INCIDENCE AND OUTCOMES OF ABNORMAL PLACENTATION AT KENYATTA NATIONAL HOSPITAL-A 3 YEAR RETROSPECTIVE DESCRIPTIVE STUDY

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DECLARATION

This Dissertation is my original work and has not been presented for the award of degree in any other University.

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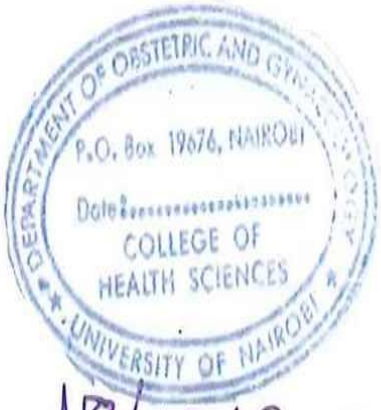

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INSTITUTIONS

1. University of Nairobi
2. Kenyatta National Hospital

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DEFINITION OF TERMS

- **Abnormal placentation-**morphological abnormalities of the placenta due to abnormal site or invasiveness of the placenta following implantation, this includes Placenta Previa, Placenta Accreta, Placenta increta and Placenta Percreta -based on antenatal/intrapartum ultrasound and/or clinical intraoperative diagnosis Global library of women's medicine (GLOWM) 2009

- **Antenatal ultrasound diagnosis of AP-** Ultrasound diagnosis of Placenta previa or Placenta accreta spectrum (PAS) after 20 weeks of gestation and before onset of labor

- **APGAR score –** A backronym used to summarize the health of a newborn, composed of a five system summarized as Appearance, Pulse, Grimace, Activity and Respiration done at 1,5 and 10 minutes of life. Scores above 7 are considered normal while any score less than 7 indicate some degree of birth asphyxia

- **Birth asphyxia –** Medical condition as a result of low oxygen during the process of birth causing significant physical harm, especially to the brain

- **Clinical intraoperative diagnosis of AP-** Placenta previa/PAS diagnosed for the ***first time*** during caesarean delivery/Examination under anaesthesia. For PAS Using The international federation of obstetrics and gynaecology (FIGO) 2018
  criteria; Appendix 2)

- **Intrapartum ultrasound diagnosis of AP-** Diagnosis of Placenta previa/PAS after 20 weeks and during onset of labor

- **Low-lying placenta-** is where the placental edge is 2 to 3.5 cm from the internal os

- **Maternal near miss morbidity-** woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy according to World health organization (WHO) 2011

- **Perinatal mortality -** number of stillbirths and deaths in the first seven days of life

- **Perinatal period-** Period from 22 weeks gestation to seventh day of life

- **Placenta accreta spectrum (PAS)-** range of pathologic adherence/invasion of the placenta into the myometrium, including placenta increta, placenta percreta, and placenta accreta (previous terminology Abnormally invasive placenta AIP/ Morbidly Adherent Placenta MAP) American college of obstetrics and gynaecology (ACOG) 2018

- **Placenta previa-** placenta developing within the lower uterine segment on transabdominal

scan (TAS) and graded according to the relationship and/or the distance between the lower placental edge and the internal os of the uterine cervix(<2cm from internal cervical os) as per the Royal college of obstetricians and Gynecologists (RCOG)

- **Post-partum hemorrhage-** For this study postpartum hemorrhage (PPH) is defined as a blood loss of 1000 ml or more within 24 hours after child birth WHO 2012

- **Potentially life threatening condition-** is an extensive category of clinical conditions, including diseases that can threaten a woman's life during pregnancy and labor and after termination of pregnancy

- **Severe maternal outcome-** a life-threatening condition (i.e. organ dysfunction), including all maternal deaths and maternal near-miss cases WHO 2011

- **Still birth –** Any baby born after 28 weeks gestation with no signs of life

ABBREVIATIONS

ACOG- The American College of Obstetricians and Gynaecologists

AIUM- American institute of ultrasound in medicine

AP- Abnormal Placentation

CS- Caesarean section

D&C- Dilatation and curettage

FIGO- The International Federation of Gynaecology and Obstetrics

IVF-In Vitro fertilization

KNH- Kenyatta National hospital

LUS Doppler -Lower uterine segment Doppler ultrasound

PAS- Placenta Accreta Spectrum

PAS- Placenta Accreta Spectrum

SMFM- Society of maternal fetal medicine

TAS- Transabdominal ultrasound

TVS- Transvaginal ultrasound

WHO- World Health Organization

ABSTRACT

Background: Global incidence of Abnormal Placentation: Placenta previa and Placenta accreta spectrum is 0.6% and 0.17% respectively. Presence of at least one previous caesarean scar increases the relative risk of Placenta previa by 1.5-5 and Placenta accreta spectrum by 2.95 to 7. In Africa, countries like Egypt with caesarean section rates of 52% the prevalence of Placenta Accreta spectrum is 0.3-0.9% and Placenta previa prevalence rate is 1.7%. Ultrasound is comparable to Magnetic resonance imaging in detecting Abnormal Placentation from 20 weeks gestation. In high income countries upto 20-30 % of cases of Abnormal Placentation remain undiagnosed until delivery. Upto a third of patients with Abnormal Placentation experience intra-partum haemorrhage, leading to postpartum haemorrhage and adverse perinatal and maternal outcomes such as preterm births, stillbirths, low APGAR scores and increased need for transfusion, emergency peripartum hysterectomy and severe postpartum maternal anaemia. Incidence and outcomes of Abnormal Placentation have not been previously evaluated in Kenya.

Study objective: To determine the incidence, maternal and perinatal outcomes due to Abnormal Placentation at Kenyatta National Hospital between January 2017 to December 2019.

Methodology: This was a 3-year retrospective descriptive study in which files of patients with an ICD-10 diagnosis of antepartum haemorrhage and third stage haemorrhage were retrieved. Eligible files had either an antenatal or intrapartum ultrasound and/or those diagnosed with Abnormal Placentation for the first time during surgery also known as the clinical intra-operative group were included, 168 patient files fit the criteria and their information filled in a mobile based data extraction tool (Open data kit, ODK). Their socio-demographic characteristics, adverse maternal and perinatal outcomes were compared based on whether the diagnosis of Abnormal Placentation (Placenta previa/Placenta accreta spectrum) was made via ultrasound antenatally or intrapartum versus clinical intra-operative diagnosis. Data collected was cleaned and analysed using SPSS version 21.

Results: Between January 2017 to December 2019, there were 168 cases of Abnormal Placentation out of 40,673 deliveries giving an incidence of 0.4% at 95% CI (0.0035, 0.0048). Of these, 112 (66.7%) had ante-natal/intrapartum ultrasound diagnosis while 56 (33.3%) had clinical intraoperative diagnosis. Sociodemographic, clinical and obstetric characteristics were comparable between the two groups. The mean age was 30.2 years (SD-5.7), most were married (79.2%), majority were multipara (73.2%), most had no history of prior caesarean delivery (69.3%) nor miscarriage (79.8%) and upto

half (50.6%) were referred from other medical facilities. The use of ante-natal or intrapartum ultrasound in diagnosis of Abnormal Placentation reduced adverse maternal outcomes by 23% RR 0.77[0.58, 1.03] though this was not statistically significant. Similarly, adverse perinatal outcomes was reduced by 24% among patients with an ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation this was also not statistically significant.

Conclusion: Early ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation is associated with less composite maternal and perinatal morbidity.

1. INTRODUCTION

1.1 Background

The prevalence of Abnormal Placentation varies globally. In Asia the estimated prevalence of Placenta previa is 12.2 per 1000 pregnancies compared to 2.7 per 1000 pregnancies in Sub-Saharan Africa (1). Observations made in the Meta-analysis by Cresswell JA et al, 2017 showed that cases of Placenta previa in Sub-Saharan Africa that did not have a classical clinical presentation of antepartum hemorrhage, were unlikely to be diagnosed pre-natally via ultrasound hence seemingly lower prevalence was reported (1)(2). Recent data suggest modest increase in the proportion of women with Placenta previa possibly due to advanced maternal age and prior caesarean section as highlighted from a study in Northern Tanzania by Senkoro EE et al, 2018 where the institutional prevalence of Placenta previa was 0.6%, comparable to the global prevalence of 0.52% (3). Similarly, in Placenta Accreta spectrum increasing age, prior uterine surgery and artificial reproductive technologies have orchestrated the consistent rise in prevalence as compared to 1927 when D S Foster a pathologist in Montreal described the first case of Placenta Accreta that was associated with massive Postpartum hemorrhage (4)(5). While 93 years ago Placenta Accreta spectrum would seem to be a rare occurrence with an incidence of 0.013% the current overall pooled prevalence of 0.17% for PAS cannot be ignored (6). Notably, countries like Egypt with significantly high Caesarean section rate of 52% which is third highest worldwide, have reported an institutional incidence of PAS of upto 0.9% similarly the incidence of Placenta previa was also high at 1.7% (7)(8)(9).

Despite of the rare nature of Abnormal Placentation, they are considered to be potentially life threatening conditions (PTLC) especially when encountered for the first time during delivery without an antenatal diagnosis. More often resulting in severe postpartum hemorrhage due to heavy bleeding before, during and after caesarean section with subsequent rise of maternal near miss morbidity and at times mortality (10). Globally, Postpartum Hemorrhage (PPH) accounts for 35% of all maternal deaths which is the leading cause of maternal mortality worldwide (11). The same applies in Kenya whereby in 2017 the Confidential enquiry report into maternal deaths also highlighted Postpartum hemorrhage as the leading cause of maternal mortality at 39.7% (12). In 2009 a cross-sectional study by Owitti et al at the largest referral hospital in East and Central Africa, Kenyatta National hospital revealed that obstetric hemorrhage was the leading cause of near miss maternal morbidity at 36.8% (13). As stated PAS commonly presents with massive Postpartum hemorrhage (PPH) following a difficult placental delivery often necessitating an emergency peripartum hysterectomy (14)(15).

1.2. LITERATURE REVIEW

1.2.1 Definition

In 2015, the American College of Obstetrician and Gynecologists obstetric care consensus in conjunction with the Society of Fetal-maternal medicine and Society of Gynecological oncologist define Placenta Accreta spectrum as a range of pathological disorders that are adherent and invade the myometrium at varying degrees whereby; Placenta Accreta the chorionic villi invades the myometrial surface, Placenta increta the chorionic villi invades the myometrium and lastly Placenta percreta which is the severest form where the chorionic villi invade the myometrium and the perimetrium (16). A clear distinction however needs to be made between PAS and Retained Placenta due to a constricted cervix, this history is usually not clear on account of patient details and also lack of proper documentation by the care giver at the time of delivery. In retention of placenta due to a constricted cervix, removal under anesthesia is easy since the cervix relaxes relatively under General anesthesia. The diagnosis of PAS can also be made with an intraoperative ultrasound prior to surgical evacuation. The Royal College of Gynaecology 2018 defines Placenta previa as placenta developing within the lower uterine segment on transabdominal scan (TAS) or Transvaginal ultrasound and graded according to the relationship and/or the distance between the lower placental edge and the internal cervical os. Historically, Placenta previa was graded into 4 types: Grade 1 Low-lying Placenta lies 2-3cm from the internal cervical os; Grade 2 placenta reaches the margin of internal cervical os while Grade 3 partially covers the internal cervical os and Grade 4 completely covers the internal cervical os.

However, in 2014 following a review by American institute of ultrasound in medicine (AIUM) the use of the terms marginal and partial placentation was discontinued as they were difficult to ascertain radiologically and only Placenta previa was used to define any placentation that abuts or overlies the internal cervical os while a low-lying placenta is where the leading edge of the placenta is >2cm from the internal cervical os. This simple classification is not only easily to reproducible radiologically but also has direct impact on the patient management and outcomes and in 2017 Society of Maternal fetal Medicine (SMFM) and American College of Gynaecologists (ACOG) adopted this classification (17).

1.2.2 Incidence and Risk factors of Abnormal Placentation

The incidence of Abnormal Placentation varies with prevailing risk factors. Advanced age and prior Caesarean delivery are the two most widely studied and consistent risk factors for developing Abnormal Placentation. The incidence of Placenta previa increased from 10 per 1000 pregnancies without prior caesarean section to 28 per 1000 pregnancies in the event of >3 prior caesarean section (18)(19). In addition, advanced age above 35 years and multi-parity had 6.3 and 2.2 increased odds of developing Placenta previa respectively (20). Similarly, in Placenta accreta spectrum history of previous caesarean section increases the incidence of PAS from 0.002% in cases with no previous caesarean section to 0.3% and 4.7% in women with one and more than six previous caesarean sections respectively (21).

