INCIDENCE OF POSTPARTUM HEMORRHAGE AMONG WOMEN WITH HYPERTENSIVE DISORDERS IN PREGNANCY AT KENYATTA NATIONAL HOSPITAL IN 2019: A PROSPECTIVE COHORT STUDY

EDWIN MUASYA MULWA MAKUMI
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DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY
FACULTY OF HEALTH SCIENCES
UNIVERSITY OF NAIROBI

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DECLARATION

This dissertation is my original work and has not been presented for a degree in any other University

Dr. Edwin Muasya Mulwa Makumi

Signed Date30th June 2021

This dissertation has been submitted for examination with the approval of University Supervisors:

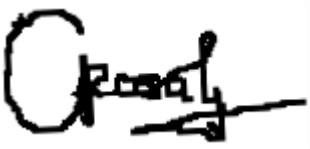
Professor Omondi Ogutu (MBchb, Mmed Obstetrics & Gynaecology, PGDRH, FCOG ECSA)

Associate Professor of Obstetrics & Gynaecology

University of Nairobi

Signed..... Date 9/7/2021

Dr. Rosa Chemwey
Consultant Obstetrics and Gynaecology,
Kenyatta National Hospital



Signed..... Date.....14/11/2021.....

LIST OF ABBREVIATIONS AND ACRONYMS

ACOG:	American College of Obstetricians and Gynecologists
AKI:	Acute kidney injury
ANC:	Antenatal clinic
AIP:	Abnormally invasive placenta
AVD:	Assisted vaginal delivery
CI:	Confidence Interval
CKD:	Chronic kidney disease
CS:	Caesarian section
DIC:	Disseminated intravascular coagulation
ERPF:	Effective renal plasma flow
GFR:	Glomerular filtration rate
HCG:	Human Chorionic Gonadotrophin
HDP	Hypertensive disorders in pregnancy
KNH:	Kenyatta National Hospital
LMIC:	Low and middle-income countries
MDG:	Millennium development goal
PPH:	Post-partum hemorrhage.
RBC:	Red Blood Cell
RR:	Relative Risk
SPSS:	Statistical Package for Social Sciences
SSA:	Sub-Saharan Africa
UON:	University of Nairobi
WHO:	World Health Organization

DEFINITION OF TERMS

Incidence: Measure of probability of occurrence of a given condition in a population over a Period.

Postpartum hemorrhage: blood loss of more than 500mls in a vaginal delivery or more than 1000 mls in a caesarian delivery.

Primary Postpartum hemorrhage. PPH occurring within 24hrs after delivery

Severe PPH. Blood loss of more than 1500mls

Cohort: Group of subjects who share a defining characteristic diagnosis -Investigation or Analysis of the cause or nature of a condition, situation, or identifying a disease from its signs and symptoms.

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ABSTRACT

Background:

Postpartum Hemorrhage (PPH) is the leading cause of maternal morbidity and mortality worldwide. PPH accounts for 35 % of all maternal deaths in low- and middle-income countries (LMIC) and 25 % in high income countries. Hypertensive disorders complicate 2-5% of pregnancies in high income countries while in LMIC it occurs in up to 8% depending on the region. In high income countries hypertensive diseases in pregnancy(HDP) are associated with a 2-3 fold increased risk of PPH. This increased risk of PPH may be attributed to HDP associated coagulopathy or thrombocytoepnia. Despite the high burden of PPH and HDP in LMIC especially in Kenya, the association between these two major causes of maternal mortality has not been studied.

Objective:

To compare the incidence and severity of PPH between hypertensive and normotensive women who delivered at Kenyatta National Hospital (KNH) between May and August 2019.

Methodology:

Study design: This was a prospective cohort study in which the exposed group were women with hypertensive disorders and the unexposed group were normotensive pregnant women who were admitted for delivery at KNH. Patients were followed up from admission, in labor and 48 hours after delivery. The main outcome was primary postpartum hemorrhage which was defined as blood loss of more than 500mls in a vaginal delivery and more than 1000 mls in a caesarian delivery, occurring within 24 hrs.' after delivery. Severe PPH was defined as blood loss of more than 1500mls. PPH was assessed by the primary care giver during delivery by visual estimation.

Site: The labor wards, antenatal wards and theater at KNH.

Sample size: Total sample size was 420 participants, (211-normotensive), 209 hypertensive.

Data collection: Data was collected using a structured questionnaire. The questionnaires were administered to patients who had consented by the principal investigator and trained research assistants.Data on demographic, pregnancy and labor characteristics of patients, and outcomes was collected. Patient's ANC booklets and files were used to retrieve any additional information required. The data was backed up in a password protected external hard drive

Data analysis: Data analysis was done using SPSS version 21. Continuous variables were summarized as means (+Standard deviation (SD)) or median. Percentages and frequencies were computed for categorical data. Continuous demographic and clinical variables between women with hypertension and those without were compared using the Student t test . Relative Risk (RR) ratio at 95% CI was the measure of association of variables. P value <0.05 was considered statistically significant.

Results

Between May and August 2019,429, a total of 420 women were enrolled into the study; 209 hypertensive and 211 normotensive. The sociodemographic characteristics were similar between the two groups. However, the Mean age was higher among HDP (29.1years +/-6.4), Compared to normotensive (27.8 +/-5.9 years). The incidence of primary PPH was 39% higher in HDP(22.7%) compared to normotensive women, RR=1.39, 95%CI (1.13-1.69),p<0.01The incidence of severe PPH was 4.3% among hypertensive women and 2.8% for normotensive women.

Conclusion

Those with HDP were likely to have PPH compared to normotensive. However, after adjusting for confounders, no evidence of an association was seen between hypertensive status and PPH.

Recommendations

In this study, women with HDP had a 39 % increased risk of PPH compared to normotensive women. HDP was also associated with % higher risk of severe PPH compared to normotensive women. Therefore, women with HDP should be monitored closely during labor and delivery and interventions implemented early to reduce the risk of PPH and severe PPH. Findings in a large multicenter study may be used to establish a direct link of HDP and PPH and formulate protocols.

CHAPTER ONE

1 INTRODUCTION

1.1 Background

Maternal mortality, as defined by WHO, refers to death of pregnant women or after termination of a pregnancy (usually within 42 days). The death of these women can be due to accidental or incidental causes related to its management irrespective of the site of the pregnancy or its duration (1).Several factors have been found that lead to maternal death. Post partum hemorhage and hypertensive disorders in pregnancy contribute the most to the causes of maternal mortality and morbidity reported globally. PPH accounts for 35 % of all maternal deaths in LMIC and 25 % in high income countries. Unsafe abortions is also a well-known predictor for maternal mortality (1). In a study in Brazil, 28,713 maternal deaths were reported from 1996 to 2012, with hypertensive disorders and PPH combined linked with over a third of cases (2). Researchers have studied the roles of unsafe abortions and hypertensive disorders in maternal mortality exhaustively. However, even though the causes of PPH are well documented (3), its risk indicators among normotensive and hypertensive parturients in SSA is poorly understood. This creates a major barrier for the early detection and control of PPH.

Reducing maternal deaths has featured on the international agenda on child and maternal health since 1990. Spearheaded through Millennium Development Goal 5 (MDG 5) by the WHO, the main aim of this MDG was to reduce the maternal mortality reported globally by over 33% by the year 2015 (4). This goal was surpassed. Worldwide, the number of death reported for pregnant women dropped by 43% by 2015, mainly in the developed world. Unfortunately, resource-poor countries mainly in Africa reported little progress, with the rate of maternal mortality reported for women in this region being unacceptably high. To address such failures, another target was set by the United Nations, the Sustainable Development Agenda, which was intended to run from 2016-2030. Like the MDG 5, its aim is to reduce maternal mortality ratio all over the world to less than 70/100,000 live births. In this agenda, countries in the developing or developed must maintain a mortality ratio less than twice the global average (5).

PPH definition varies in different settings. It is commonly defined as a blood loss that is ≥500 ml during a normal vaginal delivery and >1000 mls during a cesarean delivery and or requires a blood transfusion (6). The American College of Obstetricians and Gynecologists (ACOG)

also warns that a 10% drop in hematocrit levels for women in labor in comparison to the hematocrit level at a time of admission might be a strong indication of PPH (6).

