

Outcome of the vaginal birth after cesarean section during the second birth order in West Kazakhstan

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ABSTRACT

Background: Vaginal birth after cesarean section (VBAC) increases the chance of subsequent vaginal deliveries and reduces the repeat cesarean section (CS) rate with subsequent postoperative morbidity. **Objectives:** To detect the outcome of VBAC during the second birth order in Aktobe region of West Kazakhstan. **Patients and Methods:** A total of 832 women eligible for trial of VBAC were included in this study. Women who signed the consent of VBAC were evaluated thoroughly and data such as maternal age, body mass index, height, gestational age at admission, indication of the previous CS, estimated fetal weight, engagement of the fetal head, condition of the membranes, and cervical dilatation were collected. Data collected after delivery include duration from active phase of labor, mode of delivery, fetal, and neonatal outcomes. The collected data analyzed to detect the outcome of trial of VBAC during the second birth order in Aktobe region of West Kazakhstan. **Results:** Logistic analysis and odds ratio (OR) showed that body mass index (BMI) ≤ 25 kg/m² (OR 1.7; $P = 0.0004$), height ≥ 150 cm (OR 1.7; $P = 0.002$), gestational age ≤ 40 weeks (OR 2.3; $P = 0.0001$), and inter-delivery interval ≥ 2 years (OR 1.6; $P = 0.008$) were significantly associated with successful VBAC. In addition, $< 2/5$ of the fetal head palpable abdominally, station < -2 (OR 1.7; $P = 0.0009$), cervical dilatation ≥ 4 cm (OR 1.7; $P = 0.003$), and duration of active phase of labor ≤ 7 h (OR 1.6; $P = 0.01$) were significantly associated with successful VBAC. **Conclusion:** VBAC is safe in properly selected cases. BMI ≤ 25 kg/m², gestational age ≤ 40 weeks, inter-delivery interval ≥ 2 years, and fetal head < -2 station increase the success of VBAC. Prolonged active phase of labor > 7 h and the need for labor augmentation decrease the chance of VBAC success.

Keywords: Outcome, vaginal birth, previous cesarean, West Kazakhstan

Introduction

Women with repeat cesarean sections (CSs) are at higher risks of bladder, bowel injuries, blood transfusion, and hysterectomies.^[1,2] A survey conducted by the World Health Organization (WHO) found that women with previous one CS and singleton pregnancy are the main contributors to overall cesarean delivery rates.^[3]

A meta-analysis conducted by Ellen and Eileen found that vaginal birth after cesarean section (VBAC) may result in small

increase in uterine rupture and fetal mortality rates compared with elective repeat CS, while the successful VBAC may reduce the febrile morbidity, blood transfusion, and hysterectomy rates.^[4]

The authors concluded that VBAC decreases the maternal febrile morbidity, blood transfusion, and hysterectomy rates compared with elective repeat CSs.^[3-5] In addition, VBAC increases the chance of subsequent vaginal deliveries and reduces the repeat CS rate with subsequent postoperative morbidities.

Studies concluded that the success rate of VBAC ranges from 68 to 77%.^[5-7] VBAC is encouraged in developing countries to reduce

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the cost and morbidity of elective repeat CSs. Many previous studies were conducted to evaluate VBAC irrespective of the birth order,^[8-12] whereas this study was designed to evaluate the outcome of the VBAC during the second birth order in Aktobe region of West Kazakhstan.

Patients and Methods

This prospective study was conducted in Aktobe region of West Kazakhstan after approval of the study by the Local Institute Ethical Committee of the Obstetrics and Gynecology Department of West Kazakhstan State Medical University (WKSMU) over 3 years from 2010 to 2013.

VBAC was routinely offered at WKSMU to women fulfilling the criteria for VBAC, according to the hospital protocol. Eligibility criteria for VBAC include previous one lower segment cesarean section (LSCS) for nonrecurrent cause (placenta previa, malpresentation, malposition, fetal distress, failed induction of labor, post term pregnancy), single-intrauterine pregnancy, vertex presentation, estimated fetal weight (EFW) ≤ 3.5 kg, and clinically adequate maternal pelvis.

