

**FETOMATERNAL OUTCOMES OF SINGLETON BREECH DELIVERIES
AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET, KENYA.**

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**A thesis submitted to the School of Medicine, College of Health Sciences in
partial fulfilment of the requirement for an award of the degree of Master of
Medicine in Reproductive Health of Moi University.**

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DECLARATION

Declaration by candidate:

I declare that this thesis is my original work and has not been presented in any other institution or university for the award of degree or any academic credit. No part of this thesis may be reproduced without prior written permission of the author, supervisors and or Moi University.

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DEDICATION

I dedicate this work to all obstetricians who have dedicated their lives to improve fetal and maternal outcomes in our population.

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LIST OF ABBREVIATIONS

APGAR	Appearance, Pulse, Grimace, Activity, and Respiration
CS	Caesarean section
ECV	External Cephalic Version
IREC	Institutional Research and Ethics Committee
KG	Kilograms
LSCS	Lower section caesarean section
MTRH	Moi Teaching and Referral Hospital
NBU	Newborn unit
PPH	Post-Partum Haemorrhage
RMBH	Riley Mother and Baby Hospital
SPSS	Statistical package for social sciences
VD	Vaginal delivery
Z-A	Zatuchni -Andros

DEFINITION OF TERMS

Breech delivery: A delivery of a baby which is so positioned in the uterus that the buttocks or feet are delivered first.

Caesarean Section: Delivery of a foetus, placenta and membranes through abdominal and uterine incision.

Elective caesarean section: Refers to a planned caesarean arranged ahead of time for medical conditions which have developed before or during pregnancy.

Emergency Caesarean Section: Any caesarean section done without anticipated earlier planning.

Fetomaternal outcomes: A consequence relating to or involving both the foetus and the mother; specifically passed or directed from the foetus to the mother.

Grand multipara: A woman who has given birth more than five times.

Multipara: A woman who has given birth more than once.

Perineal tears: Lacerations of skin and other soft tissues that separate the vagina from the anus.

Post term delivery: Delivery of a foetus after 42 weeks of gestation.

Preterm delivery: Delivery of a foetus before 37 completed weeks of gestation.

Primiparous: A woman who has given birth once.

Singleton breech delivery: Delivery of a single foetus in longitudinal lie with the buttocks or feet of the foetus being delivered first.

Term delivery: Refers to the delivery of a foetus at a gestation between 37 completed week and 41 weeks.

ABSTRACT

Background: Breech presentation occurs in approximately 3% to 4% of all women at term with the incidence varying with the gestational age of the foetus. They are a major concern for both pregnant mothers and their reproductive healthcare providers because of the associated increased adverse maternal and perinatal outcomes. However, the evidence to support emergency caesarean sections rather than vaginal delivery for breech presentations is not clear cut. This necessitates a local study to describe fetal and maternal outcomes of singleton breech deliveries among women attending a major referral facility with breech presentations in Western Kenya region.

Objective: The aim of this study was to describe the fetal and maternal outcomes of singleton breech deliveries at Moi Teaching and Referral Hospital (MTRH).

Methods: This was a cross sectional descriptive study. The study participants were women with singleton breech deliveries at a gestation of 28 weeks or more. Hospital records indicated that very few breech deliveries occurred at the facility per year. Therefore, a census of all the eligible women with singleton breech deliveries was taken. A semi-structured interviewer-administered questionnaire was used for data collection.

Results: There were a total of 11, 957 deliveries at MTRH during the study period (30th August 2019 to 27th August 2020), of which 125 (1.045%) were singleton breech deliveries. Of these, 75 met the eligibility criteria to participate in the study whereby, 65 (86.7%) gave birth through emergency caesarean section while 10 (13.3%) had emergency vaginal breech delivery. Most women (50.67%; n=38) delivered at a gestational age of between 38 - 40 weeks and 72 (96%) of the women enrolled had live births. Most (66.70%) newborns weighed 2500 – 3499 grammes with 70 (93.3%) newborns having a 5-minute APGAR score of ≥ 7 . Majority (85.3%) of the newborns did not have birth complications however, 5 (6.7%) were admitted to the newborn unit, 5 (6.7%) had a clinical diagnosis of birth asphyxia while 1 (1.3%) had delayed aftercoming head. The maternal complications noted were second- and third-degree perineal tears (5.3%), post-partum haemorrhage (4.0%) and anaesthetic complications (1.3%).

Conclusions: This study noted that despite the MTRH breech delivery protocol recommendation for caesarean section for breech presentation, 13.3% of the women had vaginal breech deliveries. Birth complications (birth asphyxia, NBU admission and delayed aftercoming head) occurred in less than 15% of the newborns regardless of the mode of delivery. Furthermore, 40% of these women sustained second- and third-degree perineal tears.

Recommendations: Because maternal complications were associated with the mode of delivery, efforts should be made to ensure that those with breech presentations are identified during antenatal visits, admitted at term and prepared for elective caesarean section. In addition, those with breech presentation in labour should be prepared for emergency caesarean section. From the study there was a higher rate of perineal tears among those who delivered vaginally in MTRH. Therefore, a training for health workers on vaginal breech deliveries would be recommended.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Breech presentation occurs when the foetus lies longitudinally in the uterus with the caudal pole of the foetus occupying the lower uterine segment as the cephalic pole occupies the uterine fundus. Breech presentations account for about 3-4% of all pregnancies at term (Toivonen et al. 2012). It is a major predisposing factor for birth complications among newborns. Planned caesarean section has been considered to be a safer mode of delivery compared to spontaneous vaginal delivery among women with breech presentation in labour (Bin et al. 2016). Although the aetiology of breech presentation in pregnancy is not well known, studies have argued that the major predisposing factors for breech presentation include multiple pregnancies, multiparity, prematurity, pelvic abnormalities, placental and uterine abnormalities, polyhydramnios and restricted fetal growth (Peitsidis and Vrachnis 2021). Disorders of the endocrine system have been attributed to decreased fetal movement as a result of pituitary pathology and these may lead to breech presentation; due to the thyroid gland's inability to produce sufficient quantities of thyroid hormones. The prevalent hypothyroid conditions include overt and subclinical hypothyroidism as well as elevated thyroid stimulating hormone (TSH) levels (Garber et al. 2012).

In a study conducted in Canada, breech presentation has been demonstrated to occur in approximately 7% of pregnancies at 32 weeks gestation and 25% of pregnancies at 28 weeks gestation or less (Kotaska et al. 2009). Because of its high prevalence, morbidity and mortality; breech delivery has been a highly discussed topic in obstetrics. The commonly described complications associated with breech delivery are birth asphyxia, trauma, prematurity and congenital malformations (Gabbe et al.,

2016). Some obstetric scholars and practitioners have advocated for emergency caesarean mode of breech delivery while others recommend vaginal birth for pregnant women with breech presentations (Vlemmix et al. 2014; Dars, Malik, and Bhurgri 2014). This conflict in opinion necessitates a local study on the most appropriate mode of delivery for this group of pregnant women.

Breech presentations occur in three main variants namely: frank (or extended), incomplete (or footling) and complete (or flexed). Diagnosis of these presentations may be achieved by history taking, doing a clinical examination and through imaging. From the history a woman would say that she perceives fetal movements at the lower part of the abdomen. Clinical examination includes palpation of the woman's abdomen and vaginal examination. Leopold manoeuvres is the examination of the woman's abdomen where one feels the soft and irregular mass representing the fetal buttocks and the feet over the pelvis, the hard globular fetal head at the uterine fundus, the back of the fetus on either the right or left side near the midline. In labour, a vaginal examination may be conducted where a smooth irregular hard head with its suture lines and fontanelles is absent. The presenting part is soft and irregular and sometimes the feet may be felt. On auscultation, the fetal heart sounds are heard loudest above the umbilical region. Obstetric ultrasound images taken may confirm the breech presentation. Furthermore, the breech scoring criteria proposed by both Zatuchni-Andros (Bird and McElin 1975; Lawrence et al. 2021) and the Newman-Peacock Prognostic system (Silva and Clode 2018) should be used by obstetricians to determine the most appropriate mode of breech delivery. While the Newman-Peacock index is used as a prediction tool for the success of External Cephalic Version (ECV) procedure, the Zatuchni-Andros scoring criteria is helpful in the selection of the preferred mode of delivery for women with breech presenting foetuses. It is a means

of predicting fetal and maternal outcomes of vaginal breech deliveries and it entails gestational age, parity of the woman, previous successful breech delivery, estimated fetal weight, cervical dilatation and station of breech. The lowest Z-A score is zero while the highest score is eleven; with a score of less than 4 predicting a poor outcome.

Table 1.1: The Zatuchni -Andros (Z-A) breech scoring criteria (Bird and McElin 1975)

Parameters	Scores		
	0	1	2
Parity	Gravida1	Multipara	
Gestation age (Weeks)	39	38	37
Estimated weight (g)	>3500	2500– 3500	< 2500
Previous breech	None	1	2 or more
Dilatation	2cm	3cm	4cm or more
Station	-3 or more	-2	-1 or lower

The choice of mode of breech delivery has been argued to influence fetal and maternal outcomes (Berhan and Haileamlak 2016; Duke et al. 2014). The commonly assessed fetal outcomes are 5-minute APGAR score, admission to the newborn unit (NBU), and mortality of the foetus. The maternal outcomes of interest among women with breech presentations are postpartum haemorrhage (PPH), perineal tears and anaesthetic complications. This makes it necessary for mothers to be aware of a suitable mode of delivery to prevent complications associated with breech deliveries (Singh, Mishra, and Dewangan 2012; Hannah et al. 2001). A study conducted in the Netherlands on the influence of counselling on the mode of breech delivery (Abdessalami et al. 2017), recommended that counselling and maternal education

should be offered to pregnant mothers with breech presentation prior to the mode of delivery choice. From these findings, there is need for local studies to address the choice of mode of delivery among pregnant women with breech presentation in sub-Saharan Africa.

In many hospitals in Kenya, pregnant women at term with breech presentation are recommended to have an elective caesarean section, while those who present in labour are taken for emergency caesarean section (Kanyi et al. 2019). Women with breech presentation in the second stage of labour are allowed to deliver vaginally. This study assessed the fetal and maternal outcomes of breech deliveries at Moi Teaching and Referral Hospital (MTRH) in Western Kenya.

1.2 Statement of the problem

Breech presentation is the commonest malpresentation in pregnancy that is of great concern for both pregnant mothers and their reproductive healthcare providers. This is because breech deliveries have been associated with increased maternal and perinatal morbidity regardless of the mode of delivery (Basnet et al. 2020). Majority of women in developing countries present to health facilities in labour having not attended any antenatal clinic during pregnancy complicating the diagnosis of breech presentation and subsequent management (Pasupathy et al. 2009). The best mode of breech delivery has been a controversial issue over the years (Hannah et al. 2001; Duke et al. 2014; Berhan and Haileamlak 2016). This is because other studies have associated emergency caesarean deliveries with increased mortality and morbidity (Rauf and Ayub 2004; Duke et al. 2014). Therefore, there is need for a local study to determine fetal and maternal outcomes of singleton breech deliveries in Western Kenya.

1.3 Justification of the study

There are controversies surrounding optimal mode of singleton breech deliveries (Hannah et al. 2000; Carbillon et al. 2020). Although Moi Teaching and Referral Hospital has guidelines that recommend planned caesarean sections for women with breech presentations, it gives room for emergency caesarean sections and vaginal deliveries. Therefore, there is need for a local study to determine fetal and maternal outcomes based on the mode of delivery among these women. The findings from this study will inform both the care these women receive, and probable mitigation strategies based on the commonly reported outcomes. Furthermore, local studies influence hospital-based management guidelines especially in tertiary hospitals such as MTRH.

1.4 Significance of the study

The findings of this study will give insight on the outcomes of different modes of deliveries for foetuses presenting in breech. This will also provide justification for further studies on association of breech and mode of delivery. The findings of the study will be of great help to the ministry of health in policy formulation on how the government can avert fetal and maternal complications associated with breech deliveries.

Recommendations from the study may be used by the management of Moi Teaching and Referral Hospital to improve on the management of singleton breech presentation.

1.5 Research Questions

What are the fetal and maternal outcomes of singleton breech deliveries at Riley mother and baby unit of MTRH?

1.6 Objectives of the study

1.6.1 Broad objective

To describe the fetal and maternal outcomes of singleton breech deliveries at MTRH.

1.6.2 Specific objectives

- i. To describe the fetal outcomes of singleton breech deliveries at MTRH.
- ii. To describe the maternal outcomes of singleton breech deliveries at MTRH.

1.7 Scope of the study

The study was conducted at the RMBH unit of Moi Teaching and Referral Hospital, Eldoret, Kenya. Only postnatal mothers who had delivered singleton foetuses in breech by either emergency caesarean section or vaginal delivery after 28 weeks of gestation (period of viability) at MTRH were considered. The study was done for a period of one year after approval of the proposal.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter describes studies conducted around the globe on the epidemiology of breech deliveries and the number of women presenting with this condition. Furthermore, it reviews in detail mode of breech deliveries as well as the fetal and maternal outcomes of singleton breech deliveries.

