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A Study on the Incidence of Engagement and Non-Engagement of the Foetal Head at or after 38 Weeks of Pregnancy in Nulliparous Women and their Outcomes at Rajshahi Medical College Hospital

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Abstract

Background: Labour in nulliparous women is a crucial obstetric process, and foetal head engagement is a key determinant of labour progress and clinical decision-making. The purpose of the study is to determine the incidence of foetal head engagement and non-engagement at ≥38 weeks in nulliparous women and evaluate their maternal and fetal outcomes. ***Methods:*** This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh, from January to December 2009, and included 100 nulliparous women at ≥38 weeks of gestation with singletone foetus with cephalic presentation. Foetal head engagement was assessed using the rule of fifths, and participants were grouped as those with engaged head or non-engaged head. Labour was actively monitored with a partograph, and maternal and foetal outcomes were recorded. Data were collected using a standardized questionnaire and analyzed using SPSS software. ***Results:*** Among 100 nulliparous women ≥38 weeks, 69% had non-engaged and 31% had engaged foetal heads. Vaginal delivery was higher with engagement (77.42% vs 42.63%), while cesarean section was more frequent in non-engagement (57.97% vs 22.58%). Postpartum hemorrhage was higher in the non-engaged group (6.45% vs 1.45%), labour was longer, and neonatal outcomes were comparable, with APGAR scores of 7–10 in >94% of both groups and no APGAR <4. ***Conclusion:*** Non-engagement of the foetal head at term in primigravid women is common and, by itself, does not preclude successful vaginal delivery.

Keywords: Foetal Head Engagement, Nulliparous Women, Pregnancy Outcomes.

INTRODUCTION

Labour represents a significant milestone in a woman's life and is a complex physiological process marked by rhythmic uterine contractions that lead to progressive cervical dilatation, effacement, and descent of the presenting part [1,2]. The initiation of labour is a crucial determinant of both maternal and fetal outcomes, particularly in nulliparous women, in whom labour is often longer and more demanding. The experience and outcome of a woman's first pregnancy and childbirth have a substantial influence on her future reproductive health and childbearing potential [3]. Consequently, pregnancy and labour in nulliparous women warrant close observation, as they carry a comparatively higher risk of obstetric complications than multiparous women.

Foetal head engagement is a fundamental component of the labour mechanism and is defined as the passage of the biparietal diameter of the foetal head through the pelvic inlet [4]. In primigravida women, engagement has traditionally been expected to occur by 36–38 weeks of gestation and to remain fixed thereafter [5]. The occurrence of engagement is considered an indicator of pelvic adequacy, as the engaged foetal head effectively functions as a natural assessment of the pelvic inlet [6]. Although engagement is commonly viewed as a feature of labour in nulliparous women, it frequently

takes place during the final weeks of pregnancy and may also occur during the early stages of labour [7].

The timing of foetal head engagement shows considerable variability and is influenced by multiple factors, including foetal head size, maternal pelvic dimensions, pelvic inclination, race, and ethnic background [8]. Variations in pelvic inclination and the sagittal diameter of the pelvic inlet have been suggested as possible contributors to delayed engagement. Contrary to long-held beliefs, absence of engagement at term or even at the onset of labour has been shown to be a largely physiological finding in many nulliparous women [8]. Nevertheless, a substantial number of primigravidae continue to present with unengaged foetal heads at term, and clear management guidelines for such cases remain lacking. This ambiguity is particularly important in resource-limited settings, underscoring the need for locally relevant data among nulliparous women at or beyond 38 weeks of gestation.

From a clinical perspective, a high foetal head at term in primigravida women has traditionally been viewed as an adverse sign, often raising suspicion of cephalopelvic disproportion and increasing the likelihood of cesarean section [4]. Evidence suggests that a higher foetal station at the onset of labour is associated with prolonged labour and a greater incidence of dysfunctional labour patterns. Extended labour duration increases maternal risks such as infection, ketosis, and obstructed labour, while the fetus may be exposed to complications including low APGAR scores and birth asphyxia [9,10]. As a result, non-engagement of the foetal head at the beginning of active labour is frequently regarded as a predictor of operative delivery. However, several studies have shown that with appropriate monitoring, use of the partograph, and timely interventions, many nulliparous women with unengaged foetal heads can still achieve vaginal delivery without an increase in maternal or neonatal morbidity [11]. Therefore, evaluating foetal head engagement and its associated outcomes is vital for optimizing labour management, minimizing unnecessary cesarean sections, and improving overall maternal and neonatal health outcomes [12].