This risk of PAS is even more profound in the presence of co-existing previous caesarean section and Placenta previa where the incidence increases to 3% and 67% in one and more than six prior caesarean sections (21). The odds of developing PAS was increased to 3.4 with history of other prior uterine surgery and 32.13 in case of conception through Artificial reproductive therapy (22). Other additional risk factors include previous history of PAS, minor uterine procedures/instrumentation (e.g. Dilatation and curettage / hysteroscopic resection /removal of placenta manually /endometrial sampling or resection /myomectomy /Intrauterine device /Chemotherapy / radiotherapy/ uterine artery embolization / IVF procedures) , advanced maternal age, multiparty, curettage, smoking, hypertension in pregnancy and Asherman syndrome (23)(24)(25) (26).

1.2.3 Diagnosis of Abnormal placentation

The diagnosis of Abnormal Placentation can be made ante-natally and/or intrapartum using clinical presentation and/or ultrasound. However, histological diagnosis of PAS is considered the gold standard. While placenta previa is likely to be diagnosed easily in >90% of cases, upto 25.9 to 46.8% of patients in developed countries with Placenta Accreta spectrum lack an antenatal diagnosis (27)(28)(29). Placenta previa is the second leading cause of Antepartum hemorrhage at Kenyatta National Hospital (30). Upto 90% of patients with Placenta previa present with painless spotting or fresh bleeding that is often referred to as warning hemorrhage and usually results in no maternal or fetal compromise by 36 weeks of gestation. The remaining 10% of patients with Placenta previa may progress till 38 weeks without per vaginal bleeding (31).

Currently, a second trimester ultrasound is recommended by ACOG and SMFM for early screening followed by a confirmatory ultrasound (two dimensional gray scale and Lower uterine segment doppler) at 32 and 36 weeks to aid in planning for mode of delivery and rule out possibility of concurrent Placenta accreta spectrum. While transvaginal ultrasound (TVS) is ideal for diagnosing Placenta previa, technicalities experienced during heavy per vaginal bleeding may limit its use, a transabdominal ultrasound (TAS) has shown comparable sensitivity and specificity hence widespread of use TAS (32) . Unlike Placenta previa, Placenta accreta spectrum rarely presents with ante-partum hemorrhage, the first clinical presentation is usually intrapartum during an attempt at placental delivery that is often followed by profuse, life-threatening hemorrhage hence it is paramount to have an early ante-natal diagnosis rather than wait for histological confirmation postpartum. A high index of suspicion is therefore required to identify cases of PAS ante-natally and plan for delivery. Ante-natal diagnosis of Placenta Accreta spectrum can be made by imaging modalities and/or use of biomarkers in suspected clinical cases. Transabdominal Ultrasound and Magnetic resonance Imaging (MRI) are widely used in prenatal diagnosis of PAS. However, due to the wider availability, inexpensive nature, relatively easier training of expertise in ultrasound and comparable sensitivity and specificity, a two dimensional ((2-D) grey scale ultrasound is currently the recommended primary antenatal diagnostic tool. 2-D grey scale ultrasound has a specificity of 96.94% (95% CI 96.3–97.5), sensitivity of 90.72% (95% CI 87.2–93.6 and overall diagnostic odd ratio 98.59% (95% CI 48.8–199.0) (33). When combined with Color Doppler Imaging (CDI) the sensitivity of 2-D grey scale ultrasound increases ranging between 95-98%.

Utility of MRI in cases of PAS, according to a recent meta-analysis despite having few studies with small sample size, remains high especially in gauging depth of placental invasion, sensitivity ranges between 75% to 100% in Placenta Accreta and 65% to 100%, in Placenta Percreta (34)(35). Notably regardless of whether ultrasound or MRI is used technical expertise is necessary to maintain the high sensitivity and specificity. Ultrasound in late trimester is also faced with certain challenges that do not affect MRI like cases with posterior placenta or increased depth of myometrial invasion and presence of large fetal parts (36). Adaptation from the Placenta Accreta index as formulated by the European working group on Abnormally invasive placenta (EW-AIP) is normally utilized to enhance uniformity and reproducibility of ultrasound findings (37)(38). This 2 criteria system had a sensitivity of 81.1% and specificity of 98.9%(39**).** Clinical intra-operative diagnosis correlates with ante-natal/intrapartum ultrasound in PAS is >90% of cases. This is shown in the diagnostic odds ratio and positive likelihood ratios as summarized in the tables in Appendix 2 and 3. These clinical, ultrasound and MRI signs will also be used in the data extraction tool to confirm diagnosis of PAS.

Use of biomarker in PAS

Placental biomarkers like alpha feto proteins and serum total placental cell-free mRNA has been used to predict occurrence of PAS antenatally however, their non-specific nature limits their routine usage. Other placental analytes that can be used include: pro B-type natriuretic peptide, troponin, pregnancy-associated plasma protein, Human placental lactogen (cell-free mRNA) and free β-hCG (mRNA) (40)(41).

1.2.4 Outcomes of Abnormal Placentation

Placenta previa may occasionally present with severe ante-partum hemorrhage resulting in maternal and fetal compromise. Placenta previa increases the risk of post-partum hemorrhage from 9.7% to 17.5%, this is thought to be due to the presence of placenta in the lower uterine segment may impair the normal uterine contraction and retraction following delivery or in some cases especially Grade III and Grade IV Placenta previa which may be complicated by PAS resulting in massive intrapartum and postpartum hemorrhage (42). In such extreme cases of Placenta previa the odds of major maternal and neonatal complications increased to: 14.6 for post-partum anaemia, 2.7 for the need of blood transfusion , 8 for preterm births, 4 for developing respiratory distress syndrome and 6.3 for Intrauterine growth restriction (20). Upto 13.2% of the delivered babies were fresh stillbirths and 17.3% required Neonatal Intensive Care Unit (NICU) admission (18). 90 percent of patients with Placenta Accreta spectrum experience massive intrapartum haemorrhage of upto 3000ml that required transfusion (43). Due to massive hemorrhage caused by Abnormal Placentation, the following adverse events may occur; hypovolemic shock and multiple end organ damage like Acute Respiratory Distress Syndrome, Acute Renal failure, Sheehan's syndrome, disseminated intravascular coagulopathy and at times death. Consequently, these patients suffer increased rates of emergency Peripartum hysterectomy with subsequent urological complications, massive blood transfusion reactions disorders, increasing ICU admissions and overall hospital stay.

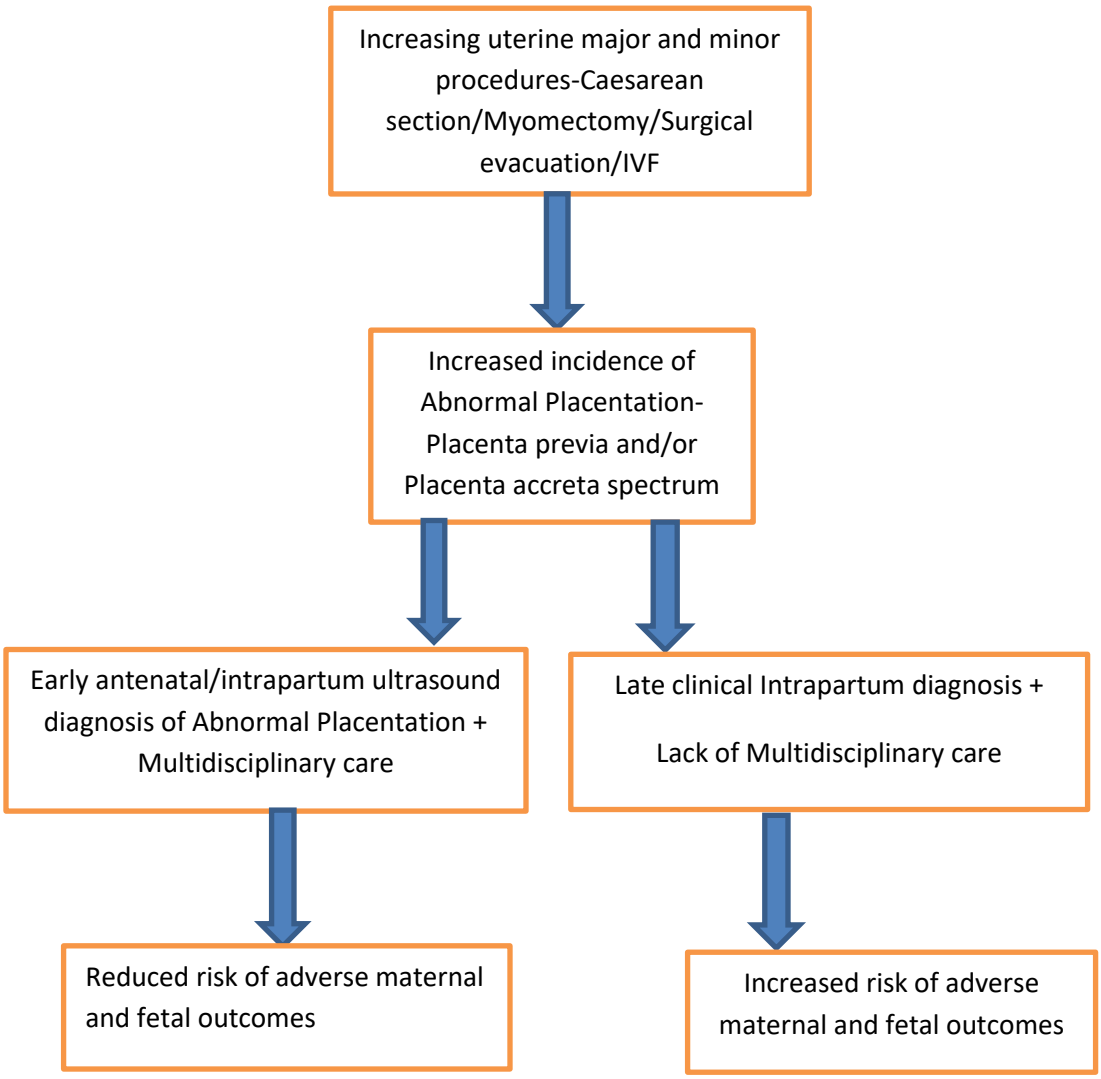
In 2015, Ahmed SR et al, noted that 26.4% of women with Placenta previa had concomitant PAS and 15.1% of all patients with Placenta previa underwent emergency hysterectomy, this was also associated with higher incidence of bladder injury in upto 13.2% and wound infection in 17.3% of the cases. (18). Early diagnosis and multidisciplinary management of Abnormal Placentation may preclude these adverse outcomes. An unpublished retrospective study by Mashalla J et al, 2020 showed that Abnormal Placentation contributed to 18% of the total hysterectomy done over the last 10 years at KNH. During hysterectomy, there is a higher likelihood of damaging the adjacent organs especially the gut and bladders, In addition, the long-term outcome of permanent loss of fertility has been shown to have significant psychological implications for women and a higher risk of vaginal prolapse in the long term (44). In 2015, Bailit JL et al, noted that patients with pre-natal diagnosis of PAS had 33% chance of blood loss >2.5litres compared to those diagnosed intrapartum; only 19% had blood loss above 2.5 litres (29). However, in 2019, Erfani H et al, concluded that despite prenatal diagnosis having a predilection for picking the severe forms of PAS, when managed in a center with multidisciplinary care; the estimated blood loss was 0.7 litres more in the Unexpected PAS that is those patients who lacked an ultrasound ante-natal diagnosis compared to those with an ante-natal diagnosis i.e. Expected PAS (28). This will involve prenatal patient optimization, planned caesarean section with contingencies for expected and unexpected complications and also careful postpartum follow-up to address any end-organ damage. Elective caesarean section is usually performed at 36-37 weeks gestation or prior to onset of labor or bleeding. Intrapartum management options include; conservative, expectant and peripartum hysterectomy (44).

