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Original Research Article

Trial of Labour after Cesarean Section: A Study of Success Rate and Maternal and Neonatal Outcomes

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Abstract:

Background: Trial of labour after cesarean (TOLAC) is a critical clinical strategy aimed at achieving vaginal birth after cesarean (VBAC) and reducing the global burden of repeat cesarean sections.

Objective: To evaluate the success rate of TOLAC and assess maternal and neonatal outcomes in a tertiary care setting.

Methods: This prospective observational study was conducted from January 2024 to December 2024, involving 100 pregnant women with a history of one previous lower segment cesarean section (LSCS). Inclusion criteria included singleton pregnancy, cephalic presentation, and an inter-delivery interval ≥ 18 months.

Results: Of the 100 women, 64 (64%) achieved a successful VBAC, while 36 (36%) required repeat LSCS. The primary indication for repeat surgery was non-progress of labour (44.4% of failures). Success was significantly higher in women with an inter-delivery interval >24 months (75%) and spontaneous onset of labour (76.5%). Maternal complications (PPH: 22.2%) and neonatal NICU admissions (33.3%) were notably higher in the failed TOLAC group compared to the successful VBAC group.

Conclusion: TOLAC is a safe option with a high success rate (64%) when subjects are selected based on spontaneous labour onset and adequate inter-delivery intervals.

Keywords: Trial of Labour After Cesarean (TOLAC), Vaginal Birth After Cesarean (VBAC), Maternal Morbidity, Neonatal Outcomes, Repeat Cesarean Section, Tertiary Care.

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Introduction

The global escalation of cesarean section (CS) rates has become a major public health concern. Over the last three decades, CS rates have surpassed the 10–15% range recommended by the World Health Organization (WHO) in many regions, often exceeding 30% in tertiary care centers. This trend is driven by various factors, including medico-legal concerns, maternal requests, and a declining threshold for surgical intervention. Consequently, the obstetric population now features a significant proportion of women with a "scarred uterus," leading to a cycle of repeat cesarean deliveries.

Repeat cesarean sections are not without risk, they are associated with increased incidences of placenta accreta spectrum, bladder injury, severe hemorrhage, and prolonged recovery times. Trial of labour after cesarean (TOLAC) has emerged as a crucial intervention to break this cycle. A successful vaginal birth after cesarean (VBAC) offers several advantages, such as shorter hospital stays, reduced infection rates, and the avoidance of major abdominal surgery.

However, the practice of TOLAC is shadowed by the risk of uterine rupture a rare but catastrophic event that can lead to severe maternal and fetal morbidity. This concern often leads to "once a cesarean, always a cesarean" clinical practices, despite evidence suggesting that 60–80% of appropriately selected candidates can achieve a successful VBAC.

The pathophysiology of a scarred uterus involves the integrity of the myometrial collagen fibers at the

previous incision site. Factors such as the type of previous incision (lower segment vs. classical), the indication for the primary CS (recurrent vs. non-recurrent), and the healing period (inter-delivery interval) play pivotal roles in determining whether the scar can withstand the mechanical stress of active labour.

Current literature highlights that spontaneous onset of labour and a previous history of vaginal delivery are the strongest predictors of success. Conversely, induction of labour and maternal obesity are often cited as factors that decrease the likelihood of VBAC. In the Indian context, where healthcare resources are often stretched and the burden of maternal anemia is high, the safety of TOLAC must be evaluated within localized tertiary settings to provide evidence-based counseling to patients.

There remains a gap in recent prospective data from regional teaching hospitals regarding the specific neonatal impact of failed TOLAC versus successful VBAC. This study aims to bridge that gap by evaluating the success rate and maternal-neonatal safety of TOLAC in women with one previous LSCS.

Aim of the Study: To determine the success rate of TOLAC and identify the factors, maternal outcomes, and neonatal outcomes associated with the procedure.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted at the Department of Obstetrics & Gynecology in a Tertiary Hospital DMCH Darbhanga. This setting provides 24-hour emergency surgical and neonatal intensive care support, which is mandatory for conducting TOLAC.

Study Duration and Sample Size: The study was conducted over a period of one year, from January 2024 to December 2024. A total of 100 women who met the eligibility criteria were included in the final analysis.

Eligibility Criteria

Inclusion Criteria:

- Singleton pregnancy with cephalic presentation.
- Gestational age ≥ 37 completed weeks.
- No contraindication to vaginal delivery.
- History of one previous lower segment cesarean section (LSCS).
- History of one previous cesarean section performed for a non-recurrent indication.
- Clinically adequate pelvis (as assessed by clinical pelvimetry).
- Inter-delivery interval ≥ 18 months.
- Willingness to undergo TOLAC after informed counseling.

