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MATERNAL AND OBSTETRIC FACTORS DETERMINING SUCCESSFUL VAGINAL BIRTH AFTER CAESAREAN SECTION- A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Rising Caesarean Section rate continues to be a concern across India. The National Family Health Survey and Health Management Information System reported 8.5% in 2005-2006, 17.2% in 2015-16 and 21.5% in 2019-21. The 2021-22 figure stood at 23.29% with Telangana State recording a staggering 54.09%. Elective Repeat Caesarean Sections (Robsons Group 5) and declining preference for Vaginal Birth After Caesarean (VBAC) accounts for a large proportion of Caesarean Sections. Medical professionals should reconsider VBAC and promote Trial of Labour after Caesarean (TOLAC) in eligible pregnant women. **Objectives:** To determine the proportion of successful VBAC and maternal and foetal factors influencing the success of TOLAC **Methodology:** A prospective observational study was carried out by recruiting pregnant women with previous history of LSCS. Data was collected as per pre-designed data collection sheet including demographic details and maternal and foetal parameters. Statistical analysis was carried out using coGuide version 1.0. **Results:** 200 women were included of which 60% had successful and 40% failed VBAC. In the univariate analysis BMI, type of labour (induced/spontaneous), cervical dilatation at admission and foetal head position (-2 or lower station at admission) were found to be significantly associated with successful VBAC. **Conclusion:** More than half of the women in our study had successful Vaginal Birth After Caesarean in spite of including only those women with LSCS in the first pregnancy and no previous history of vaginal births. Women with previous history of LSCS can be offered TOLAC after assessment by a trained medical practitioner. We recommend future studies to evaluate the effect of TOLAC on maternofoetal outcomes.

KEYWORDS : Vaginal Birth After Caesarean (VBAC), Trial Of Labour After Caesarean (TOLAC), Lower Segment Caesarean Section (LSCS)

INTRODUCTION:

The rate of Caesarean Section deliveries is constantly rising with an increase in 53% from 1996 to 2007(1,2). One out of three pregnant women have had Caesarean Section in 2011(3). The reasons for this increase are probably increase in Maternal Request Caesarean Section in urban areas, rise in high-risk pregnancies, mothers with medical complications and changes seen in obstetric practice(1). It is reported that maternal and foetal morbidity is increased with Caesarean Sections in comparison to normal vaginal delivery(4).

Complications associated with repeated Caesarean delivery are adherent placental disorders (placenta previa and placenta accreta), uterine rupture, hysterectomy and even maternal death in some cases (5,6,7).

On the other hand, vaginal delivery results in less severe adverse outcomes to the puerpera, shorter hospital stay, faster post-partum recovery of the mother, reduced neonatal diseases in the new born and better mother-child bonding (8). This applies even in the case of VBAC where lower morbidity has been reported than women undergoing elective repeat Caesarean Section (9).

Trial of Labor after Caesarean (TOLAC) allows women to opt for vaginal delivery with the objective to achieve VBAC (10). The VBAC guidelines proposed by American College of Obstetricians and Gynaecologists (ACOG) stated "immediate availability of physician and anaesthesiologist during trial of labour after Caesarean" as one of the requirements. This varies widely for individual practitioners, hence only limited candidates are offered the choice for VBAC in an attempt to minimise legal risk (11). However, pregnant women should be well counselled and given adequate support to make the decision for either VBAC or Repeat Caesarean Section(12).

Considering the necessity for encouraging Vaginal Birth after Caesarean and its potential benefits and risks, our study aims at assessing the proportion of successful VBAC in our population along with determining maternofoetal factors that influence this success.

OBJECTIVES:

Primary:

- To determine the proportion of pregnant women having successful Vaginal Birth after Caesarean Section (VBAC)

Secondary:

- To determine the maternal and foetal factors which influence the success of a trial of vaginal birth after Caesarean section.

METHODOLOGY:

The current prospective observational study was carried out at Fernandez Hospital, Hyderabad, Telangana, India, during December 2020 to June 2022. After due approval from the institutional Ethical Committee, pregnant women with previous history of one LSCS presenting to the Antenatal Clinics were recruited using convenient sampling technique.

Sample size was calculated assuming the proportion of attempted VBAC as 52.2 % as per the study by HE Knights et al. The other parameters considered for sample size calculation were 7% absolute precision and 95% confidence level. The required sample size as per the mentioned calculation was 196. To account for a non-participation rate of about 2%, another 4 subjects were added to the sample size. Hence the final required sample size was 200.

