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UNIVERSITY OF YAOUNDE I
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FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY

MATERNAL AND FOETAL COMPLICATIONS FOLLOWING INDUCTION OF LABOUR IN THREE TEACHING HOSPITALS IN YAOUNDE

Dissertation submitted in partial fulfillment of the requirements for the award of a specialization diploma (DES) in Obstetrics and Gynaecology

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ACADEMIC YEAR 2023 -2024

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DEDICATION

I dedicate this research to my parents

Mrs EBAI Janet Ndip nee AGBOR

and

Mr EBAI Linus Tabot

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Key

P= Professor

AP= Associate Professor

SL= Senior lecturer

L= Lecturer

AS = Assistant

HoD= Head of Department

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
WHO:	World Health Organisation
ACOG:	American College of Obstetricians and Gynecologists
NICE:	National Institute for Health and Care Excellence
PROM:	Premature Rupture of Membranes
PGE:	Prostaglandin E
PGF:	Prostaglandin F
PGI:	Prostaglandine I
ACTH:	Adrenocorticotrophic Hormone
IUGR:	Intra Uterine Growth restriction
SBP:	Systolic Blood Pressure
DBP:	Diastolic Blood Pressure
IUFD:	Intrauterine Foetal Death
DHEAS:	Dehydroepiandrostrone
YGOPH:	Yaounde Gyneco-Obstetric and Pediatric Hospital
YCH:	Yaounde Central Hospital
YUTH:	Yaounde University Teaching Hospital
LH:	Luteinizing Hormone
SPSS:	Statistical Package for Social Sciences
FSH:	Follicle Stimulating Hormone
CPD:	Cephalopelvic Disproportion

ABSTRACT

Background: Induction of labour refers to the iatrogenic production of uterine contractions leading to cervical modification and delivery of the foetus, placenta and membranes. Though this intervention has become instrumental in reducing maternal and perinatal morbidity and mortality worldwide, it is not void of complications. The maternal and foetal complications following induction of labour in Cameroon have not been clearly elucidated.

Objective: This research was carried out to study the maternal and foetal complications following induction of labour from 28 weeks of gestation and to compare the outcome and complications between the pharmacological methods of induction that is; Prostaglandins and Oxytocin in 3 teaching hospitals in Yaounde.

Methods: The study was a hospital based descriptive cross sectional study with an analytic component and prospective data collection, carried out between January 2024 and July 2024. Participants were recruited by consecutive sampling and included all women admitted into the labour rooms of the various study sites for induction of labour, which was prescribed by the treating physician. Participants were followed up until discharge from the hospital. Data were collected using targeted questionnaires and entered into CS Pro version 7.2.2 then analysed with SPSS version 26. Descriptive statistics followed by measures of association were calculated using Chi square test and Fischer's exact test in univariate analysis. Associations were reported with the odds ratio, their 95% confidence interval and p-value. Logistic regression was done to eliminate confounders. Statistical significance was set at a p-value <0.05

Results: 242 women were induced during the study period representing 8.7% of deliveries. 153 of these women had no exclusion criteria, consented and were enrolled into the study. The mean age of participants was 28.1(±6.2 years). The most common method of induction used was misoprostol (82(53.7%))**.** The most common indication for induction of labour was premature rupture of membranes (63(41.8%)) Among the study participants 26.8% (41participants) delivered by caesarean section. The most common indication for caesarian section was a non-reassuring foetal status (20(48,8%)). Perineal tears ((55(35.9%)) were the most common maternal complication while meconium-stained liquor (60(39.2%)) was the most common foetal complication. Comparing prostaglandins to oxytocin, the interval from induction to onset of labour was shorter when induction was done with oxytocin (6.1(±6.6) hours vs 3.3(±8.0) hours p-value 0.029) and the interval from induction to delivery was longer when prostaglandins were used for induction of labour (14.6(±9.0) hours vs 7.5(±3.5) hours p-value<0.001). Induction of labour with prostaglandines was also associated with a higher proportion of women with a maternal pyrexia **(**18.5 % vs 3.9% OR 5.11[1.12-23.39] p-value=0.022) and a higher proportion of NICU admissions (37.9% vs 19.6% OR 2.51[1.11-1.72] p-value 0.025). Only a longer mean induction-to-delivery interval was found to be independently associated with prostaglandins on multivariate analysis

Conclusion: Approximately 1 in 4 women delivered by Caesarian section following induction of labour in our study. The overall maternal and foetal outcome following induction was favourable. Prostaglandins were associated with a longer induction-to-delivery interval compared to oxytocin but otherwise appeared to be as safe as oxytocin for induction of labour

Key words: Induction, Maternal, Foetal, Complications, Prostaglandins, Oxytocin.

RESUME

Introduction : L'induction du travail est la production iatrogène des contractions utérines conduisant à des modifications cervicales dans le but d'obtenir l'accouchement d'un foetus et de ses annexes. L'induction du travail est devenue determinante pour réduire la morbidité et la mortalité maternelle et perinatale, mais elle n'est pas exempte des complications . Les issues maternelles et fœtales de l'induction du travail au Cameroun n'ont pas encore étés clairement élucidées.

Objectif : Ce travail a été mené afin d'étudier le devenir maternel et fœtal et complications après induction du travail à partir de 28 semaines de gestation et comparer ses résultats entre les 2 méthodes pharmacologiques d'induction (les prostaglandines et l'ocytocine) dans 3 hôpitaux universitaires de Yaounde.

Méthodologie : Une étude transversale descriptive avec volet analytique a été réalisée en milieu hospitalier de Janvier 2024 à Juillet 2024. Les participantes ont été recrutées par échantillonnage consécutif. Toutes les femmes admises pour induction du travail, ne présentant pas de critères d'exclusion et qui avaient consenti ont été recrutées . Les données ont été collectées à l'aide d'un questionnaire et saisies dans le logiciel CS Pro version 7.2.2, puis analysées par le logiciel SPSS version 26. Une valeur $p<0.05$ a été considérée comme statistiquement significative.

Résultats : 242 femmes ont été induites, représentant 8,7 % des accouchements. Cent cinquantre trois de ces femmes n'avaient aucun critère d'exclusion et ont consenti à être inscrites à l'étude. L'âge moyen des participantes était de 28,1 ans (±6.2 ans). La méthode d'induction la plus couramment utilisée était le misoprostol (82 (53.7 %)). L'indication la plus courante de l'induction du travail était la rupture prématurée des membranes (63 (41,8 %)). Plus du quart des participants (41(26,8 %)) ont bénéficié d'une césarienne. L'indication la plus courante de la césarienne était un état fœtal non rassurant (20 (48,8 %)). Les déchirures périnéales ((55(35,9%)) étaient la complication maternelle la plus courante tandis que le liquide amniotique teinté au méconium (60(39,2 %)) était la complication fœtale la plus fréquente. En analyse univariée, les prostaglandines comparées à l'oxytocine étaient signicativement associées à une augmentation de la durée moyenne entre l'induction et le debut de travail (6.1(±6.6) heures vs 3.3(±8.0) heures valeur-p 0.029), entre induction-et l'accouchement, (14.6(±9.0) heures vs 7.5(±3.5) heures valeur $p<0.001$), du taux de fièvre maternelle **(**18.5 % vs 3.9% OR 5.11[1.12-23.39] valeur-p=0.022) et du taux d'admission en néonatologie (37.9% vs 19.6% OR 2.51[1.11-1.72] valeur-p 0.025). Seule une durée moyenne plus longue de l'induction à l'accouchement s'est avérée être associée indépendamment aux prostaglandines sur l'analyse multivariée.

Conclusion : Environ 1 femme sur 4 ont accouché par césarienne après induction du travail . Les issues globales maternelles et fœtales après l'induction etaient favorables. Les prostaglandines etaient associées à une durée plus longue de l'induction du travail à l'accouchement par rapport à l'ocytocine.

Mots clés: Induction, Complications, Maternelles, Fœtales, Prostaglandines, Oxytocine

CHAPTER 1: INTRODUCTION

1.1Background

Induction of labour is the iatrogenic production of uterine contractions leading to cervical dilation and delivery of the foetus, placenta and membranes. Induction of labour is one of the oldest practices in obstetrics. Its origin could be traced back to the 18th century where the main indication was to prevent foeto-maternal disproportion by delivering a foetus before it became too big to pass through the maternal pelvis, which was usually deformed due to rickets[1]. Presently WHO recommends induction of labour when the risk of continuing a pregnancy outweighs the advantages of allowing the pregnancy to progress or waiting for spontaneous labour to begin [2]. As such the indications for induction of labour have become diverse and include but are not limited to: late and postterm pregnancy, premature rupture of membranes, hypertensive disorders in pregnancy , maternal medical conditions, intrauterine foetal death, intrauterine foetal growth restriction, chorioamnionitis and even for maternal convenience (social induction)[3].

Due to an increase in the prevalence of the aforementioned indications the rate of induction of labour is inadvertently increasing steadily worldwide especially in middle and high income countries. In Iceland the rate of induction of labour doubled between 1997 and 2018 [4]. In the United States of America the rate of induction of labour went from 9.6% of all births in 1997 to 27.1% in 2018[5]. Globally 1 in 4 women have their labour induced. In Africa, labour induction accounts for 4.4% of deliveries [6]. In Cameroon the rate of induction of labour is estimated at 9.9%[7]

Induction of labour has been associated with several benefits such as: reduction in the incidence of stillbirth in late term pregnancies and beyond compared to expectant management and reducing the risk of chorioamnionitis in the context of premature rupture of membranes[2].

Labour induction is carried out with the aim of achieving vaginal delivery of the foetus, placenta and membranes while ensuring good maternal and foetal outcome. Despite the fact that induction of labour is associated with many benefits it is not without risks. Although the proportion of successful vaginal delivieries after induction of labour is high, there is still a significant proportion of labour inductions that result in adverse maternal and foetal outcome and complications . Foetal complications associated with induction labour include: meconium stained liquor, neonatal resuscitation, bacterial sepsis, intracranial hemorrhage, assisted ventilation, hyperbilirubinemia, Apgar score < 7 at 5 min, and neonatal seizures[8]. Maternal complications include postpartum hemorrhage, uterine rupture, failed induction of labour and prolonged and tedious labour often resulting in instrumental delivery and unplanned caesarean sections. It is estimated that 20% of induction of labour cases result in delivery by caesarean section[9,10]. Some factors associated with the risk of complications following induction of labour include previous history of cesarean delivery, foetuses with intrauterine growth restriction , Bishop score <6, the gestational age and foetal weight [11]. Apart from its clinical implication, induction of labour (IOL) has a

profound impact on birth experiences of women, and cost implications due to its unpredictable duration, likelihood of success, as well as risk of maternal and neonatal complications.

1.2 Problem statement

In Cameroon the maternal and neonatal mortality rates remain high with a significant proportion of these deaths attributed to complications during labour and delivery[12]. Induction of labour is being increasingly used to achieve vaginal delivery worldwide [4] While induction of labour can be beneficial in certain situations, it is not without risks and it has been shown to increase the risk of maternal and foetal complications[11,13]. Data on the specific use and outcome of induction of labour in Cameroon is limited but anecdoctal evidence suggests that it is rising. There is also paucity of data on the specific maternal and foetal complications associated with induction of labour in Cameroon. This lack of data hinders the ability to assess the true impact of induction of labour in Cameroon, to identify areas for improvement of induction of labour practices in order to optimise maternal and foetal safety and to develop evidence based guidelines for the appropriate use of induction of labour in the Cameroonian health care settings.

1.3 Justification

This study aimed at investigating the maternal and foetal complications associated with induction of labour in Cameroon. By understanding the specific risks associated with induction of labour in Cameroon it enables improved patient counselling and the informed consent process not just from the point of view of women being aware of their individual chances of success of the intervention, but also to ensure optimal allocation of healthcare resources, It also enables the developement of targeted interventions to reduce induction of labour complications. This study contributes valuable data to guide clinical practice and improve maternal and foetal outcome and reduce complications following induction of labour in Cameroon

1.4 Research Question

What are maternal and foetal complications following induction of labour in 3 teaching hospital in yaounde?

1.5 Research Hypothesis

1) The prevalence of induction of labour is low.
2) Induction of labour is associated with few complications.
3) There is no difference in the proportion of inducation of labour complications between prostaglandins and oxytocin

1.6 Research Objectives

1.6.1. Main Objective

To study the maternal and foetal complications following induction of labour in 3 teaching hospitals in Yaounde.

1.6.2) Specific objectives

1)To determine the prevalence of induction of labour in the 3 teaching hospitals

2) To describe the socio -demographic and obstetric characteristics of women undergoing induction of labour in 3 teaching hospitals in Yaounde.

3)To identify the maternal and foetal complications associated with induction of labour.

4)To compare the maternal and foetal complications following induction of labour between prostaglandins and oxytocin.

1.7 Operational definition of terms

Induction of labour:	Iatrogenic production of uterine contractions in a woman not in labour
Labour	Uterine contractions leading to cervical modification and delivery
Augmentation of labour:	To increase the frequency. intensity or duration of uterine contractions in a woman already in labour
Latent phase of labour:	Period from onset of labour to cervical dilatation of 4cm
Active phase of labour:	Period from cervical dilation of 5cm to full dilation
Failure of induction of labour:	Failure of Labour to begin after 12 to 24 hours of induction
Successful induction of labour:	Vaginal delivery following induction of labour
Unfavourable bishop score:	Bishop score below 7
Favourable bishop score	Bishop score of 7 and above
Prolonged rupture of membranes	Interval between rupture of membranes and onset of labour being more than 12hours
Foetal presentation	Part of the foetus located at the pelvic inlet
Foetal lie	The orientation of the foetal longitudinal axis with respect to that of the mother
Adequate pelvis	Pelvis with normal diameters at the pelvic inlet, outlet and midpelvis clinically or radiologically
Tachysystole	When the number of contractions per minute is greater than 5 or lasting more than 60 seconds
Non-reassuring foetal state	Abnormal foetal heart rate pattern characterized by bradycardia, persistent tachycardia, late, variable or prolonged decelarations

CHAPTER 2: LITERATURE REVIEW

2.1 Anatomy of the uterus

The uterus is a pear-shaped hollow organ located in the female pelvis between the bladder and the rectum. It is the main female organ of reproduction and contains the growing foetus during pregnancy. When cut in the sagittal plane it has a triangular shaped cavity. The uterus is divided into 4 parts the fundus, the corpus, the isthmus and the cervix.

The **fundus** is the dome of the uterus between the fallopian tubes from which they emerge. The **corpus** is the main part of uterus where the embryo implants after fertilization. It has 3 layers the endometrium, the myometrium and the serosa. The myometrium is composed of 3 layers the inner circular layer, the outer longitudinal layer and middle plexiform layer. The **cervix** is the distal most part of the uterus which protrudes into the vagina. It is cylindrical about 2,5cm long and has 2 openings called the internal os and external os with the endocervical canal connecting both ora. The **isthmus** is the constricted part if the uterus measuring about 0.5 cm, situated between the corpus and the cervix. It is limited above by the anatomical internal os and below by the histological internal os. During pregnancy from the 28 weeks of gestation it expands and forms the lower uterine segment which is 8 to 10 cm at term with a thickness 2,5 to 3mm. It is distinguishable as the part of the uterus where the serosa is loosely attached.

Arterial supply: The main arterial supply of the uterus is from the uterine arteries one on each side. It is a branch of the anterior division of the internal iliac. The other sources are the ovarian and vaginal arteries with which the uterine arteries anastomoses.

Venous supply: The uterine veins run alongside the uterine arteries at the base of the broad ligament and form a venous plexus on each side of the cervix. Veins from this plexus drain into the internal iliac veins.

Lymph Drainage: The lymph vessels from the fundus of the uterus accompany the ovarian artery and drain into the para-aortic nodes at the level of the first lumbar vertebra. The vessels from the body and cervix drain into the internal and external iliac lymph nodes. A few lymph vessels follow the round ligament of the uterus through the inguinal canal and drain into the superficial inguinal lymph nodes.

Innervation of the uterus : The sympathetic and parasympathetic innervation of the uterus comes from the inferior hypogastric plexuses[14].

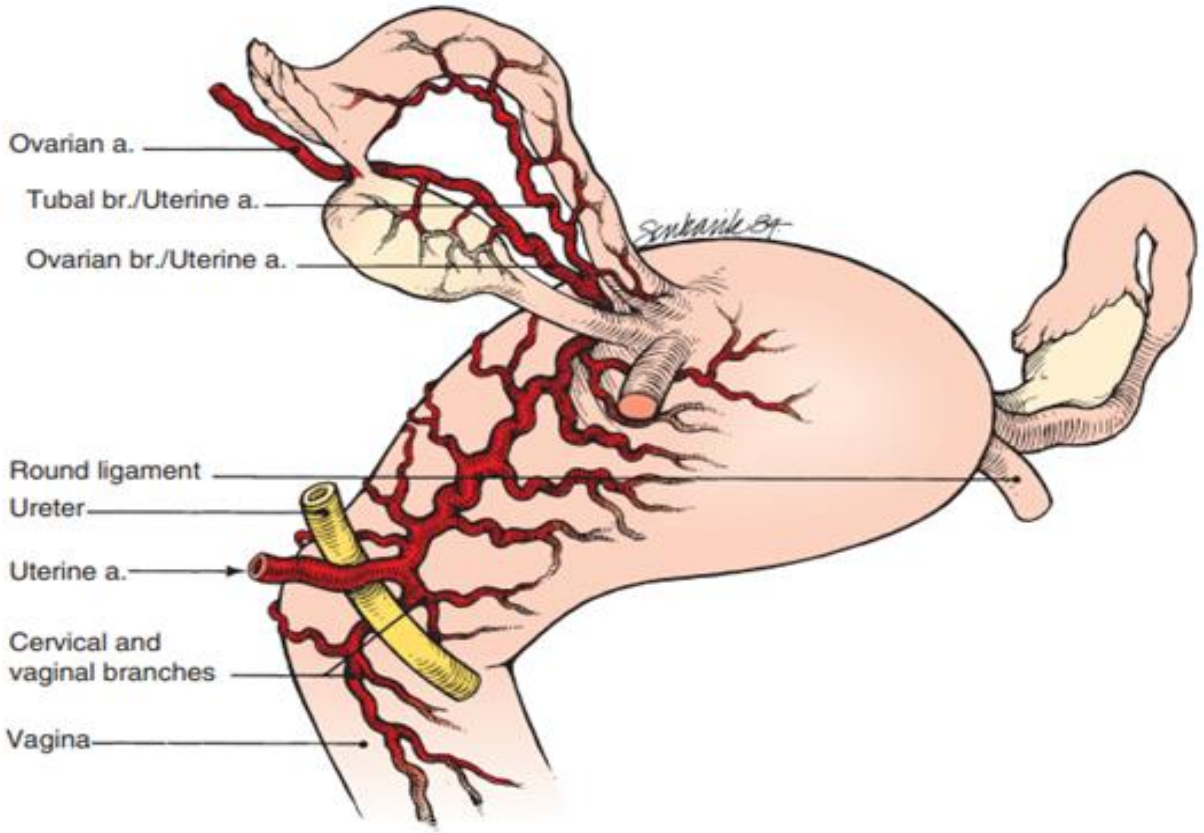

Figure 1: Arterial supply of the uterus[15]

2.2 Uterine modifications during pregnancy

Size: Increases from 7.5* 5 * 2.5 cm in non-pregnant state to 35 * 25 * 20 cm at term.

