COLLEGE OF MEDICINE

MATERNAL AND FETAL OUTCOME OF HYPERTENSION RELATED PREGNANCY AND THEIR ASSOCIATED RISK FACTORS IN ADIGRAT GENERAL HOSPITAL, NORTHERN ETHIOPIA, HOSPITAL BASED RETROSPECTIVE COHORT STUDY

By

Naomi Lijalem

(Bachelor of Science in Nursing)

A Dissertation Submitted to the Fulfillment of the Requirement of the Master in Epidemiology Degree

March 2020

DECLARATION

I, NAOMI LIJALEM GEBREMEDHIN, hereby affirm that the contents of this thesis are my own work, and that they have not previously been submitted for award of a degree, diploma or other qualification at this or any other University.

Signature: X

Naomi miss

Date: 3/25/2022

CERTIFICATE OF APPROVAL

The dissertation of Naomi Lijalem Gebremedhin is approved by the Dissertation Examination Committee:

_____

Ass. Prof. Genesis Chorwe (Chairman, Post Graduate Committee)

_____

Prof William Stones (Supervisor)

_____

Dr Atupele Kapito-Tembo (Internal Examiner)

_____

Dr Fatsani Ngwalagwa (Head of Department)

DEDICATION

To my mother, Alganesh Fitsum, and my sister, Elmar.

ACKNOWLEDGEMENTS

My sincere thanks goes to the University of Malawi particularly ¨School of public health and the staffs at Adigrat General Hospital, Tigray, Ethiopia who allowed access to information for the study on behalf of the mothers. I would also like to thank data collectors for their diligence.

I would like to express my special gratitude to:

My supervisor Professor William Stones for being enthusiastic about this work, his genuine interest, excellent supervision, constructive support, His quick feedback and valuable discussions was inspiring ensured the accomplishment of this work.

Mr. Onduru Gervas Onduru, Research scientist at National Health Laboratory and quality assurance training center, Dar Es Salaam (Tanzania) and a PhD fellow at Kamuzu University of Health Sciences (KUHeS, Malawi) for genuine interest and valuable support in data analysis and result interpretation.

To my boyfriend, Dr Solomon Hadgu, for his courage and support from the beginning until the end of my study.

Dr Chernet Gebru (Medical director of Adigrat general hospital) for devoting his skills and expertise in this work particularly statistical inputs and guidance on analysis

Mr. Mearg Alemu (Lecturer at Adigrat University College of health science) for his assistance in data entry and cleaning.

And my heartfelt gratitude also goes to African Centre of Excellence in Public Health and Herbal Medicine (ACEPHEM) and the World Bank for sponsoring my studentship.

SUMMARY

This was a quantitative retrospective cohort study and Presence of hypertensive (exposure) was assessed retrospectively from medical records of mothers who visited the obstetric ward in Adigrat General Hospital, Tigray regional state, northern Ethiopia from January 1 2017-December 30 2019

Hypertensive disorders of pregnancy are the most common causes of adverse maternal & perinatal outcomes. Conducting such studies would support to have great design policies and strategies in preventing unfavorable outcome. The General objective of this study was to determine maternal and fetal outcome and risk factors associated with pregnancy related hypertensive disorder who receive obstetric care in Adigrat General Hospital, Eastern Tigray, and Northern Ethiopia from January 2017 to December 2019.

The data were collected using data extraction sheet and entered in to Epi info and analyzed in SPSS version 25. Strength of association was measured using odds ratio and 95% confidence intervals. The p-value <0.05 was set for statistical significance.

I have found huge burden of maternal and perinatal death and complications, which makes it a big priority for the health system. A total 314 records of pregnant women was included in the study, 164 had developed HDP, but due to incompleteness and twin gestation, 14 records of those with HDP were excluded from the analysis, this resulted in the HDP prevalence of 50% (150/300). The dominant type of HDP in pregnant women studied was Preeclampsia. Majority of the study participants (90.33%) tested negative for HIV and more than ninety percent of the participants (94.67%) had Anti natal follow up. Majority of pregnant women (62.67%) underwent Spontaneous Vaginal Delivery (SVD) of which (38.7%) had HDP. Prevalence of chronic medical illness in participants was as follows, Proteinuria (72.0 %), DM (22%), CHD

(3.33%), Renal failure (2.7%). The proportion of the type of HDP chronic hypertension in pregnant women (preeclampsia, Eclampsia, super imposed preeclampsia, and gestational hypertension) were 42.00%, 25.3%, 7.30%, 12.0% and 13.30% respectively. The most frequent type of antihypertensive drug given to the mothers with HDP was hydralazine (87.3%) and mgso4 (59.3%) (Table 2).

On a logistic regression analysis, several factors were found to be associated with HDP, these included age (OR 0.15; 95% CI, 0.09-0.25, $P \leq 0.001$), education (OR 0.43; 95% CI, 0.32-0.58; $P \leq 0.01$), occupation (OR 0.65; 95% CI, 0.51-0.84; $P \leq 0.001$), residency (OR 14.24; 95% CI, 7.95-25.53; $P \leq 0.001$), HIV status (OR 16.24; 95% CI, 3.78-69.69; $P \leq 0.001$), parity (OR 0.19; 95% CI, 0.99-0.39; $P \leq 0.001$), mode of delivery (OR 3.87; 955 CI, 2.59-5.78; $P \leq 0.001$) and diabetes mellitus (OR 17.37; 95% CI, 7.22-41.84; $P \leq 0.001$).

Out of the total 6,856 deliveries, 164 (2.4%) had HDP of which 14 were excluded. out of the 150 study participants with HDP majority of them 93 (62%) were in the age range of 15-35 years. More than half of respondents with HDP (68.7%) place of residence is in rural.

Key words: Hypertensive disorder of pregnancy**,** MD, PPH, APH, PD, LBW, PB, IUGR

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

APH	Ante Partum Hemorrhage
COMREC	College of Medicine Research Ethics Committee
C/S	Caesarian section
CSA	Central Statistical Agency
DM	Diabetes mellitus
EMONC	Ethiopian National Emergency Obstetric and Newborn Care
HDP	Hypertensive Disorders of Pregnancy
HEW	Health Extension Workers
IUGR	Intra Uterine Growth Restriction
JUSH	Jima University specialized Hospital
LBW	Low birth weight
MD	Maternal Death
MDG	Millennium Development Goals
Mgso4	Magnesium sulfate
PB	Preterm birth
PD	Perinatal Death
PE	Pre-Eclampsia
PIH	Pregnancy Induced Hypertension
PPH	Post-Partum Hemorrhage
SMO	Sever Maternal Outcome
SNNPR	South nation nationalities and peoples region
SPSS	Statistical Package for Social Science

SVD	Spontaneous Vaginal Delivery
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background information

Hypertensive disorder of pregnancy is a very severe medical condition linked to high blood pressure (1). if A pregnant woman have got her blood pressure greater than or equal to 140/90 mmHg on two consecutive measurements she is considered hypertensive (2). Hypertensive disorders of pregnancy are overall term for raised blood pressure during pregnancy. It includes pregnancy induced hypertension (PIH) (without proteinuria), preeclampsia (with proteinuria) and eclampsia (preeclampsia with convulsions), gestational hypertension and chronic hypertension (3).

Hypertensive disorder of pregnancy (HDP) is one of the major public health issues globally it is one of the furthermost common complications in pregnancy forming atriad together with hemorrhage and infection (4).HDP is still a major public health issue globally not only because of high adverse maternal outcomes but there is an adjacent complement of significant perinatal morbidity and mortality (5). HDP is estimated at 10–15% and 18% of maternal deaths globally and in the USA respectively (6). In Ethiopia, 19% of the maternal mortality is caused by HDP (7).The prevalence of hypertensive disorder of pregnancy varies according to the global geographical regions and ranges from 1.5% in Sweden to 7.5% in Brazil, whereas in India, it is reported to be 6-8% (8).

The Ethiopian national EmONC assessment documented 174,561 deliveries at the 797 facilities surveyed. Pre-eclampsia/eclampsia contributed to a significant maternal disease burden among pregnant and recently delivered women seeking care at the facilities (7).

According to a multicenter study, nearly one third (30%) of hypertensive disorders of pregnancy were as a result of chronic hypertension while slightly below three quarter (70%) of the cases were established to be gestational hypertension/preeclampsia (9).

The National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy defines hypertension in pregnancy into four categories: chronic hypertension, gestational hypertension, eclampsia, and preeclampsia superimposed on chronic hypertension (8). Pre-eclampsia and eclampsia are the major causes of poor maternal and fetal outcomes. Eclampsia is rare in high-income countries, probably because of early detection and control (10). Chronic hypertension is defined as maternal blood pressure measurement of 140/90 mm Hg or greater on two occasions before 20 weeks of gestation (11). Preeclampsia is a hypertensive disorder of pregnancy which usually exhibits after 20 weeks of gestation with proteinuria (12).

