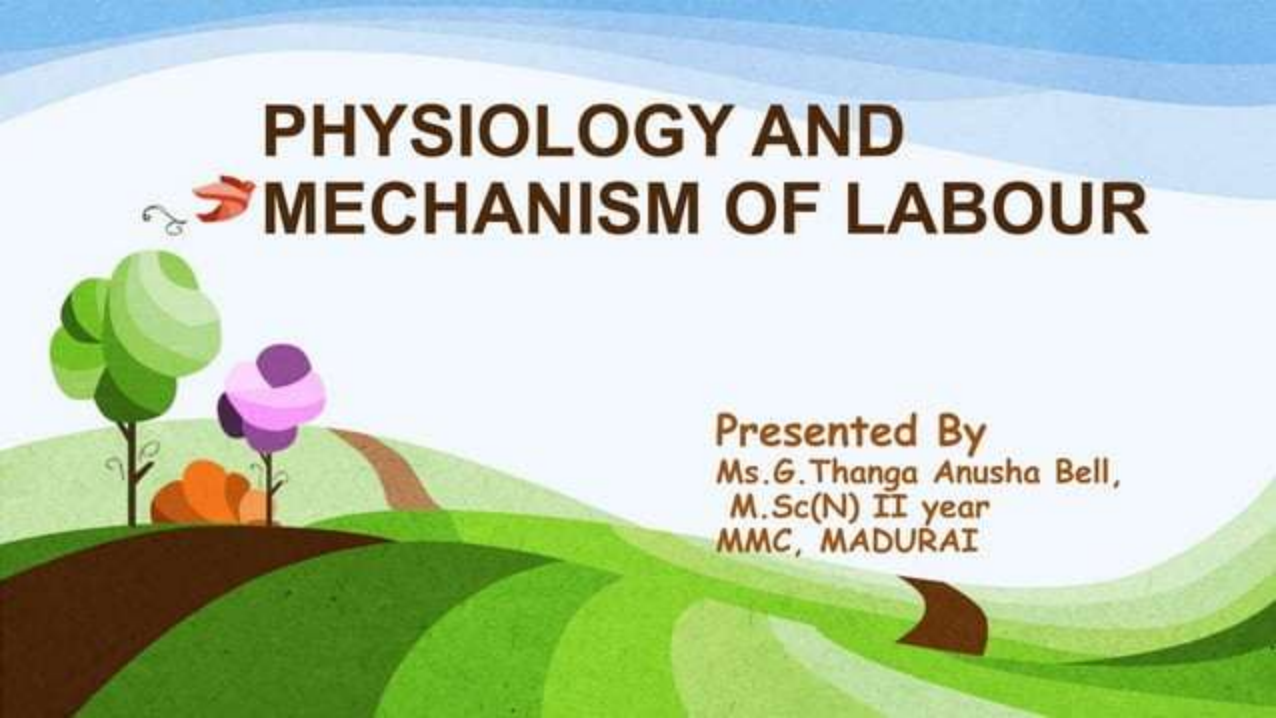
PHYSIOLOGY AND MECHANISM OF LABOUR



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DEFINITION OF LABOUR

- Labour (parturition, childbirth, or birthing) is the process by which the fetus and placenta are expelled from the uterus and the vagina into the external environment.
- *Labour* is the physiological process by which a viable foetus and the products of conception i.e. at the end of 28 weeks or more is expelled from the uterus.

TERMINOLOGIES

- **Parturition** is the birth process.
- **A parturient** is a woman in labour.
- **Labour** is a coordinated sequence of involuntary uterine contractions that result in effacement and dilatation of the cervix and voluntray bearing-down efforts that result in delivery, the actual expulsion of the products of conception, the fetus and placenta.

