

**Original article:**

## **Predictors of successful vaginal birth after caesarean section**

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### **Abstract**

A prospective observational study was conducted to find out the success of VBAC and the common predictive factors leading to successful VBAC. A total of 136 pregnant women with full term pregnancy, having history of previous one lower segment caesarean section and without any other medical and obstetrical complication were enrolled in the study. The success of VBAC was 75 percent, of which 92.16% had normal vaginal delivery and 5.88% had vacuum and 1.96% had outlet forceps delivery. Twenty five percent women required caesarean section for various indications. There was significantly higher number of women who had history of previous successful VBAC, had vaginal delivery (91.67%;  $p=0.038$ ). It was observed that the rate of vaginal delivery was significantly high in women with Bishop's score between 10 to 13 (94.64%) compared to 6 to 9 (61.25%) ( $p<0.001$ ). The baby weight determined by ultrasound scan was significantly associated with mode of delivery ( $p=0.049$ ). The common predictors of successful VBAC were history of previous successful VBAC, normal body mass index, favorable Bishop's score, spontaneous onset of labor and average baby weight.

**Key words** -Vaginal birth after caesarean section, Scar dehiscence, Rupture uterus

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### **INTRODUCTION**

Caesarean section is one of the most commonly performed major surgical procedure. The procedure needs to be performed, only when circumstances distinctly require it.<sup>1</sup>Worldwide increase in caesarean section (CS) rate during the last three decades has been the cause for concern. Even though, variation exists in rates of caesarean delivery across countries; currently the rate ranges from 10% to 40%.<sup>1,2</sup> In Delhi, capital of India, caesarean

section (CS) rate in teaching hospitals currently range between 19-35%. This high caesarean section rate has put burden on the economy of nations and individuals and families.<sup>3</sup>

Vaginal birth after cesarean section (VBAC) is associated with shorter maternal hospitalizations, less blood loss and fewer transfusions, fewer infections, and fewer thrombo-embolic events than cesarean delivery.<sup>4</sup>Several reports have indicated

that the absolute risk of uterine rupture attributable to a trial of labor is about 1 per 1000.<sup>1,2,5</sup>A successful VBAC has fewer complications than an elective repeat caesarean.<sup>6</sup> A 60 to 80% success rate of vaginal birth after previous caesarean section has been reported by many authors if the primary caesarean was done for nonrecurring indications.<sup>2</sup> Mother's choice on mode of delivery is the most important single factor in offering trial of labor. Various factors like spontaneous onset of labor, Bishops score , baby weight , scar thickness have influence on the success of VBAC. Present study was conducted to find out the success of VBAC in uncomplicated and carefully selected cases of previous LSCS and to find out the common predictive factors for a successful VBAC.

### **MATERIAL AND METHODS**

It was a prospective observational study, conducted for the period of two years One hundred and thirty six women with full term pregnancy and history of

one previous lower segment caesarean section were enrolled. The sample size for the study was determined by considering 6000 as population size [considering average number of deliveries per year](for finite population correction factor [FPC]), hypothesized percentage of outcome factor in the population (p) 10% ( $\pm 5\%$ ), confidence interval of 95% and design effect considering as cluster survey as 1 the sample size was determined as 136.

Pregnant women with full term gestation in labor with previous LSCS, women with previous one LSCS for non-recurrent indication, women with history of previous one VBAC, Sufficient inter-delivery interval ( $>2$  years), pregnant women with no other uterine scars or previous rupture, women with favorable cervix (Bishop's score  $\geq 6$ ) were included in the study. Women with high floating head, postdate with unfavorable cervix, more than one previous LSCS, multiple gestational pregnancy, associated medical or obstetrical complications during pregnancy, moderate and major degree CPD, baby weight  $>3.5$  kg, fetal mal-presentation, scar thickness  $<2$  mm on USG and those who were not willing for VBAC were excluded from study. The study was approved by the Institutional Ethics Committee of Rural Medical College, Loni, Maharashtra prior to the commencement. Pregnant women fulfilling selection criteria were briefed about the nature of the study, details about the VBAC and a written informed consent was obtained..