Hypertensive Disorders in Pregnancy cause complications in about 10% of pregnancies. World Health Organization estimates that at least one woman dies every seven minutes from complications of hypertensive disorders of pregnancy (13). Pregnancies complicated with hypertensive disorders are related to increased risk of adverse fetal, neonatal & maternal outcomes such as preterm birth, intrauterine growth restriction (IUGR), perinatal death, antepartum hemorrhage (APH), postpartum hemorrhage (PPH) and maternal death (MD) (14). It

accounts half (50%) of maternal death in sub-Saharan Africa and leads to 15% of perinatal deaths globally. HDP is a significant cause of adverse maternal and fetal outcomes more especially in low and middle income countries (14). It was also found that preeclampsia and eclampsia are the most major causes of maternal and perinatal morbidity and mortality (14). This is in agreement with what was found in Ethiopia where severe pre-eclampsia/ eclampsia(PE/E) accounts 11% of maternal death (15).

The study done by the Ethiopian National EmONC Assessment Team shows that a wide-ranging prevalence of HDP was observed across the different studies in Ethiopia (7). So, using the random effect analysis, the overall pooled prevalence of HDP in Ethiopia was 6.07% (95% CI: 4.83%, 7.31%) which is higher relative to the large study done in China on the prevalence of HDP which is 5.2% (7). Subgroup meta-analysis of the prevalence of HDP by region indicated a higher pooled prevalence of HDP in South nation nationalities and peoples region (SNNPR), 10.13% and Amhara region, 8.21% The lowest prevalence, 5.41% was observed in Addis Ababa City, capital City of Ethiopia (3).

Not much has been documented on HDP outcomes and their associated factors in Adigrat Hospital Tigray region, Ethiopia despite the study conducted regarding Patterns of Hypertensive Disorders of Pregnancy in Selected Hospitals of Tigray, Ethiopia (16). Among the participating hospitals, Adigrat hospital took the major share of hypertensive disorders of pregnancy, accounting 24.3%, while the other hospitals have a similar share with an average of 15.16% (16). Hence this study seeks to find out maternal and fetal outcomes on hypertensive disorders of

pregnancy and associated factors among women attending obstetric care at Adigrat Hospital, Northern Ethiopia.

1.2 Statement of the problem

Hypertensive disorder of pregnancy (HDP) is the main contributor to maternal and perinatal morbidity and mortality, particularly in resource-limited settings and little is known about the magnitude of HDP in Africa (17). Globally Hypertensive disorders represent major reasons of pregnancy related maternal mortality. Hypertension is the most common medical disorder encountered during pregnancy and is estimated to occur in about 6–8% of pregnancies like to the non-pregnant population (18) , (19).

According to the Health Ministry of Bangladesh, hypertension during pregnancy, depending on the severity level, is considered a risk factor, which, related with individual features, unfavorable socioeconomic conditions, certain obstetric histories and clinical problems could generate harms to the maternal-fetal binomial (20).

Pregnancy induced hypertension (PIH) is one of the most common causes of both maternal and neonatal morbidity. Pre-eclampsia is a multi-system disorder of the mother that affects the fetus because of utero-placental insufficiency. There is higher number of preterm, Intra-Uterine Growth Restriction (IUGR) and Small for Gestational Age (SGA) babies among the infants of hypertensive mothers (21).

Preeclampsia is a worldwide health problem of rising significance. It complicates 2%–8% of all pregnancies, contributes to 15% of preterm deliveries, and between 9% and 26% of maternal

deaths globally. From 2006 to 2008, 22 of 107 direct maternal deaths were related to preeclampsia and eclampsia as indicated In the most recent confidential inquiry into maternal mortality in the UK, (22). Irrespective of the Ethiopian government plan to reduce maternal mortality due to pregnancy related complication like hypertension, pre partum and post-partum hemorrhage, the incidence of hypertension and its complication on mothers and new born is predominant as indicted by different study conducted in different parts of the country (23).

1.2.1 Scientific hypothesis

There are poor maternal and fetal outcomes in pregnant women with HDP from rural areas relative to urban women.

1.2.2 Research question

What are the maternal and fetal outcomes and factors associated with pregnancy related hypertensive disorder in Adigrat General Hospital, northern Ethiopia?

1.3 Research objective

1.3.1 General objective

The General objective of this study was to determine maternal and fetal outcome and risk factors associated with pregnancy related hypertensive disorder who receive obstetric care in Adigrat General Hospital, Eastern Tigray, and Northern Ethiopia from January 2017 to December 2019.

1.3.2 Specific objectives

Specifically, the study's specific objectives were:

1. To determine the prevalence of maternal hypertension among women attending obstetric care at Adigrat General Hospital, Eastern Tigray, Ethiopia;
2. To compare maternal and fetal outcomes in pregnant women with HDP from rural areas relative to urban women;
3. To explore the maternal and fetal outcome of HDP in Adigrat General Hospital, North Ethiopia;
4. To assess the factors associated with poor pregnancy outcome among women with hypertension attending obstetric care at Adigrat General Hospital, Eastern Tigray, Ethiopia.

1.4 Significance of the study

Hypertensive disorders complicating pregnancy extremely endanger the safety of the mother and fetus during pregnancy. Even though HDP has been associated with adverse maternal and fetal outcomes, very few studies have explored HDP in Ethiopia (24). The usual pointers of developing countries like poor antenatal care, illiteracy, lack of awareness and poverty in developing countries continues to favor these nightmares of pregnant mothers (9). Thus, the aim of this study was to assess the outcome and factor associated with pregnancy related hypertensive disorder in Ethiopian hospital.

Most deaths in HDP occur due to its complications and not due to hypertension per se. With the introduction of antenatal care in large cities, severe degree of toxemia and eclampsia has become mostly preventable. But, in developing country, it still continues to be a major obstetric problem.

(20). Thus, by prevention and proper management of these complications we can reduce the maternal mortality. Hence, the present study was conducted to find out risk factors for maternal and perinatal outcomes in HDP cases.

The finding of this study would be useful to healthcare providers concerned with managing these pregnancy complications, and to policymakers and other stakeholders involved in maternal and newborn health programs.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Globally, it has been observed that Hypertensive Disorder of Pregnancy (HDP) is one of the prominent causes of maternal mortality and morbidity amongst pregnant women. According to the World Health Organization (WHO) it is estimated that the maternal death due to HDP were 25.7% in Latin-American and Caribbean, and 9.1% in Asian and African countries (23). A study conducted in Ghana shown that pregnancy induced hypertension has contributed for 8.9% maternal mortality (25). And 19% of the maternal mortality is caused by HDP in Ethiopia (3).Hypertensive disorder of pregnancy in Tigray is found to be 2.97% (4).

Pre-eclampsia is a pregnancy-specific hypertensive disorder usually occurs after 20 weeks of gestation It is a rapidly progressive condition described by raised blood pressure and protein in the urine. If unnoticed early, it can lead to eclampsia which is severe and one of the top five direct causes of maternal and infant adverse outcome (26). It is one of the chief causes of maternal and perinatal morbidity and mortality worldwide. The major direct obstetric complications including pre-eclampsia/eclampsia account for 85% of the maternal deaths in Ethiopia (25). Contrasting deaths due to other direct causes, pre-eclampsia/ eclampsia related deaths appear to be increasing and linked to multiple factors, making prevention of the disease a continuous challenge (15).

In Nigerian public tertiary hospitals Out of 100,107 admissions for maternal complications, 6753 (6.8%) women had HDP. Pre-eclampsia (PE) (54.5%) and eclampsia (E) (30.4%) were the most common HDP recorded (10).

Out of the 8822 singleton births included in the study, 510 (5.8%) had a reported HDP (including 285 (55.9%) Preeclampsia, 119 (23.3%) eclampsia, and 106 (20.8%) hypertension) in the study done in Haiti (13).

The study done in JUSH (Jimma university specialized hospital), Ethiopia during the yearlong study period shows that, there were a total of 1863 deliveries of which 8.48% were diagnosed to have HDP and 52.5% of these mothers were in the age range of 25 – 34 years. One third (32.9%) had educational level below primary education and 64.6% of them were Muslims by religion. The majority (97.5%) of the mothers were married (24).

The same study conducted in Tigray Region, Ethiopia show that More than half of the cases (56.1%) were rural residents. majority of the mothers (83.7) were between 18 and 33 years old and only 1.3% of mothers were less than 18 years. Of the total cases, 9.8% were diagnosed as gestational hypertension, 75.1% as preeclampsia, and 3% as chronic hypertension 12.1% as eclampsia. (16)

The exact cause of pre-eclampsia/eclampsia remains uncertain. However, abnormally implanted placenta is considered to be major predisposing. This abnormally implanted placenta is believed to result in poor uterine and placental perfusion, which results a state of hypoxia and increased

oxidative stress and the release of anti-angiogenic proteins into the maternal plasma along with inflammatory mediators into the maternal plasma (15).

According to WHO estimation in low- and middle-income countries the incidence of preeclampsia is 7 times higher than that in high-income countries and the risk of dying of pre-eclampsia/eclampsia of a woman in a low-income country is 300 times that of a woman in a high-income country (7).