Women eligible for VBAC presented to the hospital in spontaneous labor pains without antepartum hemorrhage or fetal distress, willing to undergo trial of vaginal birth examined and the decision of labor augmentation decided by the consultant on duty.

A total of 832 women with single-intrauterine pregnancy, vertex presentation ≥ 37 and $\leq 40^{+6/7}$ weeks' gestation, presented to the hospital in spontaneous labor pains were eligible for VBAC according to the hospital protocol and included in this prospective study after counseling and written informed consent.

Women with upper segment uterine scar (previous classical CS, previous myomectomy), antepartum hemorrhage (placenta previa, abruption placenta), severe hypertension or uncontrolled diabetes mellitus, clinically EFW > 3.5 kg, intrauterine growth restriction, post term (> 42 weeks' gestation) were excluded from this study.

VBAC is a trial of vaginal delivery for women delivered once by LSCS. Successful VBAC is spontaneous, vacuum-assisted, or outlet forceps-assisted vaginal delivery for women undergoing VBAC. Unsuccessful VBAC is failure to achieve vaginal delivery for women undergoing VBAC. Augmentation of labor is achievement of 4–5 uterine contractions every 10 min and each contraction lasting for 45–60 s by the use of oxytocin in women with ineffective uterine contraction during VBAC.

Women who signed the consent of VBAC were evaluated thoroughly to collect maternal age, body mass index (BMI), height, gestational age at admission, indication of the previous LSCS, EFW, engagement of the fetal head, condition of the membranes (ruptured or intact), and cervical dilatation in centimeters.

Engagement of the fetal head means passage of the largest transverse diameter of the fetal head through the plan of the pelvic inlet, identified by the first pelvic grip when $< 2/5$ of the fetal head felt abdominally and the lowest bony part of the head at the level of the ischial spines (station 0).

Data collected after vaginal delivery include duration from active phase of labor (cervix 4 cm dilated until delivery), mode of delivery (spontaneous or assisted by vacuum or outlet forceps), fetal outcome, APGAR score, and neonates admitted to the neonatal intensive care unit (NICU).

Women admitted with uterine cervix dilated > 4 cm, the active phase recognized from the onset of regular painful uterine contractions of increasing strength and duration.

Sample size and statistical analysis

G*Power software used for calculation of the sample size (*Heinrich Heine Universität; Düsseldorf; Germany). A number of > 111 pregnant women were needed for a statistically acceptable sample size. The collected data were presented as mean, standard deviation (\pm SD), number, and percentage (%). Statistical analysis was done using χ^2 -test for qualitative variables, unpaired Student's *t*-test for quantitative variables, and logistic analysis to detect factors associated with successful VBAC. $P < 0.05$ was considered statistically significant.

Results

A total of 832 women with one previous LSCS were eligible for VBAC according to the hospital protocol and included in this prospective study after written informed consent. VBAC was successful in 68.9% (574/832) of the studied women, and 5.7% (33/574) of the VBAC was assisted vaginal delivery using vacuum or short-curved outlet forceps. VBAC was unsuccessful in 31.1% (258/832) of the studied women.

There was no significant difference between the successful VBAC group (574 women) and the unsuccessful VBAC group (258 women) regarding the mean age, weight, duration of second stage of labor, fetal birth weight, and APGAR score at 1 and 5 min [Table 1].

The mean BMI was significantly less in successful VBAC compared with unsuccessful VBAC group [26.6 ± 2.3 versus 26.8 ± 2.1 kg/m², respectively ($P = 0.04$; 95% CI: $-0.5, -0.2, 0.12$)].

The mean height was significantly high in successful VBAC compared with unsuccessful VBAC group [166.7 ± 7.5 versus 162.6 ± 6.5 cm, respectively ($P = 0.004$; 95% CI: $3.1, 4.1, 5.1$)], and the mean gestational age was significantly less in successful VBAC compared with unsuccessful VBAC group [38 ± 2.4 versus 38.2 ± 2.1 gestation, respectively ($P = 0.007$; 95% CI: $-0.5, -0.2, 0.1$)] [Table 1].