The study investigators examined the participants for their general health and obstetric parameters that is; lie, presentation, position of the fetus and FHR, scar dehiscence, scar tenderness, vaginal examination will be made and adequacy of pelvis is noted. The weight, height of the participants was recorded using standard methodology. The participants undergoing trial of labour were explained about following aspects.

Patients were kept for spontaneous onset of labour. Patients with postdate pregnancy with borderline bishops score i.e, 6 were induced with oxytocin 1mU till adequate contractions. These women were also monitored for uterine contractions and closely watched for early recognition of scar dehiscence by identifying maternal tachycardia in absence of vaginal bleeding, scar tenderness and fetal heart rate alterations. Progress of labor was observed meticulously by periodically noting with the help of modified WHO partograph that is, progressive descent of fetus, progressive dilatation of cervix and station of the presenting part.

The success of VBAC was determined by the percentage of vaginal delivery (including instrumental).Data was analyzed using variables like maternal age, Body mass index, Scar thickness, Bishop's score ( $\geq 6$  to 9 and 10 to 13), type of onset of labor, perinatal outcome, maternal complications Neonatal outcome was analyzed in relation to Baby weight APGAR score, NICU admission. The neonates were followed up for NICU admission during their hospital stay and the causes of NICU admission were evaluated.

#### **Statistical analysis**

The categorical data was expressed in terms of frequencies and percentages while continuous data was expressed as mean  $\pm$  standard deviation (SD). The association between successful VBAC and various determinants was tested using either chi-square test or Fisher's exact test. A 'p' value of less than or equal to 0.050 at 95% confidence interval was considered as statistically significant.

#### **OBSERVATIONS AND RESULTS**

General examination findings revealed that in majority of the women (90.44%) had body mass index between 19.80 to 26.00 Kg/m<sup>2</sup>. On obstetric examination, 58.82% of the women had Bishop's score between 6 to 9 and membranes were present

in 79.41%. On ultrasound examination, 62.5% babies had estimated weight between 2.500 to 2.999 Kilogram. In 44.12% cases, caesarean section scar thickness as assessed by USG ranged between 4.0 to 4.9 mm. Majority of the women (95.59%) had spontaneous labor. Seventy five percent women had successful vaginal delivery, of which 94 (92.16%) had normal vaginal delivery, while 6 women (5.88%) had vacuum delivery and 2 women (1.96%) had outlet forceps delivery. Twenty five percent women underwent repeat LSCS for scar tenderness (44.12%) and fetal distress (20.59%). (Table 1)

In this study no association was found between maternal age and mode of delivery (p=0.803). Significantly higher number of women, who had history of previous VBAC had vaginal delivery (91.67%; p=0.038). (Table 2) In this study significantly higher number of vaginal deliveries were noted in women with normal (77.24%) body mass index (p<0.001). (Table 3). The rate of

vaginal delivery was significantly high in women with Bishop's score between 10 to 13 (94.64%) compared to 6 to 9 (61.25%) (p<0.001). (Table 4) The mode of delivery was comparable in women with respect to presence of membranes (p=1.000). The estimated fetal weight determined by ultrasound scan was significantly associated with mode of delivery (p=0.049). (Table 5) No association was found between scar thickness and mode of delivery (p=0.157). (Table 6) The location of placenta was not associated with mode of delivery (p=0.061). Type of labor was comparable in women with LSCS and vaginal delivery (p=0.165). Overall the success rate of VBAC was 75% and the failure rate of VBAC was 25% based on pertinent selection criteria and effective monitoring. The common predictors of successful VBAC were History of previous VBAC, body mass index, Higher Bishop's score, non-recurrent indication, spontaneous type of labor and baby weight.

