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Original Research Article

Factors Associated with Success of Vaginal Birth after Cesarean Section in Association to Maternal and Neonatal Outcomes

Nihayat Bakr Abdulrahman[1*], Srwa Khalid Ismail[2]

[1]MBchB, KBMS trainee in Obstetrics and Gynecology, Maternity teaching hospital, Erbil, Kurdistan-Iraq
[2]Consultant Obstetrician &Gynecologist, FRCPI, CCST, MRCOG, MRCPI, DRCOG, BSCCP, Trainer at British Fertility Society, Chair of Obs & Gyn Division SoM-UKH

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***Corresponding author:** Nihayat Bakr Abdulrahman

Abstract

Background: the likelihood of successful vaginal delivery is affected by various factors. We aimed to assess the factors that are associated with successful vaginal delivery following cesarean section CS. ***Methods:*** This was a prospective observational study that assessed the effect of maternal age, parity, antenatal care visit, gestational age, history of medical illness, smoking history, indication for past cesarean section, inter delivery interval, history of previous successful vaginal birth after cesarean section VBAC, past spontaneous vaginal delivery, membrane status on admission, cervical dilatation on admission, duration of labour, meconium stained liquor on the likelihood of achieving vaginal delivery following a previous CS. ***Results:*** about 500 pregnant women with previous one lower segment CS were included in the study, 83% (415/500) achieved with successful (VBAC), and 17 % (85/500) ended with failed trial of labour after cesarean section (TOLAC). Fifty –eight percent of the participants with successful VBAC had a history of vaginal delivery. ***Conclusion:*** success rate of VBAC is high and TOLAC is safe for most of pregnant women who attempt to deliver vaginally after one CS. Successful VBAC may help in decision making and contribute to a reduction in cesarean delivery rates and reduce maternal morbidity and mortality associated with repeated CS.

Keywords: vaginal birth after cesarean section, trial of labour after cesarean section, factors, delivery outcomes.

INTRODUCTION

The optimal mode of subsequent delivery of women with prior caesarean birth remains a subject of intense research and debate in contemporary obstetric practice especially in low resource settings**.** Vaginal birth after cesarean section (VBAC) is one of the strategies developed to reduce the rising rate of cesarean sections (CSs) [1]. VBAC provides women who desire a vaginal delivery the possibility of achieving that goal after CS [2]. VBAC is associated with shorter hospitalization, less blood loss, less infection, fewer transfusion events, and fewer thrombo-embolic events than cesarean delivery [3]. It is important to counsel women with previous one CS, about mode of delivery and to inform them about possible risks and benefits of VBAC versus elective recurrent CS [4]. Despite our limited local resources, we believe it is worth while encouraging women who fulfill specific criteria consider VBAC as recommended by Royal College of Obstetrics and Gynecology RCOG, and American College of Obstetrics and Gynecology ACOG [5, 8]. If we do the challenge of VBAC in our low resource hospital what complications we might face? Can we deprive our women from trying VBAC because of limited facility in our hospital? We lack some facilities which are recommended by RCOG and ACOG such as, one to one care, epidural anesthesia and continuous electronic fetal monitoring in north Iraq Kurdistan region because of hospital load.

There have been multiple observational studies that have assessed the probability that a woman who under taken a trial of labor after caesarean (TOLAC) will have a vaginal birth, probability of a successful VBAC that ranges between 60% to 80%, however the probability for success individual patient may vary on the basis of particular demographic characteristics and obstetric history as well as events specific to the antepartum and intrapartum periods of pregnancy, and also local obstetric resources in which trial of labor being considered [6]. It has been shown that having a

history of a previous vaginal birth and no recurrence of the indication for the first C-section are positive predictors for successful VBAC [7].

Repeated cesarean section increase maternal morbidity such as morbidly adherent placenta ,cesarean hysterectomy ,uterine rupture, scar dehiscence, massive bleeding, blood transfusion, wound infection, endometritis, and mortality, VBAC might reduce these risks [8].

