**TITLE**

# "TRANSABDOMINAL ULTRASOUND ASSESSMENT OF FETAL OCCIPUT- SPINEANGLE TO PREDICT THE MODE OF DELIVERY"

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| **NAME OF COURSE:** | **MS** |
| **NAME OF SUBJECT:** | **OBSTETRICS AND GYNECOLOGY** |
| **ACADEMIC YEAR:** | **2020-2023** |

**SUBMITTED TO- MAHARASHTRA UMIVERSITY OF HEALTH SCIENCES, NASHIK**

## LIST OF ABBREIVATIONS

ACOG – American College of Obstetricians and Gynecologists

AC – Abdominal Circmference

ACTH – Adreno Cortico Trophic Hormone

AFI – Amniotic Fluid Index

AFV – Amniotic Fluid Volume

AG – Abdominal Girth

AMTSL – Active Management of Third Stage of Labour

APGAR – Appearance, Pulse, Grimace, Activity, Respiration

ARM – Artificial Rupture of Membranes

ATP – Adenosine Triphosphate

AUA – Abnormal Uterine Action

BMI – Body Mass Index

BP – Blood Pressure

BPD – Biparietal Diameter

bpm – beats per minute

BPP – Biophysical Profile

cAMP - cyclic Adenosine Monophosphate

CAPS – Contraction associated proteins

CH – Crown Heel

CI – Confidence Interval

cpm – cycles per minute

cms - centimetres

CO – Cardiac Output

CPD – Cephalopelvic Disproportion

CPT – Complete Perineal Tear

CRH – Corticotrophin Releasing Hormone

CRL – Crown Rump Length

CS – Caesarean Section

CST – Contraction Stress Test

CTG – Cardiotocography

DFMC – Daily Fetal Movement Counting

DOD – Date of Delivery

DTA – Deep Transverse Arrest

2D – 2 Dimensional

3D – 3 Dimensional

EDD – Expected Date of Delivery

EFM – Electronic Fetal Monitoring

FD – Fetal Distress

fFN - fetal Fibronectin

FGR – Fetal Growth Restriction

FHR – Fetal Heart Rate

FHS – Fetal Heart Sound

FIGO – International Federation of Gynecology and Obstetrics

FL – Femur Length

GA – Gestational Age

gms - grams

Hb – Hemoglobin

HC – Head Circumference

HR – Heart Rate

Ht – Height

Hz- Hertz

ICA – Incordinate Uterine Action

ICOG – Indian College of Obstetrics and Gynecology

IFM – Intrapartum Fetal Monitoring

IL - Interleukins

IOL – Induction of Labour

IP – In Patient

IUFD – Intrauterine Fetal Death

IUGR – Intrauterine Growth Restriction

kgs - kilograms

LBW – Low Birth Weight

LGA – Large for Gestational Age

LMP – Last Menstrual Period

LOA – Left Occiput Anterior

LOP – Left Occiput Posterior

LOT – Left Occiput Transverse

LSCS – Lower Segment Caesarean Section

MLCK – Myosine Light Chain Kinase

MOD – Mode of Delivery

MSL – Meconium Stained Liquor

NRFS – Non- reassuring Fetal Status

NST – Non- stress Test

OA – Occiput Anterior

OP – Occiput Posterior

OPD – Out Patient Department

OR – Odd's Ratio

OT – Operation Theatre

PA – Per Abdomen

PGs – Prostaglandins

PO – Per Oral

POG – Period of Gestation

POP – Persistent Occiput Posterior

PPH – Postpartum Haemorrhage

PR – Pulse Rate

PROM – Prelabour Rupture of Membranes

PTB – Preterm Birth

PV – Per Vaginal

RCOG – Royal College of Obstetricians and Gynaecologists

RCT – Randomised Control Trial

RDS – Respiratory Distress Syndrome

RhIg – Rhesus Immunoglobulin

ROA – Right Occiput Anterior

ROP – Right Occiput Posterior

ROT – Right Occiput Transverse

RR – Respiratory Rate

RR – Relative Risk

SBP – Systolic Blood Pressure

SES – Socio Economic Status

SFH – Symphysio Fundal Height

SGA – Small for Gestational Age

SMI – Safe Motherhood Initiative

SpO2 – Oxygen Saturation

SV – Stroke Volume

TAS – Transabdominal Sonography

TCS – Transcervical Sonography

TDI – Total Dose Infusion

TDO – Transverse Diameter of the Outlet

TNF – Tumor Necrosis Factor

TOL – Trial of Labour

TOLAC - Trial of Labour After Caesarean

TPS – Transperineal Sonography

TVS – Transvaginal Sonography

USG – Ultrasonography

UV – Umbilical Vein

V/Q – Ventilation/Perfusion Ratio

VBAC – Vaginal Birth After Cesarean Section

TOL- Trial of Labour

WHO –World Health Organisation

wks – weeks

Wt – Weight

yrs - years

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# INTRODUCTION

With the widespread availability of ultrasonography devices, there has been an unprecedented increase in the importance of sonographic assessment as a valuable clinical tool, particularly in obstetric practice, due to its safety for use in pregnant women unlike other diagnostic modalities. Sonographic assessment of patients during early stages of labour has attracted considerable research interest, particular for the prediction of the progress and outcome of delivery. In fact, ultrasound evaluation during the first stage of labour has been found to be superior to vaginal examination in the detection of malpositions and in the subsequent prediction of the mode of delivery[1].

Normally late in pregnancy, a characteristic attitude is assumed by the fetus. It becomes folded upon itself so that it makes its back markedly convex with a sharply flexed head sharply making the chin in contact with the chest. Abnormalities to that attitude may occur. The fetal head may become progressively extended changing its position from the vertex to face. This results in changing of the vertebral column contour from convex to concave[2].

Deflexed head can cause arrest of labor and accounts for 1/3$^{rd}$ of cesarean sections performed for that arrest[3].

Apart from major degrees of head deflexion, there are minor degrees that cannot be detected clinically. The use of transabdominal ultrasound at the suprapubic region can detect these minor degrees which may be responsible for abnormal progress of labor[4].

The aim of our study is to assess the effect of the fetal occiput-spine angle measured through transabdominal ultrasound during the first stage of labor on the progress and outcome of labor.

## AIM AND OBJECTIVES

**AIM: To identify the role of transabdominal sonography in predicting the mode ofdelivery.**

**OBJECTIVE:**

1. To quantify the degree of fetal head deflexion using a transabdominal obstetric scan at term or in early first stage of labour
2. To correlate the occiput- spine angle with the course and outcome of labour.
3. To assess the reliability of occiput-spine angle as a parameter to predict abnormal labour patterns.
4. Assessment of clinical pelvimetry.

## REVIEW OF LITERATURE

**1. Ghi et al** have used transabdominal obstetric ultrasound in early labour to measure the occiput-spine angle and correlate it with the fetal head station . It was noted that, the higher value of occiput-spine angle width, lower was the fetal station. The occiput-spine angle width shows significant differences in relation with fetal head station. This confirms that the degree of fetal head flexion is subjected to progressive increase during fetal head descent[5].

**2. Akmal et al** have reported that digital examination to assess the fetal head position in labour is not very accurate in the majority of cases. Correct identification of fetal head position increased with the increase in cervical dilatation from 20.5 % at 3-4 cms to 44.2 % at 8-10 cms. This emphasizes the fact that digital vaginal examinations fail to identify the correct fetal head position in majority of the cases[6].

**3. Sherer et al** have concluded that the accuracy of digital vaginal examination to assess the fetal head position is improved if it is correlated with ultrasound assessments. The accuracy of digital vaginal examination was increased to 47 % when fetal head position assessed by digital vaginal examination was considered correct if reported within +/- 45 % of the ultrasound assessment. Hence, ultrasound proved to be feasible and more successful and accurate in determining fetal position compared with vaginal palpation[7,8].

**4. Hoon Ahn Ki, Oh Min Jeong** have discussed the usefulness of intrapartum ultrasound for the evaluation of labour progress and predicting successful operative vaginal delivery. Furthermore, they have reported that digital pelvic examination is inferior to ultrasound for assessing fetal head position during labour. Therefore, it remains to be determined that intrapartum ultrasound can be used to diagnose the presence of abnormal labour and predict the possibility of successful instrumental delivery, consequently improving maternal and fetal outcomes[9].

**5. Ghi and Franchi et al,** studied the correlation between the sonographic measurement of the occiput – spine angle and the fetal head station in the first stage of labour. The occiput – spine angle shows significant differences in relation with the fetal head station. This confirms that the degree of fetal head flexion is subjected to progressive increase during fetal descent[10].

**6. Dupis et al,** compared the digital vaginal examination and TAS examination for the assessment of fetal head position in second stage of labour. Fetal head position was found to be identical in 70%. Occiput - posterior and transverse head positions were associated with a

50 % rate of clinical error[11].

**7. Molina,** in there study have reported that ultrasound studies have shown that digital examination before instrumental delivery fails to identify the correct fetal position in a high proportion of cases. There is extensive evidence that digital pelvic examination does not provide accurate assessment of the position and Review of Literature 6 descent of fetal head both during first but also in the second stage of labour. The use of ultrasound is of crucial importance in assessing the fetal head position and that will predict whether vaginal delivery would be successful[12].

**NORMAL LABOR**

**DEFINITION :**

Labor is a series of events in genital organs intended to push the live foetuses out the the womb through the vagina and into the outside world. [3]

**Normal labour (Eutocia): The following conditions must be met for labour to be considered normal.**

(1) Spontaneous in onset and at term.

(2) With vertex presentation.

(3) Without undue prolongation

(4) Natural termination with minimal aids.

(5) Without having any complications affecting the health of the mother and/or the baby. [3]

**Abnormal Labor (Dystocia): Any deviation from the definition of normal labor is called Abnormal labor.**

Thus, labour in a case where the presentation is other than vertex, or where there are complications even with vertex presentation, affecting the course of labour or changing the nature of termination or adversely affecting the maternal and/or fetal prognosis is called abnormal labor.[3]

Date of Onset of Labor: Calculation based on Naegele‘s formula can only give a rough guide. Based on the formula, labor starts approximately on the expected date in 4%, one week on either side in 50%, 2 weeks earlier and 1 week later in 80%, at 42 weeks in 10% and at 43 weeks plus in 4%.[3]

**2. Theories of Labour Initiation**

A synchronised series of intermittent, involuntary uterine contractions make up labour. The foetus and placenta are expelled from the mother's body as a result of a series of events. This is made possible by the existence of abdominal pressure and uterine contractions, which push the foetus out during the delivery process known as expulsion. Regular contractions cause a progressive effacement and dilation of the cervical cavity. The baby can be propelled outside the mother's womb when the abdominal muscles exert enough pressure. A woman must physically and psychologically use her coping mechanisms during labour and delivery. Labor often starts as the foetus reaches a mature age (38-42 weeks age of gestation). Despite the fact that the precise process that starts labour is uncertain. There are various theories that attempt to explain the how and why of labour.

A) Uterine Stretch theory

B) Oxytocin theory

C) Progesterone deprivation theory

D) Prostaglandin theory

E) Theory of Aging Placenta. [15]

**CAUSATION OF ONSET OF LABOR.** [3]

The precise mechanism of human labour initiation is still unknown. However, animal experiments on endocrine, biochemical, and mechanical stretch pathways support the following hypotheses.

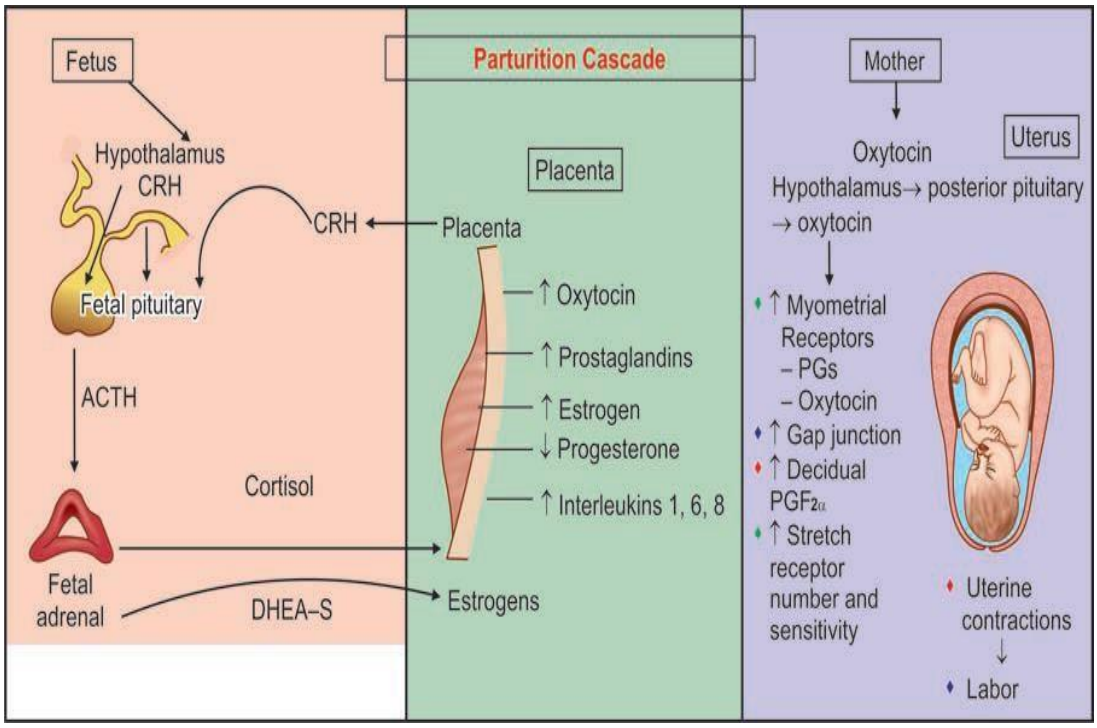



**Figure 1 – INITIATION OF PARTURITION.** [3]

• **Uterine distension:** The stretching effect of the growing foetus and liquor amnii on the myometrium can explain the onset of labour, at least in twins or polyhydramnios**. Uterine stretch** increases gap junction proteins, oxytocin receptors, and contraction-associated proteins (CAPS).

• **Fetoplacental contribution:** Cascade of events activate fetal hypothalamic pituitary adrenal axis prior to onset of labor → increased CRH → increased release of ACTH → fetal adrenals → increased cortisol secretion → accelerated production of estrogen and prostaglandins from the placenta (see Fig. 12.1).

• **Estrogen**—the probable mechanisms are:

- Increases the release of oxytocin from maternal pituitary.
- Promotes the synthesis of myometrial receptors for oxytocin (by 100– 200 folds), prostaglandins and increase in gap junctions in myometrial cells.
- Increases prostaglandin (PGF2) synthesis by accelerating lysosomal disintegration in decidual and amnion cells.

- cAMP stimulates the synthesis of myometrial contractile protein
- Boosts the excitability of myometrial cell membranes

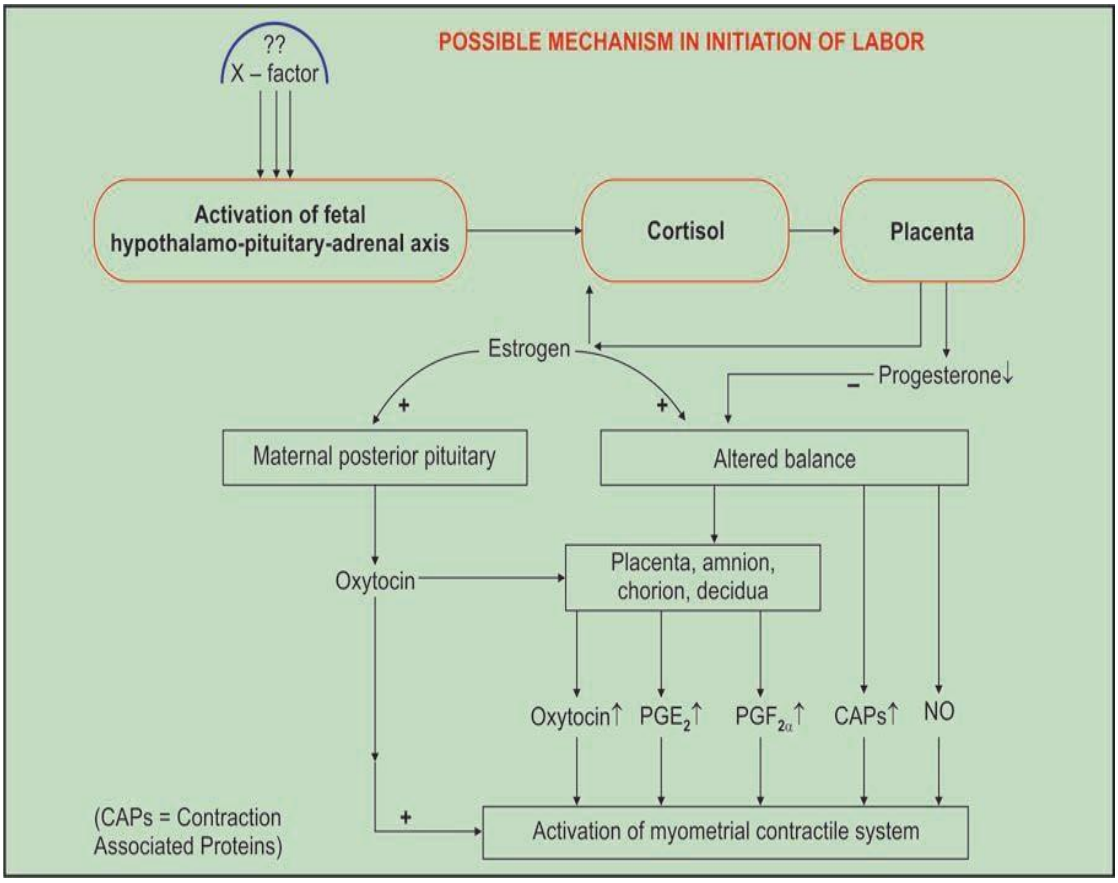
• **Progesterone:** Increased foetal production of dehydroepiandrosterone sulphate (DHEA-S) and cortisol inhibits foetal pregnenolone conversion to progesterone. As a result, progesterone levels drop prior to labour. The change in the estrogen:progesterone ratio, rather than a decrease in the absolute concentration of progesterone, is associated with prostaglandin synthesis.

• **Prostaglandins:** Prostaglandins are important factors in the initiation and maintenance of labour. Amnion, chorion, decidual cells, and myometrium are the primary sites of prostaglandin synthesis. Synthesis is triggered by the following factors: an increase in oestrogen levels, glucocorticoids, mechanical stretching in late pregnancy, an increase in cytokines (IL-1, 6, TNF), infection, vaginal examination, membrane separation or rupture.

• Prostaglandins promote the formation of gap junctions (intermembranous gaps between two cells through which stimulus flows).

**Biochemical Mechanisms Involved in the Synthesis of Prostaglandins** [3]

Phospholipase A2 in the lysosomes of the foetal membranes near term → esterified arachidonic acid → formation of free arachidonic acid → synthesis of prostaglandins through prostaglandin synthetase. Prostaglandins (E2 and F2) diffuse in the myometrium and act directly on the sarcoplasmic reticulum, Inhibiting cell proliferation.intracellular cAMP generation → increase local free calcium ions → uterine contraction. Once the arachidonic acid cascade is initiated, prostaglandins themselves will activate lysosomal enzyme systems. **The prostaglandin synthesis reaches a peak** during the birth of placenta probably contributing to its expulsion and to the control of postpartum haemorrhage.




**Flow Chart 1 – BIOCHEMICAL MECHANISMS IN INITIATION OF LABOUR.** [3]

- **Myometrial Oxytocin Receptors and Oxytocin:**

i. The fundus has a higher density of oxytocin receptors than the lower segment and the cervix.

ii. The number of receptors increases during pregnancy, peaking during labour.

iii. During labour, receptor sensitivity increases.

iv. Oxytocin stimulates amnion and decidua PG synthesis and release (E2 and F2).
The maternal plasma oxytocin level rises after vaginal examination and amniotomy

**• Neurological Factor:**

Both and adrenergic receptors are present in the myometrium, with oestrogen causing the receptors to function primarily and progesterone causing the receptors to function primarily.

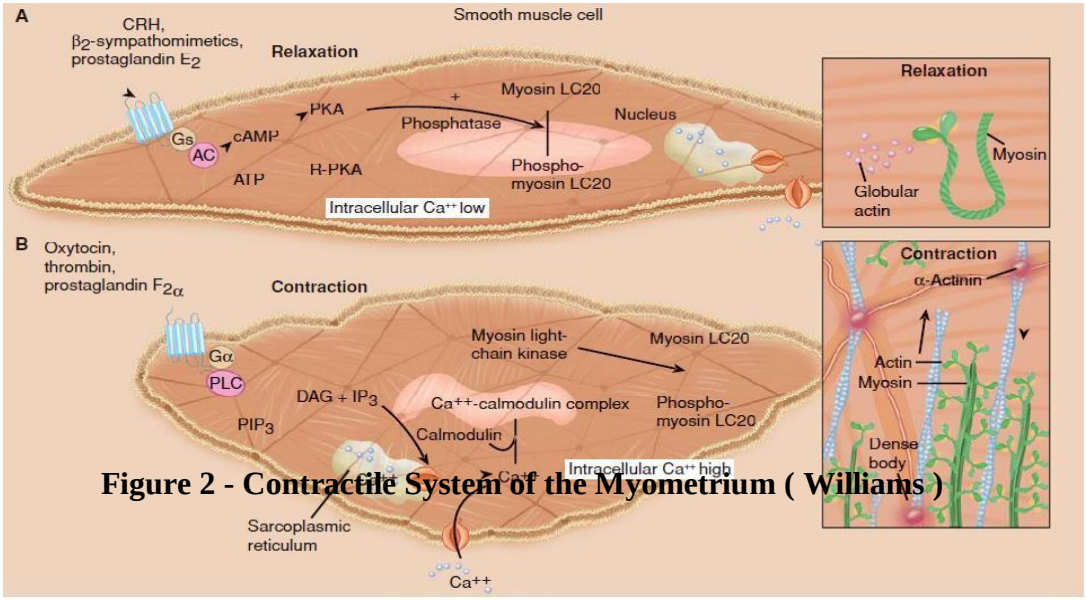



**Figure 2 - Contractile System of the Myometrium ( Williams )**

**Figure 2 – UTERINE MYOCYTE RELAXATION AND CONTRACTION.** [2]

**CONTRACTILE SYSYTEM OF THE MYOMETRIUM.** [3]

**The basic elements involved in the uterine contractile systems are:**

(a) actin

(b) myosin

(c) adenosine triphosphate (ATP)

(d) the enzyme myosin light chain kinase (MLCK)

(e) Ca++.

