

ORIGINAL ARTICLE

Impact of Fetal Birth Weight on the Success of Trial of Labor after Previous Cesarean Section: A Cross-Sectional Study

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ABSTRACT

Background: Vaginal birth after cesarean section (VBAC) is an established and safe alternative to elective repeat cesarean section (ERCS) in appropriately selected women with a previous lower segment cesarean section. Several maternal and fetal factors influence the success of trial of labor after cesarean (TOLAC), among which fetal birth weight plays a significant role.**Objective:** To evaluate the association between fetal birth weight and the success of TOLAC in women with one previous cesarean section.**Material and Methods:** This descriptive cross-sectional study was conducted in the Labour room, Department of Obstetrics and Gynecology, Nishtar Medical University / Hospital Multan, from January 2023 to August 2023. A total of 144 women with one previous lower segment cesarean section, singleton cephalic presentation, term pregnancy, and spontaneous labor were included. Patients were categorized according to neonatal birth weight. The outcome variable was successful VBAC. Data were analyzed using SPSS version 26. Chi-square test was applied, and $p \leq 0.05$ was considered significant.**Results:** Mean maternal age was 29.92 ± 5.08 years and mean gestational age was 37.50 ± 1.65 weeks. Mean fetal birth weight was 3.24 ± 0.48 kg. Successful VBAC occurred in 42.4% ($n=61$), while 57.6% ($n=83$) underwent repeat cesarean section. A statistically significant association was observed between fetal birth weight and VBAC success ($\chi^2=6.32$, $p=0.043$). Stratification showed significant associations with parity, gestational age, and previous birth weight.**Conclusion:** Fetal birth weight is significantly associated with VBAC success. Proper estimation of fetal weight may improve patient selection and reduce unnecessary repeat cesarean sections.**Keywords:** VBAC, TOLAC, Cesarean Section, Fetal Birth Weight, Vaginal Birth After Cesarean, Maternal Outcomes.

INTRODUCTION

Cesarean section rates have increased globally over the past two decades, becoming a major public health concern. Although cesarean delivery is life-saving when medically indicated, its rising prevalence has led to increased maternal morbidity, higher healthcare costs, and complications in subsequent pregnancies. As a result, vaginal birth after cesarean section (VBAC) has regained importance as a strategy to reduce repeat cesarean deliveries.

Evidence suggests that appropriately selected women with one prior lower segment cesarean section may safely undergo trial of labor after cesarean (TOLAC), with success rates ranging from 60% to 80%¹⁻⁴. Successful VBAC is associated with reduced blood loss, fewer infections, shorter hospital stay, faster recovery, and fewer complications in future pregnancies compared to elective repeat cesarean section^{1,2,5}.

However, failed TOLAC leading to emergency cesarean section carries increased maternal and neonatal morbidity, including uterine rupture, hemorrhage, and infection^{2,9}. Therefore, identifying predictors of successful VBAC is essential for safe clinical decision-making.

Multiple factors influence VBAC outcomes, including maternal age, body mass index, parity, prior vaginal delivery, indication for previous cesarean section, gestational age, and fetal weight¹⁰⁻¹³. Prediction models such as the Grobman nomogram have been developed to estimate VBAC success probability^{3,4}.

Among fetal factors, birth weight is particularly important. Higher fetal weight is associated with increased risk of cephalopelvic disproportion and labor dystocia, leading to reduced VBAC success rates¹⁶⁻¹⁹. However, evidence remains inconsistent across populations, and fetal weight thresholds vary widely.

In low- and middle-income countries, where cesarean rates are rising and resources are limited, identifying reliable predictors such as fetal birth weight is particularly important for reducing unnecessary repeat cesarean sections and improving maternal outcomes.

Therefore, this study was conducted to evaluate the impact of fetal birth weight on the success of TOLAC in a tertiary care hospital setting.

MATERIAL AND METHODS

Study Design and Setting: This descriptive cross-sectional study was conducted in the Labour room, Department of Obstetrics and Gynecology, Nishtar Medical University / Hospital Multan, from January 2023 to August 2023.