2.2 Epidemiology of singleton breech presentations

The prevalence of singleton breech presentations at term vary across various countries and continents, with a global prevalence estimated at 4% (Vistad et al. 2013). In a prospective cross-sectional study conducted at Jimma University Medical Center, Ethiopia, the prevalence of term breech delivery was reported to be at 5.3% (Assefa et al. 2019). A fifteen-year systematic review conducted in Cameroon (Kemfong Ngowa et al. 2012), reported that the prevalence of breech deliveries was 2.98%. In addition, a retrospective and descriptive study conducted in the University Teaching Hospital Yaoundé in Cameroon (Nkwabong et al. 2012), singleton breech deliveries were estimated at 4.2%; a difference that could be attributed to a point prevalence rather than a 15-year retrospective finding. A retrospective study conducted in Nigeria (Obuna et al. 2014) among 12,743 reviewed over a five year period (January 2007- December 2011) in a maternal hospital reported a 4.5% proportion of breech deliveries. In a retrospective study carried out on outcomes of singleton term breech deliveries at a Federal Medical Center, Owerri, South Eastern Nigeria (Duke et al. 2014), the estimated prevalence of breech delivery stood at 1.9%. This is close to another retrospective study conducted in Usmanu Danfodiyo University Teaching Hospital Sokoto in the North-western part of same country at 1.7% (Tunau and

Ahmed 2013). In a retrospective study conducted in Zimbabwe (Ngwenya 2019), the prevalence of breech deliveries stood at 0.66% in the year 2017 among 8,439 deliveries recorded in the demographic database.

In Saudi Arabia (Abduljabbar et al. 2016), the average prevalence of breech deliveries was 1.56% which is close to that reported in India at 2.1% (Singh, Mishra, and Dewangan 2012) and 1.3%(Usha and Kaveri 2019).Higher prevalence rates were reported in Lahore-Pakistan (Nahid 2000) at 3.36% among 10,487 deliveries seen at the teaching hospital and in Malaysia at 3.8% (Nordin 2007). Lower prevalence of breech deliveries was reported in Nepal at 2.4% (Basnet et al. 2020) among 21,768. Similarly, a low proportion of breech deliveries was reported in another study conducted in India (Jena 2018) at 2.8% . These two studies (Jena 2018; Basnet et al. 2020) were reported recently and were conducted in two countries sharing a geographical boundary within the East Asia region. In Finland, the authors estimated the prevalence of breech deliveries at 2.4% (Macharey, Gissler, Ulander, et al. 2017)based on a ten-year retrospective study conducted between 2005 to 2014 among 585, 580 deliveries. Another 9-year retrospective study was conducted in the Netherlands among 58,320 women where 4.4% of them were reported to have had breech deliveries. In Belgium, the proportion of breech deliveries among 611,021 women reviewed in epidemiologic demographic surveys between 2001 and 2010 was 4.59% irrespective of whether the deliveries were vaginal or emergency caesarean

Other studies have reported proportions of breech deliveries that are within the global average of 3% to 4%(Jadoon, Jadoon, and Shah 2008; Debero Mere et al. 2017; Dars, Malik, and Bhurgri 2014; Vistad et al. 2013; Adegbola and Akindele 2009).In India (Dars, Malik, and Bhurgri 2014) reported a breech delivery prevalence of 3% among 3090 women recruited cross-sectionally. This was also the case in Pakistan (Jadoon,

Jadoon, and Shah 2008) where 100 women were reported to have had vaginal breech deliveries out of 3,977 deliveries seen at a maternal unit in the Bolan Medical Complex Hospital giving a proportion of 3.6%. This study conducted in Pakistan (Jadoon, Jadoon, and Shah 2008) used a case series study design and was conducted over an 11-month period. This finding mirrors that reported at Wolisso Hospital in Ethiopia where 3.4% of the women had breech deliveries out of 10,214 women enrolled through a cross-sectional study design (Debero Mere et al. 2017). In Norway (Vistad et al. 2013) and Nigeria (Adegbola and Akindele 2009), equal proportion of 3.4% for breech deliveries were reported. The 3.4% proportion of breech deliveries reported in Nigeria (Adegbola and Akindele 2009) over a two-and-a-half year follow-up period were either vaginal or emergency caesarean deliveries

Both studies (Vistad et al. 2013; Adegbola and Akindele 2009) adopted retrospective techniques in data collection but enrolled varying number of participants with different eligibility criteria. In Norway, 16, 794 women who had their foetus presenting in a breech manner were enrolled over a ten-year period (2001 to 2011) and all these women delivered vaginally at the Sorlandet Hospital in Kristians. On the other hand,

There are several factors that could predispose a woman to breech presentation. These include multiparity, polyhydramnios, oligohydramnios, hydrocephaly, anencephaly, previous breech presentation, placenta previa, preterm gestation, uterine abnormality, older maternal age, maternal anticonvulsant therapy, multiple gestation, and fetal asphyxia might contribute to the occurrence of breech presentation (Gunay et al. 2020). Having a history of breech presentation from a previous pregnancy increases the likelihood of breech presentation in the subsequent pregnancy by 9% (Martel-Santiago et al. 2020). Women who have two consecutive pregnancies with breech

presentation have an increased risk of subsequent breech pregnancy of 25% and 40% for three consecutive pregnancies (Ford et al. 2010).

2.3 Mode of Delivery for Breech Presentations

2.3.1 History of breech deliveries

From the first century, breech deliveries were done vaginally. In the mid-sixteenth century, external cephalic version for breech presenting foetuses was optimized. This progressed to the nineteenth century where various instruments and manoeuvres were introduced, such as the application of forceps to the after-coming head. These forceps were developed in 1924 by Edmund Piper for application only to the after-coming head. The objective of vaginal delivery for breech presentation was mainly to ensure the safety of the pregnant mother. With the introduction of blood banking, broad spectrum antibiotics as well as the use of anaesthesia, emergency caesarean breech deliveries were introduced to reduce on the increased perinatal morbidity and mortality of newborns from vaginal breech deliveries. However, this liberalization of emergency caesarean breech delivery was attributed to increased maternal morbidity and mortality and increased the risk of potential hazards in subsequent pregnancies. This led to a renewal of interest by the reintroduction of external cephalic version that led to a successful reduction in term breech presentation.

There have been multiple studies adopting prospective and retrospective study designs as well as randomized controlled trials that have demonstrated comparable pregnancy outcomes for both vaginal deliveries and emergency caesarean sections. A case in point is the International Term Breech Collaborative Group that followed a large number of frank and complete breech cases and came to the conclusion that planned caesarean sections for women with breech presentation was amore

appropriate way of delivering the foetus. Furthermore, the trial recommended that there be a policy regulating planned vaginal birth for term singleton breech foetuses.

Several studies have been conducted on the association between mode of delivery and the fetal and maternal outcomes of singleton breech deliveries. Most of these studies showed that planned caesarean deliveries were associated with better outcomes to both the foetus and the mother.

Although the best mode of breech delivery is controversial, different studies have argued for or against vaginal and emergency caesarean delivery.

2.3.2 Caesarean Breech Deliveries

Newborns born following breech presentation (bottom first) have an increased risk of complications during vaginal birth (Hofmeyr and Kulier 2012). These include; cord prolapse, birth trauma (fractures to the clavicle, humerus, femur and skull), sternocleidomastoid hematoma, injury to the brachial plexus and testicular injuries to the male fetuses. The maternal complications that may develop include: deep perineal tears, cervical tears, uterine rupture increased infection and postpartum hemorrhage. However, these complications could be reduced by planned caesarean deliveries.

In a Cochrane Review of 2015, there were lower neonatal morbidity and mortality rates in the planned caesarean section group compared to vaginal delivery (Cluver et al. 2015). Despite this, the findings of Term Breech Trial (TBT) have contributed much information on appropriate mode of breech delivery (Hannah et al. 2000). However, the TBT did not demonstrate any statistically significant difference in childhood outcomes between the two modes of birth after two years of follow-up.

It has been demonstrated that prior to the development of the breech clinic, the rate of emergency caesarean section for breech presentation at term stood at approximately 95.7% and this could be attributed to the findings of the Term Breech Trial (Möllmann et al. 2020). However, the proportion of emergency caesarean delivery reduced to 56.5% following intervention with the breech clinic. Furthermore, the proportion of adverse birth outcomes was not solely attributed to the mode of delivery (Goffinet et al. 2006).

In the Belgian PREMODA trial (Goffinet et al. 2006), it was not possible to demonstrate which factors were the most significant in avoiding a planned or emergency caesarean section.

In Taiwan (Gunay et al. 2020), it was determined that in pregnancies with breech presentation, a planned caesarean section reduced the likelihood of fetal and maternal complications compared to vaginal breech delivery. The common risk factors associated with vaginal breech delivery that could lead to an emergency caesarean section include nulliparity, higher birth weight and induction of labour (Parissenti et al. 2017). This was also confirmed in a study conducted in Finland (Macharey, Gissler, Ulander, et al. 2017), where having a planned vaginal breech delivery at term was associated with adverse perinatal short-term outcome. Women who were nulliparous, had gestational diabetes, fetal growth restriction and a history of emergency caesarean section, had an increased risk of adverse pregnancy outcomes following vaginal breech deliveries at term. This led to many of them being recommended to have an emergency caesarean section as a mitigation strategy for adverse pregnancy outcomes (Macharey, Gissler, Ulander, et al. 2017). However, this Finnish study did not find a statistical association between birth weight and adverse

perinatal outcomes irrespective of the mode of delivery (Macharey, Gissler, Ulander, et al. 2017).

In a meta-analysis conducted in Ethiopia (Berhan and Haileamlak 2016), it was reported that an elective caesarean section had relatively safe neonatal outcomes (in the perinatal period). These findings are in contrast with those reported in the Netherlands (Vlemmix et al. 2014) where elective caesarean section doubled the risk of neonatal mortality in subsequent pregnancies compared to planned vaginal breech delivery.

In an Irish meta-analysis of 20 peer-reviewed studies (Thavagnanam et al. 2008), it was reported that there was a 20% increase in the subsequent risk of asthma in among children who had been delivered by Emergency caesarean section. However, this study did not focus on breech deliveries. In another meta-analysis conducted in China (Huang et al. 2015), the increased risk of asthma among newborns born through emergency caesarean section could be explained by several possible causal pathways. One could be due to an earlier planned caesarean section date, gestational age as well as birth weight of children born by elective caesarean section are often lower than that of emergency caesarean section (Huang et al. 2015). Secondly, it could be explained using the hygiene hypothesis which opines that intestinal bacterial flora are needed in the development of the child's immune system (Huang et al. 2015). Lack of an early life exposure of vaginal flora could explain differences of intestinal bacterial flora (Bacteroides and bifidobacterial) among those born vaginally or through caesarean section.

2.3.3 Vaginal Breech Deliveries

The findings of Term Breech Trial (TBT) in 2000(Hannah et al. 2000) have had a significant impact on obstetric practice across multiple countries and international organisations, most of which have recommended vaginal breech delivery. However, in recent years, there has been an increasing global rise in caesarean delivery with a criticism on the interpretation of the TBT trial, necessitating a reevaluation.

The chance of breech presentation persisting at the time of delivery, and the risk of caesarean section, can be reduced by external cephalic version (ECV) -turning the baby to cephalic presentation by manual manipulation through the mother's abdomen(Hofmeyr and Kulier 2012). Other methods used to attempt to correct the position of the baby include acupuncture, homoeopathy and postural methods. Over the years many postural techniques have been used by midwives, doctors and traditional birth attendants to promote cephalic version(Cluver et al. 2015).In an earlier uncontrolled clinical trial of the knee-chest position, assumed for 15 minutes every two hours of waking for five days; it was reported that from ultrasonography findings, the confirmed breech presentation after 37 weeks' gestation was followed by a normal cephalic birth in 65 of the 71 cases followed(Elkins 1982). This method has been modified by researchers through knee-chest position assumed with full urinary bladder three times a day for seven days(Chenia and Crowther 1987). Another postural method is 'Indian version', assuming the supine, head-down position with the pelvis supported by a wedge- shaped cushion for 10 to 15 minutes once or twice a day(Bung, Huch, and Huch 1987).

The International Federation of Gynaecology and Obstetrics (FIGO), the Royal College of Obstetricians and Gynaecologists (RCOG) and the Society of Obstetricians and Gynaecologists of Canada (SOGC) have advocated for vaginal breech delivery

(Kotaska et al. 2009). Some foetuses will spontaneously turn to a cephalic position before birth, and others can be rotated using external cephalic version (ECV). Other reviews address whether ECV before term or at term can safely prevent breech delivery (Cluver et al. 2015; Hofmeyr and Kulier 2012). However, for foetuses with persisting breech position, there is need to decide over the appropriate mode of delivery. Majority of women with a breech presenting baby would prefer a vaginal birth although most would choose emergency caesarean section if there is a medical indication (Hildingsson et al. 2002). For the singleton foetus in breech presentation, emergency caesarean section has been shown to be safer for the foetus than vaginal birth in many settings (Hofmeyr and Kulier 2012), although a large prospective study suggested that vaginal breech delivery may be safe under certain conditions with experienced practitioners (Goffinet et al. 2006).

During vaginal breech delivery, fetal oxygenation is considered to be potentially impaired once the umbilicus is delivered, due to umbilical cord compression. A conflict exists between the need to deliver the baby rapidly to avoid asphyxia due progressive acidosis, and the need to avoid trauma due to over-hasty delivery (Hofmeyr, Kulier, and West 2015). In a study conducted in Portugal (Pulido Valente, Carvalho Afonso, and Clode 2020), it was reported that vaginal delivery for breech presentation was as safe as cephalic presentations in a selected population and if a trained obstetrician was present at the time breech delivery. The authors (Pulido Valente, Carvalho Afonso, and Clode 2020) found no significant difference in the neonatal and maternal morbidity in the vaginal delivery, regardless of fetal presenting part. This finding could be explained by a highly selected population being allowed for a trial of labour and labour management done by an experienced obstetrician (Pulido Valente, Carvalho Afonso, and Clode 2020). This is similar to the

average 21.4% of the vaginal deliveries in the Term Breech Trial (Hannah et al. 2000) who were assisted by obstetricians in training (registrars). This is also consistent with several international societies' recommendations on a trial of labour for breech presentation if possible with appropriate case selection, management according to a strict protocol and the availability of skilled attendants (Impey et al. 2017). The American guidelines do not provide any recommendation about labour induction (ACOG 2018) while the Royal College of Obstetricians and Gynaecologists (RCOG) in the United Kingdom recommends that women should be informed that labour induction is not usually recommended (Kotaska et al. 2009; Impey et al. 2017).