CONTD.,

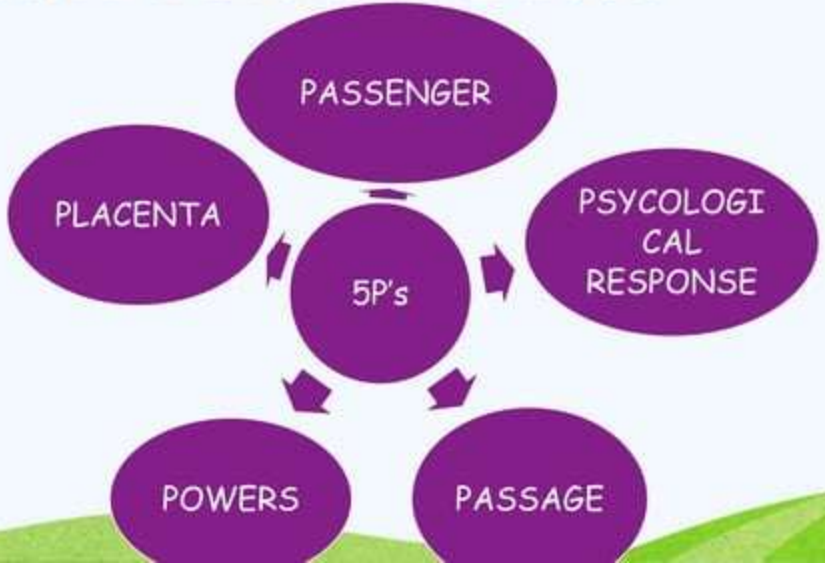
- **Dystocia** is abnormal labour or difficult labour.
- **Eutocia** is normal labour;
- **Delivery**

  It means actual birth of the foetus

Criteria for calling it Normal labour:

- Spontaneous expulsion, of a single and mature foetus (37 completed weeks) .
- Presented by vertex and through the birth canal.
- Presentation within a reasonable time (not less than 3 hours or more than 18 hours).
- Without *complications* to the mother and or the foetus.

ESSENTIAL FACTORS OF LABOUR



Essential Factors of labour

- THE PASSENGER-Fetal head size, Fetal lie, presentation, attitude, position
- THE PASSAGE WAY
- THE POWERS
- THE PLACENTA
- PSYCHOLOGICAL RESPONSE

The Passenger

- The passage of the fetus through the birth canal is influenced by the

✓**size** of the **fetal head** and **shoulder**,

✓the **dimensions** of the **pelvic girdle**,

✓ the **fetal presentation and position**.

The bones of the **cranial vault** are not firmly united, and slight **overlapping** of the bones, or **moulding** of the shape of the head, occurs during labour. This capacity of the bones to slide over one another permits adaptation to the various diameters of the pelvis. **Moulding** can be extensive, but with most neonates the head assumes its normal shape within about 3 days after birth.

CONTD.,

The **foetal head** can move on the neck about **45** degrees in **flexion** or **extension** and approximately **180** degrees during **rotation**. This movement permits smaller diameters of the foetal head to present during descent through the birth canal.

Measurements of the foetal skull

1)Anteroposterior diameters

i) Occipitomental (OM): 13.5
ii) Occipitofrontal (OF): 11.5
iii) Suboccipitobregmatic (SOB): 9.5

2) Transverse diameters

i) Biparietal (Bip): 9.25

ii) Bitemporal (Bit): 8.0

Shoulders and Pelvic girdle

Because of their mobility, the position of the shoulder (the shoulder girdle) can be altered during labour, so that one shoulder may occupy a lower level than the other. This permits a small shoulder diameter to negotiate the passage. The circumference of the hips, or pelvic girdle, is usually small enough not to create problems.

Foetal lie

Lie is the relationship of the long axis (spine) of the foetus to the long axis of the mother.

There are two lie:

i) **Longitudinal**, in which the long axis of the foetus is parallel with the long axis of the mother, and

ii) **Transverse**, in which the long axis of the foetus is at right angles to that of the mother.

Presentation

Presentation refers to that portion of the fetus that enters the pelvis first and covers the internal os of the cervix, such as cephalic (vertex, head), breach or shoulder.

Attitude

Attitude is the relationship of the fetal body parts to each other.

CONTD.,

1) The shape is roughly **ovoid**,
2)The back is markedly flexed,
3)The head is flexed on the chest,
4)The thighs are flexed on the abdomen,
5)The knees are flexed at the knee joints, and
6)The arches of the feet rest on the anterior surface of the legs; this is the attitude of "**general flexion**".
7)The arms are crossed over the thorax, and the umbilical cord lies between them and the legs.