Our study was carried out by including women with previous one LSCS for non-recurrent causes (foetal distress, non-progression of labour, malpresentation, placenta previa) and with gestational age of 37- 41 weeks, without severe medical disorders such as uncontrolled hypertension, diabetes, renal or heart diseases. Women included had singleton pregnancy with cephalic presentation and estimated foetal weight (EFW) of ≤4 kilograms with no suspicion of Cephalopelvic Disproportion (CPD) on clinical assessment. We excluded women with 2 or more previous Lower Segment Caesarean Section (LSCS), women with severe medical disorders, women with history of upper segment Caesarean section, pregnancies with detected Foetal Doppler changes or Foetal Growth Restriction.

All pregnant women with previous history of one LSCS who met our inclusion criteria were included after explaining about current study objectives and clearing all doubts. Informed consent was obtained from all study participants. Data was collected as per pre designed data collection sheet and included demographic details like maternal age, booking BMI, obstetric formula (gravida, parity, miscarriage) and neonatal data that included gestational age at delivery, birth weight, Apgar score along with other details like type of labour (spontaneous/ induced), mode of delivery (vaginal/ Caesarean section), inter delivery interval, cervical dilation at the time of admission, foetal head position (station as determined by per vaginal examination) and post-partum haemorrhage.

Successful VBAC was considered as Primary variable. Maternal and foetal outcomes were considered as Secondary outcomes. For normally distributed Quantitative parameters, the mean values were compared between study groups using Independent sample t-test (2 groups), categorical outcomes were compared between study groups using Chi square test. Binary logistic regression was used to know the factors associated with successful VBAC. Odds ratio along with 95% CI tabulated. P value < 0.05 was considered statistically significant. Data was analysed using coGuide software, V.1.0(13)

RESULTS:

A total of 200 participants were included in final analysis of which 120 (60%) participants had successful VBAC and 80 (40%) participants had unsuccessful/ failed VBAC.

Table 1: Association between Age and Successful/Failed VBAC:

Parameter	Outcome		P Value
	Failed VBAC (N=80)	Successful VBAC (N=120)	
	Mean ± SD	Mean ± SD	
Age	30.59 ± 3.55	30.48 ± 3.68	0.8301

The mean age is around 30 years in study population which is almost the same in both groups (Successful, Failed VBAC) and is not statistically significant (P- value- 0.8301

Table 2: Association between BMI and Successful/Failed VBAC (N=200)

Parameter	Outcome		P Value
	Failed VBAC (N=80)	Successful VBAC (N=120)	
	Mean ± SD	Mean ± SD	
BMI	27.75 ± 4.45	25.91 ± 3.99	0.0027

In our study, the mean BMI in successful VBAC is lower (25.91± 3.99) when compared to Failed VBAC (27.75 ± 4.45) which is statistically significant (P Value - 0.0027)

Table 3: Association between Gestational age at delivery and Successful/Failed VBAC (N=200)

Parameter	Outcome		P Value
	Failed VBAC (N=80)	Successful VBAC (N=120)	
	Mean ± SD	Mean ± SD	
Gestational Age	38.90 ± 0.95	38.96 ± 0.93	0.6117

In our study mean gestational age is around 38 weeks in the entire study population (Successful, Failed VBAC) which is not statistically significant (P- value- 0.6117)

Table 4: Association between Inter-delivery interval and Successful/Failed VBAC (N=200)

Parameter	Outcome		P Value
	Failed VBAC (N=80)	Successful VBAC (N=120)	
	Mean ± SD	Mean ± SD	
Inter delivery Interval (in years)	3.71 ± 1.92	4.06 ± 1.92	0.2184

In our study, it is shown that the Inter-delivery interval in years among the successful VBAC group (4.06 ± 1.92) is higher when compared to failed VBAC (3.71 ± 1.92) but it is not statistically significant (P value- 0.2184)

Table 5: Association between the type of Labour and Successful/ Failed VBAC (N=200)

Type of Labour	Failed VBAC	Successful VBAC	Chi Square test	P value
Induced (N = 61)	39 (63.93%)	22 (36.07%)	20.95	<0.001
Spontaneous (N = 139)	41 (29.50%)	98 (70.50%)		

In our study, it is found that 70.5% (98) of successful VBAC, and 29.5(41) of Failed VBAC had spontaneous labour, whereas 36.07% (22) of successful VBAC, and 63.9% (39) of Failed VBAC had induced labour. Association of spontaneous labour and successful VBAC is statistically significant (P value- <0.001)

Table 6: Comparison of Cervical dilatation at admission and Failed/Successful VBAC (N=200)

Parameter	Outcome		Chi square value	P value
	Successful VBAC	Failed VBAC		
≤ 1 cm (N= 140)	70 (50.00%)	70 (50.00%)	19.44	<0.001
≥2cm (N = 60)	50 (83.33%)	10 (16.67%)		