**Table 1. Distribution of study population according to the mode of delivery**

Variables	Findings	Distribution	
		Number	Percentage
<b>Mode of delivery</b>	Vaginal	102	75.00
	LSCS	34	25.00
<b>(n=136)</b>	<b>Total</b>	<b>136</b>	<b>100.00</b>
<b>Vaginal (n=102)</b>	Normal	94	92.16
	Vacuum	6	5.88
	Forceps	2	1.96
	<b>Total</b>	<b>102</b>	<b>100.00</b>

**Table 2. Association of previous VBAC with mode of delivery**

Previous VBAC	Mode of delivery			
	LSCS		Vaginal	
	Number	Percentage	Number	Percentage
Yes	2	8.33	22	91.67
No	32	28.57	80	71.43
<b>Total</b>	<b>34</b>	<b>25.00</b>	<b>102</b>	<b>75.00</b>

**Table 3. Association of body mass index with mode of delivery**

Body mass index	Mode of delivery			
	LSCS		Vaginal	
	Number	Percentage	Number	Percentage
<19.8	0	0.00	7	100.00
19.8 to 26.00	28	22.76	95	77.24
>26.0	6	100.00	0	0.00
<b>Total</b>	<b>34</b>	<b>25.00</b>	<b>102</b>	<b>75.00</b>

**Table 4. Association of Bishop's score with mode of delivery**

Bishop's score	Mode of delivery			
	LSCS		Vaginal	
	Number	Percentage	Number	Percentage
6 to 9	31	38.75	49	61.25
10 to 13	3	5.36	53	94.64
<b>Total</b>	<b>34</b>	<b>25.00</b>	<b>102</b>	<b>75.00</b>

**Table 5. Association of baby weight on ultrasound scan with mode of delivery**

Baby weight (Kgs)	Mode of delivery			
	LSCS		Vaginal	
	Number	Percentage	Number	Percentage
2.000 to 2.499	0	0.00	11	100.00
2.500 to 2.999	26	30.59	59	69.41
3.000 to 3.500	8	20.00	32	80.00
<b>Total</b>	<b>34</b>	<b>25.00</b>	<b>102</b>	<b>75.00</b>

**Table 6. Association of scar thickness with mode of delivery**

Scar thickness	Mode of delivery			
	LSCS		Vaginal	
	Number	Percentage	Number	Percentage
2.0 to 2.9	4	33.33	8	66.67
3.0 to 3.9	17	33.33	34	66.67
4.0 to 4.9	12	20.00	48	80.00
5.0 to 5.9	1	7.69	12	92.31
<b>Total</b>	<b>34</b>	<b>25.00</b>	<b>102</b>	<b>75.00</b>

## DISCUSSION

### i- Success rate and failure percentage of VBAC

In the present study out of 136 women enrolled, 102 women underwent vaginal delivery. Hence the success rate of VBAC was 75%. There is wide variation in the success rate of VBAC in the literature and shows that there has been 60% to 80% success in attempts at VBAC. The least success rate has been reported by Vander W. et al.<sup>7</sup> (56%) in 1994 while higher success rate is demonstrated by Molloy et al.<sup>8</sup> in 1987 (91%). However these studies were performed during 1980s and this success rate could not be the basis for comparison due to the various differences like indications for VBAC, advances in the maternal care, safety aspects, which have taken place during the past two decades in field of Obstetrics. The success rate of VBAC observed in the present study was in agreement with a older study by Flam et al.<sup>9</sup> in 1990 and recent Indian studies by Doshi HU et al.<sup>10</sup> during 2010 at Ahmedabad and Kumar P et al.<sup>11</sup> during 2012 at Sevagram, Wardha. Furthermore the success rate observed in the present study was comparable with other studies in Maharashtra state by Shakti V. et al.<sup>12</sup> in 2006 (72.1%) at Armed Forces Medical College, Pune but slightly low compared to study by Vidyadhar B et al.<sup>13</sup> in our own settings (85%) during 2011.

### ii-Failure rate of VBAC

In the present study out of 136 women enrolled, 34 women had repeat emergency LSCS hence the failure percentage of VBAC was 25%. Dhillon et al.<sup>14</sup> in a large nationwide prospective data from ICMR was recorded on management practices, associated complications and mortality for a period of 8 months in 2005-2006 at 30 medical colleges/teaching hospitals for delivery and reported failure rate of VBAC as 37.7%.