Weight: At term the weight of the uterus is 20 times(1000g) its non-pregnant weight (50g to 80 g). The increase in size occurs to accommodate the growing foetus, by hypertrophy of the muscle fibres (oestrogen effect) and hyperplasia (progesterone effect).

Capacity: Increases from 4 ml in non-pregnant state to 4000 ml at term.

Shape: The uterus changes from being pear shaped in the non-pregnant state to being globular by the 8th week and pyriform by the 16th week till term.

Position: with ascent from the pelvis, the uterus usually undergoes rotation with tilting to the right (dextro-rotation), probably due to presence of the rectosigmoid colon on the left side.

Consistency: Becomes progressively softer due to: increased vascularity and the presence of amniotic fluid.

Vascularisation: Uterine and ovarian vessels increase in diameter, length and tortuosity. Uterine blood flow increases progressively and reaches about 500 ml/ minute at term.

Formation of lower uterine segment: After 12 weeks, the isthmus (0.5cm) starts to expand progressively to become the lower uterine segment by 28 weeks of gestation. At term the lower uterine segment measures approximately10 cm. It can be distinguished from the corpus as the part where:

- ✓ The peritoneum is loosely attached,
- ✓ The myometrium contains 2 layers outer longitudinal and inner circular,
- ✓ The decidua is poorly developed,
- ✓ Membranes are loosely attached,
- ✓ Is passive, dilates, stretches and becomes thinner during labour.

The Cervix: It becomes hypertrophied, soft and bluish in colour due to oedema and increased vascularity. Soon after conception, a thick cervical secretion obstructs the cervical canal forming a mucous plug. The endocervical epithelium proliferates and /or everts forming cervical ectopion[16]

2.3 Anatomy of the female pelvis

The pelvis is the bony canal through which the foetus passes during delivery. It is composed of the sacrum and coccyx posteriorly and the hip bone laterally and anteriorly which is a fusion of 3 bones the ilium the sacrum and pubic bone.

The obstetrical (true) pelvis is divided into 3 parts the pelvic inlet, the midpelvis and the pelvic outlet

The pelvic inlet is bounded anteriorly by the pubic symphysis, laterally by the upper margin of the pubic bone the iliopectineal line and the ala of the sacrum, posteriorly by the sacral promontory. The normal transverse diameter in this plane(13,5cm) is greater than the anterior posterior diameter (11cm).

The pelvic midcavity is bounded anteriorly by the middle part of the pubic symphysis, laterally by the pubic bone and the inner aspect of the ischial bone and spines and posteriorly by the sacral bones. The cavity is round with similar anterior posterior and transverse diameters (12cm). the ischial spines are used as a landmark to evaluate descent of the foetal presenting part.

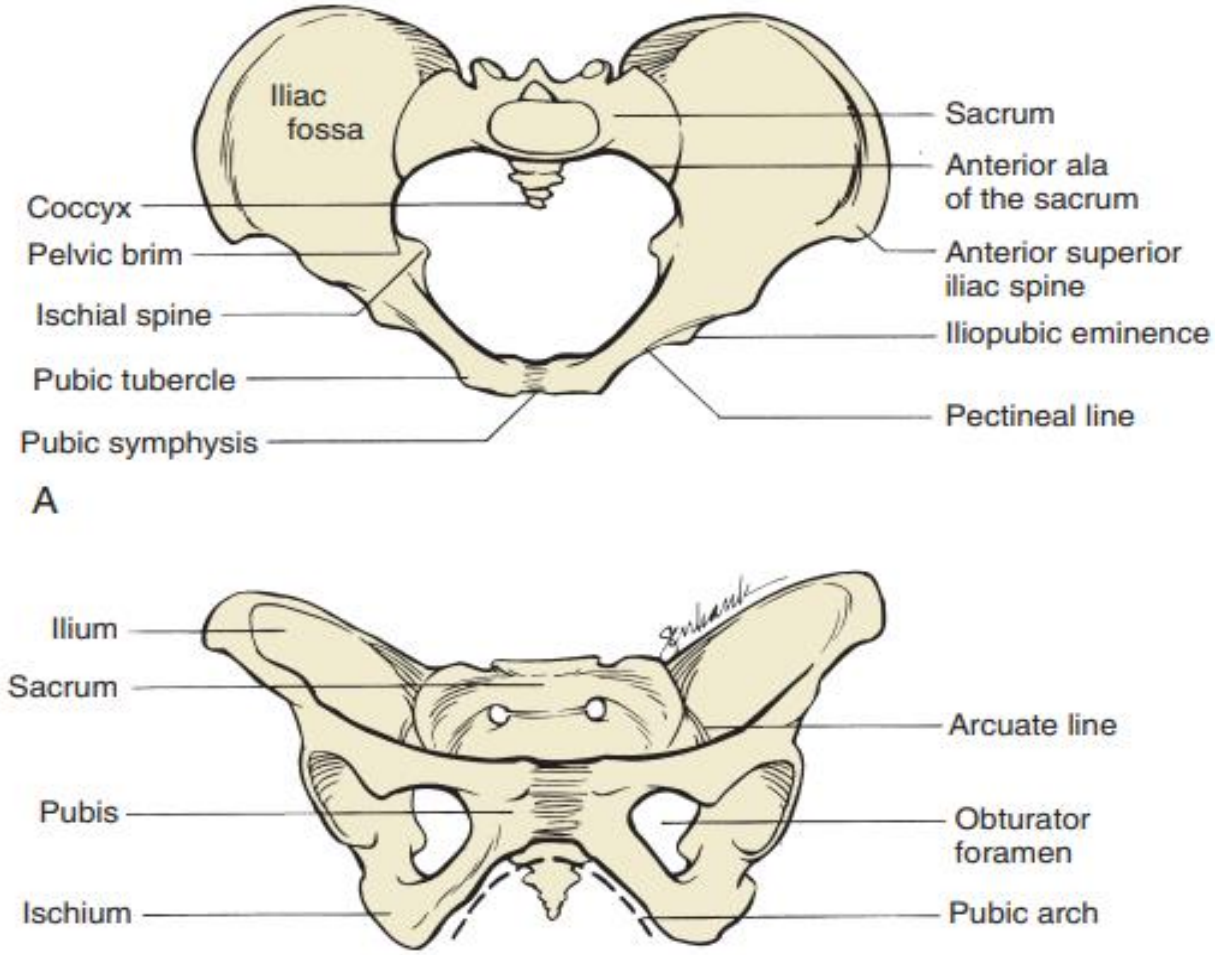

Figure 2: Anatomy of the female pelvis*[15]*

The pelvic outlet is bounded anteriorly by the lower margin of the pubic symphysis, laterally by the descending ramus of the pubic bones, the ischial tuberosity and the sacrotuberous ligament and posteriorly by the coccyx. The pelvic outlet has a larger anterior posterior diameter than a transverse diameter

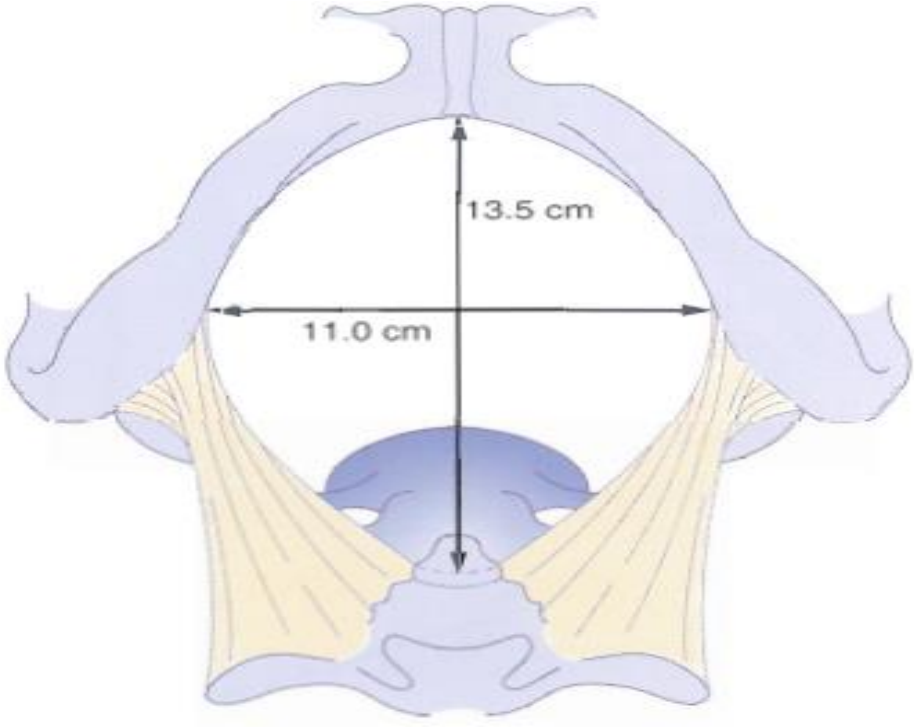

Figure 3: Pelvic Outlet[17]

Clinical pelvimetry is used to clinically asses the dimensions of the of the pelvis prior to the onset of labour to determine the mode of delivery

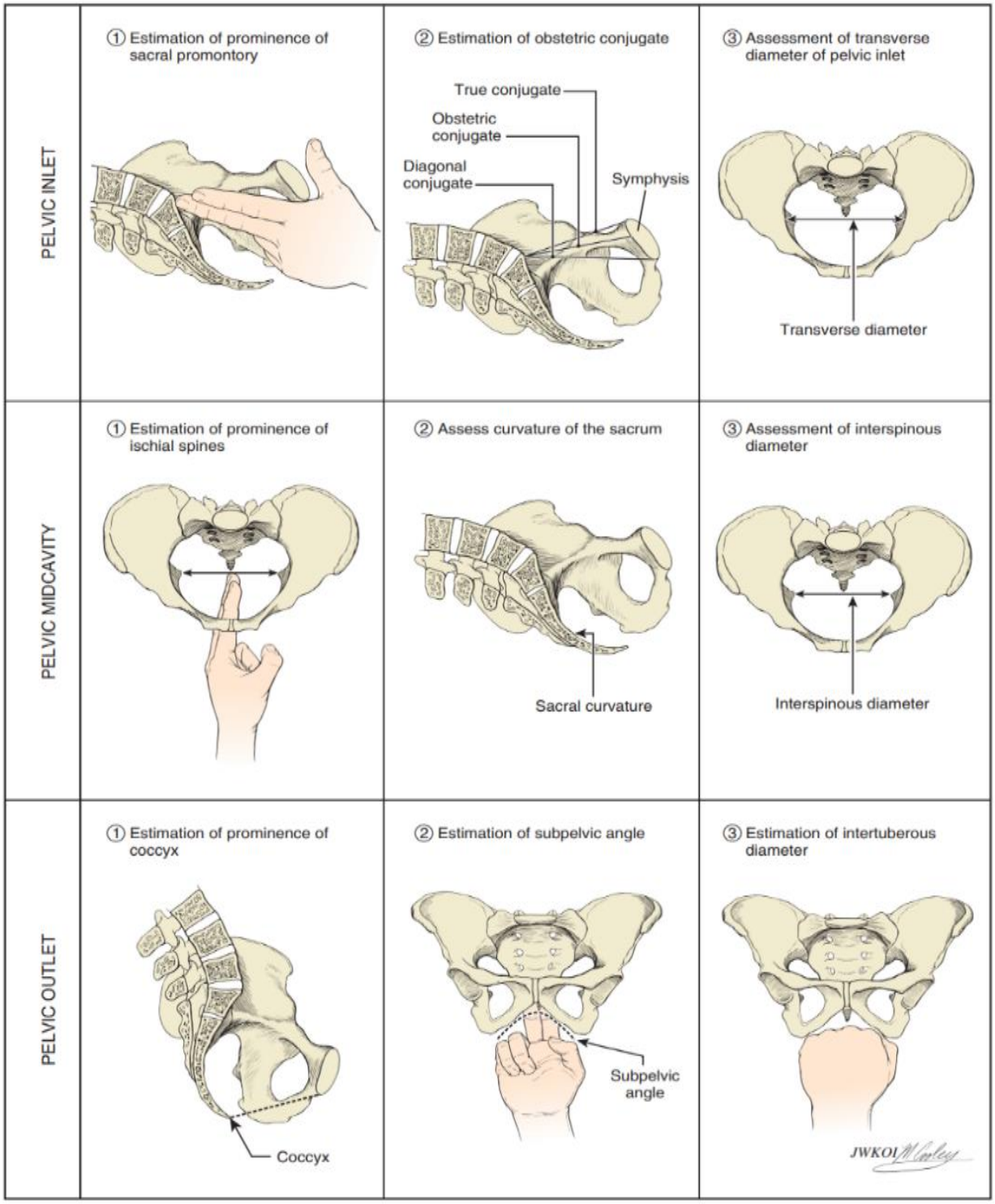

Figure 4: Clinical pelvimetry*[15]*

2.4 Mechanism of onset of labour

Labour is defined as the process by which the foetus, placenta and membranes are delivered from the uterus through the vagina from the action of regular uterine contractions that cause cervical dilatation[15].

There are four phases the uterus goes through from onset of pregnancy to delivery. These include **quiescence, activation, stimulation** and **involution**

Labour (Parturition) is the physiological event which is thought to occur due to the removal of factors that maintain uterine quiescence. The clear mechanism by which labour is initiated has not yet been elucidated but has been theorized to involve the interplay of endocrine paracrine and autocrine signaling between the foetus, the placenta, the uterus and the mother .

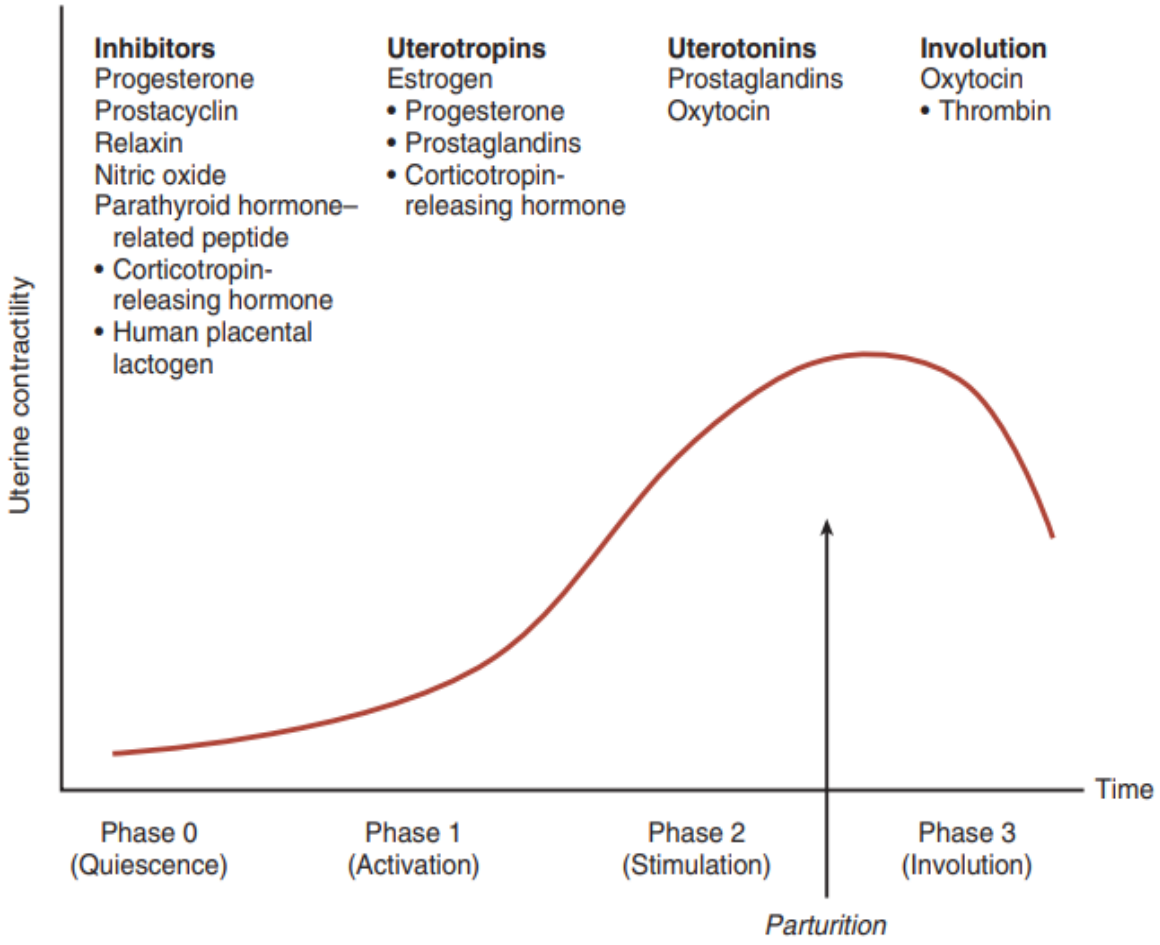

Figure 5: Regulation of uterine activity during pregnancy and labour*[15]*

2.4.1. The role hormones

During pregnancy uterine activity is inhibited by the presence of hormones such as progesterone, prostacyclin, relaxin, nitric oxide, parathyroid hormone–related peptide. During the activation phase there is an increase in foetal production of dehydroepiandrosterone sulfate (DHEAS), which on one hand increases the level oestrogen by conversion of DHEAS to estriol and estradiol by the placenta and on the other hand DHEAS together with increase in maternal and foetal cortisol, inhibit the conversion of fetal pregnenolone to progesterone. Progesterone levels therefore fall before labor[15]. An increase in oestrogen to progesterone levels is thought to stimulate uterine activity by:

- ✓ Increasing the release of oxytocin from maternal pituitary,
- ✓ Promoting the production of myometrial receptors for oxytocin and prostaglandin by 100–200 folds and increasing gap junctions in myometrial cells.
- ✓ Stimulate the synthesis of myometrial contractile proteins
- ✓ Increasing the excitability of the myometrial cell membranes
- ✓ Accelerating lysosomal disintegration in the decidual and amnion cells resulting in increasing prostaglandin synthesis in the amnion chorion decidua and myometrium. Prostaglandins in turn lower the threshold for myometrial excitement. Prostaglandin synthesis can also be stimulated by increase in cytokines (IL–1, 6, TNF), infection, vaginal examination, stripping of membrane or rupture of the membranes which can lead to preterm labour[18]

2.4.2. Uterine stretch theory

Like any hollow organ in the body, when the uterus in distended to a certain limit, it starts to contract to evacuate its contents. Uterine stretch increases expression of specific contraction associated proteins such connexin-43 and oxytocin receptors, gastrin-releasing peptide, the uterine stretch theory explains the mechanism of preterm labour in case of multiple pregnancy and polyhydramnios[16].