In the study done in Tigray region, Ethiopia indicates that out of the total 45,329 mothers who admitted for delivery in the selected six zonal hospitals in the last five years amongst all deliveries, 1404 cases of HDP were retrieved. Thus, 887 (1.95%) were diagnosed as severe preeclampsia/eclampsia ,Among the participating hospitals, Adigrat hospital took the major share of HDP, accounting 24.3%, More than half of the cases (56.1%) were rural residents (16).

2.2 Associated risk factors

Overweight (BMI > 25 Kg/m2) was one of the factors associated with HDP; mothers were at risk of developing HDP as compared with the normal and underweight Mothers. The risk of developing hypertensive disorders of pregnancy was 5.4 times higher among diabetic mothers. Rural residence, less fruit consumption, multiple pregnancy, presence of gestational diabetes mellitus were identified as independent risk factors in this study (4).

Young maternal age was not associated with HDP in the study of a systematic review and Meta-analysis which uses seventeen literatures done over HDP in Ethiopia and The final pooled meta

regression analysis showed no statistically significant difference in the rate of HDP between the young and adult women, OR = 2.92(95% CI = (0.88, 9.70)) (3). Whereas studies conducted in Nigeria, Cameroon, and Brazil showed a higher risk of HDP among young women. Though, studies conducted in Ontario and South Glamorgan region of Wales indicated a lower risk of HDP among young mothers than older women (7).

In the Case Control study on Factors Associated with Hypertension during Pregnancy in Derashie Woreda South Ethiopia, Majority of respondents was multi gravid which accounts 364 (78.1%) and the rest were prime gravid. Majority 301 (64.6%) of pregnant mothers have > 3 times Anti natal follow up and the rest have less than two times (27).

2.3 Fetal outcome

2.3.1 Fetal death

The risk of maternal death is less than 1% in severe preeclampsia and whereas that of perinatal death is about 13% although most obstetricians worry more about the risk of maternal death in women whose pregnancies are complicated by hypertensive disorders the risk of perinatal death is more daunting (5).

The study done in Norway national wide shows that during 1967–2006, women with hypertension revealed an increased risk of fetal death. There were fetal deaths 9.2%,0.8% in pregnancies with hypertensive disorders and normotensive respectively. In total 2.9%,1.5% and 0.2% of all pregnancies had pre-eclampsia, gestational hypertension and chronic hypertension

respectively of these 1.9%, 1.2% and 1.8% of these women experienced fetal death respectively (28). The study done in three university teaching hospitals in the Southern Regional State of Ethiopia demonstrated that in the multivariate analysis high parity, low gestational age, lack of antenatal care, having eclampsia, predelivery onset of HDP, vaginal delivery, low fetal birth weight, and maternal death were independent predictors of perinatal mortality (9).

2.3.2 Low birth weight

Low birth weight (LBW) is defined as a birth weight less than 2500g. In the study done in North eastern Ethiopia shows that Partner's education/being illiterate (AOR: 4.09; 95% CI 1.45,11.50), antenatal care visit at private health institutions (AOR: 0.13; 95% CI 0.02, 0.66), having history of obstetric complications (AOR: 5.70; 95% CI 2.38, 13.63), maternal weight during pregnancy (AOR: 4.04; 95% CI 1.50, 10.84) and gravidity (AOR: 0.36; 95% CI 0.18, 0.73) were significantly associated with low birth weight (29)**.**

The study done in Wolaita Sodo University Teaching and Referral Hospital, Southern Ethiopia, indicates that Mothers who had a history of hypertension during current pregnancy were six times higher risk of getting low birth weight newborn compared to those no history of hypertension during current Pregnancy [AOR=6.955;95%(2.386-20.275)] (1).

2.4 Maternal outcome

According to 2011 Ethiopia Demographic and Health Survey (EDHS) report, an estimated 676 women per 100,000 live births were dying of pregnancy and related causes. Sixty to eighty percent of all maternal deaths are due to five major complications namely, postpartum

hemorrhage, puerperal sepsis, Hypertension disorder of pregnancy, unsafe abortion and obstructed labor (25).

In the study done in Jima university teaching Hospital South west Ethiopia The commonest underlying causes for SMO (sever maternal outcome) were uterine rupture 27%, followed by hypertensive disorders 24% and obstetric hemorrhage 24%. The highest case fatality rate was found to be associated with eclampsia 28%. Maternal age, residential area, educational status and occupation were associated with SMO ($P < 0.0001$) (2).

Prior studies in Haiti have found a prevalence of preeclampsia and/or Eclampsia among pregnant women to be 7–18% (13).

2.4.1 Maternal death

Maternal mortality is noticeably high in sub-Saharan African countries including Ethiopia. Continuous nationwide systematic evaluation and assessment of the problem helps to design appropriate policy and strategy in Ethiopia (30).

From the study in Jima teaching university, south west Ethiopia Maternal deaths were direct obstetric deaths. Eclampsia, postpartum hemorrhage and pregnancy related infections were the top three leading causes of MD in this study: each accounting for 29.2, 20.8 and 12.5% of the 24 maternal deaths. The highest MD was associated with eclampsia followed by antepartum and then postpartum hemorrhage (2).

CHAPTER THREE

MATERIALS AND RESEARCH METHODOLOGY

3.1 Study design

This was a quantitative retrospective cohort study that recruited those pregnant women who received obstetric care in Adigrat General Hospital, Tigray regional state, Ethiopia. Presence of hypertensive (exposure) was assessed retrospectively from medical records from January 1, 2017 to December 31 2019 mothers who visited obstetric ward.

3.2 Study area

The study was conducted in Adigrat city. The city is located in Tigray region of Ethiopia which is 1,040km away from the capital city Addis Ababa. It is located in the Eastern zone at longitude and latitude 14°16′N 39°27′E Coordinates: 14°16′N 39°27′E, with an elevation of 2,457 meters (8,061 ft.) above sea level and below a high ridge to the west. Currently, Adigrat serves as the capital of the Eastern zone of Tigray. Adigrat has a population of 65,000 making it the second biggest city in Tigray next to Mekelle, the capital city of Tigray regional state, northern Ethiopia (4).

The total projected population of the region is 5,396,235 in 2017; of which 2,654,947 are males and 2,741,287 females. Reproductive age group females (15-49years) comprise 23.5% of the population. The annual population growth rate and total fertility rate of the region was 2.5 and 4.6, respectively in 2015 (16).

In Tigray region, there are 28 health facilities providing basic emergency obstetrics and newborn care (BEmONC) and 15 facilities providing comprehensive emergency obstetrics and newborn care respectively (16).

The selected hospital in this study Adigrat general Hospital provide services for substantial number of patients with and without obstetrics complications. This hospital is selected in this study due to the fact that it is staffed by obstetricians who can correctly diagnosed hypertensive disorders of pregnancy, it is also used as a teaching hospital to Adigrat University College of medicine and health science and relatively equipped by diagnostic facilities (4).

3.3 Source population

The source population was all women of Tigray region, northern Ethiopia from 15-49 years of age as they are regarded to be reproductive age group and treated obstetric wards.

3.4 Study population

All pregnant mothers who receive obstetric care at Adigrat General Hospital over the study period from January 2017- December 2019(three years)

3.5 Study period

The data records of mothers who visited obstetric ward in Adigrat General Hospital, northern Ethiopia from January 1, 2017- December 31, 2019 were retrospectively accessed in April 2020.

A Gantts chart showing research time frame

ACTIVITY	Dec 19	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20
Proposal submission for ethical review								
Obtaining ethical clearance								
Data collection								
Data analysis								
Report writing								
Result dissemination and submission								

3.6 Sample size

The population size estimation was based on the prevalence of HDP reported in the literature and was calculated as,

$$n = [\, z\alpha/2 + \ Z\beta] * [P1[1 - P1] + P2[1 - P2]/[P1 - P2]2 \quad (31)$$

Where

– n = the sample size required in each group (double this for total sample)

– *P*1 = first proportion=0.19,

– *P*2 = second proportion=0.50,

– *P*1 - *P*2 = size of difference of clinical importance = 0.31

– *Z α/2* depends on desired significance level = 1.96

–*Zβ* depends on desired power = 0.95

Inserting the required information into the formula gives: -

n =

[1.96 + 0.95]2 *[(0:19 *0:81) + (0.50 * 0.50)]/

[0.31]2 = 16

This gives the number required in each of the trial's two groups. Therefore the total

Sample size is double this, i.e. 32.

Adding 10% non-response rate totaling to 35

3.7 Sampling technique

consecutive sampling, also known as total enumerative sampling was applied ,it is a sampling technique in which every pregnant mother with hypertension meeting the criteria of inclusion is selected until the required sample size is achieved.

3.8 Inclusion and Exclusion criteria

3.8.1 Inclusion

All pregnant mothers who received obstetric care at Adigrat General Hospital from January, 2017 to December, 2019.were included.

3.8.2 Exclusion

Those pregnant mothers with incomplete data of more than or equal to three variables from the medical cards were excluded.

3.9 Data collection tool

Medical extraction sheet was used for data collection and it has three divisions: social demographic characteristics, risk factors and maternal and fetal outcomes. Adapted from the study done on prevalence and risk factors of Hypertension during pregnancy ((15) (2), (16).