A myofibril is a structural unit of a myometrial cell that contains the proteins actin and myosin. Myosin-actin interaction is required for muscle contraction. Myosin light chain phosphorylation is a critical step in the actin-myosin interaction. Myosin light chain kinase regulates this reaction (MLCK). Oxytocin activates phospholipase C and raises intracellular calcium levels by acting on myometrial receptors. Calcium is required for MLCK activation and binds to the kinase as a calmodulin-calcium complex. Two general mechanisms regulate intracellular calcium levels:

(a) Influx across the cell membrane.

(b) Extraction from intracellular storage sites.

Calcium is stored in the sarcoplasmic reticulum and the mitochondria of cells. Calcium storage is promoted at these sites by progesterone and cAMP. However, PGF2, E2, and oxytocin stimulate its release.

• Intracellular Ca++ → Calmodulin Ca++ → MLCK → Phosphorylated Myosin + Actin → myometrial contraction.

• Decrease of intracellular Ca++ (or its shift to the storage sites) → dephosphorylation of myosin light chain → inactivation of myosin light chain kinase → Myometrial relaxation.

**There are two types of adrenergic receptors in uterine muscles.**

(a) receptors that, when stimulated, cause a decrease in cyclic AMP (adenosine monophosphate) and uterine contraction.
(b) receptors that, when stimulated, cause a rise in cyclic AMP and inhibit uterine contraction.

**FALSE PAIN** (also spelled false labour, spurious labour):

It is found more in primigravidae than in parous women. It usually appears 1 or 2 weeks before the onset of true labour pain in primigravidae and a few days in multiparae. Such pains are most likely caused by stretching of the cervix and lower uterine segment, which causes irritation of the nearby ganglia.

**PRELABOR** (premonitory stage) [3]

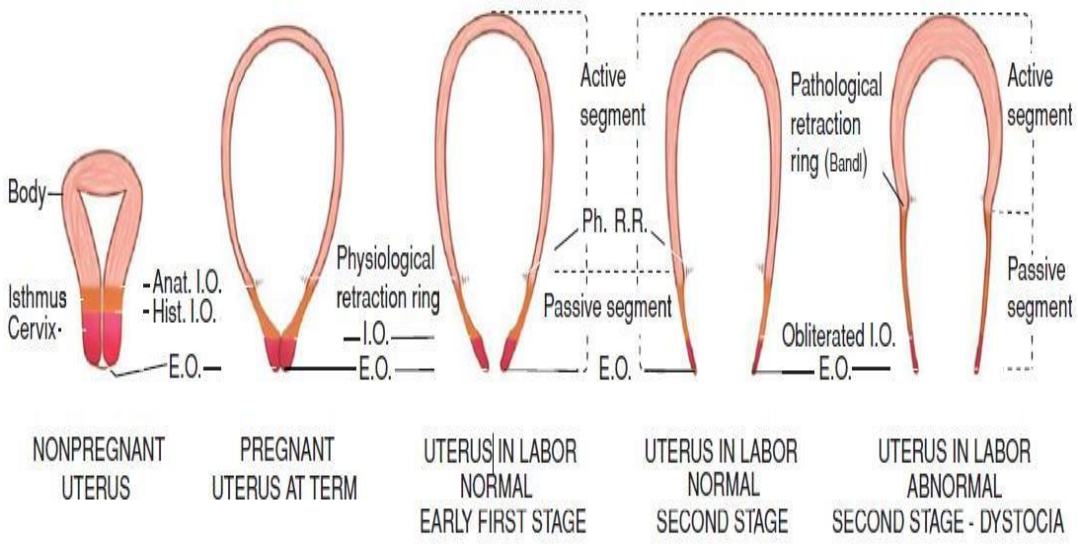
In primigravidae, the premonitory stage may begin 2-3 weeks before the onset of true labour and a few days before in multiparae.

**The characteristics are inconsistent and may include the following:**

• **Lightening:** A few weeks before labour begins, especially in primigravidae, the presenting part sinks into the true pelvis. It is caused by the active pulling up of the uterine lower pole around the presenting part. Due to mechanical factors—pressure by the engaged presenting part—there may be frequency of micturition or constipation. It's a good sign because it eliminates cephalopelvic disproportion and other conditions that prevent the head from entering the pelvic inlet.

• **Cervical changes:** The cervix becomes ripe a few days before labour begins. A ripe cervix is soft, less than 1.5 cm long, easily admits a finger, and dilates.

• **The appearance of false pain.**




Anat. I.O – Anatomical internal os

Hist. I.O – Histological internal os

E.O – External os

Ph. R.R – Physiological retraction ring

**Figure 3 – SEQUENCE OF DEVELOPMENT OF THE SEGMENTSANDRINGS IN THE UTERUS AT TERM AND IN LABOUR.** [2]

**True labor pains are characterized by:** [3]

i. Uterine contractions at regular intervals

ii. Frequency of contractions increase gradually

iii. Intensity and duration of contractions increase progressively

iv. Associated with ―show

v. Progressive effacement and dilatation of the cervix

vi. Descent of the presenting part

vii. Formation of the ‒bag of forewaters

viii. Not relieved by enema or sedatives.

**False labor pains are:** [3]

i. Dull in nature

ii. Confined to lower abdomen and groin

iii. Not associated with hardening of the uterus

iv. They have no other features of true labor pains as discussed above

v. Usually relieved by enema or sedative.

**Labor pains:**

Painless Braxton Hicks contractions with uterine hardening occur throughout pregnancy. These contractions change in nature, becoming more powerful, intermittent, and painful. The pains are usually felt in front of the abdomen or radiate to the thighs.

There is a lot of cervical secretion when labour starts. **Show is the expulsion of a cervical mucus plug mixed with blood.**

**Internal os dilatation:**

When labour pains begin, the cervical canal dilates more in the upper part than in the lower, with the former accompanied by corresponding stretching of the lower uterine segment.

The membranes are easily detached due to their loose attachment to the poorly formed decidua as a result of stretching of the lower uterine segment. The lower pole of the foetal membranes becomes unsupported and tends to bulge into the cervical canal as the cervical canal dilates. It is known as a bag of waters because it contains liquor that has passed below the presenting part.[3]

**NORMAL LABOR PHYSIOLOGY**.[3]

During pregnancy, there is significant hypertrophy and hyperplasia of the uterine muscle, as well as uterine enlargement. A thick, tenacious mucus plug has occluded the cervical canal.

**Uterine Contraction during labour:**

During pregnancy, there are irregular involuntary spasmodic uterine contractions that are painless (Braxton-Hicks) and have no effect on cervix dilatation. With the onset of labour, the nature of the contractions changes. The uterine contraction pacemaker is located in the region of the tubal ostia, where contraction waves spread downwards. While the frequency, intensity, and duration of contractions vary greatly, they are usually within normal limits in the following patterns.

- The contraction waves from both halves of the uterus are well synchronised.

- There is fundal dominance with a gradually diminishing contraction wave through the mid-zone down to the lower segment, which takes about 10-20 seconds.

- The contraction waves follow a predictable pattern

- During uterine contraction, intra-amniotic pressure rises above 20 mm Hg.

- In between contractions, good relaxation occurs, lowering intra-amniotic pressure to less than 8 mm Hg. Fundus contractions last longer than midzone contractions.

During contraction, the uterus hardens and is pushed anteriorly to align the uterine long axis with the pelvic axis. Simultaneously, the patient feels pain in the hypogastric region, which often radiates to the thighs.

**Probable causes of pain are**:

(a) Myometrial hypoxia during contractions (as in angina).

(b) Stretching of the peritoneum over the fundus.

(c) Stretching of the cervix during dilatation.

(d) Compression of the nerve ganglion.

The pain of uterine contractions is distributed along the T10 to L1 cutaneous nerve distribution. The sacral plexus refers pain from cervical dilatation and stretching to the back.

**Tonus:**

The intrauterine pressure that exists between contractions. During pregnancy, the tonus is 2-3 mm Hg because the uterus is quiescent (inactive). It ranges between 8 and 10 mm Hg during the first stage of labour. It varies inversely with relaxation.
The tonus is governed by the following factors:

I. Contractility of uterine muscles
II. Intra-abdominal pressure
III. Overdistension of uterus as in twins and hydramnios.

The degree of uterine systole is described by the intensity of uterine contraction. The intensity gradually increases as the labour progresses, peaking in the second stage during the baby's delivery. During contractions, intrauterine pressure rises to 40-50 mm Hg in the first stage of labour and 100-120 mm Hg in the second stage. Despite the reduced pain in the third stage, the intrauterine pressure is likely to be the same as in the second stage. The reduced pain is caused by a lack of stretching effect.

**Duration**: During the first stage, contractions last about 30 seconds but gradually increase in duration as labour progresses.

**Frequency:** In the early stage of labor, the contractions come at intervals of 10–15 minutes. The intervals gradually shorten with advancement of labor until in the second stage, when it comes every 2–3 minutes.

**Retraction :** [3]

Retraction is a uterine phenomenon that occurs during labour and causes muscle fibres to become permanently shortened. Contraction is a temporary shortening of the fibres, which return to their full length during relaxation. Retraction, on the other hand, results in permanent shortening and the fibres are permanently shortened.

**The Net Effects of Retraction in Normal Labor are:**

- Important in the formation of the lower uterine segment as well as the dilatation and effacement of the cervix.
- To keep the presenting part moving forward as a result of uterine contractions and to aid in the eventual expulsion of the foetus.
- To reduce the surface area of the uterus, allowing the placenta to separate.
- After placental separation, there is effective hemostasis.

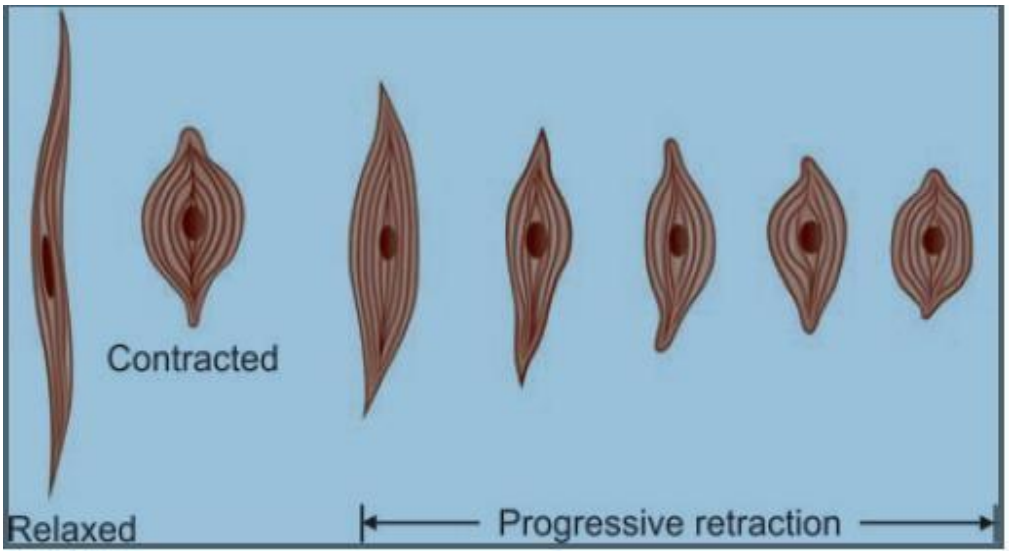



**Figure 4 – CONTRACTION AND RETRACTION OF UTERINE MUSCLE FIBRES DURING LABOR.** [3]

**STAGES OF LABOR.** [2]

Conventionally, events of labor are divided into:

• **First Stage:** It begins with the onset of true labour pain and ends with complete cervix dilatation. It is also known as the cervical stage of labour. It lasts an average of 12 hours in primigravidae and 6 hours in multiparae.

• **Second Stage:** It begins with full cervix dilatation (rather than membrane rupture) and ends with foetus expulsion from the birth canal. It is divided into two stages:

(a) The propulsive phase - begins with full dilatation and continues until the presenting part descends to the pelvic floor.

(b) The expulsive phase is distinguished by maternal bearing down efforts and concludes with baby delivery. It lasts about 2 hours in primigravidae and 30 minutes in multiparae.

•**Third Stage:** It begins after the foetus is expelled and ends with the expulsion of the placenta and membranes (after-births).

It lasts about 15 minutes in both primigravidae and multiparae. However, in active management, the duration is reduced to 5 minutes.

• **Fourth Stage:** This is the stage of observation for at least 1 hour after the after-births have been expelled. During this time, the patient's general condition and uterine behaviour must be closely monitored.

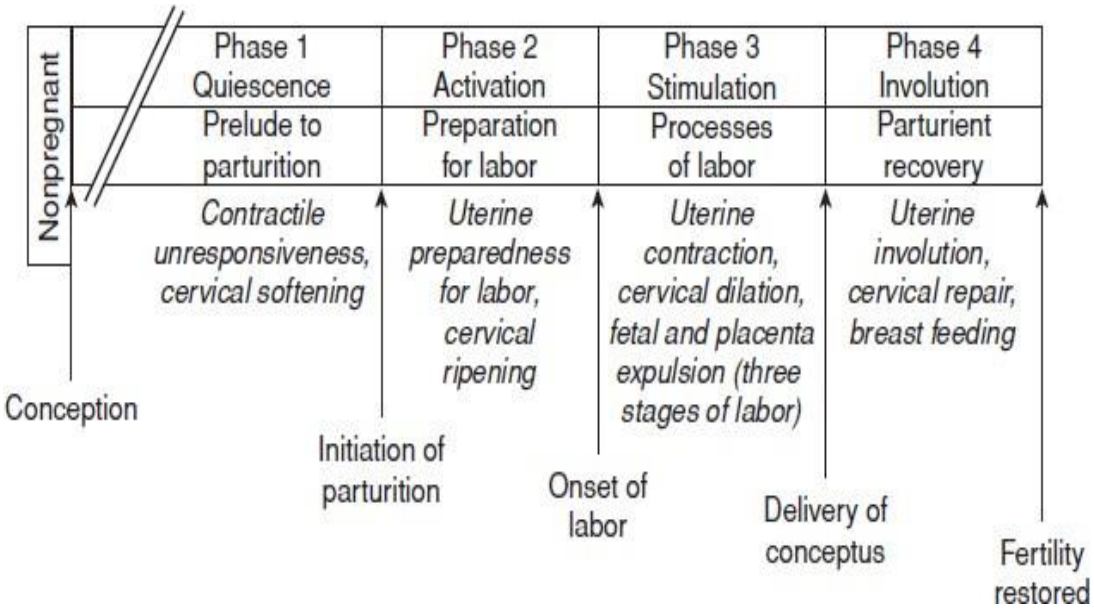



**Table 1 – PHASES OF PARTURITION.** [2]

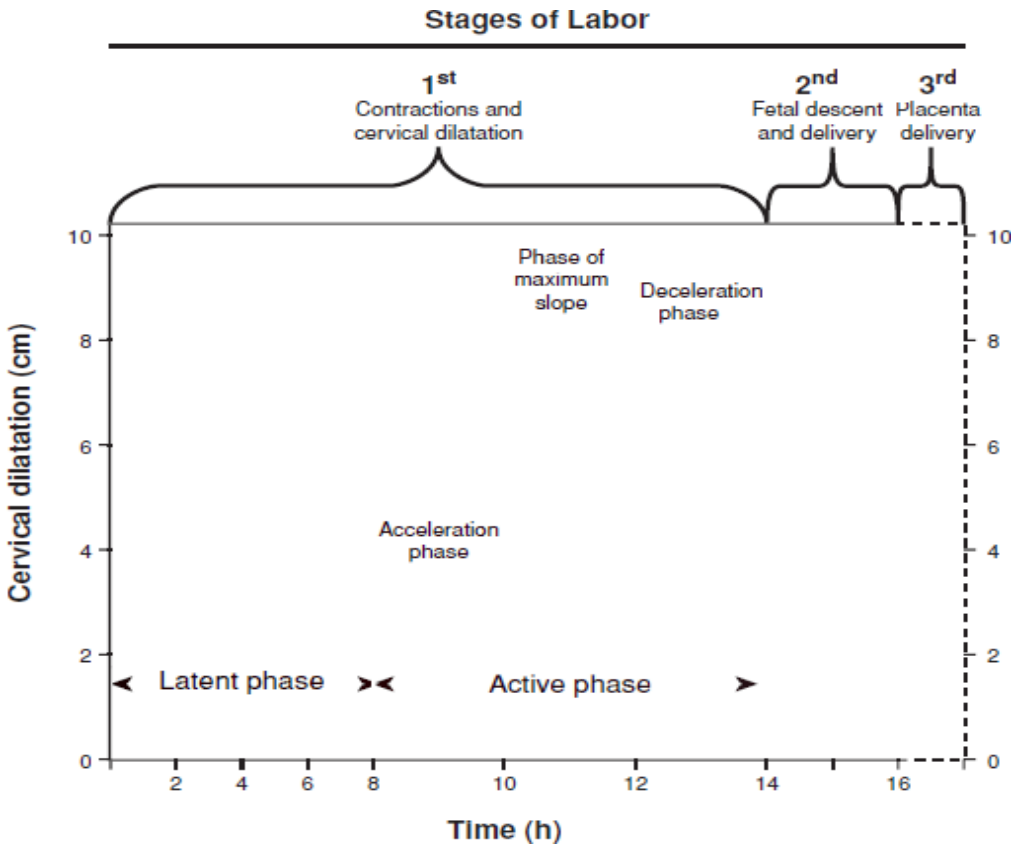



**Figure 5 - COMPOSITE OF THE AVERAGE DILATATION CURVE FOR LABOR.** [2]

**EVENTS IN EACH STAGE OF LABOR.** [16]

**The first stage is**:

This period lasts from the onset of true labour pains to the complete dilatation of the cervix. As a result, it is a cervical dilatation and effacement stage.

**Duration:** In a primigravida, it lasts approximately 12 hours, while in a multigravida, it lasts approximately 5-6 hours.

**Lower Uterine Segment:** Under the influence of uterine contractions, the uterus gradually differentiates into two distinct portions during labour:

1. The upper segment is thicker and more active, and it gets thicker as labour progresses.
2. The lower portion, that is, the lower segment with the cervix, is passive and thins and stretches out to receive the descending foetus as labour progresses; the junction of the upper and lower uterine segments is characterised by a ring of circular muscle fibres, known as the physiological retraction ring. Above this level is the cervix's contracting thick upper segment, and below it is the cervix's dilating and stretching lower segment. The ring becomes more visible during obstructed labour and is known as the pathological retraction ring or BANDL's RING. The lower uterine segment arises from the isthmus, which is defined as the portion of the non-pregnant uterus located between the anatomical internal os and the histological internal os, with the former being higher. During pregnancy, this area is said to expand as the baby grows. The lower segment is formed by the upper segment retraction, which pulls up and thins out the tissue between itself and a fixed cervix. The thinning of the lower segment during labour is caused by the downward and outward thrust of descending foetus. In late pregnancy, the upper margin of the lower segment is about the level of the upper border of the

symphysis pubis and is roughly indicated by the line of close attachment of the uterovesical fold of the peritoneum.

3. Muco sanguinous discharge: A small amount of red-tinged mucus may be passed just before the start of labour (show). This is a plug of cervical mucus and blood.
4. Cervical dilatation:
5. Cervical dilatation mechanism:
• Cervical dilatation occurs as a result of the upper segment contracting and retracting, lifting up and thinning out the lower segment, and eventually pulling the cervix over the advancing part without significantly altering the level of external os in the pelvis.
• A well-fitting presenting part promotes good uterine action and smooth cervix dilatation.
• Uterine contractions put pressure on the membranes, and the amniotic fluid's hydrostatic action dilates the cervical canal.
• The bag of forewaters is not required for the process of cervix dilatation.
• After the membranes rupture, the pressure exerted by the presenting part on the cervix causes reflex uterine contractions that are stronger than before the rupture. These aid in faster dilatation.

**Dilatation of the external os:**
As a result, it is dependent not only on the strong and coordinated action of muscles, but also on its own ability to soften and stretch. This, in turn, is dependent on its own intrinsic development and preparation during pregnancy.
This preparation is aided by the hormones oestrogen and progesterone.
Prostaglandins are also important.

**Process of cervical dilatation:**

This varies slightly between primipara and multipara. When labour begins in a primipara, the entire cervical canal is closed, including both the internal and external os. The dilatation happens in stages, starting with the internal os, then the cervical canal, and finally the external os. In a multipara, however, the start of labour, the external os, is patulous, usually admitting one finger freely, sometimes more. As in a primigravida, the internal os is not completely occluded. As a result, the dilatation process is a little faster and easier, because dilatation of the internal os causes simultaneous dilatation of the cervical canal.

**Pattern of cervical dilatation:**

Friedman explained that when cervical dilatation is plotted against time, it takes the shape of a sigmoid curve. The time course of cervical dilatation is plotted. The cervical dilatation curve is classified as follows:

• A latent phase that is relatively flat

• A rapidly advancing active phase

**Duration:**

Latent phase duration varies and is associated with minimal cervical dilatation. Sedation and anaesthesia are possibilities at this stage. The active phase is divided into two parts:

- The phase of acceleration
- Maximum slope phase
- Phase of deceleration.

The characteristics of the acceleration phase determine the outcome of labour.

**Fetal descent pattern**:

In nulliparas, the foetal head is engaged before the onset of labour. The lack of fixation of the cephalic presentation's head suggests the possibility of abnormalities. Active descent occurs during the peak of the cervical dilatation slope and continues until the head reaches the perineal floor.

**Membrane rupture**

Membrane rupture usually occurs spontaneously during active labour.

A sudden gush of nearly colourless fluid indicates a rupture.

| PARAMETERS | SCORE | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| ***CERVIX* :** | | | | |
| Dilatation(cm) | Closed | 1-2 | 3-4 | 5+ |
| *Effacement (%) | 0-30 | 40-50 | 60-70 | >/= 80 |
| Consistency | Firm | Medium | Soft | - |
| Position | Posterior | Midline | Anterior | - |
| ***HEAD*:** Station | -3 | -2 | -1,0 | +1,+2 |
| Total score = 13, Favourable score = 6-13, Unfavourable score = 0-5 | | | | |
| *Cervical length (cm) | >4 | 2-4 | 1-2 | <1 |
| *Modification (1991) replaces effacement (%) with cervical length in cm. | | | | |

**Table 2 - MODIFIED BISHOP's SCORING SYSTEM. [3]**

**Second Stage :**

**Duration :**

The second stage, also known as the expulsion stage, lasts from the complete dilatation of the cervix to the expulsion of the foetus or foetuses.

This stage could last anywhere between one to two hours for a primigravida and half an hour to one hour for a multigravida**.**

**Third Stage :**

The third stage, or placental delivery, is critical and should be closely monitored. This includes the complete expulsion of the foetus, the complete expulsion of the placenta and membranes, and subsequent firm contractions and uterine retraction. When completed spontaneously, the average duration of this stage can range from a few minutes to fifteen minutes.

**Placental detachment:**

The placenta may separate during the delivery of the foetus. Uterine contractions may cause the separation by shrinking the placental site and forcing the entire placenta mass downward. There are two ways for placental expulsion to occur:

1. Duncans Method

2. Schultze Method

**MECHANISM OF LABOR.** [2]

The position of the foetus with respect to the birth canal is critical to the route of delivery and should thus be determined early in labour. Fetal lie, presentation, attitude, and position are all important relationships.