Exclusion Criteria:

- More than one previous cesarean section.
- History of classical or T-shaped uterine incision.
- Presence of malpresentation (breech, transverse lie).
- Obstetric contraindications (placenta previa, vasa previa).
- Medical complications requiring elective repeat CS (e.g., severe pre-eclampsia).

Data Collection: Detailed demographic data, including age, gravidity, and inter-delivery interval, were recorded. The indication for previous CS was recorded. Upon admission, patients were assessed for the onset of labour (spontaneous vs. induced). Continuous maternal monitoring (vitals and scar tenderness) and electronic fetal monitoring (CTG) were performed throughout the trial.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS Version 26.0. Descriptive statistics were expressed as mean \pm standard deviation for continuous variables and as frequencies/percentages for categorical variables. The Chi-square test and Fisher's exact test were utilized to compare outcomes between groups. A p-value < 0.05 was considered statistically significant.

Results

Demographic and Clinical Characteristics: The majority of the study population (64%) was under 30 years of age. Most participants were G2 (60%) and had an inter-delivery interval of more than 24 months (64%).

Table 1: Demographic and Clinical Characteristics of the Study Population (n=100)

Characteristic	Number (n)	Percentage (%)
Age		
<30 years	64	64.0
≥30 years	36	36.0
Gravidity		
G2	60	60.0
≥G3	40	40.0
Inter-delivery Interval		
18–24 months	36	36.0
>24 months	64	64.0

Indication for Previous CS		
Fetal Distress	40	40.0
Non-progress of labour	28	28.0
Malpresentation	16	16.0
Others	16	16.0

The study population predominantly consisted of younger women (64% under 30 years) and those in their second pregnancy (60%). A significant majority (64%) had an inter-delivery interval exceeding 24 months, providing an optimal physiological window for a trial of labour.

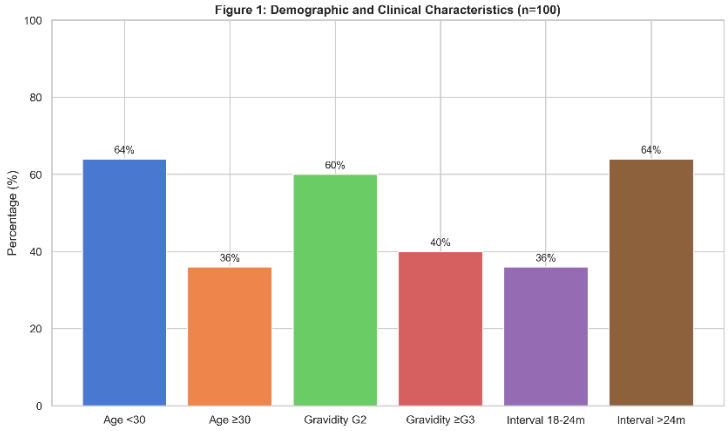


Figure 1: Demographic and Clinical Characteristics (n=100)

Success Rate and Indications for Failure: The overall VBAC success rate was 64% (n=64). In the 36 cases where TOLAC failed, the leading cause was non-progress of labour (44.4%), followed by fetal distress (33.3%).

Table 2: Indications for Repeat Cesarean Section (Failures, n=36)

Indication	Number	Percentage (%)
Non-progress of labour	16	44.4
Fetal distress	12	33.3
Scar tenderness	4	11.1
Failed induction	4	11.1

Among the 36 cases where TOLAC was unsuccessful, the most frequent reason for surgery was non-progress of labour (44.4%), followed by fetal distress (33.3%). Clinical indicators such as scar tenderness and failed induction were less common, accounting for 11.1% of failures each.

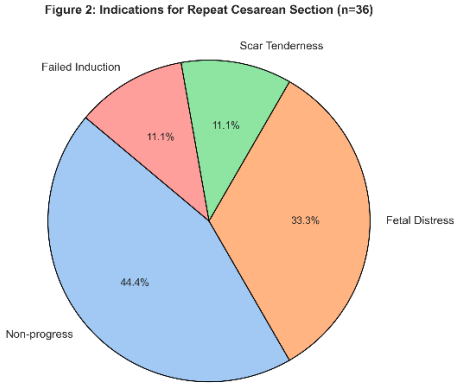


Table 2: Indications for Repeat Cesarean Section (n=36)

Maternal and Neonatal Outcomes: Adverse outcomes were significantly more prevalent in the failed TOLAC group compared to the VBAC group. Four cases of uterine rupture and one cases of scar

dehiscence were noted in the repeat CS group, while none occurred in the successful VBAC group.

