

Research Article**Determinants of Successful Vaginal Birth After Caesarean Section: A Cross-Sectional Study****Rasheeda Hingoro¹, Farah Khan², Rabia Khan³, Saira Jamshed⁴, Paras⁵, Afshan Sultana Zia⁶**

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Abstract**Background:**

In recent decades, the global rate of caesarean section (CS) deliveries has risen significantly, particularly in developing countries. A previous history of CS remains one of the most common indications for repeat caesarean delivery. Vaginal birth after caesarean (VBAC) is a clinically viable option for appropriately selected women in subsequent pregnancies. However, it carries potential risks, including uterine rupture. Therefore, identifying factors that predict successful

VBAC is essential to improve maternal outcomes and minimize complications.

Objective:

To identify factors associated with successful vaginal birth after caesarean section.

StudyDesign:

Cross-sectional study.

Duration and place of study: This study was conducted at Suleman Roshan Medical College Tando Adam from February 2025 to February 2026

Methodology:

This study was conducted in the Department of Obstetrics and

Gynaecology. A total of 227 women eligible for trial of labour after caesarean (TOLAC), based on predefined inclusion and exclusion criteria, were included. Data regarding current and previous pregnancies were collected and analyzed. Both descriptive and inferential statistical analyses were performed using SPSS version 25.0. Associations between VBAC success and relevant variables were assessed using chi-square and Fisher's exact tests. A p-value of ≤ 0.05 was considered statistically significant.

Results:

The mean age of participants was 25.4 ± 3.2 years, with the majority (67.9%) aged between 20–29 years. The overall success rate of VBAC was 69.5%. Statistically significant predictors of successful VBAC included normal body mass index ($p = 0.002$), gestational age between 37–40 weeks ($p = 0.037$), ruptured membranes at admission ($p < 0.001$), spontaneous onset of labour ($p < 0.001$), membrane sweeping as a method of induction ($p < 0.001$), and an estimated fetal weight of 2.5–3.0 kg ($p = 0.002$).

Conclusion:

A favorable VBAC success rate can be achieved with appropriate patient selection. Key predictors of success include normal BMI, term gestation (37–40 weeks), spontaneous labour onset,

ruptured membranes at admission, and optimal fetal weight.

Keywords:

Vaginal birth after caesarean (VBAC); trial of labour after caesarean (TOLAC); caesarean section; maternal outcomes.

Introduction

Caesarean section (CS) is a common obstetric surgical procedure that can be life-saving for both the mother and the fetus when medically indicated [1]. However, compared to vaginal delivery, CS is associated with a higher incidence of maternal complications, including increased morbidity and mortality [2]. In addition, emerging evidence suggests that CS may influence neonatal outcomes by affecting immune system development, increasing the risk of childhood obesity and asthma, and altering the diversity of the neonatal gut microbiota [3]. The World Health Organization (WHO) recommends that CS rates should ideally range between 10% and 15%; however, many countries have exceeded this threshold [4]. Consequently, the rising rate of CS has become a significant public health concern and a challenge for clinical practice.

Vaginal birth after caesarean (VBAC) is considered an effective strategy to reduce the increasing rates of CS in modern obstetrics. It offers women with a previous CS the opportunity to achieve a vaginal delivery in subsequent pregnancies. For

most women with one prior low-transverse CS, VBAC is regarded as a safe and appropriate option, provided that careful selection criteria are met [5, 6, 7].

The utilization of VBAC varies considerably across different countries. In the United States, the VBAC rate declined markedly from 24% in 1996 to approximately 8% in later years [8]. Concurrently, the overall CS rate increased, while the proportion of VBAC deliveries decreased significantly [9].

One of the primary contributors to the rising CS rate is the tendency for women with a previous CS to undergo repeat caesarean deliveries [10]. Several studies have identified risk factors associated with unsuccessful VBAC and increased likelihood of uterine rupture, necessitating emergency repeat CS. These risk factors include a short interpregnancy interval (less than one year) and a history of more than one previous CS [11]. Furthermore, concerns regarding medicolegal liability and the potential risks associated with uterine rupture have led some clinicians to adopt a more cautious approach in managing VBAC. This may include reluctance to use interventions such as labor augmentation with oxytocin or epidural analgesia, potentially complicating labor management [7].