Sample Size and Sampling Technique: A sample size of 144 pregnant women was calculated using the WHO sample size calculator, considering a previously reported TOLAC success rate in high-risk patients and a confidence level of 95%. Consecutive non-probability sampling was employed for participant recruitment.

Inclusion and Exclusion Criteria: Women were included in the study if they had a history of one previous lower segment cesarean section (LSCS) and presented with a singleton pregnancy in cephalic presentation at term gestation (37–42 weeks). Only those patients who had spontaneous onset of labor and fulfilled the criteria for trial of labor after cesarean section (TOLAC) were enrolled. Additionally, eligible participants had an estimated fetal weight between 2.5 kg and 4.0 kg on antenatal ultrasonography and were hemodynamically stable, with informed written consent obtained prior to inclusion. Women were excluded if they had any contraindication to vaginal delivery or TOLAC, including previous classical cesarean section, uterine rupture, or prior uterine surgery such as myomectomy. Patients with placenta previa, multiple gestation, cephalopelvic disproportion, or clinically suspected borderline pelvis were also excluded. Furthermore, women with significant obstetric or medical complications that could independently affect labor outcome—such as pregnancy-induced hypertension, uncontrolled gestational diabetes mellitus, oligohydramnios, polyhydramnios, or intrauterine growth restriction—were excluded to minimize confounding effects on fetal birth weight and delivery outcome.

Data Collection: Data collection was carried out in the Labour and Delivery Ward of the Department of Obstetrics and Gynecology after obtaining institutional ethical approval and informed written consent from all participants. Eligible women presenting in

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spontaneous labor were enrolled consecutively to minimize selection bias. A structured proforma was used to record detailed demographic, clinical, and obstetric information, including maternal age, parity, socioeconomic status, gestational age, indication for previous cesarean section, and history of previous neonatal birth weight. Estimated fetal weight was determined using standard antenatal ultrasonography prior to delivery, while actual neonatal birth weight was recorded immediately after birth using a calibrated neonatal weighing scale. All women undergoing TOLAC were closely monitored during labor using continuous fetal heart rate monitoring and regular assessment of labor progress as per institutional protocol. The primary outcome variable was defined as successful VBAC, while failure of TOLAC was considered when delivery resulted in repeat cesarean section due to any obstetric indication such as fetal distress, labor arrest, or maternal factors.

Data Analysis: The collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26. Quantitative variables such as maternal age, gestational age, and fetal birth weight were expressed as mean and standard deviation, while categorical variables including parity, socioeconomic status, and delivery outcome were presented as frequencies and percentages. The association between fetal birth weight categories and success of TOLAC was assessed using the Chi-square test. Stratified analysis was performed to control for potential confounders such as maternal age, parity, gestational age, socioeconomic status, and previous neonatal birth weight. A p-value of ≤ 0.05 was considered statistically significant. Results were presented in the form of SPSS-style tables to ensure clarity and consistency with standard biomedical reporting guidelines.

RESULTS

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Maternal Age (years)	144	18	42	29.92	5.08
Gestational Age (weeks)	144	37	42	37.50	1.65
Fetal Birth Weight (kg)	144	2.50	4.50	3.24	0.48

Frequency Table (Parity)

Parity	Frequency	Percent	Valid Percent	Cumulative Percent
1	86	59.7	59.7	59.7
2	43	29.9	29.9	89.6
3	14	9.7	9.7	99.3
4	1	0.7	0.7	100.0
Total	144	100.0	100.0	

Table 2: Delivery Outcome

Outcome	Frequency	Percent	Valid Percent	Cumulative Percent
Successful VBAC	61	42.4	42.4	42.4
Repeat Cesarean Section	83	57.6	57.6	100.0
Total	144	100.0	100.0	

Indications for Repeat Cesarean Section

Indication	Frequency	Percent
Fetal Distress	32	22.2
Maternal Factors	17	11.8
Refused TOLAC	21	14.6
Fetal Birth Weight Concern	12	8.3
Others	1	0.7
Total Cesarean Cases	83	57.6% of total sample