2. RESEARCH FRAMEWORK

2.1. Theoretical Framework

The gradual progressive increase in surgical uterine procedures has been noted to have an increase in the incidence of Abnormal Placentation globally. According to a United Kingdom National Case control study done in 2012, the adjusted odds ratio of Placenta accreta spectrum in women with a previous caesarean section was 14.41 while those with minor uterine surgery was 3.4(22). Theoretically, the risk of adverse maternal and fetal outcomes due to Abnormal Placentation should be ameliorated by early ante-natal diagnosis hence preventing forceful intrapartum placental delivery that would otherwise lead to massive PPH. However, this is not always the case as some of the cases with associated with severe maternal hemorrhage still had an antenatal diagnosis and also suffered higher rates of hysterectomy (29)(28). Thus, our null hypothesis states that there is no difference in adverse outcomes whether Abnormal Placentation is diagnosed antepartum or intrapartum among expectant women at Kenyatta National Hospital. This sought to determine the incidence of Abnormal Placentation considering our current Caesarean section rate is at 52% and Kenyatta National Hospital currently lacks a multi-disciplinary unit that is required to manage Abnormal Placentation.

Theoretical framework

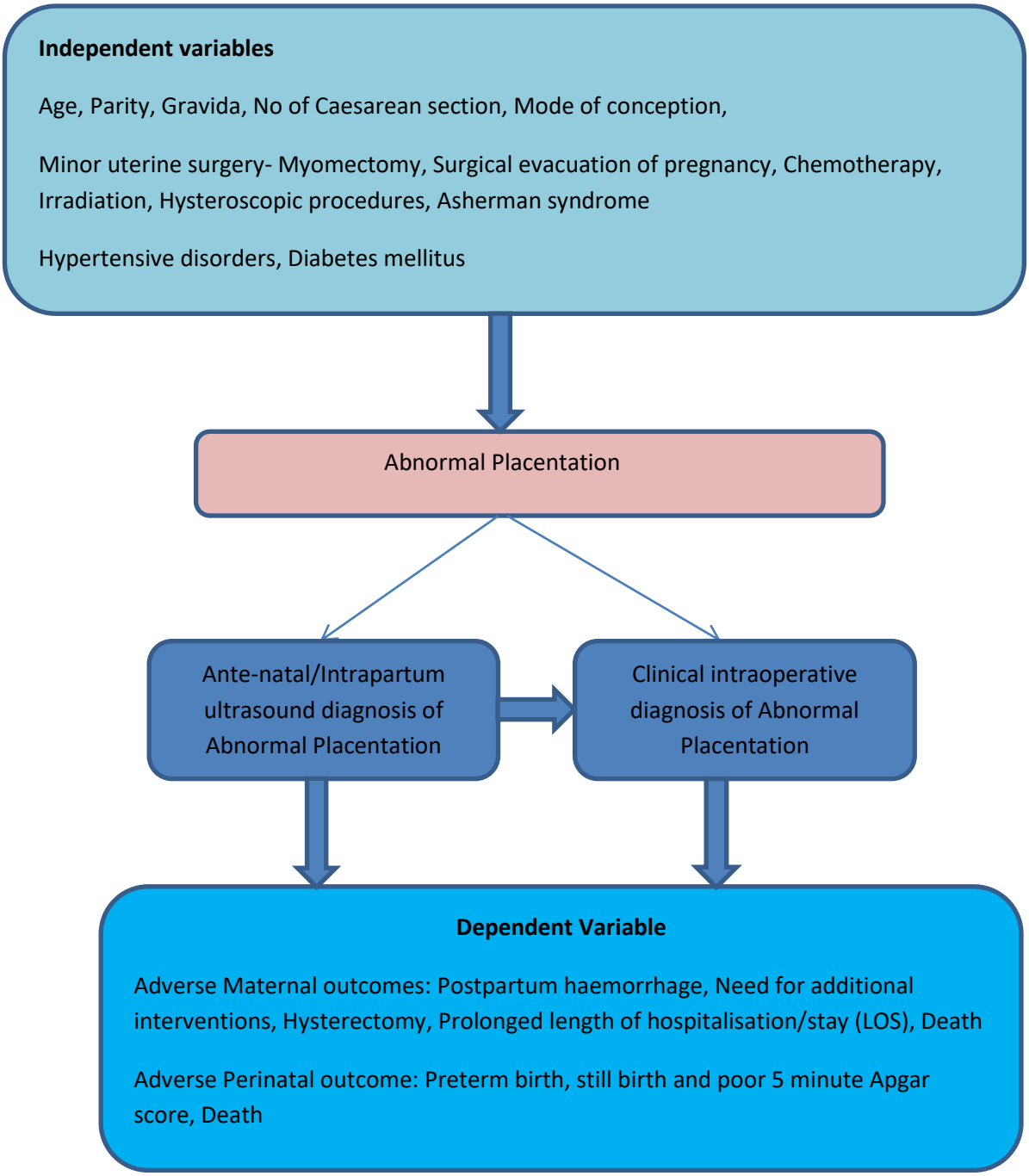


The diagram above illustrates this unique relationship whereby; Increase in uterine procedures such as caesarean sections will lead to increase in incidences of Abnormal Placentation. The effect on maternal on fetal outcome is thought to be directly related to early antenatal diagnosis. Hence if Abnormal Placentation is detected early in an institution with multidisciplinary team to deal with Abnormal Placentation then the incidence of adverse maternal and fetal outcomes will be lowered while the converse maybe true.

2.2. Conceptual Framework

Uterine damage either by primary/ secondary factors is the most favored hypothesis leading to Abnormal Placentation. While primary causes like congenital uterine anomalies are rare, secondary causes of uterine damage like caesarean sections and minor uterine surgery are seemingly on the rise. Lately, majority of the studies seem to note a positive relation between the rising caesarean section rates and increasing prevalence of Abnormal Placentation. The independent variables include: Patient sociodemographic characteristics, Obstetric and medical history as Outlined in the diagram below. These variables may negatively affect the uterine environment negatively resulting in Abnormal Placentation disorders hence viewed as the intermediate variable that can be accurately diagnosed during the ante-natal period. The adverse perinatal and maternal outcomes due to Abnormal Placentation will be the dependent variables that will be evaluated in the study. Recent study by Erfani et al, 2019 in USA noted a positive correlation of an early ultrasound diagnosis and better maternal outcomes especially in centers that offer multidisciplinary patient care hence timely interventions are instituted to anticipate and prevent adverse outcomes(28).

CONCEPTUAL FRAMEWORK



3.1 PROBLEM STATEMENT

In Kenya, few studies have been done on Abnormal Placentation, most of the studies focus on Placenta Previa as a cause of ante-partum hemorrhage. However, there are currently no studies on incidence and outcomes of Abnormal Placentation. Despite increasing morbidity of abnormal placental location especially when encountered for the first time intrapartum , there exists no structured surveillance protocol during antenatal period for women at risk of Abnormal Placentation especially in women with prior uterine surgery . The rising caesarean section rates and challenges associated with antenatal ultrasound diagnosis has led to more cases of Abnormal Placentation being diagnosed late intrapartum this increases the risk of adverse maternal and perinatal outcomes. The insight gained will be critical towards instituting evidence based Guidelines aimed at early diagnosis of patients' at risk and proper management of Abnormal Placentation by the clinicians to anticipate and mitigate risk of adverse perinatal and maternal outcomes and allow for more uterine conserving surgery.

3.2. JUSTIFICATION

Kenyatta National hospital conducts about 15,000 deliveries annually; over 52% of these deliveries are through cesarean section. Being a national referral center, it equally attends to a relatively high number of antenatal mothers. Accurate ante-enatal identification of mothers with Abnormal Placentation allows optimal referral and management of patients to a multi-disciplinary set-up to mitigate the deleterious effects of PAS which would mean more healthy mothers and babies and a shorter hospital stay.

4.RESEARCH QUESTIONS

Among pregnant women who received obstetric care (intrapartum and/or post-partum care) care at Kenyatta national hospital from January 2017 to December 2019:

What is the incidence, maternal and perinatal outcomes of Abnormal Placentation?

5. OBJECTIVES

5.1. Broad Objective

To determine the incidence, maternal and perinatal outcomes of patients with Abnormal Placentation who received obstetric care at Kenyatta national hospital between 1st January 2017 to 31st December 2019.

5.2. Primary Objectives

Among pregnant women who received obstetric care (intrapartum and/or post-partum care) at KNH from January 2017 to December 2019:

1. Determine the incidence of Abnormal Placentation
2. Determine the proportion with an ante-natal/intrapartum ultrasound and Clinical intraoperative diagnosis of Abnormal Placentation
3. Describe maternal and perinatal outcomes of patients with antenatal/intrapartum ultrasound versus clinical intraoperative diagnosis of Abnormal Placentation

5.3.Secondary objective

4. Clinical and obstetric characteristics of patients with an ante-natal/intrapartum ultrasound diagnosis and intraoperative clinical diagnosis of Abnormal Placentation

6. METHODOLOGY

6.1. Study Design

The study was a retrospective descriptive study. While a prospective study would have been preferred, due to the current Covid-19 pandemic in order to reduce patient contact and risk of unnecessary exposure data was collected retrospectively. The files at records with an ICD-10 diagnosis of Antepartum haemorrhage , 3rd stage haemorrhage and retained placenta were retrieved and evaluated for the clinical presentation, ultrasound and surgical intraoperative findings for the diagnosis of Placenta previa and/ or morbidly adherent placenta (this includes all Placenta accreta spectrum namely; Placenta accreta, increta and percreta).

6.2. Study site

This study was conducted at Kenyatta National Hospital, Nairobi. It is the largest referral facility in the republic having a bed capacity of around 2000 patients. Located in the capital city, KNH serves patients both in its environs and referral patients from different part of the country. It is suitable for the study as it have quite a high turnout of patients recording over 15,000 deliveries annually. In the maternity department, there is an antenatal clinic, 3 antenatal/post-natal wards, 1 labor ward and 2 maternity theatres. Two antenatal wards are located on ground floor and one on first floor hospitals tower block and have a bed capacity of upto 60 or more each. The Labor ward theatre is also located on ground floor adjacent to the Labor ward and the antenatal/post-natal wards.

The antenatal clinic runs from Monday to Thursday for expectant mothers on follow-up and also caters to walk-in patients with a turnover of more than 60patients per day. The diagnosis of Abnormal Placentation at Kenyatta national hospital is made by documenting clinical presentation, ultrasound

and intra-operative findings. The ultrasounds are done by the radiology department; consisting of Radiology residents, consultant radiologists and sonographers who perform majority of the ultrasounds during the day between 8-5pm. At night ultrasounds are done by the sonographer on call on emergency basis only. Hence, for some of the patients who are referred with heavy bleeding due to Abnormal Placentation since availability of ultrasound maybe a challenge, majority of the diagnosis relies on the clinical presentation. KNH has 2 fully functional theatres with personnel from junior to senior residents providing 24 hour coverage. The senior consultants are also available on call to assist in cases of major intra-operative complications. Unlike other centers KNH lacks a pre-constituted comprehensive multi-disciplinary team comprising of Senior obstetrician, General surgeon, Urologist , Neonatologist, Hematologist, Interventional radiologist, Critical care experts and Anesthesiologist for case management of pregnancies with Abnormal Placentation. However, the **individual members can be called upon to assist in emergency situations.**

6.3. Study population

All pregnant women diagnosed with Abnormal Placentation who received obstetric care at the KNH from 1st January 2017 to December 2019 with recorded information at the records department were recruited into the study.

Variables of the study

Inclusion criteria

- Women who received ante-natal care/admitted at KNH maternity department with a diagnosis of Abnormal Placentation
- Antenatal /Intrapartum ultrasound diagnosis of AP and/or clinical intraoperative diagnosis of AP from 20weeks gestation

Exclusion criteria

- Incomplete/Missing records on key variables

6.4. Sample size Calculation

The sample size to evaluate the prevalence of Abnormal Placentation is calculated with the help of Cochran's sample formula;

$$\boldsymbol{n = \frac{Z_{\alpha} p(1-P)}{e^2}}$$

To obtain optimum estimated sample size, the Cochran's formula is modified to factor in the power Sample. Hence the sample size adopted in this study is a modified one. We include the powered Factor; $f(\alpha, \beta) = (z_{\alpha/2} + z_{\beta})^2$. The second important modification is the consideration of population

Of the patient's records from which sample will be drawn.

$$\boldsymbol{n = f(\alpha, \beta) \times \frac{p(1-P)}{e^2} \times \frac{N}{(N-1)}}$$

Where: $f(\alpha, \beta) = (z_{\alpha/2} + z_{\beta})^2$

α = Type 1 error, associated critical value of 1.96, (95% confidence level (1 - α)

β = Type 2 error rate (power of $(1 - \beta)$ = 80% associated critical value of 0.842

p = Expected event rate of the proportion in the ultrasound group = 0.006 (0.6%)

q = Expected event rate of the proportion in no ultrasound group = 0.994

N = available records of patients admitted from Jan 2017-Dec 2019=300

e = The margin error (level of precision/sampling error) of = $\pm\mathbf{0.0175\%}$

$$\boldsymbol{n} = 7.84 \times \frac{\mathbf{0.006(0.994)}}{\mathbf{0.0175^2}} \times \frac{\mathbf{300}}{(\mathbf{300-1})}$$

$$\boldsymbol{n} = 153.189$$

$$\boldsymbol{n} \cong \mathbf{153}$$

Sample size for comparing the outcomes

The Sample size calculation for the retrospective, cohort study will be estimated in two levels to derive optimal sample size for this retrospective study. The first sample size computation will be used to estimate the overall sample size to be considered in the study and will inform the number of participants to be considered in assessing all the qualitative measures/variables e.g. the prevalence's and rates of abnormal placentation under consideration in this study.