Although VBAC offers several benefits, certain clinical factors are associated with

a higher risk of failure, which may result in poorer perinatal outcomes compared to planned elective repeat CS [1]. The decline in VBAC rates has been attributed to both provider reluctance due to medicolegal concerns and increasing awareness of associated risks [12]. Therefore, there is a need for reliable predictive tools to help obstetricians identify women who are good candidates for VBAC and to support informed decision-making through appropriate counseling [13].

The aim of this study is to identify the factors associated with successful VBAC and to enhance prenatal care for women considering vaginal delivery after a previous CS. Additionally, this study seeks to provide evidence-based recommendations to improve antenatal counseling and support informed decision-making among women with a history of caesarean delivery.

Material and Methods

This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology of the hospital. Data collection was carried out over a period of one month. A total of 227 women who were candidates for vaginal birth after caesarean (VBAC) were enrolled based on predefined inclusion and exclusion criteria.

Inclusion

Women were included if they had a history of one or two previous caesarean section (CS) deliveries with a lower-segment transverse uterine incision, a singleton viable pregnancy at ≥ 37 completed weeks of gestation, a clinically adequate pelvis, and an inter-delivery interval of more than two years since the previous CS. Additionally, participants had no obstetric contraindications to a trial of labour after caesarean (TOLAC).

Exclusion

Women were excluded if they had a history of uterine rupture in a previous pregnancy, significant medical or obstetric comorbidities, or a fetus with confirmed structural anomalies, chromosomal aneuploidy, or intrauterine TORCH infection.

Data were collected through detailed history taking, physical examination, relevant investigations, and intrapartum follow-up. Ethical approval was obtained from the hospital's ethical review board, and the study was conducted in accordance with ethical standards, ensuring confidentiality of all participants.

Maternal and obstetric characteristics—including age, parity, body mass index

Criteria:

(BMI), number of previous caesarean deliveries, prior history of vaginal delivery, number of antenatal visits, gestational age at delivery, Bishop score, and inter-delivery interval—were analyzed using descriptive statistics. Inferential analysis was performed using the chi-square (χ^2) test and Fisher's exact test to assess the association between these variables and the success of VBAC.

A p-value of ≤ 0.05 was considered statistically significant. All statistical analyses were performed using SPSS software (version 25.0).

Results

Table~1 displays the elementary information about the 227 subjects in this investigation. The average age of participants was recorded at 25.4 years and the majority of females (67.9%) were between the ages 20 and 29. Approximately 89 per cent were housewives and about 88.8 per cent had an average body mass index. Steady antenatal care was obtained by 47.6 per cent of women and more than 91.9 per cent of women reported no maternal comorbidities.

Table 1: Fundamental traits of research participants (N = 227)

Characteristic	Number	Percentage (%)
<i>Age (years)</i>		
20–29	154	67.8
30–39	73	32.2
<i>Occupation</i>		
Housewife	203	89.4
Student	8	3.5
Service holder	16	7.0
<i>Body mass index</i>		
Below average (< 18.5 kg/m ²)	12	5.3
Average (18.5–24.9 kg/m ²)	202	89.0
Overweight (≥ 25.0 kg/m ²)	13	5.7
<i>Antenatal care (ANC) status</i>		
Regular	108	47.6
Irregular	100	44.1
No ANC	19	8.4
<i>Maternal co-morbidities</i>		
None	209	92.1
Gestational diabetes mellitus	4	1.8
Diabetes mellitus	5	2.2
Hypertension	8	3.5
Hypothyroidism	1	0.4