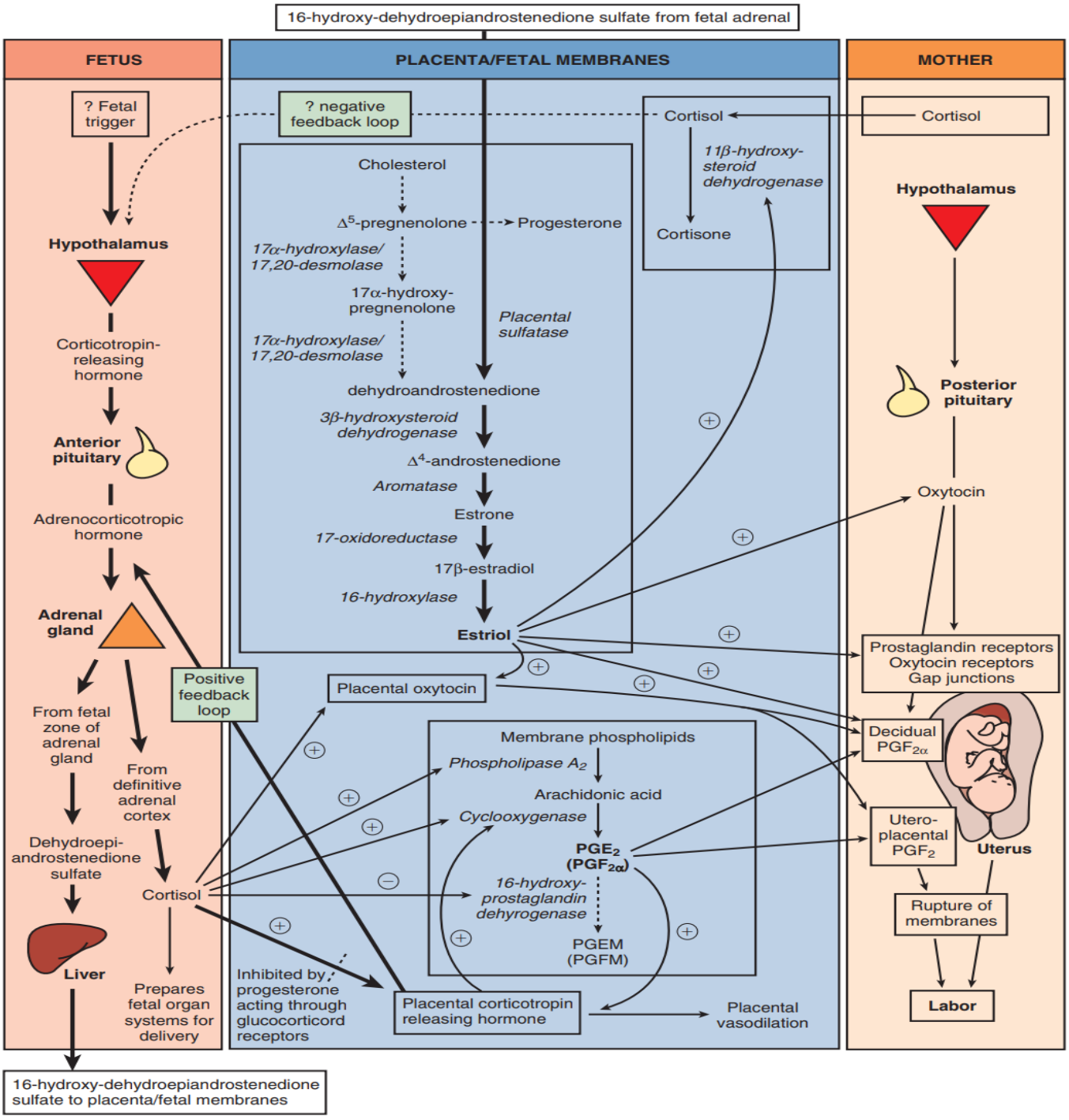

Figure 6: Cascade of physiologic onset of labour[15]

2.5 Stages of labour

Labour has traditionally been divided into 3 stages

I)First stage of labour: Ia the period from onset of labour to full dilatation. It is divided into 2 phases:

The latent Phase which is the period between onset of painful uterine contractions and cervical modification till progression of cervical dilatation up to 5 cm[19] . The normal duration of latent phase of labor in nulliparous women is about 20 hours (average 8.6 hours) and 14 hours (average 5.3 hours) in a multiparous women [18]. ***The active phase*** is the period from 5 cm cervical dilatation until full dilatation[19]

II) Second stage of labour: Is the period from full cervical dilatation to delivery of the foetus. Average duration is 1 hour in multiparous parturients and 2 hours in nulliparous parturients.

III) Third stage of labour: Period from delivery foetus to delivery of the placenta and membranes [18]

2.6. Mechanism of Labour

Mechanism of labour refers to the series of cardinal movements undertaken by the foetus through the maternal pelvis and genital tract resulting in delivery. There are 6 movements in for cephalic vertex presentation in the occipito anterior position. These movements vary slightly with other positions and presentations such as occipito posterior and face presentation. These movements include **descent, flexion, internal rotation, extension, external rotation, and expulsion**

Descent refers to the downward passage of the presenting part through the pelvis. **Engagement refers** to when the largest diameter of the foetal head passes through the pelvic inlet. In nulliparas, engagement may take place before the onset of labor, and further descent may not follow until the onset of the second stage. In multiparas, descent usually begins with engagement during labour. The greatest rate of descent occurs in the late active phase and during the second stage of labor especially for multiparous parturients. Descent is brought about by one or more of four forces:

- ✓ Pressure of the amnionic fluid,
- ✓ Direct pressure of the fundus upon the breech with contractions,
- ✓ Bearing-down efforts of maternal abdominal muscles, and
- ✓ Extension and straightening of the fetal body.

Flexion occurs when during descent, the foetal head meets an obstacle such as the cervix, pelvic walls, or pelvic floor. With this movement the chin is brought into more intimate contact with the fetal thorax, resulting in the presentation of the samllest diameter (suboccipito bregmatic diameter)

Internal Rotation is the inward rotation of the foetal head to assume the antero posterior diameter of the pelvic outlet as it passes through the pelvis this passive movement just like flexion occurs due to the shape of the pelvis and the pelvic floor musculature. The rotation occurs to bring the occiput away from the the tranverse axis.

Extension occurs once the foetus has descended to the level of the introitus. This descent brings the base of the occiput into contact with the inferior margin at the pubic symphysis. At this point, the birth canal curves upward. The fetal head is delivered by extension and rotation around the pubic symphysis. The forces responsible for this motion are the downward force exerted on the foetus, the uterine contractions along with the upward forces exerted by the muscles of the pelvic floor. The net effect is extension which causes the occiput to dilate the introitus and with further extension, progressive delivery of the head

External Rotation or Restitution, refers to the return of the fetal head to the correct anatomic position in relation to the foetal shoulders and also, serves to rotate the shoulders to align with in the antero posterior diameter of the pelvic outlet and bring the anterior shoulder under the pubic symphysis

Expulsion: It refers to delivery of the anterior shoulder followed by the rest of the foetal body

2.7. History of induction of labour

Induction of labour was introduced into obstetric practice by Thomas Denman, a leading male midwife in London in the 1780s. He advocated for induction in cases of the contracted pelvis, which at that time was mostly due to childhood rickets, where induction of labour had to be done before the foetus got too big to pass through the maternal pelvis[1] **.** Induction of labour methods have greatly evolved over the past century. In the beginning of the 20th century induction of labour was done exclusively by surgical methods which included the use of bougies, De Ribes bag and metal screw dilators for forceful dilatation of the cervix. The method of induction chosen depended on the reason for induction of labour, that is; maternal or foetal reasons. With the discovery of amniotomy as a method of induction in the 1930s most surgical methods were abandoned and amniotomy became the preferred method of induction. Medical methods of induction of labour were introduced around 1931, first with the use of oral castor oil then with the discovery of oxytocin from pituitary extract. In the 1940s medical induction of labour was done by giving oral castor oil then hourly administration of quinine then a subcutanoues administration of 2 units of oxytocin if labour did not start within 9hours. Castor oil was abandoned by the late 1940s due to it side effects which included violent diarrhoea, resulting in severe exhaustion. After the discovery of synthetic oxytocin in the 1950s, oxytocin alone was the preferred method of induction of labour until the 1980s when prostaglandins became commercially available. There was an increase in the success rates of induction of labour by the introduction of prostaglandin E2 and F2a with fewer maternal and fetal complications. It was

described as mimicking normal labour as such prostaglandins were used to ripen the cervix before augmentation of labour with oxytocin[20].

2.8. Indications for induction of labour

Generally labour is induced when the risk of continuing the pregnancy or waiting for spontaneous onset outweighs the risk of discontinuing the pregnancy[2]. This implies that labour can be induced in the preterm and term periods for several reasons related to the mother, or foetus, or both. The decision to induce labour for any given case comes after careful risks and benefits assessment for both mother and child and usually with the aid of recommendations from various obstetric societies. Some indications of induction of labour include:

I) Hypertensive disorders in pregnancy

It encompasses a spectrum of diseases characterized by an elevated blood pressure level with or without proteinuria. These include

- ✓ **Chronic hypertension**

Chronic hypertension is defined as hypertension that is present and observable before pregnancy or that is diagnosed before the 20th week of gestation.

- ✓ **Gestational hypertension**

Blood pressure elevation detected for the first time after 20weeks of gestation, without proteinuria[21]

- ✓ **Preeclampsia**

Multi systemic disorder characterized by new onset elevated blood pressure values detected for the first time after 20 weeks of pregnancy associated with proteinuria(300mg/dl on 24 hour proteinuria or 2+ on urine dipstick), or in the absence of proteinuria, could be diagnosed in the presence of signs of severity such as thrombocytopenia <100000/ml, pulmonary oedema, increased liver enzymes [22].

- ✓ **Superimposed preeclampsia.**

  This is defined as the occurrence of pre-eclampsia in someone with chronic hypertension. Distinguishing superimposed pre-eclampsia from worsening chronic hypertension is usually challenging. The diagnosis of superimposed pre-eclampsia can be made with the presence of the following findings:

- ✓ In women with hypertension and no proteinuria early in pregnancy (<20 weeks), new-onset proteinuria, after 20weeks gestation.
- ✓ In women with hypertension and proteinuria before 20 weeks' gestation.
- ✓ Sudden increase in proteinuria.
- ✓ A sudden increase in blood pressure in a woman whose hypertension has previously been well controlled.
- ✓ Thrombocytopenia (platelet count <100,000 cells/mm^3).

- ✓ An increase in ALT or AST to abnormal levels[21].

These hypertensive disorders in pregnancy complicate about 8 % to 12% of pregnancies and could result in complications such as eclampsia, HELLP syndrome, abruptio placenta, intrauterine growth restriction and intrauterine foetal death[23,24] Pre-eclampsia is considered the most severe entity in the spectrum of hypertensive disorders in pregnancy. In pregnancy induced hypertensive disorders the definitive causal treatment is interruption of the pregnancy or delivery of the foetus and the placenta, when expectant management is no longer possible. In the case of mild preeclampsia and gestational hypertension delivery is recommended over expectant management depending on the gestational age and the presence of severe features. In preeclampsia without severe features before term, expectant management is recommended with regular monitoring of the mother and foetus by means of serial foetal ultrasounds to evaluate foetal growth, weekly antepartum blood test such as uricaemia, liver enzymes, kidney function tests, close monitoring of clinical signs of severity such as: blood pressure, headaches, blurred vision and abdominal right upper quadrant pain. In the absence of features of severity pregnancy is allowed to evolve to 37 completed weeks in order to reduce the risk of neonatal respiratory complications. After 37 weeks of gestation delivery is recommended over expectant management. In the case of preeclampsia with severe features before 34 weeks expectant management can be done provided the mother and foetus are in stable conditions. Beyond 34 weeks gestation delivery is recommended due to the potential for rapid progression to the onset of complications [3]. Once delivery has been indicated, induction of labour is a valid option for delivery. Vaginal delivery is preferable to cesarean delivery for women with pre-eclampsia, thus avoiding the added stress of surgery to multiple physiologic dysfunctions. The aggressive approach to induction includes a clear end point for delivery, within 24 hours of the decision to induce labor. Most experts recommend a trial of induction regardless of cervical condition. If vaginal delivery cannot be effected within a reasonable time, cesarean delivery is considered and is also performed for other usual obstetrical indications[21].

II) Late term and postterm pregnancies

Term pregnancy refers to gestational age 37 completed weeks and 41weeks and 6 days. Due to the disparity in neonatal outcomes following deliveries in this 5week period of term pregnancies it was divided into 4 groups

Early term: from 37 completed weeks to 38 weeks 6 days weeks
Full term: from 39 completed weeks to weeks through 40 weeks 6days
Late term: from 41 completed weeks to 41 weeks 6days
Post term: from 42 weeks and beyond[25]

The post term period is associated with significant foetal complications and a few maternal complications. The risk of perinatal mortality increases by 8 times in postterm pregnancies compared to term pregnancies[26]

Neonatal complications are largely due to utero placental insufficiency from placental aging, calcification and due to increased placental programmed cell death after 41 weeks gestation this leads to decrease oxygen saturation in cord blood.

Table i: Maternal and Foetal Complications of postterm pregnancy[18]

Foetal complications			**Maternal complications**
During pregnancy	***During labour***	***During the postpartum period***	Perineal tears
Placental insufficiency	Shoulder dystocia	Chemical pneumonitis	Instrumental delivery with episiotomy
Oligohydramnios	Increased incidence of cord compression	Atelectasis and pulmonary hypertension due to meconium aspiration;	Caesarian delivery
Meconium stained liquor	Meconium aspiration	Hypoxia (low Apgar scores) and respiratory failure	
Fetal hypoxia	Poor apgar scores	Hypoglycemia and polycythemia	
Fetal distress	Low umbilical Cord pH	Increased Neonatology admissions	

Induction of labour is one of the means used to prevent post term pregnancies and the complications associated with them. WHO recommends induction of labour for women who are known with certainty to have reached 41 weeks (greater than or equal to 41 weeks +0/7 days) of gestation[27]

III) Premature rupture of membranes (PROM)

It is defined as rupture of membranes before the spontanoues onset of labour. Could be physiologic at term due to weakening of the membranes but preterm premature rupture of membranes could be due to several pathologic mechanisms which include intraamniotic infections, cigarette smoking, trauma, dietary deficiency of elements such as zinc. The main risk of premature rupture of membranes is the infectious risk for both the mother and the foetus. This risk is particularly significant if rupture of membranes is prolonged. Management of premature

rupture of membranes depends on the gestational age and the presence of other complicating factors such as signs of infection, abruptio placenta or abnormal foetal parameters. Before 34 weeks of gestation expectant management is recommended in the absence of complicating factors. After 34 weeks delivery has been traditionally recommended. Spontanoues labour usually begins with 33 hours of rupture of membranes in more than 80% of cases[28]. To reduce the risks associated with prolonged rupture of membranes induction of labour is usually done when spontaneous labour does not occur within 24hours.

IV) Gestational diabetes

Is a condition where there is impaired glucose tolerance during pregnancy[29]. It complicates about 16.7% of pregnancies world wide [30]. Impaired glucose tolerance is due to reduced peripheral insulin sensitivity mediated by the presence of human placental lactogen (HPL) , cortisol, oestrogen, progesterone and prolactin especially in the second half of pregnancy as from the 24^{th} week leading to persistent elevated blood glucose levels [31]. This elevated glucose levels can have some consequences on both mother and foetus,

Table ii: Maternal and Foetal complications of gestational diabetes[18,29]

Maternal	Foetal
✓ Increased risk of pre eclampsia	✓ Foetal malformations such sacral agenesis,
✓ Increased risk of caesarian delivery	✓ Polyhydramnious
✓ Increased risk of instrumental delivery, perineal tears and postpartum hemorrhage due to foetal macrosomia	✓ Intrauterine growth restriction (IUGR)
✓ Repeated urinary tract infections	✓ Increased risk of macrosomia
✓ Recurrent spontaneous abortion	✓ Neonatal hypoglycemia
✓ Preterm labor	✓ Shoulder dystocia
	✓ Hyperbilirubinemia,
	✓ Increased risk of intrauterine foetal death and stillbirth

In a context of gestational diabetes timing of delivery is between 39 weeks to 40 weeks of gestation, unless otherwise indicated. Expectant management up to 41 weeks of gestation could be done if associated antepartum monitoring [29]. Allowing the pregnancy to progress beyond 41 weeks is not recommended[32].

V) Malaria in pregnancy at term

Malaria is a disease caused by infestation of the human body with plasmodium species the most common and dangerous specie being plasmodium falciparium. Malaria in pregnancy has been associated with adverse maternal and foetal outcomes ranging from spontanoues abortions in the first trimester to maternal anemia, intrauterine foetal death, intrauterine growth restriction and preterm labour in the second and third trimester. The incidence of malaria in pregnancy in the third trimester in Cameroon was estimated at 4,2%. Malaria in the third trimester has been shown to be associated with adverse maternal and perinatal outcomes [33]

IV) Other indications of induction of labour

- ✓ Intrauterine foetal death
- ✓ Foetal malformations not compatible with life
- ✓ Maternal medical conditions
- ✓ Abruptio placenta
- ✓ Elective(social) induction of labour [29]

2.9. Contraindications to induction of labour

Any condition that prohibits vaginal delivery is a contraindication for induction of labour these conditions include

- ✓ Previa or placenta previa
- ✓ Transverse fetal presentation
- ✓ Umbilical cord prolapse
- ✓ History of a prior classical cesarean section
- ✓ Active herpes infection
- ✓ A previous myomectomy breaching the endometrial cavity[18]

2.10.Methods of induction of labour

I) Oxytocin

Oxytocin is peptide hormone produced by the hypothalamus and secreted by the posterior pituitary gland. It was discovered in 1906 when pituitary extract was found to cause contractions on pregnant rats' uterus. This posterior pituitary extract called "pituitrin" containing both posterior pituitary hormones was isolated and later separated into oxytocin and vasopressin. The name oxytocin was coined from the Greek word for swift birth. The molecular

structure of oxytocin was discovered by Vincent du Vigneaud and he developed a synthetic version known as syntocinon in 1954 This enabled it widespread use in obstetrics[1].

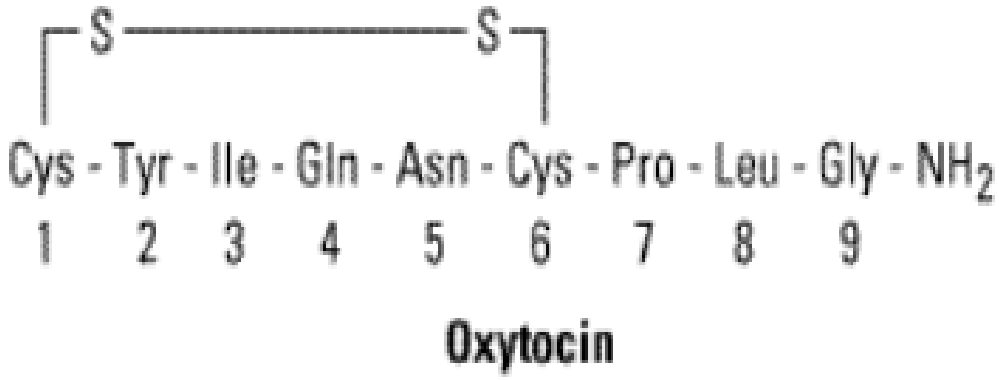

Figure 7: Chemical structure of Oxytocin [34]

Pharmacokinetics

Natural Oxytocin is synthesized in the supraoptic and paraventricular nuclei of the hypothalamus, the axons of which terminate in the posterior pituitary gland. During axonal transport, the precursor neuropeptide, oxytocin neurophysin, is cleaved and modified to the final form of the oxytocin hormone, and then it is stored in the posterior pituitary until various stimuli trigger exocytotic release into the circulation[35]. Oxytocin has specific receptors in the myometrium and the receptor concentration increases greatly during pregnancy, reaching a maximum in early labor at term. The response to a given dose of oxytocin is very individualized and depends on the sensitivity of the uterus, which is determined by the oxytocin receptor concentration. Oxytocin is not bound to plasma proteins and has a plasma half-life of approximately 1 to 6 minutes. After intravenous administration of oxytocin, uterine response occurs almost immediately and subsides within 1 hour. Following intramuscular injection of the drug, uterine response occurs within 3 to 5 minutes and persists for 2 to 3 hours. Its rapid removal from plasma is accomplished largely by the kidney and the liver. Only small amounts are excreted in urine unchanged [36].