The decision on the appropriate mode of preterm breech delivery is on a case-by-case basis, as there is no definitive evidence to recommend a specific mode of delivery (Singh, Mishra, and Dewangan 2012). Oxytocic agents used to induce or augment labour should be avoided in the presence of breech presentation because they may disguise foetopelvic disproportion (Gunay et al. 2020). If the presentation is breech and delivery is imminent, consideration may be given to a vaginal delivery in the absence of intrapartum complications. However, because of the precarious nature of vaginal breech delivery, an experienced obstetrician should conduct the delivery in the presence of a paediatrician who will receive the baby (Silva and Clode 2018). On the other hand, footling breech presentation should be delivered through emergency caesarean section to avoid cord prolapse because footling breech is associated with cord presentation (Bjellmo et al. 2019). Breech delivery of complete or frank presenting fetuses may be accomplished either through spontaneous breech delivery or assisted breech delivery. In spontaneous breech delivery, the entire infant is expelled by natural forces of the mother, with no assistance other than the support of the fetus as it is being born. On the other hand, assisted breech delivery or partial

breech extraction may be performed. During partial breech delivery, the fetus is delivered by natural forces as far as the umbilicus then the rest of the fetal body is extracted by the attendant. Release of the legs either spontaneously or by moving the femurs laterally and finding the feet is done. The hands are applied to the fetal bony pelvis using a towel, while the fingers are on the anterior superior iliac spine and the thumbs on the sacrum. Gentle downward traction with maternal pushing until the scapulas are visible is allowed. Clockwise rotation 180 degrees to deliver anterior arm and an anticlockwise 180 degrees rotation to deliver the posterior arm through a Loveset manoeuvre is performed. Delivery of the head via Mauriceau-Smellie-Viet manoeuvre where an index and middle finger are placed over the maxilla to flex the head as the fetal body rests against the palm and the forearm of the same hand, two fingers of the other hand are hooked over the fetal neck, grasping the shoulders with downward traction as suprapubic pressure is applied by an assistant to help flex the head. Once the suprapubic area is visible, the fetal body is elevated over the maternal abdomen until the head is delivered. Prague manoeuvre where the fetal head with posterior position after failed rotation to back anterior and failed Mauriceau-Smellie-Viet manoeuvre is performed. Two fingers of one hand are used to grasp the shoulders of the fetus as the other hand draws the feet up over the maternal abdomen flexing the head as it is being delivered. A bracht manoeuvre may be performed where the fetal body is held against the maternal symphysis as the rest of the body delivers spontaneously while the assistant places moderate suprapubic pressure. Pinard manoeuvre may be performed in frank breech delivery to allow delivery of the fetal feet. Basically, this manoeuvre converts frank breech into footling breech. During this manoeuvre, two fingers are used to push the knees away from the midline which leads to spontaneous flexion of the knees then the feet are felt, grasped and brought down

into the vagina. Finally, a total breech extraction may be performed by the healthcare giver. During this process of breech delivery various fetal and maternal complications may occur.

2.3.4 External Cephalic Version

External Cephalic Version (ECV) at term reduces the incidence of non-cephalic presentation at delivery. This was reported by the RCOG where the relative risk of non-cephalic presentation was less than one (RR 0.38, 95% CI 0.18–0.80) with a risk difference 52% (Murphy et al. 2017). The rates of spontaneous version for nulliparous women are estimated at approximately 8% after 36 weeks but below 5% after unsuccessful ECV. With the restrictive practice of breech vaginal delivery in the last 15 years, national colleges of obstetricians (RCOG, ACOG, SOGC and RANZCOG) and FIGO have updated their guidelines to recommended external cephalic version so as to reduce the likelihood of elective caesarean section for term breech presentation (Murphy et al. 2017; Ford et al. 2010; Kunzel 1994; ACOG 2018). From recent published data, obstetricians are urged to develop a broader perspective and an accurate assessment of the real impact of various ECV policies. Indeed, the true impact of ECV may first be limited by the timely detection of breech presentation. In a retrospective cohort study conducted at the Radcliff Hospital in the United Kingdom (Hemelaar, Lim, and Impey 2015), it was noted that a lot of effort has been instituted to optimize the success rate of ECV through tocolytics. From this result of the reported safety, effectiveness, and cost-effectiveness of ECV now in place in many units (Khaw et al. 2015). However, the effectiveness of ECV implementation services have not been clearly defined on how much it has reduced the incidence of breech presentation (Vlemmix et al. 2014).

According to the findings from a British National Health Systems study, the proportion of breech presentations not diagnosed antenatally increased from 23.2 to 32.5% ($p=0.04$), causing 52.8% of women who were eligible for ECV to miss an attempt in 2008–2009 (Hemelaar, Lim, and Impey 2015). The authors also reported that the proportion of women who declined ECV during the same period decreased significantly from 19.1 to 9.0% (Hemelaar, Lim, and Impey 2015).

In a large survey of 32,321 singleton breech pregnancies conducted in Australia, 10.5% of the participants had an ECV (Phipps et al. 2003). The authors also noted that although an ECV is usually recommended to women by 67% of obstetricians; however, there is strong evidence on the effectiveness of ECV at term in reducing the likelihood of non-cephalic presentation at birth and emergency caesarean section (Phipps et al. 2003).

In a systematic review conducted in the Netherlands, the authors (Rosman et al. 2013) noted that external cephalic version (ECV) at or near term is a safe procedure that effectively reduces the risk of emergency caesarean section in pregnancies with breech presentation. Furthermore, international guidelines recommend that all women with an uncomplicated breech pregnancy at term should be offered an ECV (Tsakiridis et al. 2020; Kotaska 2007).

In contexts such as severe oligohydramnios or multiple gestations, ECV is simply impracticable, except for a second twin after delivery of the first (Macharey, Gissler, Ulander, et al. 2017). Furthermore, previous uterine surgery is considered a relative contraindication for ECV (Groen et al. 2015). Patients with gestational diabetes mellitus, incomplete or uncontrolled glucose levels are associated with an increased risk of foetal macrosomia in late pregnancy, and even if the estimated foetal weight

seems compatible with a planned vaginal delivery when the mode of delivery is discussed, rapid foetal growth during the last weeks may lead to major difficulties during delivery (Macharey, Gissler, Ulander, et al. 2017).

Towards a consensus for a global shared vision and management of term breech presentation that could include a policy of breech presentation screening at 36 weeks of gestation is efficient and cost effective. Screening should allow timely ECV and a careful evaluation of potential underlying antenatal risks, considering obstetric history, estimated foetal weight/growth and potential gestational disorders. Furthermore, there is need to estimate foetal weight based on clinical and ultrasound examinations (Carbillon et al. 2020). Vaginal birth may be excluded when the estimated foetal weight approximates the upper limit used for selection in most national guidelines (3800g), particularly in the absence of previous successful vaginal delivery (Carbillon et al. 2020). Before vaginal delivery is considered, clinical pelvic examination is universally recommended to rule out pathological pelvic contraction. Radiologic or magnetic resonance imaging (MRI) pelvimetry is not universally conducted.

However, in a randomized controlled trial that used MRI pelvimetry (Van Loon et al. 1997) in breech presentation at term allowed better selection of delivery route, with a significantly lower emergency caesarean section rate. Furthermore, MRI pelvimetry provides a useful criterion for the pre-selection and counselling of women with breech presentation and the desire for vaginal delivery. For this reason, pelvimetry is diversely used in Europe for the pre-selection and counselling of women (particularly nulliparous women) with breech presentation and is specifically used in regions where vaginal delivery is still considered an option. In the event of failed ECV with persistent breech presentation, the policy allows for customized care tailored to each

situation in the last weeks of pregnancy. One must thoroughly consider the experience of the health care team/the availability of clinical skills required for conducting a vaginal breech delivery and carefully select women who are eligible for planned vaginal delivery. Regardless of the planned mode of delivery, adequate follow-up during the last weeks of pregnancy is mandatory, with particular consideration of possible associated underlying disorders.

There are multiple predictors of a successful external cephalic version (ECV). This ECV can effectively reduce the incidence of non-cephalic presentation at birth and the probability of emergency caesarean breech delivery (Hutton, Simioni, and Thabane 2017). However, not all women eligible for ECV opt in for the procedure due to their personal uncertainty. Irrespective of a woman's parity, descent of the presenting part was reported as the single most discriminating factor in predicting successful ECV and cephalic presentation at birth in a Canadian study. This was evidenced through a logistic regression analysis where nulliparous women with an easily palpable fetal head were significantly associated with ECV success. Other predictors of ECV success were placental location, the pregnant mother's body mass index and type of breech.

Among multiparous women, gestational age was the most significant predictor among pregnant women with a non-engaged foetus. An easily palpable fetal head, body mass index of less than 32.7 kg/m^2 and non-anterior placental location were also significant predictors of a successful ECV (Hutton, Simioni, and Thabane 2017). The definition of successful ECV evaluated both the presentation of the foetus immediately following the ECV and at the time of birth to ensure that all cephalic presentations at birth resulted from a successful ECV procedure and not a spontaneous turn.

Overall, there are considerable disagreements on the appropriate management of breech (complete, frank or incomplete) presentation with respect to the place of external cephalic version (ECV) and the type of birth. Randomised trials of planned mode of birth for vaginal breech presentation have shown benefits for the breech presenting baby managed by planned caesarean section compared with planned vaginal birth, although long-term follow-up and impact on future pregnancies remains uncertain (Hofmeyr and Kulier 2012). The increased rate of emergency caesarean section for breech presentation has decreased the rate of vaginal breech births and there is concern that practitioners are losing the skill of supporting women having vaginal breech births. Although there may be underlying reasons for the breech presentation, the baby may have a more difficult vaginal birth because of delay in birth of the head.

2.4 Fetomaternal outcomes

Literature has shown that there are many studies that have been done on the maternal and fetal outcomes of singleton breech deliveries worldwide (Hofmeyr, Hannah, and Lawrie 2015; Kothapally, Uppu, and Gillella 2017; Hofmeyr, Kulier, and West 2015). In a study conducted in Ethiopia (Berhan and Haileamlak 2016), there was a two to fivefold increased risk of fetal and maternal mortality and morbidity with planned vaginal delivery.

2.4.1 Fetal outcomes

Factors which have been associated with breech presentation include: nulliparity, previous breech birth, uterine anomaly, contracted pelvis, use of anticonvulsant drugs, placenta previa, cornual placenta, decreased or increased amniotic fluid volume, extended fetal legs, multiple pregnancy, prematurity, short umbilical cord, decreased fetal activity, impaired fetal growth, fetal anomaly and fetal death. The common birth

complications among singleton breech deliveries are delayed after coming head, trauma, birth asphyxia, fetal demise and NBU admission.

Breech babies tend to be at higher risk of adverse outcomes, with increased neonatal morbidity and mortality (Kotaska 2007), although it is unclear whether this is due to pre-existing vulnerabilities (perhaps also the factors that caused the initial breech presentation), or the effects of delivery in this position. A study conducted in France (Carbillon et al., 2020), on revisiting the management of term breech presentation as well as overcoming some controversies, reported that there exists associations between perinatal outcomes and antenatal risk factors for the fetuses who present with persistent breech presentation. Therefore, factors not limited to the mode of breech delivery ought to be considered. The interpretation of observational studies that compare outcomes after vaginal breech birth and cephalic birth is confounded by the fact that breech presentation per se appears to be a marker for poor perinatal outcome.

Perinatal mortality is the death of a live fetus or neonate before seven complete days of life. The incidence of perinatal mortality reported in a study (Singh et al., 2012) done on decision making on delivery in breech presentation at Pt.J.N.M. medical College and the associated Dr. B.R.A.M. hospital Raipur Chhattisgarh was 19.2%. A majority of the perinatal mortalities were found in those that underwent vaginal deliveries (15.8%). In Ethiopia, at the Jimma University Medical Center (Assefa et al., 2019) reported intrapartum fetal deaths at 13.9%. The study looked at the birth outcomes of singleton breech deliveries at a university in Southwest region of Ethiopia. In a retrospective study conducted in Nepal, South Asia (Basnet et al., 2020) reported that perinatal mortality occurred in 8.3% of the newborns. Recorded findings indicated that seven newborns succumbed where five of the newborns were still births

and two of the remaining newborns had early neonatal deaths. The perinatal mortality was significantly associated with low birth weight of less than 2500 grammes.

In West Indies (Bassaw et al. 2004) reported that 82.8% of the singleton breech babies were born at gestational ages between 30 and 40 weeks. In a prospective study done in Norway (Vistad et al. 2013), the mean gestational age at delivery was reported to be 39.4 weeks. Women above thirty seven weeks gestation were included in this study while in a study conducted in Germany (Bogner et al. 2018), the mean gestational age was 36.7 (\pm 1.2) weeks. A different study conducted in Germany (Möllmann et al. 2020) reported that more than half (54%) of the newborns were delivered at a gestational age of above 30 weeks. In a most recent study conducted Nepal (Basnet et al., 2020) five hundred and twenty eight out of six hundred and seventy six women who were a majority delivered at a gestational age between 37 weeks and 42 weeks.