The purpose of this study is to review the risks and benefits of VBAC in a low resource hospital setting hoping to establish our own guidelines similar to this of developing countries, and also to assess the factors that lead to a successful VBAC in our setting.

METHOD

Participant selection and settings

The study was conducted in maternity hospital in Erbil, Iraq, Kurdistan region. This is a teaching hospital which provides a 24hr. obstetric care. Most of the deliveries, and evaluations made, by residents with specialist supervision. This prospective study investigated 500 pregnant women with previous one lower segment cesarean section at active phase of first stage of labour with cervical dilatation 4cm and more, samples collected over two years from April 2019 till April 2021 . The hospital offer trial of labour, after counseling patients about the pros and cons if the following criteria are fulfilled: women with previous one lower segment cesarean section, singleton pregnancy, cephalic presentation, cases in which vaginal delivery is not contraindicated, with no history of uterine rupture, no history of previous classical incision, has no other obstetric indication for CS, with gestational age of at least 24wk or weight of 500g or more.

Data collection and procedures

We assessed the effect of the following factors including (maternal factors such as: age, parity, frequency of antenatal care visit, gestational age, history of medical illness, smoking history, indication for previous cesarean section, inter delivery interval, history of previous successful VBAC, previous spontaneous vaginal delivery, membrane status on admission, cervical dilatation on admission, duration of labour, meconium stained liquor, post-partum hemorrhage, perennial trauma, cervical tear, blood transfusion, scar dehiscence and uterine rupture, and fetal factors such as: Apgar score of baby, respiratory distress syndrome, birth weight, admission to neonatal care unit),on the likelihood of achieving VBAC as well as the factors that lead to failure of VBAC, data on pregnancy outcome obtained. Follow up of all participants to delivery was conducted.

Ethical approval and informed consent

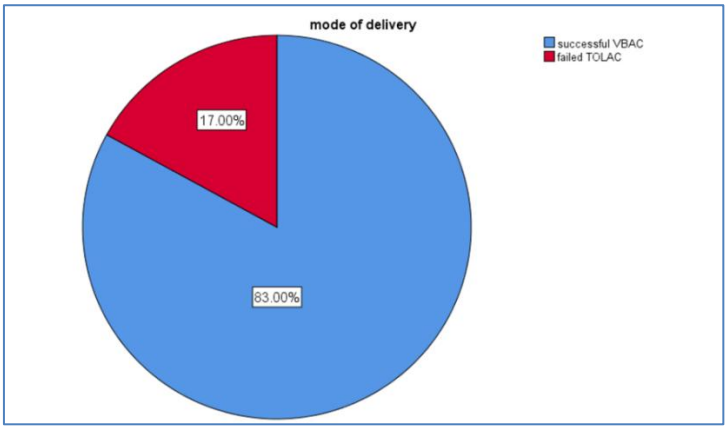
This study was approved by the ethics and scientific committees of the Kurdistan Board of Medical Specialist for scientific and ethical approval. All participants agreed to participate; written informed consent was approved from all participants.

STATISTICAL ANALYSIS

Data entered and analyzed using statistical package for social sciences version 25(SPSS Inc., IBM company, Chicago, Illinois, USA). Descriptive analyses were expressed as frequencies and percentages and the various parameters were compared between the subjects with different variables using a statistical significance level of 0.05, and analyzed using t-test and Pearson chi-square or Fisher's exact tests if necessary.

RESULTS

The sample included 500 pregnant women with previous one lower segment CS. The observed rate of successful VBAC was 83% (415/500). Fifty –eight percent of the participants with successful VBAC had a history of previous vaginal delivery. The rate of successful VBAC was higher among women who had regular antenatal care, with gestational age <40wk, inter delivery interval >2yr, birth weight <4kg, duration of labour <6hr.



According to our result age group<20yr they have 100% success rate as chance of further future fertility is high in their age compared to those above age of 40yr who have less chance of success, with (p: 0.146) (see table 1).