The second sample size computation will be used to estimate the sub-number of participants to be assessed with regard to volume of blood loss in the first 24 hours of admission. This variable is a quantitative measure and calls for a sample powered sample size determination to assess this measure. This sample will be drawn from the overall sample determined initially. The previous studies estimated the proportion of mortality rate associated with PPH at 6%. The sample size computation formula from Camargo et al (2019) is slightly modified to allow consideration of 80%

statistical power in the estimated sample of patients from the historical data. The z parameter in the formula, initially did not consider $type\ II\ error\ rate\ (1-\beta)$, which may not guarantee a reliable sensitive sample. Hence, to bridge this gap, a modification is done as a trade-off between $type\ I\ \&\ II\ errors$ and hence inject some reliable level of sensitivity to the resulting sample for the study.

Sample size for estimating qualitative variables

$$\boldsymbol{n = N \times \frac{f(\alpha,\beta)^2 pq}{f(\alpha,\beta)^2 pq + e^2(N-1)}}$$

Where: $f(\alpha,\beta) = (z_{\alpha/2} + z_{\beta})^2$

α = Type 1 error, associated critical value of 1.96, (95% confidence level (1 - α)

β = Type 2 error rate (power of $(1-\beta)$ = 80% associated critical value of 0.842

p = Expected event rate of the proportion in the Ultrasound group = 0.18 (18%)

q = Expected event rate of the proportion in No ultrasound group = 0.82

N = available records of patients admitted from Jan 2017-Dec 2019= 300

e = The margin error (level of precision/sampling error) of = $\pm$**10%**

Assumptions

The computation assumed that the patients exposed to the factors are approximately equal to Ultrasound (exposed) to No ultrasound (Un-exposed) group of patients from the sample. Hence the ration of exposed to un-exposed is 1, represented as

$$r = \frac{n_{exposed}}{n_{un-exposed}} = 1$$

Hence the overall estimated sample is obtained by multiplying the n by this factor $\left(r + \frac{1}{r}\right)$

$$n = \frac{r+1}{r} \times \ N \times \frac{f(\alpha,\beta)^2 pq}{f(\alpha,\beta)^2 pq + e^2(N-1)}$$

$$n = \frac{(1+1)}{1} \times \ 300 \times \frac{7.84 \times 0.18(0.82)}{7.84 \times 0.18(0.82) + 0.1^2(300-1)}$$

$$\boldsymbol{n = 167.4173}$$

$$n \cong 168$$

The overall sample size is $\boldsymbol{n \cong 168}$

Therefore, the overall sample size is **168** (and is assumed that when this sample is classified, will result in approximately equal exposed and un-exposed groups of patients from the historical record. With each group having an approximate sample of 84 patients.

6.5. Sampling method

Consecutive sampling was used considering the infrequent nature of AP the sample size was the minimum required, however, all files with full recorded information were included in the study. The recruitment process took place at the KNH records department.

6.6. Study period

The study was carried out over the fourth quarter of 2020; November 2020.

6.7. Study tools

The study stools that were utilized comprised of a mobile-based application (open data kit, ODK). This tool captured the mothers' clinical and socio-demographic characteristics. A sample data extraction tool is shown in Appendix 1.

6.8. Study Procedure

All records of patients with a diagnosis of Antepartum hemorrhage, 3rd stage hemorrhage and Retained placenta were retrieved. Potential study participants were identified using the inclusion and exclusion criteria. Patients were stratified according to the diagnosis as outlined in the antenatal ultrasound and/or discharge/post-operative summary. Those with Abnormal Placentation diagnosed by either an ante-natal or intrapartum ultrasound report were grouped separately from while those without a prior ultrasound diagnosis and diagnosis of AP made intra-operatively formed the Clinical intraoperative group. Once the desired sample size was met via consecutive sampling, a mobile-based data extraction tool was filled with the relevant patient information. The patient information was delinked from their identification in order to maintain confidentiality.

Quality Assurance

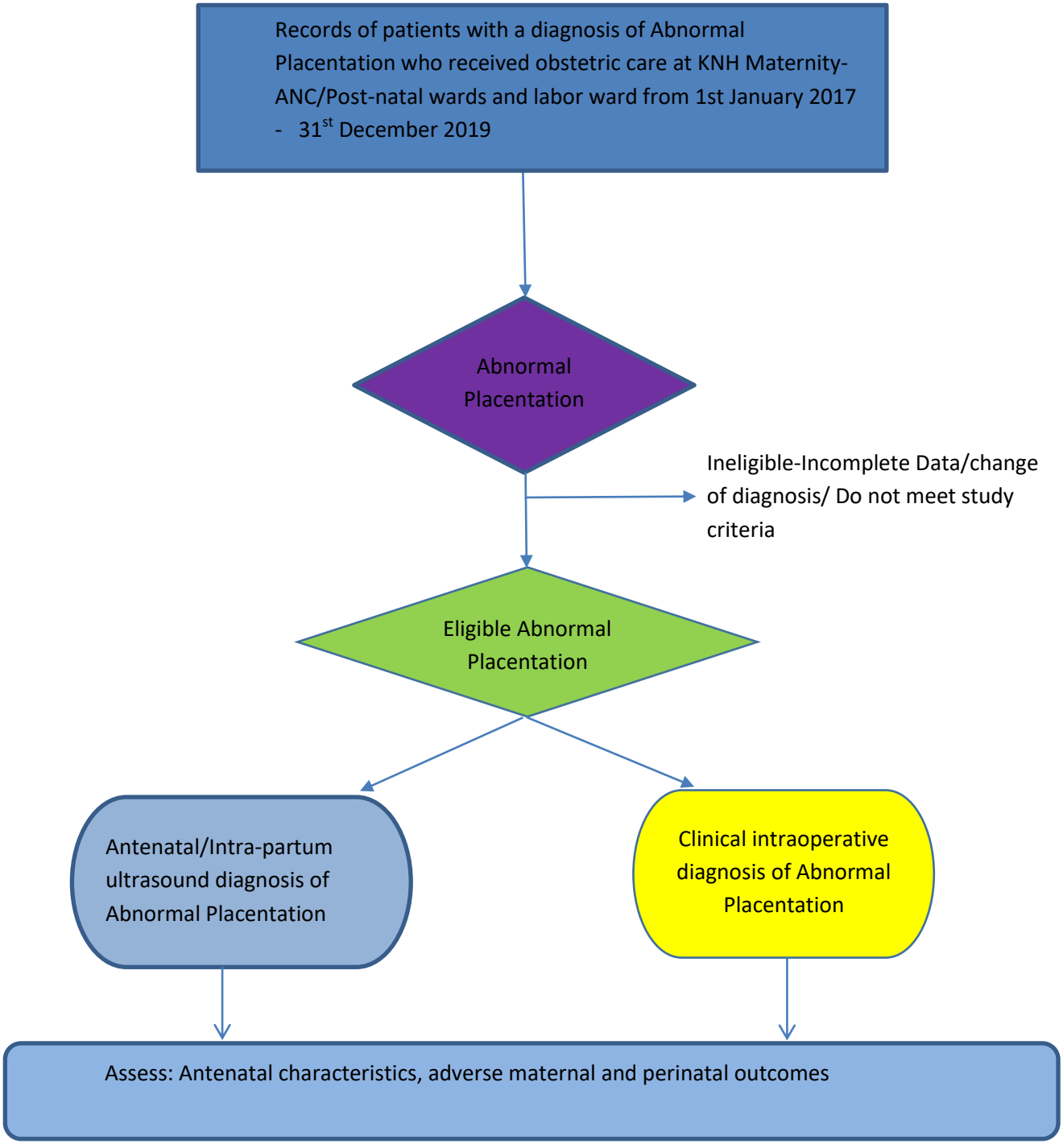
For quality assurance in the study, the following shall be measures shall be undertaken:

1. The questionnaire was pretested to determine the sensitivity of the questions in detecting important differences in the study's variables.
2. The interview process was conducted in a language understandable to the participant.
3. Adherence to the inclusion and exclusion criteria.

4. Research assistants administering the questionnaire were trained in the use of the tool and had a copy of the study procedure protocols to ensure uniformity in data collection.

The Principal Investigator assessed the collected data on a daily basis and monitored data entry.

6.9. Study flow chart



7. ETHICAL CONSIDERATIONS

1. Ethical approval as sought from the KNH/UoN research and ethics committee. Data collection and analysis did not commence before ethical approval. All patients' identifiers were delinked from collected data by use of study identification numbers.
2. The smartphones that were used to capture data were encrypted with passwords and patterns to strictly restrict unauthorized access to the data.
3. The captured data was then be uploaded to the server. Hence data collected in the smart phone consequently disappeared once the upload was complete. Thus mobile phones used ceased to have any record of patients.
4. The Server where data was finally sent is also password encrypted to restrict access. Researcher is the only person with access and custody of the data.
5. Data collected has remained confidential, accessed only by the Principal investigator to achieve set objectives.
6. All information was handled with utmost confidentiality throughout the study period, held in trust by the investigator, research assistants and the study institution
7. The study findings has been presented to the University of Nairobi, Department of Obstetrics and Gynaecology as part of the requirement of the M.Med course

8. DATA MANAGEMENT AND ANALYSIS

8.1. Study tools

This comprised of a structured mobile based data extraction tool (Open data kit-ODK)

8.2. Data collection

The principle investigator and the research assistants collected data from the recruited participant's files. The study stools comprised of a structured mobile-based data extraction tool (open data kit, ODK). The data was captured using Open data kit, ODK. The data was uploaded into the server for extraction. Server stores the data in comma delimited format (CSV). This data was exported to python, R and SPSS for processing and statistical analysis. The Patients identification details or any kind of information that may lead to any form of identification was NOT captured into the Open data kit-mobile-based data capture platform. The research assistants consisting of two Clinical officers and a nurse signed a confidential form for further protection of the patients' medical records. That way the data remained totally anonymous. The smartphones that were used to capture data were encrypted with passwords and patterns to strictly restrict unauthorized access to the data. The captured data was uploaded to the server. The data consequently disappeared from the mobile gadgets once the upload was complete. No patient records were stored on the mobile phones. The Server where data was finally sent is also password encrypted to restrict access. The Principal Investigator is still the only person with access and custody of the data.

8.3. Data management and analysis

The collected study data was entered into a customized password protected MS Access data base. After completion of data entry, the data was exported to R statistical software for cleaning, verification and analysis.

Objective 1: Determine the incidence of Abnormal Placentation among patients who received obstetric care at Kenyatta national hospital between 1st January 2017 to 31st December 2019

The incidence of patients with a diagnosis of Abnormal Placentation was calculated as the total number of patients who had an ultrasound and/or clinical intraoperative diagnosis (168) divided by the total number of women who received obstetric care during the 3 year study period at Kenyatta national hospital as the denominator (40673) giving an estimated incidence of 0.4% that is 4 in 1000 patients.

Objective 2: Determine the proportion of women with ante-natal or intrapartum ultrasound and those with a Clinical intra-operative diagnosis of Abnormal Placentation among women who received obstetric care at Kenyatta national hospital from 1st January 2017 to 31st December 2019

The proportion of patients with ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation was achieved by estimating the total number of patients with an ultrasound diagnosis of Abnormal Placentation divided by the total number of patients diagnosed with Abnormal Placentation either via ultrasound and/or clinical intraoperative as the denominator. The proportion of patients with clinical intraoperative diagnosis of Abnormal Placentation was calculated as the total number of patients who were diagnosed with Abnormal Placentation for the first time during intra-operative

management divided by the total number of patients with Abnormal Placentation in the study as the denominator.