Despite growing evidence that non-engagement of the foetal head at term may represent a normal physiological variation in nulliparous women, it continues to be a source of clinical concern and often influences decisions regarding labour management and mode of delivery. In many settings, particularly in resource-limited hospitals, a high foetal head at or after term may prompt early intervention or elective cesarean section in the absence of clear indications, contributing to potentially avoidable operative deliveries. Furthermore, data regarding the incidence of foetal head engagement at or beyond 38 weeks of gestation and its association with maternal and neonatal outcomes among nulliparous women remain limited, especially in the local context. Generating region-specific evidence is therefore essential to guide clinical decision-making, promote safe vaginal delivery where appropriate, and reduce unnecessary cesarean sections. The purpose of the study is to determine the incidence of foetal head engagement and non-engagement at ≥38 weeks in nulliparous women and evaluate their maternal and fetal outcomes.

OBJECTIVE

- To determine the incidence of foetal head engagement and non-engagement at ≥38 weeks in nulliparous women and evaluate their maternal and fetal outcomes.

METHODOLOGY & MATERIALS

This cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh, from January 2009 to December 2009. A total of 100 pregnant women at or beyond 38 weeks of gestation with a singleton cephalic foetus were included. Participants were selected using purposive sampling based on predefined inclusion and exclusion criteria to evaluate the incidence of foetal head engagement and its maternal and foetal outcomes.

Inclusion Criteria:

- Pregnant women at ≥38 weeks of gestation
- Singleton foetus with cephalic presentation

Exclusion Criteria:

- Women admitted in the active phase of labour
- Multiple pregnancies
- Placenta praevia

Upon admission, participants were divided into two groups according to foetal head engagement: Group I (engaged) and Group II (non-engaged). A thorough history, clinical examination, and relevant investigations were performed. Engagement was assessed using the "rule of fifths" (1982), with the foetal head considered engaged when two-fifths or less was palpable abdominally. Labour was actively managed and closely monitored, with a partograph maintained for each patient, and total duration of labour from the onset of the active phase recorded.

Outcome Measures:

- **Maternal outcomes:**

Mode of delivery (normal vaginal, assisted vaginal, or cesarean section), prolonged labour, postpartum hemorrhage, birth canal injury, wound infection, and puerperal sepsis.

- **Foetal outcomes:**

APGAR scores at 1 and 5 minutes, need for resuscitation, neonatal unit admission, requirement for intubation or ventilation, perinatal mortality, birth

weight, and head circumference measured immediately after delivery.

Written informed consent was obtained from all participants or their guardians. Data were collected using a standardized questionnaire, checked for accuracy, entered into a computer, and analyzed using SPSS software (Windows version).

RESULTS

Table 1: Incidence of Engagement of Foetal Head (n = 100)

Status of Engagement	Number of Patients	Percentage (%)
Non-engaged	69	69.0
Engaged	31	31.0

Table 1 shows the incidence of foetal head engagement at or after 38 weeks of gestation in 100 nulliparous women. The majority of women (69%) had a non-engaged foetal head, while 31% had an engaged foetal head at term.

Table 2: Demographic Characteristics of the Study Participants (n = 100)

Demographic Characteristic	Engaged (n = 31) Mean ± SD	Unengaged (n = 69) Mean ± SD	P value*
Age (in years)	24.42 ± 8.58	23.91 ± 3.51	0.675
Height (in cm)	151.83 ± 8.38	153.04 ± 4.02	0.327
Weight (in lbs)	121.61 ± 20.38	124.32 ± 17.74	0.502

Table 2 compares the demographic characteristics of the study participants with engaged and non-engaged foetal heads at or after 38 weeks of gestation. No statistically significant differences were observed between the two groups in terms of age, height, or weight (P > 0.05).

Table 3: Mode of Delivery Among the Study Participants by Foetal Head Engagement Status (n = 100)

Mode of Delivery	Head Engaged Group (n = 31)	Head Non-Engaged Group (n = 69)
Vaginal Delivery (VD)	24 (77.42%)	29 (42.63%)
— Normal VD (NVD)	22 (91.67%)	24 (82.76%)
— VD with Ventouse	2 (8.33%)	5 (17.24%)
LSCS	7 (22.58%)	40 (57.97%)

Table 3 presents the mode of delivery among the study participants according to foetal head engagement status at or after 38 weeks. Women with engaged foetal heads had a higher rate of vaginal delivery (77.42%) compared to those with non-engaged heads (42.03%). Conversely, cesarean section was more common in the non-engaged group (57.97%).

Table 4: Indications for Cesarean Section Among the Study Participants

Indication	Unengaged Group	Engaged Group
Foetal distress	15 (21.73%)	3 (9.68%)
Cervical dystocia	5 (7.25%)	2 (6.25%)
Cephalopelvic disproportion (Clinically diagnosed)	6 (8.70%)	0 (0.00%)
Others	14 (20.29%)	2 (6.45%)
Total	**40 (57.97%)**	**7 (22.58%)**

Table 4 shows the indications for cesarean section among the study participants according to foetal head engagement status at or after 38 weeks. Cesarean section was more common in the non-engaged group (57.97%) than in the engaged group (22.58%), with foetal distress and cephalopelvic disproportion being the main contributing factors in the non-engaged group.