Table 1: Definitions and Measurements of Study Variables

Variable	Definition	Measurement
Age	Current years at the date of admission	Complete years 15-34 and 35-49 years
Marital status	The current marital state of the client at admission	Married, Single, Divorced, Widowed
Residence	Where the client lived	Rural, Urban
Religious affiliation	Religious belief of the client	Orthodox, catholic, protestant, Muslim, Others
Place of delivery	Where she gave birth	Hospital, Clinic, Home
Highest educational attainment	The highest educational level the client attained at the time of admission	Illiterate, Primary, Secondary, Tertiary
Occupational status	How the client earned a living at the time of admission	Unemployed, Employed, Business, Farming, Others
Composite outcome	Whether the client and the fetus developed complications or not	Perinatal death, IUGR, Premature birth and LBW, APH, PPH, MD

HIV Status	HIV status of the mother on admission	Positive, Negative
Parity	How many births given by the client	Primipara, Multipara (2-5), grandpara (>5)
Attendance of antenatal care	Whether the client attended ANC	Yes, No
Number of ANC visits	The number of ANC visits attended by the client	1 up to 4
Type of HDP illness	HDP type presented by the client	Chronic HTN, Preeclampsia, Eclampsia and superimposed preeclampsia
Onset of HDP	Manifestation of signs and symptoms of HDP	At home or at hospital
Proteinuria	Laboratory results of protein in urine	Positive, Negative
Type of anticonvulsant or antihypertensive given	Anticonvulsant or antihypertensive given	Diazepam, Magnesium Sulphate, Hydralazine , others
Mode of delivery	Method of giving birth	Normal delivery, C/S, Instrumental delivery

Chronic medical conditions	Presence of other medical conditions	DM, Congestive Heart Failure, renal failure, others

3.11 Data management and analysis plan

3.11.1 Data management plan

The data were collected by the Research Assistants who was trained on data collection. The same Research Assistants also assisted in data entry. All the medical extraction sheets as well as variables were coded for easy entry and quantitative analysis. The data were verified and entered into Epi data and then it was imported into SPSS Version 25 for cleaning and further analysis. The verified data were stored in a password protected file in a USB flash disk and be backed-up on CD-RW.

All the analyses were performed using SPSS Version 25. Any missing values were verified in the medical extraction sheet. If still missing, imputation was done and the Expectation Maximization (EM) was used to impute missing data in SPSS version 25. The EM was used to facilitate maximum likelihood parameter estimation by introducing so called hidden random variables which were not observed and therefore define the missing data. This could handle up to 50% of the missing values and were always given a reliable estimate as if the data were complete.

Table 2: List of Study Variables

Variable	**Type (Independent, Dependent or Confounding Variable)**	**Type (Continuous or categorical)**
Age	Independent	Continuous
Marital status	Independent	Categorical
Residence	Independent	Categorical
Religion	Independent	Categorical
Place of delivery	Independent	Categorical
Highest educational attainment	Independent	Categorical
Occupational status	Independent	Categorical
Composite outcome	Dependent	Categorical
HIV Status	Confounding factor	Categorical
Parity	Confounding factor	Continuous
Antenatal care	Confounding factor	Continuous
Type of HDP illness	Independent	Categorical

Onset of HDP	Independent	Categorical
Proteinuria	Independent	Continuous
Type of anticonvulsant or antihypertensive given	Independent	Categorical
Mode of delivery	Confounding factor	Categorical
Chronic medical conditions	Confounding factor	Categorical

3.11.2 Data analysis plan

a. Descriptive statistics

Characteristics of the cases were described using socio-demographic variables. Proportions (%) were used for categorical variables whereas mean was used to describe continuous variables such as age. The descriptive data were presented in the form of tables.

b. Inferential statistics

Analysis was performed to compare the outcomes between those with and without HDP. Pearson's Chi Square was used to test the relationship of each exposure variable to the outcome and was presented in a two by two table. The significance alpha level was 0.05.

Potential confounders were adjusted by multiple logistic regressions. The composite outcome was coded 0 (absence of outcome- no composite outcome) and 1 (presence of composite outcome). The composite outcome was defined as either the mother has one of the following APH, PPH or MD and the fetal outcome is perinatal death, IUGR, Premature birth and LBW.

All the variables with a p-value of 0.05 or less were included in the initial multivariate analysis. The final measure from multiple logistic regressions was adjusted Odds Ratio (AOR) indicating adjusted relationship between maternal and fetal outcome and independent variables. The inferential statistics had two tables- crude OR and AOR.

3.12 Result presentation

The analyzed data were presented in the form of tables and pie charts depicting the percentage and significance of the determinants in maternal and fetal outcome.

3.13 Result dissemination

The results of this study were disseminated at College of Medicine Research Conference. Copies were sent to the Tigray region health biero, North Ethiopia. Other copies were offered to College of Medicine Research Ethics Committee (COMREC) and the University Library for referencing. A copy was submitted for possible publication through the COMREC Secretariat.

3.14 Ethical considerations

Permission to use the data from the medical cards were sought from the Adigrat General Hospital Administration and ethical waiver be granted by the COMREC. Any information about the data set was not shared to anyone else apart from the researcher and the supervisors. The data set was strictly used for the purpose of this research only and was kept in password protected folder.

3.15 Operational definition

HDP includes gestational hypertension, chronic hypertension, preeclampsia; eclampsia and super imposed chronic hypertension. The exposure of interest is HDP, defined as a diagnosis of one of the following complications during pregnancy: hypertension during pregnancy (systolic blood pressure (SBP) level ≥ 140 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg on at least two occasions, four or more hours apart after 20 weeks gestation), pre eclampsia, and/or eclampsia. Preeclampsia is characterized as a SBP level of ≥140 mmHg or DBP ≥ 90 mmHg (on at least two occasions, four or more hours apart) with proteinuria (≥ 300 mg/24 h) in at least 2 urine specimens collected 6 hours or more apart. Eclampsia is defined as a SBP level of ≥140 mmHg or DBP ≥ 90 mmHg, proteinuria, and seizures.

Chronic hypertension in pregnancy is high blood pressure (systolic ≥140mmhg or diastolic ≥90 mmhg) that either precedes pregnancy, is diagnosed with in the first 20 weeks of pregnancy, or does not resolve by the 12 weeks postpartum checkup.

Super imposed pre eclampsia is when the women with chronic hypertension develop pre eclampsia.

Fetal death was defined as the birth of a dead offspring after 20 weeks of gestation.

3.16 Possible constraints

There might be missing data in the registry and lack of patient perceptions on the topic.

Table 3 : Estimated budget

Item	**Quantity**	**Unit cost (MK)**	**Total cost (MK)**
Stationery			
Reams of paper	1	K8,000.00 each	K8,000.00
Pens	1	K200.00each	K200.00
A4 envelopes	4	K200.00 each	K800.00
Writing pad	1	K1,000.00 each	K1,000.00
Sub total			**K10,000.00**
Secretarial services			
Proposal printing 15 pages	2 copies	K30.00/page	K900.00
Printing dissertation 20 pages	4 copies	K30.00/page	K2,400.00
Binding dissertation	4 copies	K500.00/copy	K2,000.00
Binding proposal	2 copies	K500/copy	K1,000.00
Sub total			**K6,300.00**
Communication			
Phone calls	K50,000.00		
Airtime for internet	K100,000.00		
Contingencies	K35,000.00		
Sub total	**K185,000.00**		
Personal			
Data collector	**2**	**30,000/ a day**	**30*30,000=900,000**
Data entry	**2**	**30,000/ a day**	**10*30,000=300,000**
Supervisor	**1**	**40,000/ a day**	**30*40,000=1,200,000**

Statistical analysis assistant	**1**	**30,000/a day**	**10*30,000=300,000**
Researcher per diem	**1**	**30,000/a day**	**30*30,000=900,000**
Sub total			**K3,600,000**
Subtotal all			**K 3,801,300**
COM administration	Overhead fee	**10% of the total**	**K380,130**
GRAND TOTAL			**K4,181,430**

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of participants

During the study period, the total number of 314 records of pregnant women (164 with and 150 without HDP cases) from 6856 deliveries by pregnant women who visited the obstetric ward in Adigrat General Hospital, Tigray regional state, northern Ethiopia was reviewed. Fourteen incomplete records of those with HDP were discarded and the total number of pregnant women records reviewed remained 300. More than half of pregnant women (59%) were aged between 35 and 49 years old , a majority were married (71%), 80% belonged to orthodox, 59% lived in urban area, 58.67% were multipara, 33% had primary education and 33.34% were employed. The social-demographic characteristics of participants are summarized in table 4.