Objective 3: Compare maternal and perinatal outcomes following antenatal and intrapartum ultrasound and clinical diagnosis of abnormal placentation among women who received obstetric care between 1st January 2017 to 31st December 2019

The maternal and perinatal outcomes of the study participants were compared using chi square for qualitative data and t-test for quantitative data. The measure of association used was relative risk.

Objective 4: Maternal characteristics of patients with ante-natal/intrapartum diagnosis versus clinical intraoperative diagnosis of AP among women who received obstetric care between 1st January 2017 to 31st December 2019

We compared the maternal socio-demographic, obstetric and clinical characteristics of patients with an ante-natal/intrapartum diagnosis of Abnormal Placentation versus those with a clinical intraoperative diagnosis only.

9. RESULTS

A total of 40673 women received obstetric care that is either intrapartum and/or postpartum care at Kenyatta national hospital during the study period. Out of this number we obtained 391 Records of patients with a diagnosis of APH/3RD stage PPH/Retained placenta who received obstetric care at KNH Maternity department- ANC/Post-natal wards/labor ward or theatre. 79 files were missing leaving 312 files for evaluation of Abnormal Placentation. Upon review a further 144 files were ineligible as 3 cases did not meet the study criteria, 108 cases either had retained products of conception/trapped placenta/perineal tears and 33 cases had Abruptio placentae. A total 168 participants that fulfilled the eligibility criteria were recruited into the study. This is illustrated in the flow chart below.

9.1. Study flow chart

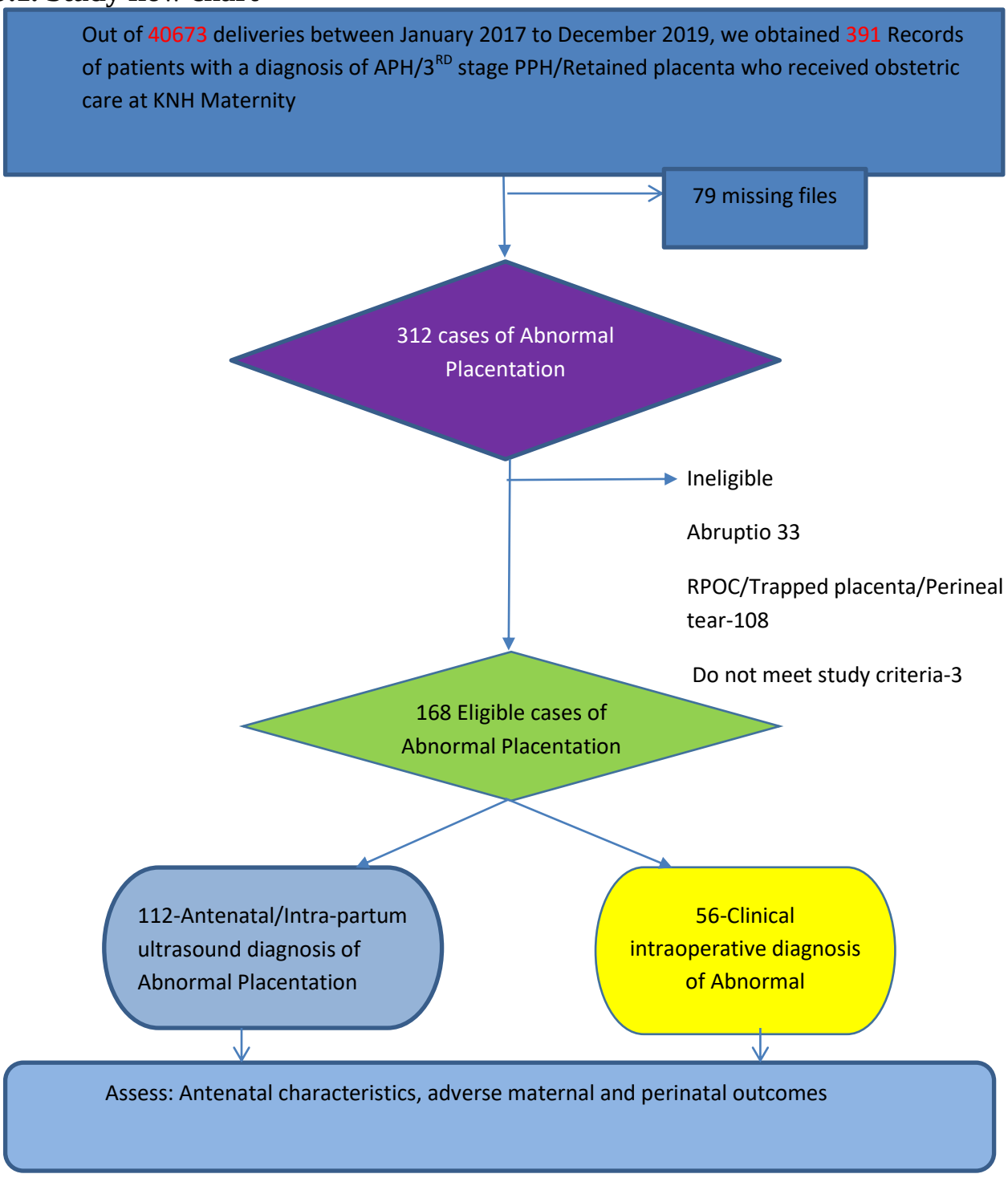
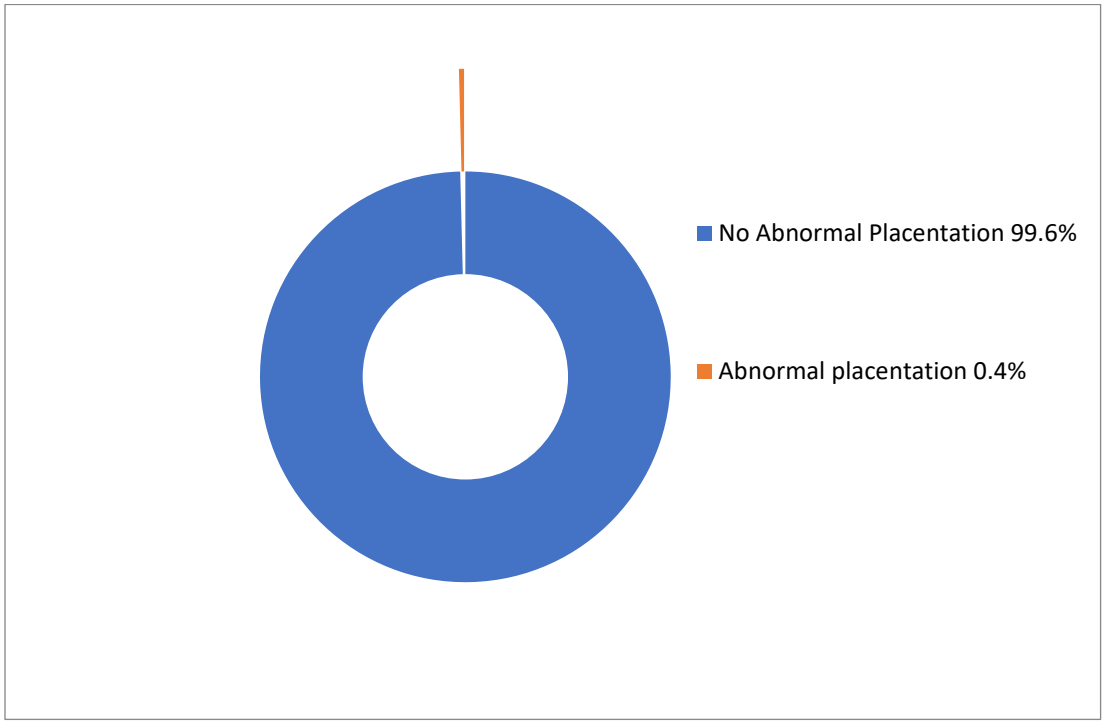


Chart 1: Incidence of patients with Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019



The pie chart above shows the 168 study participants who had a diagnosis of Abnormal Placentation out of the 40,673 deliveries conducted during the during the study period.

This shows the incidence of Abnormal Placentation at 0.4%.

$$incidence = (\frac{168}{40673})100$$

$$incidence = 0.4\%$$

Table 1: Socio-Demographic characteristics of patients with Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019

Maternal characteristics		Frequency (n)	Percentage (%)
Age	**<35**	131	78%
	>35	37	22%
Marital status	Married	133	79%
	Not-married	35	21%
Highest level of Education	Primary	49	29%
	Secondary	64	38%
	Tertiary	55	33%

The baseline socio-demographic characteristics of the study participants were as follows: the mean age was 30.2 years SD 5.7, most were married (78%), while majority were Christians (97.3%). Few had attained tertiary education (33%). Upto half of the participants (50.6%) were referred from other medical facilities.

Table 2: Maternal Obstetric characteristics of patients with Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019

Obstetric Characteristics		**Ante-natal &Intrapartum Ultrasound diagnosis of Abnormal Placentation** $n(\%)$	**Clinical intra-operative diagnosis of Abnormal Placentation** $n(\%)$	**RR[95%CI]**	**p-value**
Age	**<35** **>35**	81(48.2) 16(9.5)	33(19.6) 65(38.7)	Ref 2.5[1.9,3.3]	 0.0001*
Preterm labor	Yes No	25(14.9) 57(33.9)	36(21.4) 74(44)	0.93[0.6,1.4] Ref	0.7424
Previous caesarean section	0 1 2 3	55(32.7) 19(11.3) 4(2.4) 2(1.2)	77() 23() 5(3) 2(1.2)	Ref 0.96[0.8,1.1] 0.99[0.9,1.1] 0.99[0.9,1.1]	 0.6861 0.8713 0.7459
Previous miscarriage	0 1 2 4	68(40.5) 9(5.4) 3(1.8) 2(1.2)	90(53.6) 13(7.7) 5(3) 2(1.2)	Ref 1.0[0.9,1.1] 1.0[0.9,1.1] 0.99[0.9,1.0]	 0.8492 0.7537 0.7853
ANC visits	0 1 2 3 >3	2(1.2) 8(4.8) 15(8.9) 18(10.7) 35(20.8)	4(2.4) 10(6) 17(10.1) 25(14.9) 46(27.4)	Ref 0.7[0.2,3.1] 0.6[0.12,2.9] 0.7[0.1,3.6] 0.6[0.1,3.5]	 0.6391 0.5481 0.6934 0.6401
Gestation age at delivery	<34 weeks >35 weeks	10(6) 8(4.8)	0(0) 8(4.8)	0.4[0.3,0.7] Ref	0.0021*
Surgical evacuation of pregnancy	Yes No	10(6) 0(0)	17(10.1) 0(0)	1.6[0.03,76] Ref	0.8019
Minor Uterine Procedure	Yes No	10(6) 72(42.9)	18(10.7) 91(54.2)	1.1[0.9,1.2] Ref	0.3945
History of antenatal bleeding	Yes No	38(22.6) 40(23.8)	48(28.6) 55(32.7)	0.9[0.7,1.3] Ref	0.7784

Table 2: The 168 study participants were further grouped into two groups based on when the first Diagnosis of Abnormal Placentation was made: Antenatal/intrapartum or clinical intra-operative group. As shown above, the maternal characteristics of the 168 study participants were compared

within the two groups with Abnormal Placentation. This included known risk factors and clinical presentation of patients with Abnormal Placentation. Advanced age above 35 years was associated with Abnormal Placentation, RR 2.5[1.9, 3.3] p0.001.