Most studies reported that singleton babies born breech had normal birth weight ranging between 2500 and 3500 grammes. In Ethiopia 62% (Assefa et al. 2019) and West Indies (Bassaw et al. 2004) 62.6% of the infants had normal birth weights between 2500 and 3500 grammes. The mean birth weight reported in studies conducted in Norway (Vistad et al. 2013) and Germany (Bogner et al. 2018) were 3399 grammes and 2577 (\pm 409) grammes respectively.

APGAR score is a fetal outcome that has been reported by various researchers globally. It is an initial test carried out on infants at one minute and at five minutes to show how best the baby tolerated labour and how the baby is doing outside the mother's womb respectively. The baby's skin colour, breathing effort, heartrate, muscle tone and reflexes are examined. The total score ranges between zero and ten. A score of seven or more is considered normal whereas a score of less than seven is

abnormal. A prospective study that was conducted in Norway (Vistad et al. 2013) evaluated the maternal and neonatal outcomes of singleton breech deliveries performed at term and compared these outcomes in those that underwent planned vaginal deliveries and the ones that underwent planned caesarean sections. A majority of the neonates had an APGAR score of more than 7. In the planned vaginal breech delivery group, only seven infants had a 5 minute APGAR score of less than 7 against none in the planned caesarean delivery group. In Germany, the authors (Bogner et al. 2018) reported a mean 5-minute APGAR score of 9.44 (\pm 0.9) a finding that was similar to that of a study that was done at the JIMMA university in Ethiopia (Assefa et al., 2019) that reported a 5-minute APGAR score of ≥ 7 at 77.7% among the singleton breech deliveries. A two year retrospective study was conducted in a tertiary hospital Nepal (Basnet et al., 2020) on the evaluation of both the short-term maternal and perinatal outcomes of breech deliveries that were conducted through a vaginal route. From the study, it was reported that 20.2% of the newborns had a 5 minute APGAR score of less than 7.

Newborn unit admissions for infants born breech were reported in various studies conducted worldwide. In Norway, NBU admission was reported at 9% (Vistad et al. 2013). Higher newborn unit admissions for breech delivered infants was reported in an Ethiopian study at 25% (Assefa et al. 2019). A study done in Germany reported that 5.6% of newborns were admitted to the newborn unit following breech delivery (Möllmann et al. 2020).

From the findings of studies conducted in Austria, there was a statistically significant association ($p < 0.001$) between mode of delivery and birth complications (Bogner et al. 2018). Although there was no statistical difference reported in the first study conducted in India (Singh, Mishra, and Dewangan 2012), higher proportions of birth

complications (stillbirth and birth asphyxia) were reported among neonates born of women who had undergone emergency caesarean sections. In Canada (Hannah et al. 2001), serious morbidity ($p=0.003$) and perinatal mortality ($p=0.01$) was significantly associated with the mode of delivery.

Breech presentation has been shown to be associated with trauma-related injury during birth, perinatal mortality, and maternal morbidity (Uotila, Tuimala, and Kirkinen 2005; Wasim, Wasim, and Majrooh 2017). Perinatal asphyxia (Assefa et al. 2019), prominent occiput, low-set ears, torticollis, and developmental dysplasia of the hip are seen more frequently in breech presentation. In addition to birth trauma, adverse outcomes are also associated with factors that co-exist with breech presentation, such as preterm birth, intrauterine growth retardation or anomalies. A higher risk of asphyxia, traumatic injury, neonatal morbidity or mortality has been shown in planned vaginal breech birth compared with planned caesarean breech birth in several studies (Wasim, Wasim, and Majrooh 2017; Assefa et al. 2019; Bassaw et al. 2004; Gunay et al. 2020).

2.4.2 Maternal Outcomes

In a study conducted at a university hospital in Telangana India (Kothapally, Uppu, and Gillella 2017), where the researchers looked at the obstetric outcomes of breech presentation in pregnancy, 90% of the women who had singleton breech deliveries reported no maternal complications. Similarly, another study done in Bhubaneswar-India (Jena 2018) reported that 81.4% of the study participants did not have any maternal complications. In Nigeria 82.1% (Igwegbe, Monago, and Ugboaja 2010) of women who had singleton breech deliveries did not report any complication irrespective of the mode of breech delivery. However, the proportionate differences in lack of complications were not markedly different. These low proportions of

complications indicate that singleton breech deliveries (majority of them being caesarean sections) are safe to the pregnant women with presentation.

In the few studies that assessed maternal complications, anaesthetic complications were reported at 2.6% in Nigeria (Igwegbe, Monago, and Ugboaja 2010) and 4.1% in India (Jena 2018). In a study conducted in the United States of America (Weiniger et al. 2016), it was reported anaesthetic complications at 0.04% during emergency caesarean delivery for breech presenting foetuses.

Post-partum haemorrhage is a maternal complication that was assessed in a few countries that looked at outcomes of breech deliveries. In Nigeria (Igwegbe, Monago, and Ugboaja 2010), the proportion of post-partum haemorrhage was found to be 1.3%. This complication was seen among 5.1% of breech deliveries in a study conducted in India (Jena 2018). In Nepal (Gurung et al. 2017) the researchers reported post-partum hemorrhage in 4.8% of the study participants. Furthermore, in a different study conducted in India post-partum haemorrhage was reported at 8% among women with breech deliveries (Kothapally, Uppu, and Gillella 2017). In a more recent study conducted in Nepal (Basnet et al., 2020) reported post-partum hemorrhage occurred in 3 women at a rate of 3.6%.

In the TBT trial (Hannah et al. 2000), maternal mortality and morbidity were considered as primary outcomes. Of the women who had been planned for caesarean breech deliveries, 90.4% had emergency caesarean deliveries compared to 56.7% among those who opted for vaginal deliveries. The trial however found no statistically significant difference in maternal morbidity and mortality among those who either had emergency caesarean sections and vaginal deliveries (Hannah et al. 2000).

In a study conducted in the United States of America (Weiniger et al. 2016) with an objective to determine maternal outcomes of term breech deliveries, very low proportions of maternal complications were reported as follows: anaesthesia complications at 0.04%, Chorioamnionitis at 0.9%, Endometritis at 0.6%, Sepsis at 0.7 %, Blood Transfusion following post-partum haemorrhage at 0.7 %, Hysterectomy at 0.1% and prolonged hospitalization of more than seven days after delivery at 1.2%.

In a study conducted in Australia among women with breech presentations, pregnant mothers who had non-anomalous pregnancies were enrolled (Bin et al. 2016). From the findings of the study, severe maternal morbidity and postpartum readmission were higher among women who had intended vaginal breech deliveries compared to planned caesarean breech deliveries (Bin et al. 2016).

From the findings of a 5-year retrospective study conducted in Nepal (Malla et al. 2016) that sought to determine maternal outcomes by mode of breech delivery; post-partum haemorrhage (> 1000 ml) was reported in 0.6% of the women reviewed while 0.1% of them underwent relaparotomy for hemoperitoneum.

In Lusaka-Zambia (Kasela, Ahmed, and Vwalika 2018), the authors assessed thefetomaternal outcomes of term assisted breech deliveries. The three-month cross-sectional study was conducted at Lusaka University Teaching Hospital among 73 pregnant women with term breech admitted to the labour ward and had delivered vaginally. The common adverse maternal outcomes noted were postpartum haemorrhage and episiotomy.

2.5 Management Policies

There are different management policies and guidelines in place for the management of breech. Although there is no specific global guideline, different countries and regions have their own specific guidelines. These guidelines are anchored on an algorithm to decide the most appropriate mode of delivery (Bird and McElin 1975; Silva and Clode 2018; ACOG 2018; Kotaska 2007; Ford et al. 2010). These include: ultrasound evaluation of fetal size and cephalic flexion (Bird and McElin 1975; Stefanovic 2020), maternal pelvimetry (Carbillon et al. 2020) and the woman's desire to attempt a vaginal birth (Toivonen et al. 2012; Wasim, Wasim, and Majrooh 2017; Uotila, Tuimala, and Kirkinen 2005).

The elements for managing and monitoring labour are the obstetrician's self-assessed expertise in vaginal breech (Vlemmix et al. 2014) and continuous electronic fetal monitoring (Rauf and Ayub 2004). In Belgium, "selected vaginal breech" approach was recommended (Vistad et al. 2013). However, compared to other European countries with the same policy, the national rate of vaginal breech delivery has been reported to be low (Bjellmo et al. 2019). This has returned focus on planned vaginal breech deliveries.

Overall, the ideal management approach for women with term breech presentation is still a matter of intense debate (Carbillon et al. 2020), however, there has been a steady decline in vaginal breech deliveries over the years. The Royal College of Obstetricians and Gynaecologists (RCOG) recommends elective caesarean delivery for all the term breech presenting babies (Ford et al. 2010; Kotaska 2007). This was informed by the findings of the Term Breech Trial that showed significantly low perinatal mortality of 1.6% in the planned caesarean section arm (Hannah et al. 2000). This was also reiterated by the International Federation of Gynaecology and

Obstetrics (FIGO) who recommended caesarean section as a preferred mode of breech delivery (Kunzel 1994).

From the immediate outcomes of the TBT trial, it was recommended by the Royal College of Obstetricians and Gynaecologists (RCOG) as well as the American College of Obstetricians and Gynaecologists (ACOG) that over the next few years, all women with persistent singleton breech presentation at term should undergo a planned caesarean delivery (Carbillon et al. 2020; Weiniger et al. 2016; ACOG 2018; Ford et al. 2010). It has therefore been observed in some countries that previously had a high proportion of vaginal breech deliveries now opting for emergency caesarean breech deliveries (Jena 2018; Nordin 2007). However, despite the undeniable strengths of the TBT (Hannah et al. 2000), a number of limitations have been noted. First, the authors did not strictly adhere to the criteria for vaginal birth as well as using non-optimal labour management methods. Furthermore, the TBT Collaborative Group published a 2-year analysis of paediatric outcomes, despite a large (greater than 50%) post-randomization loss to follow-up. When a multiple logistic regression analysis was conducted, the TBT study also reported a lower risk of maternal morbidity in the vaginal breech delivery group (OR=3.33; 95% CI 1.75–6.33, $p < 0.001$), compared to those who had emergency caesarean breech deliveries (OR=0.25; 95% CI 0.11–0.57, $p < 0.001$). Furthermore, a Danish population-based retrospective study (Hartnack Tharin, Rasmussen, and Krebs 2011) further clarified the recommendations of systematically planned caesarean sections for women with term breech deliveries. Specifically, the proportions of emergency caesarean sections for term breech deliveries increased from 79.6 to 94.2% between 1997 and 2008 in Denmark, while intrapartum or early neonatal mortality decreased from 0.13 to 0.05%.

In a ten-year Finnish population-based case-control study of singleton deliveries that excluded preterm deliveries, antepartum-diagnosed stillbirths, placenta previa and infants with congenital malformations (Macharey, Gissler, Ulander, et al. 2017), the study determined that antenatal risk factors were associated with adverse perinatal outcomes in planned vaginal breech labour at term. The study (Macharey, Gissler, Ulander, et al. 2017) further determined that stillbirth rate was significantly higher among those with planned vaginal breech labour compared to cephalic presentations (0.2 vs 0.1%, respectively). This was correlated with fetal growth restriction, oligohydramnios, gestational diabetes mellitus (GDM) and a history of caesarean section. The survey of the mother-neonate dyads also excluded congenital malformations, placenta previa and pre-labour stillbirths (Macharey, Gissler, Ulander, et al. 2017). From the study's findings, there was a statistically significant association between breech presentation at term and antenatal stillbirth. The obstetric risk factors for adverse perinatal outcomes were oligohydramnios, foetal growth restriction, gestational diabetes, history of caesarean section and congenital anomalies. Women with planned singleton vaginal breech deliveries had adverse perinatal outcome classified as umbilical arterial pH < 7.00, APGAR score at 5 minutes below 7, neonatal mortality during the first six days of life (excluding still- birth) which were significantly associated with foetal growth restriction, oligohydramnios, gestational diabetes and a history of caesarean section.

In a Norwegian (Bjellmo et al. 2017) population-based study assessing vaginal breech delivery as a risk factor for perinatal death and cerebral palsy for ten years (1999 to 2009), the authors noted the limitation of using retrospective data from registries. Furthermore, the high rate of intrapartum conversion of some planned vaginal deliveries to emergency caesarean breech deliveries could have increased the risk for

adverse pregnancy outcome for those who underwent caesarean sections. From the study's findings, it was possible to explain that pregnancy outcomes were affected by a combination of antenatal acquired risk factors for neonatal death with increased vulnerability to the birth process.

In a retrospective longitudinal study through ultrasound assessment of fetal presentation in South Wales (Fox and Chapman 2006), 21% of all foetuses adopted a non-cephalic presentation at 28–29 weeks of gestation, and this proportion progressively decreases to 5% from 37 to 38 weeks. Uterine malformation was shown to disturb both the continuous process of spontaneous cephalic version and normal foetal growth (Fox and Chapman 2006). This disturbance could lead to an increased term breech presentation rates in these cases. It is important to estimate the foetal weight and well-being among pregnant women with persistent breech presentation at term. Even among some pregnant women with controlled gestational diabetes mellitus, there have been instances of excess foetal weight during the final weeks of pregnancy (Carbillon et al. 2020). This overgrowth and gestational diabetes related complications such as pre-eclampsia could lead to possible dystocia. Therefore, foetal weight estimates should be closely in the thirty seventh week of gestation.

The majority of women with a breech presenting baby would prefer a vaginal birth although most would choose caesarean section if there is a medical indication (Hofmeyr, Kulier, and West 2015). For the singleton foetus in breech presentation, emergency caesarean section has been shown to be safer for the foetus than vaginal birth in many settings (Hofmeyr and Kulier 2012), although a large prospective study suggested that vaginal breech delivery may be safe under certain conditions with experienced practitioners (Goffinet et al. 2006).