Table 4: Demographic characteristic of the pregnant women in the study

Variables	Frequency (%)
Age	
15-35	123 (41.0%)
36-49	177 (59.0%)
Marital status	
Married	213 (71.0%)
Single	59 (19.67%)
Divorced	21 (7.0%)
Widowed	7 (2.33%)
Parity	
Primipara	99(33%)
Multipara	176(58.67%)
Grandpara	27(8.33)
Residence	
Rural	123 (41%)
Urban	177 (59%)
ANC	
Yes	284(94.67%)
No	16(5.33%)
Mode of Delivery	
SVD	62.67%)
C/S	37.33%
Religion	

Orthodox	240(80%)
Catholic	44(14.67%)
Protestant	7(2.33%)
Muslim	9(3.0%)
Other	0 (0%)
Education	
Illiterate	80 (26.67%)
Primary	133 (44.33%)
Secondary	63 (21.0%)
Tertiary	24 (8.0%)
Occupation	
Unemployed	104 (34.66%)
Employed	112 (37.34%)
Business	60 (20.0%)
Farming	24 (8.00%)

4.2 Prevalence and factors associated with maternal hypertension among women attending obstetric care at Adigrat General Hospital, Eastern Tigray, Ethiopia

Of the total 314 records of pregnant women included in the study, 164 had developed HDP. Due to incompleteness and twin gestation, 14 records of those with HDP were excluded from the analysis, this resulted in the HDP prevalence of 50% (150/300), the dominant type of HDP in pregnant women studied was Preeclampsia. Majority of the study participants (90.33%) tested negative for HIV. Of the positive HIV results, (18.0%) had HDP. Majority of cases with HDP were Primigravida (55.30%). More than ninety percent of the participants (94.67%) had Anti

natal follow up, of these 46%) were HDP cases and 54.34%) had four ANC follow ups. Majority of pregnant women (62.67%) underwent Spontaneous Vaginal Delivery (SVD) of which (38.7%) had HDP. Prevalence of chronic medical illness was in participants was as follows, Proteinuria (72.0 %), DM (22%), CHD (3.33%), Renal failure (2.7%). The proportion of the type of HDP chronic hypertension in pregnant women (preeclampsia, Eclampsia, super imposed preeclampsia, and gestational hypertension) were 42.00%, 25.3%, 7.30%, 12.0% and 13.30%b' respectively ((Fig. 1). The most frequent type of antihypertensive drug given to the mothers with HDP was hydralazine (87.3%) and mgso4 (59.3%) (Fig 2).

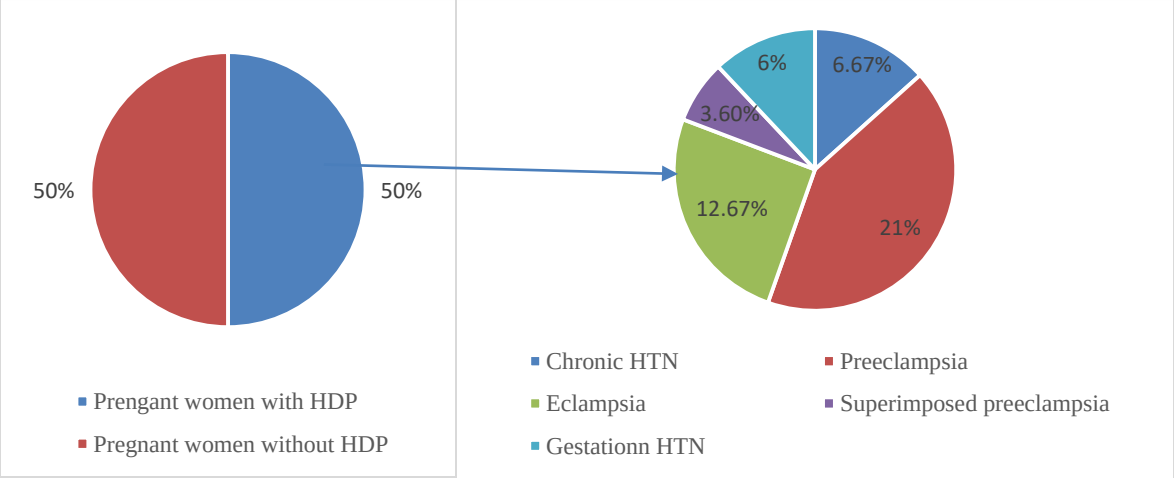

Figure 1: Left: Pregnant women with and without HDP (N=300); right: type of HDP among pregnant women with HDP (n=150)

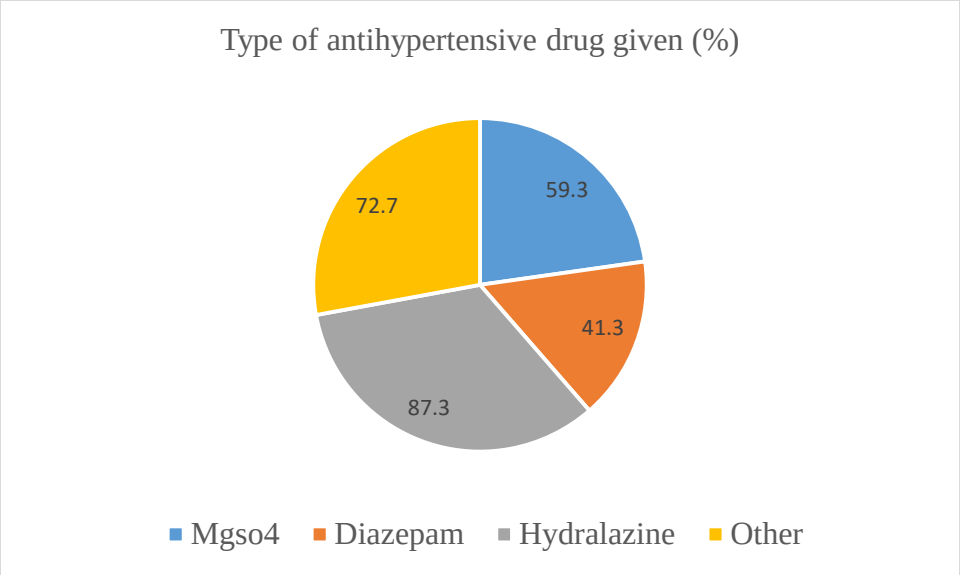

Figure 2: Type of antihypertensive drug given to pregnant women

On a logistic regression analysis, several factors were found to be associated with HDP, these included age (OR 0.15; 95% CI, 0.09-0.25, *P*≤0.001), education (OR 0.43; 95% CI, 0.32-0.58; *P*≤0.01), occupation (OR 0.65; 95% CI, 0.51-0.84; *P*≤0.001), residency (OR 14.24; 95% CI, 7.95-25.53; *P*≤0.001), HIV status (OR 16.24; 95% CI, 3.78-69.69; *P*≤0.001), parity (OR 1.17; 95% CI, 0.840-3.08; *P*≤0.001) and diabetes mellitus(OR 17.37; 95% CI, 7.22-41.84; P≤0.001). Pregnant women who lived in rural area were 14.24 times likely to develop HDP compared to those living in urban areas. Comparably, those with positive HIV status were 16.24 times likely to have HDP than those with negative HV status. The likelihood of having HDP was 13.34times and 15.96 times in primipara and in those who delivered by CS compared to grandpara and those had SVD respectively. Pregnant women with diabetes mellitus were 17.31 times likely to have pregnancy related hypertensive disorder than those without DM.

When adjusted for chronic heart diseases, renal failure, ANC follow up, education and occupation, we found that all factors that were associated with HDP on unadjusted model were associated with HDP in the adjusted model except HIV status (OR 0.27; 95% CI, 0.05-1.64; P>0.001). The summary of logistic regression analysis is presented in table 3.

Table 5: Factors associated with HDP among women attending obstetric care at Adigrat General Hospital, Eastern Tigray, Ethiopia

Factors	COR(95%,CI)	P value	AOR(95%,CI)	P value
Age			0.23(0.11-0.50)	0.000
15-35	0.15(0.09-0.25)	0.000		
36-49	Ref.	-	-	-
Education			0.57(0.36-0.88)	0.011
Primary	0.38(0.21-0.70)	0.002		
Secondary	0.10(0.04-0.22)	0.000		
Tertiary	0.18(0.07-0.48)	0.001		
Illiterate	Ref.	-	-	-
Occupation			1.09(0.72-1.65)	0.659
Employed	0.18(0.11-0.33)	0.000		
Business	0.19(0.10-0.39)	0.000		
Farming	0.61(0.24-1.56)	0.306		
Unemployed	Ref.	-	-	-
Residency			0.15(0.07-0.31)	0.000
Rural	14.24(7.95-25.53)	0.000		
Urban	Ref	-	-	-
HIV status		0.000	0.27(0.05-1.64)	0.16
Yes	16.24(3.78-69.69)			
No	Ref.	-	-	-
Parity			0.19(0.99-0.39)	

Primipara	13.34(4.79-37.14)	0.000		
Multipara	1.33(0.53-3.36)	0.54		
Grandpara	Ref.	-	-	-
Mode of delivery				
C/S	15.96(7.16-35.61)	0.000	2.96(1.81-4.84)	0.000
Instrumental	6.54(3.17-13.49)	0.000		
SVD	ref.	-	-	-
Diabetes mellitus		0.000		0.000
Yes	17.37(7.22-41.84)			
No	ref.	-	-	-

4.3 Maternal and Fetal factors associated with poor pregnancy outcome among women with hypertension attending obstetric care at Adigrat General Hospital, Northern Ethiopia

During the study period, 26.33% pregnant women developed maternal complications while the fetal complications were35.33% among pregnant women with and without maternal complications. Of the pregnant women, 23.67% developed both mother and fetus complications and majority (22.33%) were from the exposed group (with HDP). Among pregnant women with maternal complications, the maternal death, APH, and PPH was 3.0%, 11.66% and 12.34% respectively. The proportions of fetal complications were as follows, PD (3.66%), LBW (18.67%), PB (17.67%) and IUGR (10.66%). Factors associated with poor pregnancy outcome among women with hypertension attending obstetric care at Adigrat General Hospital, Northern Ethiopia were both mother and fetus complications (χ=73.23, P≤0.001), maternal complications

alone (χ=72.57, P≤0.001), fetus complication alone((χ=118.17, P≤0.001), PD ((χ=7.64, P≤0.001), LBW ((χ=50.58, P≤0.001), PB ((χ=50.62, P≤0.001) and IUGR ((χ=31.48, P≤0.001) (Table 4).