Table 3: Proportion of women with ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019

	Patients with Abnormal Placentation	**Percentage**
Ante-natal/intrapartum ultrasound diagnosis of AP	112	66.7%
Clinical intraoperative diagnosis of AP	56	33.3%

Out of the 168 study participants, only 112 had a positive ultrasound diagnosis of Abnormal Placentation (Placenta Previa/ Placenta Accreta Spectrum). The remaining 56 patients, lacked an ultrasound diagnosis and were diagnosed with Abnormal Placentation intraoperatively.

$$proportion = 112/168$$

$$proportion = 66.7\%$$

Table 4: Composite adverse maternal and perinatal outcomes of patients with Abnormal Placentation at Kenyatta national hospital from January 2017 to December 2019

	Ultrasound diagnosis of AP (n=112)	**No Ultrasound diagnosis of AP (n=56)**		
	$\boldsymbol{n}(\%)$	$\boldsymbol{n}(\%)$	$\boldsymbol{RR}[95\%\boldsymbol{CI}]$	**p-values**
Composite adverse Maternal outcomes • Yes • No	53(47.3) 59(52.7)	33(58.9) 21(37.5)	0.77[0.58,1.03] Ref	0.083
Composite adverse perinatal Morbidity • Yes • No	38(33.9) 74(66.1	24(42.9) 30(53.6)	0.76[0.52,1.13] Ref	0.18

Table 3, shows the composite adverse maternal outcomes in lieu of the adverse maternal outcomes of interest that is APH, PPH, need for blood transfusion, Hysterectomy and length of stay as there were no maternal deaths. Though not statistically significant the clinical intra-operative group had significantly higher composite adverse maternal outcomes (58.9%) versus patients with an ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation (47.3%) and the use of an ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation reduced the risk of adverse maternal outcomes by 23% RR 0.77[0.58, 1.03] .The composite adverse perinatal outcomes included; preterm delivery, stillbirths, Poor 5 minute APGAR score, perinatal deaths in 24 hours and NICU/NBU admissions. The composite adverse perinatal outcomes was higher (42.9%) compared to the group with an ante-natal/intrapartum ultrasound (33.8%), the risk of adverse perinatal outcomes was reduced by 24% RR 0.76[0.52, 1.13], this was also not statistically significant. The individual maternal and perinatal outcomes that were evaluated in the study are further discussed in the subsequent tables below.

Table 5: Maternal outcomes of patients with Ante-natal/intrapartum ultrasound diagnosis versus Clinical intraoperative diagnosis of Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019

	Ante-natal/intrapartum Ultrasound diagnosis of AP N=112	Clinical intraoperative diagnosis of AP N=56	p-value
APH	63 (41.2%)	9 (16.1 %)	* 0.039
Placental site bleeding	28 (25.0%)	18 (32.1%)	0.43
PPH >1000-1999ml	16 (14.3%)	13 (23.2%)	0.32
PPH >=2000 ml	9 (8.0%)	4 (7.1%)	
Surgical site infection	2 (1.8%)	3 (5.4%)	0.20
Post op Anemia Hb<7g/dl	10 (8.9%)	10 (17.9%)	0.083
Need for blood transfusion	19 (17.0%)	15 (26.8%)	0.15
Hospital Length of stay			0.74
<=4 days	53 (47.3%)	28 (50.0%)	
>4 days	59 (52.7%)	28 (50.0%)	

Table 5: This compares the maternal outcomes of the study participants with an ante-natal/intrapartum ultrasound diagnosis (112) versus those with clinical intraoperative diagnosis 56). Upto 63 patients (41.2%) who had an ante-natal/intrapartum ultrasound diagnosis of Abnormal Placentation experienced ante-partum hemorrhage unlike 9 patients (16.1%) p-0.039 in the clinical Intraoperative group this was statistically significant. Other adverse maternal outcomes though not statistically significant were encountered more in the clinical intraoperative group such as: Placental site bleeding (32.1%), developed PPH >1000ml (23.2%), Post-op Hb less than 7g/dl (17.7%) and need for transfusion (26.8%) compared to those with an ante-natal/intrapartum ultrasound diagnosis of AP who had comparatively less Placental site bleeding (25%), developed PPH >1000ml (14.3%), Post-op Hb less than 7g/dl (8.9%) and need for transfusion (17%) Mean

blood loss was similar in both groups at 500ml SD. Emergency caesarean section was the most common mode of delivery in both groups. Placental site bleeding and PPH>1000-1999ml was more in the group without a prior ultrasound diagnosis of AP at 32.1% and 23.2% respectively. Due to these adverse maternal outcomes the need for additional intrapartum interventions is discussed separately in Table 6.

Table 6: Intrapartum interventions among patients with Abnormal Placentation (AP) at Kenyatta national hospital from January 2017 to December 2019

	Antenatal/intrapartum Ultrasound diagnosis of AP N=112	**Clinical intra-operative diagnosis of AP N=56**	**p-value**
Need for additional uterotonics	24 (21.4%)	15 (26.8%)	0.48
Use of tranexamic acid	15 (13.4%)	12 (21.4%)	0.20
Explorative laparotomy	3 (2.7%)	2 (3.6%)	0.76
Examination under anaesthesia	4 (3.6%)	4 (7.1%)	0.32
Hemostatic suture/B-lynch/devascularisation/UBT	22 (19.6%)	10 (17.9%)	0.74
Hysterectomy	5 (4.5%)	2 (3.6%)	0.77

Table 6: The above table compares the need for additional interventions among the study participants who were diagnosed with Abnormal placentation. Upto half of the patients required additional interventions from the standard practice in third stage of labor during vaginal/caesarean section. The clinical intraoperative group required additional uterotonics (26.8%), tranexamic acid (21.4%), Explorative laparotomy (3.6%) and Examination under anaesthesia (7.1%) compared to the group with an ante-natal/intrapartum ultrasound diagnosis who required slightly

less additional uterotonics (21.4%), tranexamic acid (13.4%), Explorative laparotomy (2.7%) and Examination under anaesthesia (3.6%). Conversely, the rates of Hysterectomy and devascularising procedures such as use of haemostatic sutures, B-lynch/uterine artery ligation and uterine balloon tamponade were more in the ante-natal/intrapartum ultrasound group.

Table 7: Perinatal outcomes of newborns delivered among the study participants with an Ante-natal/intrapartum ultrasound diagnosis versus Clinical intraoperative diagnosis of Abnormal Placentation at Kenyatta national hospital from January 2017 to December 2019

	Ante-natal/intrapartum Ultrasound diagnosis AP N=112	**Clinical intraoperative diagnosis of AP N=56**	**p-value**
Gestational age			0.75
<34 wks.	38 (35.19%)	20 (37.74%)	
>=34 wks.	70 (64.81%)	33 (62.26%)	
Apgar score at 5 minutes	9.00 (7.00-10.00)	9.00 (8.00-9.00)	0.71
Apgar score at 5 minutes			0.81
<7	91 (88.35%)	35 (89.74%)	
>=7	12 (11.65%)	4 (10.26%)	
Apgar score at 5 minutes	9.00 (7.00-10.00)	9.00 (8.00-9.00)	0.71
Still birth- Fresh	1 (0.9%)	7 (12.5%)	0.014
Still birth- macerated	2 (1.8%)	5 (8.9%)	0.10
NICU/NBU admission	28 (25.0%)	11 (19.6%)	<0.001
Perinatal death in 24hours	1 (0.9%)	2 (3.6%)	0.39
Birth weight	2489.44 (763.63)	2518.77 (1004.65)	0.84

Table 7: The table above shows the perinatal outcomes of newborns delivered among the study participants with a diagnosis of Abnormal Placentation. Upto a third of the births were preterm at gestational age less than 34 weeks and this was comparable in both groups. Adverse perinatal outcomes such as fresh stillbirth (12.5%), Macerated stillbirth (8.9%) and Perinatal death in 24 hours (3.6%) were more in the clinical intra-operative group with AP compared to ante-natal/intrapartum

ultrasound group where fresh still birth (0.9%), Macerated stillbirth (1.8%)and Perinatal death in 24 hours (0.9%). Surprisingly, the NICU/NBU admissions were higher in the Ante-natal/intrapartum ultrasound group (25%) versus clinical intraoperative group (19.6%) and this was statistically significant, $p<0.001$.

10. DISCUSSION

This study reviewed 168 records of patients with a Final diagnosis of Abnormal Placentation that is Placenta previa, Placenta accreta spectrum or both at Kenyatta National Hospital; out of a total of 40,673 deliveries conducted from January 2017 to December 2019. This brought the incidence rate of Abnormal Placentation to 0.4%, this was comparable to a study by Senkoro et,al 2019 in Tanzania in a tertiary center where the incidence of Placenta Previa was 0.6%. The lower incidence is likely due to the fact that in our setting patients with placenta previa and placenta accreta spectrum records were grouped together as Abnormal Placentation. These patients were further grouped into two groups: those with an antenatal/intrapartum ultrasound diagnosis and those with Clinical intra-operative diagnosis (no ultrasound but diagnosis of Abnormal placentation made intraoperatively). Ante-natal/intrapartum diagnosis of Abnormal Placentation in our set up was made in 73.2%, this was similar to a Nigerian study at a referral hospital by Anzaku, et al 2012 that showed the ante-natal diagnosis rate to be 74.8%.The socio-demographic characteristics were comparable in both groups: mean age of 30.1 years, >75% were married and upto 50.6% were referred from other facilities to Kenyatta national hospital. This was comparable to a study by Anzaku, et al 2012 in Nigeria where the mean age was 30.2 years, 56.3% were referral and majority were multipara. Those who had an ultrasound diagnosis had mostly achieved tertiary education at 38.8% compared to those with clinical intraoperative diagnosis at 21.4% (p0.044). When maternal characteristics were compared, only 9 patients (16.1%) in the clinical intraoperative group presented with antepartum hemorrhage compared to 41.2% who had an ante-natal/intrapartum ultrasound diagnosis and this was statistically significant p-0.039 suggesting that most cases of Abnormal Placentation are diagnosed when they present with revealed hemorrhage . Other risk factors such as prior history of APH and manual removal of placenta were either missing or not reported. The mode of conception was mostly inferred as there was only one case of In vitro fertilization reported. Upto 16.7% of the study participants had a

history of surgical evacuation of pregnancy and this was comparable in both groups. An evaluation of the maternal outcomes; there was no maternal death however there was more morbidity associated with late clinical intraoperative diagnosis of AP resulting in more cases of postpartum hemorrhage due to placental site bleeding necessitating the use of additional intrapartum procedures such as B-lynch/hemostatic sutures/Uterine artery ligation or uterine balloon tamponade and hysterectomy which was followed by severe post-partum anemia. Subsequently resulting in a lower mean admission hemoglobin level at 9g/dl and 11 g/dl ($p<0.001$) respectively .Comparatively, maternal morbidity was higher among the clinical intra-operative group where 60% had APH, 30.2% developed PPH and subsequently 17.8% developed Severe Post-operative -anemia and 3.6% underwent Hysterectomy. Patients with an antenatal ultrasound diagnosis of Abnormal Placentation, 41.2% presented with APH, 22.3% developed PPH leading to 8.93% cases of severe postoperative anemia and 4.5% underwent hysterectomy. These findings were similar to Erfani et al, 2019 in the USA where those with no prior ultrasound diagnosis of PAS experienced worse maternal outcomes in terms of mean estimated blood loss and number of transfused units of blood, Unlike Bailit et al, 2015 that showed more adverse outcomes in the group with an ante-natal diagnosis of PAS. There was only one case of bladder injury and 5 cases of surgical site infection in the study population. Neonatal outcomes were more severe with perinatal mortality of 31.4% which was significantly higher compared to 18.7% in the study by Anzaku et al, 2012 in Nigeria. Perinatal mortality was estimated at both fresh and Macerated still births were commonly observed in the clinical intra-operative group compared to those with an ante-natal/intrapartum ultrasound diagnosis. The 5minute APGAR score was significantly lower in both groups. Surprisingly, there were more NBU/NICU admissions in those with an ante-natal ultrasound diagnosis despite use of corticosteroids compared to those with clinical intra-operative diagnosis at 25.9% and 21.4% ($p<0.001$) respectively.

10.1 Conclusion

- Findings suggest that while overall incidence of Abnormal Placentation is low in comparison to other African countries. While the incidence of Abnormal Placentation at KNH from January 2017 to December 2019 is low, is associated with significant adverse maternal and perinatal outcomes.
- Ante-natal diagnosis of Abnormal Placentation at Kenyatta national hospital is comparatively lower than in other African countries.
- Lack of an ante-natal ultrasound diagnosis of Abnormal Placentation is associated with significant adverse maternal and perinatal outcomes.

10.2 Recommendations

- There is need for increased ultrasound surveillance of women at risk of Abnormal Placentation.
- Patients with Placenta previa need to be routinely evaluated using grey scale +/- Lower uterine segment doppler ultrasound to rule out concurrent PAS.
- More standard operating procedures for timing and mode of diagnosis of Abnormal Placentation need to be put in place.
- A multidisciplinary team for management of Abnormal Placentation needs to be constituted to pre-empt, manage and avert severe maternal and perinatal morbidity from Abnormal Placentation.
- There is need for a standardized care and reporting of PAS cases intraoperatively.

11. STUDY DISSEMINATION PLAN

The study findings were presented to the UoN department of Obstetrics and Gynaecology as part of the requirements of the MMed Program in both hard and soft copies. Hard copies of the results shall be sent to the University of Nairobi repository for storage. The findings shall also be shared with

The office of the head of department Obstetrics and Gynaecology in KNH with a view of dissemination of the new knowledge that has been generated to improve patient care.