Table 5: Maternal Outcomes Among the Study Participants (n = 100)

Outcome	Engaged Group (n = 31)	Unengaged Group (n = 69)
PPH	1 (1.45%)	2 (6.45%)
Birth Canal Injury	0 (0.00%)	0 (0.00%)
Wound Infection	2 (2.90%)	2 (6.45%)
Puerperal Sepsis	0 (0.00%)	0 (0.00%)

Table 5 compares maternal complications between engaged and unengaged groups. Postpartum hemorrhage (PPH) occurred more frequently in the unengaged group (6.45%) compared to the engaged group (1.45%). Wound infections were reported in both groups, while no cases of birth canal injury or puerperal sepsis were observed.

Table 6: Distribution of Fetal Outcome Among the Study Participants (n = 100)

APGAR Score Range	Engaged Group (n = 31)	Unengaged Group (n = 69)
7 – 10	30 (96.77%)	65 (94.20%)
4 – 6	1 (3.23%)	3 (4.35%)
0 – 3	0 (0.00%)	0 (0.00%)

Table 6 presents the distribution of fetal outcomes based on APGAR scores. The majority of newborns in both groups had scores in the 7–10 range, indicating good condition. Low APGAR scores (4–6) were observed in 1 baby (3.23%) in the engaged group and 3 babies (4.35%) in the unengaged group. No cases fell into the critical 0–3 range.

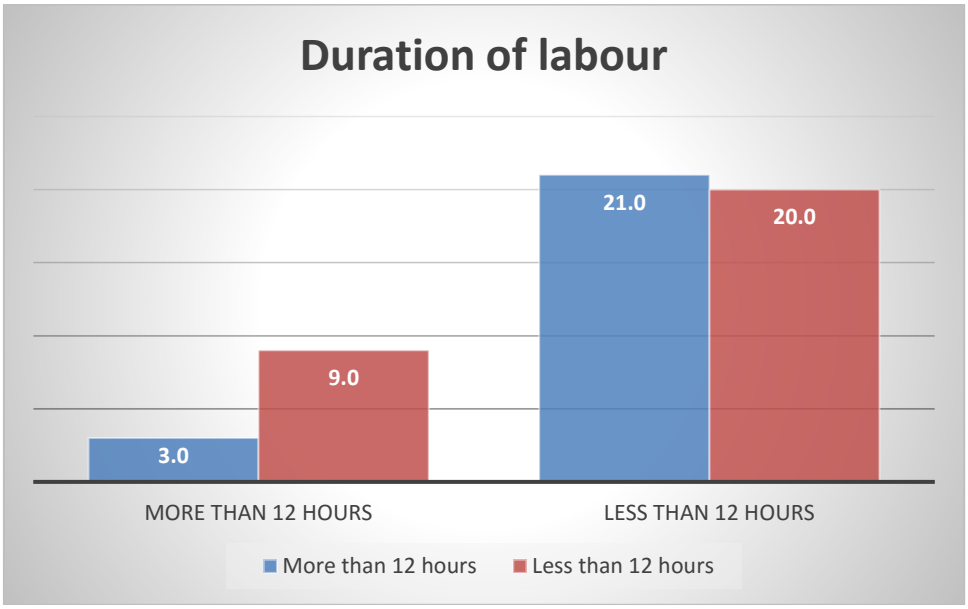

Figure 1: Duration of Labour Among the Study Participants

Figure 1 illustrates the duration of labour among the study participants according to foetal head engagement status at or after 38 weeks. The majority of women with engaged foetal heads experienced labour lasting less than 12 hours, whereas a higher proportion of women with non-engaged foetal heads had labour exceeding 12 hours.

DISCUSSION

Foetal head engagement is a critical event in the labour process and plays a significant role in determining maternal and neonatal outcomes in nulliparous women. Engagement reflects the alignment of the foetal head with the maternal pelvis and serves as an important predictor of labour progress, mode of delivery, and potential complications. The findings of this study demonstrate that non-engagement of the foetal head at or after 38 weeks is associated with longer labour duration, higher rates of cesarean section, and slightly increased maternal complications, while most neonates maintain favorable APGAR scores. These results highlight the clinical relevance of assessing foetal head engagement at term to guide labour management, anticipate potential interventions, and optimize both maternal and neonatal outcomes.