In addition to PPH, hypertensive disorders are contributors to maternal mortality and morbidity in pregnancy. Globally, 5-10% of cases are linked with hypertensive disorders (7). Classified as gestational hypertension, preeclampsia, masked hypertension and white coat hypertension (8), these disorders present in different ways in at-risk women. Many studies also suggest that familial factors may increase the risk and vulnerability of parturients to PPH (9,10) but stress the need for more research worldwide. To achieve the target of the Sustainable Development Agenda target of less than 70 maternal deaths per 100,000 live births by 2030 in Kenya, thus, there is need for progressive maternal health research (11). Identifying known/ unknown modifiable risk factors for PPH could help in its prevention and management.

Studies in high income countries have linked HDP with PPH(12).The multifactorial pathogenesis of HDP which include endothelial dysfunction, impaired uteroplacental blood flow, imbalance between angiogenic and antiangiogenic factors contribute to coagulation abnormalities. HDP are also associated with placenta abruption, thrombocytopenia or disseminated intravascular coagulation which often leads to PPH.

CHAPTER TWO

2 LITERATURE REVIEW

Pregnancy related deaths are a major cause of unexpected mortality of women. It is estimated that nearly half a million women die while giving birth every year with about a quarter of these cases resulting from hemorrhage (10). This makes PPH the commonest cause of death and suffering among pregnant women in the developing world as well as developed countries, with about 1-5% of deliveries (10). Blood loss that is >500 ml is considered PPH while a level below that after a vaginal delivery is considered normal (13). In other definitions PPH's termed as blood loss level that leads to hypovolemia, a drop in hematocrit by 10%, or a level of blood loss that necessitates the transfusion of blood and blood products such as platelets (13). PPH is classified into two groups – primary and secondary PPH. In primary PPH, a blood loss more than 500 ml is reported after a vaginal birth and over 1000 ml when childbirth is by a caesarian section (CS). However, in both cases, blood loss must occur within the first 24 hours of delivery to be considered diagnostic for primary PPH. Primary PPH is reported in around 5% of pregnancies all over the world (14,15). Secondary PPH is defined as heavy lochia discharge or an excessive blood loss from the vagina at least 24 hours after the third stage of labor (16). Many studies associate it with the development of uterine atony, vaginal or cervical tears, vaginal hematoma, adherent placenta, retained placenta, or uterine angle extension to name a few. It has also been observed that secondary PPH can lead to major complications such as hypovolemic shock, renal failure, disseminated intravascular coagulation, and or acute respiratory distress syndrome (15,17,18).

Active management of the third stage of labor has shown to yield good results in the reduction of risk of PPH. This includes injection with oxytocin, massage of uterine walls and controlled cord traction (19). When the placenta is not delivered spontaneously, numerous conditions can be considered. This is the case of placenta being detached from the uterine wall but still trapped inside the uterus due to a closed cervix, an entrapped placenta. The placenta not being detached but there are no signs of invasive growth in the uterine wall cause an adherent placenta, or there is abnormal invasive growth into or through the uterine wall also known as AIP (20,21). AIP often leads to severe PPH that eventually require blood transfusions and in more severe cases hysterectomy, complications that can be minimized if diagnosed before labor (22–24). Several epidemiological studies have been performed to identify women at risk of developing PPH, in the hope of initiating sufficient preventive measures(25). Some risk factors identified include

multiparty, caesarean section, hypertensive disorders, macrosomia, previous PPH, induction of labor, augmentation of labor, operative vaginal delivery, CS and placenta previa (26,27) .

Hemostasis is the process that maintains equilibrium between coagulation and fluidity of blood in damaged blood vessels through actions of the coagulation cascade, platelets, and fibrinolysis (28,29). The main aim of the coagulating process is to stop bleeding by forming a clot through a cascade of processes initiated after exposure of tissue factor primarily after vascular damage (30). Massive hemorrhage is defined as loss of total blood volume within 24 hours, 50% within 3 hours, or a rate of blood loss of 150 ml/min, or hemorrhage requiring massive transfusion of ≥10 units of red blood cells (RBC) within 24 hours (31,32) . It is noteworthy that massive hemorrhage following surgery or childbirth may lead to coagulopathy. In such kind of instances an abundant release of tissue factor leads to activation of a coagulation cascade and consequent consumption of coagulation factors and platelets (28,29). The simultaneous systemic hypo-perfusion causes hypothermia and or acidosis, which not only inhibits coagulation but also activates anticoagulation factors and fibrinolysis, which complicate coagulation further (32,33)

PPH preventive measures include minimizing risk factors or giving additional uterotonics to high risk women (6,34,35). Once PPH has developed treatment options relate to the cause of hemorrhage: uterotonics for atony, surgical repair of lacerations, removal of retained tissue, and correction of diagnosed coagulopathy (13). Severe PPH can be avoided in clinical practice hence the need to be more vigilant. Other risk indicators for PPH include instrumental delivery, augmentation of labor, multiple pregnancy, polyhydramnios/ hypertensive disorders (36,37).

Hypertensive disorders in pregnancy are the third leading cause of maternal deaths in Kenya. In the "Confidential Enquiry into Maternal Death" (CEMD) of 2014, it led to about 18% of the maternal deaths. This was an upward trend of what had been reported earlier(38). Hypertensive disorders complicate 2-5% of pregnancies in developed countries while in LMIC it occurs in up to 8% depending on the region(39). In general, hypertensive disorders are seen more often in primigravida, those exposed to excess HCG (multifetal gestation, molar pregnancy), patients having preexisting hypertension or genetic predisposition. This could have been brought about through Abnormal trophoblastic invasion, oxidative stress, genetic or immunological factors, changes in inflammatory/vascular system, maternal maladaptation, interaction of factors (40).

Chronic hypertension refers to a spike in blood pressure preceding pregnancy and or it may occur within the first 20 weeks of a pregnancy. Most of the time, chronic hypertension does

not resolve 12 weeks postpartum after a checkup. Depending on the biology of women and the progression of pregnancy, women can experience one of two types of chronic hypertension. In mild cases, systolic and diastolic spikes in blood pressure of 179 mm Hg and 109 mm Hg have been reported. In severe cases, on the other hand, systolic and diastolic blood pressures reach 180 mm Hg and 110 mm Hg respectively (8). Left unchecked, this condition can complicate up to 5% of all pregnancies with delay in childbearing being the commonest ramification (41).

Gestational hypertension occurs after a gestation period of 20 weeks. It is diagnosed at whenever a patient or pregnant mother present with the following: 1) elevated systolic (≥ 140 mm Hg) and diastolic (≥90 mm Hg) blood pressure, with the diastolic pressure measured with the fifth Korotkoff sound, 2) history of normal blood pressure, 3) no evidence of preeclampsia, eclampsia, or protein in urine of women (8,42). Also termed transient hypertension, diagnosis of gestation hypertension can be done in retrospect if the parturient has a normal blood pressure 12 weeks postpartum and has not had preeclampsia (43). This is because studies have found that gestational hypertension presents at a gestation of 24 and 35 weeks in 50% of women (44).

Preeclampsia is a disease of unknown etiology that affects multiple organs. Characterized by proteinuria and hypertension after a gestation of 20 weeks (45), it prevents the remodeling of blood vessels, which is necessary for development of placenta. Fetal syncytial trophoblasts penetrate and remodel the maternal spiral arteries during a normal pregnancy. This causes them to dilate and then transform into low capacitance vessels, which improve circulation of blood and placental perfusion. However, because of the restrictions induced by preeclampsia the placenta does not fuse well with the maternal blood vessels, which leads to intrauterine growth restriction and adverse fetal manifestations. A relationship between gravidity and the risk of developing preeclampsia exists. During the first pregnancy, risk of preeclampsia is highest. This is commonest among women who become pregnant at a young age (43). Other key factors associated with the development of preeclampsia are the presence of chronic hypertension, the presence of chronic renal diseases, high BMI, and the antiphospholipid antibody syndrome. It is is believed that it can be prevented through supplementation with antioxidant vitamins, use of omega-3 fatty acids, supplementation with magnesium, and low dietary intake of calcium (44,46,47).