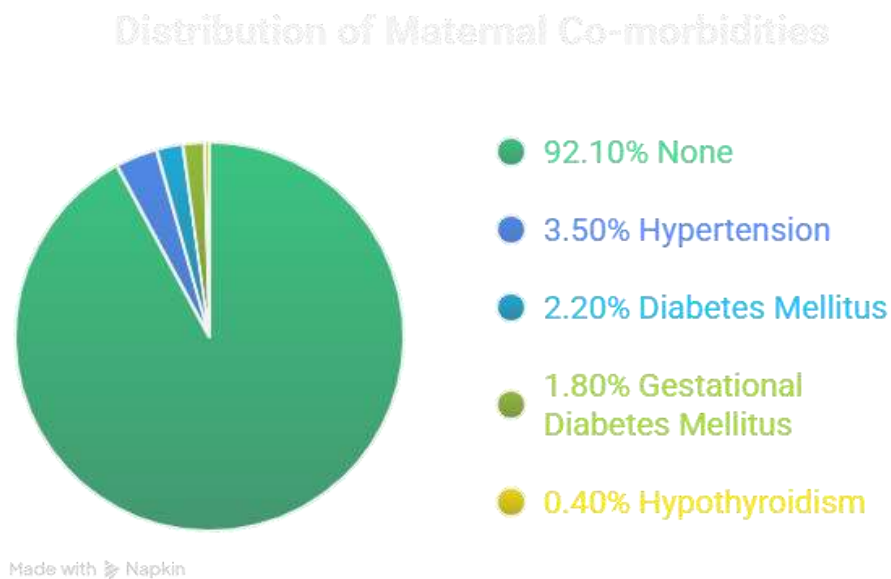


Figure 1: Maternal co-morbidities Pie chart

Table 2 shows that almost 90.9% of people had a record of a prior CS. The most common causes of the previous primary CS were labor failure (12.3%), oligohydramnios (13.9%), mother desire (20.3%), and fetal distress (30.5%).

Table 2: Features associated with the prior cesarean section (N= 227)

Characteristic	Number	Percentage (%)
<i>Number of previous CS</i>		
One	206	90.7
Two	25	9.3
<i>Indication for previous primary CS</i>		
Foetal distress	69	30.4
Maternal desire	46	20.3
Oligohydramnios	32	14.1
Failure to progress	28	12.3

Malpresentation	22	9.7
Post-dated pregnancy	19	8.4
Cephalopelvic disproportion	11	4.8

Of the 227 women studied, 158 achieved a successful VBAC, yielding an overall success rate of 69.5%, while 69 women (30.5%) underwent an emergency repeat CS.

Table 3 displays the characteristics associated with successful versus failure VBAC. There were statistically significant correlations between the average BMI ($p = 0.002$), gestational age between 37 and 40 weeks at delivery ($p = 0.037$), ruptured membranes at admission ($p < 0.001$), spontaneous labor (p of 0.001), sweeping or membrane stretching as the induction technique ($p < 0.001$), and an EFW of 2.5–3.0 kg on ultrasonography ($p = 0.002$). Twenty-one patients did not have cardiotocography (CTG) at admission, while twenty-five patients had unavailable ultrasonography data.

Table 3: Factors linked to a healthy vaginal delivery following a cesarean section ($N = 227$)

Characteristic	VBAC (Success) <i>N</i> (%)	VBAC Failed <i>N</i> (%)	<i>p</i> -value
Age			
20–29 years	104 (67.7)	50 (32.3)	0.555 ^a
30–39 years	53 (73.3)	19 (26.7)	
BMI			
Below average	1 (10.0)	11 (90.0)	0.002 ^b
Average	148 (73.5)	53 (26.5)	
Overweight	7 (54.5)	6 (45.5)	
Antenatal care status			
Regular	69 (64.0)	39 (36.0)	0.237 ^b

Irregular	76 (76.8)	23 (23.2)	
No ANC	12 (62.5)	7 (37.5)	
Number of previous CS			
One	144 (70.0)	62 (30.0)	1.000 ^b
Two	13 (64.7)	7 (35.3)	
Inter-delivery interval			
Less than 2 years	5 (69.1)	4 (42.9)	0.642 ^b
Greater than 2 years	153 (70.0)	66 (30.0)	
Prior VBAC			