In our study, 50 out of 60 women presenting with ≥2 cm of cervical dilatation at admission had successful VBAC accounting for 83.3%. The association of ≥2 cm cervical dilatation at admission and successful VBAC is statistically significant (P value- <0.001)

Table 7: Association of Foetal head position -2 station or lower at admission with Failed/ Successful VBAC (N=200)

Foetal head position - 2 or lower at admission	Failed VBAC	Successful VBAC	Chi square value	P value
Yes (N = 93)	18 (19.35%)	75 (80.65%)	30.87	<0.001
No (N = 107)	62 (57.94%)	45 (42.06%)		

In our study, 80.6% (75) of women presenting with foetal head position at or lower than - 2 at admission had Successful VBAC when compared to 19.35% (18) in the Failed VBAC Group, which is statistically significant (P value- <0.001)

Table 8: Comparison of PROM with Successful VBAC (N=120)

Parameter	PROM	
	Yes	No
Successful VBAC (N= 120)	25 (20.83%)	95 (79.17%)

In our study, it is seen that in successful VBAC, 79.17% (95) women did not have PROM whereas 20.83% had PROM.

Table 9: Comparison of Labour Augmentation with VBAC (N=121)

Parameter	Outcome	
	Successful VBAC	Failed VBAC
ARM+Oxytocin (N = 46)	25 (54.35%)	21 (45.65%)
ARM (N = 43)	30 (69.77%)	13 (30.23%)
Oxytocin (N = 32)	18 (56.25%)	14 (43.75%)

25 (54.35%) women in Successful VBAC and 21(45.65%) had Labour augmentation with ARM + Oxytocin in our study population. 30 (69.77%) of Successful VBAC and 13(30.23%) of Failed VBAC in our study population had augmentation only with ARM. 18(56.25%) women in Successful VBAC and 14(43.75%) women in Failed VBAC

had Labour augmentation with only Oxytocin.

Table 10: Descriptive analysis of Mode of Delivery in the study population (N=200)

Mode of Delivery	Frequency	Percentage
SVD	72	36.00%
AVD	48	24.00%
EM LSCS	80	40.00%

In our study, 72 (36%) women had Spontaneous vaginal delivery, 48(24%) had Assisted vaginal delivery and 80(40%) had Emergency LSCS

Table 11: Association of Birth weight with Failed/Successful VBAC (N=200)

Parameter	Outcome		P Value
	Failed VBAC (N=80)	Successful VBAC (N=120)	
	Mean ± SD	Mean ± SD	
Birth weight (in kg)	3.09 ± 0.33	3.07 ± 0.30	0.5884

Mean Birth weight among both failed and successful VBAC groups is 3 kgs, the association is not statically significant in our study.

Table 12: Descriptive analysis of APGAR at 1min in study population (N=200)

APGAR at 1min	Frequency	Percentage
APGAR at 1min < 7	2	1.00%
APGAR at 1min >7	198	99.00%

The incidence of APGAR <7 at 1 min is 1% (2).

Table 13: Descriptive analysis of APGAR at 5 min in study population (N=200)

APGAR at 5 min	Frequency	Percentage
APGAR at 5 min <7	2	1.00%
APGAR at 5 min >7	198	99.00%

The Incidence of APGAR <7 at 5 min is 1 % (2) .

Table 14: Descriptive analysis of findings at Caesarean Section- Previous Scar integrity (N=80)

Findings at CS- Previous Scar integrity	Frequency	Percentage
Scar dehiscence	3	3.75%
Intact Scar	77	96.25%

The incidence of Scar dehiscence is 3.73% (3) in our study and 96.25% (77) of women who underwent Emergency LSCS had an intact scar.

Table 15: Comparison of Postpartum Haemorrhage (>1000 ml) in study population

Postpartum Haemorrhage	Outcome	
	Successful VBAC	Failed VBAC
N = 10	4	6

In our study, postpartum haemorrhage >1000ml was seen in 4 cases in successful VBAC group and 6 in failed VBAC group.

Table 16: Comparison of NICU admissions of newborn in study population

NICU admissions	Outcome	
	Failed VBAC	Successful VBAC
N = 3	1	2
Note: No Test is Applicable due to the nature of the data		

Our study shows that 3 babies had NICU admission among the study population.