Table 1: Maternal characteristics on admission, duration of active labor, and APGAR score of the studied groups

Variables	Successful VBAC (n=574)	Unsuccessful VBAC (n=258)	P (95% CI of difference)
Age (years)	27.2±2.2	26.9±3.1	1** (-0.12, 0.3, 0.71)
BMI (kg/m ²)	26.6±2.3	26.8±2.1	0.04* (-0.5, -0.2, 0.12)
Height (cm)	166.7±7.5	162.6±6.5	0.004* (3.1, 4.1, 5.1)
Weight (kg)	74.4±6.6	78.4±9.5	1** (-5.3, -4, -2.7)
Gestational age (weeks)	38±2.4	38.2±2.1	0.007* (-0.5, -0.2, 0.1)
Duration of second stage of labor (h)	1.8±1.2	2.2±2.8	1** (-0.8, -0.4, -0.04)
Cervical dilatation on admission (cm)	4.2±3.6	4.1±3.2	0.01* (-0.3, 0.2, 0.7)
Duration of active phase of labor (h)	6.4±1.7	8.6±1.5	0.01* (-2.4, -2.2, -1.9)
Birth weight (kg)	3.1±0.5	3.3±0.8	1** (-0.3, -0.2, -0.09)
APGAR score 1 min	7.5±1.8	7.1±1.9	0.8** (0.13, 0.4, 0.7)
APGAR score 5 min	8.5±0.5	8.2±0.8	1** (0.19, 0.3, 0.4)

**Nonsignificant difference; *Significant difference; Data presented in mean±SD; Unpaired Student's *t*-test used for statistical analysis of the data; BMI: Body mass index; VBAC: Vaginal birth after cesarean section

The cervical dilatation on admission was significantly high in successful VBAC compared with unsuccessful VBAC group [4.2 ± 3.6 versus 4.1 ± 3.2 cm, respectively ($P = 0.01$; 95% CI: -0.3, 0.2, 0.7)]. Also, the duration of active phase of labor was significantly less in successful VBAC compared with unsuccessful VBAC group [6.4 ± 1.7 versus 8.6 ± 1.5 h, respectively ($P = 0.01$; 95% CI: -2.4, -2.2, -1.9)] [Table 1].

The number of women with BMI >25 kg/m² was statistically high in unsuccessful VBAC compared with successful VBAC group [33.7% (87/258) versus 21.9% (126/574); respectively] and the number of women with height <150 cm was statistically high in unsuccessful VBAC compared with successful VBAC group [24% (62/258) versus 15.2% (87/574), respectively]. In addition, the number of women admitted in labor with gestational >40 weeks was statistically high in unsuccessful VBAC compared with successful VBAC group [18.6% (48/258) versus 9.1% (52/574), respectively] and the number of women with inter-delivery interval <2 years was statistically high in unsuccessful VBAC compared with successful VBAC group [19.8% (51/258) versus 12.7% (73/574), respectively] [Table 2].

The number of women admitted with ≥2/5 of fetal head palpable abdominally and head station ≥-2 was statistically high in unsuccessful VBAC compared with successful VBAC group [31.4% (81/258) versus 20.7% (119/574), respectively]. In addition, the number of women admitted with cervical dilatation <4 cm was statistically high in unsuccessful VBAC group compared with successful VBAC group [23.3% (60/258) versus 14.8% (85/574), respectively] and the number of women with duration of active phase of labor >7 h was statistically high in unsuccessful VBAC group compared with successful group [20.5% (53/258) versus 13.6% (78/574), respectively] [Table 2].

Logistic analysis and OR showed that BMI ≤25 kg/m² [OR 1.7 (95% CI: 1.3–2.5), $P = 0.0004$], height ≥150 cm [OR 1.7 (95% CI: 1.2–2.5), $P = 0.002$], gestational age ≤40 weeks (OR 2.3 (95% CI: 1.5–3.5), $P = 0.0001$), and inter-delivery interval ≥2 years (OR 1.6 (95% CI: 1.1–2.5), $P = 0.008$) were significantly associated with successful VBAC [Table 3].