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(Table 3 continued)

Characteristic	Successful VBAC N (%)	Failed VBAC N (%)	p-value
Yes	10 (72.7)	4 (27.3)	1.000 ^b
No	148 (69.3)	66 (30.7)	
Prior vaginal birth before CS			
Yes	22 (69.2)	10 (30.8)	0.925 ^a
No	136 (69.6)	59 (30.4)	
History of stillbirth			
Yes	4 (100.0)	0 (0.0)	1.000 ^b
No	154 (68.7)	69 (31.3)	
History of wound infection or puerperal sepsis			
Yes	6 (55.6)	5 (44.4)	0.676 ^b
No	152 (70.2)	64 (29.8)	
Gestational age at delivery			

37–40 weeks	124 (73.9)	44 (26.1)	0.037 ^a
Greater than 40 weeks	34 (56.0)	27 (44.0)	
Modified Bishop's score			
Less than 4	6 (55.6)	5 (44.4)	0.380 ^b
4–6	28 (52.3)	25 (47.7)	
Greater than 6	124 (75.6)	40 (24.4)	
Membrane status at admission			
Intact	114 (62.7)	68 (37.3)	<0.001 ^a
Ruptured	41 (97.1)	1 (2.9)	
Labour status			
Spontaneous	126 (80.0)	32 (20.0)	<0.001 ^a
Induction	32 (45.6)	38 (54.4)	

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(Table 3 continued)

Characteristic	Successful VBAC N (%)	Failed VBAC N (%)	p-value
Type of induction where n = 69			
Sweeping or stretching	24 (74.1)	8 (25.9)	<0.001 ^b
Dinoprostone gel	1 (11.1)	10 (88.9)	
Intrauterine catheter	5 (19.0)	25 (81.0)	
EFW in ultrasonography where n = 202			
2.5–3.0 kg	95 (80.4)	23 (19.6)	0.002 ^b
3.1–3.5 kg	38 (50.8)	36 (49.2)	
Greater than 3.5 kg	5 (50.0)	5 (50.0)	
AFI in ultrasonography where n = 202			

Less than 5 cm	6 (62.5)	4 (37.5)	0.761 ^b
5–10 cm	114 (63.5)	66 (36.5)	
Greater than 10 cm	10 (88.9)	1 (11.1)	
CTG on admission where <i>n</i> = 206			
Reactive	127 (67.3)	63 (33.3)	0.500 ^b
Non-reactive	13 (84.6)	2 (15.4)	

^aChi-square test; ^bFisher's exact test

Discussion

In this study, VBAC was attempted in 227 women, of whom 158 achieved successful vaginal delivery, yielding a success rate of 69.5%. Factors that strongly predicted VBAC success were identified and analyzed in the context of existing literature.

For most women with a history of CS, VBAC is considered a safe and practical option. Systematic reviews indicate that, in carefully selected populations, the success rate of a trial of labor exceeds 75%, with major complications such as uterine rupture occurring in less than 1% of cases [13]. A large study conducted in a developing country reported that 88.6% of 1,532 women attempting VBAC delivered vaginally [14]. The moderate success rate observed in this study likely reflects both the clinical context and the characteristics of the study population.

High VBAC success rates directly translate to a reduction in adverse maternal and fetal outcomes, making VBAC an effective strategy for lowering the overall cesarean section rate.

The majority of participants in this study were aged 20–29 years. Although the success rate among women aged 30–39 appeared slightly higher, this difference was not statistically significant. Previous research has shown that VBAC success declines in women over 35 years of age [12], and Bujold et al. found that maternal age ≥ 35 years was associated with reduced likelihood of successful vaginal delivery in a cohort of 2,493 women [15]. While lower maternal age may be favorable for VBAC, findings vary across studies.

Women with a normal BMI exhibited significantly higher VBAC success rates. Evidence suggests that both pre-pregnancy BMI and gestational weight gain independently influence VBAC outcomes

[16]. Although the precise biological mechanisms remain unclear, these findings highlight the importance of optimizing maternal weight management in women planning VBAC.

