

# Obstetric Outcomes among low Risk Parturients when Active Phase of labor is defined at a Cervical Dilatation of 6 versus 4 Centimeters

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Received: 2025-10-02

Accepted : 2026-06-14

## Abstract

**Background:** Labor is the physiological process by which the fetus and placenta are expelled from the uterus through the vaginal canal. Management of normal labor involves monitoring maternal vitals, cervical progress, and labs, while minimizing interventions. Active labor, once defined at 4 cm dilation, is now considered to begin at 6 cm, impacting obstetric management and outcomes.

**Objectives:** This study aims to compare maternal and neonatal outcomes, alongside labor interventions, when defining active labor onset at 4 cm versus 6 cm cervical dilation.

**Methods:** A prospective case-control study was conducted at Al-Mawanee Teaching Hospital, Basrah, for the period from 1<sup>st</sup> of November 2024 to 30<sup>th</sup> of July 2025. Eligible term, singleton, cephalic pregnancies were included. Data collection involved questionnaires, examinations, and monitoring of labor management, maternal complications, and neonatal outcomes.

**Results:** This study compared outcomes among 200 women admitted in labor at 4 cm versus 6 cm cervical dilation. Significant differences included maternal age (older in 6 cm group,  $p=0.04$ ) and parity (more nulliparas at 4 cm,  $p=0.003$ ). Cervical consistency was softer in the 6 cm group ( $p=0.028$ ), and fetal head station was more advanced ( $p=0.05$ ). Cesarean indications differed ( $p=0.032$ ): fetal distress predominated at 6 cm, poor progress at 4 cm. maternal complications and neonatal outcomes showed no significant differences.

**Conclusions:** Admission at 4 cm was linked to longer labor, more oxytocin use, and cesareans for poor progress, while 6 cm showed better readiness. Overall cesarean rates, maternal complications, and neonatal outcomes were similar.

**Keywords:** Obstetric Outcomes, Low Risk Parturients, Active Phase, Labor, Basrah.

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## Introduction

**L**abor is a physiological process that results in the expulsion of the fetus and placenta from the uterus. It is divided into three main stages, with the first stage further subdivided into latent and active phases. The progression of labor depends on the interaction of uterine contractions, fetal positioning, and maternal pelvic anatomy, collectively referred to as the “power, passenger, and passage” triad (1). Accurate assessment of labor progression, typically through serial cervical examinations, is essential to ensure appropriate clinical management (2,3).

In the management of normal, low-risk labor, a minimal-intervention approach is encouraged. Maternal vital signs are monitored routinely, and vaginal examinations are generally performed every two to four hours unless clinical circumstances require more frequent assessments (4). Excessive examinations, especially after membrane rupture, increase the risk of infection (5). Women are encouraged to ambulate and change positions for comfort and to promote labor progression. Interventions such as amniotomy and oxytocin augmentation are used selectively when clinically indicated (6).

The first stage of labor begins with regular uterine contractions and cervical change and ends with full cervical dilation. The latent phase, lasting until approximately 4–6 cm dilation, is variable and often prolonged in nulliparous women (7). Factors such as poor cervical remodeling, excessive analgesia, and maternal obesity may contribute to prolonged latent phases (8). The active phase follows, marked by

more frequent, intense contractions and a more rapid rate of cervical dilation (9,10).

Defining the active phase at 6 cm rather than 4 cm has significant clinical implications. Early diagnosis of active labor at 4 cm may lead to premature

interventions, including oxytocin use and cesarean delivery due to perceived labor arrest (11,12). Studies have shown that adopting the 6 cm threshold is associated with fewer interventions, lower cesarean rates, and comparable neonatal outcomes (13). This shift supports a more physiologic, individualized approach to labor management.

The global increase in cesarean section rates, including in Malaysia, underscores the importance of reevaluating current labor practices (14,15,16,17). Cesarean delivery carries significant risks, including uterine rupture, abnormal placentation, and increased neonatal respiratory complications in future pregnancies (18,19). A revised definition of active labor may reduce unnecessary interventions and promote safer maternal and neonatal outcomes.

### Aim of the study

To compare maternal outcomes (e.g., duration of labor, mode of delivery, maternal morbidity) when the active phase of labor is defined at 4 cm versus 6 cm.