Eclampsia is usually a complication in women with pre-eclampsia with severe features. It is defined as new onset of grand mal seizure activity and /or unexplained coma in pregnancy or postpartum. Even though pre-eclampsia and elevated blood pressure are major indicators,

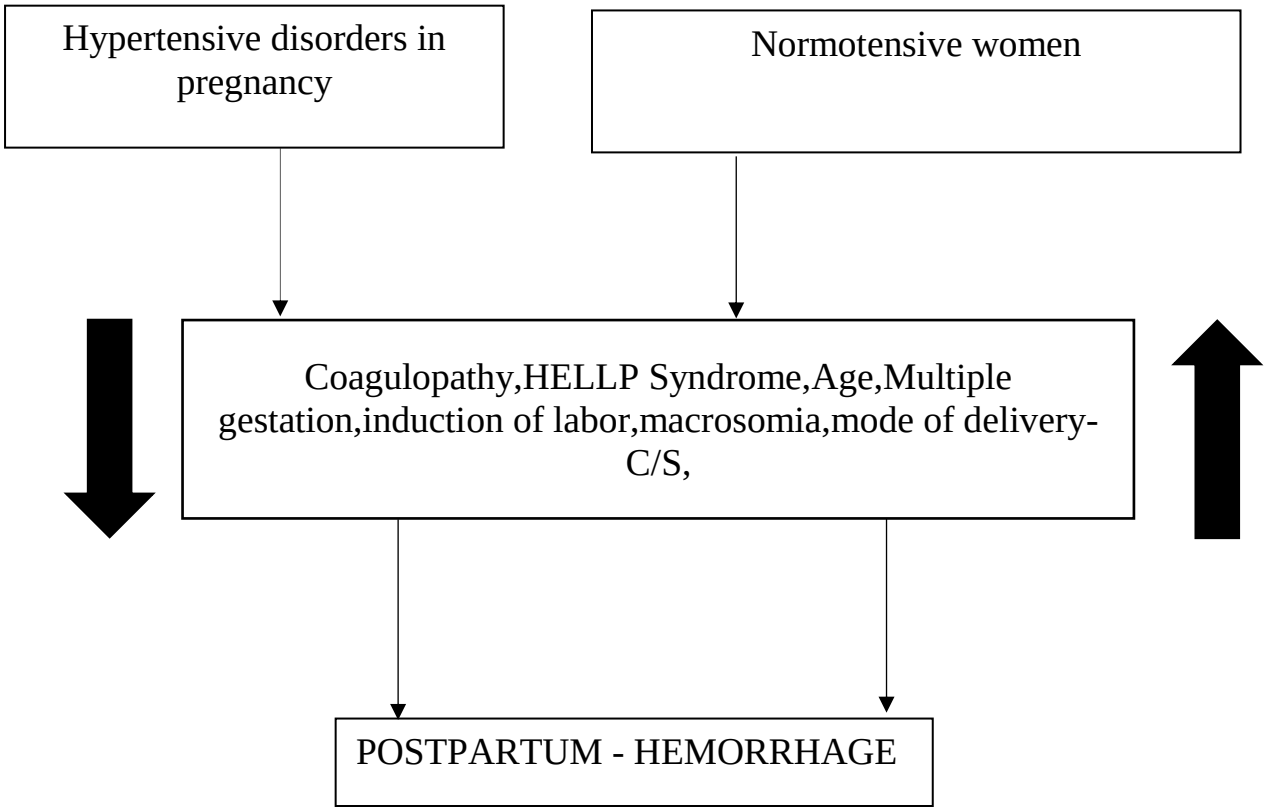
eclampsia can present unexpectedly, often without symptoms. Furthermore, while edema and ischemia are among its main causes, the exact causality of eclampsia is unknown. The timing of an eclampsia seizure can be antepartum (53% of cases), intrapartum (19% of cases), or postpartum (28% cases) (48).

Hypertensive disease in pregnancy is linked with maternal and fetal complications commonly noted in severe pre-eclampsia or eclampsia. Adverse fetal outcomes such as prematurity, fetal death, low birth weight, and stunted growth are very common. Maternal complications include abruption placenta, acute kidney injury (AKI), cerebrovascular accidents, preterm labor, and maternal death. Some of these are thought to be brought about by postpartum hemorrhage (49).

Normal physiologic changes of pregnancy include an increase in red cell mass and volume of plasma by 25% and 40% respectively (50). In preeclampsia and eclampsia this expansion is absent offering no buffer in the event of PPH (51). Hemodynamic parameters in preeclampsia include a reduction in cardiac output and pulmonary wedge pressure, an increase in peripheral vascular resistance, heightened sensitivity of the vascular system to endogenous pressor peptides, and an increase in vascular permeability that heightens loss of albumin from intravascular space (52). Parturients with preeclampsia may be normotensive in spite of the remarkable hypovolemia.

The renal system is adversely affected in preeclampsia with a reduction in GFR and ERPF (effective renal plasma flow)(53,54). Severe PPH might worsen the condition. Magnesium sulphate is a preventive remedy of eclampsia. It is thought to cause vasodilation thus preventing cerebral ischemia and inducing antihypertensive effect. This vasodilation could induce PPH though studies on this are not conclusive (55–57). MgSO4 has a tocolytic effect that may cause hypotonia of the uterus. Uterus atony is a well-defined cause of PPH (58). Calcium channel blockers especially nifedipine are widely used in hypertensive diseases in pregnancy to control blood pressure. They are also useful in preterm labor. These drugs inhibit influx of calcium into the smooth muscles that induce uterine contraction (59). However, if delivered in the absence of uterine contractions, the atonic uterus might bleed excessively and therefore cause PPH (60).

2.1 Conceptual Framework



2.2Justification

There are limited studies linking HDP with PPH and none is available locally. Most other studies investigated HDP as one of the numerous risk factors for PPH. At KNH, no study has evaluated PPH in relation to hypertensive disorders in pregnancy. This is conceivable because of the multifactorial pathogenesis of HDP, where endothelial dysfunction, impaired uteroplacental blood flow, and the major angiogenic factors also contribute to development of hypertension and coagulation abnormalities. HDP might also induce placenta abruption, thrombocytopenia, or disseminated intravascular coagulation, which often leads to PPH. This study was aimed at filling these gaps. We intended to compare the difference in incidence of postpartum hemorrhage between hypertensive and normotensive women in Kenya National Hospital. To assist health workers to detect PPH early and structure up a health policy program that can be used in clinical practice and benefit the women at risk.

2.3 Research Question

What is the association between HDP and PPH among women who delivered at KNH in 2019?

2.4 Hypothesis

$H_0$1: The incidence of PPH among hypertensive and normotensive women who delivered at KNH in 2019 is the same.

2.5Objectives

2.5.1Main Objective

To determine whether HDP is associated with PPH among hypertensive and normotensive women who delivered at KNH in 2019.

2.5.2Specific Objectives

Between hypertensive and normotensive women in KNH in 2019,to compare;

1) The incidence of primary PPH.
2) The incidence of severe PPH.
3) The effect of HDP on PPH adjusted for potential confounders.

CHAPTER THREE

3 METHODOLOGY

3.1 Study Design

This was a prospective cohort study in which the exposed group were women with HDP and unexposed group were normotensive women. Patients were enrolled at admission, followed up in labor, delivery and up to 48hrs postpartum to observe for the main outcome of interest which was postpartum hemorrhage. This was the preferred study design because it avoids selection bias since outcome of interest is not known at baseline.

3.2 Study Area and Site Description

This study was done at KNH labor ward. KNH labor ward is located in Nairobi and it is the biggest referral hospital in Kenya. The center serves as a referral hospital with many consultant doctors. It is also a teaching hospital for the University of Nairobi (UoN) and Kenya Medical Training College (KMTC). The average number of deliveries at the KNH is 800-1000 per month with high and low-risk women from Nairobi and surrounding Counties being its major clientele. Due to the referral nature of KNH, many patients with hypertensive disorders in pregnancy are referred to the facility and it is best suited for carrying out the study.

3.3 Study period

The study was carried out at Kenyatta National Hospital from May to August 2019.

3.4 Study Population

Pregnant women greater than 24 weeks gestation who delivered at KNH. The exposed group was women with hypertensive disorders while the non-exposed were normotensive women. The main outcome measure was postpartum hemorrhage. PPH was defined as blood loss of more than 500mls in a vaginal delivery and more than 1000 mls in a caesarian delivery. Severe PPH was defined as any blood loss exceeding 1500mls. PPH was assessed by the primary care giver during delivery by visual estimation.

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3.5 Inclusion Criteria

Pregnant mothers above 24 weeks gestation who delivered at KNH labor wards between May to August 2019 and had consented to participate in the study.

3.6 Exclusion Criteria

1) Preexisting bleeding disorders
2) Preexisting malignancies
3) Deep venous thrombosis

3.7 Sample Size Determination

In a research study done by Von Schmidt et al, the incidence of PPH in preeclampsia was 7.4%. The incidence of PPH in normotensive women was 1.4%. We assumed a higher incidence of PPH at 8% for exposed and 2% for non-exposed. We used these statistics in our calculations.

$$n = \frac{\left[z_\alpha \sqrt{(1+1/m)\bar{p}(1-\bar{p})} + z_\beta \sqrt{p_0(1-p_0)/m + p_1(1-p_1)}\right]^2}{(p_0 - p_1)^2}$$

Where:

α = alpha

β = 1 – power

P_0 = Incidence of PPH in Normotensive.