**Fetal Lie**

Fetal lie refers to the longitudinal or transverse relationship of the foetal long axis to that of the mother.

**Fetal Presentation:**

The presenting part is the part of the foetal body that is either first within or close to the birth canal. On vaginal examination, it is usually felt through the cervix. As a result, in longitudinal lies, the presenting part is either the foetal head or breech, resulting in cephalic and breech presentations. The shoulder is the presenting part when the foetus is lying with the long axis transversely.

**Cephalic Presentation:**

Such presentations are classified based on the relationship between the fetus's head and body. Normally, the head is flexed sharply, bringing the chin into contact with the thorax. The presenting part is the occipital fontanelle, and this presentation is known as a vertex or occiput presentation. Face presentation occurs when the foetal neck is sharply extended, causing the occiput and back to come into contact and the face to be first in the birth canal. The foetal head may be partially flexed in some cases, with the anterior (large) fontanelle, or bregma, presenting - sinciput presentation - or partially extended in other cases, resulting in brow presentation. These latter two symptoms are typically transient. Sinciput and brow presentations almost always convert to vertex or face presentations as labour progresses by neck flexion or extension, respectively.

**Fetal Attitude or Posture**

During the later months of pregnancy, the foetus adopts a distinct posture known as attitude or habitus.

In general, the foetus forms an ovoid mass that roughly corresponds to the shape of the uterine cavity.

The foetus folds or bends upon itself in such a way that the back becomes noticeably convex; the head is elongated.

The thighs are flexed over the abdomen and the legs are bent at the knees; the chin is almost in contact with the chest; and the legs are bent at the knees.
Arms are usually crossed over the thorax or become parallel to the sides in all cephalic presentations.
The umbilical cord is located between their upper and lower extremities.
This distinctive posture is caused by the mode of foetal growth and its adaptation to the uterine cavity.
Abnormal deviations from this attitude occur as the foetal head extends from the vertex to the face presentation.
As a result, the foetal attitude gradually shifts from a convex (flexed) to a concave (extended) contour of the vertebral column.

**Fetal Position**

The relationship of an arbitrarily chosen portion of the foetal presenting part to the right or left side of the birth canal is referred to as position.

As a result, for each presentation, there may be two options: right or left. In vertex, face, and breech presentations, the foetal occiput, chin (mentum), and sacrum are the determining points.

There are left and right occipital, left and right mental, and left and right sacral presentations because the presenting part can be in either position.

These are denoted by the abbreviations LO and RO, LM and RM, and LS and RS, respectively.

**Varieties of Presentations and Positions**

The relationship of a given portion of the presenting part to the anterior, transverse, or posterior portion of the maternal pelvis is considered for even more accurate orientation. Because the presenting part in right or left positions can be directed anteriorly (A), transversely (T), or posteriorly (P), each of the three presentations has six variations. Thus, in an occiput presentation, the presentation, position, and variety may be abbreviated as follows in clockwise order:

**ROT, ROA LOA, ROP LOP, LOT, OA, OP**

Two-thirds of all vertex presentations are in the left occiput position, while one-third are in the right.

The acromion (scapula) is the portion of the foetus arbitrarily chosen for orientation with the maternal pelvis in shoulder presentations.

**Definition :** [16]

The mechanism of labour is the process by which the foetus adapts to the pelvic architecture in

order to achieve a safe vaginal delivery of a live foetus with minimal morbidity and no mortality to the mother and foetus. The adaptations of the foetal head as it passes through the different segments of the pelvis are important because labour can be stopped at any stage if the foetal head fails to achieve its purpose of passing through the pelvis.

**Cardinal Movements of the Fetus:**

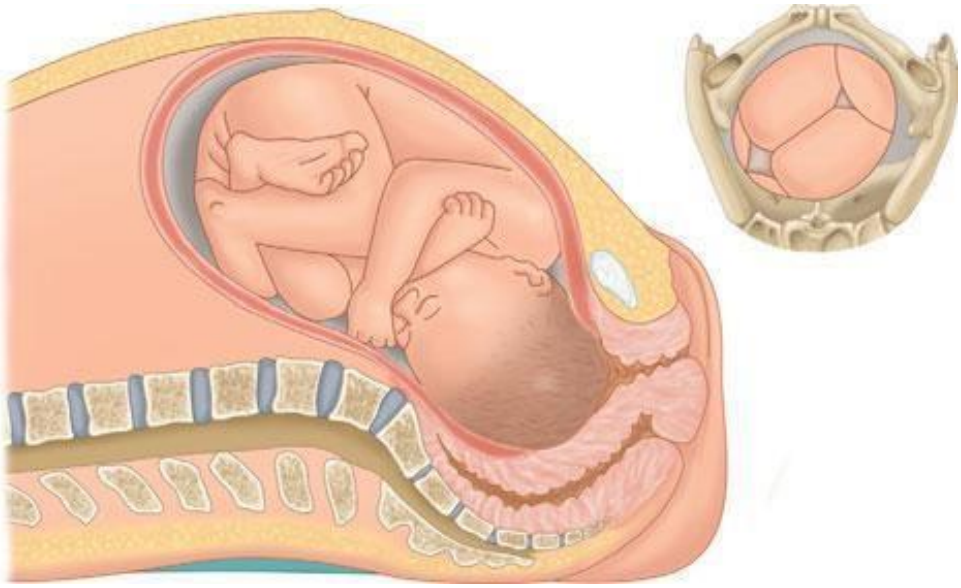
The cardinal movements are:

- Engagement
- Descent
- Flexion
- Internal rotation
- Extension
- Restitution
- External rotation
- Expulsion

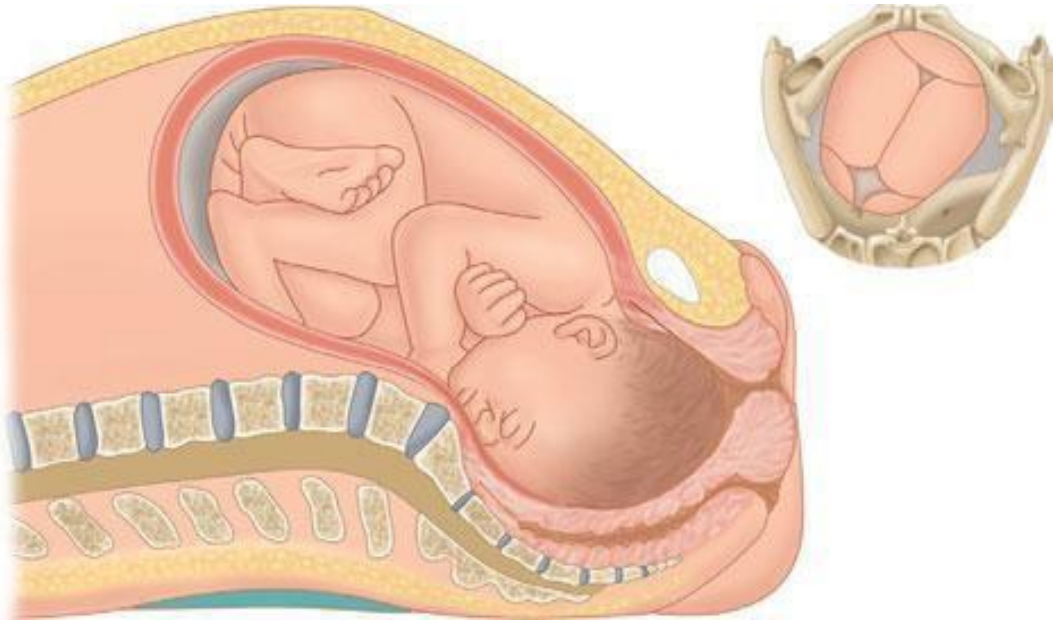
All these movements occur simultaneously. The three factors involved in labor are :

1. The pelvis and the soft parts- passage
2. The fetus- passenger
3. The uterine forces- the force.

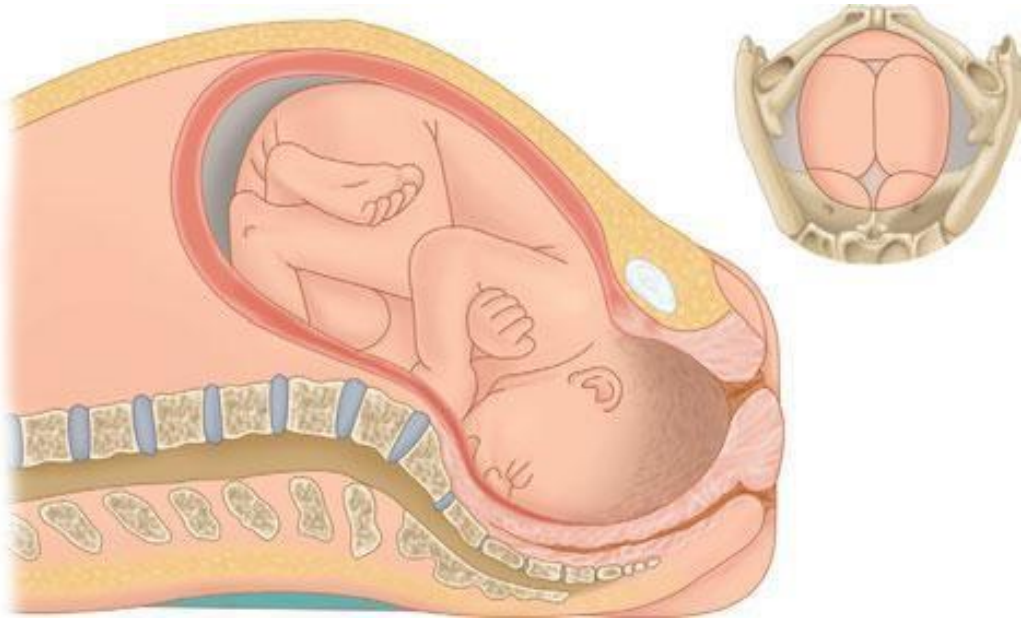
**A. Head floating, Before Engagement**



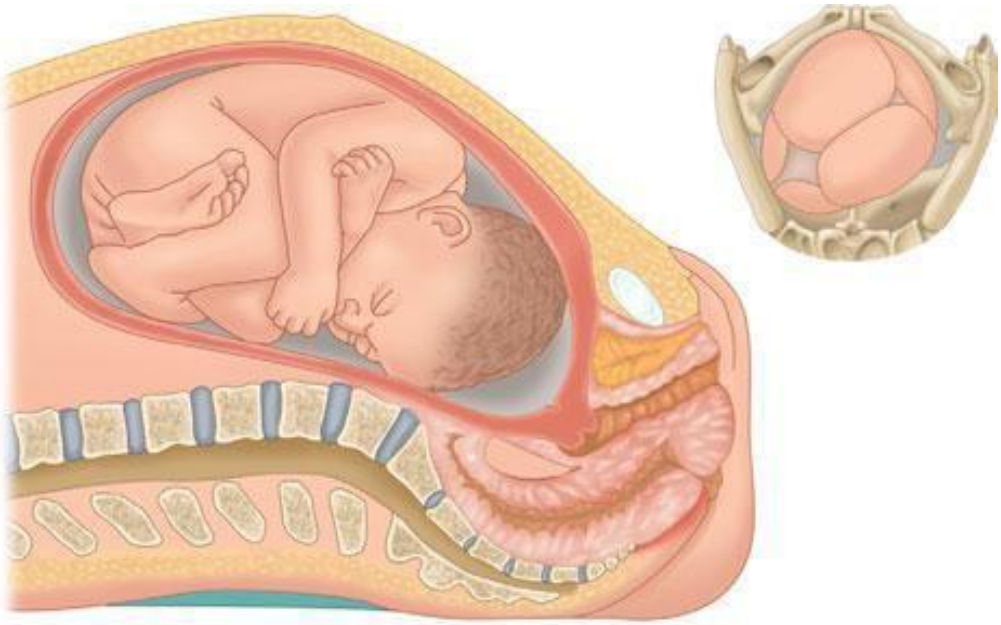
**B. Engagement, Descent, Flexion**



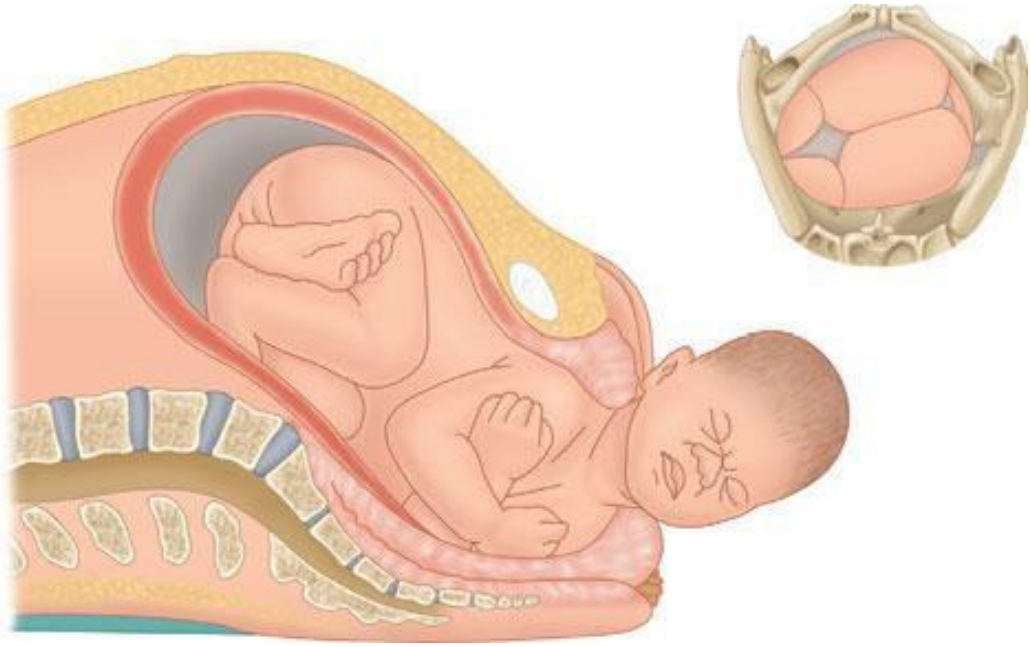
**C. Further Descent, Internal Rotation**



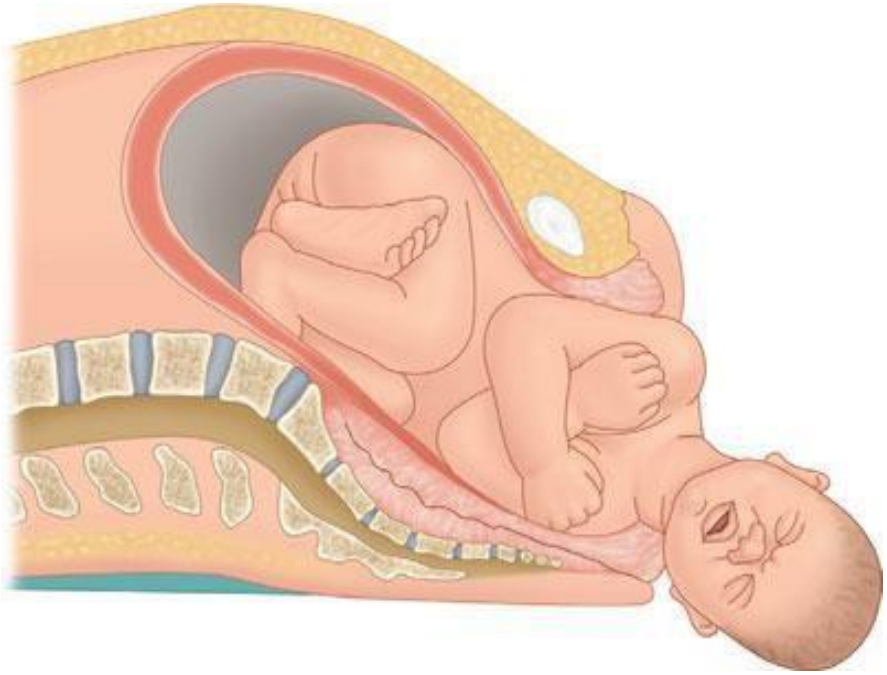
**D. Complete Rotation, Beginning Extension**



**E. Restitution (External Rotation)**



**F. Delivery of Anterior Shoulder**



**G. Delivery of Posterior Shoulder**

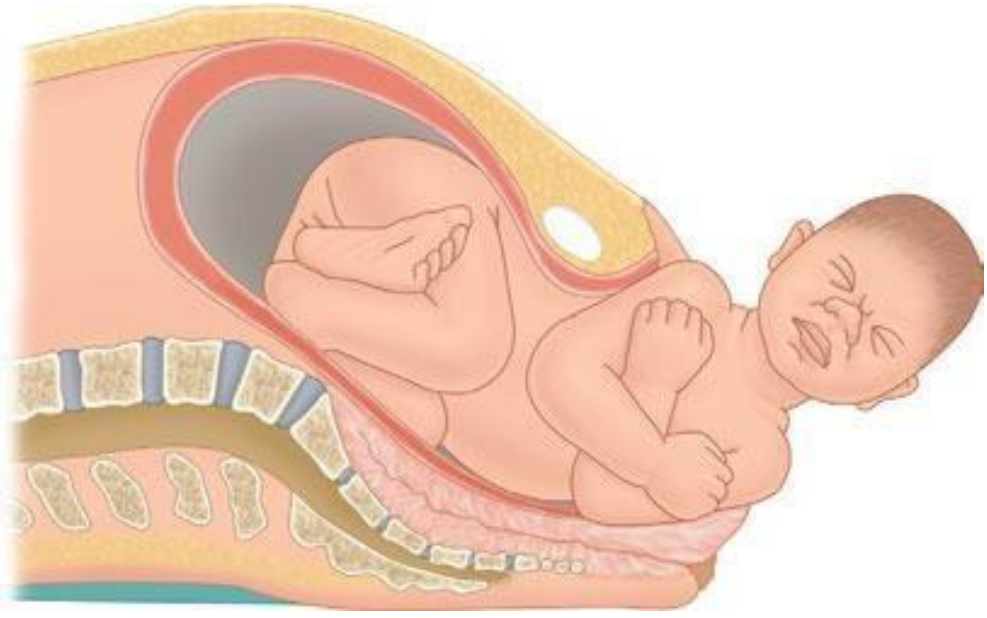


**Figure 6 A to G – MECHANISM OF LABOR.** [2]

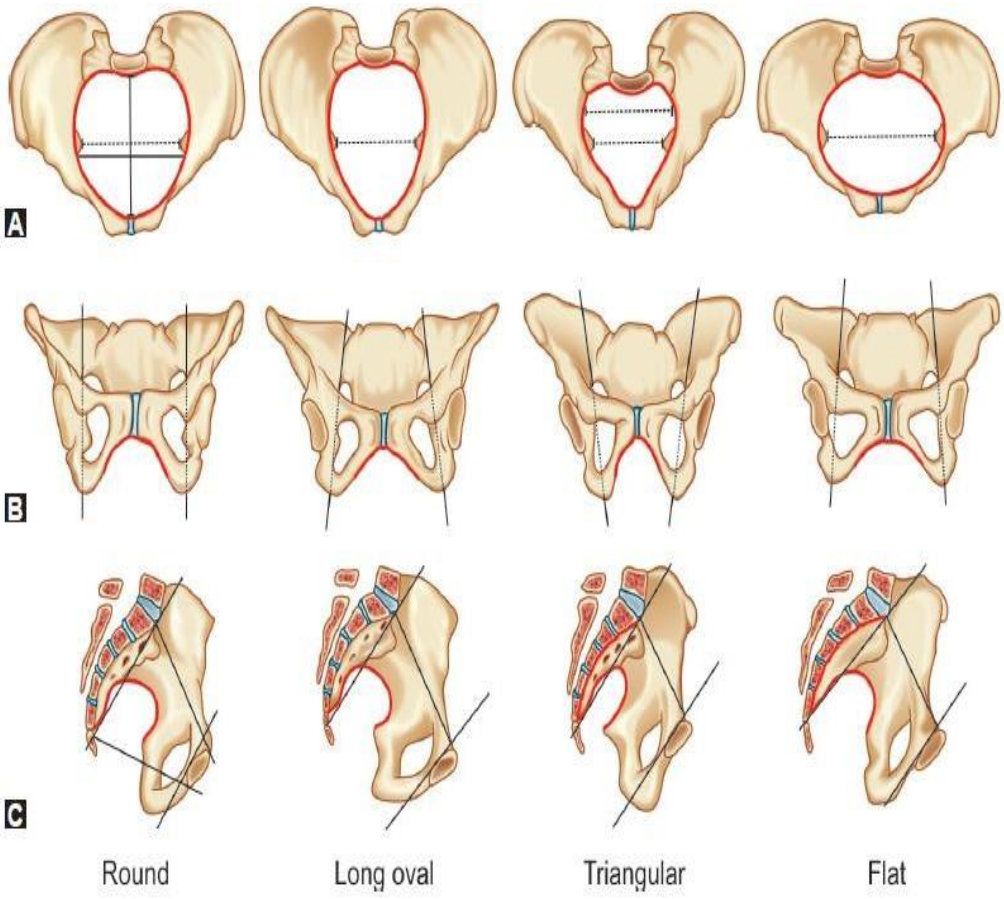



**Figure 7 A to C – ANATOMICAL FEATURES OF PARENT PELVIC TYPES.**

**A. INLET, B. CAVITY, C. OUTLET [2]**

| | | GYNECOID | ANTHROPOID | ANDROID | PLATYPELLOID |
|---|---|---|---|---|---|
| | **Shape** | **Round** | **Antero - posteriorly oval** | **Triangular** | **Transversely Oval** |

| | | | | | |
|---|---|---|---|---|---|
| **Inlet** | Anterior and posterior segment | Almost equaland spacious | Both increased with slight anterior narrowing | Posterior segment short and anterior segment narrow | Both reduced-flat |
| | Sacrum | Sacral angle more than $90^0$.<br>Inclined backwards. Wellcurved from above down and side to side. | Sacral angle more than $90^{0.}$<br>Inclined posteriorly. Long and narrow. Usual curve | Sacral angle less than $90^0$.<br>Inclined forwards andstraight. | Sacral angle more than $90^0$.<br>Inclined posteriorly. Short and straight. |
| **Cavity** | ***Sacrosciatic Notch*** | Wide and shallow | More wide and shallow | Narrow and deep | Slightly narrow and small |
| | ***Side Walls*** | Straight or slightly divergent | Straight or divergent | Convergent | Divergent |
| **Outlet** | ***Ischial Spines*** | Not prominent | Not prominent | Prominent | Not prominent |
| | ***Pubic Arch*** | Curved | Long and curved | Long and straight | Short and curved |
| | ***Subpubic Angle*** | Wide ($85^0$) | Slightly narrow | Narrow | Very wide |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | (> $90^0$) |
| | ***Bituberous Diameter*** | Normal | Normal or short | Short | Wide |

**Table 3 – ANATOMICAL FEATURES OF PARENT PELVIC TYPES.[2]**

| | | **GYNECOID** | **ANTHROPOID** | **ANDROID** | **PLATYPELLOID** |
|---|---|---|---|---|---|
| **Inlet** | ***Position*** | Occipito – lateral or oblique occipito-anterior | Direct occipito - anterior or posterior | Occipito -lateral or oblique occipito-posterior | Occipito – lateral |
| | ***Diameter of engagement*** | Transverse or oblique | Anteroposterior | Transverse or oblique | Transverse |
| | ***Engagement*** | No difficulty. Usual mechanism | No difficulty except flexion isdelayed | Delayed and difficult | Difficult by exaggerated parietal presentation |
| **Cavity** | ***Internal rotation*** | Easy anterior rotation | Non-rotation common | Difficult anterior rotation. Notoccurs early above the ischial spines, chances of | Anterior rotation usually occurs latein the perineum |

| | | | | | |
|---|---|---|---|---|---|
| | | | | arrest | |
| **Outlet** | ***Delivery*** | No difficulty | More incidence offace to pubis delivery | Difficult delivery with increased chance of perineal injuries. | No difficulty |

**Table 4 – OBSTETRIC OUTCOME IN PARENT PELVIC TYPES. [3]**

**Assessment of the pelvis (Pelvimetry).[3]**

Assessment of the pelvis can be done by bimanual examination:

**Clinical Pelvimetry or by Imaging Studies - Radio-Pelvimetry**, **ComputedTomography (CT) and Magnetic Resonance Imaging (MRI).**

**Clinical Pelvimetry:** This is done manually.

**Time: In vertex presentation,** the assessment is performed at any time after the 37th week, but it is preferable at the start of labour.