To evaluate neonatal outcomes (e.g., Apgar scores, neonatal intensive care unit admissions) under the two definitions.

To assess the overall impact of these definitions on labor interventions (e.g., augmentation, operative deliveries).

## Patients and Methods

A prospective case control study was conducted at the gynecological and Obstetrical Department at AlMawanee Teaching Hospital in Basrah City. For the period from 1st of November 2024 to 30th of July 2025.

Low risk pregnant women whom presented with active stage of labor at a cervical dilation of 4cm or 6 cm to the labor ward

were categorized into two groups based on cervical dilation at admission (4 cm or 6 cm).

Group One: women are regarded as being in active labor at 6 cm cervical dilation.

Group Two :women are regarded as being in active labor at 4 cm cervical dilation.

This study included women with singleton pregnancies who presented in spontaneous labor at term, between 37 and 41 weeks of gestation, with a cephalic fetal presentation. Women were excluded if they had a history of chronic medical disorders such as hypertension, diabetes mellitus, or cardiac disease, or if there were any fetal complications including fetal growth restriction or congenital anomalies.

Additional exclusion criteria included women who underwent labor induction, those with a history of uterine surgery—including previous cesarean sections—and those with multiple gestations.

Approval to conduct the study was obtained from the University of Basrah, College of Medicine, and the Basrah Directorate of Health.

The participants were thoroughly informed about the study's purpose and significance, and verbal consent was secured before their enrollment. Data were collected using a structured questionnaire specifically developed for the study, complemented

by direct interviews with participants. The questionnaire gathered information on socio-demographic characteristics, including age, place of residence, and occupation. Pregnancy-related variables such as gravidity, parity, history of miscarriage, previous mode of delivery, and gestational age were also recorded. A detailed clinical profile was established through the assessment of past medical and surgical history. Upon admission, each participant underwent a comprehensive clinical examination. Anthropometric measurements, including height and pre-pregnancy body mass index (BMI), were documented. A full systemic and obstetric examination was conducted, and cervical dilation was assessed by the researcher, with findings verified using a cervical dilation and effacement chart. Intrapartum management details were recorded, including whether amniotomy was performed, the use of oxytocin infusion, duration of the active phase of labor, and the mode of delivery (spontaneous vaginal or cesarean section). Participants were monitored throughout the postpartum period until discharge, during which maternal outcomes such as cervical tears, primary postpartum hemorrhage (PPH), and early-onset sepsis were documented. Neonatal outcomes recorded included birth weight, Apgar scores at 1 and 5 minutes, and admission to the neonatal intensive care unit (NICU).

Data entry was conducted using computerized statistical software, specifically the Statistical Package for Social Sciences (SPSS) version 26. Appropriate statistical tests were applied. A significance level (p-value) of  $\leq 0.05$  was considered for all statistical analyses.

## Results

The study included 200 women divided into two groups (100 women with 6 cm cervical dilation and 100 women with 4 cm cervical dilation). There was a statistically significant difference in maternal age between the two groups, with women admitted at 6

cm having a slightly higher mean age ( $p = 0.04$ ). No significant differences were observed between the groups regarding pre-pregnancy weight, height, or BMI. The distribution of BMI categories (normal, overweight, obese) was similar across both groups. A significant difference was found in parity ( $p = 0.003$ ), with more nulliparous women in the 4 cm group and more grand multiparas ( $>5$ ) in the 6 cm group.

Table 3.1: Demographic and Anthropometric Characteristics of Women Admitted at 4 cm and 6 cm cervical dilatation

| Variables            |               | 6 cm cervical dilatation (n=100) | 4 cm cervical dilatation (n=100) | P-value |
|----------------------|---------------|----------------------------------|----------------------------------|---------|
| Age                  | Mean $\pm$ SD | 27.57 $\pm$ 5.41                 | 25.98 $\pm$ 5.28                 | 0.04    |
| Pre pregnancy weight | Mean $\pm$ SD | 75.12 $\pm$ 9.8                  | 75.69 $\pm$ 10.8                 | 0.697   |
| Height               | Mean $\pm$ SD | 163.68 $\pm$ 5.48                | 164.42 $\pm$ 5.89                | 0.747   |
| BMI                  | Mean $\pm$ SD | 28.18 $\pm$ 3.19                 | 28.14 $\pm$ 3.24                 | 0.933   |
|                      | Normal        | 14 (14.0%)                       | 15 (15.0%)                       |         |
|                      | Overweight    | 52 (52.0%)                       | 54 (54.0%)                       |         |
|                      | Obese         | 34 (34.0%)                       | 31 (31.0%)                       |         |
| Parity               | Nullipara     | 18 (18.0%)                       | 26 (26.0%)                       | 0.003   |
|                      | 1-4           | 76 (76.0%)                       | 71 (71.0%)                       |         |
|                      | $>5$          | 6 (6.0%)                         | 3 (3.0%)                         |         |