P1 = Incidence of PPH in Hypertensive.

Zα = standard normal variate for significance level

Zβ = standard normal variate for power (type 2 error)

m = number of exposed versus unexposed

n = sample size (rounded up to the closest integer)

We assumed the following:

Zα = 1.96 at 0.5% level of confidence

Zβ = 0.84 at 80% power

Po = 2%

P1 = 8%

m = 1 (1 versus 1)

Sample size was calculated using an http://epitools.ausvet.com.au/content.php?page=cohortSS calculator. A minimum of 204 women were required per arm to demonstrate a power of 80%

at 95% confidence interval (CI). To take care of missing data, the total sample size of 408 patients was adjusted by 5%. Therefore, 211 patients per arm (422 subjects) were required.

3.8 Sampling Procedures

Consecutive sampling was done. As parturients were received in the labor ward, they were screened for eligibility and enrolled to the groups. This was done until we got our desired sample size.

3.9 Methods of Recruitment

Study participants were recruited in antenatal wards and the labor ward at the KNH. The principal investigator with the help of three trained research assistants did the recruitment. Pregnant women were assessed for eligibility, recruited, and taken through the consenting process. Written informed consent was obtained from all women who volunteered to participate.

3.10 Study Procedure

Patients were recruited as from 24 weeks gestation to term. Those recruited in labor ward were followed up during labor, delivery and up to 48 hours after delivery and the development of adverse outcomes noted; our main one being PPH. Follow up was done in labor ward, theatre, postnatal wards, HDU, ICU and dialysis units. Follow-up stopped after 48 hours post-delivery. The principal investigator and assistants at these points filled a questionnaire. Those recruited from the antenatal wards were monitored to check if they went into spontaneous labor and when they did, they were transferred to labor ward for monitoring. Those who were induced were monitored and assessed for established labor then transferred to labor ward if they were found to be in established labor.

3.11 Data Variables

Study Objective	Exposure Variable	Outcome Variable	Sources of Data
Incidence of PPH	▪ Hypertensive ▪ Normotensive	PPH	▪ Questionnaire ▪ Patients file
Incidence of sever PPH	▪ Hypertensive ▪ Normotensive	PPH	▪ Patients file
demographics, pregnancy labor and delivery characteristics	▪ Age ▪ Level of education ▪ Occupation	PPH	▪ Questionnaire ▪ Patients file

	▪ Parity ▪ Gestational age ▪ Multiple pregnancy ▪ Onset of labor- Induced, spontaneous ▪ Mode of delivery ▪ Manual removal of placenta ▪ Birth weight ▪ Birth outcome ▪ Atony-Yes -No ▪ Tears -Yes -No		

3.12 Data Collection Procedure

Data was collected using a structured questionnaire. The questionnaires were administered to patients who had consented by the principal investigator and trained research assistants. Three research assistants, nurses in the reproductive health units, underwent training by the principal investigator. Training took three days prior to commencement of data collection. Initially they observed the process of obtaining consent and filling of questionnaires. Thereafter they worked under supervision until the principal investigator was satisfied. Data on demographic, pregnancy and labor characteristics of patients, and outcomes was collected. Patient's ANC booklets and files were used to retrieve any additional information if required. The data was backed up in a password protected external hard drive.

3.13 Quality Control

To ensure proper administration of questionnaires, research assistants were trained beforehand. The principal investigator and research assistants pretested the questionnaires and all the necessary improvements made before data collection. To validate content and consistency, a pretest and validation was done with 42 women which was 10 % of our sample size. On recruitment, two healthcare care providers filled a questionnaire for each patient and the similarity between responses were established by analysis. The questionnaires were shared

with other consultant doctors and other healthcare workers at KNH to establish their suitability for data collection. The data on our questionnaire was double-checked for completeness after completion of interviews.

3.14 Data Analysis

Statistical analysis was done using IBM SPSS version 21. Continuous variables such as age were summarized using mean and standard deviation. Percentages and frequencies were calculated for categorical data. Continuous demographic and clinical variables between women with hypertension and those without were compared using the student t test. Categorical demographic and clinical data, was compared using the Pearson's Chi-square test. Relative Risk (RR) ratio at 95% CI was the measure of association of variables. P value <0.05 was considered statistically significant.

3.15 Ethical Considerations

3.15.1 Ethical clearance

Ethical review and approval to conduct the study was obtained from the UON/KNH Ethics Review Committee (ERC). Number P73/02/2019

3.15.2 Informed consent

All the participants included in the study provided signed informed consent for their participation. After examination, printed consent forms in both English and Kiswahili with detailed information on this study were issued to the participants. Literate women read forms by themselves. Before signing the consent form, a question-and-answer session was held between the woman and study interviewer where we explained the benefits and risk of this study, responded to all questions and concerns. We talked about voluntary participation, the freedom of the woman to withdraw at any time and about confidentiality of the women and their data. Thumbprints were taken for illiterate participants.

3.15.3 Withdrawal

Particpants were given the option to withdraw at any time without any form of prejudice

3.15.4 Confidentiality

During and after completion of this study, the confidentiality of parturients was respected. Names of participants were not recorded on our data collection tools. Signed consent forms

and data collection tools were filled and stored in a locked cabinet. Only the principle investigator ,statistician and collaborators in this study had access to data.

3.16 Results Dissemination Plan

Findings will be shared with line clinicians, KNH obstetrics and gynecology department, UoN obstetrics department, and medical officer of health or the Ministry of Health for further action. We will also publish our novel findings in peer-reviewed journals and present in conferences.

3.17 Limitations of the Study

Estimation of blood loss by the caregiver may be less or more than the actual amount since only visual estimation was done. Training sessions were held with our research staff to minimize bias.

3.18 Financial Support

This study was funded out of pocket.

CHAPTER FOUR

4 RESULTS

4.1 Study Flow Chart

Betwen May and August of 2019, 429 women were screened and 420 enrolled. To hundred and fifteen had HDP and 214 were normotensive. Of the 215 women with a hypertensive status, six were excluded for either declining consent (3) or DVT (3), which left us with 209 participants. Of the 214 normotensive women, three were excluded due to missing data (>20%), which left us with 211 participants as depicted in ***Figure 1*** below.