IN CEPHALIC PRESENTATION

1. If the head is **fully flexed** on the chest, the **occiput** (vertex) presents first and the **posterior fontanel** is palpable on vaginal examination; this is termed an **occipital**, or **vertex**, presentation.
2. If the head is **partially flexed** or **not flexed** (moderate flexion), the anterior fontanel presents and is palpable on vaginal examination; this is termed a sinciput presentation or a military attitude.
3. If the head is **markedly extended**, the brow is the presenting part: this is termed a **brow presentation**
4. If the head is hyper extended, the chin (mentum) is the presenting part; this is termed a face or chin presentation

Cause of Onset of Labour:

(1) Hormonal factors:

(i) Oestrogen theory

(ii) Progesterone withdrawal theory

(iii) Prostaglandins theory

(iv) Oxytocin theory

(v) Foetal cortisol theory

(2) Mechanical factors:

(i) Uterine distension theory:

(ii) Stretch of the lower uterine segment

(1) Hormonal factors:

- **(i) Oestrogen theory:**
- During pregnancy, most of the oestrogens are present in a binding form. During the last trimester, more free oestrogen appears increasing the excitability of the myometrium and prostaglandins synthesis.
- **(ii) Progesterone withdrawal theory:**
- Before labour, there is a drop in progesterone synthesis leading to predominance of the excitatory action of oestrogens.

(iii) Prostaglandins theory:

Postaglandins E2 and F2a are powerful stimulators of uterine muscle activity

(iv) Oxytocin theory:

Although oxytocin is a powerful stimulator of uterine contraction , its natural role in onset of labour is doubtful. The secretion of oxytocinase enzyme from the placenta is decreased near term due to placental ischaemia leading to predominance of oxytocin's action.

(v) Foetal cortisol theory:

Increased cortisol production from the foetal adrenal gland before labour may influence its onset by increasing oestrogen production from the placenta

(2) Mechanical factors:

(i) Uterine distension theory:

Like any hollow organ in the body, when the uterus in distended to a certain limit, it starts to contract to evacuate its contents. This explains the preterm labour in case of multiple pregnancy and polyhydramnios.

(ii) Stretch of the lower uterine segment:

By the presenting part near term

Clinical Picture of Labour

(A) Prodromal (pre - labour) stage:

(1) Shelfing, (2) Lightening, (3) Pelvic pressure symptoms, (4) Increased vaginal discharge, (5) False labour pain.

(B) Onset of Labour:

(1) True labour pain, (2) The show, (3) Dilatation of the cervix, (4) Formation of the bag of fore – water

(A) Prodromal (pre - labour) stage:

- **(1) Shelfing:** It is falling forwards of the uterine fundus making the upper abdomen looks like a shelf during standing position.
- **(2) Lightening:**
- It is the relief of upper abdominal pressure symptoms as dyspnoea, dyspepsia and palpitation due to :
- - Descent in the fundal level after engagement of the head and
- - Shelfing of the uterus

(3) Pelvic pressure symptoms:
With engagement of the presenting part the following symptoms may occur:
- Frequency of micturition.
- Rectal tenesmus.
- Difficulty in walking.

(4) Increased vaginal discharge.

(5) False labour pain:

(B) Onset of Labour:

(1) True labour pain.

(2) The show:

(3) Dilatation of the cervix:

(4)Formation of the bag of fore – waters

PHYSIOLOGICAL EFFECTS OF LABOUR

(I) On the Mother:

(A) First stage-Minimal effects.

(B) Second stage:

- Temperature: slight rise to 37.5oC, - Pulse: increases up to 100/min.

- Blood pressure: systolic blood pressure may rise slightly due to pain, anxiety and stress.

- Oedema and congestion of the conjuctiva.

- Minor injuries: to the birth canal and perineum may occur particularly in primigravidas

(C) Third stage:

Blood loss from the placental site is 100-200 ml and from laceration or episiotomy is 100 ml so the total average blood loss in normal labour is 250 ml.