Because the tissues have softened, assessment can be done effectively during this time.

Procedures: The patient must empty his or her bladder. The pelvic examination is performed with the patient in the dorsal position while aseptic preparations are made

**The following features are to be noted simultaneously:**

1. State of the cervix

2. To note the station of the presenting part in relation to ischial spines

3. To test for cephalopelvic disproportion in nonengaged head and

4. To note the resilience and elasticity of the perineal muscles.

- Internal examinations should be gentle, thorough, methodical, and purposeful.
- It should be emphasised that once removed, the sterilised gloved fingers should not be reintroduced.
- The sacrum is smooth and well curved, and it is usually inaccessible beyond the lower three pieces.
- The length, breadth, and curvature from top to bottom and side to side should all be noted.
- Sacrosciatic Notch: The notch is wide enough that two fingers can easily be placed over the sacrospinous ligament that covers the notch.
- The configuration of the notch indicates the capacity of the posterior segment of the pelvis and the lower pelvic side walls.
- Ischial spines: Smooth (everted) spines that are difficult to palpate.
- They may be noticeable and encroach on the cavity, reducing the available space in the mid pelvis.
- Ilio-pectineal Lines: Look for any beaking that indicates a narrow fore pelvis (android feature).

- Sidewalls: Unless convergent, they are normally not easily palpable by sweeping fingers.
- Symphysis pubis posterior surface: It usually has a smooth, rounded curve.
- The presence of angulation or beaking indicates an abnormality.

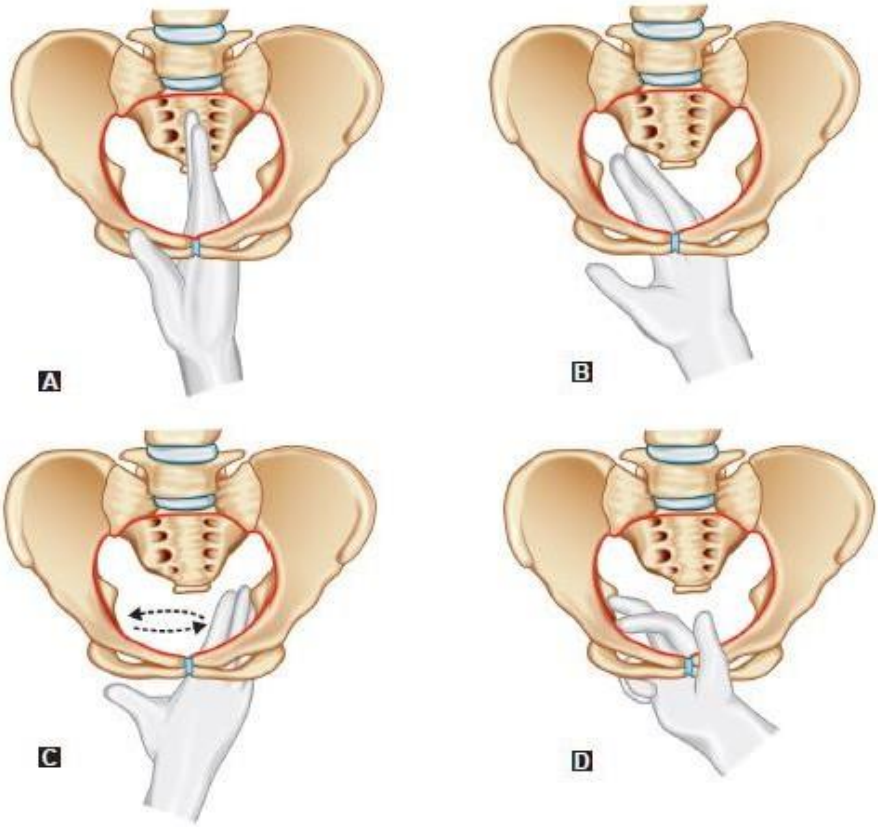



Figure 8 A to D- CLINICAL ASSESSMENT OF PELVIS. [3]

- The mobility of the sacrococcygeal joint and the presence of a hooked coccyx, if present, are noted.

- The pubic arch is normally rounded and should accommodate the palmar aspect of two fingers.

- The arch's configuration is more important than the pubic angle.

- Diagonal conjugate - If the middle finger cannot reach the promontory or only barely touches it, the conjugate is probably large enough for an average-sized head to pass through.

- The inferior pubic rami are defined, and the angle roughly corresponds to the fully abducted thumb and index fingers in females.

- It roughly corresponds to the fully abducted middle and index fingers in a narrow angle.

- TDO is measured by placing the knuckles of the first interphalangeal joints or the knuckles of the clinched fist between the ischial tuberosities

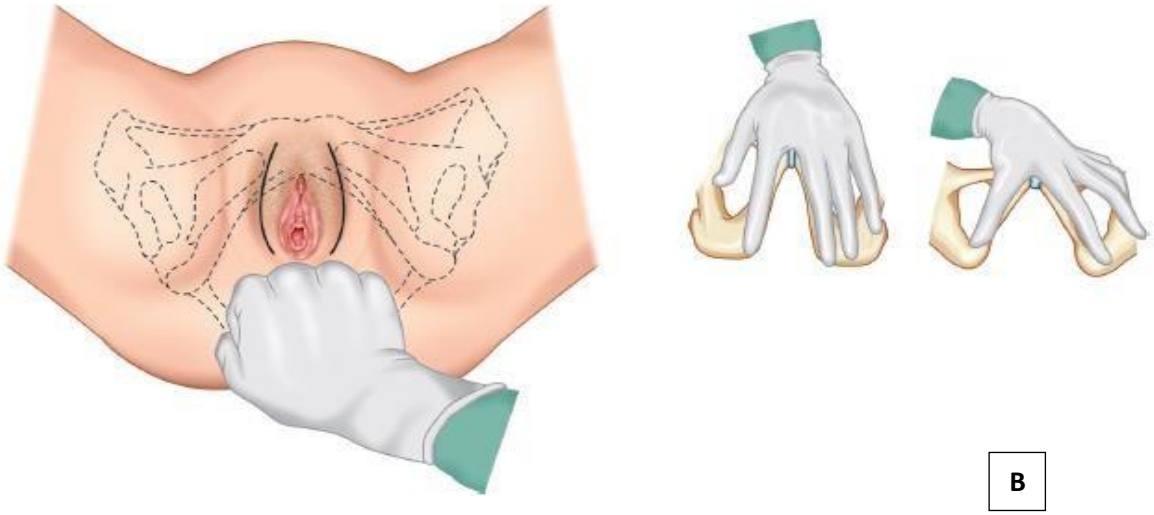



**Figure 9 – MEASUREMENT OF TDO AND SUBPUBIC ANGLE. [3]**

The distance between the inferior margin of the symphysis pubis and the skin over the sacrococcygeal joint can be measured using either the diagonal conjugate method or external callipers.[3]

**DIAGNOSIS OF CPD AT BRIM. [3]**

The presence and degree of cephalopelvic disproportion at the brim can beascertained by the following**:**

**Clinical :**

(a) Abdominal method

(b) Abdominovaginal (Muller-Munro Kerr)

**Imaging Pelvimetry:**

**Cephalometry :**

(a) Ultrasound

(b) Magnetic Resonance Imaging

(c) X-ray

- Clinically, a previous history of spontaneous delivery of an average-sized baby rules out contracted pelvis in multigravida. However, in a primigravida with non-engagement of the head even during labour, disproportion should be ruled out.

- The abdominal method involves placing the patient in a dorsal position with the thighs slightly flexed and separated.

- The left hand grasps the head, when the head is pushed downwards and backwards, two fingers (index and middle) of the right hand are placed above the symphysis pubis, keeping the inner surface of the fingers in line with the anterior surface of the symphysis pubis to note the degree of overlapping, if any.

**Inferences:**

• The head can be pushed down into the pelvis without the parietal bone overlapping on the symphysis pubis — no disproportion

.• The head can be pushed down slightly, but there is slight overlapping of the parietal bone as evidenced by touch on the under surface of the fingers (overlapping by 0.5 cm or 1/4 of the

symphysis pubis thickness) — moderate disproportion.

• Because the head cannot be pushed down, the parietal bone overhangs the symphysis pubis, displacing the fingers — a severe disproportion.

The abdominal method can be used for screening. It can be difficult to elicit at times due to a deflexed head, a thick abdominal wall, an irritable uterus, and a high floating head.

**Abdominovaginal method (Muller-Munro Kerr):**

This bimanual method is superior to the abdominal method because it allows for simultaneous pelvic assessment. Muller demonstrated the method by placing the vaginal finger tips at the level of the ischial spines to note the head's descent.

Munro Kerr added the thumb placement over the symphysis pubis to note the degree of overlapping.

Enema is used to empty the lower bowel. The patient is instructed to empty his or her bladder. The patient is positioned in a lithotomy position, and an internal examination is performed with all aseptic precautions. Two right-hand fingers are introduced into the vagina, with the finger tips at the level of the ischial spines and the thumb over the symphysis pubis. The head is grasped with the left hand and pushed downward and backward into the pelvis.

**Inferences:**

1. The head can be pushed down to the level of the ischial spines, and the parietal bone does not overlap the symphysis pubis — there is no disproportion.
2. The head can be pushed down slightly but not all the way to the level of the ischial spines, and the parietal bone overlaps slightly — slight or moderate disproportion; and
3. The head cannot be pushed down, and the parietal bone instead overhangs the symphysis pubis, displacing the thumb — severe disproportion.

**Limitations of clinical assessment:**

1. The method is only useful for determining the presence or absence of disproportion at the brim and is not suitable for eliciting midpelvic or outlet contraction.
2. The foetal head can be used as a pelvimetry tool to elicit only contractions in the anteroposterior plane of the inlet; however, it is less useful when the contraction affects the

transverse diameter of the inlet.

**Occiput Spine Angle**

A successful pregnancy results in the safe delivery of the foetus.

The position and attitude of the foetus are important predictors of vaginal delivery.[9]

The occipito-anterior position with a well-flexed head favours vaginal delivery, whereas a deflexed head leads to abnormal labour patterns and Caesarean deliveries.

The importance of knowing the degree of head flexion will aid in predicting the mode of delivery, early detection of abnormal labour patterns, and appropriately planning and counselling patients regarding the expected mode of delivery.

Digital examination has traditionally been regarded as the gold standard for assessing foetal position and attitude during labour, despite the fact that it is subject to performer error.[14]

The measurement of the occiput-spine angle of the foetal head using a transabdominal obstetric ultrasound at term or in early labour patients has recently become popular.

A non-invasive, feasible, reliable, and accurate aid in assessing the degree of flexion of the foetal head, which will assist the obstetrician in predicting the success of a vaginal delivery.[8]

**OS Angle**

During transabdominal ultrasound, the angle formed by a line tangential to the foetal occipital bone and a line tangential to the first vertebral body of the cervical spine is measured on the sagittal plane to quantify the degree of foetal head deflexion in relation to the trunk.[4]

Transabdominal ultrasound was used because it is well documented as the gold standard for foetal head position determination. The angle was calculated twice and independently for each

case by the three main radiologists to evaluate intra and interobserver variations of this measurement. TAS was performed by radiologists who were blinded to clinical examinations performed by an obstetrician during labour.[11]

A two-dimensional ultrasound sagittal sonogram of the foetal head and cervical spine was recorded. To quantify the position of the foetal head, an offline measurement of the angle between two lines drawn tangential to the occipital bone and first vertebra was performed on the image. The foetal head's flexion could be depicted directly by following the foetal spine in the sagittal plane towards the foetal head in the occipito- anterior position. The foetal head was deflexed to various degrees.

The movement of the depicted biparietal diameter from an imaginary line parallel to the pelvic inlet to an angle of up to 90 degrees represents an acutely hyper-extended foetal head.[11]

An occiput-spine angle of >/= 125 degrees is associated with shorter labour duration and successful vaginal deliveries, whereas 124 degrees increases the risk of prolonged labour and operative interventions.[4]

Normal labour is becoming a lost art as Caesarean rates rise. The use of ultrasound to assess the degree of foetal head deflexion and correlate it with the course and outcome of labour is a boon to the Obstetrician in their day-to-day practise with the goal of improving obstetric care. A non-invasive modality like this would make it easier to develop a decision-making strategy during labour.

**INDUCTION OF LABOR (IOL).**

Induction refers to the stimulation of contractions prior to the onset of spontaneous labour, with or without ruptured membranes.[3]
When the cervix is closed and uneffaced, labour induction will usually begin with cervical ripening, which is a process that uses prostaglandins to soften and open the cervix.
Induction of labour refers to the initiation of uterine contractions (after the viability period) by any method (medical, surgical, or combined) for the purpose of vaginal delivery. Augmentation of labour is the process of stimulating already present but insufficient uterine contractions (both in frequency and intensity).

**Purpose of Induction of Labor:**

Induction is recommended when the risks of continuing the pregnancy to the mother or the foetus are greater. Before induction, the gestational age and pulmonary maturity of the foetus must be confirmed. Preterm induction may be necessary in rare cases.

The term "Elective Induction of Labor" refers to the initiation of labour at term without any acceptable medical or obstetric indication. It is done for the patient's, obstetrician's, or hospital's convenience.

**Indications :**[2]

When the benefits to either the mother or the foetus outweigh the risks of continuing the pregnancy, induction is recommended. Membrane rupture without labour, gestational hypertension, oligohydramnios, unsatisfactory foetal status, postterm pregnancy, and various maternal medical conditions such as chronic hypertension and diabetes are among the more common indications (American College of Obstetricians and Gynecologists, 2013b).[18]

**Contraindications** :[2]

Most conditions that preclude spontaneous labour or delivery make methods to induce or augment labour contraindicated.

Maternal contraindications include prior uterine incision type, contracted or distorted pelvic anatomy, abnormally implanted placentas, and uncommon conditions such as active genital herpes infection or cervical cancer. Fetal factors include significant macrosomia, severe hydrocephalus, malpresentation, and unsatisfactory foetal status.

| Maternal | Fetal |
|---|---|
| • Psychological upset when there is induction failure and caserean section is done<br>• Tendency of prolonged labor due to abnormal uterine action<br>• Increased need of analgesia during labor | • Iatrogenic prematurity<br>• Hypoxia due to uterine dysfunction<br>• Prolonged labor<br>• Operative interference |

| | |
|---|---|
| • Increased operative interference<br>• Increased morbidity | |

**Table 5 – DANGERS OF IOL.** [3]

**Techniques.** [2]

For decades, oxytocin has been used to induce or augment labour. Other effective methods include prostaglandins like misoprostol and dinoprostone, as well as mechanical methods like membrane stripping, artificial membrane rupture, extraamnionic saline infusion, transcervical balloons, and hygroscopic cervical dilators. Importantly, and as recommended in the Guidelines for Perinatal Care, each obstetrical department should have its own written protocols that describe how these methods for labour induction and augmentation are administered (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2012).

**Factors Affecting Successful Induction.** [2]

Several factors influence labour induction's ability to achieve vaginal delivery. Multiparity, a BMI of 30, a favourable cervix, and a birthweight of 3500 g are all positive factors (Peregrine, 2006; Pevzner, 2009). A higher BMI reduced labour duration to reach the active phase and complete dilatation in both nulliparas and multiparas, according to Kominiarek and colleagues (2011).

In many cases, the uterus simply isn't ready for labour. An unripe cervix is one example. Indeed, the Consortium on Safe Labor researchers reported that elective induction resulted in vaginal delivery in 97 percent of multiparas and 76 percent of nulliparas, but that induction was more likely to be successful with a ripe cervix (Laughon, 2012a).

The increased caesarean delivery risk associated with induction is most likely influenced by the duration of the induction attempt, particularly with an unfavourable cervix (Spong, 2012).

According to Simon and Grobman (2005), a latent phase of up to 18 hours during induction allowed the majority of these women to have a vaginal delivery without a significantly increased risk of maternal or neonatal morbidity.

According to Rouse and colleagues (2000), a minimum of 12 hours of uterine stimulation with oxytocin after membrane rupture.

| Maternal | Fetal |
|---|---|
| • confirm the indication IOL<br>• Exclude the contraindication of IOL<br>• Assess Bishop score (score>6, favourable)<br>• Perform clinical pelvimetry to assess pelvic adequacy<br>• Adequate counselling about the risks, benefits and alternatives of IOL with the woman and the family members. | • To ensure fetal gestational age<br>• To estimate fetal weight (clinical and USG)<br>• Ensure fetal lung maturation status<br>• Ensure fetal presentation and lie.<br>• Confirm fetal well-being. |

**Table 6 – PARAMETERS TO ASSESS PRIOR TO IOL. [3]**

| | |
|---|---|
| Period of gestation | Pregnancy nearer the term/ post term – more the success |
| Preinduction score | Bishop score >/= 6 is favourable. Dilatation of the cervix is most important |
| Sensitivity of the uterus | Positive oxytocin sensitivity test |
| Cervical ripening | Favorable in multiparous and in cases with PROM |
| Presence of Ffn in vaginal swab >50 ng/ml | Favorable for successful IOL |

| | |
|---|---|
| Other positive factors | Maternal height >5 feet, Normal BMI,<br>EFW < 3kg |

**Table 7 – FACTORS FOR SUCCESSFUL IOL.**

| Techniques | Agent | Route/Dose | Comments |
|---|---|---|---|
| **Pharmacological** | | | |
| Prostaglandin $E_2$ | Dinoprostone gel,0.5mg (Prepidil) | Cervical 0.5mg; repeat in 6 hr; permit3 doses total | 1. Shorter I-D times with oxytocin infusion than oxytocin alone. |
| | Dinoprostone insert,10mg (Cervidil) | Posterior fornix, 10mg | 1. Insert has shorter I-D times than gel<br>2. 6-12 hr interval from last insert to oxytocin infusion |
| Prostaglandin $E_1$ | Misoprostol tablet, 100 or 200µg(Cytotec) | Vaginal, 25µg; repeat3-6 hr<br>Oral, 50-100µg; repeat 3-6 hr | 1. Contractions within 30-60 min<br>2. Comparable successwith oxytocin infusion |
| **Mechanical** | | | |
| Transcervical 36F Foley catheter | 30ml balloon | | 1. Improves Bishop scoresrapidly<br>2. 80-ml balloon more effective |
| | | | 3. Combined with oxytocin infusion is superior to $PGE_1$ vaginally<br>4. Results improved with EASI with possible decrease infection rate |

| | | | |
|---|---|---|---|
| Hygroscopi cdilators | | Laminaria, magnesium sulphate | 1.Rapidly improvesBishop score<br>2. May not shorten I-D times with oxytocin<br>3. Uncomfortable, requirespeculum and placement on an examination table |

**Table 8 – REGIMENS FOR PREINDUCTION CERVICAL RIPENING AND / LABOR INDUCTION. [2]**

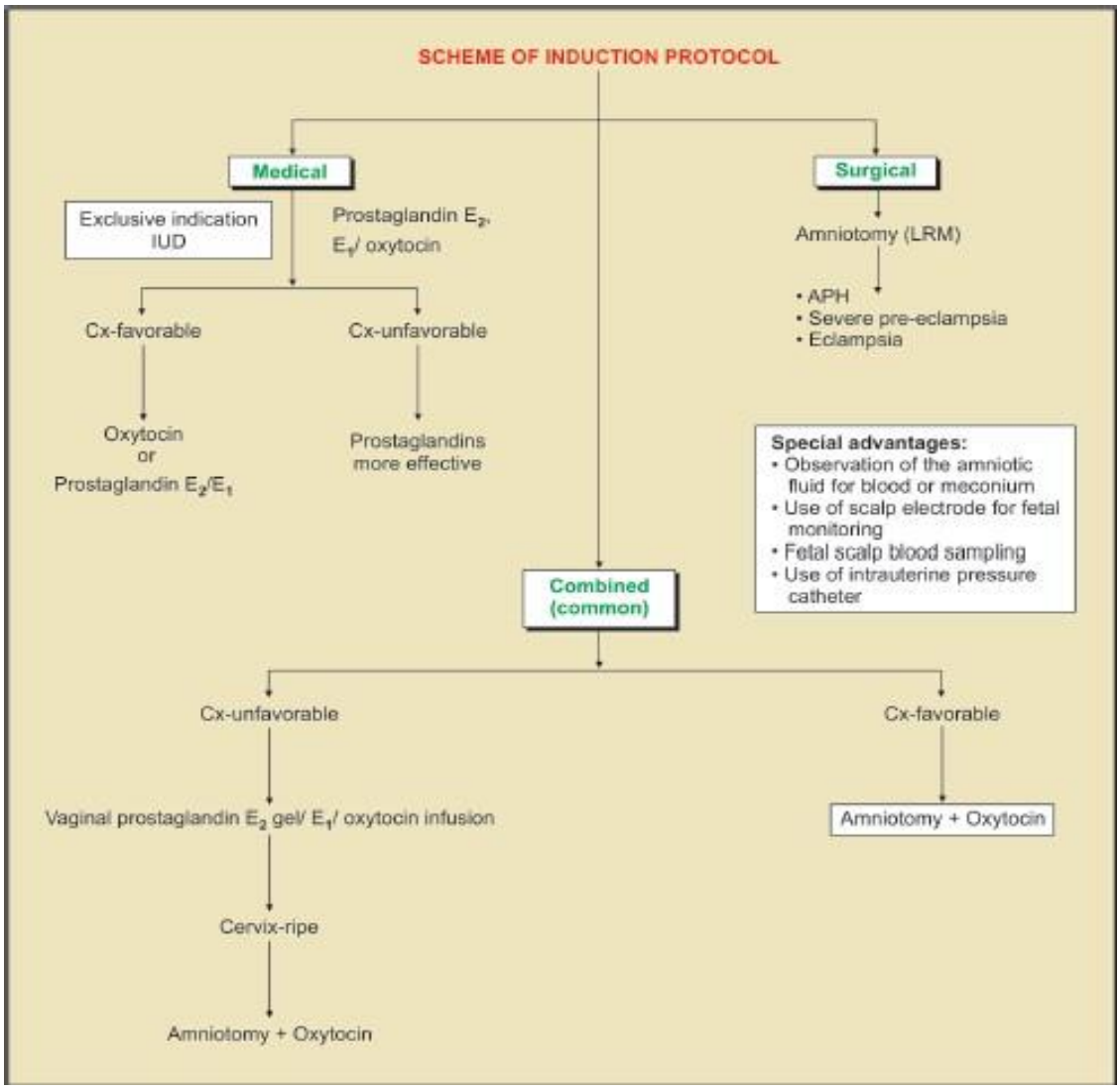
| **METHODS OF CERVICAL RIPENING** | |
|---|---|
| ***Pharmacological methods*** | ***Non Pharmacological methods*** |
| • Prostaglandins(PGs) - Dinoprostone(PGE2): Gel, tablet, suppository<br>-Misoprostol (PGE1): Tablets.<br>• Oxytocin<br>• Progesterone receptor antagonists - Mifepristone(RU 486)<br>• Relaxin<br>• Hyaluronic acid<br>• Estrogen | • Stripping the membranes<br>• Amniotomy (artificial rupture of the membranes)<br>• Mechanical dilators,osmotic dilators(Laminaria)<br>• Transcervical balloon catheter |
| • Use(off-level) of Misoprostol($PGE_1$) for cervical ripening is safe and effective (ACOG-2003) | |

**Table 9 – METHODS OF CERVICAL RIPENING. [3]**

**SURGICAL INDUCTION.[3]**

**Methods:**

- Artificial rupture of the membranes (ARM)
- Stripping the membranes




**Flow Chart 2 – SCHEME FOR IOL. [3]**

**Augmentation :** [2]

Augmentation refers to enhancement of spontaneous contractions that are considered inadequate because of failed cervical dilation and fetal descent

**The essential components of active management of labor (AMOL)**:[3]

- Antenatal education to explain the purpose and procedure of AMOL
- (education during pregnancy)
- Only after the diagnosis of labour (regular painful uterine contractions with cervical effacement) is a woman admitted to the labour ward.
- One-on-one nursing care with partographic labour monitoring is provided.
- Amniotomy (ARM) with labour confirmation
- If cervical dilatation is greater than 1 cm/hr, oxytocin augmentation (escalating dose) is recommended.
- Delivery occurs within 12 hours of admission.
- If necessary, epidural analgesia
- Fetal monitoring via intermittent auscultation or continuous electronic monitoring. Active participation of the consultant obstetrician.