In the present study the commonest indication for emergency LSCS was scar tenderness (44.12%) followed by fetal distress (20.59%), thick meconium stained liquor, non progress of labour (11.76%) and Failure of induction (8.82%). Rubina Bashir et al.<sup>15</sup> study showed that FD, delayed in descent and scar tenderness, were the indications for repeat caesarean section. Shakti V. et al.<sup>12</sup> reported foetal distress (50.0%) as the commonest indication for emergency caesarean section followed by scar tenderness (22.7%), failure to progress of scar (13.7%), abruption placenta (9.1%) and cord prolapsed (4.5%). Begum I et al.<sup>16</sup> in their study reported foetal distress (37%) as the commonest indication for emergency caesarean section followed by scar tenderness (16.6%).

### iii-Body mass index

In the present study 90.44% of the women had normal body mass index (19.80 to 26.00 Kg/m<sup>2</sup>)

and significantly higher number of vaginal deliveries were noted in women with normal (77.24%) body mass index ( $p < 0.001$ ). These findings suggest that, women having normal body mass index are ideal candidates for VBAC. However there was lack of data in the literature to support these findings.

#### **iv-Indication for LSCS during previous pregnancy**

In this study, the commonest indication for the LSCS during the previous pregnancy was foetal distress (44.12%) followed by breech (18.38%). The other indications were severe oligo-hydramnios (8.82%), transverse lie (5.88%), Failure of induction, severe preeclampsia (4.41% each), big baby, loop of cord (3.68% each), Non progress of labour (2.94%), dystocia, severe IUGR (1.47%) and eclampsia (0.74%).

It is reported that, the indication of prior caesarean section is significantly associated with the success of current VBAC. VBAC is maximally successful in women who were operated previously for non recurrent indications such as malpresentations, foetal distress, dystocia, antepartum hemorrhage etc. This underlines the need to evaluate such women with more precision while subjecting them to a primary caesarean section, and to clinically correlate the cases which were subjected to LSCS for so called foetal distress.<sup>10</sup>

In a prospective study carried out on 263 women by VardhanS. et al.,<sup>12</sup> significantly higher success rates were observed for VBAC in women with prior caesarean for non-recurrent indications- 91% for breech, 88% for foetal distress and 70% for dystocia. Also, VBAC rates approaching 67% are seen when prior section is done for CPD. Brill and Windrim<sup>17</sup> systematically reviewed all English-language articles describing the impact of various factors on outcomes when VBAC is attempted.

Articles reviewed included published abstracts, retrospective and prospective studies, and meta-analyses. They concluded that a non-recurrent indication for previous caesarean section (CS), such as breech presentation or foetal distress, is associated with a much higher successful VBAC rate than recurrent indications such as cephalopelvic disproportion (CPD). Even with a history of CPD, two-thirds of the women will have successful VBAC, though rates decrease with increasing numbers of prior CS. This emphasizes that for a successful VBAC the previous indication for caesarean section should be carefully evaluated and patients with non recurrent indications should be recruited for vaginal delivery.

Wing and Paul<sup>18</sup> stated that success of VBAC varies with the indications of primary caesarean section and reported 91%, 84% and 77% success when the previous LSCS was for breech presentation, foetal distress, and dystocia respectively. However, in the present study we could not find the association between individual indications for prior caesarean due to inadequate distribution of sample.

#### **y-Prior VBAC**

Prior vaginal delivery subsequent to LSCS was also associated with higher chances of VBAC. In a study of 318 women by Iyer<sup>19</sup> it is stated that there are more chances of VBAC (84.8%) in women with history of previous vaginal delivery compared to ones without (62.7%) ( $p < 0.01$ ). Similarly women with a prior vaginal delivery have higher rates of successful VBAC than patients without a prior vaginal birth.<sup>51</sup> Furthermore, women with a successful VBAC have a higher success rate in a subsequent trial of labour compared with women whose vaginal delivery was prior to caesarean delivery.<sup>20</sup> The findings of the present study were consistent with this hypothesis as 17.65% of the women had history of previous VBAC and significantly higher number of women who had

history of previous VBAC had vaginal delivery (91.67%;  $p=0.038$ ).