The present study found that 69% of nulliparous women at or after 38 weeks had a non-engaged foetal head, while only 31% showed engagement, highlighting that non-engagement at term is common in primigravid women. These findings closely mirror those of Diegmann *et al.,*[13], who reported engagement in approximately 31% and non-engagement in 69% of nulliparas in early labour, showing an almost identical distribution. Similar trends were observed by Murphy *et al.,*[14], with only 22% of term nulliparous women having engaged heads and 78% remaining unengaged at the onset of labour. Kushtagi *et al.,*[15] reported an even lower engagement incidence (16.9%) at admission, while Bhadra *et al.,*[16] found ~61% unengaged heads at term. Collectively, these studies confirm that non-engagement at term is a frequent physiological occurrence rather than an abnormal finding.

In this study, there were no statistically significant differences in mean maternal age, height, or weight between the engaged and non-engaged groups.

A marked difference in mode of delivery was observed according to foetal head engagement, with vaginal delivery significantly higher in women with engaged heads (77.42%) compared to those with non-engaged heads (42.63%), while cesarean section was more common in the non-engaged group (57.97% vs 22.58%). These results align with Babar *et al.,*[17], who reported higher cesarean rates among primigravida women with unengaged heads (63% vs 21%), and Malik *et al.,*[18], who observed spontaneous vaginal delivery in 65% of women with engaged heads versus 42% in the unengaged group, with cesarean more frequent in unengaged women (39% vs 19%). Falzone *et al.,*[19] similarly noted that although 61.4% of nulliparous women with unengaged vertices achieved vaginal delivery, cesarean for labour arrest was higher in the unengaged group (38.6% vs 8.33%). These findings suggest that while vaginal delivery is possible in non-engaged cases, non-engagement is associated with a higher likelihood of operative delivery.

Cesarean section indications were predominantly foetal distress (21.73%) and clinically diagnosed cephalopelvic disproportion (8.70%) among non-engaged women, with smaller contributions from cervical dystocia and other causes. Comparable patterns were reported by Kakoma *et al.,*[20], where acute foetal distress accounted for 31.3% of cesarean cases, engagement failure for 25%, and CPD for 9.4%, and Elsayed *et al.,*[21], who found foetal distress (35%) followed by CPD (12%) as leading indications.

Typically, the diagnosis of CPD in a primipara requires little or no progress over a 2–4 hour period with adequate uterine contractions and cervical dilatation of at least 3–4 cm. However, CPD is often diagnosed before labour begins, resulting in many unnecessary cesarean sections each year. Therefore, caution should be exercised when diagnosing CPD. Although X-ray pelvimetry may be suggested antenatally or postnatally when CPD is suspected, postpartum pelvimetry was not performed in women who underwent cesarean section in this study. Apart from potential health risks from radiation, this method of pelvic assessment is largely obsolete, as its results often do not influence delivery management. Ultimately, a woman's motivation to achieve vaginal delivery and the level of support she receives are likely more influential on the outcome than pelvic measurements. Even in confirmed cases of CPD, labour can often proceed safely without compromising the baby's well-being.

Maternal complications were generally low, though postpartum hemorrhage (PPH) occurred more often in non-engaged women (6.45%) versus engaged women (1.45%), consistent with Mentzoni *et al.,*[22], who reported severe PPH in 2.3% of nulliparas. Wound infections were low and comparable in both groups, and no cases of birth canal injury or puerperal sepsis were observed, indicating minimal maternal morbidity regardless of engagement status.

Neonatal outcomes were favorable, with the majority scoring 7–10 on APGAR (96.77% engaged, 94.20% unengaged), while only a few scored 4–6 and none scored 0–3. These findings align with Banu *et al.,*[23], who reported 99.6% of engaged and 99.1% of unengaged neonates had APGAR 7–10, confirming that foetal head engagement at term does not significantly impact immediate neonatal condition.

Finally, labour duration was shorter in women with engaged heads, with most completing labour within 12 hours, whereas non-engaged women more frequently experienced labour exceeding 12 hours. This observation is consistent with Bibi *et al.,*[24], who found spontaneous labour was shorter in women with engaged heads, while 54.7% of unengaged women had prolonged labour compared with 34% of engaged women. These findings reinforce that engagement status at or after 38 weeks is an important factor influencing labour duration in nulliparous women.

Limitations of the study

The study had a few limitations:

- Various maternal and foetal parameters had to be assessed clinically due to the lack of sophisticated instruments.
- The study population was limited in size.

CONCLUSION

It may be concluded that engagement of the foetal head before labour is neither a constant feature in primigravid patients nor a necessary criterion for successful vaginal delivery. This study reported that the incidence of non-engaged foetal head at or after 38 weeks of pregnancy in nulliparous women is quite high (69%), and a considerable proportion of them (42.63%) delivered vaginally. The incidence of cephalopelvic disproportion was low (8.70%) among women with non-engaged foetal heads. These findings suggest that obstetricians in Bangladesh should adopt a conservative approach, and non-engagement at term in primigravid women should not, by itself, be an indication for cesarean section.

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