Table 2: Maternal and obstetrics factors associated with successful VBAC

Variables	Successful VBAC (n=574)	Unsuccessful VBAC (n=258)	P
Maternal factors			
BMI >25 kg/m ²	126 (21.9%)	87 (33.7%)	0.006*
Height <150 cm	87 (15.2%)	62 (24%)	0.01*
Gestational age on admission >40 weeks	52 (9.1%)	48 (18.6%)	0.0006*
Inter-delivery interval <2 years	73 (12.7%)	51 (19.8%)	0.02*
Obstetrics factors			
Fetal head ≥2/5 palpable abdominally	119 (20.7%)	81 (31.4%)	0.01*
Fetal head station ≥-2	119 (20.7%)	81 (31.4%)	0.01*
Cervical dilatation <4 cm	85 (14.8%)	60 (23.3%)	0.01*
PROM	91 (15.9%)	47 (18.2%)	0.4**
Duration of active phase of labor >7 h	78 (13.6%)	53 (20.5%)	0.03*
Augmentation of labor	88 (32.8%)	55 (21.3%)	0.07**

**Nonsignificant difference; *Significant difference; χ^2 used for statistical analysis; Data presented in number and percentage (%); BMI: Body mass index; CI: Confidence interval; n: Number; PROM: Premature rupture of membranes; VBAC: Vaginal birth after cesarean section

In addition, <2/5 of the fetal head palpable abdominally, station <-2 [OR 1.7 (95% CI: 1.2–2.4), $P = 0.0009$], cervical dilatation ≥4 cm [OR 1.7 (95% CI: 1.2–2.5), $P = 0.003$], duration of active phase of labor ≤7 h [OR 1.6 (95% CI: 1.1–2.4), $P = 0.01$] were significantly associated with successful VBAC. The need for labor augmentation was significantly associated with unsuccessful VBAC [OR 1.5 (95% CI: 1.0–2.1), $P = 0.03$] [Table 3].

Discussion

A total of 832 women with one previous LSCS were eligible for VBAC according to the hospital protocol and included in this prospective study after written informed consent. VBAC was successful in 68.9% (574/832) of the studied women, 5.7% (33/574) of the VBAC had assisted vaginal delivery using vacuum or outlet forceps, and VBAC was unsuccessful in 31.1% (258/832) of the studied women. In Balachandran *et al.* study, 83.47% (96 women) had successful VBAC and 16.5%

Table 3: Logistic regression and odds ratio analysis of the maternal and obstetrics factors associated with successful VBAC

Variables	Successful VBAC (n=574)	Unsuccessful VBAC (n=258)	Odds ratio (95% CI) P
Maternal factors (total studied women 832)			
BMI >25 kg/m ² (n=213)	126	87	1.7 (1.3-2.5)
BMI ≤25 kg/m ² (n=619)	448	171	0.0004*
Height <150 cm (n=149)	87	62	1.7 (1.2-2.5)
Height ≥150 Cm (n=683)	487	196	0.002*
Gestational age on admission >40 weeks (n=100)	52	48	2.3 (1.5-3.5)
Gestational age on admission ≤40 weeks (n=732)	522	210	0.0001*
Inter-delivery interval <2 years (n=124)	73	51	1.6 (1.1-2.5)
Inter-delivery interval ≥2 years (n=708)	501	207	0.008*
Obstetrics factors (total studied women 832)			
Fetal head ≥2/5 palpable abdominally (n=200)	119	81	1.7 (1.2-2.4)
Fetal head <2/5 palpable abdominally (n=732)	455	177	0.0009
Fetal head station ≥-2 (n=200)	119	81	1.7 (1.2-2.4)
Fetal head station <-2 (n=732)	455	177	0.0009*
Cervical dilatation <4 cm (n=145)	85	60	1.7 (1.2-2.5)
Cervical dilatation ≥4 cm (n=687)	489	198	0.003*
PROM (n=138)	91	47	1.18 (0.8-1.7)
No PROM (n=694)	483	211	0.3**
Duration of active phase of labor >7 h (n=131)	78	53	1.6 (1.1-2.4)
Duration of active phase of labor ≤7 h (n=701)	496	205	0.01*
Augmentation of labor (n=143)	88	55	1.5 (1.0-2.1)
No need for augmentation of labor (n=689)	489	203	0.03*