Pharmacodynamics

Endogenous oxytocin production and secretion is controlled by a positive feedback mechanism which the initial release of oxytocin stimulates, such as contractions, leading to cervical dilation and these actions amplify oxytocin release from the pituitary, referred to as the Ferguson reflex. Oxytocin promotes contractions by increasing the intracellular calcium. The oxytocin receptor is a G-protein coupled receptor. Oxytocin binding and receptor

activation triggers intracellular calcium mobilization and smooth muscle contraction. During pregnancy, increased estrogen promotes myometrial oxytocin receptor gene expression, leading to a 50- to 100-fold increase in oxytocin receptor concentration in the first trimester of pregnancy, an additional 200- to 300-fold increase throughout gestation, and a maximum concentration during early labor[37].

Intrapartum risk of oxytocin use

The use of oxytocin has been associated with some maternal adverse effects including

- ✓ Uterine tachysystole and fetal heart rate changes
- ✓ Clinical chorioamnionitis
- ✓ Postpartum hemorrhage
- ✓ Water intoxication

The current body of evidence does not show a reliable association between oxytocin use and adverse neonatal outcomes including low Apgar scores, neonatology admission[38]

II) Prostaglandin analogues

Prostaglandins are lipophilic arachidonic acid metabolites that are produced endogenously and which take part in several physiologic processes. They were first isolated from seminal plasma in 1935 . Prostaglandines are formed from serial oxidation of arachidonic acid by the cyclooxygenase enzymes COX1 and COX 2. Initially, arachidonic acid is created when the enzyme phospholipase A2 cleaves the lipid diacylglycerol into the molecule arachidonic acid. Cyclooxygenase enzymes then produce prostaglandins from arachidonic acid through sequential oxidation of each compound to produce leukotrienes and prostaglandines[37] To exert their effect prostaglandines bind to prostaglandin receptors which are part of the G-protein couple receptor family. Prostaglandins of the Fand E series have marked effects on the uterus and cervix.

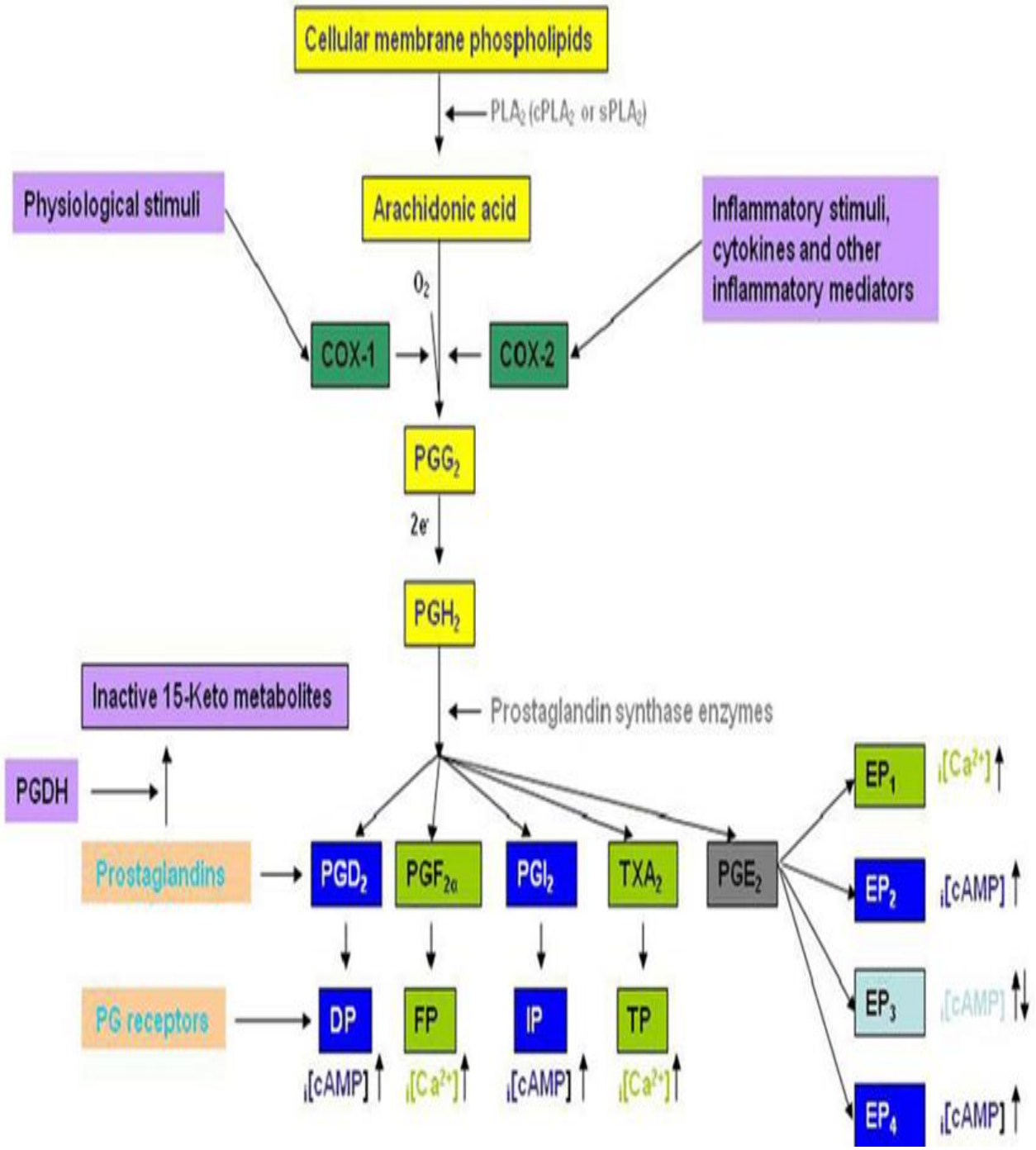

Figure 8: Prostaglandin synthesis from Arachidonic acid*[39]*

Table iii: Effects of prostaglandin on different body tissues[40]

	PGE1	**PGE2**	**PGF2**	**PGI**
Vascular effects	Vasodilatation	Vasodilatation	Vasoconstriction	
Gastrointestinal tract		Longitudinal muscle contraction Circular muscle relaxation	Circular muscle contraction	Weak circular muscle contraction
Airways	Smooth muscle relaxation	Smooth muscle relaxation	Smooth muscle contraction	Smooth muscle relaxation
Platelets	Inhibit platelet aggregation			Inhibit platelet aggregation
Kidneys	Increase glomerular filtration rate due to its vasodilatory effect	Antagonizes the inhibition of phosphate resorption by parathyroid hormone in the proximal tubule Increase glomerular filtration rate glomerular due to its vasodilatory effect		Increase glomerular filtration rate glomerular due to its vasodilatory effect
Eye	Lower introcular pressure	Lower intraocular pressure	Lower intraocular pressure	
Anterior pituitary	Promote the release of growth hormone, prolactin, TSH, ACTH, FSH, and LH	Promote the release of growth hormone, prolactin, TSH, ACTH, FSH, and LH		

Prostaglandins in their natural form have a short half life, are chemically unstable and have several side effects such as rhinorrhea, trembling, retching, emesis, diarrhea and so cannot effectively be used as therapeutic agents ***Exogenous*** prostaglandin analogues which are derived from structural manipulation of prostaglandines and are

more stable have a longer duration of action better specificity and fewer side effects. Prostaglandin analogues are widely used in obstetrics for termination of pregnancy, induction of labour and prevention and management of postpartum hemorrhage. The two main prostaglandin analogues used in induction of labour are Prostaglandine E1 and E2 analogues. They stimulate myometrial contraction by increasing intracellular calcium levels.

Dinoprostone (Prostaglandins E2)

Figure 9: Chemical structure of Dinoprostone[40]

Dinoprostone exist as a suppository, gel, and time release insert which are inserted vaginally. After administration rapid metabolism of dinoprostone occurs primarily in the local tissues; any systemic absorption of the medication is cleared mainly in the maternal lungs and, secondarily, at sites such as the liver and kidneys. The gel and time-release vaginal insert formulations are indicated only for cervical ripening before labor induction. However, the 20-mg suppository is not indicated for cervical ripening. It instead is used for pregnancy termination between 12 and 20 weeks' gestation and for evacuation of the uterus after fetal demise up to 28 weeks. The gel form is available in a 2. 5-mL syringe for an intracervical application of 0.5 mg of dinoprostone. With the woman supine, the tip of a prefilled syringe is placed intracervically, and the gel is deposited just below the internal cervical os. After application, the woman remains reclined for at least 30 minutes. Doses may be repeated every 6 hours, with a maximum of three doses recommended in 24 hours. A 10-mg dinoprostone vaginal insert is also used for cervical ripening. This is a thin, flat, rectangular polymeric wafer held within a small, white, mesh polyester sac. The sac has a long attached tail to allow easy removal from the vagina. The insert provides slower release of medication-0.3 mg/hr-than the gel form. The vaginal insert is used as a single dose placed transversely in the posterior vaginal fornix. Dinoprostone has a half life of Less than 5 minutes. The most common effects associated with dinoprostone is tachysytole with or without an abnormal foetal heart rate pattern[3,16]

Misoprostol

It is an orally active synthetic PGE1 analogue initially marketed for the prevention of peptic ulcers, was later found to have effects on the uterus.

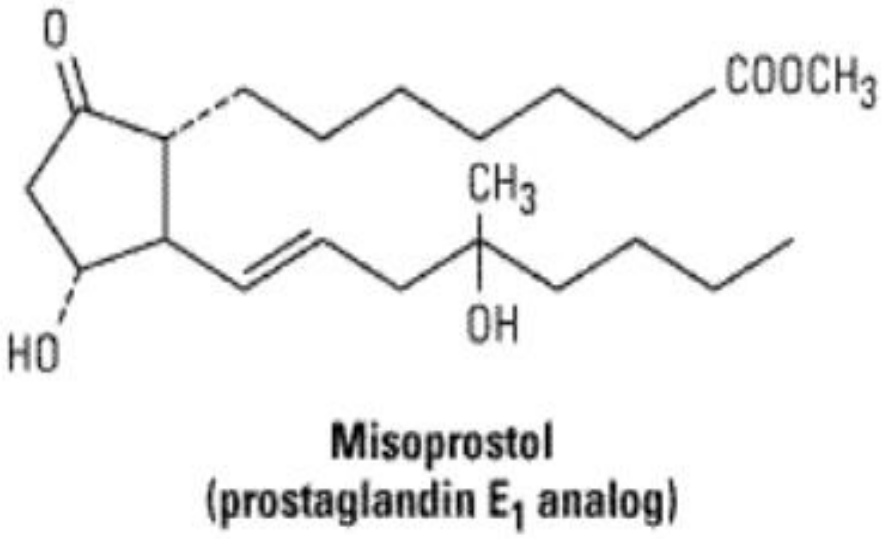

Figure 10:Chemical Structure of Misoprostol[40]

Misoprostol exists as 100 or 200mcg tablet and could be administered orally, sublingually or vaginally. Misoprostol is rapidly absorbed after administration and the onset of action is approximately 30 minutes after oral administration and persists for about 3 hours. Misoprostol is a pro-drug metabolized by de-esterification into the active metabolite misoprostol acid. Misoprostol is primarily excreted in urine as inactive metabolite[16]

2.11. Monitoring and surveillance during induction of labour

The partograph is a tool for monitoring maternal and foetal wellbeing during the active phase of labour, and a decision-making aid when abnormalities are detected.
Its central feature is a graph used to record the progress of cervical dilation, as determined by vaginal examination. Start the graph at 5 cm of dilation, and 3 contractions every 10 minutes. In the case of induction of labour induction of labour, it is started at 4 cm of dilation. Parameters are plotted on the graph each time they are checked:

Maternal Parameters:

- ✓ Vital signs (heart rate, blood pressure and temperature)
- ✓ Time of spontaneous or artificial rupture of the membranes

- ✓ Uterine contractions (number per 10 minutes and duration)
- ✓ Urine output
- ✓ Drugs administered (oxytocin, antibiotics, antispamodics, magnesium sulphate)

Foetal Parameters:

- ✓ Foetal heart rate
- ✓ Amniotic fluid (colour, odour and quantity)
- ✓ Descent of the foetal head and head moulding

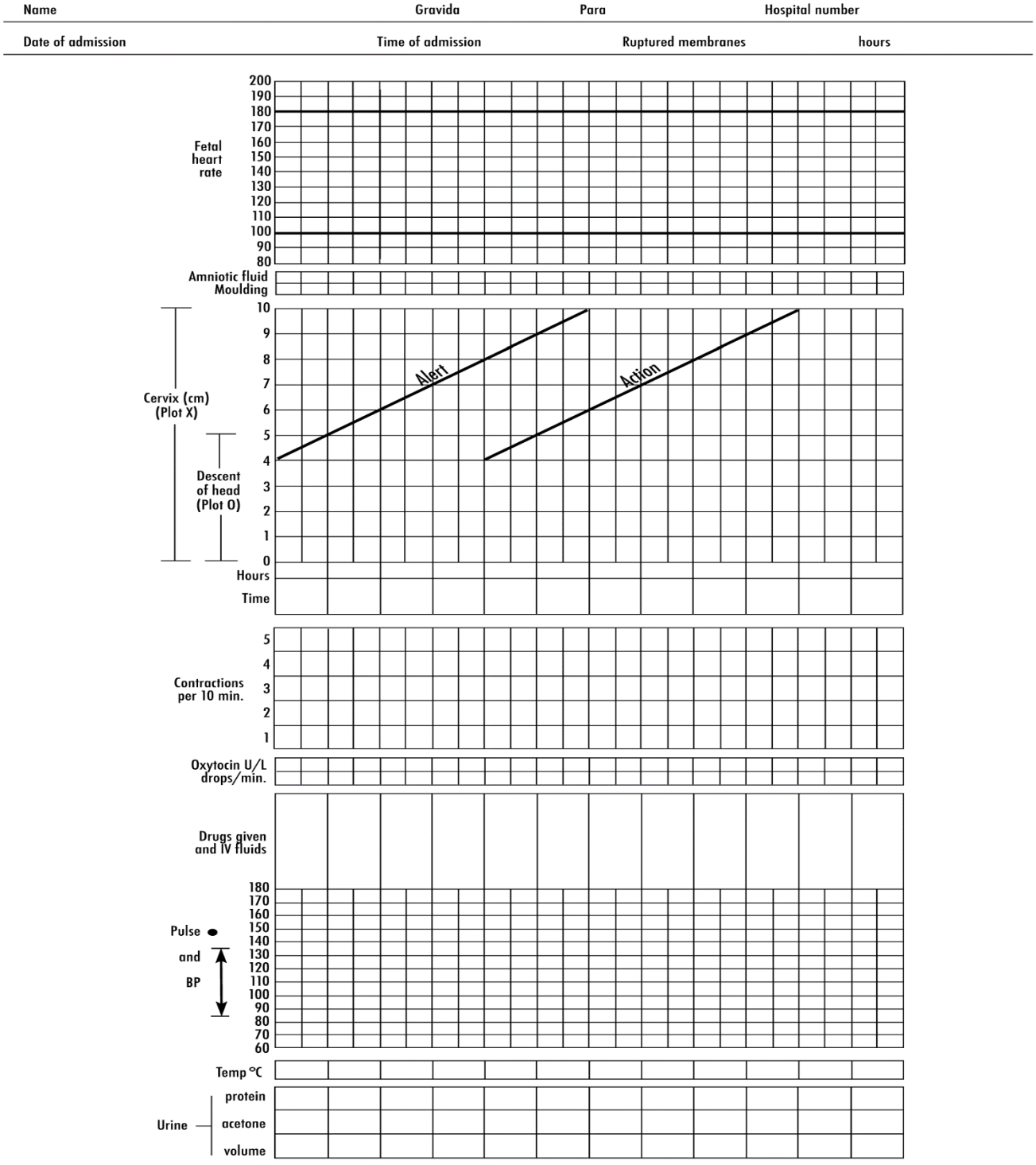

Figure 11: WHO partogram*[16]*

2.12 Factors influencing the outcome of induction of labour

I) Bishop score

The bishop score is a pelvic evaluation score that was developed in 1964 by English obstetrician Edward Bishop. It is a score that is the summation of a numerical estimate based on digital examination of the cervix to evaluate five criteria that carry a maximum the score of 13 . These criteria include cervical dilatation, effacement, and station are scored 0 to 3 points, while cervical position and consistency are scored 0 to 2 points

Table iv: Bishop score[3]

Score	Dilatation	Position	Effacement	Station	Cervical consistency
0	Closed	Posterior	0-30	-3	Firm
1	1-2	Mid position	40-50	-2	Medium
2	3-4	Anterior	60-70	-1,0	Soft
3	5-6		80	+1,+2	

- ✓ Cervical dilation is the measure of how dilated the cervix is in centimeters. This is performed by estimating the average diameter of the open cervix.
- ✓ Effacement is the thinning or shortening of the cervix expressed as a percentage of the whole cervix. Zero percent effacement means the cervix is a normal, pre-labor length. Fifty percent effaced means the cervix is at half of the expected length. If the cervix is 100% effaced, it is paper thin.
- ✓ The station is the position of the fetal head relative to the ischial spines of the maternal pelvis. The ischial spines are halfway between the pelvic inlet and outlet. At zero station, the fetal head is at the level of the ischial spines. Above and below this level are divided into thirds, by which station is denoted with negative numbers above and positive numbers below the zero station. As a fetal head makes its descent, the station changes from -3, -2, -1, 0, +1, +2, +3. In 1989, the American College of Obstetrics and Gynecology redefined station from -5 to +5, using centimeters instead of thirds as a measurement from the ischial spines. The Bishop score, however, uses the -3 to +3 system.
- ✓ Position refers to the position of the cervix relative to the fetal head and maternal pelvis.
- ✓ The consistency of the cervix refers to the feel of the cervix on the exam. A firm cervix has a consistency of the fore head , median intensity has the consistency of the similar to the tip of the nose, while a soft cervix has a consistency similar to the lips of the oral cavity.[41]

Since its conception in the 1960s the Bishop score has been the main tool used to predict the outcomes after induction of labour. Favourable Bishop's score of 7 and above translated to a higher probability of successful induction of labour while an unfavourable bishop's score of 6 and below indicates that the cervix had to be further ripened prior to the onset of induction of labour[41] Initially the bishop score was designed to predict the successful vaginal delivery in the multiparous women at term with the available methods of induction at the time which included oxytocin membranes stripping and amniotomy. Today this scoring system has been extrapolated to predict outcomes irrespective of gestational age and parity and in the context of newer methods of induction which also have a cervical ripening effect such a misoprostol and ballon catheter[42]. The Bishop score is one of the most significant predictors of successful induction of labour.

II) Parity

Multiparity is associated with better maternal and neonatal outcomes compared to nulliparity following induction of labour. There is also a lower rate of caesarian delivery in multiparous parturients compared to nulliparous parturients[43].