12. STUDY LIMITATIONS

The limitations of the study include:

1. Retrospective: missing data, files this was factored in the sample size calculation.
2. Lack of standardized intra-operative reporting of Abnormal Placentation. This relied heavily on the intra-operation notes by the attending consultant/resident also aided by the use of FIGO clinical criteria in Appendix 2.

It was not be possible to infer cause and effect however; this study will form a baseline to inform other future studies.

13. STUDY BUDGET

Category	Remarks	Units	Unit Cost (KShs)	Total (KShs)
Proposal Development	Printing drafts	500 pages	5	2,500
	Proposal Copies	10 copies	350	3,500
	Ethics	1	3000	3000
Data Collection	Stationery Packs (Pens, Paper and Study Definitions)	20	200	4000
	Research assistants	3	25000	75,000
Data Analysis	Statistician	1		50,000
Thesis Write Up	Computer/Mobile ODK services			50,000
	Printing drafts	1000 pages	10	10,000
	Printing Thesis	10 copies	500	5,000
	Publishing	2	10000	20000
Contingency funds				20,000
Total				**243000**

12. TIME FRAME

Number	Activity	Estimated Time
1	Proposal Development and Presentation	October 2019 to June 2020
2	Submission of proposal for ethical approval	June 2020
3	Ethical corrections, pretesting and seeking permission	June to October 2020
4	Data Collection	November 2020
5	Data Analysis	November to December 2020
6	Thesis writing	December 2020
7	Thesis submission	December 2020

14. REFERENCES

1. Cresswell JA, Ronsmans C, Calvert C, Filippi V. Prevalence of placenta praevia by world region: a systematic review and meta-analysis. Trop Med Int Heal [Internet]. 2013 Jun 1 [cited 2020 May 4];18(6):712–24. Available from: http://doi.wiley.com/10.1111/tmi.12100
2. Prual A, Bouvier-Colle MH, De Bernis L, Bréart G. Severe maternal morbidity from direct obstetric causes in West Africa: Incidence and case fatality rates. Bull World Health Organ. 2000;78(5):593–602.
3. Frequency, Risk Factors, and Adverse Fetomaternal Outcomes of Placenta Previa in Northern Tanzania [Internet]. [cited 2020 Jun 12]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5339534/
4. Forster DS. A CASE OF PLACENTA ACCRETA. Can Med Assoc J [Internet]. 1927 Feb [cited 2019 Sep 9];17(2):204–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20316176
5. IRVING, FC. A study of placenta accreta. Surg Gynecol Obs. 1937;64:178–200.
6. Jauniaux E, Bunce C, Grønbeck L, Langhoff-Roos J. Prevalence and main outcomes of placenta accreta spectrum: a systematic review and metaanalysis. American Journal of Obstetrics and Gynecology. Mosby Inc.; 2019.
7. Jadoon B, Mahaini R, Gholbzouri K. Determinants of over and underuse of caesarean births in the Eastern Mediterranean Region: An updated review. Vol. 25, Eastern Mediterranean Health Journal. World Health Organization; 2019. p. 837–46.
8. El Gelany S, Mosbeh MH, Ibrahim EM, Mohammed M, Khalifa EM, Abdelhakium AK, et al. Placenta Accreta Spectrum (PAS) disorders: Incidence, risk factors and outcomes of different management strategies in a tertiary referral hospital in Minia, Egypt: A prospective study. BMC Pregnancy Childbirth [Internet]. 2019 Aug 27 [cited 2020 Jun 12];19(1):313. Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-019-2466-5
9. Zakherah MS, Abdel-Aziz M, Othman ER, Abbas AM. Maternal and neonatal outcomes of placenta previa and accreta at Assiut women's health hospital, Egypt. Int J Reprod Contraception, Obstet Gynecol. 2018 Jul 26;7(8):3024.
10. Usta IM, Hobeika EM, Abu Musa AA, Gabriel GE, Nassar AH. Placenta previa-accreta: Risk factors and complications. In: American Journal of Obstetrics and Gynecology. 2005. p. 1045–9.
11. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic analysis. Lancet Glob Heal. 2014;
12. Godia PM, Mgamb E, Maua J, Okoro D, Smith H, Mathai M, et al. First Confidential Report into Maternal Deaths in Kenya Citation: Ministry of Health Kenya 2017: Saving Mothers Lives. 2017.
13. Maureen J, Owiti MD. Describing the causes of Near-Miss Maternal Morbidity and Mortality at Kenyatta National Hospital, Nairobi UNIVERS'TY OF NAIROBI M E D IC A L LIBRARY.
14. Shellhaas CS, Gilbert S, Landon MB, Varner MW, Leveno KJ, Hauth JC, et al. The frequency and complication rates of hysterectomy accompanying cesarean delivery. Obstet Gynecol [Internet]. 2009 Aug [cited 2019 Sep 9];114(2 Pt 1):224–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19622981
15. Hull AD, Resnik R. Placenta accreta and postpartum hemorrhage. Clin Obstet Gynecol [Internet]. 2010 Mar [cited 2019 Sep 9];53(1):228–36. Available from:

http://www.ncbi.nlm.nih.gov/pubmed/20142659
16. Jauniaux E, Chantraine F, Silver RM, Langhoff-Roos J. FIGO consensus guidelines on placenta accreta spectrum disorders: Epidemiology,. Int J Gynecol Obstet [Internet]. 2018 Mar [cited 2019 Sep 9];140(3):265–73. Available from: http://doi.wiley.com/10.1002/ijgo.12407
17. Placenta Previa - Nomenclature, Diagnosis and Clinical Management - The ObG Project [Internet]. [cited 2020 May 4]. Available from: https://www.obgproject.com/2017/02/07/placenta-previa-nomenclature-diagnosis-clinical-management/
18. Ahmed SR, Aitallah A, Abdelghafar HM, Alsammani MA. Major Placenta Previa: Rate, Maternal and Neonatal Outcomes Experience at a Tertiary Maternity Hospital, Sohag, Egypt: A Prospective Study. J Clin DIAGNOSTIC Res [Internet]. 2015 [cited 2020 Jun 20];9(11):QC17. Available from: /pmc/articles/PMC4668479/?report=abstract
19. Marshall NE, Fu R, Guise JM. Impact of multiple cesarean deliveries on maternal morbidity: A systematic review. In: American Journal of Obstetrics and Gynecology. Mosby Inc.; 2011. p. 262.e1-262.e8.
20. Neonatal and Maternal Complications of Placenta Praevia and Its Risk Factors in Tikur Anbessa Specialized and Gandhi Memorial Hospitals: Unmatched Case-Control Study [Internet]. [cited 2020 Jun 20]. Available from: https://www.hindawi.com/journals/jp/2020/5630296/#B11
21. Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol. 2006 Jun;107(6):1226–32.
22. Fitzpatrick KE, Sellers S, Spark P, Kurinczuk JJ, Brocklehurst P, Knight M. Incidence and Risk Factors for Placenta Accreta/Increta/Percreta in the UK: A National Case-Control Study. PLoS One [Internet]. 2012 Dec 27 [cited 2020 Jun 20];7(12). Available from: https://pubmed.ncbi.nlm.nih.gov/23300807/
23. Marshall NE, Fu R, Guise J-M. Impact of multiple cesarean deliveries on maternal morbidity: a systematic review. Am J Obstet Gynecol [Internet]. 2011 Sep [cited 2019 Oct 12];205(3):262.e1-8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22071057
24. Eshkoli T, Weintraub AY, Sergienko R, Sheiner E. Placenta accreta: Risk factors, perinatal outcomes, and consequences for subsequent births. Am J Obstet Gynecol. 2013;208(3):219.e1-219.e7.
25. Bowman ZS, Eller AG, Bardsley TR, Greene T, Varner MW, Silver RM. Risk factors for placenta accreta: a large prospective cohort. Am J Perinatol [Internet]. 2014 Oct [cited 2019 Oct 12];31(9):799–804. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24338130
26. Garmi G, Salim R. Epidemiology, etiology, diagnosis, and management of placenta accreta. Obstet Gynecol Int [Internet]. 2012 [cited 2019 Oct 11];2012:873929. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22645616
27. Jauniaux E, Bhide A. Prenatal ultrasound diagnosis and outcome of placenta previa accreta after cesarean delivery: a systematic review and meta-analysis. Vol. 217, American Journal of Obstetrics and Gynecology. Mosby Inc.; 2017. p. 27–36.
28. Erfani H, Fox KA, Clark SL, Rac M, Rocky Hui SK, Rezaei A, et al. Maternal outcomes in unexpected placenta accreta spectrum disorders: single-center experience with a multidisciplinary team. In: American Journal of Obstetrics and Gynecology. Mosby Inc.; 2019. p. 337.e1-337.e5.
29. Bailit JL, Grobman WA, Rice MM, Reddy UM, Wapner RJ, Varner MW, et al. Morbidly

adherent placenta treatments and outcomes. Obstet Gynecol [Internet]. 2015 Mar [cited 2019 Oct 22];125(3):683–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25730233
30. RISK FACTORS OF ANTEPARTUM HAEMORRHAGE AT KENYATTA NATIONAL HOSPITAL: A CASE CONTROL STUDY UNIVERSITY OF NAIROBI DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY PRINCIPAL INVESTIGATOR AWARD OF DEGREE IN MASTERS OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY.
31. Fan D, Wu S, Liu L, Xia Q, Wang W, Guo X, et al. Prevalence of antepartum hemorrhage in women with placenta previa: A systematic review and meta-analysis. Sci Rep. 2017 Jan 9;7.
32. Petpichetchian C, Pranpanus S, Suntharasaj T, Kor-anantakul O, Hanprasertpong T. Comparison of transabdominal and transvaginal sonography in the diagnosis of placenta previa. J Clin Ultrasound [Internet]. 2018 Jul 1 [cited 2020 Jun 19];46(6):386–90. Available from: http://doi.wiley.com/10.1002/jcu.22600
33. D'Antonio F, Iacovella C, Bhide A. Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis. Ultrasound Obstet Gynecol [Internet]. 2013 Nov [cited 2019 Oct 9];42(5):509–17. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23943408
34. Palacios-Jaraquemada JM, Bruno CH, Martín E. MRI in the diagnosis and surgical management of abnormal placentation. Acta Obstet Gynecol Scand [Internet]. 2013 Apr [cited 2019 Oct 22];92(4):392–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22881062
35. D'Antonio F, Iacovella C, Bhide A. Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis. Ultrasound Obstet Gynecol [Internet]. 2013 Nov [cited 2019 Oct 22];42(5):509–17. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23943408
36. Budorick NE, Figueroa R, Vizcarra M, Shin J. Another look at ultrasound and magnetic resonance imaging for diagnosis of placenta accreta. J Matern Fetal Neonatal Med [Internet]. 2017 Oct [cited 2019 Oct 22];30(20):2422–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27806657
37. Collins SL, Ashcroft A, Braun T, Calda P, Langhoff-Roos J, Morel O, et al. Proposal for standardized ultrasound descriptors of abnormally invasive placenta (AIP). Ultrasound Obstet Gynecol [Internet]. 2016 Mar [cited 2019 Oct 22];47(3):271–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26205041
38. Alfirevic Z, Tang AW, Collins SL, Robson SC, Palacios-Jaraquemada J. Pro forma for ultrasound reporting in suspected abnormally invasive placenta (AIP): An international consensus. Vol. 47, Ultrasound in Obstetrics and Gynecology. John Wiley and Sons Ltd; 2016. p. 276–8.
39. Pilloni E, Alemanno MG, Gaglioti P, Sciarrone A, Garofalo A, Biolcati M, et al. Accuracy of ultrasound in antenatal diagnosis of placental attachment disorders. Ultrasound Obstet Gynecol [Internet]. 2016 Mar [cited 2019 Nov 12];47(3):302–7. Available from: http://doi.wiley.com/10.1002/uog.14893
40. Lyell DJ, Faucett AM, Baer RJ, Blumenfeld YJ, Druzin ML, El-Sayed YY, et al. Maternal serum markers, characteristics and morbidly adherent placenta in women with previa. J Perinatol [Internet]. 2015 Aug [cited 2019 Oct 24];35(8):570–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25927270
41. Zhou J, Li J, Yan P, Ye YH, Peng W, Wang S, et al. Maternal plasma levels of cell-free β-HCG mRNA as a prenatal diagnostic indicator of placenta accrete. Placenta [Internet]. 2014 Sep [cited 2019 Oct 24];35(9):691–5. Available from:

http://www.ncbi.nlm.nih.gov/pubmed/25063251
42. Onwere C, Gurol-Urganci I, Cromwell DA, Mahmood TA, Templeton A, Van Der Meulen JH. Maternal morbidity associated with placenta praevia among women who had elective caesarean section. Eur J Obstet Gynecol Reprod Biol. 2011 Nov 1;159(1):62–6.
43. Hudon L, Belfort MA, Broome DR. Diagnosis and management of placenta percreta: A review [Internet]. Vol. 53, Obstetrical and Gynecological Survey. Obstet Gynecol Surv; 1998 [cited 2020 Jun 20]. p. 509–17. Available from: https://pubmed.ncbi.nlm.nih.gov/9702791/
44. Piñas Carrillo A, Chandraharan E. Placenta accreta spectrum: Risk factors, diagnosis and management with special reference to the Triple P procedure [Internet]. Vol. 15, Women's Health. SAGE Publications Ltd; 2019 [cited 2020 Jun 20]. Available from: /pmc/articles/PMC6777059/?report=abstract
45. Jauniaux E, Ayres-de-Campos D, Langhoff-Roos J, Fox KA, Collins S. FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders,. Int J Gynecol Obstet [Internet]. 2019 Jul 1 [cited 2020 Jun 22];146(1):20–4. Available from: http://doi.wiley.com/10.1002/ijgo.12761
46. D'Antonio F, Iacovella C, Palacios-Jaraquemada J, Bruno CH, Manzoli L, Bhide A. Prenatal identification of invasive placentation using magnetic resonance imaging: Systematic review and meta-analysis [Internet]. Vol. 44, Ultrasound in Obstetrics and Gynecology. John Wiley and Sons Ltd; 2014 [cited 2020 Jun 22]. p. 8–16. Available from: https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/uog.13327