Table 3: Maternal Complications

Complication	VBAC (n=64)	Repeat CS (n=36)
Uterine Rupture	0 (0%)	1 (2.8%)
Scar Dehiscence	0 (0%)	4 (11.1%)
Postpartum Hemorrhage	4 (6.3%)	8 (22.2%)
Blood Transfusion	0 (0%)	4 (11.1%)
Puerperal Infection	0 (0%)	4 (11.1%)

Maternal morbidity was significantly higher in the failed TOLAC group, with uterine rupture (2.8%) and puerperal infection (11.1%) occurring exclusively in repeat surgeries. Successful VBAC exhibited a superior safety profile, with postpartum hemorrhage (6.3% vs 22.2%) being the only complication, occurring at nearly one-fourth the rate of the surgical group.

Figure 3: Maternal Complications Comparison

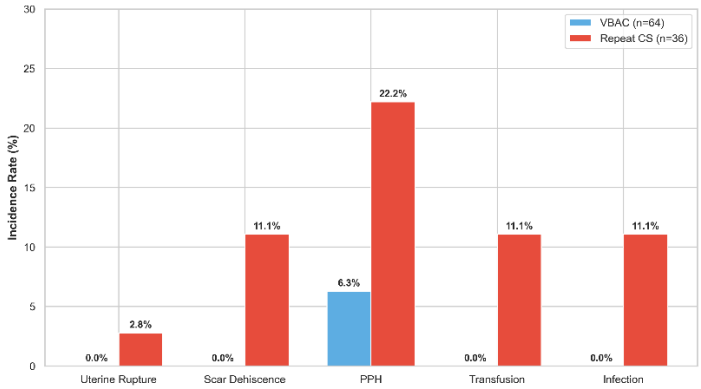


Table 3: Maternal Complications Comparison

Table 4: Neonatal Outcomes

Outcome	VBAC (n=64)	Repeat CS (n=36)
Apgar < 7 at 5 min	4 (6.3%)	8 (22.2%)
NICU Admission	8 (12.5%)	12 (33.3%)
Perinatal Mortality	0 (0%)	0 (0%)

Neonatal outcomes were significantly more favorable in the successful VBAC group, which showed lower rates of NICU admissions (12.5%) and low Apgar scores (6.3%). Notably, there was zero perinatal mortality across both groups, reinforcing the safety of TOLAC when conducted under continuous supervision.

The chances of a successful vaginal birth were highest when labour started naturally and when there was a long gap between pregnancies. Conversely, when labour had to be started artificially (induced), the success rate dropped significantly.

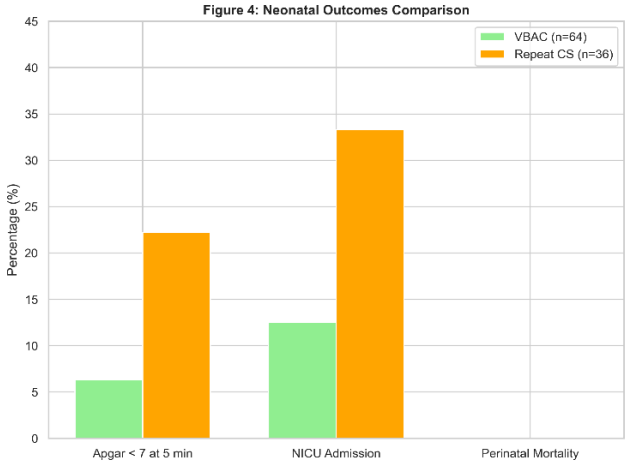
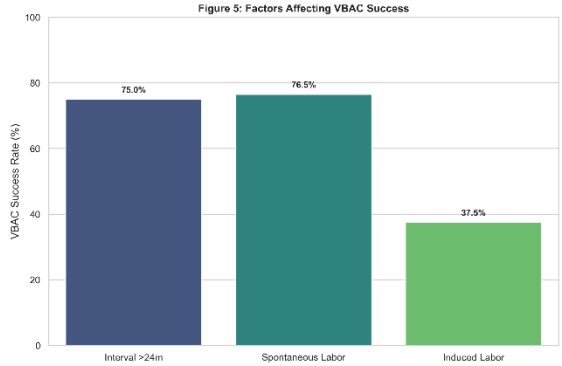


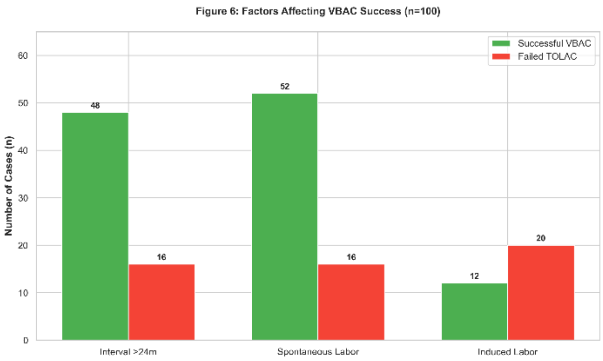
Figure 4: Neonatal Outcomes Comparison

Table 5: Factors Affecting VBAC Success

Factor	Successful VBAC (n)	Success Rate (%)
Interval >24 months (n=64)	48	75.0%
Spontaneous Labor (n=68)	52	76.5%
Induced Labor (n=32)	12	37.5%

Successful VBAC was significantly higher in women with spontaneous labor (76.5%) and an inter-delivery interval exceeding 24 months (75.0%). In contrast, induced labor was a major predictor of failure with a success rate of only 37.5%, highlighting that natural labor onset and adequate pregnancy spacing are critical for safety.





