INTRODUCTION

The world health organization (WHO) defines normal birth as "spontaneous in onset, low risk at the start of labor and remaining so throughout labor and delivery. The infant is born spontaneously in the vertex position between 37 and 42 weeks of pregnancy. After birth, mother and infant are in good condition ***(Funai et al., 2015).***

This is considered the preferred way of natural labor and delivery. It occurs when a pregnant woman goes into natural labor without drugs or other methods of inducing labor, and gives birth/delivers her baby normally, without a C-section, vacuum extraction, or forceps ***(Nierenberg, 2015).***

Obstetricians have divided labor into 3 stages that delineate milestones in a continuous process.

- First stage: from the onset of labor to full dilatation (commonly lasts for 8-12 hours in a first labor, 3-8 hours in subsequent labors).
- Second stage: from full dilatation of the cervix to delivery of the baby (commonly lasts 1-2 hours in a first labor, 0.5-1 hour in subsequent labors)
- Third stage: from delivery of the baby to the delivery of the placenta (commonly lasts up to 5-15 minutes if actively managed) ***(Steer and Flint, 1999).***

- Active management often involves prophylactic administration of oxytocin or other uterotonics (prostaglandins or ergot alkaloids), cord clamping / cutting ***(Milton, 2016).***

There are a many benefits of Women Giving Birth Naturally for both mother and baby

For the Mother compared to C-section, recovery time for a vaginal birth is shorter and uterine rupture during subsequent pregnancy may occur as the result of a scar left after a C-section However, vaginal delivery means no uterine scar ***(Nierenberg, 2015).***

For the baby the pressure created during labor helps remove amniotic fluid from his/her lungs. This helps clear any blockages in the nasal area and lungs **and** the baby passes through the birth canal, he/she picks protective bacteria that help to form a balanced immune system ***(Nierenberg, 2015).***

There are a lot of factors that can affect the success of normal vaginal delivery especially fetal biometry

The fetal head, from an obstetrical viewpoint, and in particular its size, is important because an essential feature of labor is the adaptation between the fetal head and the maternal bony pelvis ***(Cunningham et al., 2005).*** And it is represent the point of interface between passenger and passageway ***(Lipschuetz et al., 2015*)*.***

Fetal head circumference is an important parameter which can be used not only to determine fetal age but also fetal growth because the biparital diameter of the head can be misleading in cases associated with head shape changes (dolicocephaly) the head circumference considered the most important fetal head measure ***(Jeswar et al., 2012).***

Previous retrospective study conclude that large head circumference is more strongly associated with unplanned caesarian section or instrumental delivery than high birth weight and recommend prospective study to test fetal head circumference as a predictive parameter for prelabor counseling in women with big babies ***(Lipschuetz et al., 2015).***

Aim of the Study

This study aims to assess the accuracy of fetal head circumference compared to expected fetal weight in pregnant women as a predictor of spontaneous vaginal delivery.

Research Question:

In pregnant women undergoing spontaneous vaginal delivery, does fetal head circumference predict successful vaginal delivery accurately as expected fetal weight?

Research Hypothesis:

In pregnant women undergoing spontaneous vaginal delivery, fetal head circumference may predict successful vaginal delivery accurately as expected fetal weight.

Chapter (I): Vaginal Delivery

The world health organization (WHO) defines normal birth as "spontaneous in onset, low risk at the start of labor and remaining so throughout labor and delivery. The infant is born spontaneously in the vertex position between 37 and 42 weeks of pregnancy. After birth, mother and infant are in good condition ***(Funai et al., 2015).***

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Labor is a clinical diagnosis characterized by regular, painful uterine contractions that increase in frequency and intensity is associated with progressive cervical effacement or dilatation. More specifically, it is associated with a change in the myometrial contractility pattern from irregular contractures (long-lasting, low-frequency activity) to regular contractions (high-intensity, high frequency activity) ***(Walsh, 2010).***