In MTRH there is a selection criterion for breech delivery according to protocol number 36 of the reproductive health. Trial of labour is allowed in case of frank or complete breech with estimated fetal weight of >2500g and <4000g, flexed fetal head on ultrasound, with a written informed consent and availability of skilled care providers. Vaginal delivery is also allowed in parturient with spontaneous labour who have declined to consent for caesarean delivery and those presenting at an advanced stage of labour. Absolute contraindications to vaginal breech delivery at MTRH include cord presentation, fetal macrosomia or growth restriction, other presentations other than frank or complete breech, fetal anomaly incompatible with vaginal delivery and patients with previous scar.

2.6 Conceptual Framework

Fetomaternal outcomes are hypothesized to be affected by the mode of singleton breech deliveries. The mode of breech delivery is therefore the independent variable while fetomaternal outcomes are the dependent variables. Both mode of delivery and fetomaternal outcomes could be affected by the gestational age of the foetus, birth weight of the newborn as well as parity of the pregnant mother. The specific fetal outcomes of interest are APGAR scores at 5 minutes, admission to the newborn unit and perinatal mortality. The maternal outcomes of interest identified were post-partum haemorrhage, perineal tears and anaesthetic complications (Figure 2.1).

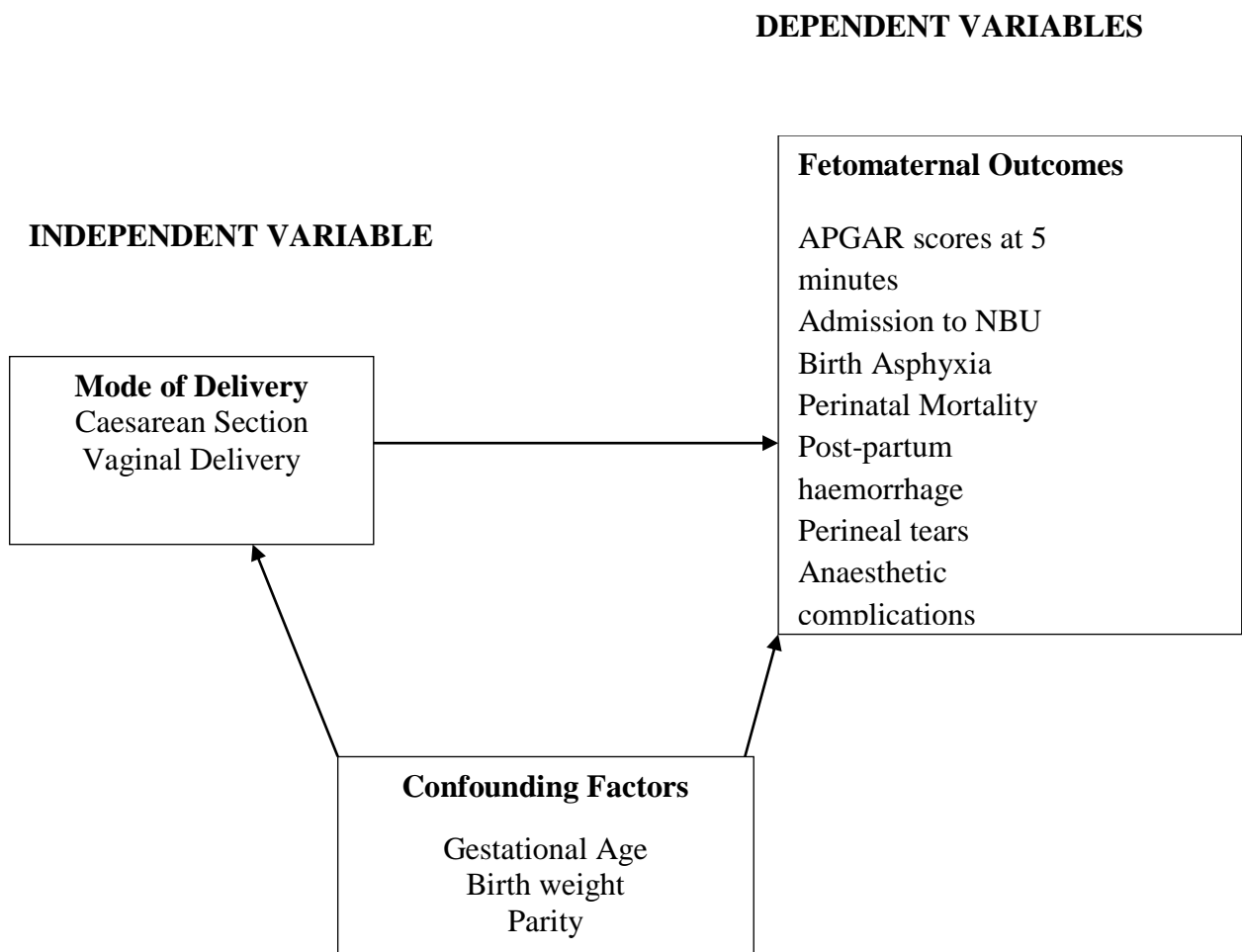


Figure 2.1: Conceptual Framework

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study site

The study was conducted at Moi Teaching and Referral Hospital (MTRH)'s Riley Mother and Baby unit in Eldoret, Kenya. The hospital is the second largest national referral facility in Kenya after Kenyatta National Hospital. It is located in Uasin Gishu County in Eldoret town. The hospital also doubles up as a teaching hospital for Moi University School of medicine, University of East Africa –Baraton, Kenya Medical Training College (KMTC) and MTRH College of Health Sciences. It has a bed capacity of 1,020 specialized beds with a daily average of 1300 inpatients and 1500 outpatients. Majority of the patients visiting MTRH come from 23 Counties in Kenya, parts of Eastern Uganda, South Sudan, Tanzania and the Democratic Republic of Congo with an estimated population of 24 million. Averagely, there are approximately 1000 to 1200 monthly deliveries conducted at the facility (MTRH statistics, 2018). This study selected MTRH as a study site due to its unique status as a teaching and referral hospital where most women with breech presentation seek obstetric care. Furthermore, the cosmopolitan and diverse nature of the patients attending the hospital provides a more holistic representation of the obstetric outcomes among women with breech presentation in labour.

3.2 Study design

This study adopted a cross-sectional descriptive study design to describe the fetal and maternal outcomes of singleton breech deliveries at MTRH. Breech presentations are rarely encountered in majority of the labour wards and because of this a baseline cross-sectional descriptive study design is the most appropriate study design to answer the postulated research questions.

3.3 Study population

This study enrolled postnatal mothers aged 18 years or more who had delivered singleton foetuses in breech presentation after 28 weeks of gestation either through emergency caesarean section or vaginal delivery at MTRH's labour ward.

3.4 Sampling technique

Women who had had singleton breech deliveries and met the study's eligibility criteria were consecutively sampled until the desired sample size was achieved.

3.5 Sample size determination

This study adopted Fischer's formula to determine the desired sample size to answer the research questions.

$$n = \frac{Z^2 Pq}{e^2}$$

Where:

- z is the z-value at 95% Confidence Interval = 1.96
- p is the global Prevalence of breech deliveries estimated at 4% (Toivonen et al. 2012; Peitsidis and Vrachnis 2021).
- q is the proportion of non-breech presentation deliveries estimated at 96%.
- e is the margin of error estimated at 5%

$$n = \frac{1.96^2 \times 0.04 \times 0.96}{0.05^2} = 59.01$$

The minimum calculated sample size in this study is 59 women with singleton breech deliveries. Because of the small sample size obtained, a census of all singleton breech deliveries seen at MTRH was conducted between 30th August 2019 to 27th August 2020.

3.6 Eligibility Criteria

3.6.1 Inclusion Criteria

- i. Women with unplanned singleton breech deliveries at a gestation of more than 28 weeks at MTRH's postnatal wards and hostels.

3.6.2 Exclusion Criteria

- i. Women who had elective caesarean sections.
- ii. Antepartum fetal deaths.
- iii. Pregnant women with known co-morbidities such as hypertension, cardiac disease, diabetes and hepatitis.
- iv. Women with previous scars.

3.7 Recruitment and enrolment

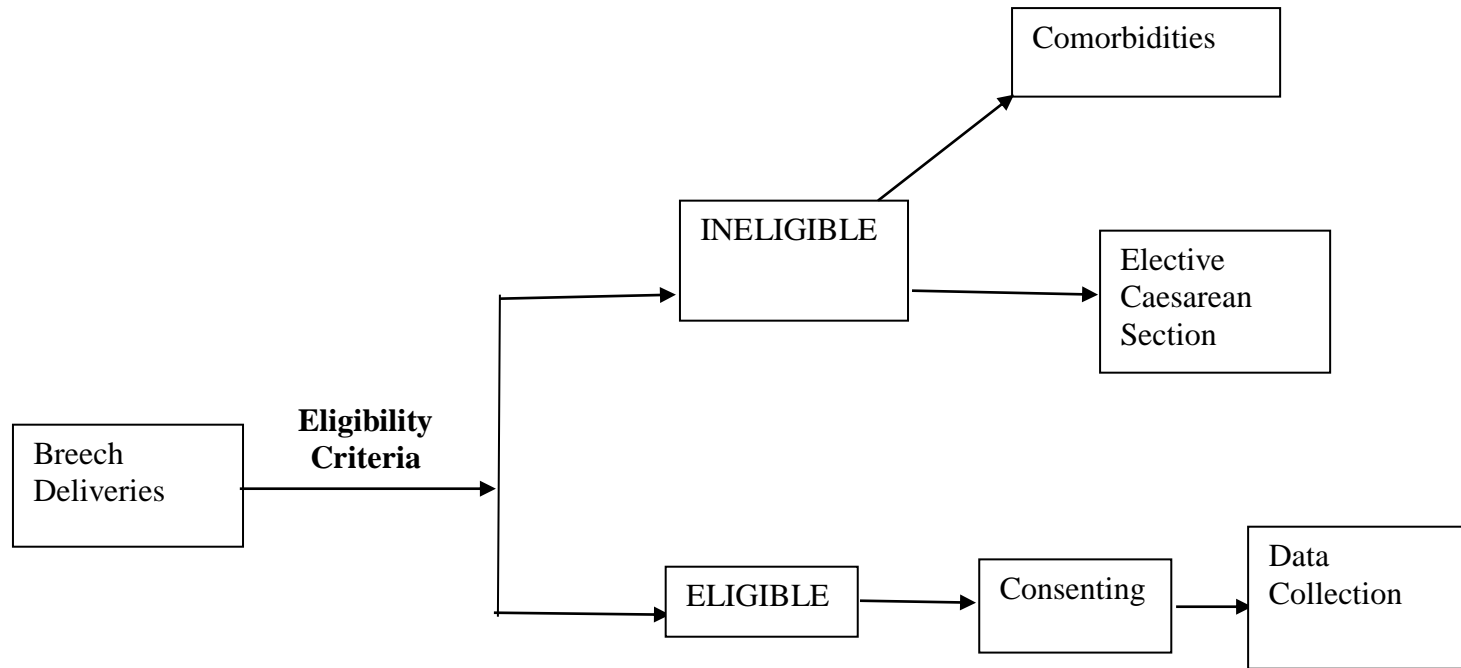


Figure 3.1: Recruitment and enrolment flow chart

Women with a history of breech deliveries were approached for enrolment after admission to the postnatal ward and the hostels within the first 24 hours of delivery. Eligibility criteria were applied and those who did not meet the eligibility criteria were excluded from the study. Data collection process was initiated after informed consenting was done to the eligible participants. Questionnaires were administered to the participants and patients files were reviewed for additional information.

3.8 Data management

3.8.1 Data Collection

Data Sourcing

Potential study participants were sourced from the postnatal ward and the hostels of RMBH unit of MTRH within 24 hours from the time of breech delivery to a singleton foetus. They were informed of the study objectives and procedures by a research assistant prior to administering a written informed consent privately. The written informed consenting was done to those who had presented in labour and delivered either vaginally or via emergency caesarean section. Women who had been booked for elective caesarean delivery and went into labour were not included in the study.

Data Collection Tools

The study adopted both primary and secondary data collection techniques. Demographic information such as age, parity, marital status was obtained using an interviewer administered questionnaire while information on previous obstetrical history such as medical conditions, previous vaginal breech deliveries, last delivery and any complication was drawn from the medical records.

3.8.2 Data Entry

The collected data was double entered into a Statistical Package for Social Sciences (SPSS) version 24 electronic database by two research assistants prior to analysis. This was done to ensure data completeness and mitigate on missing and mismatching entries. The Principal Investigator reviewed each entry for accuracy and consistency. The database was encrypted with a password to ensure participants' privacy and confidentiality, as the password was only shared with the study team. All the data collected was backed-up both in the cloud and on external hard drives to minimise likelihood of loss. Hard copy questionnaires were stored in a locked cabinet and will be shredded after five years of study completion.

3.8.3 Data Quality

Data cleaning was conducted prior to analysis to rule out outliers, check for any data entry errors, invalid and inconsistent responses as part of data quality assurance.

3.8.4 Data Analysis Techniques

Descriptive statistical analysis was done by summarizing categorical variables in frequencies with corresponding proportions. The primary fetal outcomes of interest were APGAR score at 5 minutes, admission to NBU, birth asphyxia and perinatal mortality. The APGAR score ≥ 7 was considered to be adequate. Maternal outcomes were mode of delivery and birth-related complications such as postpartum haemorrhage, perineal tears and anaesthetic complications. Participants' characteristics were presented as frequencies with corresponding proportions. To assess the relationship between mode of delivery and fetal outcomes or maternal complications, a Fisher's exact test was used at a critical value of $p \leq 0.05$

3.9 Ethical considerations

Ethical approval to conduct the study was sought from the Institutional Research Ethics Committee (IREC) at the Moi Teaching and Referral Hospital or Moi University School of Medicine. Verbal and written informed consent were obtained from all the study participants. The participants were not coerced, and they had a right to withdraw at any point from participation in the study. The identity and response of the study participants was kept confidentially. This study's findings will be presented in scientific conferences and published in peer-reviewed journals.