**Nonsignificant difference; *Significant difference; BMI=Body mass index; CI=Confidence interval; n=Number; PROM=Premature rupture of membranes; VBAC=Vaginal birth after cesarean section

(19 women) recorded failure rate, whereas 50% (95/190) had successful VBAC and 50% (95/190) failure rate were recorded in Ugwu *et al.* study and 66% (344/522) had successful VBAC recorded by Durnwald and Mercer.^[13-15]

In Raja *et al.* study, 100 women were included and were scored according to age, gestation age, indication of the previous cesarean, vaginal birth history, Bishop's score, and BMI.^[16] They found that the rates of successful VBAC increased from 38% in women having a score of 0–3 to 58% in women having a score of 4–6. Among those having a score of 7–9 and 10–12, the success rates were 71 and 86%, respectively.^[16]

Raja *et al.* concluded that increasing scores correlated with the increasing probability of VBAC and they also concluded that the admission VBAC scoring system is useful in counseling women with previous cesarean for the option of induction of labor or repeat cesarean delivery.^[16]

In this study, the mean height was significantly high in successful VBAC compared with unsuccessful VBAC group and the number of women with height <150 cm was statistically high in unsuccessful VBAC compared with successful VBAC group.

In addition, Kirchengast and Hartmann reported that short stature was significantly associated with higher incidence of operative deliveries and CSs.^[17] In this study, the BMI was significantly less in successful VBAC compared with unsuccessful group and the number of women with BMI >25 kg/m² was significantly high in unsuccessful group.

Moreover, the mean gestational age was significantly less in successful VBAC compared with unsuccessful group and the number of women admitted in labor with gestational >40 weeks was significantly high in unsuccessful VBAC group. In addition, logistic analysis and OR of the studied women showed that the BMI ≤25 kg/m², height ≥150 cm, and gestational age ≤40 weeks were significantly associated with successful VBAC.

Abdelazim *et al.* concluded that the BMI >25 kg/m² and gestation ≥40 weeks were associated with unsuccessful trial of labor after previous CS.^[18] Landon *et al.* reported significantly lower success rate of VBAC (68.4%) in obese (BMI ≥30) than in nonobese (76.9%), and Juhasz *et al.* reported decreasing chances of successful VBAC with increasing BMI. In addition, Tessmer-Tuck *et al.* concluded that VBAC success was independently associated with maternal age <30 years, BMI <30, prior vaginal delivery, and prior VBAC.^[12,19,20]

Smith *et al.* concluded that VBAC is likely to be unsuccessful at 41–42 gestational weeks compared with VBAC at 40 weeks and Coassolo *et al.* reported 31.3% VBAC failure at 40 gestational weeks or beyond against 22% in <40 gestational weeks.^[21,22]

In addition, Tita *et al.* concluded that the risks of maternal morbidity and cesarean delivery but not neonatal morbidity increased significantly among laboring nulliparous women beyond 39 gestational weeks.^[23]

The cervical dilatation on admission and the duration of the active phase of labor in studied women were significantly high in successful VBAC compared with unsuccessful VBAC group and

the number of women admitted with cervical dilatation <4 cm and duration of active phase of labor >7 h was statistically high in unsuccessful VBAC group compared with successful group. In addition, logistic analysis and OR of the studied women showed that the cervical dilatation ≥ 4 cm and duration of labor ≤ 7 h were significantly associated with successful VBAC, and Durnwald *et al.* reported increased chances of successful VBAC in women admitted with cervical dilatation >1 cm.^[15]

The number of studied women with inter-delivery interval <2 years, $\geq 2/5$ of fetal head palpable abdominally, and fetal head station ≥ -2 was significantly high in unsuccessful VBAC compared with unsuccessful group. Logistic analysis and OR of the studied women showed that the inter-delivery interval ≥ 2 years, $<2/5$ of the fetal head palpable abdominally, and fetal head station <-2 were significantly associated with successful VBAC.