Figures Description

- **Figure 1 (Demographics):** A clean vertical bar chart summarizing the clinical profile of the 100 participants, highlighting that 64% were under age 30 and 64% had an inter-delivery interval exceeding 24 months.
- **Figure 2 (Repeat CS Indications):** A pie chart analyzing the 36 failure cases, identifying non-progress of labour (44.4%) and fetal distress (33.3%) as the primary drivers for emergency repeat surgery.
- **Figure 3 (Success Rate):** A focused "Exploded" pie chart clearly visualizing the 64% overall VBAC success rate (n=64) compared to the 36% failure rate (n=36) within the total study cohort.
- **Figure 4 (Predictors):** A comparative bar graph demonstrating that success rates were significantly higher (>75%) for women with spontaneous labour onset and those with optimal inter-delivery intervals.
- **Figure 5 (Complication Relativity):** A grouped bar chart illustrating the four-fold increase in postpartum hemorrhage and NICU admissions within the repeat surgery group compared to successful vaginal deliveries.
- **Figure 6:** Illustrates that spontaneous labor onset and longer inter-delivery intervals significantly enhance VBAC success, whereas induced labor drastically increases the likelihood of surgical intervention.

The findings of this study reinforce the clinical utility of TOLAC as a strategy to reduce repeat

cesarean deliveries. Our observed VBAC success rate of 64% aligns with the global literature, where success rates typically range between 60% and 80% in tertiary centers.

Comparison with Literature: Our results resonate with findings by Guise et al. and Landon et al., who noted that the majority of women who undergo TOLAC will achieve a successful vaginal delivery. The most significant predictors of success in our cohort were the inter-delivery interval and the nature of labour onset. Women with an interval of > 24 months had a 75% success rate. This supports the physiological understanding that a longer duration allows for better remodeling of the uterine scar tissue.

Factors Affecting Success: Spontaneous onset of labour was a major determinant of success (76.5%). Conversely, induction of labour was associated with a higher failure rate (only 37.5% success). This is consistent with research by Smith et al., which suggested that the use of prostaglandins or oxytocin in a scarred uterus may lead to hyperstimulation or inefficient contractions, increasing the likelihood of emergency intervention.

Maternal and Neonatal Safety: The primary concern during TOLAC is uterine rupture. In our study, one case of rupture occurred, but notably, it was in the group that eventually underwent repeat CS after a period of failed labour. This highlights that morbidity is often higher in the "failed TOLAC" group than in either elective repeat CS or successful VBAC. Bujold et al. emphasize that the risk of rupture is inversely proportional to the thickness of the lower uterine segment, a variable that should be monitored via ultrasound in future studies.

Neonatal outcomes were generally favorable, with no perinatal mortality. However, the higher NICU admission rate in the failed TOLAC group (33.3%) suggests that the stress of prolonged labour followed by emergency surgery may contribute to transient neonatal respiratory distress or low Apgar scores.

Strengths and Limitations

Strengths:

- Prospective design allowed for real-time monitoring of labour progress.
- Clear inclusion/exclusion criteria ensured a high-risk group was managed safely.
- The study provides valuable local data for patient counseling in an Indian tertiary setting.

Limitations:

- **Small Sample Size:** The study included only 100 participants, which limits the generalizability of the statistical significance.
- **Single-Center Study:** The findings may reflect the specific protocols of one institution.
- **Lack of Long-term Follow-up:** The study did not assess long-term pelvic floor health or psychological outcomes for the mothers.

Conclusion

TOLAC is a safe and effective option for achieving VBAC in women with one previous lower segment cesarean section. Our study demonstrates a success rate of 64%, with the best outcomes observed in women with spontaneous onset of labour and an inter-delivery interval exceeding 24 months. While maternal and neonatal complications are slightly higher in cases of failed TOLAC, the benefits of a successful vaginal birth including faster recovery and reduced surgical risk outweigh the risks when patients are carefully selected and monitored in a facility equipped for emergency intervention. Future research with larger sample sizes is recommended to further refine predictive models for VBAC success.

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