Table 6: Maternal and fetal factors associated with poor pregnancy outcome in pregnant women with and without HDP in Adigrat General Hospital, Northern Ethiopia.

Maternal/Fetal outcome	Frequency (%)	HDP status		P-value
		With HDP N (%)	Without HDP N (%)	
Does both the mother and fetus develop complication				0.000
Yes	71 (23.67%)	67 (22.33%)	4 (1.34%)	
No	229(76.33%)	83 (27.67%)	146 (48.66%)	
Does the mother develop complication				0.000
Yes	79 (26.33%)	72(24.00%)	7 (2.33%)	
No	221(73.67%)	78 (26.00%)	143(47.67%)	
Type of maternal complication				
MD	9 (3.00%)	9 (3.00%)	0 (0.00%)	
APH	35 (11.67%)	30 (10.00%)	5 (1.67%)	
PPH	37 (12.33%)	35 (11.66%)	2 (0.67%)	
Does fetus develop complication				0.000
Yes	106(35.33%)	98 (32.67%)	8 (2.67%)	

No	194(64.67%)	52 (17.33%)	142 (47.33%)	
Type of fetal complication				
Perinatal death				0.006
Yes	11 (3.66%)	10 (3.33%)	1 (0.33%)	
No	289(96.34%)	140(46.67%)	149 (49.67%)	
LBW				0.000
Yes	56 (18.67%)	52 (17.33%)	4 (1.33%)	/
No	244(81.33%)	98 (32.67%)	146 (48.66%)	
Preterm birth				0.000
Yes	53 (17.67%)	50 (16.67%)	3 (1.00%)	
No	247(82.33%)	100(33.33%)	147 (49.00%)	
IUGR				0.0000
Yes	32 (10.66%)	31 (10.33%)	1 (0.33%)	
No	268(89.34%)	119(39.67%)	149 (49.67%)	

CHAPTER FIVE

DISCUSSION AND LIMITATIONS

5.1 Discussion

I have found huge burden of maternal and perinatal death and complications, which makes it a big priority for the health system. Previous studies demonstrated that hypertension disorders of Pregnancy are one of the major causes of maternal and fetal death and sufferings in the study area. Every year, an estimated 54,000–216,000 Ethiopian mothers are expected to have pre-eclampsia/eclampsia, based on the predicted prevalence of 2%–8% from a total 2.7 million deliveries per year (7). In this study, the prevalence of the HDP was 164 (2.4%) low compared to that which has been reported from south-eastern Nigeria, Finland and Benin (32),(33)(34),(35), but was less than the overall pooled prevalence of hypertensive disorders of pregnancy previously reported in Ethiopia. The subgroup meta-analysis by region and year of study indicated a higher prevalence of hypertensive disorders of pregnancy (HDP) in Southern Nations, Nationalities, and Peoples' Region, 10.13% (95% CI = (8.5, 12.43)) and Amhara region, 8.21% (95% CI = (3.94, 12.48)). The lowest prevalence, 5.41% (95% CI = (4.30, 6.51)) was observed in Addis Ababa City, capital City of Ethiopia (3). The variation in prevalence of HDP across region might be due to the difference in way of life like diet and physical activity and due to the difference in ANC service utilization (3). The factor that may be responsible for the low prevalence of hypertensive disorder of pregnancy in Adigrat General Hospital could be due to time constraint and small sample size.

In this study from 300 study participants More than half of pregnant women (59%) were aged between 35 and 49 years old , majority were married (71%), 80% belonged to orthodox, 59% lived in urban area, 58.67% were multipara, 33% had primary education and 33.34% were employed. And The study done in JUSH (Jimma university specialized hospital), Ethiopia during the yearlong study period shows that, there were a total of 1863 deliveries of which 8.48% were diagnosed to have HDP and 52.5% of these mothers were in the age range of 25 – 34 years. One third (32.9%) had educational level below primary education and 64.6% of them were Muslims by religion. The majority (97.5%) of the mothers were married (24). The age and parity distribution of the cases in this study were also similar to those in other reports (16,36).

The finding of the meta-analysis in Ethiopia showed a significant association of hypertensive disorders of pregnancy with increasing age. Women aged more than 35 years old were 1.64 times more likely to develop HDP than women aged 20–34 during their pregnancy (3). Whereas studies conducted in Nigeria, Cameroon, and Brazil showed a higher risk of HDP among young women. Though, studies conducted in Ontario and South Glamorgan region of Wales indicated a lower risk of HDP among young mothers than older women (7). in this study finding from the total 150 study participants with HDP, above half mothers 93 (62.0%) were in age group from 15-35 .age was associated with HDP (OR 0.15; 95% CI, 0.09-0.25, $P \leq 0.001$). the same study conducted in Tigray Region, Ethiopia indicate that majority of the mothers (83.7) were between 18 and 33 years old and only 1.3% of mothers were less than 18 years (16).

Compared to the recommendations by the World Health Organization (WHO), the caesarean section delivery rate of 13.8% is above the recommended cut off. WHO recommends caesarean section rates between 5% and 10% and rates of 15% are considered to do more harm than good. Literature suggests that cesarean section rates higher than the proposed 15% upper threshold are associated with increased morbidity and mortality for both mothers and babies (37). A population-based retrospective cohort study conducted in Zhejiang province in China in 1995-2000 demonstrates the importance of use of cesarean section during delivery among women with HDP. It was found that moderate and severe HDP early developed during pregnancy could increase the risk of perinatal mortality while the cesarean delivery could decrease the risks in women with HDP (15). In many studies null parity was reported as a common risk factor for the development of hypertensive disorders of pregnancy (36). However in this study parity was associated with HDP (OR 1.17; 955 CI, 0.10-0.27; $P \leq 0.001$) and the likelihood of having HDP was 13.34 times in primipara compared to grandpara. The study result showed that rural residence was associated with the development of hypertensive disorder of pregnancy with (OR 14.24; 95% CI, 7.95-25.53; $P \leq 0.001$).Pregnant women who lived in rural area were 14.24 times likely to develop HDP compared to those living in urban areas similarly In the study done on Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region, Ethiopia: matched case-control study Rural residents were at greater odds of suffering from hypertensive disorders (OR = 3.7, 95% CI; 1.9, 7.1) (36). This finding is also consistent with a previous finding in an epidemiological study among pregnant mothers in Cairo, Egypt (15).This could be due to the fact that mothers from rural areas book antenatal care far ahead in pregnancy and have lesser number ANC visits which could be related with postponement in health seeking activities. This postponement in health care seeking could in turn be influenced by lack of awareness on

pregnancy related problems, husband and family influences, local cultural influence and bad experiences in health facilities. In this study DM have been higher predisposition to develop hypertensive disorders of pregnancy Pregnant women with diabetes mellitus were 17.31 times likely to have pregnancy related hypertensive disorder than those without DM(OR 17.37; 95% CI, 7.22-41.84; P≤0.001) and it has been recognized as the most common predictor in prior studies too (36). The drug of choice for controlling eclamptic seizures and for treating severe pre-eclampsia is magnesium sulfate, which has proven superiority over diazepam and other anticonvulsants (7). But in this study the most frequent antihypertensive drug given was hydralazine 131 (87.3%) and only 89 (59.3%) was treated with mgso4.

According to the World Health Organization (WHO) it is estimated that the maternal death due to HDP were 25.7% in Latin-American and Caribbean, and 9.1% in Asian and African countries (23). A study conducted in Ghana shown that pregnancy induced hypertension has contributed for 8.9% maternal mortality (25). And 19% of the maternal mortality is caused by HDP in Ethiopia (3). In this study among pregnant women with maternal complications, the maternal death, APH, and PPH was 3.0%, 11.66% and 12.34% respectively.