Abdelazim *et al.* concluded that the women admitted with cervical dilatation <4 cm and head station ≥ -2 are at high risk of unsuccessful trial of labor after previous CS.^[18] A total of 100 women included in Raja *et al.* study scored according to maternal age, gestation, indications of previous cesarean, history of vaginal birth, Bishop's score, and BMI.^[16] Raja *et al.* concluded that increasing scores correlated with the increasing probability of VBAC.^[16]

In this study, the NICU admission was significantly high in unsuccessful VBAC compared with successful group [1.9% (5/258) cases (two birth asphyxia and three meconium aspiration) versus 0.17% (1/574) one case (meconium aspiration); respectively ($P = 0.02$)]. Ball and Hinshaw and Tan *et al.* reported high risks of neonatal morbidity and hypoxic ischemic encephalopathy after unsuccessful VBAC.^[7,24]

In this study, the scar dehiscence was found in 0.38% (1/258) case and impending rupture uterus was found in 0.38% (1/258) of unsuccessful VBAC compared with successful group ($P = 0.08$). Premature rupture of membranes (PROM) does not affect the success of the VBAC, while logistic analysis and OR showed that the augmentation of labor was significantly associated with unsuccessful VBAC. Scar dehiscence risk of 0.2–0.7% in women undergoing VBAC was reported in the literature and by Cahill *et al.*^[5,8]

Careful decision of labor augmentation and spontaneous onset of labor in women with previous LSCS increase the success of VBAC. Smith *et al.* concluded that women with failed VBAC are at higher risk of uterine rupture and perinatal death.^[21] Hochler *et al.* reported 0.3% risk of uterine rupture and two cases ended in hysterectomy during their retrospective study to evaluate the safety of trial of labor after cesarean delivery in multiparous women.^[25] They concluded that the VBAC conferred a higher risk for hysterectomy and neither induction nor augmentation of labor increased the risk of uterine rupture.^[25]

Minsart *et al.* found that the North American and Australian women who deliver in Shanghai have low rates of attempted trial of labor after CS and VBAC, while the European women having the highest rate of trial of labor after CS, followed by Chinese women.^[26]

Belihu *et al.* found that there are disparities in successful VBAC between Eastern African origin and Australian-born women. Unsuccessful VBAC attempt is more common among Eastern African immigrants, suggesting the need for improved strategies to select and support potential candidates for vaginal birth among these immigrants and to reduce potential complications associated with failed VBAC attempt.^[27]

Torigoe *et al.* found that the institutional policies and practices for VBAC vary widely in Japan and concluded that strategies as well as pregnancy care providers are needed to support women to consider VBAC as a possible birth option after CS.^[28] Mu *et al.* concluded that national policies and guidelines on VBAC are needed to ensure the safety of the mothers and their newborns.^[29] Seffah and Adu-Bonsaffoh concluded that adequate patient education and counseling in addition to appropriate patient selection for trial of labor after CS remains the cornerstone to achieve high VBAC success rate with minimal adverse outcomes in low-resource settings.^[30] Many previous studies were conducted to evaluate VBAC irrespective of the birth order,^[8-12] whereas this study was designed to evaluate the outcome of the VBAC during the second birth order in Aktobe region of West Kazakhstan.

The strength of this study is from the conduction of the study over 3 years in the tertiary hospital, large number of the studied population, comparative nature of the study, and proper statistical analysis. Women eligible for VBAC according to the hospital protocol but refused to sign the consent for VBAC and decided to deliver through elective cesarean was the only limitation faced during this study.

Conclusion

VBAC is safe in properly selected cases. BMI ≤ 25 kg/m², gestational age ≤ 40 weeks, inter-delivery interval ≥ 2 years, and fetal head <-2 station increase the success of VBAC. Prolonged active phase of labor >7 h and the need for labor augmentation decrease the chance of VBAC success.

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Conflicts of interest

There are no conflicts of interest.

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