Table 3.2 shows Obstetric and Cervical Assessment Findings. The Gestational age, cervical effacement, cervical position, and membrane status were comparable between the two groups, with no statistically significant differences. Cervical consistency differed significantly ( $p = 0.028$ ), with more women in the 6 cm group having softer cervixes and none classified as “firm.” The fetal head station showed a borderline significant difference ( $p = 0.05$ ), with more advanced station (+1 and +2) observed in the 6 cm group.

Table 3.2: Obstetric and Cervical Assessment Findings at Admission

| Variables                 |               | 6 cm cervical dilatation (n=100) | 4 cm cervical dilatation (n=100) | p-value |
|---------------------------|---------------|----------------------------------|----------------------------------|---------|
| Gestational age (weeks)   | Mean $\pm$ SD | 38.42 $\pm$ 0.94                 | 38.5 $\pm$ 1.46                  | 0.675   |
| Cervical effacement (%)   | Mean $\pm$ SD | 64.1 $\pm$ 7.5                   | 62.58 $\pm$ 7.9                  | 0.173   |
| Cervical consistency      | Soft          | 48 (48.0%)                       | 38 (38.0%)                       | 0.028   |
|                           | Medium        | 52 (52.0%)                       | 57 (57.0%)                       |         |
|                           | Firm          | 0 (0.0%)                         | 5 (5.0%)                         |         |
| Station of the fetal head | -3            | 3 (3.0%)                         | 0 (0.0%)                         | 0.05    |
|                           | -2            | 30 (30.0%)                       | 26 (26.0%)                       |         |
|                           | -1            | 32 (32.0%)                       | 50 (50.0%)                       |         |
|                           | 0             | 29 (29.0%)                       | 23 (23.0%)                       |         |
|                           | 1             | 4 (4.0%)                         | 1 (1.0%)                         |         |

|                   |           |            |            |       |
|-------------------|-----------|------------|------------|-------|
|                   | 2         | 2 (2.0%)   | 0 (0.0%)   |       |
| Cervical position | Anterior  | 64 (64.0%) | 57 (57.0%) | 0.638 |
|                   | Mid       | 33 (33.0%) | 39 (39.0%) |       |
|                   | Posterior | 3 (3.0%)   | 4 (4.0%)   |       |
| Membrane status   | Intact    | 95 (95.0%) | 93 (93.0%) | 0.361 |
|                   | Ruptured  | 5 (5.0%)   | 7 (7.0%)   |       |

Table 3.3 shows the Intrapartum Interventions and Outcomes. Cervical dilation at amniotomy was significantly higher in the 6 cm group ( $p = 0.001$ ). Women admitted at 4 cm experienced significantly longer durations from amniotomy to delivery and overall labor duration (both  $p < 0.001$ ). Oxytocin augmentation was more frequently required in the 4 cm group (85% vs. 61%,  $p < 0.001$ ). No significant difference was found in the mode of delivery (NVD vs. CS) between the two groups ( $p = 0.304$ ), despite statistically non-significant difference in normal delivery rates between the two groups, the proportion of vaginal deliveries was slightly higher in the 6cm group compared to the 4cm group. Among cesarean sections, fetal distress was more common in the 6 cm group, while poor labor progress was more common in the 4 cm group ( $p = 0.032$ ).