In Nigerian public tertiary hospitals Out of 100,107 admissions for maternal complications, 6753 (6.8%) women had HDP. Pre-eclampsia (54.5%) and eclampsia (30.4%) were the most common HDP recorded (10).similarly in this study Pre-eclampsia and eclampsia were the most common HDP recorded were with the proportion of 42.00%, 25.3% respectively. correspondingly in the study done in Haiti Out of the 8822 singleton births included in the study, 510 (5.8%) had a reported HDP (including 55.9% Preeclampsia and 23.3% eclampsia (13).also the same study

conducted in Tigray Region, Ethiopia show that Of the total cases 75.1% were as preeclampsia and 12.1% as eclampsia (16).

Comparably, those with positive HIV status were 16.24 times likely to have HDP than those with negative HV status. The likelihood of having HDP was 15.96 times in those who delivered by CS compared those had SVD.

In this study The proportions of preterm birth was 17.67% where as In the study done in Selected Hospitals of Tigray, Ethiopia on the Patterns of Hypertensive Disorders of Pregnancy indicates 40% of deliveries among the hypertensive disorders of pregnancy cases were preterm, of which the majority (79%) were seen in pre-eclamptic mothers. In line with this finding in the study in Debre Berhan (35.4% were preterm and 82.1% were in pre eclamptic mothers) (16) .

The proportion of perinatal death in this study was 3.66%, while in the study done in Tigray selected Hospitals shows that Majority of the fetal deaths (87.4%) occurred among the sever preeclampsia/eclampsia cases. This is consistent with a study conducted in Sudan in which the rate of small for gestational age and neonatal mortality was higher in pre-eclampsia compared to other hypertensive groups. Similarly a study in Kampala, Uganda reported that adverse neonatal outcomes were associated with severe preeclampsia (16). The study done in Norway national wide demonstrate that during 1967–2006, women with hypertension revealed an increased risk of fetal death. There were fetal deaths 9.2%, 0.8% in pregnancies with hypertensive disorders and normotensive respectively (28). In this study Factors associated with poor pregnancy outcome among women with hypertension attending obstetric care at Adigrat General Hospital,

Northern Ethiopia fetus complication alone were ((χ=118.17, P≤0.001), PD ((χ=7.64, P≤0.001), LBW ((χ=50.58, P≤0.001), PB ((χ=50.62, P≤0.001) and IUGR ((χ=31.48, P≤0.001). some of the preterm birth and low birth weight is because of intervention/ early delivery to prevent maternal and fetal morbidity and mortality.

5.2 Strengths and limitations of the study

5.2.1 Strengths of the study

In this particular study the study area is selected due to the fact that the hospital is staffed by obstetricians who can correctly diagnosed hypertensive disorders of pregnancy (HDP), is also using as a teaching hospital to Adigrat University College of medicine and health science and relatively equipped by diagnostic facilities.

5.2.2 Limitations of the study

It would be much better if it had been studied using follow up studies instead of retrospective cohort study.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This quantitative retrospective cohort study was to determine maternal and fetal outcome and risk factors associated with pregnancy related hypertensive disorder who receive obstetric care in Adigrat General Hospital. Out of the total 6,856 deliveries, 164 (2.4%) had HDP of which 14 were excluded from the analysis due to either incompleteness or twin gestation. More than half of pregnant women (59%) were aged between 35 and 49 years old , majority were married (71%), 80% belonged to orthodox, 59% lived in urban area, 58.67% were multipara, 33% had primary education and 33.34% were employed.

On a logistic regression analysis, several factors were found to be associated with HDP, these included age (OR 0.15; 95% CI, 0.09-0.25, $P \leq 0.001$), education (OR 0.43; 95% CI, 0.32-0.58; $P \leq 0.01$), occupation (OR 0.65; 95% CI, 0.51-0.84; $P \leq 0.001$), residency (OR 14.24; 95% CI, 7.95-25.53; $P \leq 0.001$), HIV status (OR 16.24; 95% CI, 3.78-69.69; $P \leq 0.001$), parity (OR 1.17; 955 CI, 0.10-0.27; $P \leq 0.001$), mode of delivery (OR 3.87; 955 CI, 2.59-5.78; $P \leq 0.001$) and diabetes mellitus (OR 17.37; 95% CI, 7.22-41.84; $P \leq 0.001$). Pregnant women who lived in rural area were 14.24 times likely to develop HDP compared to those living in urban areas. Comparably, those with positive HIV status were 16.24 times likely to have HDP than those with negative HV status. The likelihood of having HDP was 13.34 times and 15.96 times in primipara and in those who delivered by CS compared to grandpara and those had SVD respectively. Pregnant women with diabetes mellitus were 17.31 times likely to have pregnancy related hypertensive disorder than those without DM. This highlights that there is essential to outspread

obstetric services to the grass root level in which rural occupants can get all types of services in a nearer distance. In addition, it necessitates strong nutritional education for the community during pregnancy and even the time prior pregnancy including the routine supply of supplements. Accurately identifying and managing of pregnant women having diabetes mellitus is also a need to remind health professionals. It is suggested that these factors can be used as a screening tool for the prediction, early detection as well as timely interventions of HDP.

6.2 Recommendations

There are statistical associations with age, education, occupation, residency, HIV status, parity, mode of delivery and DM and maybe a greater effort is needed to focus on early detection in those sub groups. But as the condition can occur for any pregnant woman, it is vital to have good ANC to detect and manage for all women. In other words, all women need good ANC and tools to detect pre eclampsia, plus the health system needs to focus especially on those with risk factors.

Maternal and fetal outcomes are common and adversely influenced by Pregnancy-related hypertensive disorders. At both the community and hospital levels Efforts should be made to increase awareness regarding hypertensive disorder of pregnancy and ease its associated morbidity and mortality. Hypertensive disorder of pregnancy is highly associated with the increased threat of perinatal adverse effects. As a result, early diagnosis and apposite supervisions are very important. For mothers who have preexisting chronic medical illness, prime gravid, rural residence Special emphasis should be given to have early diagnosis and readiness for better management of hypertension disorders of pregnancy.

The provision of parenteral anticonvulsants to pre-eclamptic/ eclamptic women is also one of the 9 emergency obstetric care (EmOC) signal functions vital to the reduction of maternal mortality (38).

Timely referral of eclamptic mothers could be challenging through other means of transportations. So Capability for referral should be improved by assuring the availability of appropriate clinical protocols for stabilization and ambulances for referral to higher levels of care at all health facilities providing maternity care.

At all facilities providing obstetric care the availability of urine test strips, anticonvulsants, and anti-hypertensive should be guaranteed. This includes health centers and clinics at which primary care is provided. The drug of choice for controlling eclamptic seizures and for treating severe pre-eclampsia is magnesium sulfate, which has proven superiority over diazepam and other anticonvulsants (7).

At present the proven measures are 1) calcium supplementation in pregnancy- though many experts are sceptical about this and it has not been incorporated into programs very extensively 2) low dose aspirin for those at high risk- this could and should be introduced as it is very cheap and has good evidence to support it. 3) Giving magnesium sulfate for fetal/ newborn neuroprotection: in a situation where delivery is necessary because of the maternal condition, giving magnesium sulfate improves newborn outcomes (even when it is not needed for the

maternal condition). So ensuring that all preterm mothers where delivery is needed get a dose of magnesium.

Community Education should emphasis on the significance of screening for hypertension during pregnancy, awareness of symptoms (e.g. headaches, visual disturbances, and generalized edema), and need for prompt actions if seizures happen. The HEWs should well train to pass such important information to the community.

REFERENCES

1. Obsa MS, Woticha EW, Weji BG, Dessu BK, Wolde GD, Girmay BG, et al. Neonatal and fetal outcomes of pregnant mothers with hypertensive disorder of pregnancy at hospitals in Wolaita. J Midwifery Reprod Heal. 2019;4–9.
2. Woldeyes WS, Asefa D, Muleta G. Incidence and determinants of severe maternal outcome in jimma university teaching hospital, south-west Ethiopia: a prospective cross-sectional study. BMC Pregnancy Childbirth. 2018 Jun 20;18(1).
3. Berhe AK, Kassa GM, Fekadu GA, Muche AA. Prevalence of hypertensive disorders of pregnancy in Ethiopia: a systemic review and meta-analysis. BMC Pregnancy Childbirth. 2018 Jan 18;18(1).
4. Kahsay HB, Gashe FE, Ayele WM. Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region , Ethiopia : matched case-control study. BMC Pregnancy Childbirth. 2018;5(18):1–10.
5. Adu-Bonsaffoh K, Ntumy MY, Obed SA, Seffah JD. Perinatal outcomes of hypertensive disorders in pregnancy at a tertiary hospital in Ghana. BMC Pregnancy Childbirth. 2017 Nov 21;17(1).
6. Abdelaziz A, Maher MA, Sayyed TM, Bazeed MF, Mohamed NS. Early pregnancy screening for hypertensive disorders in women without a-priori high risk. Ultrasound Obstet Gynecol. 2012 Oct;40(4):398–405.
7. Gaym A, Bailey P, Pearson L, Admasu K. International Journal of Gynecology and Obstetrics Disease burden due to pre-eclampsia / eclampsia and the Ethiopian health system ’ s response. Int J Gynecol Obstet. 2011;115(1):112–6.