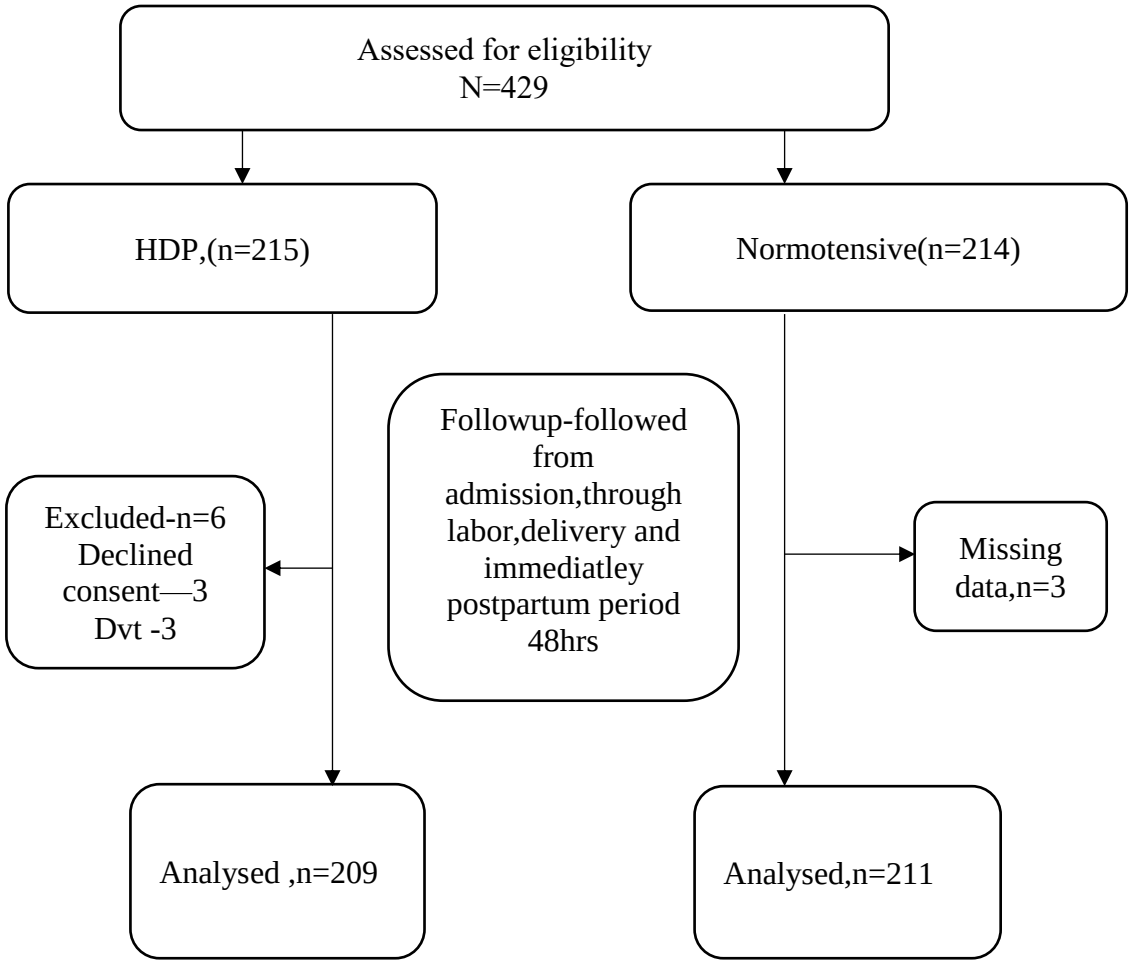

Figure 1.Study flow chart

4.2 Demographic and reproductive characteristics of hypertensive and normotensive women who delivered at 24+ weeks at KNH between May and August 2019

The 209 hypertensive women evaluated had a median age of 29 years, range 17-45 years, while the 211 normotensive women reviewed were slightly younger at 27 years, range 16-44 years. Though the hypertensive women were older this was not statistically significant

(p>0.05). Women with hypertensive disorders were more likely to be unemployed but that was not statistically significant (p>0.05). The level of education of these women did not vary statistically (p>0.05). Hypertensive women were 2.1 times more likely to have preterm births and this was significant (OR (95%CI=2.17 (1.79-2.63), p<0.01). The odds of labour induction was 2.12 times higher among hypertensive patients than normotensive patients (OR (95% CI) = 2.12 (1.69-2.64), p<0.01. Hypertensive women were less likely to present with a breech foetal presentation than normotensive women (OR (95% CI) = 0.44 (0.16-1.21), p=0.04. Other reproductive characteristics such as the parity and whether one had multiple gestation did not differ statistically (P>0.05) as presented in Table 1 below.

Table 1. The demographic and reproductive characteristics of hypertensive and normotensive women who delivered at 24+ weeks gestation at KNH in May-August 2019

		Hyper, (n=209)	Normo, (n=211)	OR (95% CI)	P
Age	Median (Range)	29 (17-45)	27 (16-44)		
Ae group (years)	<20	11 (5.3)	10 (4.7)	Ref	
	20-24	53 (25.4)	62 (29.4)	0.88 (0.55-1.38)	0.59
	25-34	98 (46.9)	110 (52.1)	0.89 (0.58-1.39)	0.64
	35-39	37 (17.7)	19 (9.0)	1.26 (0.80-1.98)	0.26
	40+	10 (4.8)	10 (4.7)	0.95 (0.52-1.74)	0.87
Education	Primary	47 (22.5)	33 (15.7)	Ref	
	Secondary	101 (48.3)	111 (52.9)	0.81 (0.64-1.02)	0.09
	Tertiary	61 (29.2)	66 (31.4)	0.81 (0.63-1.06)	0.13
Occupation	Self Employed	64 (31.2)	66 (32.4)	0.84 (0.64-1.11)	0.24
	Unemployed	106 (51.7)	113 (55.4)	0.83 (0.64-1.07)	0.17
	Employed	35 (17.1)	25 (12.3)	Ref	
	Missing	4	7		
Grouped parity	Nulliparity	70 (33.7)	67 (32.7)	Ref	
	Multiparity	130 (62.5)	133 (64.9)	0.96 (0.78-1.19)	0.75
	Missing	9	11		
	Grandmultiparous	8 (3.8)	5 (2.4)	1.57 (1.10-2.22)	0.07
Multiple pregnancies	Yes	9 (4.4)	14 (6.7)	0.77 (0.46-1.31)	0.29
	No	197 (95.6)	194 (93.3)	Ref	
Gestation	Median (Range)	37 (20-48)	39 (3-46)		
Gestation (grouped)	Early preterm (<31 weeks)	36 (17.1)	6 (2.9)	2.17 (1.79-2.63)	**<0.01**
	Late preterm (31-36 weeks)	58 (27.6)	19 (9.1)	1.91 (1.57-2.32)	**<0.01**
	Term (37-41 weeks)	109 (51.9)	167 (79.9)		Ref
	Missing	6	19		
Foetal presentation	Breech	3 (1.6)	11 (5.4)	0.44 (0.16-1.21)	**0.04**
	Vertex	180 (97.8)	190 (93.6)		Ref
	Others	1 (0.5)	2 (1.0)	0.68 (0.13- 3.4)	0.59
	Missing	25			
Onset of labour	Spontaneous	91 (71.7)	155 (93.9)		Ref
	Induction	36 (28.3)	10 (6.1)	2.12 (1.69-2.64)	**<0.01**
	Missing	82	46		

4.3 Incidence of PPH among hypertensive and normotensive women who delivered at KNH at 24+ gestation between May and August 2019.

The incidence of PPH was 22.7% among hypertensive women and 12.3% normotensive women as depicted in Figure 2 below. The risk of PPH was 1.85 times higher among hypertensive women than normotensive women (P<0.01).

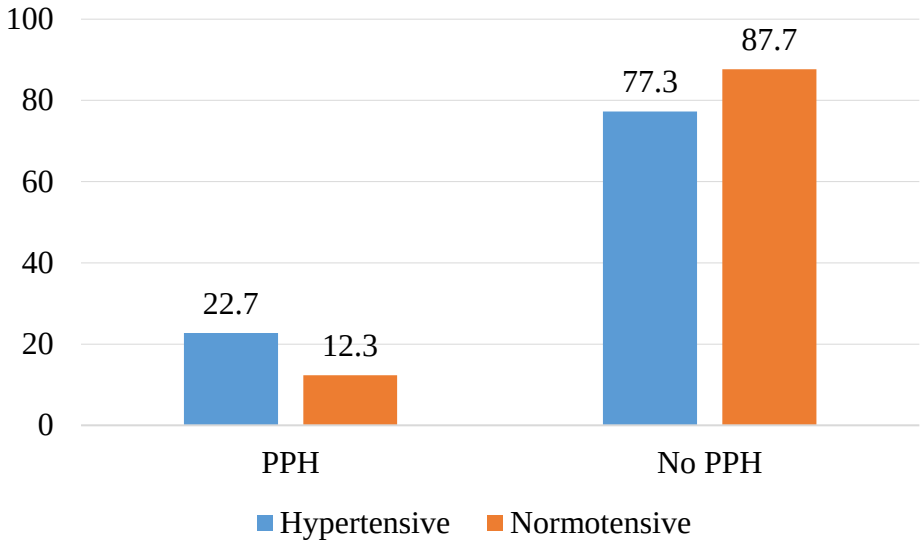

Figure 1. The incidence of PPH among normotensive and hypertensive women who delivered at 24+ weeks gestation at KNH in May-August 2019

The incidence of severe PPH was 4.3% among hypertensive women and 2.8% normotensive as depicted in Figure 3 below. Overall the risk of severe PPH as 1.5 times higher among hypertensive women but not statistically significantly (P=0.43).