CHAPTER FOUR

4.0 RESULTS

4.1 Sociodemographic and clinical Characteristics of the study participants

This study enrolled 75 women majority (74.7%; n=56) of whom were aged 20-35 years. More than half (56%) of the study participants were multiparous, with more than one third (37.3%) of all the study participants having had a previous delivery within two to five years. Furthermore, 70.7% of all the study participants reported a gestation age at birth of 38 weeks or more while only 4 (5.3%) of the women having a history of breech delivery (Table 4.1).

Table 4.1: Socio-demographic and Reproductive characteristics of study participants

Participant Characteristic	N	%
Age (years)		
<20	9	12.0
20-35	56	74.7
>35	10	13.3
Parity		
Primiparous	27	36.0
Multiparous	42	56.0
Grandmultiparous	6	8.0
Year of last delivery		
<2 years	28	37.3
2-5 years	28	37.3
>5 years	19	25.4
Gestational age		
28-34 weeks	5	6.7
35-37 weeks	17	22.7
38-40 weeks	38	50.7
>40 weeks	15	20.0
Previous vaginal breech delivery		
Yes	4	5.3
No	71	94.7

4.2 Singleton breech deliveries among all deliveries at Riley Mother and Baby Unit of Moi Teaching and Referral Hospital.

Over the study period, 125(1.045 %) women had singleton breech deliveries. The total number of deliveries was 11,957 for a period of one year. Multiple deliveries were: 202 twin and 7 triplet deliveries. There were a total of 11,748 singleton deliveries. Elective breech C/S deliveries were 33 while emergency breech deliveries were 92. Those with comorbidities were 17 and the participants who were eligible for analysis were 75.

Recruitment flow chart

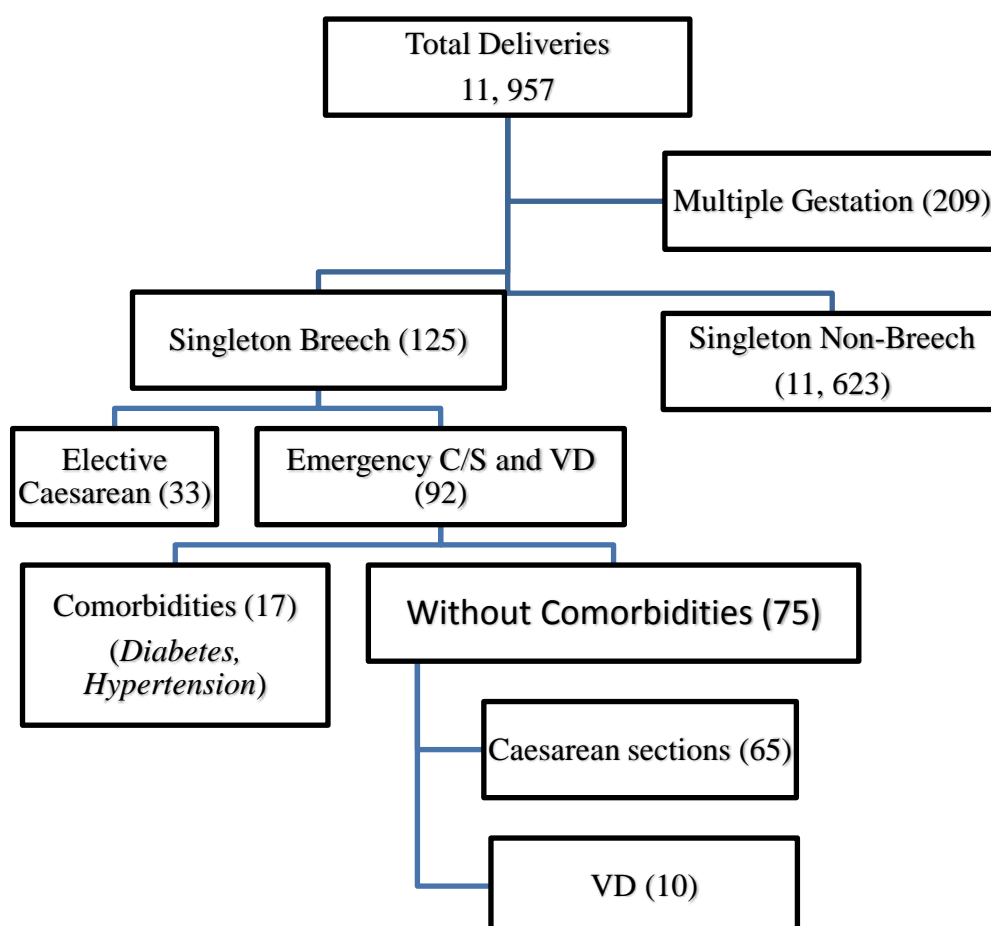


Figure 4.1: Participants recruitment flow chart

4.3 Fetal outcomes of singleton breech deliveries seen at MTRH

This study assessed immediate perinatal outcomes, 5-minute APGAR score and birth complications as the main fetal outcomes of interest. All women who had vaginal breech delivery had a live newborn within 24 hours from the time of delivery, however, 3 (4.6%) of caesarean sections were fresh still births. Similarly, all vaginal deliveries had a 5-minute APGAR score ≥ 7 similar to 92.3% of caesarean deliveries. Most newborns did not have birth complications, however, there was a delayed after coming head and admission to newborn unit among one and two newborns respectively from vaginal delivery. Among emergency caesarean deliveries, the common birth complications were birth asphyxia and admission to the newborn unit at 7.7% and 4.6% respectively. Mode of delivery was statistically associated ($p=0.006$) with birth complication, as there was a higher proportion of birth complications among those delivered vaginally (Table 4.2).

Table 4.2: Fetal outcomes of singleton breech deliveries seen at MTRH

Fetal Outcome	Pattern	Vaginal Delivery n(%)	Emergency caesarean Section n(%)	Total	p-value
Perinatal Outcome	Live	10 (100)	62 (95.4)	72 (96.0)	0.488
	FSB	0	3 (4.6)	3 (4.0)	
5-minute APGAR score	1-3	0	4 (6.2)	4 (5.3)	0.662
	4-6	0	1 (1.5)	1 (1.3)	
	≥ 7	10 (100)	60 (92.3)	70 (93.4)	
Birth weight(grammes)	1500-2499	1 (10)	5 (7.7)	6 (8.0)	0.463
	2500-3499	8 (80)	42 (64.6)	50 (66.7)	
	≥ 3500	1 (10)	18 (27.7)	19 (25.3)	
Birth Complications	None	7 (70)	57 (87.7)	64 (85.3)	0.006
	Delayed after coming head.	1 (10)	0	1 (1.3)	
	Birth Asphyxia	0	5 (7.7)	5 (6.7)	
	NBU Admission	2 (20)	3 (4.6)	5 (6.7)	

4.4 Maternal outcomes of singleton breech deliveries seen at MTRH

Among the women enrolled in this study with singleton breech presentation of their foetuses, 65 (86.70%) of them gave birth through emergency caesarean section while 10 (13.30%) had vaginal deliveries.

The common maternal complications noted among vaginal deliveries were perineal tears while in the emergency caesarean deliveries there were anaesthetic complications and post-partum haemorrhage. The mode of delivery was significantly associated ($p < 0.001$) with having a maternal complications (Table 4.3).

Table 4.3: Maternal outcomes of singleton breech deliveries seen at MTRH

Maternal Complication	Vaginal Delivery n(%)	Emergency caesarean Section n(%)	Total	p-value
None	6 (60)	61 (93.9)	67(89.4)	<0.001
Anaesthetic	0	1 (1.5)	1(1.3)	
Perineal Tears	4 (40)	0	4 (5.3)	
PPH	0	3 (4.6)	3 (4.0)	

CHAPTER FIVE

5.0 DISCUSSION

5.1 Fetal outcomes of singleton breech delivery at Moi Teaching and Referral Hospital.

Majority (70.7%) of the newborns from women enrolled in this study had a gestational age of 38 weeks or more. This finding matches that from Germany (Möllmann et al. 2020) and West Indies (Bassaw et al. 2004) where more than half (54%) and 82.8% of the newborns had a gestational age of 30-40 weeks respectively. From the findings of a study conducted in Norway (Vistad et al. 2013), the mean gestational age was reported to be 39.4 weeks. However, this finding is higher than that reported in another study conducted in Germany (Bogner et al. 2018) where the mean gestational age was 36.7 (\pm 1.2) weeks.

This study stratified birth weight into three categories as low birth weight (1500-2499 grammes), normal birth weight (2500-3499 grammes) and large for gestational age (\geq 3500 grammes) at 8.0%, 66.7% and 25.3% respectively. The most frequent (66.7%) birth weight was 2500 to 3499 grammes which is similar to that reported in Ethiopia at 62% (Assefa et al. 2019) and West Indies (Bassaw et al. 2004) at 62.6%. Similarly, the mean birthweight reported in studies conducted in Norway (Vistad et al. 2013) and Germany (Bogner et al. 2018) was 3399 grammes and 2577 (\pm 409) grammes respectively. This similarity could be explained by the fact that a majority of these births occurred at term (after thirty seven complete weeks of gestation).

APGAR score was one of the fetal outcomes that was assessed in this study. It is a standardized, convenient and generally accepted rapid method of assessing the clinical status of a newborn infant at 1 minute, 5 minutes and ten minutes after birth. It reports the state of the infant immediately after birth and the response of the newborn to

resuscitation. It was developed by Dr. Virginia in 1952 and it has been adopted for use globally. The APGAR score at 5 minutes predicts the clinical status of the infant better than the 1 minute APGAR score. At 1 minute the newborn has just gone through the stressful process of labour and so it may not indicate the true picture of the clinical state of the newborn. In this study, APGAR score at 5 minutes was reported. A 5 minute APGAR score of less than 7 was considered a low score while a score of 7 or more was considered normal. A5-minute APGAR score was normal (≥ 7) among nearly all (93.3%) the newborns in this study. This finding is similar to that reported in Ethiopia at 77.7% (Assefa et al. 2019). In Germany, the authors (Bogner et al. 2018) reported a mean 5-minute APGAR score of 9.44 (± 0.9) which matches the findings of this study. Furthermore, the findings are similar to those from Norway (Vistad et al. 2013) and another study conducted in Germany (Möllmann et al. 2020) which reported similar 5-minute APGAR score findings. The similarity of the findings from these studies could be explained by the fact that a majority of these deliveries occurred through emergency caesarean section. The findings from this study contrast that reported in Nigeria (Igwegbe et al., 2010) where 50 percent of the newborns had a 5 minute APGAR score of less than seven. The difference could be explained by the use of vaginal mode of breech delivery in a majority of deliveries.

There was a statistically significant association between mode of delivery and birth complications ($p=0.006$). The birth complications of interest in this study were: delayed after coming head, birth asphyxia and NBU admission. This study reports that 6.7% of all the newborns were admitted to the newborn unit. This finding is close to that reported in Norway at 9% (Vistad et al. 2013) and Germany at 5.6% (Möllmann et al. 2020). However, it contrasts the finding from a study conducted in Ethiopia where 25%

of the newborns were admitted to NBU(Assefa et al. 2019). This could be explained by the high numbers of birth asphyxia that were reported in Ethiopia (Assefa et al., 2019). This finding on birth complications being significantly associated with the mode of breech delivery was also witnessed in other studies conducted in different countries(Bogner et al. 2018; Singh, Mishra, and Dewangan 2012). Although there was no statistical difference reported in the first study conducted in India (Singh, Mishra, and Dewangan 2012), higher proportions of birth complications (stillbirth and birth asphyxia) were reported among neonates born of women who had undergone emergency caesarean sections. In Austria (Bogner et al. 2018), there was a statistically significant association between mode of delivery and admission to the newborn unit ($p<0.001$) as a birth complication. In Canada(Hannah et al. 2001), serious morbidity ($p=0.003$) and perinatal mortality ($p=0.01$) was significantly associated with the mode of delivery. This current study's findings on the significant association between mode of delivery and birth complications are consistent with those reported in other countries across the globe which targeted the same group of women and used similar study designs(Bogner et al. 2018; Hannah et al. 2001).

This study reports a fresh still-birth rate of 4.6% among three women who had emergency caesarean sections with no perinatal mortality noted among those who had vaginal deliveries. However, this relationship was not statistically significant. One of the fresh stillbirths was found to have congenital anomalies, while two women had prolonged labour. This finding is in contrast with that reported in Finland (Macharey, Gissler, Rahkonen, et al. 2017) where the stillbirth rate in term breech presentation was significantly higher compared to cephalic presentation.