(II) On the Foetus:

(A) Moulding:

The physiological gradual overlapping of the vault bones as the skull is compressed during its passage in the birth canal. One parietal bone overlaps the other and both overlap the occipital and frontal bones so fontanelles are no more detectable.

It is of a good value in reducing the skull diameters but; severe and / or rapid moulding is dangerous as it may cause intracranial haemorrhage.

STAGES OF LABOUR

(I) *First stage:*

- It is the stage of cervical dilatation.
- Starts with the onset of true labour pain and ends with full dilatation of the cervix i.e. 10 cm in diameter.
- It takes about 10-14 hours in primi gravida and about 6-8 hours in multi para.

First Stage: Phases of cervical dilatation:

(A) Latent phase:

This is the first 4 cm of cervical dilatation which is slow takes about 8 hours in nullipara and 4 hours in multipara. The latent phase begins with mild, irregular uterine contractions that soften and shorten the cervix

(B) Active phase:

Begin after 4 cm of cervical dilatation. The normal rate of cervical dilatation in active phase is 1.2 cm/ hour in primigravidae and 1.5 cm/hour in multiparae. If the rate is < 1cm / hour it is considered prolonged.

(C) Transitional phase

The transitional phase happens when the mother move from the first stage of labour to the second, pushing stage. It usually starts when her cervix is about 8cm (3.5in) dilated, and end when her cervix is fully dilated, or when you get the urge to push.

(II) Second stage:

- It is the stage of expulsion of the foetus.
- Begins with full cervical dilatation and ends with the delivery of the foetus.
- Its duration is about 1 hour in primigravida and ½ hour in multipara.
-(ACOG) has suggested that a prolonged second stage of labor should be considered when the second stage of labour exceeds 3 hours in nulliparous and 2 hours in multiparous.

(A) Delivery of the head:

(1) Descent:

It is continuous throughout labour particularly during the second stage and caused by:

a. Uterine contractions and retractions.

b. The auxiliary forces brought by contraction of the diaphragm and abdominal muscles.

c. The unfolding of the foetus

(2) Engagement:

The head normally engages in the oblique or transverse diameter of the inlet.

(3) Increased flexion:

Increased flexion of the head occurs when it meets the pelvic floor according to the lever theory.

Increased flexion results in :

a. The suboccipito - bregmatic diameter (9.5cm) passes through the birth canal instead of the suboccipito- frontal diameter (10 cm).

b. The part of the foetal head applied to the maternal passages is like a ball. The circumference of this ball is 30 cm.

c. The occiput will meet the pelvic floor. Lever action producing flexion of the head; conversion from occipitofrontal to suboccipitobregmatic diameter typically reduces the anteroposterior diameter from nearly 11.5- to 9.5 cm.

(4) Internal rotation:
The rule is that the part of foetus meets the pelvic floor first will rotate anteriorly.
As the head descends, the presenting part, usually in the transverse position, is rotated about 45° to anteroposterior (AP) position under the symphysis.

(5) Extension:
The suboccipital region lies under the symphysis then by head extension the vertex, forehead and face come out successively.

(6) Restitution:
After delivery, the head rotates 1/8 of a circle in the opposite direction of internal rotation to undo the twist produced by it.

(7) External rotation:
The shoulders enter the pelvis in the opposite oblique diameter to that previously passed by the head. When the anterior shoulder meets the pelvic floor it rotates anteriorly 1/8 of a circle. This movement is transmitted to the head so it rotates 1/8 of a circle in the same direction of restitution

(B) Delivery of the shoulder and body:

The anterior shoulder hinges below the symphysis pubis and with continuous descent the posterior shoulder is delivered first by lateral flexion of the spines followed by anterior shoulder then the body.

(III) Third stage:

- It is the stage of expulsion of the placenta and membranes.
- Begins after delivery of the fetus and ends with expulsion of the placenta and membranes.
- Its duration is about 10-20 minutes in both primi and multipara.

(IV) Fourth stage:

- It is the stage of early recovery.
- Begins immediately after expulsion of the placenta and membranes and lasts for one hour.
- During which careful observation for the patient, particularly for signs of postpartum haemorrhage is essential. Routine uterine massage is usually done every 15 minutes during this period.