The key to active management involves strict vigilance (one to one care), active and informed intervention in time. The incidence of operative delivery is not increased and less analgesia is required.

**Aim:** To expedite delivery within 12 hours without increasing maternal morbidity and

perinatal hazards.

**Active management of labor:** Objective is

(a) early detection of any delay in labor

(b) diagnose its cause and

(c) initiate management.

**Contraindications are:**

- Presence of obstetric complication
- Presence of fetal compromise
- Multigravida (not a routine).

**Advantages are:**

- Less chance of dysfunctional labor
- Shortens the duration of labor (< 12 hours)
- Fetal hypoxia can be detected early
- Low incidence of caesarean birth
- Less analgesia
- Less maternal anxiety due to support of the caregiver and prenatal education.

**Limitations of Active Labor Management:**

It is used only in specific cases and in specific hospitals where intensive intrapartum monitoring by trained personnel is possible. More staff involvement is required in the antenatal clinic and labour ward.[3]

## ELECTRONIC FETAL MONITORING.[2]

1. Internal (Direct) Electronic Monitoring
2. External (Indirect) Electronic Monitoring
3. Fetal Heart Rate Patterns

**Other Intrapartum Assessment Techniques :**

- Fetal Scalp Blood Sampling
- Fetal Pulse Oximetry
- Scalp Stimulation
- Vibroacoustic Stimulation
- Fetal Pulse Oximetry
- Fetal Electrocardiography
- Intrapartum Doppler Velocimetry

**Intrapartum Surveillance of Uterine Activity:**

- Internal Uterine Pressure Monitoring

- External Monitoring

**PARTOGRAPH.** [3]

Partograph is a composite graphical record of key data (maternal and fetal) during labor, entered against time on a single sheet of paper.

**The components of a Partograph are:**

a) Patient identification

b) Time — recorded at hourly interval.

Zero time for spontaneous labor is the time of admission in the labor ward and for induced labor is the time of induction

c) Fetal heart rate — recorded at every 30 minutes

d) State of membranes and color of liquor **:** to mark _I‘ for intact membranes, _C‘ for clear and _M‘ for meconium stained liquor

e) Cervical dilatation and descent of the head.

f) Uterine contractions — the squares in the vertical columns are shaded according to duration and intensity.

g) Drugs and fluids

h) Blood pressure (recorded in vertical line) at every 2 hours and pulse at every 30 minutes

i) Oxytocin - concentration in the upper box and dose (m IU/min) in the lower box

j) Urine analysis

k) Temperature record.

**Advantages of a Partograph:**

i. A single sheet of paper can provide essential information at a glance.

ii. There is no need to record labour events on a regular basis.

iii. It can predict deviations from normal labour progression early on. As a result, appropriate steps could be taken in a timely manner.

iv. It facilitates the handover procedure.

v. The use of partographs in labour management (WHO 1994) has reduced the rate of caesarean section and prolonged labour.
Maternal morbidity, perinatal morbidity, and mortality have all decreased.

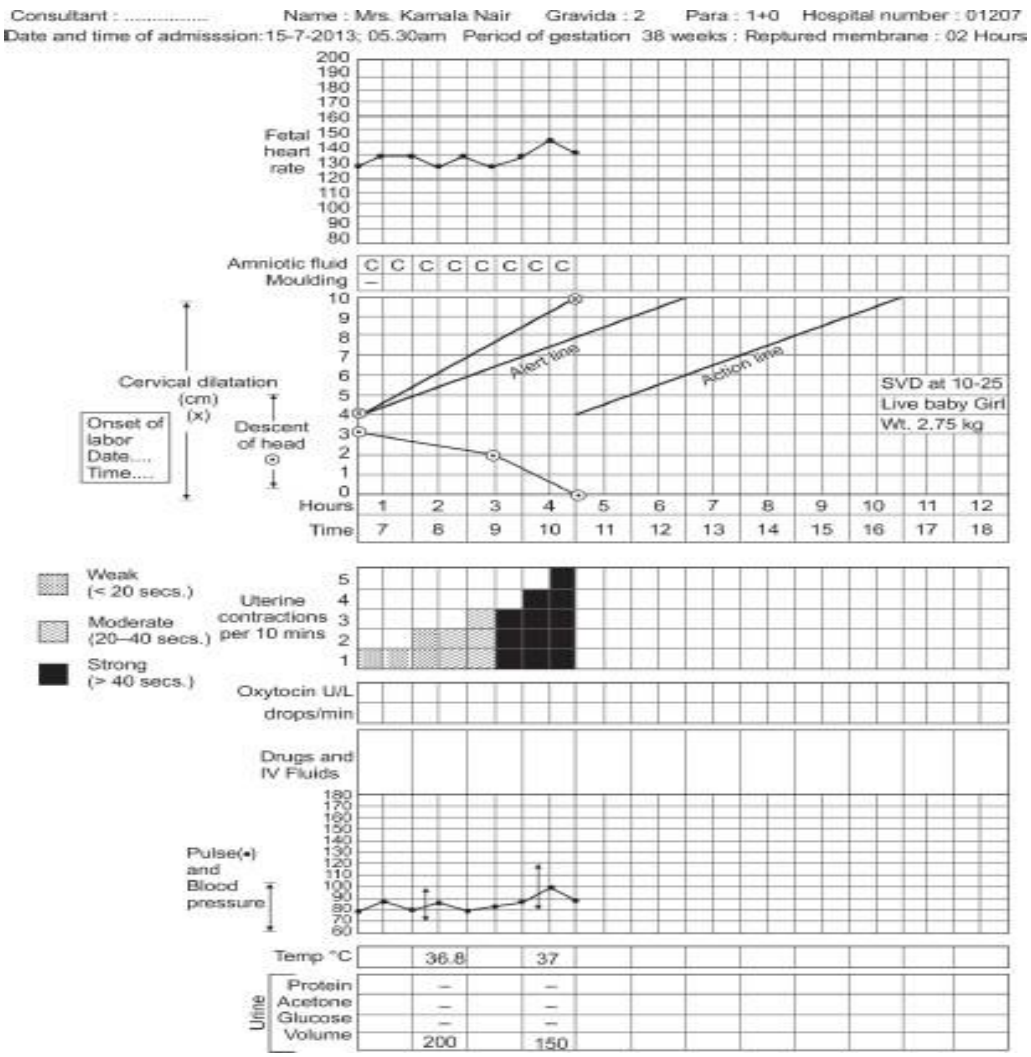



**Figure 9 – PARTOGRAPH.** [3]

## MANAGEMENT OF NORMAL LABOR. [3]

Normal Labor Management The goal is to maximise observation while minimising active intervention. The goal is to maintain normalcy and detect any deviation from normalcy as soon as possible.

**Antiseptics and Asepsis**:

Strict surgical cleanliness and asepsis must be maintained on the part of the patients and attendants involved in the delivery process.

**Patient care**

The vulva is shaved or has her hair clipped. The vulva and perineum are thoroughly cleansed with soap and water before being treated with 10% Dettol solution or Hibitane (chlorhexidine) 1 in 2000.

The woman should shower or bathe, wear a clean gown, and remain mobile. Throughout her labour, she is encouraged and supported emotionally. During vaginal examination and delivery, antiseptic and aseptic precautions must be taken.

**Vaginal Examination in labor** :

To be more reliable and informative, the first vaginal examination should be performed by a senior doctor. The patient is examined while lying in the dorsal position.

**Preliminaries**:

1. Toileting—Wash hands and forearms with soap and running water, and scrub finger nails with a scrubbing brush. The procedure should take no more than 3 minutes.

2. A pair of sterile gloves is put on.

3. Vulval toileting is done.

4. After separating the labia with two fingers of the left hand, the gloved middle and index fingers of the right hand are smeared liberally with antiseptic cream like Cetavlon (cetrimide IP 0.5% W/W and hibitane 0.1%W/W).

5. A thorough examination should be performed.Vaginal examination should be kept as minimum as possible to avoid risks of infection.

**The following information are to be noted and recorded carefully**

- Degree of cervical dilatation in centimetres.
- Degree of effacement of cervix
- Status of membranes and if ruptured colour of the liquor.
- Presenting part and its position
- Caput or moulding of the head
- Station of the head in relation to ischial spines

**Management of the First Stage.** [3]

**Principles**:

1. Non-interference with expectant waiting in order to prepare the patient for natural birth.

2. To closely monitor labour progress, maternal conditions, and foetal behaviour in order to detect any intrapartum complications early.

**Actual Management**:

**• General—**

a. Antiseptic dressing is as previously described.

b. Encouragement, emotional support, and assurance are provided to maintain morale.

c. Constant monitoring is ensured.

**Bowel-**

In the early stages, an enema with soap and water or a glycerine suppository is traditionally administered. If the rectum feels loaded during vaginal examination, this may be given. However, enema has no effect on labour duration or infection rate.

**Rest and ambulation—**

If the membranes are intact, the patient may walk. This posture prevents venacaval compression and promotes head descent. Ambulation can shorten the duration of labour, reduce the need for analgesia, and increase maternal comfort. If, on the other hand, labour is electronically monitored or an analgesic drug (epidural analgesia) is
administered, she should be in bed.

**Diet—**

During labour, the stomach empties slowly. If aspirated after general anaesthesia when needed unexpectedly, low pH of the gastric contents is a real danger. As a result, food is withheld during active labour. In the early stages of labour, fluids such as plain water, ice chips, or fruit juice may be administered.
Intravenous fluid with ringer solution is started when an intervention is expected or the patient is in distress.

**Bladder Care—**

The patient is encouraged to pass urine on her own because a full bladder frequently inhibits uterine contraction and may result in infection. If the woman is unable to use the restroom, she is given a bed pan. Privacy must be protected, and comfort must be provided. If the patient is unable to pass urine, especially in the late first stage, catheterization must be performed under strict aseptic conditions.

**Pain relief —**

When the pains are well established during the active phase of labour, the most commonly used analgesic drug is pethidine 50-100 mg intramuscularly. It is repeated after 4 hours if necessary. Pethidine is a powerful analgesic and sedative. Metoclopramide 10 mg IM is commonly used to treat nausea caused by pethidine. Pethidine It crosses the placenta and has a respiratory depressant effect on the newborn. If delivery is expected within two hours, the drug should not be administered.

**Assessment of Progress of labor and Partograph recording**.

1. **Pulse** is recorded every 30 minutes and is marked with a dot (**.**) in the partograph.
2. **Blood pressure** is recorded at every 1 hours and is marked with arrows (↔)
3. **Temperature** is recorded every 2 hours.
4. **Urine Output** is recorded for volume, protein or acetone. **Any drug** (oxytocin or other) when given is recorded in the partograph.

***Abdominal Palpation***

a) Uterine contractions are evaluated in terms of frequency, intensity, and duration. The partograph records the number of contractions in 10 minutes as well as the duration of each contraction in seconds. Every half hour, the partograph is charted as follows: contraction duration 20 seconds; between 20 and 40 seconds; and > 40 seconds.

b) Pelvic grip: Gradual disappearance of previously felt head poles (sinciput and occiput) (usually occur in labor). Abdominal palpation for foetal head descent in fifths felt above the brim is to be used.

c) A downward and medial shift in the maximal intensity of the foetal heart beat.

***To Note the Fetal Well Being*:**

**Fetal heart rate (FHR),** as well as its rhythm and intensity, should be recorded every half hour in the first stage and every 15 minutes in the second stage or after membrane rupture. The observation should be made immediately after a uterine contraction to be useful. The timer should be set for 60 seconds. A standard stethoscope is adequate for routine clinical observation. Doppler ultrasonic cardiography (Doppler) is useful in the case of obesity and polyhydramnios, however. The normal foetal heart rate is between 110 and 150 beats per minute.

**Continuous Electronic Fetal Monitoring:**

The device records foetal heart action via foetal electrocardiography and uterine contraction via tocography at the same time. It is frequently used in high-risk pregnancies.

***Vaginal Examination***

a) Cervical dilatation in centimetres in relation to hours of labour is a reliable indicator of labour progress.

b) Take note of the head position and degree of flexion.

c) Take note of the head's position in relation to the ischial spines.

d) If the membranes are ruptured, the colour of the liquor (clear or meconium stained).

e) Head moulding degree—Moulding occurs first at the occipitoparietal bone junction and then between the parietal bones.

f) Caput formation—Progressive growth is more important than its presence.

***Evidences of Fetal distress are :***

- An increase in FHR > 160 bpm or < 110 bpm

- FHR takes a long time to come back to its normal rate after the contraction passes off

- Irregularity

**To Watch the Maternal Condition.**

**Routine check up includes**:

(a) To record 2 hourly pulse, blood pressure and temperature

(b) To observe the tongue periodically for hydration

(c) To note the urine output, urine for acetone, glucose and

(d) IV fluids, drugs.

***Evidence of Maternal distress are:***

- Anxious look with sunken eyes

- Rising pulse rate of 100 per minute or more

- Dehydration, dry tongue

- Hot, dry vagina often with offensive discharge

- Acetone smell in breath

- Scanty high colored urine with presence of acetone

**MANAGEMENT OF THE SECOND STAGE.** [3]

Increased uterine contraction intensity with the appearance of bearing down efforts. Urge to defecate as the presenting part descends Vaginal examination revealed complete cervix dilatation.

**Principles**:

(1) **To assist** in the natural expulsion of the fetus slowly and steadily,

(2) **To prevent** perineal injuries.

**General Measures**:

• The patient should be positioned in bed, and the FHR should be recorded every 5 minutes.

• If available, administer inhalation analgesics in the form of Gas N2O and O2 to relieve pain during contractions.
• A vaginal examination is performed at the start of the second stage to confirm its onset as well as to detect any accidental cord prolapse. The head's position and station must be reviewed once more, and the head's progressive descent must be ensured.

**Preparation for Delivery :**

• Position: The woman's position during delivery may be lateral or partial sitting. Dorsal position with 15° left lateral tilt is commonly preferred because it prevents aortocaval compression and makes pushing effort easier.

• The accoucheur scrubs up, puts on a sterile gown, mask, and gloves, and stands on the right side of the table.

• Cotton swabs soaked in savlon or dettol solution are used to toilet the external genitalia and inner side of the thighs. One sterile sheet is placed beneath the patient's buttocks and another over the abdomen. Leggings should be sterilised.

**Essential aseptic procedures are remembered as 3 ‘C’s:**

a) Clean hands

b) Clean surface

c) Clean cutting and ligaturing of the cord.

**To catheterize the bladder**, if it is full.

**Conduction of Delivery**.[3]

The assistance required in spontaneous delivery is divided into three phases:

- Delivery of the head
- Delivery of the shoulders
- Delivery of the trunk

**Delivery of the head:**

**The principles to be followed are** to maintain flexion of the head, to prevent its early extension and to regulate its slow escape out of the vulval outlet.

- The patient is encouraged to bear down during uterine contractions. This allows the head to descend more easily.
- When the scalp is visible for about 5 cm in diameter, the head maintains flexion during contractions. This is accomplished by pressing the perineum with the right palm while pushing the occiput downwards and backwards with the thumb and index fingers of the left hand. If the patient passes stool, the area should be cleaned and antiseptic lotion applied.
- Repeat the procedure during subsequent contractions until the sub-occiput is positioned beneath the symphysis pubis. At this stage, the maximum diameter of the head (biparietal diameter) stretches the vulval outlet without any head recession even after the contraction is over, a condition known as crowning of the head. The goal of increasing head flexion is to ensure that the vulval outlet is distended by the

small suboccipito-frontal diameter 10 cm (4") rather than the larger occipito-frontal diameter 11.5 cm (4 1/2").

- Episiotomy is performed when the perineum is fully stretched and threatens to tear, especially in primigravidae, after prior infiltration with 10 mL of 1% lignocaine. Bulging thinned out perineum is a better criterion for deciding when to perform episiotomy than visibility of 4-5 cm of scalp. Episiotomy is performed on a case-by-case basis.

- The slow delivery of the head in between contractions is to be controlled.When the sub-occipito frontal diameter emerges, this is done. This is accomplished by pushing the chin with the right hand's sterile towel-covered fingers placed over the anococcygeal region while the left hand applies pressure to the occiput (Ritzen maneuvere).

- Immediately after delivery of the head, wipe the mucus and blood in the mouth and pharynx with a sterile gauze piece on a little finger.

- The eyelids are then wiped with sterile dry cotton swabs, one for each eye, starting from the medial to the lateral canthus to minimise contamination of the conjunctival sac.

.

**Delivery of the Shoulders:**

Shoulders should not be delivered hastily. Wait for uterine contractions and movements of restitution and external rotation of the head to occur. This implies that the bisacromial diameter is located in the pelvic anteroposterior diameter.

Gentle traction on the head is recommended to avoid overstretching of the neck, which can result in brachial plexus injury, hematoma of the neck, or clavicle fracture.

**Delivery of the Trunk:**

After the shoulders are delivered, the forefingers of each hand are inserted under the axillae and the trunk is gently delivered by lateral flexion.

**Immediate Care of the New Born.**[3]

The baby should be placed on a tray covered with clean dry linen shortly after birth, with the head slightly downwards (15°). It aids in the gravity drainage of mucus accumulated in the tracheobronchial tree. The tray is placed between the mother's legs and should be lower than the uterus to allow blood to gravitate from the placenta to the infant.
Gentle suction should be used to clear the air passage (oropharynx) of mucus and liquor.

Apgar ratings should be taken at 1 minute and 5 minutes.

Clamping and ligature of the cord—The cord is clamped by two Kocher's forceps, one 5 cm away from the umbilicus and cut in between.

**Management of the Third Stage.**[3]

**The third stage of labour is the most critical.**

**The principles** underlying third stage management are to maintain strict vigilance and strictly follow the management guidelines in practise in order to avoid complications, the most serious of which is postpartum haemorrhage.

**The uterus** is massaged to harden it, which aids in the expulsion of any retained clots.
Intramuscular administration of oxytocin (5-10 units) or methergin 0.2 mg.

When compared to ergometrine, oxytocin is more stable and has fewer side effects (nausea, vomiting, rise of BP).

**The vulva, vagina, and perineum** are carefully examined for injuries and, if necessary, repaired. The wound from the episiotomy has been sutured.

Cotton swabs soaked in antiseptic solution are used to clean the vulva and surrounding area.

**Fourth stage -** Vital signs are monitored for at least an hour after birth. The patient is admitted to the ward when the uterus is fully contracted and there is no abnormal vaginal bleeding, operative

Vaginal Delivery. [3]

Any delivery process that is aided by vaginal operations is referred to as operative vaginal delivery. Forceps delivery, ventouse delivery, and destructive operations are all common. Obstetric procedures (shoulder dystocia)

**Forceps**

Obstetric forceps are a pair of instruments designed specifically to aid in the extraction of the foetal head and thus the delivery of the foetus

| **Classification for Operative Vaginal Delivery ( Forceps / Ventouse ) ACOG 2000** | |
|---|---|
| **Type of Procedure** | **Criteria** |
| ***Outlet*** | 1) The scalp is visible at the introitus without the labia being separated.<br>2) The foetal skull has reached the pelvic floor.<br>3) The sagittal suture is in a direct anteroposterior diameter or in the anterior or posterior position of the right or left occiput.<br>4) The foetal head is at or near the perineum.<br>5) Rotation is <450 |
| ***Low*** | The foetal skull's leading point (station) is +2cm or more but has not yet reached the pelvic floor.<br>(a)The rotation is 450 degrees.<br>(b) Rotation is greater than 450 |
| ***Mid*** | The foetal head has been engaged. The head is 1/5 palpable per abdomen, but the presenting part is greater than +2cm station. |

| | |
|---|---|
| ***High*** | Head is not palpable. This type is not included in classification |

**Table 10 – CLASSIFICATION FOR OPERATIVE VAGINAL DELIVERY (ACOG 2000 ).[3]**

**Ventouse:**

Ventouse is a delivery aid that works by creating a vacuum between itself and the foetal scalp. While in forceps, the pulling force drags the cranium and is directly transmitted to the base of the skull.