III) Maternal Body Mass Index

Body mass index is calculated as the weight in kilograms divided by the square of the height in meters **[kg/(m)2**

Table v: Classification of body mass index*[44]*

Body mass index	Characteristic
< 18.5	Underweight
≥18.5-24.9	Normal weight
≥25.0-29.9	Overweight
≥ 30-39.9	Obese
≥40	Morbid Obesity

Higher maternal body mass index is associated with adverse outcome following induction of labour. Maternal obesity has been shown to have an increased risk of caesarian section, longer time from induction of labour to delivery irrespective of the method of induction of labour, and an increased in the instrumental delivery rate[45,46]

IV) Foetal weight

Foetal weight can be estimated clinically through calculations using the fundal height or radiologically where certain foetal measurements are put into regression equations to determine the estimated foetal weight,

Formulars used to estimate foetal weight clinically include include

1)Johnson formular : **Foetal weight (g)=[Fundal height (cm)- n]× 155 where**

n=12 if vertex is above ischial spine or 11 if vertex is below ischial spine. If a patient weighs more than 91 kg, 1 cm is subtracted from the fundal height.

2)Dare's formular :

Foetal weight (g) = abdominal girth(cm) × Symphysio-fundal height (cm)

3) **Kongnyuy-Mbu formular:**

Foetal Weight (g) =3[Fundal height(cm)]2

Radiological methods include **ultrasonography** and **magnetic resonance imaging**. Due to the scarcity and cost of magnetic resonance imaging,ultrasonography is the most commonly used imaging modality. Some studies have shown that the clinical methods of estimating foetal weight are just as accurate as radiological methods

Foetal weight <2500g and >4000g at the time if induction of labour were associated with higher rates of caesarian section and admission into the neonatology unit[47] There is an increase in caesarian section rates with every 500 g increase in foetal weight[48]

Other factors that affect the outcome of induction of labour include: Maternal age, Gestational age at induction of labour, Method of induction of labour[18]

2.13 Recent publications

2.13.1 Proportion of induction of labour, demographic and obstetrical characteristics

Year	Author	Country	Title of study	Study design	Findings
2014	Walsh et al	Ireland	Mode of delivery and outcomes by birth weight among spontaneous and induced singleton cephalic nulliparous labors	Hospital based prospective observational study	The mean maternal age = 29.4 ± 5.3 years The mean birth weight was 3539 ± 463 g; Rate of caesarian section was (28.7%) in nulliparous women induced group compared to spontaneous labour. There was higher incidence of post patum hemorrhage, surgical vaginal delivery, anal sphincter injury, and shoulder dystocia in all birth weight groups
2019	Beshir et al	Harari Ethopia	Outcome of induction and associated factors among induced labours in public Hospitals	Retrospective cross sectional study	Prevalence of success of induction of labor was 65% Most common indications were Preeclampsia/eclampsia and pre-mature rupture of membranes
2017	Lueth et al	Ethopia	Prevalence, outcomes and associated factors of labor induction among women delivered at public hospitals of Mekelle town	A hospital based crossectional study	Prevalence of induction of labour was 5.5% Majority of induced women delivered vaginally An unfavorable Bishop Score before induction and induction using misoprostol were the factors associated with failed induction of labor.
2019	Yosef et al	Ethopia	Proportion and Outcome of Induction of Labor Among Mothers Who Delivered in Teaching Hospital	Retrospective cross-sectional study	The prevalence of labor induction was 20.4%. The most commonly reported cause of induction was preeclampsia The unfavorable and induction using misoprostol were the factors associated with failed induction of labor.

2017	Bengtsson et al	Sweden	Neonatal outcomes of elective labor induction in low-risk term pregnancies	National population-based cohort study.	Elective Induction of labour was associated with a higher risks of chorioamnionitis, bacterial sepsis, intracranial hemorrhage, assisted ventilation, hyperbilirubinemia, APGAR < 7 at 5 min, and neonatal seizures compared to deliveries with spontaneous labor onset.
2021	Jaiswal et al	Tanzania	Maternal and neonatal outcome in pregnant women undergone induction of labor at Muhimbili National Hospital.	Descriptive cross sectional study	Induction of labour accounted for 2.5% of all deliveries. The most common indications for induction were postdate pregnancy, hypertensive disorders of pregnancy, and premature rupture of membrane. The majority of induced women delivered vaginally. Neonatal outcomes were generally positive, no neonatal deaths or Apgar scores at the 5th minute less than 7
2010	Tandu-Umba et al	Congo	Maternal and perinatal outcomes of induction of labor at term in the university clinics of Kinshasa	descriptive retrospective cohort study	Proportion of deliveries following induction of labour was 3.2% were concerned with induction of labor. Means maternal age was 30.5 ± 5.7 years,
2021	Ugwuororko et al	Nigeria	Obstetric Outcome of Induction of Labour in a Tertiary Hospital in Nigeria	Retrospective Cross-Sectional Study	The prevalence of induction of labour was 4.6%. Indications for caesarian sections included foetal distress, cephalopelvic disproportion/malposition and failed cervical ripening

2.13.2. Comparism of Outcome and Complication following induction of labour with Oxytocin vs Prostaglandins

Year	Author	Country	Title Of Study	Study Design	Findings

2020	El Awdy et al	Egypt	Comparison Of Obstetrical Outcome With Labor Induction Agents Used At Term	Hospital based prospective study	Misoprostol associated with a higher proportion of induction of labour compared to oxytocin . No statistical significant difference in maternal and neonatal complication in both groups
2024	Ameri et al		Effect of misoprostol versus oxytocin on delivery outcomes after labour induction in pregnant women: A systematic review and meta-analysis of randomized controlled trials	A systematic review and meta-analysis of randomized controlled trials	Vaginal misoprostol associated with a reduced risk of caesarian section but increased risk of tachysystole No statistical significance in perinatal outcomes between oxytocin and misoprostol
2019	Tanya Das et al	India	Induction of Labor with Oral Misoprostol vs Oxytocin: A Comparative Study	Prospective comparative study	The successful induction and vagina delivery rate was more with oral misoprostol than with oxytocin. Induction to active labor time and induction to delivery time was significantly shorter for the oxytocin group than the misoprostol group
2014	Acharya et al	Nepal India	Outcome of misoprostol and oxytocin in induction of labour	Hospital-based observational study	Rate of induction of labour was found to be 7.2%. Post-term pregnancy was the most common reason for induction of labour .The Onset of labour was much rapid in oxytocin than misoprostol but induction to delivery intervals were similar. Foetal distress was the most common indication for caesarean section. The occurrence maternal complication was found to be similar in misoprostol and oxytocin groups, nausea/vomiting and fever were the most common

					maternal complication. meconium stained amniotic fluid was the most common neonatal complication
2015	Garba et al	Kano Nigeria	Induction to delivery interval using transcervical Foley catheter plus oxytocin and vaginal misoprostol: A comparative study at Aminu Kano Teaching Hospital	prospective randomized controlled trial	The average induction delivery time interval was shorter in the misoprostol group than in the Foley catheter oxytocin group
2022	Ahmed et al	Cairo, Egypt	Oxytocin Versus Oral Misoprostol for Induction of Labor in Pregnant Women with Term Prelabour Rupture of Membranes: a Randomized Clinical Trial	Randomized Controlled Clinical Trial	No significant difference in the proportion of vaginal deliveries with both misoprostol and oxytocin patients induced by misoprostol had a shorter induction to delivery interval
2022	Muhmed et al	Egypt	Oxytocin Versus Vaginal Misoprostol for Induction of Labour in Pregnant Women with Term Pre-Labour Rupture of Membranes	Randomised controlled trial.	NICU admission was found less with misoprostol compared to oxytocin but this difference was not statistically significant . The common maternal side effect was shivering for both misoprostol and oxytocin No statistically significant difference in maternal outcomes between oxytocin and misoprostol

CHAPTER 3: METHODOLOGY:

3.1. Study Design

This study was a hospital based descriptive cross-sectional study with an analytic component. Data collection was prospective.

3.2. Study duration

The study was conducted over a period of seven months from January 2024 to July 2024

3.3. Study setting

The study sites included 3 teaching hospitals in Yaounde namely:

- ✓ **Yaounde Gyneco-Obstetric and Pediatric Hospital (YGOPH),**
- ✓ **Yaounde Central Hospital (YCH),**
- ✓ **Yaounde University Teaching Hospital (YUTH).**

These hospitals represent the main reference centres in Yaounde. Their strategic locations in the town of Yaounde ensures that they receive referrals from primary and secondary health facilities and are very accessible by road.

3.3.1. Yaounde Gyneco-Obstetric and Pediatric Hospital (HGOPY)

The Yaounde Gyneco-Obstetric and Pediatric Hospital is a parastatal health facility that was created in 2001 from the Sino- Cameroon cooporation and inaugurated on the 28th of March 2022 by the president of the republic of Cameroon. It was created with the aim of improving the health care for women and children in Cameroon. To this effect the Gynecology and Obstetric department has a staff strength of 11 obstetricians and gynecologist among whom is one professor of gynecology and obstetrics who also doubles as the director general of the hospital, two associate professors, midwives and other supporting staff. The hospital also has pediatricians, anesthesiologists who work in collaboration with the maternity. The gynecology and obstetrics department of the hospital made up of an outpatient consultation unit, a family planning unit, a general labour room with four beds, one private labor / delivery room, one general delivery room with 2 beds , 4 general hospitalisation rooms with 48 beds and 12 private hospitalisation rooms. The hospital has a state of the art theatre with 4 operating rooms, a neonatal intensive care unit which is adjacent to the labour room and a general intensive care unit. The maternity carries out approximately 2000 deliveries per year, with 65 % of these deliveries being pervaginal and 35% by caesarian section

3.3.2. Yaounde Central hospital (HCY)

The Yaounde Central Hospital is Cameroon's largest hospital and has been operational since 1933. Presently the maternity unity has 7 gynecologist among who 1 associate Professor, 6 midwives, residents, neonatology nurses and other supportive staff. The maternity unit is equipped with an operating theatre that has 2 operating rooms general labour room with 4 beds. A delivery room with 5 beds, an emergency unit, a neonatatology intensive care unit, an intensive care unit and hospitalisation wards . The maternity carries out averagely 200 deliveries per month

Yaounde University Teaching Hospital (CHU)

The hospital was founded 1965. It has as goal to train general physicians who can diagnose and treat a wide range of diseases, and can provide health education. The hospital has a newly renovated maternity ward with a well-equipped theatre, 1 general labour room with 3 beds, 2 private labour rooms and 2 delivery rooms. Adjacent to the delivery room is the intensive care unit with 6 beds. The hospital also has a neonatology unit and a hemodialysis unit. The staff of the maternity ward is comprised of 6 obstetricians among which 2 associate professors, 2 midwives, 8 delivery nurses and other supporting staff. The maternity ward conducts on average 50 deliveries per month

3.4. Study population

The study population included women undergoing induction of labour from 28 weeks of gestation (using prostaglandines and oxytocin) in the labour rooms of the aforementioned study sites.

3.4.1) Inclusion criteria

- ✓ Women who were undergoing induction of labour from 28 weeks gestation with Prostaglandines (misoprostol or dinoprostone) and oxytocin.
- ✓ Women who consented to be part of the study.
- ✓ Adolescents whose parents or guidians gave informed consent.

3.4.2) Exclusion criteria

- ✓ Women induced for foetal malformations.
- ✓ Women induced for intrauterine foetal death.
- ✓ Women who refused to consent to the study.

3.4.3. Non inclusion criteria

- ✓ Women with previous uterine scars.

- ✓ Women with multiple pregnancies.
- ✓ Women with babies in malpositions or malpresentations.
- ✓ Gestational ages less than 28 weeks.

3.5. Sampling method

A non-probability consecutive sampling was used to recruit study participants. Every woman undergoing induction of labour from 28 weeks in the study sites without exclusion or non-inclusion criteria was recruited. These women were followed up till discharge from the hospital.

3.6 Sample size

The sample size was calculated using Lorentz formular

$$n= z^2 \times p\ (1-p) / d2$$

n = sample size.

Z = standard normal distribution corresponding to significance level at $\alpha = 0.05$.

p = proportion of labor induction.

"P", proportion of labor induction is assumed to be 9.57%. This proportion was gotten from the maternity annual report of the Yaounde Gyneco Obstetric and Pediatric Hospital for 2022

d = margin of error 5%.

N=133

3.7. Study procedure

3.7.1 Ethical and administrative procedure

Prior to the onset of the study ethical, clearance was obtained from the ethical review board of the faculty of medicine and biomedical sciences of the University of Yaounde I. After obtaining ethical clearance, administrative clearance was gotten from the respective ethics review board of each study site by depositing a copy of the research protocol, an application letter and a copy of the ethical clearance from the faculty.

3.7.2 Data collection

Potential participants for the study were admitted into the labour room either from outpatient consultation, hospitalisation, from home or were referred from another health facility. After the decision to induce had been taken by the treating physician they were sent to the labour room from where they were recruited into the study.

To determine the prevalence of induction of labour, the number of women who underwent induction of labour from 28weeks gestation irrespective of the indication was noted by the principal investigator each month and the end of the study period the total number of induced cases was divided by the total number of deliveries.

The medical records of all potential participants were reviewed in order to rule out any exclusion criteria. Women who had no exclusion criteria were approached to consent and be part of the study. Those who consented were enrolled into the study. The number of women excluded from the study and their exclusion criteria was recorded by the principal investigator throughout the study period.

To obtain their social and demographic data participants were interviewed. The obstetrical data and method of induction of labour was gotten by reviewing the participant files. The method of induction of labour used by the treating physician was determined mainly by the Bishop score. Other factors taken into consideration were the parity and the indication for induction of labour. For unfavourable Bishop scores (bishop score<7) induction was done with misoprostol or dinoprostone. When the Bishop score was favourable (greater than or equal to 7) oxytocin was used for induction of labour. In some cases cervical ripening was done with a foley's catheter prior to induction of labour when the bishop score was unfavourable. Misoprostol was administered at 50mcg per dose either sublingually or in the posterior vaginal fornix every 4 to 6 hours with a maximum of 4 to 5 doses. Dinoprostone came in pre-filled syringes of 0.5 mg and was placed in the cervical canal for a maximum of 2 doses. Oxytocin was titrated with a start dose of 10IU in 500cc of 5-10% glucose solution and started at 5 to 10 drops per minute. The titration was increased by 5 to 10 drops per minute for a maximum dose of 60 drops/minute or until onset of adequate contractions (4-5 contrations in 10 minutes lasting 40 to 60 minutes).

Outcome and complications were recorded progressively during labour, delivery and throughout the participants stay in the hospital until discharge.

3.8. Data collection tool

Information was gathered with the help of a targeted data collection sheet(questionnaire) administered by the principal investigator and research assistants who were residents on internship in the study sites. The data collection sheet was anonymous containing identification numbers only known by the principal investigator. The first page of the questionnaire contained an information sheet about the study clearly explaining the implications

and the objectives of the study. This was followed by the consent form and or assent form to be signed by the participants or their guardians in cases where participants were below the age of 18. The structure and design of the data collection was designed from previous studies[9,49,50]The questionnaire was divided into 2 sections: the first section contained the socio demographic and obstetric data, and the second section contained the maternal and foetal outcome and complications . After designing the questionnaire it was internally validated by the supervisor and co-supervisor. It was then tested by colleagues to determine the ease of administration, he feasibility, and reliability of the data collection sheet in collecting information necessary for the study. The questionnaire was pre-tested on five subjects from the 3 study sites. Consideration was given to the time taken to completely administer a questionnaire, difficulties encountered by the participants in understanding certain questions and difficulty the prtesters had in explaining the different questions and collecting the right information. Based on the feedback from the participants and colleagues who pre tested the questionnaire, it was adapted and modified to the final version which can be seen in Appendix V.

3.9. Data analysis

Data collected were entered into a data entry form in CS Pro version 7.7.2. The data base generated was exported to SPSS version 26 for statistical analysis. The proportion of induction of labour was gotten by dividing the total number of inductions irrespective of their inclusion in the study or not, by the total number of deliveries from 28 weeks gestation that occurred during our study period.

For socio demographic, obstetric and outcome variables, statistics was done for quantitative variables in means and standard deviations when the distribution was normal (age , foetal birth weight , interval from induction of labour to delivery). Qualitative variables were summarized using frequencies and their percentages.

Bivariate analysis was done with each outcome as a dependent variable and method of induction (Prostaglandine and Oxytocin) as an independent variable. Statistical test for associations between variables was done using Chi square test and Fisher’s exact test. Odds ratios with their 95% confidence intervals were evaluated to assess the magnitude of association between variables. P-values were used to assess for the statistical significance of association between outcome variables and method of induction with statistical significance set at 5%. All associations from bivariate analysis were included into a corresponding multivariate analysis (using multiple logistic regression) to estimate the adjusted odds ratio and adjusted p values and find independent associations (by eliminating the effect of confounders)

3.10. Ethical consideration

3.10.1. Autonomy and Informed consent

Before being recruited, the purpose, objectives and implications of the study were clearly explained to potential participants first verbally then with the help of an information sheet containing detailed information about the study (Appendix I). Each potential participant decided on their own to be part of this study without any external influence, After the participants agreed to be part the study, written consent was gotten using an informed consent form (Appendix II). For participants less than 18 years old, consent was gotten from the parents or guidians using an assent form (Appendix III)

3.10.2. Confidentiality

Participants' information was collected privately. Each participant was identified with the help of participant code written on the data collection sheet . The names corresponding to the codes on the data collection sheet were registered on a coding sheeting accessible only to the principal investigator to ensure that the participant's information remained confidential.

3.10.3. Beneficence and non-maleficence

Participants in the study benefited from a close follow up and monitoring during the period of induction of labour to discharge from the hospital to ensure early detection of complications and prompt reactions an to achieve the best outcome for mother and baby. This study was an observational study. All procedures carried out on participants was in the best interest of both mother and baby following evidence-based recommendations. No actions were harmful to mother or baby

3.11. Timeline

Protocol writing and correction, application for ethical and administrative approval was done between October 2023 and January 2024. Data collection was carried out for over a period of 7 months (January to July 2024) One month was taken for data analysis, completion of the dissertation and correction by supervisors. .