Mechanism of normal labor:

Uterine contractions have two major functions: to dilate the cervix and to push the fetus through the birth canal. The fetus is not merely the passive recipient of these forces, however the ability of the fetus to negotiate the pelvis successfully depends on the complex interaction of three variables: the powers, the passenger, and the passage ***(Cunningham et al., 2010).***

Powers:

Powers refer to the force generated by the uterine musculature during contractions. It is generally believed that the more optimal the powers, the more likely a successful outcome .No data exist to support this statement, however the features used to describe contractions are frequency, intensity, and duration. It should be noted that the frequency of contractions does not necessarily reflect the force of contraction. As with other types of muscle contractions, action potentials must be generated and propagated to yield effective contractions in a process known as electromechanical coupling ***(Cunningham et al., 2010).***

Passenger

The passenger is the fetus. Several fetal variables may influence the course of normal labor and delivery.

- **Fetal size:** Fetal macrosomia, which is defined by the American college of obstetricians and gynecologists as an estimated fetal weight (not birth weight) more than or equal to 4500 g (ACOG, 2000), is associated with an increased risk of caesarean delivery because of cephalopelvic disproportion. Assessment of estimated fetal weight can be made either by clinical examination (Leopold's maneuver) or ultrasound, although both approaches are subjects to significant errors (approximately 15% - 20% at term).

- **Lie:** Fetal lie refers to the long axis of the fetus relative to the longitudinal axis of the uterus and can be longitudinal, transverse, or oblique. For a single gestation, a vaginal delivery should be attempted only if the lie is longitudinal.

- **Presentation:** Fetal presentation refers to the fetal part that directly overlies the pelvic inlet with a longitudinal lie, presentation is usually cephalic (vertex), breech, or shoulder. When more than one fetal part presents at the pelvic inlet, the term ‘compound presentation’ is used. rarely ,the umbilical cord may present at the inlet, which

is known as a funic presentation. Approximately 5% of singleton pregnancies at term have a malpresentation in labor.

- **Attitude:** Fetal attitude describes the degree of flexion or extension of fetal head in relation to the fetal spine. Adequate flexion (chin to chest) is necessary to achieve the smallest possible presenting diameter in a cephalic presentation. Deflection in the early stage of labor may be corrected by the architecture of pelvic floor and uterine contractions. ***(Cunningham et al., 2010).***

- **Position:** Fetal position refers to the relationship of a denominator of the fetal presenting part to a denominating location on the maternal pelvis. For example, in a cephalic presentation, the fetal site used for reference is typically the occiput (e.g., right occiput anterior). In a breech presentation, the sacrum is used as the designated fetal site (e.g., right sacrum anterior). Any fetal position that is not right occiput anterior is referred to as a malposition.

- **Station:** Fetal station refers to how far the leading bony edge of the presenting part of the fetus has descended in to the maternal pelvis to the ischial spines. It is typically assessed clinically by bimanual examination. An older arbitrary system (-3 to +3, with 0 being at the level of

the ischial spines) has been replaced with a more recent classification designed to quantify the distance from the ischial spines (-3 to +5).

- **Number of fetuses.**
- **Presence of fetal anomalies:** Anomalies may obstruct delivery (e.g., sacrococcygeal teratoma) ***(Cunningham et al., 2010).***

Passage

The passage through which the fetus must pass during normal labor and delivery consists of the bony pelvis and the soft tissues of the birth canal (i.e., cervix, pelvic floor musculature), both of which offer varying degrees of resistance to fetal expulsion. The bony pelvis is of the greater and lesser pelvis and divided by the pelvic brim ***(Cunningham et al., 2010).***

Its anatomic boundaries are made up of the sacral promontory, the anterior ala of the sacrum, the arcute line of the ilium, the pectineal line of the pubis, and the symphysis pubis. The true pelvis can be divided into planes that must be navigated by the fetus during labor, including the pelvic inlet, mid cavity, and outlet. The female pelvis is classically described as having one of the four shapes: gynecoid, anthropoid, android, and platypoid. This

classification was designed to separate the more favorable configurations for successful vaginal delivery (i.e., gynecoid, anthropoid) from the less favorable one ***(Zhang et al., 2010).***

Stages and duration of normal labor:

Although labor is a continuous process, it is traditionally has been divided into three stages to facilitate study and assist in clinical management.