**Silicon cups with the following characteristics are used:**

1) Suction cups in four sizes (30, 40, 50 and 60 mm)

2) A vacuum cleaner

3) Traction tubes

**Guidelines for operative vaginal delivery (RCOG)[19]**

• **Fetal** - To shorten and reduce the effects of the second stage of labour on medical conditions.

• **Maternal** - To shorten and reduce the effects of the second stage of labour on medical conditions.

• **Cardiovascular disease** (Class III or IV) (N Y H A Classification)

• Hypertensive crises

• Myasthenia gravis

• Spinal cord injury

• Patients at risk of autonomic dysreflexia

• Proliferative retinopathy

• Nulliparous women - failure to progress for 3 hours (total of active and passive second-stage labour) with regional anaesthesia, or 2 hours without regional anaesthesia

• Multiparous women - failure to progress for 2 hours (total of active and passive second-stage labour) with regional anaesthesia, or 1 hour without regional anaesthesia

**Contraindications:**

• Inexperienced operator; inability to assess foetal position; high station (above 0 station); suspicion of cephalopelvic disproportion; other presentations than vertex.

• Fetus that is 34 weeks premature.

• Membranes that are still intact.

**Prerequisites for operative vaginal delivery (according to the RCOG's Green top guidelines):**

**Complete abdominal and vaginal exam:**

• The head is 1/5th palpable in relation to the abdomen.

• Vertex presentation during vaginal examination.

• The cervix has dilated completely and the membranes have ruptured.

• The exact position of the head can be determined, allowing proper instrument placement.

• Caput and moulding evaluation.

• Pelvis is thought to be adequate. Irreducible moulding could be a sign of cephalopelvic disproportion.

• A clear explanation should be given, and informed consent should be obtained.

• Adequate analgesia is provided for mid-cavity rotational deliveries. This is typically a regional block.

• A pudendal block may be necessary, especially in the case of an emergency delivery.

• The maternal bladder has recently been emptied. The indwelling catheter or balloon should be removed.

• Use aseptic technique.

**Preparation of Staff:**

• The operator must have the necessary knowledge, experience, and skill.

• There are adequate facilities available (appropriate equipment, bed, lighting).

• Have a backup plan in place in case of a delivery failure. When performing mid-cavity deliveries, theatre personnel should be immediately available to allow for an immediate caesarean section (less than 30 minutes).

• If a junior trainee is performing the delivery, a senior obstetrician who is experienced with mid-cavity deliveries should be present.

• Anticipation of potential complications (e.g., shoulder dystocia, postpartum haemorrhage) • Personnel trained in neonatal resuscitation present.

**Pre-Requisites of the Procedure**

• The procedure should be explained to the patient, and his or her consent should be obtained.
• Encouragement and emotional support
• The position of the lithotomy.
• The bladder should be empty.
• Antiseptics for the vagina, vulva, and perineum.
• Vaginal examination to determine pelvic capacity, cervical dilatation, presentation, position, station, and degree of flexion of the head, as well as whether or not the membranes are ruptured.

**Complications:**

**Maternal**

1. Complete perineal tear, vaginal, labial, periurethral, and cervical lacerations.
2. Cervical annular detachment when used on an incompletely dilated cervix.
3. If used with an incompletely dilated cervix, it can cause cervical incompetence and future prolapse.
4. Injury to the femoral nerve (L2, L3, L4, lumbosacral trunk L4, L5)
5. Traumatic, atonic, or both PPH
6. Complications of anaesthesia
7. Maternal morbidity and puerperal sepsis

**Fetal:**

- Asphyxia
- Facial bruising
- Skull fracture

- Cervical spine injury.
- Cephalohaematoma.
- Scalp lacerations and bruising
- Subgaleal hematomas
- Intracranial haemorrhage.
- Neonatal jaundice
- Subconjunctival haemorrhage
- Injury of sixth and seventh cranial nerves
- Retinal hemorrhage
- Fetal death

**CAESAREAN SECTION.[3]**

• **Definition:** It is an operative procedure in which foetuses after the end of the 28th week are delivered through an incision on the abdominal and uterine walls.

| Factors for Rising Cesarean Section Rate | |
|---|---|
| • Early identification of at-risk foetuses (IUGR)<br>• Identifying high-risk mothers<br>• Increased use of repeat CS in cases of previous caesarean delivery; • Rising rates of induction of labour and induction failure.<br>• A decrease in operative vaginal (mid forceps, vaccum) and manipulative vaginal deliveries (rotational forceps) | • Decline in vaginal breech delivery<br>• Increased number of women with age >30 and associated medical complications.<br>• Adoption of small family norm - neither the obstetrician, nor the patients are ready to accept any risk of abnormal labor.<br>• Wider use of electronic fetal monitoring and increased diagnosisof fetal distress.<br>• Fear of litigation in obstetric practice<br>• Caeserean delivery on demand (Controversial) |

**Table 11 – FACTORS FOR RISING CAESAREAN SECTION RATE.**

**INDICATIONS.**[3]

Cesarean delivery is performed when labour is not possible (central placenta previa) and/or vaginal delivery is deemed unsafe for the foetus and/or mother.

**The indications are broadly divided into two categories** :

- Absolute
- Relative (common)

| ABSOLUTE INDICATIONS | RELATIVE INDICATIONS |
|---|---|
| Vaginal delivery is not an option.<br>Even with a dead foetus, Caserean is required.<br>There are only a few signs:<br>1. Previa of the central placenta.<br>2. Cephalopelvic disproportion or contracted pelvis (absolute)<br>3. Obstruction caused by a pelvic mass (cervical or broad ligament fibroid)<br>4. Cervical carcinoma advanced<br>5. Obstruction of the vaginal canal (atresia, stenosis)<br><br>**Caesarean section indications Primigravidae:**<br>1. Induction failure<br>2. Fetal distress (foetal FHR that is not reassuring)<br>3. Cephalopelvic asymmetry (CPD)<br>4. Dystocia (dysfunctional labour) is the inability of labour to progress.<br>5. Misposition and misrepresentation (occipitoposterior, breech) | Vaginal delivery is possible, but the risks to the mother and/or baby are high (more often multiple factors may be responsible)<br><br>1. Cephalopelvic asymmetry (relative)<br><br>2. Prior caserean delivery-<br><br>(a) When the primary CS was due to recurrent indication (contracted pelvis)<br><br>(b) Previous two CS<br><br>(c) Scar dehiscence features<br><br>(d) Previous classical CS<br><br>3. Unconvincing FHR (fetal distress)<br><br>4. Dystocia may be caused by a relatively large foetus (passenger), a small pelvis (passage), or inefficient uterine contractions (three Ps) (power)<br><br>5. Antepartum haemorrhage: (a) placenta previa (b) placental abruption. |

| | |
|---|---|
| **Multigravidae:**<br>1. Previous Caesarean section<br>2. Pregnancy haemorrhage (placenta previa, placental abruption)<br>3. Deception (breech, transverse lie) | 6. Breech, shoulder (transverse lie), and brow malpresentation<br>7. Failure to progress in labour due to failed surgical induction of labour<br>8. Negative obstetric history, including recurrent foetal loss<br>9. Hypertensive disorders:<br>(a)severe pre-eclampsia,<br>(b)eclampsia with uncontrolled seizures despite antiseizure therapy<br>10. Medical-gynecological disorders:<br>(a) uncontrolled diabetes, heart disease (aortic coarctation, Marfan's syndrome)<br>(b) Mechanical obstruction (due to benign or malignant pelvic tumours (carcinoma cervix), or after vesicovaginal fistula repair)<br>11. At the request of the mother. |

**TABLE 12 – INDICATIONS FOR CAESAREAN SECTION. [3]**

**TIME OF OPERATION :**

**Elective—**

When the operation is scheduled during pregnancy to ensure the highest quality of obstetrics, anaesthesia, neonatal resuscitation, and nursing services.

When an operation is performed due to an unforeseen or acute obstetric emergency. From the time of decision to the start of the procedure, an arbitrary time limit of 30 minutes is thought to be reasonable.

**Complications of Cesarean Section.**[3]

- The complications are either related to the operations (inherent risks) or to the anaesthesia.
- The complications are classified as follows:
- Maternal
- Fetal

**The Complications May be** :

- Intraoperative
- Postoperative

**Intraoperative complications :**

• Extending the uterine incision on one or both sides. This may involve the uterine vessels, resulting in severe haemorrhage and the formation of a broad ligament hematoma.
• Lower uterine incision lacerations—may extend laterally or inferiorly into the vagina.
• Bladder injury—while uncommon in primary CS, it may occur in a repeat procedure. If a bladder injury occurs, it is repaired with a two-layer closure of 2-0 chromic catgut.
• Continuous bladder drainage is then kept up for 7-10 days.
• Ureteral injury is uncommon (1 in 1000 procedures). Injury occurs while attempting to control bleeding from lateral extensions.
• Unless there are prior pelvic/abdominal adhesions, gastrointestinal tract injury is uncommon.
• Hemorrhage may occur as a result of uterine atony or uterine lacerations. Medical care should be initiated. Where there are wound lacerations, surgical management is used. A blood transfusion is required.
• Morbid adherent placenta (placenta accreta) is common in patients with placenta previa who have had a previous caesarean delivery. In such cases, a total hysterectomy is frequently required

to control the haemorrhage.Postoperative complications :

**Maternal :**

• Immediate • Remote

**A) Immediate**

• Postpartum Hemorrhage - Blood loss during caesarean section is frequently underestimated. It is mostly caused by uterine atony, but blood coagulation disorders can occur on rare occasions.

• Shock - While most commonly associated with blood loss, it may occur when the operation is performed after prolonged labour without correcting pre-existing dehydration and ketoacidosis.

• Anaesthetic hazards - These are mostly associated with emergency operations.

The risks are associated with aspiration of gastric contents. Aspiration atelectasis or aspiration pneumonitis (Mendelson's syndrome) may result. Hypotension and spinal headache are two more.

• Infections - The most common sites are the uterus (endomyometritis), urinary tract, abdominal wound, peritoneal cavity (peritonitis), and lungs.

**The following are infection risk factors:**

- Prolonged labour and membrane rupture, multiple vaginal examinations.
- Prophylactic antibiotics significantly reduce the risk.

**• Intestinal obstruction –**

The obstruction may be mechanical due to adhesions or bands, or it may be paralytic ileus as a result of peritonitis. Deep vein thrombosis and thromboembolic disorders are more likely to

occur after a caesarean section than after a vaginal delivery. Septic thrombophlebitis is another well-known complication.

• **Wound complications—**

Abdominal wound sepsis is a common complication.

The following complications are discovered during skin stitch removal:

(1) Sanguine or open pus

(2) Hematoma

(3) Destruction (peritoneal coat intact)

(4) Abdominal burst (involving the peritoneal coat).

**B) Remote:**

**Gynaecological problems-** Menstrual excess or irregularities, chronic pelvic pain, or backache are all examples of

**General surgical procedures-** include incisional hernia repair and intestinal obstruction caused by adhesions and bands.

**Pregnancy in the Future** - There is a risk of scar rupture.

**Fetal:** Iatrogenic prematurity and the development of RDS are common after caesarean delivery. This occurs when foetal maturity is unknown.

## METHODOLOGY

The present study on **"TRANSABDOMINAL ULTRASOUND ASSESSMENT OF FETAL OCCIPUT-SPINE ANGLE TO PREDICT THE MODE OF DELIVERY"** is a prospective observational hospital based non-invasive study conducted on 100 women attending the labour ward in the Department of Obstetrics and Gynaecology at tertiary care centre. A written informed consent will be obtained from all participants after getting the approval of institutionalethics committee.[Appendix ll]

**SOURCE OF DATA :**

Antenatal women at term (beyond 37 weeks) or in early labour who visit OBGY outpatient department and labour ward at tertiary care centre.

**DURATION OF STUDY:** 2 years

**STUDY DESIGN:** prospective observational hospital based non-invasive study.

**INCLUSION CRITERIA :**

1. Gestational age- term patients >/=37 weeks, in early labour(cervical dilation</=4cms).
2. Singleton pregnancy with cephalic presentation.
3. Station of the fetal head must be above the ischial spine(level 0).
4. Partogram monitoring in labour is employed.
5. Willing to participate in the study.
6. Clinically pelvis must be adequate.

**EXCLUSION CRITERIA :**

1. History of uterine malformation.
2. Suspicious and some specific fetal malformation.
3. Intrauterine growth restriction of the fetus.
4. Average estimated fetal weight (>/= 3500gms) USG- Hadlock formula.
5. Occiputo posterior position.
6. Non cephalic presentation like breech, oblique lie, transverse lie.
7. Previous history of cephalopelvic disproportion.

**METHOD OF COLLECTION OF DATA :**

Term antenatal patients visiting the OBG OPD department willing to participate in the study and those getting admitted to labour ward with early labour pains will be included in the study.

Early labour pains is defined as onset of true labour pains and cervical dilatation </= 4cms, beyond 37 completed weeks of pregnancy.

A brief history will be taken, detailed general, physical, obstetrical examination, followed by internal examination and pelvic assessment will be done. They will be asked to get a transabdominal obstetric scan to measure the occiput- spine angle. At times it will be done as a part of term growth antenatal scan. The occiput-spine angle will be determined using a transabdominal obstetric ultrasound scan at the radiology department of our hospital. Measurements will be taken by 3 different observers which included the chief sonologist and 2 senior residents to reduce with inter-observer bias. These observers will be blind to labour outcome.

An appropriate ultrasound machine will be used, using a curvilinear probe with a frequency of 3.5 Hz will be used for the ultrasound examination at the Radiology department of our hospital in our study. The patient will be placed in a supine position on the bed. The ultrasound transducer will be first placed longitudinally in the suprapubic region of the maternal abdomen to identify the cervical spine and the occipital bone of the fetus, and then transversely, to obtain the position of spinal column, the midline cerebral echo, and the cerebellum[13].

The landmarks depicting fetal occipital position (anterior, transverse or posterior) will be the fetal orbits for occipito-posterior position, the midline cerebral echo for occipito- transverse position, and the cerebellum or occiput for occipito-anterior position. For the latter position the fetal spine will be demonstrated in its sagittal plane and traced from the fetal thorax to the occiput. The position of the fetal spine will be determined by obtaining a transverse section of the fetal chest at the four-chamber view of the heart[13].

Occiput spine angle is measured using a 2-dimensional sagittal sonogram of fetal head and cervical spine is taken and saved. On the image, an offline measurement of the angle formed between the two lines drawn tangential to quantify the position of fetal head[14].

The findings will be recorded in a datasheet depicting a circle, like a clock, with 24 divisions, each representing 15 degree. At delivery, all fetal occiput positions will also recorded.

The results of the ultrasound examination, the labour outcome and the mode of delivery will be correlated retrospectively. OS angle of >/= 125 degrees had high chances of successful vaginal delivery when compared with patients of OS angle < 125 degree[14].

Then the patient will be followed up until she gets admitted to the labour ward with labour pains. Her labour will be managed as per the existing labour room protocols. Induction and augmentation of labour will be done on existing protocols. Labour will be monitored and events in labour and its outcome will be documented using a partogram chart. Correlation between Occiput-spine angle and mode of delivery will be done and results will be analysed using appropriate statistical methods.

**SAMPLE SIZE AND DESIGN :**

Number - 100 consecutive patients.

Sample size calculation

$n = Z^2 \alpha /2 . s^2 / d^2$

s – Standard deviation = 9.8

d – Allowable error = 2 %

$n = (1.96)^2 . (9.8)^2 / 2^2$

= 92.23 ( approximately 100 )

**According to Statistical analysis,**

Total sample size chosen for the study is 100(MINIMUM-93)

**STATISTICAL ANALYSIS :**

Student 't' test and Chi square test. [4]

We have applied necessary statistical methods.

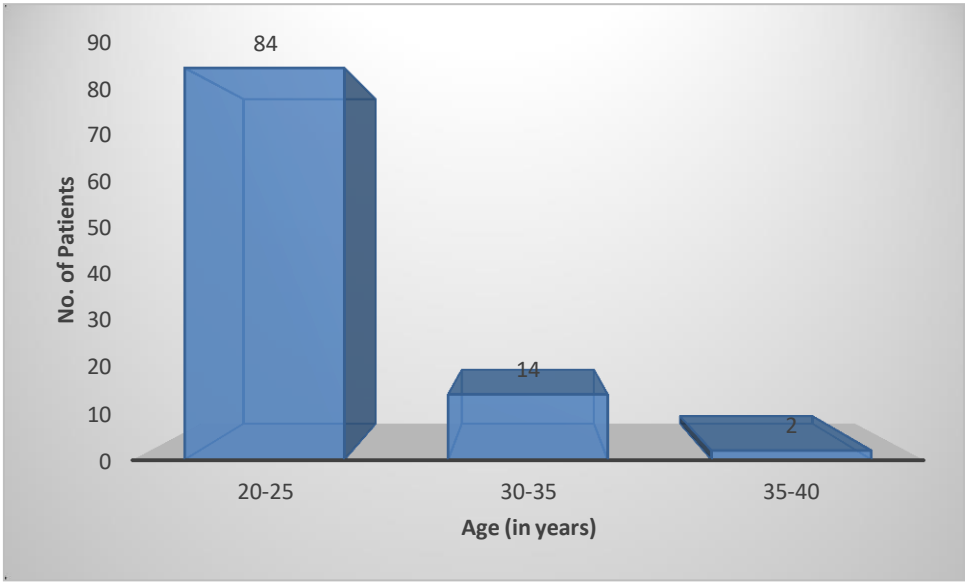

**FIGURE 11- GE VOLUSON 730 ULTRASOUND MACHINE**

## RESULTS

### Table 13 - AGE DISTRIBUTION

| Age (in years) | No. of Patients | Percentage |
|---|---|---|
| 20-25 | 84 | 84.0 |
| 30-35 | 14 | 14.0 |
| 35-40 | 2 | 2.0 |
| **Total** | 100 | 100.0 |

### Graph 1 - AGE DISTRIBUTION

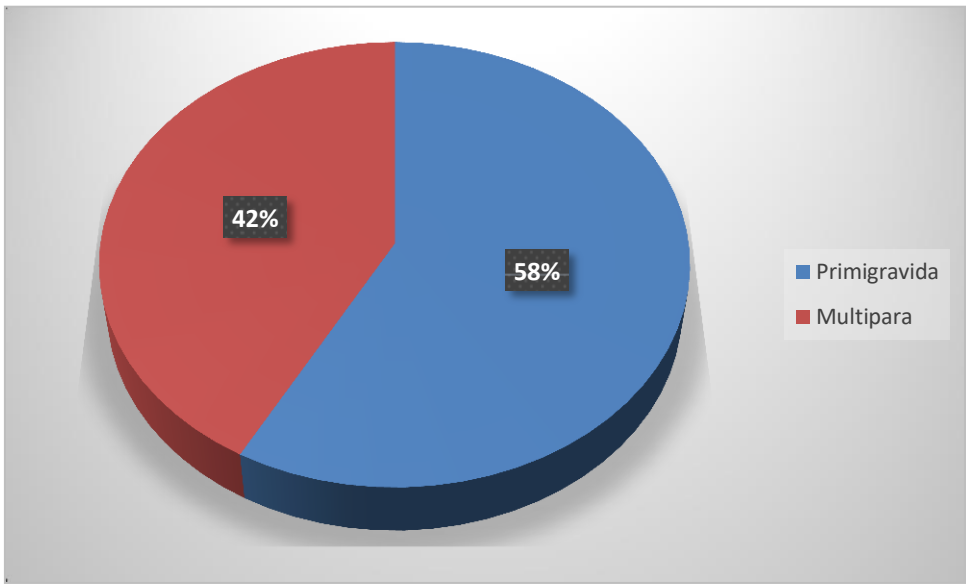



84% belonged to age group of 20-25 years, 14% belonged to the age group of30-35 years and 2% belonged to the age group of 35-40 years.

**Table 14 – DISTRIBUTION OF PARITY INDEX**

| Parity | No. of Patients | Percentage |
|---|---|---|
| Primigravida | 58 | 58.0 |
| Multipara | 42 | 42.0 |
| **Total** | **100** | **100.0** |

**Graph 2 – DISTRIBUTION OF PARITY INDEX**

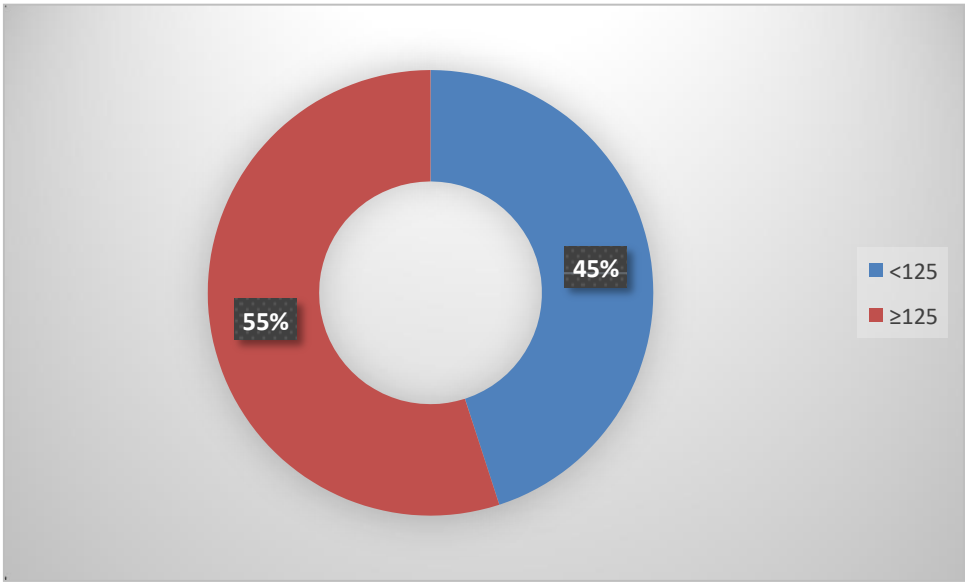



58% were Primigravida and 42% were Multipara.