3.12. Resources needed

3.12.1 Human resources

- ✓ The principal investigator
- ✓ Research assistants who were mostly residents on internship in the various study sites
- ✓ A supervisor and Co-supervisor

- ✓ A statistician

3.12.2. Material resources

- ✓ A personal Computer
- ✓ A computer modem
- ✓ Data collection sheets consent forms assent forms information sheets
- ✓ Didatic materials
- ✓ Data analysis software
- ✓ USB Key

3.13. Study limitations

This study was carried out in teaching hospitals in the capital of the country, that have better equipment and a good number of specialist which by virtue of their competencies and upto date knowledge on current recommendations, will have less adverse maternal and foetal outcome. This does not necessarily reflect the reality in the country as many hospitals have few or no specialist doctors and have mediocre equipment increasing the chances for adverse outcomes. This might make generalisation of the results difficult

CHAPTER 4: RESULTS

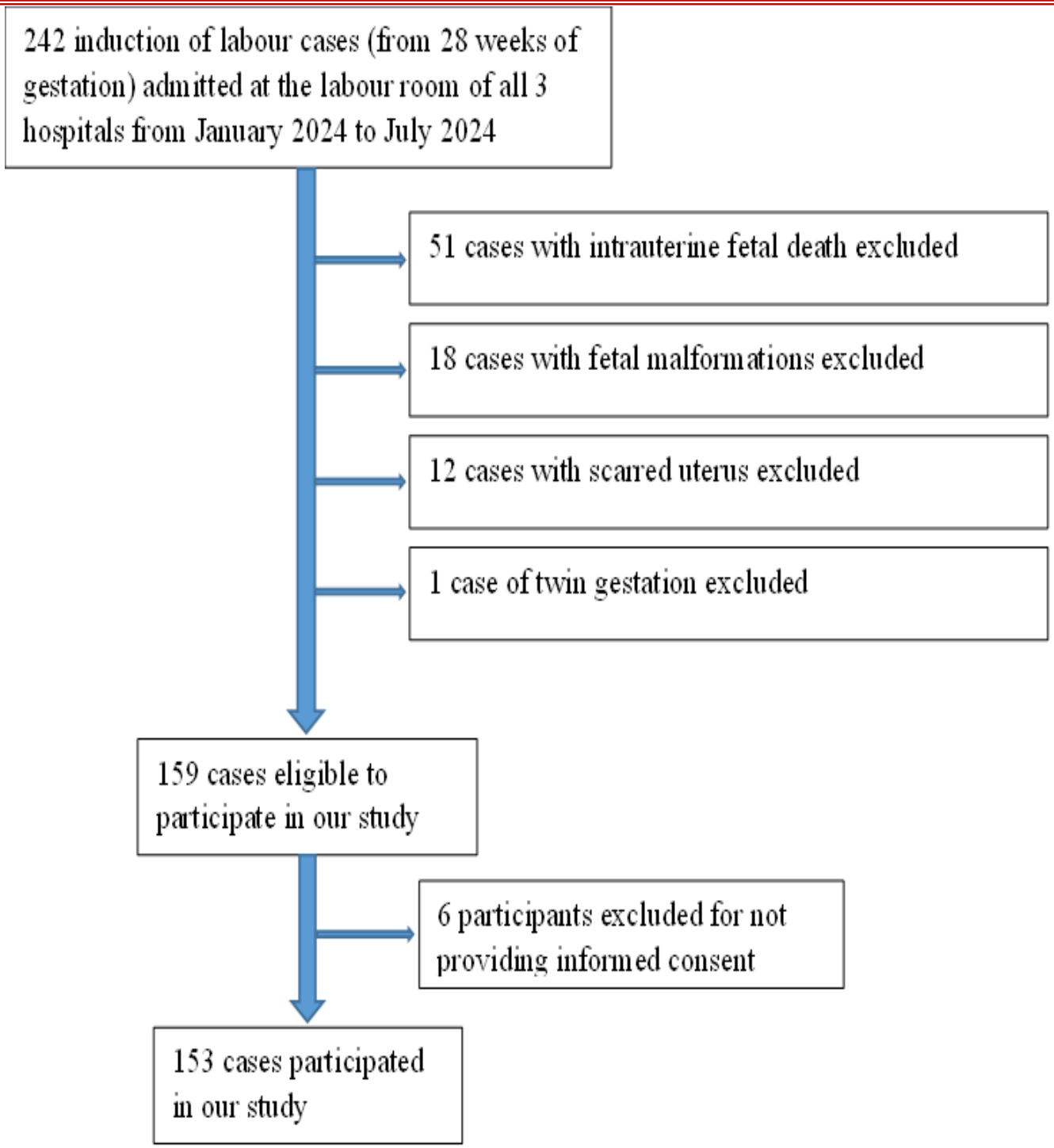

Figure 12: Participant recruitement flow chart

A total of **242** pregnant women with gestational ages of 28 weeks and above underwent induction of labour between January and July 2024. 83 cases had exclusion and non-inclusion criteria and were not included in the study. **159** cases met the inclusion criteria, but 6 women did consent to be part of the study mostly due to unwillingness to be interrogated or concerns about privacy and confidentiality of their information. They were

excluded from the study. A total of 153 women met the inclusion criteria, consented and were enrolled in the study

Table VI below shows the distribution of study participants according to study sites. The Yaounde Central Hospital had the highest proportion of study participants (**41.2%**) followed by the Yaounde Gyneco-Obstetric and Pediatric hospital **(34%**).

Table vi: Distribution of Study Participants according to Study Site

Study site	Frequency(N=153)	Percentage (%)
YGOPH	52	34.0
YCH	63	41.2
YUTH	38	24.8

4.1. Prevalence of Induction of Labour Cases

During our study period, we registered a total of 2781 deliveries and an absolute frequency of induction of labour cases of 242. The prevalence of induction of labour was **8.7%**.

4.2. Socio-Demographic and Obstetrical Characteristics of Study Population

4.2.1. Sociodemographic data

The minimum age of participants was **16** years, and the maximum age was **44** years, More than half of thebstudy participants were between the ages of **21** and **30** years. The most represented age group was **26** to **30** years (30.7%) The mean age of study participants was **28.1** years (±6.2 years). Proportion of participants who were 20 and under was **13.7%**

The figure below shows the distribution of age among the study participants

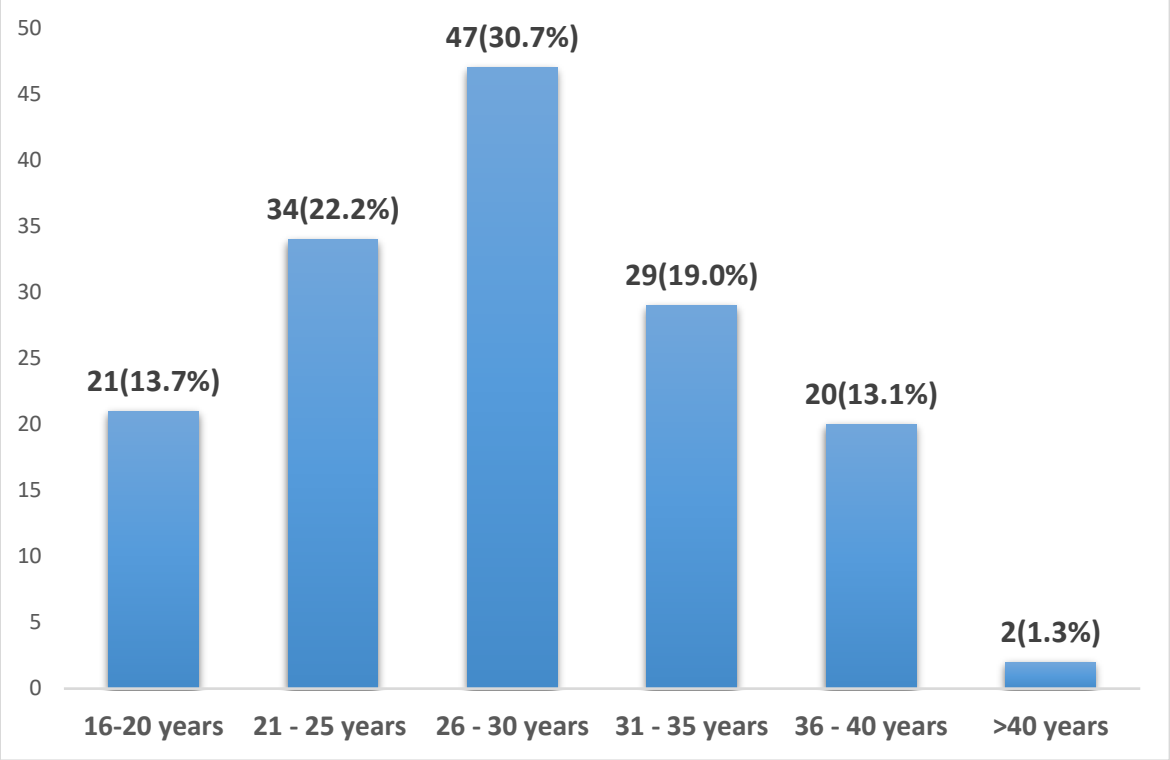

Figure 13: Distribution of study participants according to age group

In this study, majority of study participants were single **(52.3%),** were employed (58.1%) and had at least secondary school education **(54.9%).** Most participants lived in urban areas **(94.1%),** were Christians **(94.8%)** and originated from the Centre and West regions of the country**(45.8%** and **32.7%** respectively).

Table VII shows the distribution of socio-demographic data

Table vii: Distribution of Study Participants according to Socio-Demographic characteristics

Variable	Frequency (n), N=153	Percentage(%)
Marital status		
Married	49	32.0
Single	80	52.3
Cohabiting	24	15.7
Occupation		
Student	44	28.8
House wife	20	13.1
Private sector	25	16.3
Public sector	32	20.9
Self-employed	32	20.9
Educational level		
Primary	6	3.9
Secondary	84	54.9
Higher	63	41.2
Residence		
Urban	144	94.1
Rural	9	5.9
Religion		
Christian	145	94.8
Muslim	8	5.2
Region of Origin		
Littoral	8	5.2
Center	70	45.8
West	50	32.7
Northwest	9	5.9
Southwest	4	2.6
East	4	2.6
South	5	3.3
North	2	1.3
Far North	1	0.6

4.2.2) Obstetrical Data

The figure below (Figure 14) shows the distribution of study participants according to the number of antenatal contacts. Most study participants had between 4 and 7 antenatal contacts **(62%)**. Less than **20 %** of study participants had the WHO recommended number of at least 8 antenatal contacts

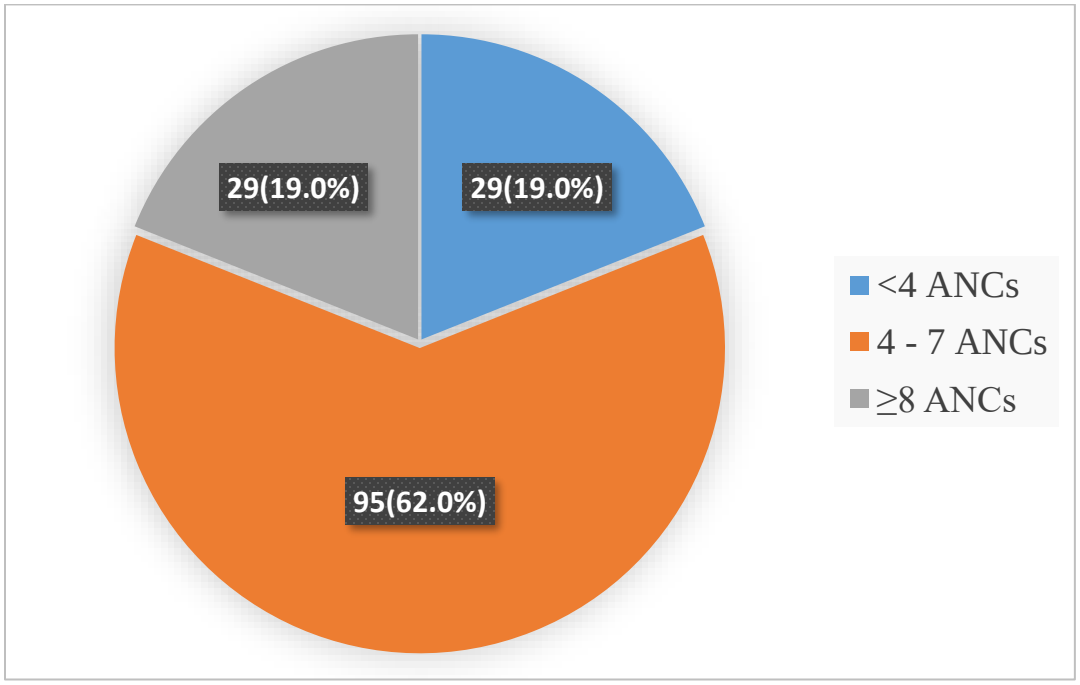

Figure 14:Distribution of study Participants according to number of antenatal contacts

The table below (Table VIII) shows the distribution of obstetrical data of study participants

Table viii: Distribution of Study Participants according to Obstetrical characteristics

Variable	Frequency (n), N=153	Percentage (%)
Parity		
Nullipara	61	39.9
Primipara	32	20.9
Multipara	49	32.0
Grandmultipara	11	7.2
Gestational Age(weeks)		
[28 – 34[	6	3.9
[34 – 36[	25	16.4
[37 – 38[	38	24.8
[39 – 40[	59	38.6
[41 – 41[	21	13.7

≥42	4	2.6
Chronic illness	16	10.4
Mode of Admission		
Referred	31	20.3
Internal transfer	34	22.2
From home	88	57.5
Bishop Score		
<7	99	64.7
≥7	54	35.3
Methods of induction		
Prostaglandins only	90	58.9
Misoprostol	82	53.7
Dinoprostone	8	5.2
Oxytocin (only)	51	33.3
Combination (prostaglandin and oxytocin)	12	7.8

In this study there were more participants with term **(77.1%)** than preterm **(20.3%)** and postterm (**2.6%)** pregnancies. There were more pregnancies between 39 and 40 completed weeks **(38.6%)** than any other gestational age group. Most women in this study had at least 1 previous term delivery **(60.1%).** The most represented parity group was nulliparous women **(39.9%)**. One in **10** women had a chronic disease (HIV, Hepatitis B, Chronic hypertension, Asthma). Majority of study participants presented at the labour room from home (**57.5%)** and **20.3%** were referred. Most study participants prior to induction of labour had an unfavourable bishop score **(64.7%)**. The most common method of induction used was misoprostol (**53.7%**) followed by oxytocin **(33.3%)**. Only **7%** of labour inductions were with more than one method of induction, used either simultaneously or successively (Combinations such as: cervical ripening with foley's catheter then induction with misoprostol and oxytocin or prostaglandines and oxytocin used together to induce labour).

The most common indication of induction of labour was premature rupture of membranes **(41.8%)** followed by late term pregnancy **(17%)** and malaria in pregnancy **(10.5%**). The least common indication for induction of labour was post term pregnancy **(1,3%).** When considered collectively hypertensive disorders in pregnancy accounted for **20.3%** of induction of labour cases making them the second most common indication of induction of labour in this study. Social induction of labour constituted **8.5%** of induction of labour cases.

The distribution of indications for induction of labour is shown in the figure below(Figure 15).

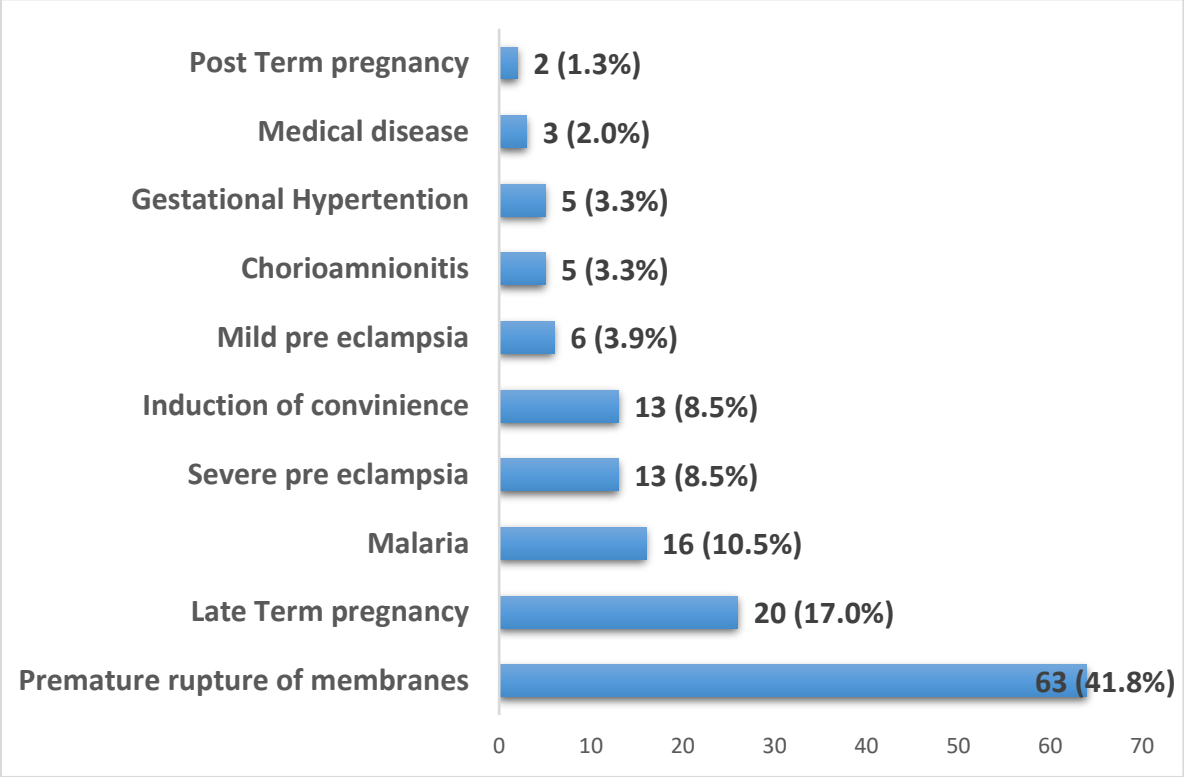

Figure 15:Distribution Indications for Induction of Labour

4.3. Outcome and complications following Induction of Labour

4.3.1.Maternal Outcome and complications following Induction of Labour

The average duration from onset of induction of labour to onset of active labour was **5 hours (±7.0)**. The mean duration from onset of labour to vaginal delivery was **11.9 (±8.0) hours**.

This is shown in the table below (Table IX)

Table ix: Interval from induction to active labour and delivery

Duration (in hours)	Min. – Max.	Mean (±SD)
Time from induction to active labour	1 – 36 hours	5.0 (±7.0) hours
Time from induction to vaginal delivery	4 – 45 hours	11.9 (±8.0) hours

Majority of study participants delivered vaginally **(73.2%)** of these **7.1%** were instrumental deliveries. Caesarean sections accounted for **26.8%** of deliveries. The most common indications for caesarean section wwere a non-reassuring foetal status **(48.8%)** followed by failed induction of labour **(22%)** and cephalopelvic disproportion **(17.1%).** A total of **17%** of participants in this study had postpartum haemorrhage. There were 3 cases of uterine rupture among the study participants. **35.9%** deliveries were complicated by perineal tears; of these **38.2%** of these were episiotomies. Perineal tears were the most common maternal complication. Few study participants developed a fever **(11.8%**) and tachysystole (**15%**) during labour

Table x: Distribution according to Maternal outcome and complications

Variable	Frequency (N=153)	Percentage (%)
Mode of Delivery		
Caesarean section	**41**	**26.8**
Vaginal delivery	**112**	**73.2**
Type of Vaginal delivery [N=112]		
Instrumental	8	7.1
Spontanoues	104	92.9
Postpartum Hemorrhage(PPH)	26	17.0
Uterine rupture	3	2.0
Perineal tear/injury	55	35.9
1st degree	22	40.0
2nd degree	11	20.0
3rd degree	1	1.8
Episiotomy	21	38.2
Tachysystole	23	15.0
Maternal pyrexia	18	11.8

Table xi: Distribution according to indication for caesarean section

Variable	Frequency(N=41)	Percentage (%)
Non reassuring foetal status	20	48.8
Failed induction of labour	9	22.0
Cephalopelvic disproportion	7	17.1
Cervical dystocia	4	9.8
Eclampsia	1	2.4

4.3.2. Foetal Outcome and Complications following Induction of Labour

Foetal birth weight ranged from 800g to 4620g. The average foetal weight was **3105.3g**. Majority of neonates were female **(52.3%)**. Overall foetal outcome was positive. There were 6 neonatal deaths and proportion of life births was at **96.7%**. A total of **94.8 %** of neonates had Apgar score of 7 and above at the first minute and **96.1%** at the fifth minute but almost one third of neonates were later admitted in the neonatology intensive care unit**(30.9%)** mostly due to neonatal infection**(37.8%**) , prolonged rupture of membranes**(21.7%),** neonatal asphyxia**(13%)** neonatal infection neonatal jaundice**(10.9%),** prematurity**(10.9%)** and macrosomia **(8.7%)**. The average duration of neonatal admission was **11.4days (±5.7) days** The most common neonatal complication was meconium-stained liquor **(39.2%).**

Table xii: Distribution according to foetal outcome and complications

Variable	Frequency (N=153)	Percentage (%)
Life births	147	96.7
Apgar at 1st minute <7	8	5.2
Apgar at 5th minute <7	6	3.9
Amniotic fluid		
Clear	66	43.1
Meconium stained	60	39.2
Yellowish	27	17.7
Admission into NICU	46	30.9
Indication for admission into NICU [N=46]		
Prolonged ROM	10	21.7
Neonatal asphyxia	6	13.0
Neonatal infection	16	37.8
Neonatal Jaundice	5	10.9
Macrosomia	4	8.7
Prematurity	5	10.9

Most Participants who delivered by caesarean section were nulliparous **(43.9%).** There was an association between gestational age and mode of delivery **(p-value =0.001**) and associated between the mean foetal weight and the mode of delivery**(p-value=<0.001).** The likelihood of vaginal delivery seemed to increase with gestational age upto 40 weeks 6 days **(40.2%)** and then decline from the late term period **(7.1%).** The mean foetal weight of children born by caesarean section was higher than the mean weight of children born vaginally and this difference was statistically significant.