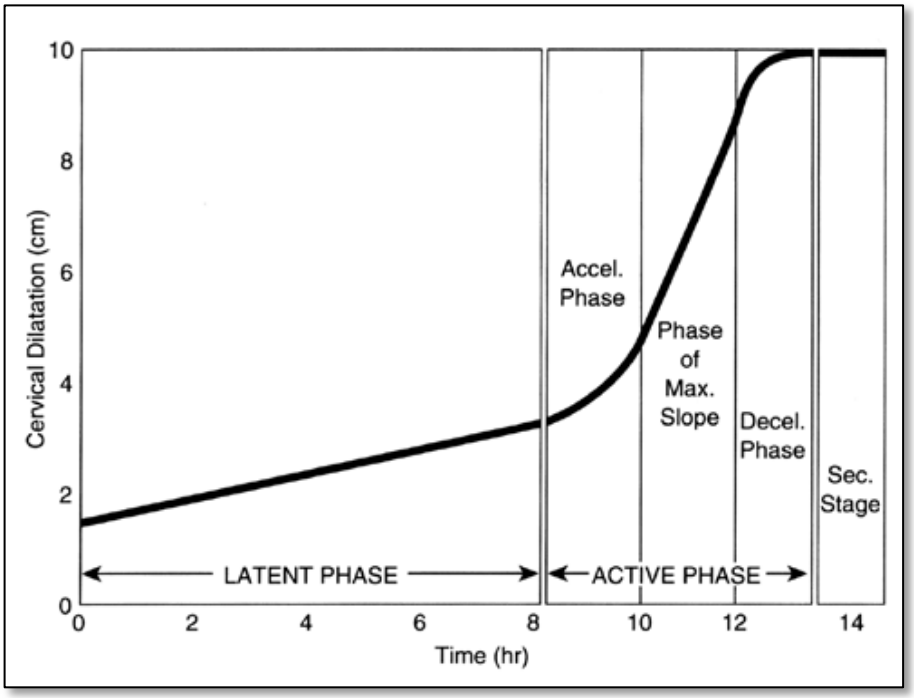
First stage

The first stage refers to the interval between the onset of labor and full cervical dilatation. It has been subdivided into three phases according to the rates of cervical dilatation ***(Friedman, 1954).***

1. **Latent phase:** The latent phase referred to the period between the onset of labor and the point at which a change in the slope of the rate of cervical dilatation is noted. It is characterized by slow cervical dilatation and is of variable duration ***(Zhang et al., 2010).***

2. **Active phase:** This phase is associated with a faster rate of cervical dilatation and usually begins at approximately 2 to 4 cm dilatation The active phase is broken down further into an acceleration phase , a phase of maximum slope, and deceleration phase, but these subdivisions are rarely used currently ***(Zhang et al., 2010).***

By comparing a parturients rate of cervical dilatation with the normal profile described by Friedman, it is possible to detect abnormal labor patterns and identify pregnancies at risk of adverse events. This task can be facilitated by use of a partogram which is a graphic representation of the labor curve against which a patient progress in labor is plotted. In this way, abnormal labor pattern can be identified easily and appropriate measures taken ***(Friedman, 1954).***



Accel: acceleration, **Decel:** deceleration, **Sec:** second

Fig. (1): Shows cervical dilatation curve for nulliparous labor ***(Friedman, 1954).***

Second stage:

The second stage of labor refers to the interval between full cervical dilatation (10 cm) and delivery of the infant. It is characterized by descent of the presenting part through the maternal pelvis and culminates with expulsion of the fetus ***(Zhang et al., 2010).***