**Table 15 - DISTRIBUTION OF OCCIPUT – SPINE ANGLE.**

| Occiput Spine Angle | No. of Patients | Percentage |
|---|---|---|
| <124 ˚ | 45 | 45.0 |
| ≥125 ˚ | 55 | 55.0 |
| **Total** | **100** | **100.0** |

**Graph 3 - DISTRIBUTION OF OCCIPUT – SPINE ANGLE.**

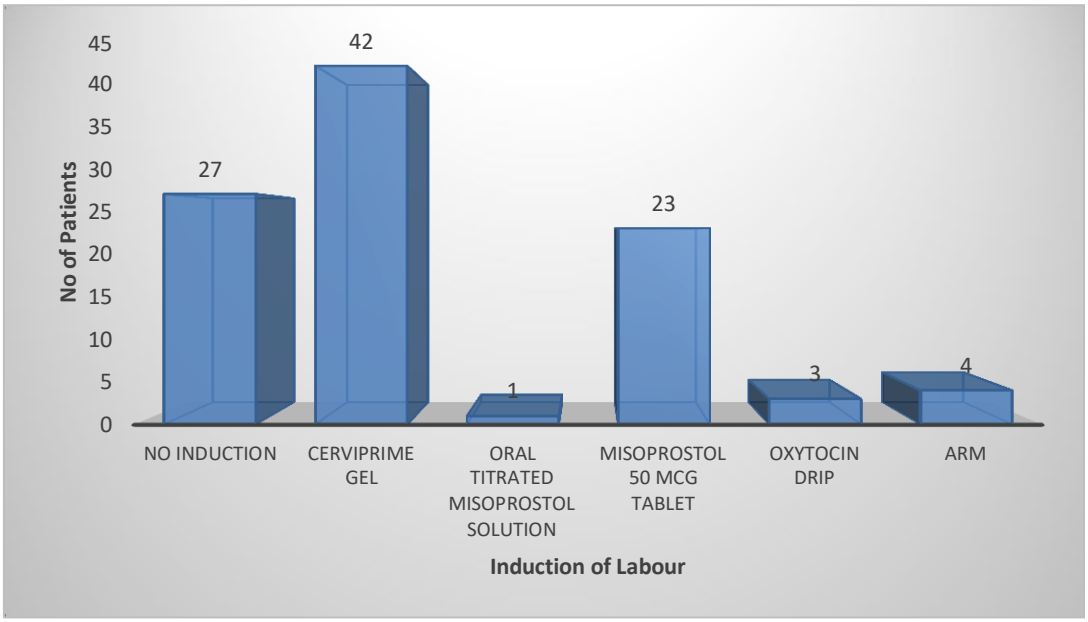



45% had Occiput - spine angle of <125 ˚ and 55% had Occiput - spine angleof >125 ˚.

## Table 16 – DISTRIBUTION OF INDUCTION OF LABOUR

| Induction of Labour | No. of Patients | Percentage |
|---|---|---|
| No Induction | 27 | 27.0 |
| Dinoprostone gel | 42 | 42.0 |
| Oral titrated misoprostol solution | 1 | 1.0 |
| Misoprostol 50 mcg tablet | 23 | 23.0 |
| Oxytocin drip | 3 | 3.0 |
| ARM | 4 | 4.0 |
| **Total** | **100** | **100.0** |

## Graph 4– DISTRIBUTION OF INDUCTION OF LABOUR

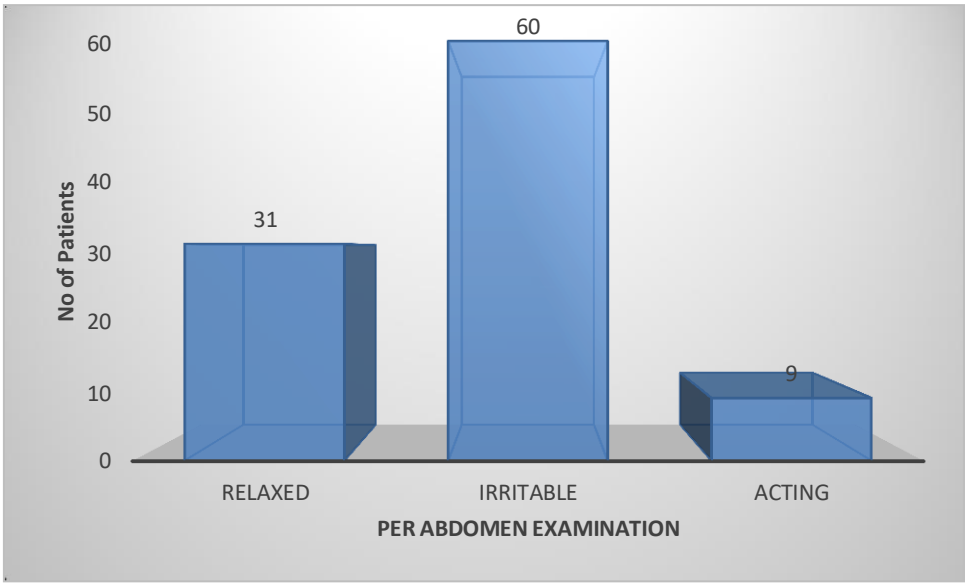


27% Patient were not induced, 42% were induced with Dinoprostone gel, 1% were induced with oral titrated Misoprostol, 23% were induced with 50 microgram of Misoprostol, 3% induced with Oxytocin drip, 4% were augmented with ARM.

**Table 17 – DISTRIBUTION OF PER ABDOMEN EXAMINATION.**

| Per Abdomen Examination | No. of Patients | Percentage |
|---|---|---|
| Relaxed | 31 | 31.0 |
| Irritable | 60 | 60.0 |
| Acting | 9 | 9.0 |
| **Total** | **100** | **100.0** |

**Graph 5 – DISTRIBUTION OF PER ABDOMEN EXAMINATION.**

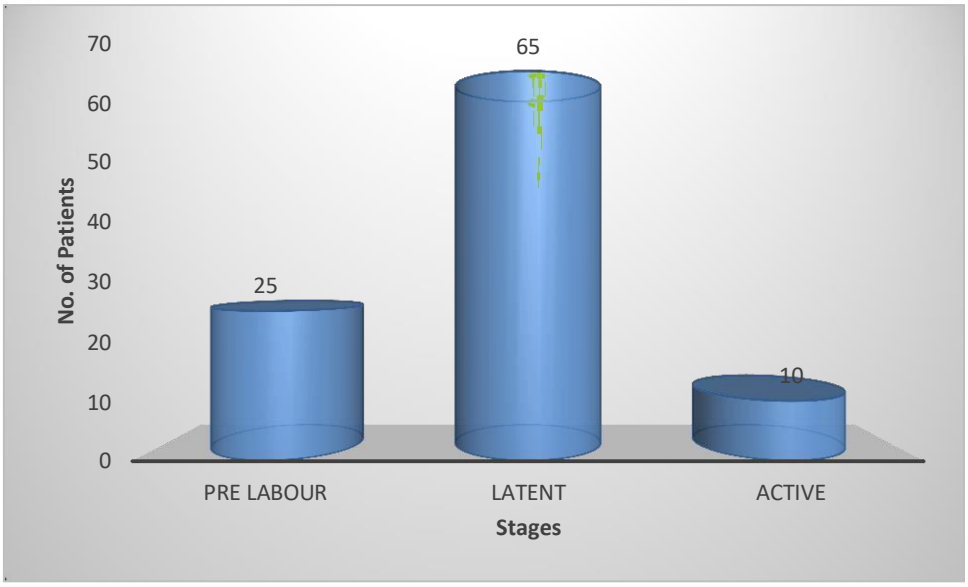



31 % patients had relaxed uterus, 60 % had irritable uterus and 9 % had acting uterus

**Table 18 – DISTRIBUTION OF STAGES OF LABOUR.**

| Stages of Labour | No. of Patients | Percentage |
|---|---|---|
| Pre labour | 25 | 25.0 |
| Latent | 65 | 65.0 |
| Active | 10 | 10.0 |
| Total | 100 | 100.0 |

**Graph 6 – DISTRIBUTION OF STAGES OF LABOUR.**

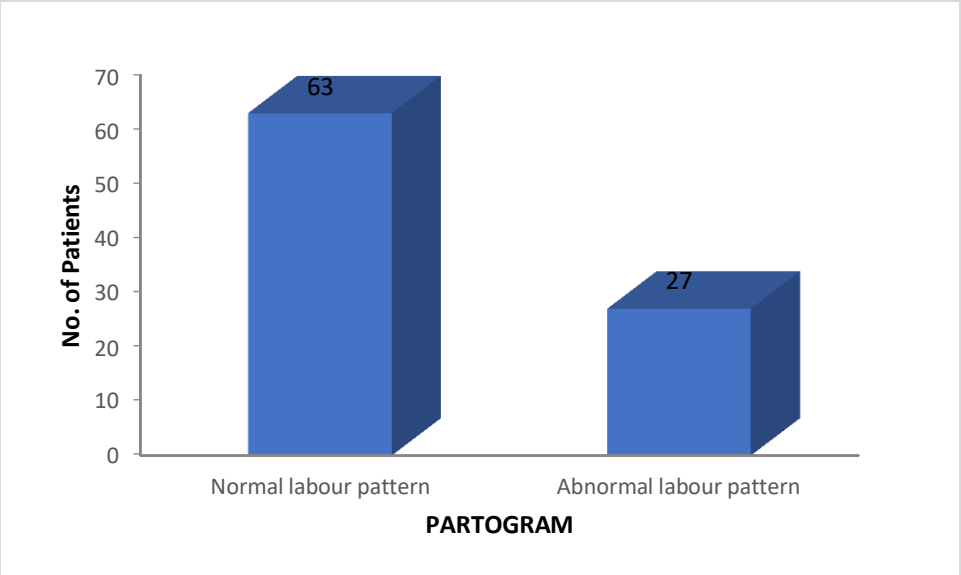



25% patients were in early stage, 65% patients in latent stage, 10% patients were in active stage.

**Table 19 – DISTRIBIUTION OF PARTOGRAM.**

| Partogram | No. of Patients | Percentage |
|---|---|---|
| Normal labour pattern | 63 | 63.0 |
| Abnormal labour pattern | 27 | 27.0 |
| **Total** | **100** | **100.0** |

**Graph 7 – DISTRIBIUTION OF PARTOGRAM.**

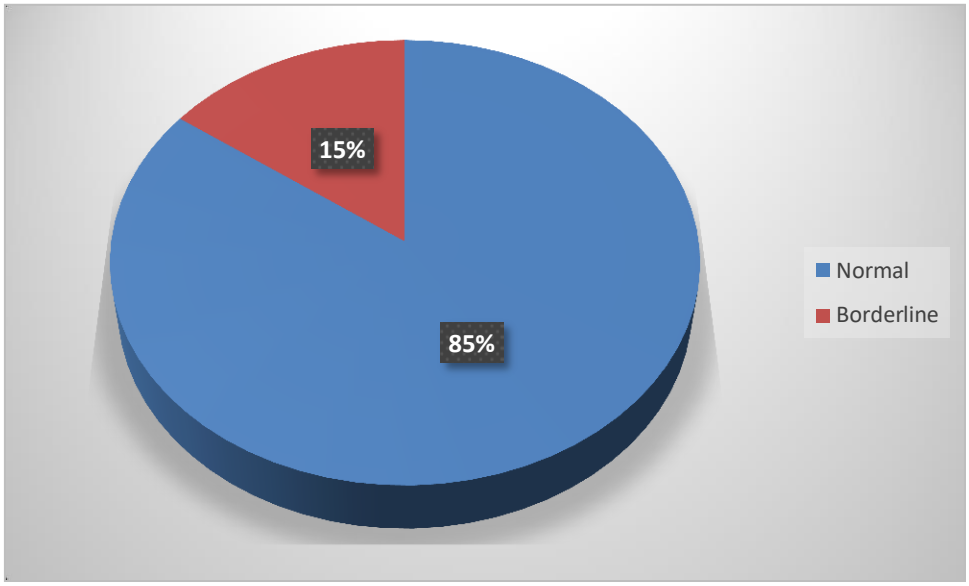



63 patients had normal labour pattern and 27 had abnormal labour pattern.

**Table 20 – DISTRIBUTION OF PELVIMETRY.**

| Pelvimetry | No. of Patients | Percentage |
|---|---|---|
| Normal | 85 | 85.0 |
| Borderline | 15 | 15.0 |
| Total | 100 | 100.0 |

**Graph 8 – DISTRIBUTION OF PELVIMETRY.**

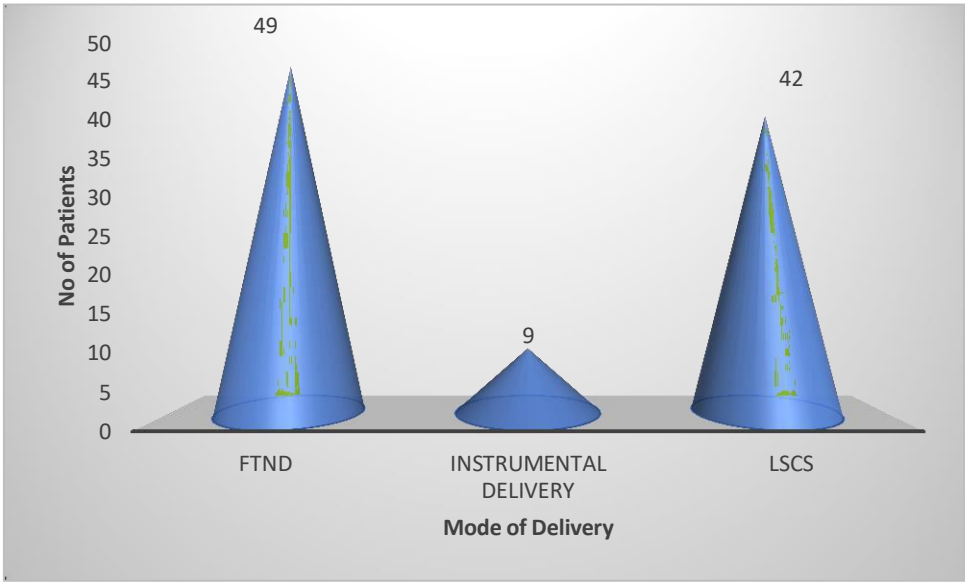



85% had Normal pelvimetry and 15% had Borderline pelvimetry.

**Table 21 – DISTRIBUTION OF MODE OF DELIVERY.**

| Mode of Delivery | No. of Patients | Percentage |
|---|---|---|
| FTND | 49 | 49.0 |
| Instrumental Delivery | 9 | 9.0 |
| LSCS | 42 | 42.0 |
| Total | 100 | 100.0 |

**Graph 9 – DISTRIBUTION OF MODE OF DELIVERY.**

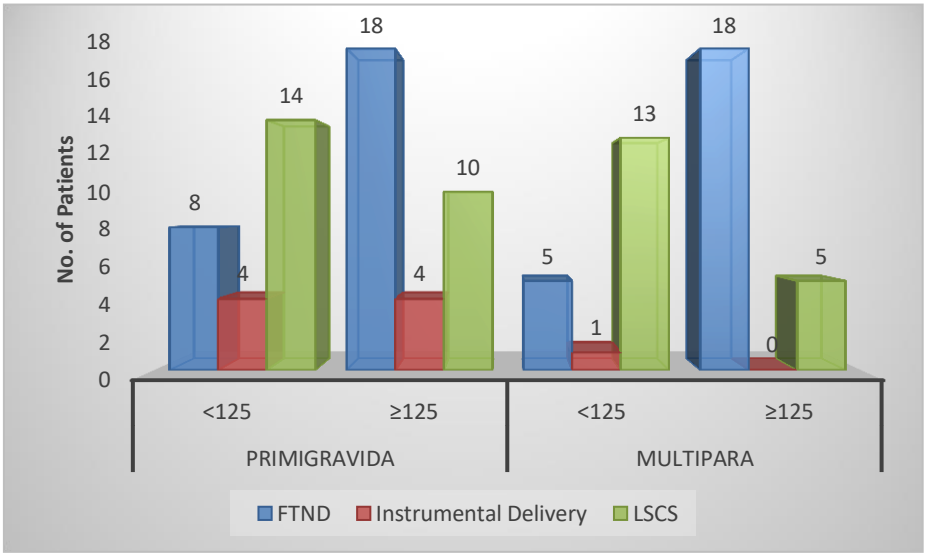



49% patients had a FTND with RMLE, 9% had Instrumental vaginal deliveryand 42% underwent LSCS for various reasons.

**Table 22 – COMPARISON BETWEEN PARITY, OCCIPUT-SPINE ANGLE AND MODE OF DELIVERY.**

| Parity | Occiput-Spine Angle | Mode of Delivery | | | Total | 'p' value |
|---|---|---|---|---|---|---|
| | | FTND | Instrumental Delivery | LSCS | | |
| Primigravida | <125 | 8 | 4 | 14 | 26 | 0.140 |
| | | 30.8% | 15.4% | 53.8% | 100.0% | |
| | ≥125 | 18 | 4 | 10 | 32 | |
| | | 56.3% | 12.5% | 31.3% | 100.0% | |
| | Total | 26 | 8 | 24 | 58 | |
| | | 44.8% | 13.8% | 41.4% | 100.0% | |
| Multipara | <125 | 5 | 1 | 13 | 19 | 0.003 |
| | | 26.3% | 5.3% | 68.4% | 100.0% | |
| | ≥125 | 18 | 0 | 5 | 23 | |
| | | 78.3% | 0.0% | 21.7% | 100.0% | |
| | Total | 23 | 1 | 18 | 42 | |
| | | 54.8% | 2.4% | 42.9% | 100.0% | |
| Total | <125 | 13 | 5 | 27 | 45 | 0.001 |
| | | 28.9% | 11.1% | 60.0% | 100.0% | |
| | ≥125 | 36 | 4 | 15 | 55 | |
| | | 65.5% | 7.3% | 27.3% | 100.0% | |
| | **Total** | **49** | **9** | **42** | **100** | |
| | | **49.0%** | **9.0%** | **42.0%** | **100.0%** | |

**Graph 10 – COMPARISON BETWEEN PARITY, OCCIPUT-SPINE ANGLE AND MODE OF DELIVERY.**




In primigravida with OS angle <125°, 8% had FTND, 4% instrumental delivery and 14% LSCS and with OS angle >125°, 18% had FTND, 4% instrumental delivery and 10% LSCS.

In multigravida with OS angle <125°, 5% had FTND, 1% instrumental delivery and 13% LSCS and with OS angle >125°, 18% had FTND, none had Instrumental delivery and 5% LSCS.

## DISCUSSION:

A few research that relate to the current topic are readily available online.

For discussion purposes, similar matching experiments have been taken.

### Table 23 – COMPARISON OF AGE

| Studies | Age ( Years ) |
|---|---|
| GHI et al, 2016. | 32.6 +/- 5.8 |
| S A AHMED et al, 2013 | 22.28 +/- 3.256 |
| CHAN V YT et al, 2015 | 31 +/- 4 |
| PRESENT STUDY | 26.01 +/- 3.76 |

Ghi et al. 2016 and Chan V YT et al. 2015 report that the mean age of the patients under study was above 30, however S A Ahmed et al. 2013 report that the mean age was less than 25 years. Patients in our study had a mean age of more than 25 years.

### Table 24 – COMPARISON OF PARITY

| Studies | Primigravida | Multipara |
|---|---|---|
| GHI et al, 2016 ( 108 ) | 73 | 35 |
| AHMED S A et al, 2013 | 100 | -- |
| CHAN V YT et al, 2015 | 86 | 14 |
| PRESENT STUDY | 58 | 42 |

In the studies by Ghi et al. and Chan V YT et al., the majority of the patients belonged to the Primigravida category, whereas in our study, 58% did.

Additionally, studies have demonstrated the value of employing clinical factors such as parity, body mass index, height, and cervical length evaluated with a transvaginal ultrasound to predict the likelihood of a caesarean delivery following labour induction.

**Table 25 – COMPARISON OF GESTATIONAL AGE**

| Studies | Gestational Age ( weeks ) |
|---|---|
| GHI ET AL, 2016 | >/= 37 weeks |
| AHMED S.A | >41 weeks |
| VIOLA YT CHAN | 39+/- 1 week |
| SALVATORE GIZZO | Term |
| ONLINE LIBRARY | >/= 37 weeks |
| PRESENT | >/= 37 – 41 weeks |

The average gestational age was more than or equal to 37 weeks in compared to research by Ghi et al, Viola YT Chan, and Salvatore Gizzo. Ahmed S. One research had participants for > 41 weeks, whereas ours had participants for >/= 37 weeks.

We can evaluate the foetal head position and station during labour with the aid of Leopold's exercises. Transvaginal digital examination is said to be very subjective, operator- and experience-dependent, and that transabdominal ultrasonography is a better method for identifying foetal head position. [20]
Clinical engagement of the foetal head is a judgement call. An important tool in the clinical decision-making process is the translabial ultrasonography, which can be used to do the examination. [21]

The factors used to determine the Bishop score on a digital examination include foetal head descent, cervical length, dilatation, and foetal head position. The posterior cervical angle has been measured using ultrasound. According to the authors, digital Bishop score examination can be replaced with ultrasound examination. The single criterion that can best be evaluated on a digital examination is dilatation. [22]

Furthermore, ultrasound has been used to determine the foetal occiput position and posterior cervical angle in order to predict the outcome of a successful induction of labour.
A posterior cervical angle of more than 120 was considered favourable for vaginal delivery by the authors. [23]

Intrapartum ultrasound has been used to assess the foetal spine and occiput position during labour in order to diagnose persistent occiput posterior position and predict the success of a vaginal delivery.[24]

During labour, intrapartum ultrasound has also been used to determine the foetal head descent. In the second stage of labour, a comparison of digital examination and ultrasound parameters such as foetal head direction, angle of progression, and progression distance is also reported.[25]

During labour, intrapartum ultrasound has also been used to determine the foetal head descent. In the second stage of labour, a comparison of digital examination and ultrasound parameters such as foetal head direction, angle of progression, and progression distance is also reported.[25]
During the second stage of labour, translabial ultrasound was used to determine that an angle of progression of 120 is associated with a high rate of vaginal delivery success.[26]

Another similar comparison of foetal head position determination by digital examination,

transvaginal sonography, and transabdominal sonography was performed, and they concluded

that the transvaginal route will be more feasible during labour because the abdominal route may

be technically difficult as the head is engaged and enters the pelvis. [27]

Intrapartum assessment of foetal head position and pelvic station is critical in labour

management. These parameters help the obstetrician identify normal and abnormal labour mechanisms in both nulliparous and multiparous women. [28]

Several ultrasound parameters have been proposed to assess the foetal head station during labour, including intrapartum transperineal ultrasound, head station, angle of progression, head perineum distance, and head symphysis distance. These parameters were compared to digital examination and a high degree of correlation with ultrasound parameters was found. [29]

The significance of digital examination and the use of ultrasound examination of foetal head position in labour, and it is noted that digital examination was in most cases inaccurate. According to the authors, intrapartum ultrasound assessment of the position of the foetal head is the gold standard. [30, 31]

It was then argued that transvaginal digital examination is highly subjective and operator and experience dependent, and that transabdominal ultrasound is more effective at detecting foetal head position. [20]

The position of the foetal head influences the mode of delivery. A digital examination of the foetal head is performed. Palpation is used to identify the suture lines that will be used. Tell us about the head's position. Because digital examination is not always perfect and was incorrect in 35% of cases, systematic ultrasound to determine foetal head position, particularly

the occiput position, can predict the mode of delivery. [32]

Another similar comparison of foetal head position determination by digital examination, transvaginal sonography, and transabdominal sonography was performed, and they concluded that the transvaginal route will be more feasible during labour because the abdominal route may be technically difficult as the head is engaged and enters the pelvis. [27]

**OS angle on ultrasound :**

The measurement of the occiput-spine angle of the foetal head using a transabdominal obstetric ultrasound at term or in early labour patients has recently become popular. A non-invasive, feasible, reliable, and accurate aid in assessing the degree of flexion of the foetal head, which will assist the Obstetrician in predicting the success of a vaginal delivery.[8]

Table 26 - COMPARISON OF MEAN VALUES OF OS ANGLE.

| **Studies** | **OS angle ( ◦ )** |
|---|---|
| GHI et al, 2016 | 126 +/- 9.8 |
| HASSAN et al , 2013 | > 125 |
| GHI et al, 2014 | 128.7 +/- 12.5 |
| PRESENT STUDY | 124.13 +/- 7.99 |

The relationship between foetal station and successful vaginal delivery in nulliparous women was investigated, and it was discovered that a high or unengaged head does not appear to be a

useful predictor of caesarean delivery, because descent can occur during labour. [33]

Several studies have attempted to identify factors that could predict the mode of delivery.