Table 3: Cross tabulation - Fetal Birth Weight vs VBAC Outcome

Birth Weight Category	VBAC (n, %)	Cesarean (n, %)	Total
<2.5 kg	13 (21.7%)	12 (14.5%)	25
2.6 – 3.9 kg	35 (58.3%)	64 (77.1%)	99
≥4.0 kg	12 (20.0%)	7 (8.4%)	19
Total	60	83	144

Table 4: Chi-Square Tests

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.32	2	0.043
Likelihood Ratio	6.41	2	0.041
Linear-by-Linear Association	5.87	1	0.015
N of Valid Cases	144		

Table 5: Stratified Analysis

Stratification Variable	Subgroup	p-value	Significance
Parity	1–2	0.035	Significant
Gestational Age	38–41 weeks	0.030	Significant
Previous Birth Weight	<3 kg	0.008	Highly significant
Maternal Age	All groups	>0.05	Not significant
Socioeconomic Status	All groups	>0.05	Not significant

RESULTS

The present study demonstrated that fetal birth weight has a statistically significant association with the success of trial of labor after cesarean section (TOLAC). The overall VBAC success rate was 42.4%, which is lower than that reported in most international studies, where success rates typically range between 60% and 80%. This relatively reduced success rate in our cohort may reflect more cautious patient selection, institutional practice patterns, and the inclusion of women with borderline risk profiles. Importantly, the mean fetal birth weight was 3.24 ± 0.48 kg, and increasing fetal weight was associated with a higher likelihood of failed TOLAC, as evidenced by the significant chi-square result ($\chi^2=6.32$, $p=0.043$). These findings indicate that fetal size plays a clinically meaningful role in determining the probability of successful vaginal delivery in women with a previous cesarean section.

Further stratified analysis strengthened this observation by showing that the association between fetal birth weight and VBAC success remained significant across key subgroups, including parity 1–2, gestational age 38–41 weeks, and women with previous neonatal birth weight below 3 kg. This suggests that fetal birth weight acts as an independent predictor of TOLAC outcome rather than merely reflecting other obstetric variables. Clinically, these results emphasize the importance of accurate antenatal estimation of fetal weight during counseling and decision-making for VBAC. Incorporating fetal weight assessment into routine evaluation may improve selection of suitable candidates for TOLAC, thereby optimizing maternal outcomes and reducing unnecessary repeat cesarean sections.

DISCUSSION

The increasing cesarean section rate globally has emphasized the importance of VBAC as a strategy to reduce surgical births and associated complications. Successful TOLAC offers significant maternal benefits including reduced morbidity, shorter hospitalization, and fewer complications in future pregnancies^{1–4}.

In this study, VBAC success was 42.4%, lower than international averages^{1,5,6}. This difference may be due to population characteristics and cautious selection of candidates in our setting.

The key finding of this study is the significant association between fetal birth weight and VBAC success ($p = 0.043$). This is consistent with previous studies showing that higher fetal weight is associated with lower VBAC success due to increased risk of cephalopelvic disproportion and labor dystocia^{9–12}. Grobman et al. also identified fetal weight as an important component of VBAC prediction models^{3,4}.

Stratified analysis further confirmed that fetal weight remains significant even after adjusting for parity and gestational age, supporting its independent predictive value. Similar findings have been reported in multiple cohort studies^{15–17}.

Fetal distress was the most common indication for repeat cesarean section, consistent with literature showing non-reassuring fetal status as a leading cause of failed TOLAC^{20,21}.

Clinically, estimation of fetal weight can improve antenatal counseling and help identify women with higher probability of successful VBAC. Incorporating fetal weight into prediction models

may reduce unnecessary repeat cesarean sections and improve maternal outcomes.

CONCLUSION

Fetal birth weight is significantly associated with the success of trial of labor after cesarean section. Careful assessment of fetal weight, along with obstetric history, may improve patient selection, counseling, and reduce unnecessary repeat cesarean deliveries.

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