Indications that the second stage has started are an increase in bloody show, maternal desire to bear down with each contraction, a feeling of pressure on the rectum accompanied by the desire to defecate, and onset of nausea and vomiting. The mother typically assumes a more active role in the second stage than the first stage because she pushes or bears down to aid descent of the fetus. In the presence of a reassuring fetal heart rate, it is desirable for nulliparous patient without regional anesthesia to push for as long as 2 hours (3 hours with regional anesthesia) before restoring to interventions to facilitate delivery. For a multiparous women, the recommendations is 1 hour if no regional anesthesia and 2 hours if there is regional anesthesia ***(Neal et al., 2010).***

Third stage

The third stage of labor refers to the time from delivery of the baby to separation and expulsion of the placenta and fetal membranes. The three classic signs of

placental separation are (1) lengthening of the umbilical cord, (2) a gush of blood from the vagina, which signifies separation of the placenta from the uterine wall and (3) a change in the shape of the uterine fundus from discoid to globular, with elevation of the fundal height ***(Farrar et al., 2011).***

The major complications associated with this period is a hemorrhage, which remains an important cause of maternal morbidity and mortality. Average blood loss at delivery is generally estimated to be 500 ml ***(Farrar et al., 2011).***

Obstetrics care providers should be alert to excessive blood loss and should be prepared to intervene as required.

Retention of the placenta for longer than 30 minutes at term is a commonly used endpoint for intervention even in the absence of active hemorrhage. The world health organization defines a retained placenta as one that has not been expelled by 60 minutes after delivery ***(WHO, 1990).***

Cardinal movement in labor:

The cardinal movement of labor refer to change in the position of fetal head during its passage through the birth canal. Because of a symmetry in the shape of fetal head and the maternal bony pelvis, such rotations are required if the fetus is to negotiate the birth canal

successfully. These seven discrete movements are engagement, desent, flexion, internal rotation, extension, external rotation or restitution, and expulsion ***(Williams, 2011).***

Engagement

Engagement refers to the passage of the widest diameter of the fetal presenting part to a level below the plane of the pelvic inlet. In the cephalic presentation with a well-flexed head, the largest transverse diameter of the fetal head is the bipariteal diameter (9.5 cm). Engagement can be confirmed clinically by palpitation of the presenting part abdominally (when only two fifth of the head can be palpated abdominally) or vaginally (with confirmation of station at or below the ischial spines). Engagement is an important clinical milestone in the progress of labor, because it demonstrates that the bony pelvis is adequate to allow passage of the fetal head. For multiparous women, engagement may occur at any time after 36 weeks. In primipara, however, failure of engagement to take place by 36 weeks is often an early sign of cephalopelvic disproportion ***(Simkin & Anchta, 2011).***

Descent

Descent refers to the downward passage of the presenting part through the pelvis. Descent of the fetus is

not a steady, continuous process. The greatest rate of descent occur during the deceleration phase of the first stage and during the second stage of labor ***(Simkin & Ancheta, 2011).***

Flexion

Flexion of the fetal head occurs passively as the head descends because of the shape of the bony pelvis and the resistance of the soft tissues of the pelvic floor. Although flexion of the fetal head is present of most fetus antepartum, complete flexion usually occur only during the course of labor to allow the fetus presents the smallest diameter of its head (suboccipito-bregmatic diameter), which allows optimal passage through the pelvis ***(Simkin & Ancheta, 2011).***

Internal rotation

Is the rotation of the presenting part from its original position to the anteroposterior position. This change typically results in the fetal occiput rotating toward the symphysis pupis as it descends, which lead to the widest axis of the fetal headlines up with the widest axis of the pelvis. Internal rotation is a passive movement that results from the shape of the pelvis and the resistance of the pelvic floor muscles ***(Simkin & Ancheta, 2011).***