Regular antenatal care was reported by 47.6% of participants, among whom 64.0% achieved successful VBAC. Women who attended routine prenatal visits had higher success rates compared to those with irregular or no care. This aligns with TOLAC guidelines emphasizing that comprehensive counseling and systematic evaluation of women with prior CS can maximize VBAC success and minimize the risk of uterine rupture [17].

Most participants (90.9%) had a history of one prior CS, with a VBAC success rate of 70.0%. Among women with two previous CS deliveries (9.1%), the success rate was 64.7%. Notably, 72.7% of women with a prior successful VBAC delivered vaginally in the current pregnancy. Iyer et al. reported similar findings, demonstrating that prior vaginal delivery is associated with higher VBAC success compared to an exclusively cesarean history [18]. These results indicate that both prior VBAC and prior vaginal birth are meaningful predictors of success.

The indication for the previous CS was also significantly associated with VBAC outcomes. In this study, the most frequent indications were fetal distress (30.5%),

maternal request (20.3%), oligohydramnios (13.9%), and failure to progress (12.3%). VBAC was more likely to succeed when the prior CS was performed for non-recurrent indications, such as malpresentation, fetal distress, or dystocia [19]. Doshi et al. observed higher VBAC success when the previous CS was for non-recurrent reasons: breech (91%), fetal distress (88%), and dystocia (70%) [12]. Similarly, Brill and Windrim concluded that non-recurrent prior CS indications are associated with significantly higher VBAC success compared to recurrent indications like cephalopelvic disproportion [20].

Women with an inter-delivery interval exceeding two years had higher VBAC success rates. A retrospective study reported uterine rupture rates of 1.05% when the interval exceeded 18 months, rising to 2.25% when shorter [15]. These data support the recommendation of a minimum inter-delivery interval of at least two years before attempting VBAC.

A Modified Bishop's score >6 was associated with a VBAC success rate of 75.6%, consistent with prior evidence that a cervical score ≥ 5 predicts improved outcomes [21]. Success rates were also higher among women with gestational age 37–40 weeks (73.9%), amniotic fluid index (AFI) >10 cm (88.9%), ruptured membranes at admission (97.1%),

spontaneous labor onset (80.0%), or induction via membrane sweeping/stretching (74.1%). Landon et al. similarly reported positive associations of spontaneous labor onset (80.6%) and term gestation (37–40 weeks, 75.0%) with VBAC success [22].

Among women with an ultrasonography-estimated fetal weight (EFW) of 2.5–3.0 kg, 80.4% achieved successful vaginal delivery, while success declined with fetal weight >3.5 kg, consistent with findings by Iyer et al. [18].

The obstetric and intrapartum factors identified in this study provide practical clinical predictors to guide patient selection and counseling for TOLAC. These findings can assist obstetricians in identifying women most likely to benefit from a trial of labor after previous cesarean delivery, ultimately improving maternal and neonatal outcomes.

Conclusion

This study demonstrates that nearly two-thirds of carefully selected women can achieve a successful vaginal birth after a previous cesarean section. Factors significantly associated with VBAC success include a normal BMI, gestational age of 37–40 weeks, spontaneous onset of

labor, ruptured membranes at admission, induction via membrane sweeping or stretching, and an ultrasound-estimated fetal weight of 2.5–3.0 kg. Considering these factors in clinical decision-making may enhance VBAC outcomes.

To further improve care for women opting for vaginal delivery after cesarean, prospective studies with larger and more diverse populations are needed. Such research can help identify additional predictive factors and refine existing VBAC prediction models, ultimately supporting safer and more personalized obstetric care.

Limitations of the Study

1. The study was conducted at a single hospital and over a limited time frame. Consequently, the findings may not be fully generalisable to the broader population or to other healthcare settings.
2. The sample size, while adequate for an exploratory cross-sectional study, remained relatively modest. Studies conducted on larger cohorts would yield more robust and reproducible results.

Funding Source

None

Conflicts of Interest

None

Ethical Approval

Permission was taken from the ethical review committee of the institute

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