Table 3.3: Intrapartum intervention and Outcomes concerning Cervical Dilatation at Admission

| Variables                                  |                | 6 cm cervical dilation (n=100) | 4 cm cervical dilation (n=100) | p-value |
|--------------------------------------------|----------------|--------------------------------|--------------------------------|---------|
| Cervical dilatation at amniotomy (cm)      | Mean $\pm$ SD  | 7.63 $\pm$ 5.4                 | 5.40 $\pm$ 0.79                | 0.001   |
|                                            |                |                                |                                |         |
| Duration from amniotomy to delivery (hour) | Mean $\pm$ SD  | 2.68 $\pm$ 1.26                | 3.58 $\pm$ 1.37                | 0.001   |
|                                            |                |                                |                                |         |
| Oxytocin augmentation                      | Yes            | 61 (61.0%)                     | 85 (85.0%)                     | 0.001   |
|                                            | No             | 39 (39.0%)                     | 15 (15.0%)                     |         |
| Duration of labor (hour)                   | Mean $\pm$ SD  | 3.33 $\pm$ 1.29                | 4.81 $\pm$ 1.39                | 0.001   |
|                                            |                |                                |                                |         |
| Mode of delivery                           | NVD            | 80 (80.0%)                     | 77 (77.0%)                     | 0.304   |
|                                            | CS             | 20 (20.0%)                     | 23 (23.0%)                     |         |
| Indication of CS                           | Fetal distress | 12 (60.0%)                     | 6 (26.1%)                      | 0.032   |
|                                            | Poor progress  | 8 (40.0%)                      | 17 (73.9%)                     |         |

Table 3.4 shows the maternal Complications during Delivery. No statistically significant differences were observed between the two groups regarding maternal complications such as vaginal or perineal tears, postpartum haemorrhage (PPH), or need for blood transfusion. Most of the women in both groups had no complications.

Table 3.4: Maternal Complications during Delivery among Women Admitted at 4 cm versus 6 cm Cervical Dilatation

| Maternal complications during delivery | 6 cm cervical dilation (n=100) | 4 cm cervical dilation (n=100) | p-value |
|----------------------------------------|--------------------------------|--------------------------------|---------|
| None                                   | 87 (87.0%)                     | 85 (85.0%)                     | 0.504   |
| Vaginal tear                           | 1 (1.0%)                       | 2 (2.0%)                       | 0.554   |
| Perineal tear                          | 5 (5.0%)                       | 6 (6.0%)                       | 0.742   |
| PPH                                    | 6 (6.0%)                       | 7 (7.0%)                       | 0.758   |
| Blood transfusion                      | 1 (1.0%)                       | 0 (0.0%)                       | 0.681   |

Table 3.5 shows the Neonatal Outcomes. All neonates in the 6 cm group were alive at birth, compared to 99% in the 4 cm group; the neonatal death in the 4cm group was classified as an early neonatal death, occurring a few hours after birth, and was attributed to birth asphyxia that clinically confirmed by the attending senior pediatrician, though the difference was not statistically significant ( $p = 0.316$ ). Birth weight and APGAR scores at 1 and 5 minutes were similar between the two groups, with no significant differences. NICU admission rates did not differ significantly between groups ( $p = 0.688$ ).

Table 3.5: Neonatal Outcomes Based on Cervical Dilatation at Admission

| Neonatal outcomes        |               | 6 cm cervical dilation (n=100) | 4 cm cervical dilation (n=100) | p-value |
|--------------------------|---------------|--------------------------------|--------------------------------|---------|
| Neonatal status          | Alive         | 100 (100.0)                    | 99 (99.0)                      | 0.316   |
|                          | Dead          | 0 (0.0%)                       | 1 (1.0%)                       |         |
| Birth weight (Kg)        | Mean $\pm$ SD | 3.5 $\pm$ 3.28                 | 3.44 $\pm$ 0.33                | 0.169   |
| APGAR score at 1 minute  | Mean $\pm$ SD | 7.08 $\pm$ 1.17                | 6.95 $\pm$ 1.41                | 0.466   |
| APGAR score at 5 minutes | Mean $\pm$ SD | 9.61 $\pm$ 0.84                | 9.48 $\pm$ 1.18                | 0.409   |
| NICU admission           |               | 17 (17.0%)                     | 19 (19.0%)                     | 0.688   |

## Discussion

The onset and definition of active labor remain key determinants in obstetric practice, guiding admission protocols, intrapartum management, and expectations regarding maternal and neonatal outcomes (1). Thus, conducting research to compare obstetric outcomes between women admitted at 4 cm versus 6 cm cervical dilatation is of high clinical relevance, especially in low-resource settings where judicious use of interventions is crucial.