15. APPENDICES

15.1. APPENDIX 1: Data Extraction tool

1. Date of admission

2. Date and time of discharge or death

3. Age of the client

4. Highest education level

a) Primary b) Secondary c) Tertiary/college/University

5. Marital status

a) Single b) Married

6. Is it a referral patient?

Yes No

7. Religion

a) Christian b) Muslim c) Hindu d) Others

15. Obstetric History

8. Number of term pregnancies >28weeks

9. Number of miscarriages <28weeks

10. Last normal menstrual period (LNMP)

○ a) Date……month…..year ○ b) can't remember ○ Option 3

11. Current gestational age of pregnancy as per labor ward admission (based on LNMP/ 1st trimester ultrasound

12. Number of previous caesarean section

13. Any history of minor uterine procedure?(surgical evacuation of pregnancy, Intrauterine device, Myomectomy, Endometrial sampling or resection, Manual removal of placenta etc)

○ Yes ○ No

16. History of bleeding in previous pregnancies

○ Yes ○ Not Applicable

16. Has the patient received any Antenatal care?

○ Yes ○ No

16 (a). Number of antenatal visits16 (b).Number of ultrasounds done

17. Placenta features as Reported on ultrasound

17a. Fundal

○ Yes ○ No ○ Not Captured

17b. Anterior

○ Yes ○ No ○ Not Captured

17c. Posterior

○ Yes ○ No ○ Not Captured

17d. Low-lying

Yes No Not Captured

17e. Placenta Previa

Yes No Not Captured

17f. Placental consistency

Yes No Not Captured

17g. Placenta Accreta/increta/percreta

Yes No Not Captured

17h. Was Lower uterine segment Doppler ultrasound included?

Yes No Not Captured

18. Antenatal Hemoglobin level

19. Any history of ante-natal bleeding in current pregnancy?

Yes No

20. Admission hemoglobin level

Risk evaluation and co-morbidities

21. History of smoking

Yes No

22. Any history of Hypertension?

Presently Past both presently and past none

If presently, past or both (presently & past), state the type of hypertension:

Chronic hypertension Pre-eclampsia

23. Any History of Diabetes in pregnancy?

Presently Past both presently and the past none

If presently, past or both (presently & past), state the type of diabetes.

Gestational diabetes mellitus

Intrapartum outcomes of current pregnancy

24. Clinical presentation on admission

Per vaginal bleeding Lower abdominal pain both none

25 (a). Date of delivery

25(b).Gestational age at delivery (in weeks)

On admission

26. Mode of delivery

Spontaneous vaginal delivery Assisted vaginal delivery Emergency Caesarean section Elective Caesarean section

27. Estimated blood loss

28 (a). Fetal outcome

a (i). Still birth- Fresh a (ii).Still birth- macerated b. NICU admission c. Perinatal death in 24 hours

28(b). Fetal outcome: please indicate Alive- Apgar score 28 (c). Fetal outcome: please indicate Birth weight

29. Need for additional interventions

Explorative laparotomy Examination under anaesthesia hemostatic stature or B-lynch Hysterectomy Number of blood transfusions Additional uterotonics Tranexamic acid None

30. Intra-operative Surgical complications

a) Bladder injury b) ureteric injury Placental site bleeding

31. Post –operative complications

32. a) Surgical site Infection

Yes No

32b) Post op Anemia Hb level< 7g/dl

Yes No

32. c) Venous thromboembolism

Yes No

32. d) Hemodynamic instability BP less than 90/60

Yes No

32. e) Death

Yes No

32. f). Shock BP

Yes No

On discharge

33. Final diagnosis on discharge /intraoperative notes

a)Placenta previa b)Placenta accreta/increta/percreta c)Previa and PAS d) Retained placenta

33. How was the diagnosis arrived at?

33. a) Clinical presentation based on history and physical exam

Yes No

33. b) Antenatal ultrasound

Yes No

33. c) Intrapartum ultrasound

Yes No

33. d) Failed placental delivery/separation > 30minutes after AMSTL

Yes No

33. e) Clinical intraoperative

Failed placental separation or adherent placenta noted during caesarean section or Examination under anaesthesia Low lying placenta seen intraoperatively Both

15.2 APPENDIX 2: FIGO classification for clinical diagnostic criteria for PAS

Adopted from **FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders, Eric Jauniaux,et al 2019**(45)

Grade 1: PAS-Placenta accreta

- During vaginal delivery

    ○Even after active management of 3rd stage of labor -Intramuscular syntocinon injection and gentle controlled cord traction the placenta fails to separate spontaneously.

    ○Any Attempted manual delivery of the placenta is followed by massive placenta site bleeding that often requires additional surgical procedures

- During Laparotomy this includes cesarean delivery

    ○Same as above

    ○No visible placental invasion at the placenta-myometrial junction

Grade 2: PAS-Placenta increta

- Often diagnosed intra-operatively

    ○Abnormal bluish/purple coloring or distension on the placental bed accompanied with multiple blood vessels

    ○Placental tissue only invades the myometrium but not the uterine serosa

    ○Attempts at gentle cord traction does not result in placental separation but causes the uterus to be pulled inwards also called ‘the dimple sign’

Grade 3: Abnormally invasive placenta (Percreta)

- Intra-operative findings
    - ○Placental seen to invade the myometrium, serosa with or without bladder/other pelvic organs(broad ligament, vaginal wall, pelvic sidewall)

15.3 APPENDIX 3: Ultrasound and MRI signs of PAS

Tables adopted from Meta-analysis by **F. D'Antonio,** et al 2014 and 2013 :**Prenatal identification of invasive placentation using magnetic resonance imaging and Prenatal identification of invasive placentation using ultrasound** (46)(35)**.**

Ultrasound parameter	Studies (*n*)	Total sample (*n*)	Sensitivity (%)	Specificity (%)	LR+	LR–	DOR
Grayscale ultrasound (overall)	23	3707	90.72	96.94	11.01	0.16	98.59
			(87.2–93.6)	(96.3–97.5)	(6.1–20.0)	(0.11–0.23)	(48.8–199.0)
Placental lacunae	13	2725	77.43	95.02	4.52	0.29	24.32
			(70.9–83.1)	(94.1–95.8)	(2.5–8.1)	(0.20–0.43)	(9.13–64.8)
Loss of hypoechoic space	10	2633	66.24	95.76	5.64	0.38	21.98
			(58.3–73.6)	(94.9–96.5)	(2.3–14.1)	(0.20–0.69)	(6.8–70.6)
Abnormalities of uterus–	9	2579	49.66	99.75	30.56	0.51	93.70

Ultrasound parameter	Studies (*n*)	Total sample (*n*)	Sensitivity (%)	Specificity (%)	LR+	LR–	DOR
bladder interface							
			(41.4–58.0)	(99.5–99.9)	(8.1–115.5)	(0.34–0.77)	(35.5–247.5)
Color Doppler ultrasound (overall)	12	714	90.74	87.68	7.77	0.17	69.02
			(85.2–94.7)	(84.6–90.4)	(3.3–18.4)	(0.10–0.29)	(22.8–208.9)

MRI sign	Studies (*n*)	Total sample (*n*)	Sensitivity (%)	Specificity (%)	LR+	LR–	DOR
Uterine bulging	5	119	79.1	90.2	8.06	0.23	34.8
			(60.3–90.4)	(76.2–96.4)	(2.93–22.2)	(0.11–22.2)	(7.46–162.4)
Heterogeneous signal intensity	6	143	78.6	87.7	6.38	0.24	26.2

MRI sign	Studies (*n*)	Total sample (*n*)	Sensitivity (%)	Specificity (%)	LR+	LR–	DOR
			(57.7–90.8)	(50.4–98.0)	(1.22–33.5)	(0.12–0.52)	(3.85–177.8)
Dark intraplacental bands on T2	6	146	87.9	71.9	3.13	0.17	18.6
			(70.9–95.6)	(55.6–84.0)	(1.76–5.56)	(0.06–0.48)	(4.12–83.8)
Focal interruption of myometrium	4	119	92.0	75.6	3.77	0.11	35.5
			(79.2–97.2)	(50.4–90.4)	(1.54–9.23)	(0.03–0.35)	(5.03–250.9)
Tenting of bladder	2	74	80.0	98.6	31.5	0.28	119
			(28.0–99.5)	(92.2–100)	(5.9–168)	(0.07–1.09)	(9.9–1436)

17.ETHICAL APPROVAL

Dear P345/06/2020

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Ref: KNH-ERC/RR/566

24th August, 2020

KENYATTA NATIONAL HOSPITAL KNH 05 OCT 2020 KNH/UoN-ERC P.O.Box 20723-00202 NRB.

Dr. Victoria Adhiambo Gamba
Reg. No. H58/7123/2017
Dept. of Obstetrics and Gynecology
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Gamba,

Research Proposal: **Incidence and risk of adverse outcomes of abnormal placentation at KNH; A 3 year descriptive cohort study (P345/06/2020)**

This is to acknowledge receipt of your research proposal and to inform you that upon review by the KNH- UoN Ethics and Research Committee during the 257th ERC meeting held on 12th August, 2020, the following observations and suggestions were made:

General comments

1. Study title: Write KNH in full in the title.
2. Certificate of Authenticity: Signature of Chair of Department of Obstetrics and Gynecology, UoN does not look 'authentic'.
3. Definition of terms: The abbreviation AP is not defined in the list of abbreviations yet it is used severally (see page vi). Ensure that all abbreviations used in the write up are listed.
4. List of abbreviations: Arrange the abbreviations in alphabetical order for ease of reference.
5. Summarize the abstract to approximately 350 words; otherwise it becomes an Executive Summary.
6. Include the Theoretical Framework for the study.

Methodology

7. Study design: Give more details on the study design including what it will involve and why the selected design is the most appropriate.
8. Inclusion criteria: You have used the abbreviations AP which is not in the list of abbreviations. Also take note that you are highly unlikely to find any patient record at the Kenyatta National Hospital with a diagnosis of "*abnormal placentation*". Consider using diagnoses that represent abnormal placentation instead.
9. Study procedure: Describe how you will identify patients who were managed for abnormal placentation to enable you make a list of the records to be retrieved.
10. Data collection and Study tools:
    i. Separate the two sections.
    ii. What are the qualifications of the research assistants?

INCIDENCE AND RISK OF ADVERSE OUTCOMES OF ABNORMAL PLACENTATION AT KENYATTA NATIONAL HOSPITAL-A 3 YEAR DESCRIPTIVE COHORT STUDY

A RESEARCH PROPOSAL IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTERS OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY, UNIVERSITY OF NAIROBI

Dr Victoria Adhiambo Gamba (MBChB- UoN)

H58/7123/2017

2020