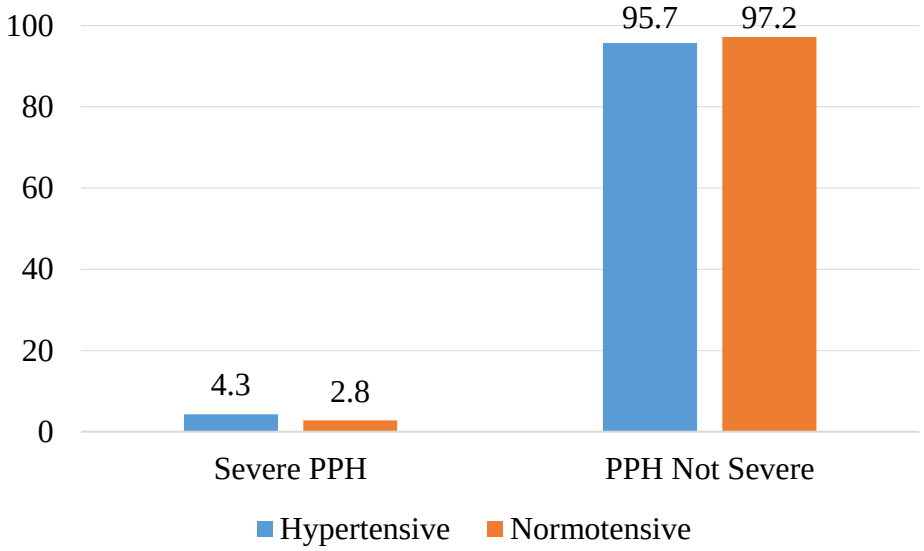

Figure 2. The incidence of severe PPH among normotensive and hypertensive women who delivered at 24+ weeks gestation at KNH in May-August 2019

4.4 Maternal outcomes relevant to PPH of normotensive and hypertensive women who delivered at 24+ weeks gestation at KNH in May-August 2019

A crude analysis of the maternal outcomes, hypertensive women had statistically significant risk of having a CS delivery compared to normotensive (RR (95% CI) =1.24 (1.02-1.51), p=0.03). The risk of perineal tears was significantly lower among hypertensive than normotensive women (RR (95% CI) = 0.67 (0.44-1.03), p=0.04. However, after adjusting for the gestation on admission, the onset of labour, and fetal presentation, the hypertensive status of women was not associated with the risk of adverse maternal outcomes. Cervical tears were 21% higher in hypertensive than normotensive women but not statistically significantly (ARR (95% CI) =1.21 (0.11-12.6), p=0.22. The requirement for dialysis, incidence of cervical tears, and the need for manual placenta removal were 0.95, 0.74, and 0.86 times lower among hypertensive patients but not statistically significantly (P>0.05), as depicted in table 3 below.

Table 2. Maternal outcomes of normotensive and hypertensive women who delivered at 24+ weeks gestation at KNH in May-August 2019

		Hyper n=209	Norm N=211	RR (95% CI)	P	ARR (95% CI)	P
Mode of delivery	CS	127 (60.2)	105 (49.8)	1.24 (1.02-1.51)	0.03	0.71 (0.42-1.22)	0.22
	SVD	84 (39.8)	106 (50.2)	Ref			
Perineal tears	Yes	18 (22.2)	38 (35.5)	0.67 (0.44-1.03)	0.04	0.74 (0.34-1.62)	0.45
	No	63 (77.8)	69 (64.5)	Ref			
Cervical tears	Yes	2 (2.9)	3 (2.4)	1.13 (0.38-3.37)	0.82	1.21 (0.11-12.6)	0.87
	No	66 (97.1)	121 (97.6)	Ref			
Manual placenta	Yes	65 (32.0)	80 (41.2)	0.83 (0.67-1.03)	0.08	0.86 (0.47-1.56)	0.62
removal	No	133 (68.0)	114 (58.8)	Ref			
Outcome of birth	Still	25 (12.1)	0 (0.0)	-	-	-	-
	Live	181 (87.9)	204 (100)	-	-	-	-
Blood	Yes	15 (8.9)	9 (4.8)	1.34 (0.96-1.87)	0.13	1.34 (0.41-4.47)	0.98
transfusion	No	154 (91.1)	177 (95.2)	Ref			
Dialysis done	Yes	3 (1.8)	1 (0.5)	1.59 (0.89-2.83)	0.23	0.95 (0.07-12.2)	0.97
	No	164 (98.2)	184 (99.5)	Ref			

4.5 Association between demographic and reproductive characteristics and PPH 1

Hypertensive status, mode of delivery, presence of cervical tears, and manual placenta removal after delivery were associated with PPH as depicted in table 4 below. The risk of PPH was 1.85 times among hypertensive women (RR=1.85 (1.19-2.86), p<0.01, Women who delivered by caesarean section, developed cervical tears, and had an assisted SVD delivery were 4.23, 6.23,

and 6.72 more likely to develop PPH than those who had a normal delivery and without cervical tears (P<0.05). Manual placenta removal lowered the risk of PPH by 0.39 times. Age, parity, gestation, and birth weight did not influence occurrence of PPH statistically (P>0.05).

Table 3. Association between selected characteristics and postpartum haemorrhage among pregnant women who delivered at KNH between May and August 2019

		PPH (n=74)	No PPH (n=348)	RR (95% CI)	P
Hypertensive status	Hypertensive	48 (64.9)	163 (46.8)	1.85 (1.19-2.86)	**<0.01**
	Normotensive	26 (35.1)	185 (53.2)	Ref	
Age group	<20	4 (5.4)	17 (4.90)	Ref	
	20-24	21 (28.4)	94 (27.2)	0.95 (0.36-2.51)	0.93
	25-34	31 (41.9)	177 (51.2)	0.78 (0.30-2.00)	0.61
	35-39	13 (17.6)	43 (12.4)	1.14 (0.41-3.11)	0.79
	Missing	0	2		
Grouped parity	Nulliparity	27 (37.5)	110 (32.3)	Ref	
	Multiparity	41 (56.9)	222 (65.1)	0.79 (0.51-1.23)	0.29
	Grandmultiparous	4 (5.6)	9 (2.6)	1.56 (0.64-3.77)	0.34
	Missing	2	7		
Multiple pregnancies	Yes	4 (5.6)	19 (5.6)	1.00 (0.40-2.50)	1.00
	No	68 (94.4)	323 (94.4)	Ref	
	Missing	2	6		
Gestation	Early preterm	5 (6.8)	37 (10.7)	0.68 (0.28-1.62)	0.37
	Late preterm	15 (20.3)	62 (18.0)	1.12 (0.66-1.89)	0.67
	Term	48 (64.9)	228 (66.1)	Ref	
	Post term	6 (8.1)	18 (5.2)	1.44 (0.68-3.01)	0.35
	Missing	0	3		
Onset of labour	Spontaneous	34 (81.1)	212 (84.8)	Ref	
	Induction	8 (19.0)	38 (15.2)	1.26 (0.62-2.54)	0.52
	Missing	32	78		
Labour augmentation	Yes	4 (8.2)	40 (17.6)	0.46 (0.17-1.24)	0.12
	No	45 (91.8)	187 (82.4)	Ref	
	Missing	25	121		
Mode of delivery	CS	62 (83.8)	170 (48.9)	4.23 (2.35-7.62)	**<0.01**
	SVD	12 (16.2)	178 (51.1)	Ref	
Assisted SVD	Yes	10 (83.3)	52 (29.9)	6.72 (1.92-23.6)	**<0.01**
	No	3 (16.7)	122 (70.1)	Ref	
	Missing	0	4		
Perineal tears	Yes	6 (46.2)	50 (28.6)	2.02 (0.71-5.74)	0.18
	No	7 (53.8)	125 (71.4)	Ref	
	Missing	61	173		
Cervical tears	Yes	2 (14.3)	3 (1.7)	6.23 (1.87-20.8)	**<0.01**
	No	12 (85.7)	175 (98.3)	Ref	
	Missing	60	170		
Manual placenta removal	Yes	13 (18.6)	132 (40.4)	0.39 (0.22-0.69)	**<0.01**
	No	57 (81.4)	195 (59.6)	Ref	
	Missing	4	21		
Birth weight	Low <2500	24 (32.4)	96 (28.2)	1.25 (0.80-1.97)	0.32
	Normal 2500-4000	44 (59.5)	232 (68.0)	Ref	
	Macrosomia >4000	6 (8.1)	13 (3.8)	1.98 (0.96-4.05)	0.07
	Missing	0	7		

In a logistic regression analysis, the presence of cervical tears and manual placenta removal were identified as predictors for PPH among pregnant women who delivered at KNH between May and August 2019. Women who developed cervical tears while delivering were 11.3 times more likely to develop PPH than those who lacked cervical tears (P=0.01), while women who had manual placenta removal were 18.4 times more likely to develop PPH (P=0.04).