Table xiii: Distribution of some sociodemographic and obstetric characteristics according to mode of delivery

	Caesarean Section n(%), N=41	Vaginal delivery n(%), N=112	Total n(%), N=153	p-value
Age group(years)				0.362
16-20	4 (9.8)	17 (15.2)	21 (13.7)	
21 - 25	10 (24.4)	24 (21.4)	34 (22.2)	
26 - 30	12 (29.3)	35 (31.2)	47 (30.7)	
31 - 35	6 (14.6)	23 (20.5)	29 (19.0)	
36 - 40	9 (22.0)	11 (9.8)	20 (13.1)	
>40	0 (0.0)	2 (1.8)	2 (1.3)	
Parity				0.353
Nullipara	18 (43.9)	43 (38.4)	61 (39.9)	
Primipara	7 (17.1)	25 (22.3)	32 (20.9)	
Multipara	11 (26.8)	38 (33.9)	49 (32.0)	
Grandmultipara	5 (12.2)	6 (5.4)	11 (7.2)	
Gestational Age(weeks)				**0.001**
[28 – 34[	0 (0.0)	6 (5.4)	6 (3.9)	
[34 – 37[	7 (17.1)	18 (16.1)	25 (16.3)	
[37 – 38[	5 (12.2)	33 (29.5)	38 (24.8)	
[39 – 40[	14 (34.1)	45 (40.2)	59 (38.6)	
[41 – 41[	13 (31.7)	8 (7.1)	21 (13.7)	
[≥42	2 (4.9)	2 (1.8)	4 (2.6)	
Bishop Score				0.898
<7	27 (65.9)	72 (64.3)	99 (64.7)	
≥7	14 (34.1)	40 (35.7)	54 (35.3)	
Fetal Weight				**<0.001**
Min. - Max	1880 – 4620g	800 – 4300g	800 – 4620g	
Mean (±SD)g	3396.3(±567.7)	2998.7(±554.9)	3105.3(±583.8)	

4.4. Comparing Maternal and Foetal Outcomes Between Induction with Prostaglandines only Versus Oxytocin only

4.4.1. Foetal outcome and complications

Table XV Shows the distribution of foetal outcome and complications between the methods of induction and the univariate analysis. The total number of participants here was N=141. Participants in whom more than one method of induction was used (12 participants) were excluded from this analysis

Table xiv: Distribution of foetal outcome and complications according to method of induction

Foetal Outcome	Prostaglandin\s Only n(%), N=90	Oxytocin Only n(%), N=51	Total n(%), N=141	OR [95%CI]	P-value
Life birth	86 (96.6)	50 (98.0)	136 (97.1)	0.57[0.06-5.66]	0.630
Apgar at 1st minute <7	5 (5.6)	3 (5.9)	8 (5.7)	0.71[0.48-4.86]	0.811
Apgar at 5th minute <7	4(4.4)	2 (3.9)	6 (4.3)	1.36[0.74-5.67]	0.746
Amniotic fluid					0.899
Clear	37 (41.1)	23 (45.1)	60 (42.6)	0.93[0.81-4.77]	
Meconium stained	38 (42.2)	20 (39.2)	58 (41.1)	1.47[0.87-3.23]	
Yellowish	15 (16.7)	8 (15.7)	23 (16.3)	1.09[0.86-4.01]	
Neonatology admission	33 (37.9)	10 (19.6)	43 (31.2)	2.51[1.11-1.72]	**0.025**

In this study there were **90(58.8%)** participants that were induced with prostaglandins only and **51(33.3%)** induced with oxytocin only. There was a higher proportion of female babies in prostaglandin group (**57.8%)** and higher proportion of male babies in the oxytocin only **(51%)** group. The proportion of live births in the oxytocin group was slightly higher **(98%)** than in the Prostaglandin only group **(96.6%),** Both groups had similar proportion of babies with Apgar score of <7 at the first minute (**5.6% vs 5.9%)** and at the fifth minute **(4.4%vs3.9%).** The proportion of neonates with meconium-stained liquor was higher in the prostaglandin group **(42.2%)** than in the oxytocin group **(39.2%)**. The difference in proportion of gender the babies, Apgar scores and quality of amniotic fluid was shown to be not statistically significant. More babies delivered after induction with prostaglandin only were admitted into the neonatology intensive care unit **(37.9%)** compared to the oxytocin only group **(19.6%)**. This difference was found to be statistically significant **(OR=2.51[1.11-1.72]**, **P- value**= **0.025)**.

4.4.2 Maternal outcome and complications

The table XVI shows the distribution of maternal outcome and complications according to the method of induction and the univariate analysis

Table xv: Distribution according to labour characteristics and maternal complications between method of induction

Maternal Outcome	Prostaglandin Only n(%), N=90	Oxytocin Only n(%), N=51	Total n(%), N=141	OR[95%CI]	p-value
Mean Interval from induction to onset of labour	6.1(±6.6) hours	3.3(±8.0) hours	5.0 (±7.0) hours	---	**0.029**
Mean Interval from labour onset to delivery	14.6(±9.0) hours	7.5(±3.5) hours	11.9 (±8.0) hours	---	**<0.001**
Mode of Delivery					
Caesarean section	27 (30.0)	11 (21.6)	38 (27.0)	1.56[0.82-3.01]	0.194
Vaginal delivery	63 (70.0)	40 (78.4)	103 (73.0)	0.64[0.33-1.22]	
PPH	18 (20.0)	7 (13.7)	25 (17.7)	1.57[0.61-4.06]	0.349
Uterine rupture	3 (3.3)	0 (0.0)	3 (2.1)	---	0.188
Perineal tear/injury	36 (40.0)	15 (30.0)	51 (36.4)	1.56[0.74-3.25]	0.239
Tachysystole	15 (18.5)	8 (16.3)	23 (17.7)	1.17[0.45-2.99]	0.751
Maternal pyrexia	15 (18.5)	2(3.9)	17 (12.8)	5.11[1.12-23.39]	**0.022**

There was a higher proportion of caesarian deliveries in the prostaglandin only **(30%)** compared to the oxytocin only group **(21.6%)** and a higher proportion of vaginal deliveries in oxytocin only group **(78.4%)** compared to the prostaglandin only group **(70%).** The misoprostol only group had a higher proportion of postpartum haemorrhage **(20%)** compared to the oxytocin only **(13.7%)** group. The proportion of tachysystole was higher in the Prostaglandin only group **(18,5%)** than in the oxytocin only group **(16.3%)** and all cases of uterine rupture were in the misoprostol only group, the proportion of perineal tears in the prostaglandin group was also higher in the Prostaglandin only group **(40%**) than in the oxytocin group **(30%).** These differences were found to be statistically insignificant on univariate analysis.

The mean duration from onset of induction to onset of active labour was longer in the Prostaglandin only group **6.1(±6.6)** hours compared to the oxytocin only group **3.3(±8.0) hours(P-value=0.029)**, and a longer duration from induction to vaginal deliver in the Prostaglandin only group **14.6(±9.0)** hours compared to the oxytocin only group **7.5(±3.5)** hours **(P value=<0.001)**. The proportion of maternal pyrexia was higher in the Prostaglandin only **18.5%** group compared to the oxytocin group **3.9% (OR = 5.11[1.12-23.39], P value=0.022).** These differences were found to be statistically significant on univariate analysis.

Table xvi: Multivariate analysis

Outcome	OR [95%CI]	p-value	aOR[95%CI]	ap-value
Admission at Neonatology	2.51[1.11-1.72]	**0.025**	1.66[0.69-3.97]	0.216
Maternal pyrexia	5.11[1.12-23.39]	**0.022**	4.29[0.89-20.55]	0.069
Mean Interval from induction to onset of labour	---	**0.029**	---	0.975
Mean Interval from labour onset to delivery	---	**<0.001**	---	**<0.001**

aOR=adjusted Odd's Ratios

On multivariate analysis only the difference in means duration from onset of induction to onset of labour was found to be independently associated with the method of induction, that a longer duration from induction to delivery being independently associated with induction with Prosatglandins compared to oxytocin (**p value =0.001).**

CHAPTER 5: DISCUSSION

Induction of labour is an intervention in obstetrics that is highly debated. There are a lot of discripancies on the complications following induction of labour and the safety and efficacy of the different methods of induction from research done in different settings and countries. This research was carried out to study the maternal and foetal outcome, and the complications following induction of labour. Then comparing these outcomes between the pharmacological methods of induction: Prostaglandins and oxytocin.

In our study the total number of cases of induction of labour during the study period from 28 weeks of gestation was 242, which represented 8.7% of total number of deliveries. This proportion roughly reflects the prevalence of the most common indications of induction of labour identified during our study that is; premature rupture of membranes(7.4%) and hypertensive disorders in pregnancy (7.7% -8.2%) in Cameroon[51–53]. The prevalence is close to what was reported in Ethopia (9%) and in India(7.2%) probably due to similarities in study design and sociodemographic and obstetric characteristics [50,54]. This proportion was higher than that reported in Congo 3.2% and in Nigeria (4,6%), and is above the overall induction rate in Africa(4.4%)[55–57]. These differences could be explained by the fact that the study in Congo and Nigeria were retrospective studies and so excluded many files with incomplete information. Also the study included only term pregnancies. The overall variation in prevalence of induction of labour rate in Africa can be due to the difference in practices in the various countries and even within health facilities in the same country.

The proportion of induction of labour in our study was significantly lower than the induction of labour rates in developed countries such as Ireland (14.5% to 33.2%) and Finland (30.3%) probably due to their higher rates of elective induction of labour and induction of labour on scarred uterus compared to developing countries like Cameroon. In developed countries there is also an increased rate of elderly pregnancies and obesity in pregnancy which increases the risk of complications such as gestational diabetes, hypertension in pregnancy and therefore leading to an increase in the rate of induction of labour[58,59].

The age range for study participants in this study was between 16 to 44 years old a mean age of 28.1 years (±6.2 years) and the modal age group was 26 to 30 years. Proportion of adolescent in our study was 13.7%, This high proportion could be explained by the fact that Cameroon has an overall high rate of adolescent pregnancies and this age group usually at their first pregnancy are at risk of obstetrical complications such as preeclampsia premature rupture of membranes and late term pregnancies which increases their chances for induction of labour[60].

The age distribution in our study was similar to the results in Tanzania (28.72years), Ethopia(26.8 years) and in Nigeria(modal age: 25 to 29 years) though the proportion of adolescents here was significantly lower in their studies than that in our study due to the fact that their study population included only adolescent participants from the age of 18 years[9,56,61]. In developed countries such as Finland, where women undergoing induction

of labour are generally older (mean age 32.1 years and 32.4% of the study population of advanced maternal age)[58]

Most of our study participants were single (52.3%) and 58.1% were employed. Nulliparous women accounted for 39.9% of study participants. In Ethopia, in Nigeria and in India similar results were also reported in nulliparous women representing the highest proportion of study participants(47.98%, 49.4% and 61.9% respectively)[49,50,56]. Another study in Ethopia and in Tanzania reported more of multiparous women in their studies[61,62]. Majority of study participants had at least 4 antenatal visits and less than 20% had 8 or more visits understandably because almost half of study participants (45.1%) had gestational ages of less than 40 weeks which is the period at which they are expected to have their 8th visit according to WHO recommendations [63]. The most represented gestational age group was 39 to 40 completed weeks gestation. Most participants had an unfavourable bishop score on admission (64.7%) explaining why the proportion of participants induced with prostaglandins only (58.8%) was higher than those induced with oxytocin only (33.3%)

Premature rupture of membranes was the most common indication of induction of labour. This could be explained by the fact that our study sites receive many referrals and in utero transfers from surrounding health facilities of lower categories as they contain standard neonatology intensive care units capable of managing premature neonates and many other neonatal emergencies. This finding is similar to the result of in Cameroon in 2012 reporting premature rupture of membranes as the most common indication for induction of labour in twin pregnancies in 2012 and in Ethopia 2020 also reporting premature rupture of membranes as their most common indication for induction of labour[9,64]. Ther studies in Nigeria, Tanzania and India reported postdate pregnancies as their most common indication of induction of labour and this disparity from our study could be explained by difference in practices. In our setting pregnancies without complications are allowed to exceed the post date(40 weeks) into the late term period (41weeks) before considering induction of labour[50,56,61,65].

The second most common indication of induction in our study was hypertensive disorders in pregnancy. This is because the hospitals in our study are also among the few hospitals in the country with standard intensive care units and hemodialysis unit where hypertensive disorders in pregnancy and their various complications can be conveniently managed and so most causes of hypertension in pregnancy are referred to these hospitals. Hypertensive disorders in pregnancy was among the top 3 indications for induction of labour in all related studies Postterm pregnancies accounted for only 1.3% of induced cases in our study and this is because of the practice guidelines in our setting of inducing before 42 weeks gestation in a bid to reduce the prevalence of post term practices and the complications associated with them.

In this study majority of participants delivered vaginally(73,2%) and proportion of caesarian sections was 26.8 % this proportion of caesarian section is higher than the overall rate of caesarian section in Cameroon[66]. This could be because, the hospitals concerned in our study mostly receive referrals who have already developed complications and have a higher risk of caesarian section from surrounding health facilities. The proportion of caesarian deliveries in our study is comparable to that obtained by in Nigeria possibly because of the similarities in demographic characteristics and study setting[56,65]. This proportion was less than what was reported in Tanzania(38.3%) and in India(33.2%). This difference could be attributed to disparities in obstetrical practices as the proportions reflect the high overall caesarian section rate in those countries. [50,61,67].

The main indication for caesarian section in our study was non-reassuring foetal status (48.8%) and this finding is unanimous among all related studies including that done in Cameroon in 2012[66].This could be explained by the fact that induction of labour cases were emergency inductions for obstetric conditions(premature rupture of membranes , hypertensive diseases in pregnancy that already compromise foetal condition. Our study also had a significant proportion of tachysystole (15%) which could affect the foetal heart rate.

The mean duration from onset of induction to active labour and the mean duration from onset of induction to delivery in our study was 5 and 11hrs respectively. This is similar to the time from induction to delivery interval of 12 hours reported in Nigeria due to same protocols of induction and obstetrical characteristics and similarities in study population[65]. This is different from the results reported in India where mean duration from induction to delivery was 17.4 hours[50]. These differences is probably due to a difference in induction of labour protocols as they admistered misoprotol at a dosage of 25mcg per dose as opposed to 50 mcg in our study and for oxytocin, they started their titration at 2,5IU of oxytocin as opposed to 10 IU in our setting. Shorter intervals were reported in a study in Egypt in 2023 (mean interval from induction to labour 5.86-6.74 hrs and mean interval from induction to delivery 7.5-8.43hrs), possibly because their study was carried exclusively in participants with premature rupture of membranes[68].

Majority of caesarian deliveries were in nulliparous parturients (43.9%). In our study, the proportion of vaginal deliveries increased with gestational age up to 40 weeks then declined in the late term period with this gestational age accounting for only 7.1% of vaginal deliveries. There was a statistically significant association between gestational age and mode of delivery (P value =0.001). The most common maternal complication was perineal tear (35.9 %) this is possibly because most study participants were nulliparous which is known risk factor for perineal tears.

The proportion of postpartum hemorrhage in this study (17%) was higher than that reported by in Ethopia and India probable due to the higher dosages of uterotonics used in our study and the high proportion of perineal

tears in our study(35.9%)[9,50,69]. Just like in other related studies uterine rupture was the least common maternal complication (1.2%)

Most neonates born following induction of labour in our study were female (52.3%). The overall foetal outcome in our study was positive with the proportion of life births being 96.7%. Even though non reassuring foetal heart rate pattern was the most common indication of caesarean section, majority of neonates were born with a good Apgar at the first minute (94.8%) and at the fifth minute (96.1%). This is probably due to intrauterine resuscitation measures used prior to surgery. This findings was similar to what was reported by all related studies except in Congo where 25% of neonates having a poor Apgar score at the 5^{th} minute[55]. 37.8% percent of babies were transferred into the neonatology unit within in our study mainly due to early neonatal infection (37.8%) predictably due to the proportion of premature rupture of membranes in our study (41.8%). The most common neonatal complication in our study was meconium stained amniotic fluid which is similar to what was reported in India in 2017 et al and in Egypt 2020 [50,69].

In this study the proportion of a casearian deliveries was higher in the prostaglandin (30%) group compared to the oxytocin only group (21.6%) but there was no association between the mode of delivery and the method of induction. This is similar to what was reported by 2 studies in Egypt in 2020 and 2023[68,69]. Our finding was different from that reported in India where there were similar proportions of caesarian section deliveries in both groups , but a lower proportion of vaginal deliveries in the oxytocin group compared to the prostaglandin group possibly because all participants had an unfavourable bishop score in their study. No cervical ripening was done prior to induction of labour with oxytocin[50].

The mean duration from induction to active labour and from induction to delivery in the prostaglandin only group in our study was longer than the oxytocin only group (6.1 hours vs 3.3 hours with p value =**0.029** and 14.623 hours vs 7.5 hours p-value <**0.001** respectively) probably because all participants induced with oxytocin only already had a good bishop score with significant cervical dilatation. In our study the difference in both intervals was statistically significant, but only duration from induction to delivery was found to be independently associated with the method of induction, showing that those induced with prostaglandin-only, had a longer interval from induction to delivery compared to those induced with oxytocin. In India in 2017 a longer mean duration from induction to delivery in the prostaglandin-only group compared to the oxytocin group was also reported[50]. Studies in Egypt reported a statistically significant longer interval from induction to delivery in the oxytocin only group compared to the misoprostol only group[68,69].

In this study we found a significant higher proportion of maternal pyrexia (18.5% vs 3.9% OR 5.11 [1.12-23.39] p value 0.022) and neonatal admission (37.9% vs 19.6%, OR 2.52[1.11-1.72] P value 0.025) in the prostaglandin-

only group, probably because of the longer duration from induction to delivery associated with prostaglandin-only group. These outcomes were not independently associated with the method of induction on multivariate analysis. In India similar proportions in neonatal admissions were reported in both groups probably because both groups had very longer means intervals from induction to delivery (17.6 hours in misoprostol only group vs 16.9 hours in the oxytocin only group) predisposing participants to infection.