#### **vi-Favourable cervix**

Not surprisingly, patients who present to labour and delivery with advanced cervical examination findings have a greater success rate of vaginal birth. Several components of the cervical examination have been investigated, including cervical dilation and cervical effacement. The more advanced the cervical examination finding is upon initial presentation, the higher the rate of successful VBAC.<sup>20</sup> In the present study, Bishop's score was in between 6 to 9 in 58.82% cases and presence of membranes was in 79.41% cases. The success rate of VBAC was significantly high in women with Bishop's score between 10 to 13 (94.64%) compared to 6 to 9 (61.25%) ( $p<0.001$ ) but presence of membranes did not influence the success rate of VBAC ( $p=1.000$ ).

#### **vii-Baby weight**

In the present study baby weight as determined by ultrasound scan was between 2.500 to 2.999 Kgs in 62.5%. The other findings observed on ultrasound included posterior placenta in 23.53% of the women and scar thickness between 4.0 to 4.9 (44.12%). The baby weight determined by ultrasound scan was significantly associated with mode of delivery ( $p=0.049$ ) while no association was found between success rate of VBAC with scar thickness ( $p=0.157$ ) and location of placenta ( $p=0.061$ ). Birth weight greater than 4000 g is associated with an almost 4-fold higher risk of caesarean birth among nulli-parous women. Several studies have demonstrated a difference in VBAC rates between patients with a birth weight greater than 4000 g and those with a lower birth weight. In accordance with these findings, several studies have demonstrated a higher failure of a trial of labour with increasing birth weight.<sup>6,10</sup> The findings of the present study were in agreement with other

study which reported that, women with neonatal weights exceeding 3 kg had less chances of successful VBAC compared to those having neonatal weights  $\leq 3$  kg. A similar result was obtained by another study by Iyer S. et al.,<sup>19</sup> in which it was concluded that the chances of vaginal delivery decreased as the foetal weight exceeded 3.5 kg ( $P<0.05$ ).

#### **viii-Type of Labour**

The 2010 ACOG guidelines<sup>10</sup> state that induction of labor for maternal or fetal indications remains an option in women undergoing TOLAC. In the present study majority of the women (95.59%) had spontaneous labour and induction was done in 4.41%, which included cases of postdate with borderline bishops score. Induction was done using Oxytocin 1Mu till patient went into active labour, failing which patient was taken for LSCS. However, the success rate of VBAC was comparable in women with spontaneous labour and those who were induced. ( $p=0.165$ ) One study demonstrated that patients who could be induced with oxytocin had a significantly lower cesarean delivery rate compared with those induced with a Foley bulb. Farmer et al.<sup>21</sup> and Wing et al.,<sup>18</sup> in two different studies found a higher incidence of uterine rupture in cases induction with misoprostol.

Overall, the present study showed higher success rate of VBAC with in carefully selected and monitored patients with lower incidence of complications. VBAC definitely reduces the caesarean section rate and thus its associated morbidity and mortality. Careful selection of patients is the corner stone of successful VBAC with special consideration of maternal age and gestational period.

#### **CONCLUSION**

In the present study ,it was observed that the common predictors of successful VBAC were history of previous successful VBAC, normal body

mass index, higher Bishop's score, spontaneous onset of labour and average baby weight, while the success rate of VBAC was independent of maternal age, gravidity, antenatal care, presence of membranes, scar thickness and location of placenta. A higher bishops' score was always a promising predictor for VBAC.

The present study showed that trial of vaginal delivery in properly selected patients is safe, provided trials are conducted in an institution, under constant supervision and termination done by caesarean section, when need arises. A successful VBAC reduces the caesarean section rate and its associated morbidity and mortality.

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