Table 17: Comparison of Indication for previous CS in Successful/Failed VBAC

Indication for Previous Section	Outcome	
	Successful VBAC	Failed VBAC
Non progress of labour (N = 30)	14 (46.67%)	16 (53.33%)
Failed induction (N = 8)	3 (37.50%)	5 (62.50%)
Cord around the neck (N = 11)	3 (27.27%)	8 (72.73%)
Presumed fetal compromise (N = 55)	35 (63.64%)	20 (36.36%)
Abnormal lie (N = 2)	1 (50.00%)	1 (50.00%)
Severe Pre-eclampsia (N = 7)	5 (71.43%)	2 (28.57%)
PROM (N = 11)	6 (54.55%)	5 (45.45%)
Breech presentation (N = 21)	13 (61.90%)	8 (38.10%)
Cephalopelvic disproportion (N = 6)	2 (33.33%)	4 (66.67%)
Oligohydramnios (N = 17)	13 (76.47%)	4 (23.53%)
LGA (N = 7)	5 (71.43%)	2 (28.57%)
Maternal request (N = 8)	6 (75.00%)	2 (25.00%)
Compound presentation (N = 1)	1 (100.00%)	0 (0.00%)
Placenta Previa (N = 2)	1 (50.00%)	1 (50.00%)
Postdated (N = 3)	3 (100.00%)	0 (0.00%)
Meconium-stained liquor (N =6)	4 (66.67%)	2 (33.33%)
Not known (N = 2)	2 (100.00%)	0 (0.00%)
IHCP (N = 1)	1 (100.00%)	0 (0.00%)
Fetal growth restriction (N = 1)	1 (100.00%)	0 (0.00%)
Cord prolapse (N = 1)	1 (100.00%)	0 (0.00%)

**** No test was applicable due to zero cell value***

Of all the indications for previous CS that were seen to influence VBAC in subsequent pregnancies, oligohydramnios, maternal request, LGA and severe preeclampsia as the indication for previous Caesarean Section were the commonest with 76.47%, 75%, and 71.43% each respectively in successful VBAC group.

DISCUSSION:

The current prospective observational study to determine the proportion of pregnant women having successful VBAC and maternal and foetal factors which influence the success of TOLAC have included 200 women of which 60% had successful VBAC. The maternal age and gestational age of those who had successful vs failed VBAC was statistically insignificant. BMI, type of labour (spontaneous vs induced), foetal head position at -2 station or lower by per vaginal examination at admission and cervical dilatation >_ 2 cm at admission were found to be significantly associated with a successful outcome.

Success rates of VBAC vary among different studies with 65%, 84% and 85% as reported in other retrospective studies, which are in agreement or higher than the current findings or lower as seen in a cross-sectional study that reported 41%. (14–17). However, the variations in the success rates might be due to different geographical locations and differences in the ethnicity and race of the study population, and also with the inclusion of women with previous vaginal births. The mean age of the participants in line with the prospective observational study conducted by Raha Maroyi et al. is 29 years. (18) The gestational age of the current study population who had successful and failed VBAC is found to be in good understanding with the study carried out by Yan Ping Xing et al in Chinese population that reported p value of 0.62.(19)

An integrated model developed to predict the success of VBAC by Sebastian Manzanares et al reported BMI of <25 as a factor of indication for success, which is seen similarly in our study as BMI 25.91. However, the other factors that are found associated in that model were not included in the current study.(20) Similarly, a prospective observational study carried out in India to develop a predictive model for success of VBAC reported success rate of 78% and BMI as an associated factor in the multivariate analysis that is in line

with our current study findings.(21) Retrospective study carried out by Shaina Parveen et al has reported a significant association of estimated birth weight to the success of VBAC which is in contrast with this study report.(14)

Parity and presence of Gestational diabetes/ preeclampsia were not considered in the current study which are proven to be significantly associated with the success of VBAC as per systemic review and meta-analysis carried out by Yanxin Wu et al. which is a limitation of our study. (22) Stratification of the women based on history of number of Caesarean sections and previous successful/ failed VBAC to check for the success of VBAC is also missing in this study (limitation), since the success of previous VBAC was found to be associated with improved outcomes as per the retrospective study conducted by Abdulrahim A Rouzi et al.(23)

CONCLUSION:

The current prospective observational study carried out to determine the proportion of women undergoing Trial Of Labour After Caesarean has reported that more than half of the women had successful Vaginal Birth After Caesarean. The need of the hour in our country today is to work towards bringing down Caesarean rates. This study encourages caregivers to offer women with previous history of Caesarean Section the option to try for vaginal delivery after evaluation by a trained medical practitioner. Of all the factors considered in our study, BMI less than 25.9, Foetal head position at -2 station or lower at admission, spontaneous labour and cervical dilatation at admission >_ 2 cm were found to be significantly associated with success of VBAC. Our study did not evaluate TOLAC in women with prior history of vaginal birth, which has been indicated to be a favourable factor for VBAC in various studies. This is a limitation of our study. We also did not evaluate TOLAC in women with previous 2 or more CS and in women with pre-existing medical disorders such as Diabetes and Hypertension complicating pregnancy. We recommend further studies to study these effects on TOLAC and success of VBAC .

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