Table 4. Logistic regression analysis of factors Association between selected characteristics and postpartum haemorrhage among pregnant women who delivered at KNH between May and August 2019

	RR (95% CI)	P
Hypertensive status	1.52 (0.46-5.03)	0.48
Ceasarian section delivery	0.08 (0.00-1.59)	0.09
Presence of cervical tears	11.316 (1.63-78.1)	**0.01**
Manual placenta removal	18.4 (1.06-319.0)	**0.04**

CHAPTER FIVE

5 DISCUSSION, CONCLUSIONS, AND RECOMMEDATIONS

5.1 Discussion

The study found a 39 % increase in incidence of postpartum hemorrhage among women with hypertensive disorders in pregnancy compared to normotensive women. The incidence of PPH was 22.7% among hypertensive women and 12.3% normotensive women respectively. The incidence of severe PPH (blood loss > 1500mls) was 4.3% among hypertensive women and 2.8% normotensive.However,after adjusting for comfounders,no evidenence of association was seen between hypertensive status and PPH(ARR=1.53,95% CI).

In a cohort study done in Norway in 2013 by Von Schmidt et al, looking at the risk of PPH in preeclampsia, the incidence of PPH in preeclampsia was 7.4 % and 4.2% in normotensive(3). Another study by Eskid et al in Netherlands in 2009, which looked at abnormal bleeding associated with preeclampsia in singleton pregnancies, excess postpartum bleeding (>1,500 mL) occurred in 3.0% of preeclampsia cases and in 1.4% of normotensives. Moderate bleeding postpartum (>500 mL) was also more common in preeclampsia cases (22.9% versus 13.9%0. The HYPITAT trial showed that PPH is more frequently found in women with hypertensive disease of pregnancy at term (10% vs. 0.4–1.3% for a low-risk population.(12). From above studies, which were all done in high income countries, women with HDP were more likely to develop PPH though their incidences were not as high as in our study. The incidence of PPH in normotensive women was 12.3%. This can be attributed to a better level of care and monitoring in these high-income countries compared to our setting.

Women with HDP were slightly older, unemployed and were more likely to deliver prematurely. In both the hypertensive and normotensive women, increased parity, those whose onset of labor was induced and augmented had a higher risk of developing PPH although this was not statistically significant. These factors are also associated with an increased risk of PPH. Women who were delivered by caesarian section, had cervical tears and assisted vaginal delivery were 4.23, 6.23 and 6.73 more likely to develop pph.

Maternal outcomes recorded included cervical tears, perineal tears and manual removal of placenta. These were comparable in both study groups. The risk of PPH was higher in women with these outcomes for both study groups.

We suggest that an imbalance beteween angiogenic and antiangionic factors in those with hypertensive disorders in pregnancy,which leads to coagulopathy ,could be associated with increased incidence of PPH in this cohort of women. Other factors that may be responsible include low platelets and HELLP syndrome.

However, blood transfusion was required in 8.9% of those with HDP and 4.8% of normotensive women with a relative risk of 1.34 though this was not statistically significant. Similar findings were seen in those who had dialysis due to acute kidney injury. Acute Kidney Injury requiring dialysis was observed in 1.8% of HDP and 0.5% of normotensive women $p<0.01$.

Neonates born to those with hypertensive disorders in pregnancy were less likely to have a normal weight (2500grams-4000grams) compared to those born of normotensive women $p<0.01$.HDP (61).This was however not associated with occurrence of PPH.

5.2 Conclusion

The risk of PPH was higher among women with a hypertensive state in pregnancy, even though the HDP status of women could not be used to predict the occurrence of PPH. However, manual placenta removal and occurrence of cervical tears increased the risk of PPH by over ten times.

5.3 Study limitations

Definition of PPH is arbitrary. Our definition was based on visual estimation of blood loss. Visual estimation may underestimate or overestimate PPH, suggesting that its incidence could have been lower or higher than reported. A standardized way to define PPH can be use of hemoglobin levels before and one week after delivery to mitigate this.

5.4 Recommendations

It is recommended that healthcare workers taking care of these women should be vigilant and anticipate PPH in women with HDP. Close monitoring of these patients while in labor should be a priority. PPH prophylaxis measures such as use of uterotonics such as oxytocin and misoprostol should be instituted. A larger multicenter study should be done in the country to look at the risks in the wider population.

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APPENDICES

Appendix 1: Questionnaire

POSTPARTUM HEMORRHAGE IN WOMEN WITH HYPERTENSIVE DISORDERS IN PREGNANCY VERSUS THEIR NORMOTENSIVE COUNTERPARTS DELIVERING AT KENYATTA NATIONAL HOSPITAL IN 2019: A PROSPECTIVE COHORT STUDY

Consent approved by participant Yes……No……..
Serial number……File number…….
Date of admission……
Age……..
Diagnosis
Educational background…
Primary
Secondary
Tertiary…
Occupation……
Parity……..
Nulliparity
Multiparity
Grandmultiparous
Multiple pregnancy
Yes
No
Gestation period……
Early preterm
Late preterm
Term
Post term
Fetal presentation
Breach
Vertex
Others
Onset of labor
Spontaneous
Induction of labor

Augmented labor
Yes
No

Mode of delivery: CS…… (Cause of the CS)
……
…….

SVD: Assisted Yes……No……..
Episiotomy Yes…….No…….
Perineal Tear Yes…….No……..
If Yes Grade 1..…Grade 2……Grade 3……Grade 4……

Cervical tears Yes……..No……

Manual placenta removal

Yes

No

Atony

Yes

No

Use of magnesium sulphate Yes……No

Use of nifedipine Yes……No

Outcome …….

Birth weight…….

Apgar score…….

Admission to NBU Yes ……No……..

Administration of oxygen Yes …….No……..

PPH Yes……..No…….

500mls-1000mls

1000mls-1500mls

>1500mls.

Transfused Yes No

Dialysis done Yes No

Admission to HDU/CCU Yes No

Appendix 2: Informed Consent

INCIDENCE OF POSTPARTUM HEMORRHAGE IN HYPERTENSIVE VERSUS NORMOTENSIVE WOMEN DELIVERING AT KNH IN 2019; A PROSPECTIVE COHORT STUDY

Introduction:

My name is Edwin Makumi, a postgraduate student at the Department of Obstetrics, University of Nairobi. I am conducting a study to determine the incidence of PPH in HDP pregnancy from 24 weeks of gestation. You are hereby, requested to participate in the study. This information will help you make a decision on whether to participate in the study or not. You may ask any questions about the study or anything in the form that is not clear.

Purpose of the study

PPH and HDP are the leading causes of maternal morbidity and mortality worldwide. Being able to predict these life-threatening conditions will help in their prevention and management. This study aims to establish whether hypertensive diseases in pregnancy are associated with increased incidence of PPH.

Benefits:

By participating in the study, you will help us to know whether HDP are associated with increased incidence of PPH or not. This will enable us anticipate any problems that may occur in your future pregnancies in case you have the condition and attempt to prevent them. You will also receive information about this common condition-affecting woman such as its symptoms and how it can be managed, and any questions you might have regarding the condition will be answered.

Possible risks:

There are no risks involved by your participation in the study. You will receive the standard of care accorded to other patients in the hospital. No invasive procedures will be conducted on you. The risk being investigated, i.e., postpartum hemorrhage is a possible risk of pregnant women with HDP and is not due to your participation in the study.

Voluntarism:

Participation in this study is voluntary. If you choose to participate in this study, you are allowed to leave the study at any time if you wish to do so. The care you receive from the hospital will not be influenced by the decision you make.

Compensation:

No compensation will be offered for participation in the study.

Procedure:

If you agree to participate in the study, the principal investigator or his research assistant will interview you and fill the responses in a questionnaire. The interviewer may also obtain some additional information from your medical records.

Confidentiality:

The information that you will provide will be kept confidential. Names or any information identifying you will not be included in the questionnaires or final report

Contact information:

For more information on the research, you can contact the following:
Principal investigator, Dr. Edwin M. M. Makumi
Department of Obstetrics and Gynecology, University of Nairobi
P.O. Box 29136-00625, Nairobi.
Telephone no. 0725290621.
Or
The chairperson,
KNH/UON Ethics and Research Committee
P.O. Box 20723-00202, Nairobi.
Telephone number: (254-020) 2726300-9 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

Consent:

I _____, the undersigned, acknowledge that I have been provided with adequate information about the study by Dr. /Mr. /Mrs. /Ms. _____. I have read the information, or it has been read to me. I have had the opportunity to ask questions, which have been answered to my satisfaction. I voluntarily agree to participate in the study.

Signature of Participant _____ Date _____

Signature of Researcher/ Assistant _____ Date _____

Kiambatisho 2:Ridhaa

Matukio ya damu baada ya kujifungua dhidi ya wanawake walio na shinikizo la damu na wa kawaida watakaojifungua katika hospitali kuu ya Kenyatta 2019.