Counseling women about the various modes of delivery and predicting the possibility of a

caesarean section in cases with occiput posterior foetal head positions were investigated.

Ultrasound detection of the foetal head's occiput position in the early stages of labour is useful in

labour prediction. [34]

The position of the foetal head influences the mode of delivery. A digital examination of the foetal head is performed. Palpation is used to identify suture lines, which indicate the position of the head. Because digital examination is not always perfect and was incorrect in 35% of cases, systematic ultrasound to determine foetal head position, particularly the occiput position, can predict the mode of delivery. [32]
It is argued that digital examination of foetal head assessment may be inaccurate, so intrapartum sonography in foetal head position assessment prior to instrumental delivery is a better alternative, and ultrasonography is widely used in labour. [35]

Every woman in labour planning an induction of labour would like to know the options for vaginal, operative, or instrumental delivery. Ultrasound will aid in determining foetal head position, station, and caput formation, as well as assisting the obstetrician in dealing with complex obstetric challenges. [36]

## CONCLUSION

Induction of labour is a common obstetric procedure used for a variety of foetal and maternal reasons. Fetal head attitude (the relationship of the foetal head to the spine) during labour has a significant impact on the outcome of the labour. As the foetal head descends during the labour process, the degree of flexion and deflexion increase progressively.

Until recently, digital examination was regarded as the gold standard for assessing foetal attitude and position, albeit with some error.

A total of 100 term antenatal cases were enrolled, with the majority of them in the latent phase of labour.

The foetal occiput spine angle is a new sonographic parameter used to assess foetal head deflexion at term or in the early stages of labour. They were then classified as having a favourable angle of 125 and a less favourable angle of 124.

Fetuses with a smaller occiput spine angle (124) are more likely to require surgery. During the second stage of labour, a small number of patients in the primigravida group required instrumental assistance. The greater the angle, the better the chances of a term vaginal birth, regardless of parity.

The foetal occiput spine angle measurement appears to be a reliable parameter for predicting abnormal partogram labour patterns. The majority of patients in the study group with a spine angle greater than 125 had a safe vaginal delivery. All of the babies had a good perinatal outcome, with no deaths in the study group.

The foetal head station and the risk of obstetric intervention appear to be strongly related to the width of the foetal occiput spine angle.

This study taught us that a simple, non-invasive, affordable, and easily accessible sonographic parameter for determining the degree of foetal head flexion will assist the treating obstetrician in discussing and counselling patients about management options at the start of labour in order to encourage patients to promote normal birth.

## SUMMARY

A hospital-based cross-sectional study was conducted on term antenatal patients visiting the outpatient department and those admitted to the OBG department's labour ward.

The study was approved by the Institutional Ethical Review Board's ethical committee (IERB). A total of 100 patients between the ages of 18 and 40 were included in the study. Women with uncomplicated pregnancies beyond 37 weeks but less than 41 weeks who agreed to participate in the study were followed up on.

A structured interview was used to obtain information on maternal demographics, prior medical/surgical history, general physical, obstetric examination, internal examination, and pelvic assessment.

At the Radiology department, each patient had a transabdominal obstetric scan to determine the foetal occiput spine angle. Patients were then classified based on the degree of the angle, which was either >/= 125 or 124.

Patients were followed up on upon admission to the labour ward, and her labour would be managed in accordance with the existing labour room protocols. Induction and labour augmentation will be carried out in accordance with the partographic depiction.

The relationship between the foetal occiput spine angle and the mode of delivery was investigated. The mode of delivery, which could be full term vaginal delivery, instrumental delivery, or caesarean delivery, was one of the maternal outcome variables. There were no perinatal deaths in the study group.
The foetal occiput spine angle is determined by the degree of head flexion. An angle of >/= 125 is significantly associated with shorter labour duration and successful vaginal deliveries, whereas an angle of 124 is associated with an increased risk of prolonged labour and operative deliveries.

Multigravidas were more advantageous, with a higher foetal occiput spine angle favouring a full-term vaginal delivery.

Obtaining a foetal occiput spine angle measurement along with a term scan for all antenatal cases would provide a good correlation about the possible course and outcome of labour, which would be beneficial to the concerned obstetrician. Labor can be better planned and monitored, and good counselling leads to better patient compliance. Delivery mode can be planned and monitored accordingly.

The World Health Organization has long sought to reduce the use of caesarean sections. Allowing labour to progress in women with a favourable foetal occiput spine angle may help to reduce caesarean rates indirectly.

We must work to ensure that vaginal births are safe.

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**PROFORMA**

NAME: SL. NO:

AGE: OPD NO:

PLACE OF DELIVERY: IPD NO:

DATE OF DELIVERY: PARITY:

OS ANGLE:

**ON EXAMINATION:**

**PA:**

**PV:**

**PELVIMETRY:**

**BISHOP's SCORE**: CERVIX POSITION -

CONSISITENCY -

DILATATION –

EFFFACEMENT -

STATION –

TOTAL -

**STAGE OF LABOUR:**

**INDUCTION / AUGMENTATION OF LABOUR:**

**DURATION OF LABOUR:**

STAGE 1

STAGE 2

**PARTOGRAM:**

FETAL CONDITION

CURVE

ABNORMAL LABOUR PATTERNS

COLOUR OF LIQUOR

VITAL SIGNS

**MODE OF DELIVERY:**

FTND

INSTRUMENTAL

CAESAREAN SECTION

**OUTCOME:**

MATERNAL

FETAL

**CONSENT FORM**

1. I am willing to participate as one of the case for the research study entitled " **TRANSABDOMINAL ULTRASOUND ASSESSMENT OF FETAL OCCIPUT- SPINE ANGLE TO PREDICT THE MODE OF DELIVERY"**

2. I have been informed in detail about this research study by audio-visual means.

3 I have also been informed about the various complications, medical or technical, temporary or permanent, immediate or long term etc which may arise during the course of this study and has been allowed to ask questions regarding the study.

4. This has been explained to me in the language of my understanding.

5. After understanding all information, i am signing this consent letter without any force or coercion,

Signature of the Patient /Relative / Companion

Date:

Signature of witness:

Date:

**CONSENT FORM IN HINDI LANGUAGE**

1.□□ □□ ” TRANSABDOMINAL ULTRASOUND ASSESSMENT OF FETAL OCCIPUT- SPINE ANGLE TO PREDICT THE MODE OF DELIVERY” □□□□□□□□□□□□□□□□□ □□ □□□□□□□□ □□□□□□ □□□ □□□□□ □□□□ □□ □□□□□ □□ □□□/□□□

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**CONSENT FORM IN MARATHI LANGUAGE**

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**KEY TO MASTER CHART**

AB – ABNORMAL
CM - CENTIMETER
CX - CERVIX
FD – FETAL DISTRESS
FTND - FULL TERM NORMAL DELIVERY
ID - INSTRUMENTAL DELIVERY
IOL – INDUCTION OF LABOUR

LSCS - LOWER SEGMENT CAESAREAN SECTION

MOD – MODE OF DELIVERY

MSL – MECONIUM STAINED LIQUOR

N- NORMAL

OS – OCCIPUT SPINE

PA – PER ABDOMEN

PARTO - PARTOGRAM

POG – PERIOD OF GESTATION

PPH – POSTPARTUM HEMORRHAGE

PV – PER VAGINAL

PARITY : 1 – PRIMIGRAVIDA

2 – MULTIPARA

IOL :

1 – CERVIPRIME GEL

2 – ORAL TITRATED MISOPROSTOL SOLUTION

3 - TABLET MISOPROSTOL 50 mcg

4 – OXYTOCIN DRIP

5 – ARM

MOD :

1 – FTND

2 – LSCS

3 - ID

MASTERCHART

| Sr. No | AGE | PARITY | GA | OS-A | CERVIX DIL | PELVIMETRY | BISHOP | IOL | STAGE 1 DUR | STAGE 2 DUR | PARTO | MOD | MATERNAL | FETAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 2 | 39+2 | 125 | 2CM | N | 6 | NA | 8 | 60MIN | N | 1 | N | N |
| 2 | 32 | 2 | 38 | 120 | 2CM | N | 6 | NA | 5 | 45MIN | N | 1 | N | N |
| 3 | 21 | 1 | 38+5 | 120 | CLOSED | AB | 4 | NA | NA | NA | FD | 2 | N | NICU |
| 4 | 37 | 2 | 40 | 118 | CLOSED | N | 6 | 1 | 12 | 90MIN | MSL | 2 | N | N |
| 5 | 21 | 1 | 40+2 | 110 | 2CM | N | 8 | 2 | 9 | 120MIN | FD | 2 | PPH | NICU |
| 6 | 29 | 1 | 39 | 114 | CLOSED | N | 5 | 1 | 11 | 60MIN | N | 2 | N | N |
| 7 | 22 | 1 | 38+4 | 114 | 3CM | N | 6 | NA | 13 | 60MIN | N | 2 | N | N |
| 8 | 24 | 2 | 38 | 130 | 2CM | N | 8 | 1 | 14 | 45MIN | N | 1 | N | N |
| 9 | 32 | 1 | 39+5 | 135 | 2CM | AB | 4 | 1 | NA | NA | N | 2 | PPH | N |
| 10 | 25 | 1 | 40 | 128 | 2CM | N | 8 | 1 | 10 | 60MIN | N | 1 | N | N |
| 11 | 23 | 1 | 37+3 | 125 | CLOSED | N | 4 | NA | 15 | 45MIN | N | 1 | N | N |
| 12 | 27 | 1 | 40 | 126 | 3CM | N | 5 | 1 | 14 | 120MIN | FD | 1 | N | N |
| 13 | 27 | 2 | 38 | 138 | 3CM | N | 6 | 1 | 17 | 120MIN | N | 1 | N | N |
| 14 | 27 | 2 | 40 | 130 | 3CM | N | 4 | 1 | 12 | 60MIN | N | 1 | N | N |
| 15 | 21 | 1 | 39+3 | 118 | CLOSED | AB | 4 | NA | NA | NA | N | 2 | N | N |
| 16 | 20 | 2 | 38+6 | 108 | CLOSED | N | 8 | 2 | 15 | 120MIN | N | 2 | N | N |
| 17 | 24 | 2 | 39+3 | 123 | CLOSED | N | 6 | NA | 15 | 120MIN | MSL | 3 | N | NICU |
| 18 | 23 | 2 | 37+3 | 131 | 3CM | N | 7 | 2 | 12 | 90MIN | N | 2 | N | N |
| 19 | 26 | 2 | 37+2 | 116 | CLOSED | N | 5 | NA | 16 | 60MIN | FD | 2 | N | NICU |
| 20 | 26 | 1 | 37 | 131 | 2CM | N | 6 | 1 | 16 | 45MIN | N | 2 | N | N |
| 21 | 20 | 1 | 38+2 | 116 | 2CM | N | 8 | 1 | 12 | 60MIN | N | 3 | N | N |
| 22 | 29 | 1 | 39+6 | 131 | 3CM | N | 8 | NA | 13 | 60MIN | N | 1 | N | N |
| 23 | 20 | 1 | 40+3 | 110 | CLOSED | AB | 7 | 1 | NA | NA | N | 2 | N | N |
| 24 | 24 | 1 | 38+3 | 131 | 2CM | N | 6 | NA | 16 | 120MIN | N | 1 | N | N |
| 25 | 25 | 1 | 37+2 | 128 | 2CM | N | 8 | NA | 18 | 90MIN | N | 3 | PPH | N |
| 26 | 28 | 1 | 40+1 | 118 | CLOSED | N | 4 | NA | 15 | 60MIN | N | 1 | N | N |
| 27 | 29 | 2 | 38+4 | 123 | 3CM | N | 6 | NA | 11 | 60MIN | N | 2 | N | N |
| 28 | 20 | 1 | 38 | 128 | 3CM | N | 7 | NA | 10 | 60MIN | MSL | 1 | N | N |
| 29 | 33 | 2 | 38+4 | 127 | 2CM | N | 8 | NA | 9 | 60MIN | N | 1 | N | N |
| 30 | 28 | 1 | 38 | 136 | 3CM | AB | 5 | NA | NA | NA | N | 2 | N | N |
| 31 | 21 | 1 | 38+1 | 111 | CLOSED | AB | 9 | NA | NA | NA | N | 2 | N | N |
| 32 | 31 | 2 | 39+3 | 112 | CLOSED | N | 6 | 1 | 16 | 90MIN | N | 3 | N | N |
| 33 | 28 | 2 | 38 | 138 | CLOSED | N | 8 | 2 | 11 | 45MIN | FD | 1 | N | N |
| 34 | 30 | 1 | 39+1 | 128 | 2CM | N | 5 | NA | 15 | 60MIN | N | 1 | N | N |
| 35 | 30 | 1 | 39+2 | 131 | 3CM | N | 6 | NA | 16 | 120MIN | N | 1 | N | N |
| 36 | 28 | 1 | 39 | 119 | CLOSED | AB | 5 | 1 | NA | NA | N | 2 | N | NICU |
| 37 | 26 | 2 | 38+1 | 126 | 2CM | N | 6 | NA | 12 | 60MIN | N | 1 | N | N |
| 38 | 27 | 1 | 39 | 132 | 3CM | N | 6 | NA | 10 | 45MIN | N | 1 | N | N |
| 39 | 28 | 2 | 38+1 | 128 | 2CM | N | 6 | NA | 10 | 45MIN | N | 1 | N | N |
| 40 | 25 | 1 | 39+3 | 118 | CLOSED | N | 5 | 2 | 12 | 45MIN | MSL | 1 | PPH | NICU |
| 41 | 20 | 2 | 41 | 138 | 2CMM | N | 6 | NA | 10 | 30MIN | N | 2 | N | N |
| 42 | 22 | 1 | 38+3 | 130 | 3CM | N | 8 | NA | 12 | 45MIN | N | 2 | N | N |
| 43 | 32 | 2 | 40+1 | 112 | CLOSED | N | 7 | NA | 14 | 60MIN | N | 2 | N | N |
| 44 | 27 | 1 | 38 | 133 | 2CM | N | 8 | 1 | 16 | 60MIN | N | 1 | N | N |
| 45 | 32 | 2 | 38+4 | 125 | 2CM | N | 5 | 1 | 18 | 120MIN | FD | 3 | N | NICU |
| 46 | 28 | 2 | 39 | 110 | CLOSED | AB | 7 | 1 | NA | NA | N | 2 | N | N |
| 47 | 24 | 2 | 38+2 | 118 | CLOSED | N | 7 | 1 | 16 | 120MIN | N | 1 | N | N |
| 48 | 23 | 2 | 39 | 124 | CLOSED | N | 8 | 1 | 18 | 90MIN | N | 1 | N | N |
| 49 | 26 | 2 | 38 | 124 | 2CM | N | 5 | NA | 12 | 30MIN | FD | 3 | TEAR | NICU |
| 50 | 27 | 2 | 38 | 131 | CLOSED | N | 9 | 1 | 15 | 90MIN | N | 1 | N | N |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | 24 | 1 | 40 | 129 | CLOSED | N | 5 | 1 | 17 | 90MIN | N | 1 | N | N |
| 52 | 23 | 1 | 39+4 | 118 | 2CM | N | 8 | NA | 11 | 90MIN | N | 1 | N | N |
| 53 | 34 | 1 | 38+2 | 112 | 2CM | N | 7 | NA | NA | NA | N | 2 | N | N |
| 54 | 28 | 2 | 39 | 130 | CLOSED | N | 7 | 1 | 12 | 30MIN | N | 1 | N | N |
| 55 | 27 | 2 | 39 | 133 | 3CM | N | 8 | NA | 16 | 90MIN | N | 1 | N | N |
| 56 | 26 | 2 | 38 | 132 | 3CM | N | 8 | NA | 10 | 30MIN | N | 1 | N | N |
| 57 | 30 | 1 | 39+4 | 123 | 2CM | N | 8 | NA | 9 | 30MIN | N | 1 | N | N |
| 58 | 26 | 2 | 38+4 | 121 | 2CM | N | 6 | NA | 11 | 30MIN | N | 1 | N | N |
| 59 | 22 | 1 | 40 | 110 | 3CM | AB | 8 | NA | NA | NA | N | 2 | N | N |
| 60 | 22 | 1 | 41+2 | 118 | 3CM | N | 9 | NA | NA | NA | N | 2 | N | N |
| 61 | 23 | 1 | 39 | 130 | CLOSED | N | 7 | 1 | 16 | 45MIN | N | 1 | N | N |
| 62 | 23 | 2 | 39+2 | 118 | CLOSED | N | 9 | 1 | 15 | 120MIN | N | 1 | N | N |
| 63 | 29 | 1 | 38 | 126 | CLOSED | N | 4 | 2 | 16 | 30MIN | MSL | 1 | TEAR | NICU |
| 64 | 26 | 1 | 38 | 125 | 2CM | N | 4 | NA | 16 | 90MIN | MSL | 3 | TEAR | NICU |
| 65 | 26 | 2 | 38+4 | 133 | 3CM | N | 9 | NA | 12 | 45MIN | N | 1 | N | N |
| 66 | 22 | 2 | 40 | 122 | 2CM | N | 6 | NA | 10 | 60MIN | N | 1 | N | N |
| 67 | 38 | 1 | 39+5 | 120 | 2CM | N | 7 | NA | 12 | 45MIN | N | 1 | N | N |
| 68 | 30 | 1 | 38 | 122 | 3CM | N | 9 | NA | 10 | 30MIN | N | 1 | N | N |
| 69 | 33 | 1 | 38+2 | 116 | CLOSED | N | 9 | 1 | 16 | 90MIN | N | 1 | N | N |
| 70 | 26 | 1 | 38+3 | 121 | CLOSED | N | 9 | 1 | 16 | 120MIN | N | 1 | N | N |
| 71 | 26 | 1 | 40+1 | 133 | 3CM | N | 8 | NA | 10 | 30MIN | N | 3 | PPH | N |
| 72 | 28 | 2 | 40 | 129 | 2CM | N | 6 | NA | 10 | 30MIN | N | 1 | TEAR | N |
| 73 | 24 | 2 | 39 | 114 | 2CM | AB | 9 | 1 | NA | NA | N | 1 | N | N |
| 74 | 26 | 1 | 38+5 | 116 | 2CM | N | 9 | 1 | NA | NA | N | 2 | N | N |
| 75 | 23 | 1 | 39 | 117 | 3CM | N | 9 | NA | 16 | 120MIN | N | 1 | N | N |
| 76 | 28 | 1 | 38+5 | 136 | 3CM | N | 8 | NA | 10 | 30MIN | N | 1 | N | N |
| 77 | 24 | 1 | 40 | 128 | 3CM | N | 6 | NA | 12 | 30MIN | N | 3 | N | N |
| 78 | 22 | 1 | 39+2 | 124 | 2CM | N | 4 | NA | 8 | 30MIN | FD | 2 | N | NICU |
| 79 | 23 | 1 | 40 | 124 | 2CM | N | 7 | NA | 9 | 30MIN | N | 3 | TEAR | N |
| 80 | 20 | 1 | 40+2 | 126 | 2CM | N | 7 | NA | 6 | 45MIN | N | 3 | N | N |
| 81 | 26 | 1 | 38+5 | 123 | 3CM | N | 8 | 1 | 12 | 30MIN | N | 1 | N | N |
| 82 | 24 | 1 | 39 | 128 | CLOSED | N | 6 | 1 | 14 | 120MIN | N | 1 | PPH | N |
| 83 | 25 | 1 | 40 | 130 | 2CM | N | 6 | NA | 12 | 60MIN | N | 1 | N | N |
| 84 | 25 | 2 | 38 | 114 | 3CM | AB | 7 | NA | NA | NA | N | 2 | N | N |
| 85 | 32 | 2 | 38 | 116 | CLOSED | AB | 7 | 1 | NA | NA | N | 2 | N | N |
| 86 | 23 | 1 | 39 | 118 | 2CM | N | 6 | 2 | 10 | 30MIN | N | 1 | N | N |
| 87 | 27 | 2 | 38+2 | 128 | 2CM | N | 8 | NA | 18 | 90MIN | N | 1 | N | N |
| 88 | 28 | 2 | 39 | 128 | 2CM | N | 5 | NA | 16 | 120MIN | N | 1 | N | N |
| 89 | 28 | 1 | 40 | 122 | 2CM | N | 9 | 1 | 10 | 30MIN | N | 1 | N | N |
| 90 | 24 | 2 | 38+2 | 110 | 2CM | AB | 9 | NA | NA | NA | N | 2 | N | N |
| 91 | 33 | 1 | 41 | 128 | 3CM | N | 5 | NA | 16 | 90MIN | N | 1 | N | N |
| 92 | 28 | 2 | 38+1 | 124 | 3CM | N | 8 | NA | 12 | 30MIN | N | 1 | N | N |
| 93 | 21 | 2 | 38+2 | 124 | 2CM | N | 5 | NA | 18 | 120MIN | N | 3 | PPH | N |
| 94 | 26 | 1 | 39 | 130 | 2CM | N | 8 | NA | 10 | 15MIN | N | 1 | N | N |
| 95 | 22 | 2 | 38 | 126 | 3CM | N | 6 | NA | 12 | 60MIN | N | 3 | N | N |
| 96 | 24 | 1 | 39+2 | 130 | 3CM | N | 6 | NA | 10 | 30MIN | N | 1 | N | N |
| 97 | 24 | 2 | 38+1 | 128 | 3CM | N | 5 | NA | 16 | 90MIN | N | 1 | N | N |
| 98 | 25 | 1 | 39 | 110 | 3CM | AB | 9 | NA | NA | NA | N | 2 | N | N |
| 99 | 24 | 1 | 39 | 126 | 3CM | N | 6 | NA | 16 | 90MIN | N | 1 | N | N |
| 100 | 30 | 2 | 39+3 | 128 | 2CM | N | 9 | NA | 10 | 30MIN | N | 1 | N | N |

FIGURE 12 (A-D) – ULTRASOUND IMAGES OF OS ANGLE MEASUREMENT