5.2 Maternal outcomes of singleton breech deliveries seen at MTRH

In this study, 65 (86.70%) of the women enrolled with singleton breech presentation of their foetuses gave birth through emergency caesarean section compared to 10 (13.30%) who had vaginal deliveries. This finding of more emergency caesarean deliveries compared to vaginal deliveries among women with singleton breech presentation is comparable to the findings from other African countries (Abiodun, Joseph, and Tajudeen 2012; Assefa et al. 2019). In a study conducted in Ethiopia's Jimma University Medical Center (JUMC) in Addis Ababa, 61.1% of the term foetuses who were presenting in breech position were delivered through emergency caesarean section (Assefa et al., 2019). Similarly, in Nigeria (Abiodun, Joseph, and Tajudeen 2012) where the authors compared vaginal and emergency caesarean sections among women with singleton breech presentation; most women delivered through emergency caesarean sections. However, in a different study conducted in Oromia Region of Southern Ethiopia (Debero Mere et al. 2017), there was a significantly higher proportion (82.6%) of vaginal delivery among women with singleton breech presentation. This difference was still witnessed despite the fact that the authors (Debero Mere et al. 2017) excluded preterm deliveries in a mission hospital in the rural region of Ethiopia with resource constraints. Similarly, in other studies (Jennewein et al. 2019; Wasim, Wasim, and Majrooh 2017) conducted in countries outside the continent of Africa higher proportions of vaginal deliveries were reported. In Germany (Jennewein et al. 2019), it was reported that there were 74.9% singleton vaginal breech deliveries while in Pakistan (Wasim, Wasim, and Majrooh 2017) 65% of the women had vaginal deliveries. The difference could be explained by the different modes of deliveries used in these studies.

This study reports that most (89.33%) of the study participants did not have any complication associated with breech deliveries. This finding is similar to other studies reporting on singleton breech deliveries (Jena 2018; Igwegbe, Monago, and Ugboaja 2010; Kothapally, Uppu, and Gillella 2017). In a study conducted in India (Kothapally, Uppu, and Gillella 2017), 90% of the women who had singleton breech deliveries did not have any complications noted. However, lower proportions of no complications were reported in Bhubaneswar-India (Jena 2018) and Nigeria (Igwegbe, Monago, and Ugboaja 2010) at 82.1%. However, the proportionate differences in lack of complications were not markedly different. These low proportions of complications indicate that singleton breech deliveries (majority of them being emergency caesarean sections) are safe to the women diagnosed with this pregnancy presentation.

Anaesthetic complications were assessed in this study. It was reported this complication occurred at a rate of 1.33%. In this study only one participant had anaesthetic complication which was described as difficult induction.

Postpartum hemorrhage is defined as the blood loss of more than 500ml following vaginal delivery or more than 1000mls following emergency caesarean delivery that is associated with hemodynamic instability requiring urgent intervention. There were 4% of the women enrolled with post-partum haemorrhage following singleton breech deliveries which was close to that reported in two studies previously conducted in India at 5.1% (Jena 2018) and 4.8% (Gurung et al. 2017). However, in Nigeria (Igwegbe, Monago, and Ugboaja 2010), the proportion of post-partum haemorrhage was found to be 1.3% which is much lower than that reported in this study. However, a different study conducted in India reported a much higher proportion of post-partum haemorrhage at 8% (Kothapally, Uppu, and Gillella 2017), a difference attributed to the difference in the eligibility criteria. Differences in study designs, enrolment of varying

numbers of study participants, conducting of the studies in different setups and different study durations could directly influence the proportion of participants with the factor of interest.

Perineal tears were assessed in this study. They are defined as lacerations that develop as a result of injuries to the overstretching perineal tissues that occur during childbirth. The perineum is a diamond shaped area between the vaginal opening anteriorly and the anal opening posteriorly. Perineal tears due to fetal malpresentation are lacerations of skin and other soft tissues that separate the vagina from the anus. During breech delivery the perineum may be stretched unevenly by irregular pressure from the breech or the limbs causing tears. In this study, all perineal tears were reported among women who had vaginal deliveries. These tears accounted for 40% of all complications reported among women who had vaginal breech deliveries. This study classified the vaginal tears between first to fourth degrees, depending on the extent of laceration. The first-degree tear is limited to the mucosa and skin of the introitus. The second-degree involves the fascia and muscles of the perineum while the third degree involves the anal sphincters. Lastly, fourth degree tears have the trauma extending to the rectal lumen through the mucosa. Among the women with perineal tears, those with second- and third-degree perineal tears required repair. Three women sustained second degree perineal tears that were repaired in labour ward while one woman had a third-degree perineal tear which was repaired in theatre. This study collected perineal tears data because of its associated risk for infections, post-partum haemorrhage, disfiguration, and faecal incompetence. However, the findings of this study contrast those reported in a retrospective study conducted in Nepal (Basnet et al. 2020) where no cases of third and fourth degree tears were reported. The authors (Basnet et al. 2020) noted that their study design and sample size were not strong enough to provide conclusive findings.

Secondly, the authors did not compare the outcomes of vaginal delivery with emergency caesarean delivery. Because of this, they could not infer from the study that the higher rate of perinatal morbidity and mortality can be attributable to vaginal mode of delivery. In another study conducted in two French tertiary care centres of Paris suburbs (Fuchs et al. 2013), perineal tears occurred in 63% of the women who delivered macrosomic infants. This difference could be attributed to the scope of the study in France (Fuchs et al. 2013), compared to that of the current study. The French study was conducted between 2005 to 2008 among 27,630 patients who delivered in the two tertiary hospitals compared to the current study conducted in a single tertiary hospital among 75 mothers.

CHAPTER SIX

6.0 CONCLUSION, RECOMMENDATIONS AND STUDY LIMITATIONS

6.1 Conclusions

This study noted that despite the caesarean section protocol for singleton breech deliveries at MTRH, 13.3% of the women had vaginal breech deliveries.

Birth complications including birth asphyxia, admission to the newborn unit and delayed aftercoming head occurred in < 15% of the newborns regardless of the mode of delivery. Furthermore, 40% of these women sustained second- and third-degree perineal tears.

6.2 Recommendations

In advanced labour uncomplicated breech deliveries can be conducted either through emergency caesarean delivery or vaginal delivery because there was good perinatal outcome irrespective of the mode of delivery.

Because maternal complications were associated with the mode of delivery, efforts should be made to ensure that those with breech presentations are identified during antenatal visits, admitted at term and prepared for elective caesarean section. In addition, those with breech presentation in labour should be prepared for emergency caesarean section.

From this study there was a higher rate of perineal tears among those who delivered vaginally in MTRH so i would recommend training for healthcare workers on vaginal breech deliveries.

6.4 Strength of the study

This study contributes to the knowledge on fetal and maternal outcomes of singleton breech deliveries at a national teaching and referral hospital located in Western Kenya. Previous studies have focused on the association between mode of delivery and fetal outcomes; however, this study went ahead to assess both maternal and perinatal outcomes.

The findings of this study could further inform hospital and national healthcare policy makers on the management guidelines for breech presentation and the resulting maternal and fetal outcomes.

6.5 Study Limitations

- i. The study was conducted in a tertiary hospital and therefore the findings cannot be generalized to the entire population.
- ii. The study adopted a cross-sectional descriptive study design rather than a prospective cohort study that could allow for follow-up and comparison of treatment outcomes among women who had vaginal and emergency caesarean breech deliveries.
- iii. The study was not powered enough to make recommendations on the most appropriate mode of unplanned breech deliveries.

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APPENDICES

Appendix I: Patient Information and Consent Form

Dear participant,

My name is Dr. Doreen Momanyi, and I am a qualified medical doctor, registered by the Kenya Medical Practitioners and Dentist Board. I am currently pursuing a master's degree in Reproductive Health at Moi University. I am conducting research entitled **“Fetomaternal outcomes of term breech deliveries at Moi Teaching and Referral Hospital in Eldoret Kenya.”** Participation in this study is entirely voluntary. The information you provide is confidential and your name will not be exposed anywhere. There are no known or anticipated risks to you as a participant in this study.

The findings from our study shall be used to improve services in MTRH, inform protocols and may be published in medical journals and or presented in scientific conferences (local or international). You will be at free will to withdraw from the study at any point in time without any repercussions.

The Moi University/MTRH Ethics and Research Committee will approve has study.

For any question or clarification, please do not hesitate to contact me on 0728147638, my research assistants or:

The chairperson,

IREC, MOI TEACHING AND REFERRAL HOSPITAL

P.O BOX 3-30100

ELDORET.

Tel: +254 787 723 677.

Your participation is highly appreciated. Thank you.

Consent

I have read the information herein (or it has been read to me) concerning this study and I understand what is required of me to participate in the study. My questions and concerns have been addressed to my satisfaction. I also understand that all the information provided is only for the purpose of research. I voluntarily agree to take part in the study.

Respondent's signature:Date.....

Witness' signatureDate.....

Appendix II: Cheti Cha KukubaliKushirikiKatikaUtafiti

Jina langu ni daktari Doreen Momanyi. Nimehitimu kama daktari na kusajiliwa na bodi ya kusajili madaktari Kenya. Kwa sasa mimi ni mwanafunzi wa shahada ya uzamili (MMed) katika afya ya uzazi, chuo kikuu cha Moi. Ninafanya utafiti kuhusu matokeo ya uzazi ya kina mama wenye hali ya “Term breech deliveries”. Naomba kukualika ushiriki kwa huu utafiti. Kushiriki ni Kwa hiari. Kushiriki kwako kwenye utafiti ni muhimu kwani itatuwezesha kupata habari ambazo zitachangia katika kuboresha huduma za afya ya kina mama wajawazito.

Habari zitakazokusanywa ikiwemo utambulisho wako utalindwa Kwa mujibu wa sheria (jina lako halitatumika na utatambuliwa Kwa nambari itakayojulikana na mimi au wasaidizi wangu). Matokeo ya utafiti huu yanaweza kutumiwa kuunda itifaki au kuchapishwa katika majarida ya matibabu na kuwasilishwa kwa mikutano wa kisayansi humu nchini na hata kimataifa. Matibabu yako hayataadhirika kwa vyovyote vile na kujiunga kwako kwa huu utafiti. Una uhuru wa kujiondoa kutoka utafiti huu wakati wowote bila majuto yoyote.

Kamati ya utafiti na maadili (IREC) ya chuo kikuu cha Moi na Hospitali ya Rufaa ya Moi imeidhinisha utafiti huu. Kwa swali lolote au ufafanuzi zaidi, tafadhali usisite kuwasiliana na wasaidizi wangu au mimi kwa nambari ya simu 0728147638. Pia unaweza kuwasiliana na kamati ya maadili na utafiti kwa anwani zifuatazo:

Mwenyekiti wa IREC,

Hospitali ya Rufaa ya Moi (MTRH),

Sanduku la posta 3-30100,

ELDORET.

Asante sana.

Ridhaa ya kushiriki kwenye utafiti

Nimejuzwa au kusoma habari iliyopo katika cheti hiki na nimeelewa kile kinachohitajika kwangu kushiriki katika utafiti huu. Maswali yote na wasiwasi wowote niliokuwa nayo yameshughulikiwa kikamilifu. Pia nimeelewa ya kwamba habari nitakazotoa ni za matumizi ya utafiti pekee. Kwa hiari yangu nimekubali kushiriki katika utafiti huu.

Sahihi ya mshiriki Tarehe.....

Sahihiyashahidi Tarehe.....

Appendix III: Questionnaire

PART A: Sociodemographic Characteristics

This section presents the socio demographics of the respondents (Tick where applicable)

1. Age.....(years)
2. Parity.....
3. Last delivery (year)
4. Mode of delivery
5. How many times have you given birth
6. Previous vaginal breech delivery Yes [] No []
7. If Yes, how many.....
8. Were you referred from another facility? Yes[] No[]
9. Reason for referral.....

Part B: Medical and Obstetrical data

10. Gestational age at delivery (weeks)
11. Do you have any known medical condition such as hypertension,diabetes,asthma,epilepsy? Yes[] No[]
12. If yes, which one?.....

PART C: Current Maternal Outcomes

13. Has the patient experienced any of the following maternal outcomes?
 - a) Anaesthesia complications Yes [] No []
 - b) Perineal tear Yes [] No []
 - i. If yes, what degree of perineal tear

• First [], Second [], Third [], Fourth []

- c) Post-partum haemorrhage Yes [] No []
- d) Sepsis Yes [] No []
- e) Blood Transfusion Yes [] No []
- f) Hysterectomy Yes [] No []
- g) Patient underwent relaparotomy for any reason Yes [] No []

14. Anyother maternal outcomes (Specify).....

PART D: Fetal Outcomes

15. Pregnancy outcome (tick where appropriate)

Live birth [] Stillbirths (fresh) [](macerated) []

16. Average birth weight (grams).....

17. Apgar score at 1 minute?.....

18. Apgar score at 5 minutes?

19. Fracture Yes [] No []

20. If Yes, which fracture ?.....

21. Birth-asphyxia Yes [] No []

22. Admission to neonatal nursery? Yes [] No []

23. Any other fetal outcome? Yes [] No []

If yes, which one?-----

PART E: Mode of delivery and Fetomaternal complications

24. State whether the following fetomaternal outcomes are associated with the mode of term breech delivery?

A. Vaginal Group

- a) Admission of the baby to the neonatal intensive care unit? Yes [] No []
- b) If Yes, what was the mean duration of admission at neonatal intensive care unit?
- c) Apgar score of less than 8 Yes [] No []
- d) Uterine , cervical or vaginal tears Yes [] No []
- e) Cord prolapse Yes [] No []
- f) Delayed aftercoming head Yes [] No []

B. Caesarean Group

- a) Admission of the baby to the neonatal intensive care unit? Yes [] No []
- b) If Yes, what was the mean duration of admission at neonatal intensive care unit?
- c) Apgar score of less than 8 Yes [] No []
- d) Blood Transfusion Yes [] No []
- e) Anaesthetic complications Yes [] No []
- f) Sepsis Yes [] No []

