF)</b>	<b>Total (RWF)</b>
<b>Project Personnel</b>			
Principal Investigator	1	0	0
Research assistants	2	250000	500000
Statistician	1	300000	300000
<b>SUBTOTAL 1</b>			<b>800000</b>
<b>Other requirements (equipment/services)</b>			
Laptop	1	200000	200000
Copy papers	5 reams	5000	25000
Printing		30000	30000
Writing materials: notebooks, diary, pens		10000	10000
Travelling		200000	200000
Report writing and dissemination		500000	500000
<b>SUBTOTAL 2</b>			<b>965000</b>
<b>GRAND TOTAL</b>			<b>1765000</b>

**ANNEX 3: CHECK LIST OR DATA COLLECTION SHEET**

**IMMEDIATE NEONATAL OUTCOME OF MOTHERS WITH HYPERTENSION**

**File number:**

**FIRST PART: Maternal demographic:**

Criteria		Observation
Age Occupation		
Education lever  Health insurance  Referred  Follow up at CHUB Status  GTPAL  Pregnancy  Past medical history	None Primary Secondary University Yes No Yes No Single Married Divorced Gravida, Term, Preterm birth ,Abortion, Living child Singleton Twin Chronic hypertension History of pre-eclampsia/eclmpasia before Drugs during current pregnancy Others: Precise	Name of hospital
Gestational age		
Antenatal	Yes No	
Number of antennal visits  Mode of delivery	1 2 >3 Spontaneous vaginal delivery Instrumental delivery Caesarean section: Why	

**SECOND PART: Type of hypertension disorder**

<b>Type</b>		
Chronic hypertension	<b>Yes</b> <b>No</b>	
Gestational hypertension	<b>Yes</b> <b>No</b>	
Preeclampsia -eclampsia,	<b>Yes</b> <b>No</b>	
preeclampsia superimposed on chronic hypertension	<b>Yes</b> <b>No</b>	

**THIRD PART: Neonatal parameters and Neonatal abnormal status**

<b>Criteria</b>	<b>Findings</b>	<b>Observation</b>
sex	Female Male	
weight	Normal weight Macrosomia Low birth weight Extremely low birth weight Very low birth weight	
gestational age	Preterm Term Post term	
Intrauterine growth retardation	Yes No	
respiratory distress syndrome	Mild respiratory distress Moderate respiratory distress Severe respiratory distress TTN	
congenital malformation	Yes No	
meconium aspiration syndrome	Yes No	
APGAR score	at 1 minutes at 5 minutes at 10 minutes	
Birth asphyxia	Mild birth asphyxia Moderate birth asphyxia Severe birth asphyxia	
Perinatal outcome	Alive NICU admission Death: - Still birth flesh -Still birth macerated	

## ANNEX 4: ETHICAL CLEARANCE



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CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019  
Ref: CMHS/IRB/029/2019

**UWIZEYIMANA Phoibe**  
School of Nursing and Midwifery, CMHS, UR


Dear UWIZEYIMANA Phoibe,

**RE: ETHICAL CLEARANCE**

Reference is made to your application for ethical clearance for the study entitled *“Immediate Neonatal Outcomes in Mothers with Hypertension Disorders at Butare University Teaching Hospital in Rwanda”*

Having reviewed your protocol and been satisfied with your revised version incorporating the comment from the IRB, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

  
Professor Jean Bosco GAHUTU  
Chairperson Institutional Review Board,  
College of Medicine and Health Sciences, UR



**Cc:**

- Principal, College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR



## ANNEX 5: PERMISSION OF DATA COLLECTION



### CENTRE HOSPITALIER UNIVERSITAIRE UNIVERSITY TEACHING HOSPITAL

CENTRE HOSPITALIER UNIVERSITAIRE  
DE BUTARE (CHUB)  
OFFICE OF DIRECTOR GENERAL

Huye, 28/02/2019

N° Ref: CHUB/DG/SA/02/...../2019

0376

Mrs. Phoibe Uwizeyimana  
UR-CMHS  
Phone: +250788816498  
Email: [uphoibe@yahoo.fr](mailto:uphoibe@yahoo.fr)

Dear Uwizeyimana,

#### Re: Your request for data collection

Reference made to your letter requesting for permission to collect the data within University Teaching Hospital of Butare for your research proposal entitled "*Immediate neonatal outcomes in mothers with hypertension disorder at Butare University Teaching Hospital in Rwanda*", and based to the different approvals Ref: CMHS/IRB/029/2019 from Institution Review Board of University of Rwanda and No: RC/UTHB/014/2019 from our Research-Ethics committee, we are pleased to inform you that your request was accepted. Please note that your final document will be submitted in our Research Office.

Sincerely,

**Dr. Augustin SENDEGEYA**  
Director General of CHUB



Cc:

- Head of Clinical Services Division
- Director of Education and Research
- Chairperson of Research Committee
- Research officer

**CHUB**

E-mail : [info@chub.rw](mailto:info@chub.rw)  
Website: [www.chub.rw](http://www.chub.rw)

B.P : 254 BUTARE  
Hotline: 2030

**ANNEX 6: NATIONAL INSTITUTE OF HEALTH CERTIFICATE**



**Certificate of Completion**

The National Institutes of Health (NIH) Office of Extramural Research certifies that **uwizeyimana Phoibe** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 02/09/2018.

Certification Number: 2645451.