Utangulizi

Jina langu ni Edwin Makumi,mwanafunzi uzamili katika idara ya uzazi,chuo kikuu cha Nairobi. Mimi ninafanya utafiti ili kujua matukio ya damu baada ya kujifungua kwa walio na shinikizo la damu mimba kutoka wiki 24 za ujauzito.Kwa sasa ninakuuliza kushirika katika utafiti.Habari hii itasaidia kutoa maamuzi ikiwa kama kushiriki kataika utafiti au la.Unaweza kuuliza maswali yoyote kuhusu utafiti au kitu katika mfumo ambayo si wazi.

Madhumuni

Damu baada ya kujifungua na shinikizo la damu katika ujauzito ni visababishi vikuu vya maradhi na vifo vya wajawazito duniani kote. Kuwa na uwezo wa kutabiri hali hizi za kutishia maisha itasaidia katika kuzuia na usimamizi wao. Utafiti huu unalenga kuangalia kama shinikizo la damu wakati wa ujauzito unahusishwa na kuongezeka kwa matukio ya damu baada ya kujifungua.

Faida

Kwa kushiriki katika utafiti utatusaidia kujua kama shinikizo la damu linahusishwa na kuongezeka kwa matukio ya damu au la. Hii itawezesha sisi kuyatarajia matatizo yoyote ambayo yanaweza kutokea katika mimba yako ya baadaye. Wewe pia kupokea taarifa kuhusu hali ya kuathiri kawaida mwanamke kama vile dalili zake na jinsi inaweza kudhibitiwa, na maswali yoyote unaweza kuwa kuhusu hali hiyo zitajibiwa.

hatari iwezekanavyo:

Hakuna hatari ya kushiriki kwako katika utafiti. Utapokea kiwango cha huduma wanayopewa wagonjwa wengine hospitalini. Hakuna taratibu vamizi utafanywa juu yenu. hatari kuwa

uchunguzi, yaani, damu baada ya kujifungua ni uwezekano wa hatari ya wanawake wajawazito walio na shinikizo la damu na si kutokana na ushiriki wako katika utafiti.

Hiari:

Kushiriki katika utafiti huu ni hiari. Kama kuchagua kushiriki katika utafiti huu, unaruhusiwa kuondoka utafiti wakati wowote kama unataka kufanya hivyo. Huduma ya kupokea kutoka hospitali si kuathiriwa na uamuzi unaofanya.

fidia:

Hakuna fidia utapewa kwa ajili ya kushiriki katika utafiti.

Utaratibu:

Ukikubali kushiriki katika utafiti, mpelelezi mkuu na msaidizi wa utafiti watakuhoji na kujaza majibu katika hojaji. Wapelelezi pia watapata maelezo ya ziada kutoka kumbukumbu za matibabu.

siri:

maelezo ambayo itatoa yatakuwa siri. Majina au taarifa yoyote kutambua huwezi kujumuishwa katika dodoso au ripoti ya mwisho

Maelezo ya mawasiliano:

Kwa habari zaidi juu ya utafiti, unaweza kuwasiliana na yafuatayo:
Mkuu wa uchunguzi, Dk Edwin MM Makumi
Idara ya uzazi na magonjwa ya wanawake, Chuo Kikuu cha Nairobi
PO Box 29136-00625, Nairobi.
Piga simu no. 0725290621.
au
mwenyekiti,
KNH / UON Maadili na Kamati ya Utafiti

PO Box 20723-00202, Nairobi.
Namba ya simu: (254-020) 2726300-9 Ext 44355
Barua pepe: uonknh_erc@uonbi.ac.ke

Makubaliano:
I _____, aliyetia, kukiri kwamba nimepewa taarifa za kutosha kuhusu utafiti na Dr / Mr. /Bi. / Bi. _____. Nimesoma habari, au nimesomewa habari. Nimekuwa na nafasi ya kuuliza maswali, ambayo nimejibiwa na nikaridhika. Kwa hiari nakubali kushiriki katika utafiti.

Sahihi ya Mshiriki _____ Tarehe _____

Sahihi ya Mtafiti / Assistant _____ Tarehe _____

Appendix3: Dummy Tables

Table 1.Incidence of PPH

	HDP No (%)	**Normotensive No (%)**	**RR (95% CI)**	**P Value**
PPH				

Demographics

	HDP No (%)	**Normotensive No (%)**	**RR (95% CI)**	**P value**
Mean age, years ± SD				
Maternal age , years				
<20				
20-24				
25-29				
30-34				
35-39				
≥40				
Marital status				
Single				
Married				
Educational level				
None				
Primary				
Secondary				
Tertiary				
occupation				
Unemployed				
Self employed				
Formal				

Pregnancy Characteristics and Labor characteristics

		HDP No (%)	**Normotensive No (%)**	**RR(95% CI)**	**P value**
Parity					
	Nulliparous				
	multiparous				
Gestational age at delivery					
Early preterm <31					
Late preterm 32-36					
Term 37-40					
Post term >40					
Multiple pregnancy	Yes no				
Fetal presentation	vertex				
	breech				
	others				
Onset of labour	spontaneous				
	induced				
augmentation of labor					
Mode of delivery					
	SVD				
	AVD				
	Emergency CS				
	Elective CS				
Manual placental removal	Yes No				
Anesthesia	No				
	opioids				
	epidural				
	Spinal at CS				
	GA				

Maternal and neonatal outcomes

		HDP No%	Normotensive %	RR(95% CI	Pvalue
Maternal outcomes	Admission to ICU				
	Dialysis				
	Transfused				
Neonatal outcomes	Admission to NBU				
	Apgar Score				

Appendix 4: Timeline

Activity	2018			2019									
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**April**	**May**	**June**	**July**	**Aug**	**sep**	**oct**
Proposal development													
Proposal presentation													
Ethics committee													
Data collection													
Data analysis													
Results presentation													

Appendix 5: Budget

Proposed Expense	**Cost**
Research assistants	90,000
statistician	40,000
Computer costs (preparation of dissertation and publications)	24,000
erc	2,000
Poster printing	2,500
Grand Total	**158,500**

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

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/151

25th April, 2019

KENYATTA NATIONAL HOSPITAL * APPROVED 25 APR 2019 KNH/UoN-ERC P. O. BOX 20723 - 00202 NAIROBI *

Dr. Edwin M. Mulwa Makumi
Reg. No.H58/87219/2016
Dept. of Obstetrics and Gynaecology
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Makumi

RESEARCH PROPOSAL: INCIDENCE OF POSTPARTUM HEMORRHAGE IN HYPERTENSIVE VERSUS NORMOTENSIVE WOMEN DELIVERING AT K.N.H IN 2019: A PROSPECTIVE COHORT STUDY (P73/02/2019)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 25th April 2019 – 24th April 2020.

This approval is subject to compliance with the following requirements:

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

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

Yours sincerely,

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

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Dean, School of Medicine, UoN
The Chair, Dept. of Obs/Gynae, UON
Supervisors: Prof. Omondi Ogutu, Dr. Rosa Chemwey

KNH/R&P/FORM/01

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
   EDWIN M MUKWA MAKUMI
2. Email address: edwinmakumi1a@gmail.com Tel No. 0725290621
3. Contact person (if different from PI).....
4. Email address: ..... Tel No. .....
5. Study Title
   INCIDENCE OF POSTPARTUM HEMORRAGE IN HYPERTENSIVE VERSUS NORMOTENSIVE WOMEN DELIVERING IN KNH IN 2019: A PROSPECTIVE COHORT STUDY
6. Department where the study will be conducted KNH LABOUR WARD
   (Please attach copy of Abstract)
7. Endorsed by Research Coordinator of the KNH Department where the study will be conducted.
   Name: DR IKOL ADUNGO Signature ..... Date 07/05/2019
8. Endorsed by KNH Head of Department where study will be conducted.
   Name: Dr. Maria HOD Signature ..... Date 02/05/19
9. KNH UoN Ethics Research Committee approved study number P73/02/2019
   (Please attach copy of ERC approval)
10. I EDWIN M MUKWA MAKUMI commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Research and Programs.
    Signature..... Date 6/5/19.
11. Study Registration number (Dept/Number/Year) Obst&Gynae/301/2019
    (To be completed by Research and Programs Department)
12. Research and Program Stamp

KENYATTA NATIONAL HOSPITAL
13 MAY 2019
P.O. Box 20723-00202 Nairobi
Research & Programs

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Research and Programs and investigators **must commit** to share results with the hospital.

Version 2: August. 2014