..... **END**

Appendix IV: MTRH Protocol for Breech Presentations

MTRH DEPARTMENT OF REPRODUCTIVE HEALTH PROTOCOL FOR BREECH DELIVERY

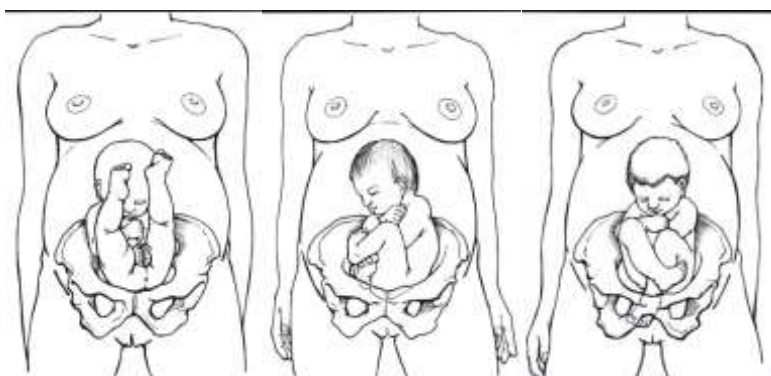
Introduction

The management of breech delivery continues to be controversial. The debate surrounding the optimal mode of delivery for the breech fetus focuses on a single clinical question: what the magnitude of risk to the fetus of a TOL is and how should we balance it against the increased immediate and future risk of CS to the mother and her future children. The appropriate technique of assisted vaginal breech delivery is important to a health worker when faced with a client presenting at an advanced stage of labor where delivery is imminent. Furthermore, not all parturients with spontaneous labor and a breech would consent for emergency cesarean delivery even in the early stages of labor. Careful patient selection is important in order to minimize complications to minimize complications

Diagnosis:

- Leopold: presenting part: breech smaller, less firm compared to the head that is at the fundus.
- FHR: located in upper abdominal quadrants.
- Vaginal exam: buttocks, buttocks with feet, 2 feet or 1 foot.
- **Ultrasound:** direct visualization (the golden standard)

There are three different ways of presentation:



Frank Breech Complete Breech Footling Breech

Selection criteria for vaginal breech delivery

1. There is insufficient evidence on which to base a recommendation for frank or complete breech with estimated fetal weight <2500 and >4000g
2. Frank or complete breech at 36 weeks or more.
3. Parity, age, pelvimetry, medical complications are not important during patient selection
4. For a woman with suspected breech presentation, pre- or early labour ultrasound should be performed to assess type of breech presentation, estimated weight, and attitude of fetal head. However, for a woman in labour a decision should be made on the mode of delivery whether or not a scan can be done to confirm any of these parameters.
5. Patient should have given a written consent.
6. Availability of experienced care providers (including those skilled in neonatal resuscitation)

ABSOLUTE Contraindication to vaginal delivery

- Cord presentation

- Fetal growth restriction or macrosomia
- Any presentation other than a frank or complete breech with a flexed or neutral head attitude (footling presentation can be accepted when the buttocks is felt during VE too)
- Fetal anomaly incompatible with vaginal delivery
- Patient with a previous Caesarean Section in history

Role of sonography

Ultrasound **MAY** be performed to assess

1. Type of breech presentation, and attitude of fetal head, congenital anomalies, cord position
2. Estimated weight
3. Amniotic fluid assessment, placenta localization

MANAGEMENT:

Intrapartum

- Inform obstetrician-gynaecologist consultant on call
- A paediatrician should be available to receive the baby
- Induction of labor is contraindicated
- Augmentation of labor is allowed as per to protocol on augmentation of labor.
- Clinical pelvic examination should be performed to rule out pathological pelvic contraction. Good progress in labor is the best indicator of adequate fetal-pelvic proportions.
- In the absence of adequate progress in labor, Caesarean section is advised.
- Maternal bladder should be emptied before start of active 2nd stage

- A passive second stage without active pushing is advised and may last up to 90 minutes, allowing the breech to descend well into the pelvis. Once active pushing commences, if delivery is not imminent after 60 minutes, Caesarean section is recommended.
- Leave membranes intact, if possible, because of higher risk of cord prolapsed.
- Fetal monitoring is every 5 minutes in second stage.
- Ideally, Reserve Theater when patient gets to second stage.

Technique for vaginal breech delivery

- Explain the need for effective pushing in second stage.
- Oxytocin 5IU in 500mls of saline, must be ready for augmentation in 2nd stage.
- Spontaneous descent and expulsion of the breech to the umbilicus with maternal pushing only.
- Maternal effort delivers buttocks.
- Delivery of limbs spontaneously will occur. If not use Pinardmaneuver i.e. place two fingers medial to the limb at the knee and abduct the limb while flexing at the hip (don't extract legs before the popliteal fossa is visible)
- Allow maternal effort delivers trunk up to scapula.
- Next contractions, arms will spontaneously deliver.
- When that fails in the next contraction: rotate the body to facilitate delivery of the arms over the chest, one arm at a time(Løvsetmaneuver)
- Support the body with one arm in a horizontal position. Or allow to hang until the nape of the neck appears at the introitus.
- Next contraction, the head will be born, suprapubic pressure (Brachtmaneuver) may help. Maternal efforts encouraged.

- If not delivered: flex head with two fingers on the cheekbones and 1 on the chin (MauriceauSmellieVeitmaneuver)
- During partial breech extraction, the anterior shoulder may be difficult to deliver if it is impacted behind the pubic symphysis. In this event, the body is gently lifted upward toward the pubic symphysis, and the operator inserts 1 hand along the hollow of the maternal pelvis and identifies the posterior humerus of the fetus. By gentle downward traction on the humerus, the posterior arm can be easily delivered, thus allowing for easier delivery of the anterior shoulder and arm.
- When delivery of the shoulder is difficult to accomplish, a nuchal arm should be suspected. To dislodge the arm, the operator rotates the body 180 degrees to bring the elbow toward the face. The humerus can then be identified and delivered by gentle downward traction. In cases of double nuchal arm, the fetus is rotated counterclockwise to dislodge and deliver the right arm and rotated clockwise to deliver the left arm. If this action is unsuccessful, the operator must insert a finger into the pelvis, identify the humerus, and possibly extract the arm, resulting in fracture of the humerus or clavicle.
- Head entrapment: higher risk in premature baby (increased head to body ratio)
- Symphysiotomy or emergency abdominal rescue can be lifesaving.
- Whether used routinely or only if spontaneous birth is not forthcoming, fetalmanoeuvres should be employed only after spontaneous delivery to the umbilicus.

CARE AFTER BREECH DELIVERY

- Active management of third stage
- Examine for maternal trauma

- Examine for neonatal trauma
- Documentation and inform patient.

Consent form for spontaneous/assisted breech delivery

Before a patient can consent to a vaginal breech delivery, she needs to know the benefits and risks of both CS and vaginal delivery.

It is advisable to discuss the mode of delivery antenatally.

If that is not possible/ or is not done it needs to be done in Labour Ward.

She needs to know the following:

- That it is safe to deliver the baby vaginal, when all precautions are in place, and the team will make sure that is done. (by applying this protocol)
- There is always a chance that a caesarian section will still be performed when she is not progressing well.
- First Apgar Score maybe low, but will not result in problems in later life.
- That if she opts for caesarian section, this can have a small negative effect on her future pregnancies and deliveries.

When she has understood all these, she can sign the existing consent form, which should be placed inside her file.

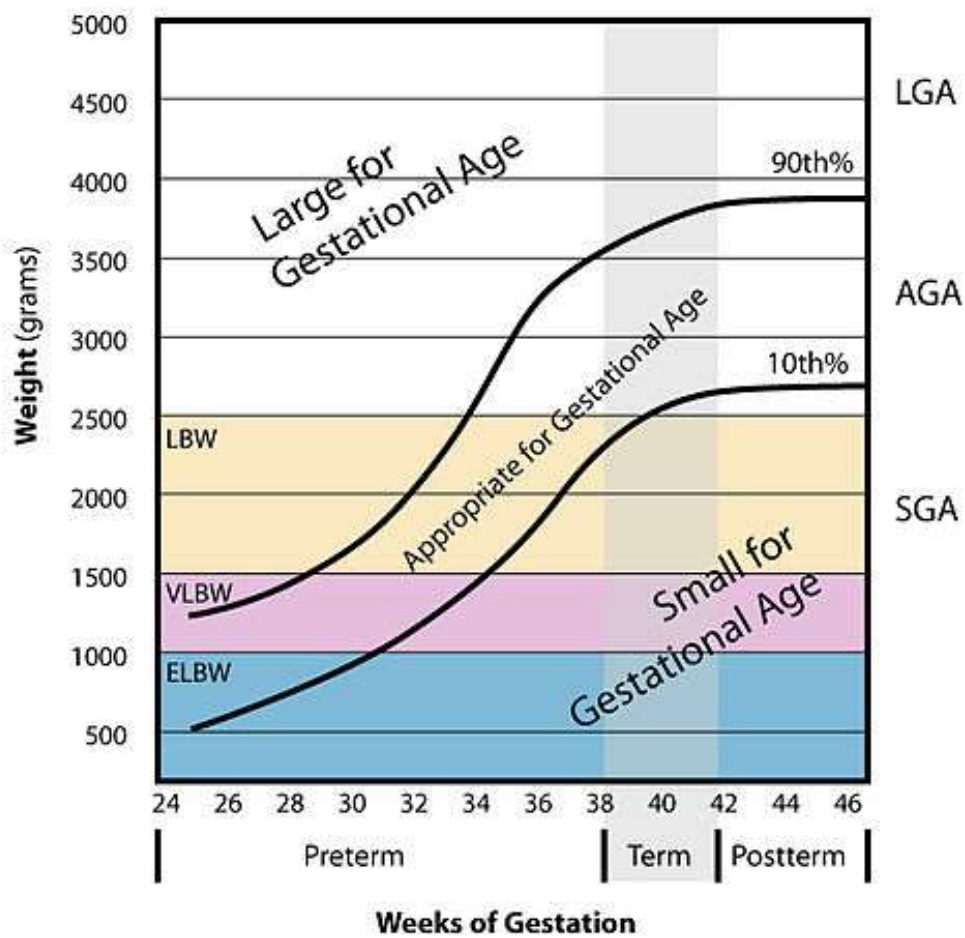
References

1. Hannah, ME et al, "Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomized multicentre trial. Term Breech Trial Collaborative Group," Lancet, 2000, 356 (9239): 1375-83

2. Whyte,H, Hannah ME et al. Outcomes of children at 2 years after planned cesarean birth versus planned vaginal birth for breech presentation at term: The international randomized Term Breech Trial. Are J ObstetGyn Volume 191, Issue 3, September 2004, and Pages 864-871

- 3.SOGC clinical guidelines on vaginal breech delivery June 2009


Appendix V: Chart on Gestation Age Vs Birthweight




Appendix VI: Budget

Items	Quantity	Unit price	Total (Kshs)
STATIONERY / EQUIPMENT			
Printing papers	5 reams	500	2500
Black cartridges	2	2000	4000
Writing pens	1 packet	600	600
Flash Disc	1	2000	2000
Box files	2	250	250
Document wallets	4	100	400
Sub Total			10,000
PROPOSAL DEVELOPMENT			
Printing drafts & final proposal	10 copies	500	5,000
Photocopies of final proposal	6copies	150	900
Binding of copies of proposal	6copies	100	600
Sub Total			6,500
PERSONNEL			
Biostatistician	1	35,000	35,000
Research assistants	3	30000	90,000
Sub Total			89,000
THESIS DEVELOPMENT			
Printing of drafts and final thesis	10copies	900	9,000
Photocopy of final thesis	6copies	500	3,000
Binding of thesis	7copies	350	2,450
Sub Total			14,450
TOTAL			119,950
Miscellaneous Expenditure			20000
GRAND TOTAL			175,950

APPENDIX VII: IREC Approval



MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3



MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
Tel: 33471/2/3
29th August, 2019

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

Reference: IREC/2019/139
Approval Number: 0003417

Dr. Doreen Momanyi,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE

29 AUG 2019

APPROVED

P. O. Box 4606 - 30100 ELDORET

Dear Dr. Momanyi,

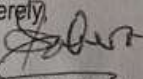
FETOMATERNAL OUTCOMES SINGLETON BREECH DELIVERIES AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET, KENYA

This is to inform you that **MU/MTRH-IREC** has reviewed and approved your above research proposal. Your application approval number is **FAN:0003417**. The approval period is **29th August, 2019 – 28th August, 2020**.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by **MU/MTRH-IREC**.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **MU/MTRH-IREC** within 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to **MU/MTRH-IREC** within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. 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.
- vii. Submission of an executive summary report within 90 days upon completion of the study to **MU/MTRH-IREC**.


Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

Sincerely,



DR. S. NYABERA
DEPUTY-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE


cc	CEO -	MTRH	Dean -	SOP	Dean -	SOM
	Principal -	CHS	Dean -	SON	Dean -	SOD

APPENDIX VIII: MTRH Approval



An ISO 9001:2015 Certified Hospital





INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
29 AUG 2019
APPROVED
P.O. Box 4606-30100 ELDORET

MOI TEACHING AND REFERRAL HOSPITAL

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ELDORET, KENYA

Ref: ELD/MTRH/R&P/10/2/V.2/2010 3rd September, 2019

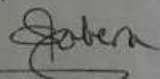
Dr. Doreen Momanyi,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

“Fetomaternal Outcomes Singleton Breech Deliveries at Moi Teaching and Referral Hospital, Eldoret, Kenya”.

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.



DR. WILSON K. ARUASA, MBS
CHIEF EXECUTIVE OFFICER
MOI TEACHING AND REFERRAL HOSPITAL

cc - Senior Director, (CS)
- Director of Nursing Services (DNS)
- HOD, HRISM

All correspondence should be addressed to the Chief Executive Officer
Visit our Website: www.mtrh.go.ke
TO BE THE LEADING MULTI-SPECIALTY HOSPITAL FOR HEALTHCARE, TRAINING AND RESEARCH IN AFRICA