8. Of S, Of P, Disorders H, Pregnancy OF, Outcome P, Government AT, et al. Original research article study of prevalence of hypertensive disorders of pregnancy and their maternal and perinatal outcome at government Victoria hospital , Original Research Article. J Evid Based Med Healthc 6(31) 2097-2100. 2019;6(31):2097–100.
9. Endeshaw G, Berhan Y. Perinatal outcome in women with hypertensive disorders of pregnancy: a retrospective cohort study. Int Sch Res Not. 2015 Jan 8;2015:1–8.
10. Adamu AN, Okusanya BO, Tukur J, Ashimi AO, Oguntayo OA, Tunau KA, et al. Maternal near-miss and death among women with hypertensive disorders in pregnancy : a secondary analysis of the Nigeria Near-miss and Maternal Death Survey. 2019;126:12–8.
11. Leeman L, Fontaine P. Hypertensive disorders of pregnancy [Internet]. 2008. Available from: www.aafp.org/afp.
12. Seyom E, Abera M, Tesfaye M, Fentahun N. Maternal and fetal outcome of pregnancy related hypertension in Mettu Karl referral hospital, Ethiopia. J Ovarian Res. 2015;8(1).
13. Bridwell M, Handzel E, Hynes M, Jean-louis R, Fitter D, Hogue C, et al. Hypertensive disorders in pregnancy and maternal and neonatal outcomes in Haiti : the importance of surveillance and data collection. BMC Pregnancy Childbirth. 2019;(19):1–11.
14. Parmar MT, Solanki HM, Gosalia V V, Mehul Tribhovandas P. Study of risk factors of perinatal death in pregnancy induced hypertension (PIH) [Internet]. Vol. 3, National Journal of Community Medicine ▏ 2012;3 Available from: www.njcmindia.org.
15. Grum T, Seifu A, Abay M, Angesom T, Tsegay L. Determinants of pre-eclampsia/eclampsia among women attending delivery services in selected public hospitals of Addis Ababa, Ethiopia: a case control study. BMC Pregnancy Childbirth. 2017 Sep 15;17(1).

16. Kahsay HB, Gashe FE, Ayele WM. Patterns of hypertensive disorders of pregnancy in selected hospitals of Tigray, Ethiopia. J Adv Med Med Res. 2018 Nov 16;27(12):1–14.

17. Noubiap JJ, Bigna JJ, Nyaga UF, Jingi AM, Kaze AD, Jobert MPH, et al. The burden of hypertensive disorders of pregnancy in Africa : a systematic review and meta - analysis. J Clin Hypertens. 2014;21(December 2018):479–88.

18. Brown CM, Garovic VD. Drug treatment of hypertension in pregnancy. pmc. 2015;74(3):283–96.

19. Manuscript A. NIH Public Access. Natl Inst Heal. 2014;20(3):229–39.

20. Ahmed SS, Sultana N, Begum ML, Lima LS, Abedin F. Pregnancy induced hypertension and associated factors among pregnant women. Gynecol Women's Heal. 2017;3(4):2474–7602.

21. Sivakumar S, Vishnu Bhat B, Badhe BA. Effect of pregnancy induced hypertension on mothers and their babies. Indian J Pediatr. 2007 Jul;74(7):623–5.

22. Townsend R, O'Brien P, Khalil A. Current best practice in the management of hypertensive disorders in pregnancy. Vol. 9, Integrated Blood Pressure Control. Dove Medical Press Ltd.; 2016;9:79–94.

23. Ayele G. Factors associated with hypertension during pregnancy in Derashie woreda South Ethiopia , Case Control. Qual Prim Care. 2016;24(5):207–13.

24. Wolde ZSegni HWoldie M. Hypertensive disorders of pregnancy in Jimma university specialized hospital. Ethiop J Health Sci. 2011;(21(3)):147–54.

25. Tessema GA, Tekeste A, Ayele TA. Preeclampsia and associated factors among pregnant women attending antenatal care in Dessie referral hospital , Northeast Ethiopia : a hospital-based study. BMC Pregnancy childbirth73. 2015;73(15):1–7.

26. Olusanya BO, Solanke OA. Hypertension in pregnancy perinatal outcomes associated with maternal hypertensive disorders of pregnancy in a developing country. 2012;1955(31):120–30.

27. Ayele G, Lemma S, Agedew E. Factors associated with hypertension during pregnancy in Derashie woreda south Ethiopia, case control community and maternal health project officer in save the children in Segen people area zone, southern nation. Vol. 24, Research Article Open Access Quality in Primary Care. 2016;24.

28. Division MF. Hypertensive disorders in pregnancy and fetal death at different gestational lengths : a population study of 2 121 371 pregnancies. 2012:1521-1528.

29. Wachamo TM, Yimer NB, Bizuneh AD. Risk factors for low birth weight in hospitals of north wello zone, Ethiopia: a case-control study. PLoS One. 2019 Mar 1;14(3).

30. Tessema GA, Laurence CO, Melaku YA, Misganaw A, Woldie SA, Hiruye A, et al. Trends and causes of maternal mortality in Ethiopia during 1990-2013: Findings from the global burden of diseases study 2013. Vol. 17, BMC Public Health. BioMed Central Ltd.; 2017;17.

31. 9241544058_(p1−p22).pdf. p. 1−30.

32. Adamu AN, Okusanya BO, Tukur J, Ashimi AO, Oguntayo OA, Tunau KA, et al. Maternal near-miss and death among women with hypertensive disorders in pregnancy: a secondary analysis of the Nigeria Near-miss and Maternal Death Survey. BJOG An Int J Obstet Gynaecol. 2019 Jun 1;126(S3):12–8.

33. Ye C, Ruan Y, Zou L, Li G, Li C, Chen Y, et al. The 2011 survey on hypertensive disorders of pregnancy (HDP) in China: Prevalence, risk factors, complications, pregnancy and perinatal outcomes. PLoS One. 2014 Jun 17;9(6).

34. Sultana N. Pregnancy induced hypertension and associated factors among pregnant women. J Gynecol Womens Heal. 2017 Mar 30;3(5).

35. Lake EA, Olana Fite R. Low birth weight and its associated factors among newborns delivered at Wolaita Sodo university teaching and referral hospital, Southern Ethiopia, 2018. Int J Pediatr. 2019 Jul 22;2019:1–7.

36. Kahsay HB, Gashe FE, Ayele WM. Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region, Ethiopia: matched case-control study. BMC Pregnancy Childbirth. 2018 Dec 6;18(1).

37. Liyew EF, Yalew AW, Afework MF, Essén B. Incidence and causes of maternal near-miss in selected hospitals of Addis Ababa, Ethiopia. PLoS One. 2017 Jun 1;12(6).

38. Gaym A, Bailey P, Pearson L, Admasu K, Gebrehiwot Y. Disease burden due to pre-eclampsia/eclampsia and the Ethiopian health system's response. Int J Gynecol Obstet. 2011;115(1):112–6.

APPENDIX

A: Medical extraction sheet

MES Code:_____

CASE Code:_____

A. Socio-demographic Data

1. Age: 15-35 ☐ 35-49 ☐
2. Marital Status: Married ☐ Single ☐ Divorced ☐ Widowed ☐
3. Residence: Rural ☐ Urban ☐
4. Religion: Orthodox ☐ Catholic ☐ Protestant ☐ Muslim ☐ her ☐
5. Highest Educational Attainment: Illiterate ☐ primary ☐ secondary ☐ tertiary ☐
6. Occupation: Unemployed ☐ Employed ☐ Business ☐ Farming ☐ er ☐

B. Risk factors

1. HIV Status: Positive ☐ Negative ☐

2. Parity: Primipara ☐ Multipara ☐ Grand Para ☐

3. Place of Delivery: Hospital ☐ Clinics ☐ Home ☐

4. Attendance of ANC: Yes ☐ No ☐

5. Number of ANC Visits: one ☐ wo ☐ three ☐ our ☐

6. Onset of HDP: Home ☐ Health facility ☐

7. Proteinuria: Positive ☐ Negative ☐

8. Type of HDP illness: chronic hypertension ☐ preeclampsia ☐

Eclampsia ☐ superimposed preeclampsia ☐

9. Type of Anticonvulsant or Antihypertensive given: Mgso4 ☐ azepam ☐

Hydralazine ☐ others ☐

10. Mode of Delivery: SVD ☐ C/S ☐ Instrumental ☐

11. Chronic Medical Conditions: Diabetes mellitu ☐ chronic heart failure ☐

renal failure ☐ other ☐

C. Maternal and Fetal Outcome

1.Does both the mother and the fetus develop complication? Yes ☐ No ☐

2. Does the mother developed complication? Yes ☐ No ☐

3. If yes what was the maternal complication? Maternal death ☐ PH ☐ PPH ☐

4. Does the fetus developed complication? Yes ☐ No ☐

5. If yes what was the fetal/ neonatal complication? Perinatal death ☐ low birth weight ☐

Preterm birth ☐ IUGR ☐