CONCLUSION

- ✓ The prevalence of induction of labour is relatively low in our setting but higher than the overall rate of induction of labour in Africa (4.4%).
- ✓ Premature rupture of membranes was the most common indication for induction of labour and most inductions were done using misoprostol
- ✓ Most women who were induced delivered vaginally even though there was still a significant proportion of caesarian deliveries following induction of labour. Non-reassuring foetal heart rate was the main reason for the caesarian deliveries
- ✓ The overall maternal and foetal outcomes following induction of labour were good. There were more life births than intrapartum deaths, most neonates with Apgar scores >7 at the first and fifth minute. Apart from perineal tears the portion of other maternal complications was low.
- ✓ Prostaglandins appeared to be as safe as oxytocin for induction of eventhough induction to delivery time was double in the prostaglandin- only group compared to the oxytocin-only group.

RECOMMENDATIONS

To Health Care Personnel:

Women undergoing induction of labour should be monitored closely preferable continuous monitoring with cardiotocograph due to the likelihood of abnormal foetal heart rhythms and other complications such a tachysytole which could result in uterine rupture

To the Faculty of Medicine and Biomedical Sciences:

To carry out comparative studies on the occurrence of maternal and foetal complications in women being induced compared to women who go into labour spontaneously and also, to carry out similar studies in hospitals of lower categories to identify variations in induction of labour practices and outcome following induction of labour

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APPENDICES

APPENDIX I: INFORMATION SHEET

Hospital ID : 1) HCY ☐2) HGOPY☐ 3)CHU☐ **Questionnaire Code** : ……**Date:** ….....

Institution: Department Of Obstetrics And Gynecology, Faculty of Medicine and Biomedical Sciences , University Of Yaounde I

Research topic: Maternal And Foetal Complications Of Induction Of Labour In 3 teaching Hospitals In Yaounde

As part of the requirements for the award of a specialisation diploma (DES) in Obstetrics and Gynecology

The Researcher: Ebai Ethel Bissong 4th year resident in Obstetrics and Gynecology.

Tel : +237 674942159 E-mail : ebaiethelb17@gmail.com

Supervisor : Pr. MBU Robinson ENOW (Professor of Obstetrics and Gynecology)

Co-Supervisor: Dr. EBONG Clifford (Senior Lecturer in Obstetrics and Gynecology)

Research goal: The Aim of this study is to identify the complications of the practice of induction and augmentation of labour in 3 high turnover hospitals in Yaounde. The results of this study. This study will enable identification of the negative results of induction of labour in order to improve on the practices and improve on maternal and foetal outcomes.

Information to participant: This study has been approved by **the University of Yaounde 1**, the **Yaounde Gyneco-Obstetrics and Paediatrics Hospita**l, **Yaounde Central Hospita**l, and the **Yaounde University Teaching Hospital** and you have been selected to participate in the study due to the fact that you meet the criteria for inclusion into the syudy. You will be asked a series of questions which can last for about 30 minutes and you will undergo a clinical examination. Your medical file will also be reviewed to complete the data collection process. Your contribution will help in completing the research, and any information you provide will be used strictly for academic purposes. Your participation in the study is voluntary, and every information you provide will be kept confidential. No names or information about any individual will be shared or published. There will neither be any direct benefits nor harm in participating in this study.

APPENDIX II: CONSENT FORM

I, _____ confirm that the person administering this questionnaire has carefully explained the nature, procedure, potential benefits and anticipated inconvenience of participation. I have understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable). I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the questionnaire and to clinical examination.

I have received a signed copy of the informed consent agreement.

Yaounde the ……./ ……/ 2024

Participant's signature: …… **Researcher's signature: ……**

-

Appendix III: Assent Form

I, _____ father/ mother/ guardian of ----------
confirm that the person administering this questionnaire has carefully explained the nature, procedure, potential benefits and anticipated inconvenience of participation. I have understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and I accept for my daughter to participate in the study. I understand that participating is voluntary and that we are free to withdraw at any time without penalty (if applicable). I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that our participation will be kept confidential unless otherwise specified.

I agree to the recording of the questionnaire and to clinical examination.

I have received a signed copy of this assent form

Yaounde the ……./ ……/ 2024

APPENDIX IV: DATA COLLECTION SHEET

Topic : Maternal and Foetal Complications Following Induction Of Labour In 3 Teaching Hospitals In Yaounde

Participant code [……..] **Hospital list: [1]CHU [2]HGOPY [3]HCY**

SECTION A1: SOCIOOBSTETRICAL DATA			
Serial Number	**Variable**	**Response**	**Code**
1.	Age (years)		
2.	Marital status	[1] Married [2] Single [3] Cohabiting	
3.	Highest level of education	[1] No education, [2] Primary, [3]Secondary [4]Higher	
4.	Occupation	[1]=Student[2]=House wife [3]=Employed [a]private sector [b]=self-employed [c]=public sector	
5.	Region of origin	[1]=Center, [2]=West,[3]=Northwest [4]=Southwest, [5]=East [6]=South, [7]=Adamawa [8]=North [9]=Far North [10]=Littoral	
6.	Residence	[1] Urban [2] rural	
7.	Religion	[1] Christian (specify …….)[2]Muslim [3] Others (Specify)	
8.	Gravidity (G)	G……..	
9.	Parity (TPAL)	T……..P……A……..L……	
10.	Gestational age from last menstrual period		
11.	Certainty of the last menstrual period	[1] Yes [2] No	
12.	Gestational age in weeks from first ultrasound		
13.	Number of Antenatal consultations		
14. a	Any chronic illnesses	[1]Yes [2]No	
b	If Yes Which Ones	[1] HIV [2] Hepatits b [3]Asthma [4]Diabetes [5]Hypertension	
15.	Pathologies during pregnancy	[1]=Yes [2]=No If Yes specify……..	

16.	Mode of admission	[1] = Referred, [2] = internal transfer, [3] = from home	
17.	SBP on admission (mmHg)		
18.	DBP on admission (mmHg)		
19.	Pre-pregnancy weight (kg)		
20.	Weight at the time of admission(kg)		
21.	Height (m)		
22.	Fundal height(cm)		
23.	Estimated foetal weight(grams)		
24.	Cervical effacement		
25.	Cervical consistency	[1] Firm [2]Intermediate [3]Soft	
26.	Position of the cervix	[1]Anterior [2]Median [3]Posterior	
27.	Cervical dilatation(cm)		
28.	Station of the foetal head		
29.	Indication of induction of labour	1]Late term pregnancy(41 to 41 weeks 6 days) [2]post date pregnancy [3]Post term pregnancy [4]Premature rupture of membranes [5]Mild pre eclampsia [6]Severe pre eclampsia [7]Chorioamnionitis [8]Intrauterine fetal death [9] Malaria in pregnancy [10] Others	
30.	Methods of induction of labour used	1] Misoprostol [2] Oxytocin [3] Foley catheter [4] Dinoprostone	
31. a	For multiple methods was it simultaneous use or not	[1] Simultanoues(at the same time) [2] Successive	
32.	If misoprostol was used , how many doses	[1] 1 [2] 2 [3]3 [4]4 [5] 5 or more	
SECTION B			
SECTION B1: MATERNAL OUTCOMES			
33.	Interval from induction to onset of labour		

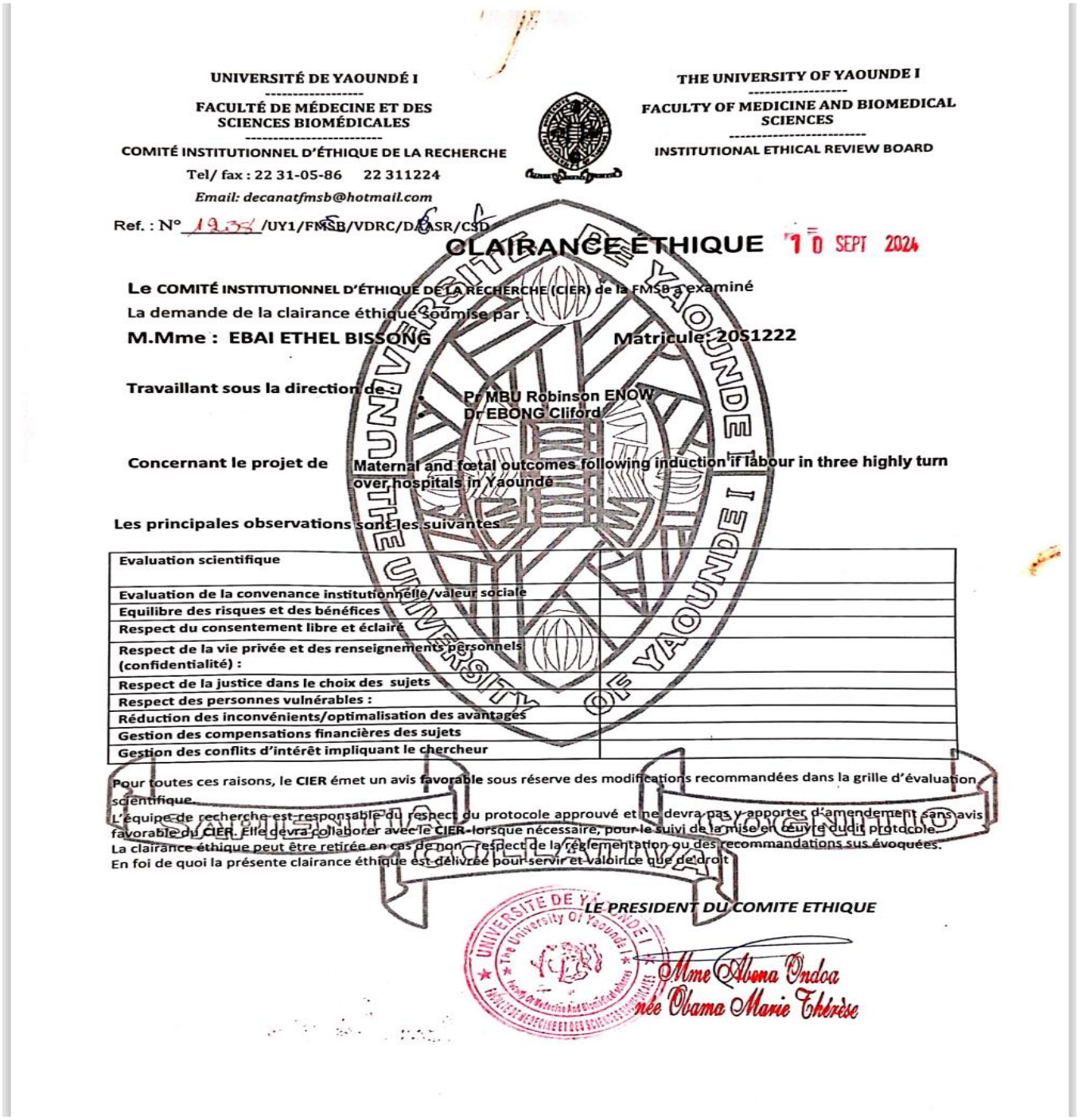
34.	Mode of delivery	[1]= caesarian Section [2]=Instrumental delivery(specify)…… [3]= Unassisted vaginal delivery	
35.	If vaginal or instrumental delivery interval from onset of induction to delivery		
36.	If caesarian section what was the indication		
37.	Blood loss after delivery	[1] <500cc [2]>500cc	
38.	Uterine rupture	1] = Yes [2] = No	
39.	Perineal tear	1] = Yes (specify the Degree)…… [2] = No	
SECTION B2: FETAL OUTCOMES			
40.	Quality amniotic fluid at delivery	[1] = Clear [2] =Meconium stained [3]=Yellowish	
41.	Baby's weight(grams)		
42.	Gender	[1] Female [2] Male	
43. a	Life birth	[1] = Yes [2] = No	
b	If life birth Apgar at first minute		
c	Apgar at 5th minute		
44.	Admission into neonatology unit	[1] = Yes [2] = No	
45.	If yes Indication for admission	[1] = Yes [2] = No	
46.	Length of admission		

LMP:

Date of delivery:

Date of first ultrasound

APPENDIX V: ETHICAL CLEARANCE



UNIVERSITÉ DE YAOUNDÉ I
FACULTÉ DE MÉDECINE ET DES SCIENCES BIOMÉDICALES
COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE
Tel/ fax : 22 31-05-86 22 311224
Email: decanatfmsb@hotmail.com

THE UNIVERSITY OF YAOUNDE I
FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES
INSTITUTIONAL ETHICAL REVIEW BOARD

Ref. : N° 1935 /UY1/FMSB/VDRC/DAASR/CSD

CLAIRANCE ÉTHIQUE 10 SEPT 2024

Le COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE (CIER) de la FMSB a examiné
La demande de la clairance éthique soumise par :
M.Mme : EBAI ETHEL BISSONG **Matricule: 20S1222**

Travaillant sous la direction de :
- **Pr MBU Robinson ENOW**
- **Dr EBONG Clifford**

Concernant le projet de **Maternal and fœtal outcomes following induction if labour in three highly turn over hospitals in Yaoundé**

Les principales observations sont les suivantes

Evaluation scientifique	
Evaluation de la convenance institutionnelle/valeur sociale	
Equilibre des risques et des bénéfices	
Respect du consentement libre et éclairé	
Respect de la vie privée et des renseignements personnels (confidentialité) :	
Respect de la justice dans le choix des sujets	
Respect des personnes vulnérables :	
Réduction des inconvénients/optimalisation des avantages	
Gestion des compensations financières des sujets	
Gestion des conflits d'intérêt impliquant le chercheur	

Pour toutes ces raisons, le **CIER** émet un avis **favorable** sous réserve des modifications recommandées dans la grille d'évaluation scientifique.
L'équipe de recherche est responsable du respect du protocole approuvé et ne devra pas y apporter d'amendement sans avis favorable du **CIER**. Elle devra collaborer avec le **CIER** lorsque nécessaire, pour le suivi de la mise en œuvre dudit protocole.
La clairance éthique peut être retirée en cas de non respect de la réglementation ou des recommandations sus évoquées.
En foi de quoi la présente clairance éthique est délivrée pour servir et valoir ce que de droit

LE PRESIDENT DU COMITE ETHIQUE

Mme Abena Ondoa
née Obama Marie Thérèse

APPENDIX VI: ADMINISTRATIVE CLEARANCE (YGOPY)

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DE LA SANTE PUBLIQUE
HOPITAL GYNECO-OBSTETRIQUE ET PEDIATRIQUE DE YAOUNDE
HUMILITE – INTEGRITE – VERITE - SERVICE

HGOPY YGOPH

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
MINISTRY OF PUBLIC HEALTH
YAOUNDE GYNAECO-OBSTETRIC AND PEDIATRIC HOSPITAL
HUMILITY – INTEGRITY – TRUTH - SERVICE

COMITE INSTITUTIONNEL D'ETHIQUE DE LA RECHERCHE POUR LA SANTE HUMAINE (CIERSH)

Arrêté n° 0977 du MINSANTE du 18 avril 2012 portant création et organisation des Comités d'Ethiques de la Recherche pour la santé Humaines. (CERSH).

AUTORISATION N° 780 /CIERSH/DM/ATTD/2024

CLAIRANCE ETHIQUE

Le Comité Institutionnel d'Ethique de la Recherche pour la Santé Humaine (CIERSH) a examiné le 21 Aout 2024, la demande d'autorisation et le Protocole de recherche intitulé **« Maternal and Fœtal complications of induction and augmentation of labour in three high turnover hospitals in Yaoundé»** soumis par le Docteur EBAI ETHEL BISSONG.

Le sujet est digne d'intérêt. Les objectifs sont bien définis. La procédure de recherche proposée ne comporte aucune méthode invasive préjudiciable aux participants. Le formulaire de consentement éclairé est présent et la confidentialité des données est préservée. Pour les raisons qui précèdent, le CIERSH de HGOPY donne son accord pour la mise en œuvre de la présente recherche.

Le Docteur EBAI ETHEL BISSONG, devra se conformer au règlement en vigueur à HGOPY et déposer obligatoirement une copie de ses travaux à la Direction Médicale de ladite formation sanitaire./-

Yaoundé, le 27 AOUT 2024

LE PRESIDENT

Prof MBU Robinson
Directeur Général
HGOPY

N°1827 ; Rue 1564 ; Ngousso ; Yaoundé 5ème
BP : 4362 Tél. : 242 05 92 94 / 222 21 21 24 33 / 222 21 24 31 Fax : 222 21 24 30
E-mail : hgopy@hotmail.com / hgopy@hgopy.cm

APPENDIX VII: ADMINISTRATIVE CLEARANCE (YCH)

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DE LA SANTE PUBLIQUE
SECRETARIAT GENERAL
DIRECTION DE L' HOPITAL CENTRAL DE YAOUNDE
SECRETARIAT MEDICAL
N°231/24/ /AMS/DHCY/CM/SM

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DE LA SANTE PUBLIQUE
SECRETARIAT GENERAL
DIRECTION DE L' HOPITAL CENTRAL DE YAOUNDE
SECRETARIAT MEDICAL
Yaoundé, le 10 MAI 2024

ACCORD DE PRINCIPE

Je soussigné **Professeur FOUDA Pierre Joseph**, Directeur de l'Hôpital Central de Yaoundé, marque mon Accord de principe à **Mme EBAI ETHEL BISSONG** Résident en 4ème Année de Gynécologie et Obstétrique à la Faculté de Médecine et des Sciences Biomédicales de l'Université de Yaoundé I , sous le thème « **Maternal and fetal outcomes following induction of labour in three teaching hospitals in Yaounde" a l'Hopital Central de Yaounde sous la supervision du docteur EBONG Cliford.**

Pour Le Directeur et par ordre
Le Conseiller Médical,

HOPITAL CENTRAL DE YAOUNDE
Le Conseiller Médical

Pr. Olga Pierre Emple Fouda

Ampliations :

- Conseiller Médical ;
- Chef service concerné ;
- Intéressé ;
- Archives /Chrono.

APPENDIX VIII: ADMINISTRATIVE CLEARANCE (YUTH)

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie
MINISTERE DE LA SANTE PUBLIQUE

REPUBLIC OF CAMEROON
Peace – Work – Fatherland
MINISTRY OF PUBLIC HEALTH

CENTRE HOSPITALIER ET UNIVERSITAIRE DE YAOUNDE
YAOUNDE UNIVERSITY TEACHING HOSPITAL

C H U YAOUNDE

DIRECTION GENERALE
CELLULE D'APPUI PEDAGOGIQUE, DE LA RECHERCHE ET DE LA COOPERATION
BUREAU DE LA CAPRC

U T H YAOUNDE

N°857/AR/CHUY/DG/DGA/DM/CAPRC/CEAAP/CEARC

AUTORISATION DE RECHERCHE

Dans le cadre de la rédaction d'un mémoire de fin d'études, en vue de l'obtention du Diplôme de fin de spécialisation en Gynécologie, Madame EBAI Ethel BISSONG est autorisée à mener une recherche au CHUY sur le thème : « **Maternal and fœtal complications of induction and augmentation of labour in three high turnover hospitals in Yaoundé** ».

Ces travaux se dérouleront dans le service de Gynécologie-Obstétrique sous la supervision de Pr. MVE KOH Valère, Gynécologue-Obstétricien.

Toutefois, elle devra obligatoirement déposer un exemplaire de mémoire au CHUY (Bureau de la CAPRC).

En foi de quoi la présente autorisation dont la durée de validité est de 03 mois à compter de la date de signature, lui est délivrée pour servir et valoir ce que de droit.

Yaoundé, le 15 AOUT 2024

LE DIRECTEUR GENERAL

Pr. Nlome Enyime Félicien

COPIE :
- CAPRC
- BCAPRC
- SUPERVISEUR
- CHRONO