In the present study, maternal demographic characteristics were broadly comparable between the two groups, except for maternal age and parity. Women admitted at 6 cm were slightly older, and there was a higher proportion of grand multiparas,



while nulliparity was more common in the 4 cm group. These findings align with physiological expectations, as multiparous women typically experience faster cervical dilatation and are more likely to present later in labor as reported by Lisonkova et al., (2017) and Ashwal et al. (2020) (20, 21).

With respect to cervical and obstetric parameters, cervical consistency and foetal head station differed between groups. Softer cervixes and more advanced stations were more frequently observed in the 6 cm group, which is consistent with the natural progression of cervical ripening and descent of the presenting part. These findings strengthen the reliability of the data, as they reflect the expected physiological changes as labor advances (22), this agree with our study , which also demonstrate that greater cervical dilatation was associated with a softer cervix and lower fetal head station.

Intrapartum outcomes revealed more favorable labor progress in the 6 cm group. Women admitted at 4 cm experienced significantly longer durations of labor and more frequent need for oxytocin augmentation. This is consistent with the hypothesis of Miller et al. (2020) (23). Interestingly, while the overall cesarean section rates did not differ between the groups, the indications did. Caesareans for poor labor progress predominated in the 4 cm group, whereas fetal distress was more common among the 6 cm group. This difference may reflect variations in labor dynamics, where earlier admission predisposes to intervention for protracted labor, while later admission may increase the likelihood of encountering intrapartum fetal compromise once labor is already advanced and these findings agree with the findings from Dur-E-Shahwar et al. (2018)(24).

Maternal complications, including perineal trauma, postpartum haemorrhage, and blood transfusion—did not differ significantly between groups, suggesting

that timing of admission did not adversely influence immediate maternal morbidity. Similarly, neonatal outcomes, including Apgar scores, NICU admission, and perinatal survival, were not significantly different between groups, though one neonatal death due to birth asphyxia occurred in the 4 cm group which is in line with the findings from Daka et al. (2022) (25). While this finding did not reach statistical significance, it warrants attention in larger-scale studies.

Our results are consistent with a growing body of evidence supporting the redefinition of active labor onset at 6 cm. Zhang et al. (2010) reported that cervical dilatation from 4 to 6 cm progresses more slowly than previously believed, and treating 4 cm as active labor often leads to unnecessary augmentation.(26)

The absence of a difference in overall cesarean rates contrasts with the report of (Kjerulff et al., 2017) (27), who found that earlier admission was associated with an increased risk of operative delivery. This discrepancy could be explained by the relatively low-risk population included in our study, the exclusion of inductions, and local practice patterns that may emphasize patience before surgical intervention.

Taken together, these findings support the contemporary view that redefining active labor onset at 6 cm may reduce unnecessary interventions without adversely affecting maternal or neonatal outcomes. Earlier admission, particularly among nulliparas, appears to predispose to longer labors and increased reliance on oxytocin, perpetuating the “cascade of interventions” described in obstetric literature (28). Conversely, waiting until 6 cm before diagnosing active labor allows for more favorable cervical and fetal head conditions, which may facilitate smoother labor progress (3).

However, the observation that cesarean deliveries for fetal distress were more common in the 6 cm group

warrants further exploration. It is possible that by the time women are admitted at more advanced dilatation, there is less opportunity for early detection and correction of evolving fetal compromise (29). This highlights the need for careful intrapartum monitoring and balanced clinical decision-making when adopting later admission thresholds. The strengths of this study include its prospective design, restriction to low-risk women, and standardized clinical assessments. Nevertheless, some limitations must be acknowledged. The sample size, while adequate for detecting differences in labor interventions, may not have been sufficient to detect rare but clinically important neonatal outcomes.

## Recommendations

First, redefining the onset of active labor at 6 cm cervical dilatation in low-risk women is advised to reduce unnecessary interventions and prolonged labor. Delayed admission until this point—particularly for nulliparous women—should be encouraged when maternal and fetal conditions are stable. To ensure safety, rigorous intrapartum monitoring is essential for women admitted at 6 cm, given the potentially higher risk of fetal distress. Additionally, obstetric staff and trainees should be updated on modern labor progression models, such as Zhang's curve, to move away from outdated 4 cm benchmarks. Antenatal education should also emphasize the safety and benefits of later hospital admission during labor.

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