Table-1: Comparison of age group

age groups	successful VBAC	failed TOLAC	Total
< 20 years	6	0	6
	100.0%	0.0%	100.0%
20 - 29 years	235	58	293
	80.2%	19.8%	100.0%
30 - 40 years	171	26	197
	86.8%	13.2%	100.0%
> 40 years	3	1	4
	75.0%	25.0%	100.0%
Total	415	85	500
	83.0%	17.0%	100.0%

Women with regular ANC visit have higher rate of successful VBAC (P<0.001) compared to those who did not, as shown in Table 2.

Table-2: Antenatal care visit

	successful VBAC	failed TOLAC	Total
ANC regular	239	17	256
	93.4%	6.6%	100.0%
irregular	172	49	221
	77.8%	22.2%	100.0%
none	4	19	23
	17.4%	82.6%	100.0%
Total	415	85	500
	83.0%	17.0%	100.0%

In regard to gestational age group possibility of successful VBAC is zero in post term pregnancy while higher in term and preterm age group with (p: <0.001) (see Table 3).

Table-3: Gestational age group possibility of successful VBAC.

Gestational age (week)	Successful VBAC	failed TOLAC	Total
pre-term	63	8	71
	88.7%	11.3%	100.0%
term	352	72	424
	83.0%	17.0%	100.0%
post-term	0	5	5
	0.0%	100.0%	100.0%
Total	415	85	500
	83.0%	17.0%	100.0%

According to our study relation of medical illness and VBAC was statistically not significant, with (P: 0.658) (see Table 4).

Table-4: Medical illness among women undergoing TOLAC.

		Successful VBAC	failed TOLAC	Total
medical illnesses	yes	30	5	35
		85.7%	14.3%	100.0%
	no	385	80	465
		82.8%	17.2%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

Relation of smoking and VBAC was statistically not significant with (P: 0.072) (see Table 5).

Table-5: Smoking

		Successful VBAC	failed TOLAC	Total
smoking	yes	6	4	10
		60.0%	40.0%	100.0%
	no	409	81	490
		83.5%	16.5%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

According to our study the rate of successful VBAC is significantly (P :< 0.001) high among those with inter delivery interval >2yr had higher chance of VBAC compared to those who had interdelivery interval <2yr (see Table 6).

Table-6: Interdelivery interval

		Successful VBAC	failed TOLAC	Total
inter delivery intervals (year)	< 2 years	59	34	93
		63.4%	36.6%	100.0%
	2-4 years	295	45	340
		86.8%	13.2%	100.0%
	> 4 years	61	6	67
		91.0%	9.0%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of successful VBAC was significantly (P: 0.001) high (92.2%) among women who had previous successful VBAC compared with 79% among women who have no previous VBAC, as presented in (Table 7).

Table-7: Women with previous history of successful VBAC.

		successful VBAC	failed TOLAC	Total
previous successful VBAC	yes	141	12	153
		92.2%	7.8%	100.0%
	no	274	73	347
		79.0%	21.0%	100.0%
Total	415	85	500	
		83.0%	17.0%	100.0%

The incidence of successful VBAC was significantly (P: 0.011) higher (86.6%) among women who had previous vaginal delivery compared with (78%) among women who have no previous vaginal delivery see (Table8).

Table-8: Previous vaginal delivery

		successful VBAC	failed TOLAC	Total
previous VD	yes	252	39	291
		86.6%	13.4%	100.0%
	no	163	46	209
		78.0%	22.0%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of successful VBAC was not significantly high (P: 0.747) among women who presented with intact membrane on admission compared to those presented with membrane rupture on admission (see Table 9).

Table-9: Membrane status at admission

		successful VBAC	failed TOLAC	Total
membrane status at	intact	385	78	463
admission		83.2%	16.8%	100.0%
	ruptured	30	7	37
		81.1%	18.9%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of successful VBAC was significantly (P :< 0.001) higher (91.5%) with duration of labour <6hr. compared with 66.7% among women with duration of labour >6hr., as duration of labour increased failure rate increased (see Table 10).

Table-10: Duration of labour from admission until delivery

duration of labour (hour)	successful VBAC	failed TOLAC	Total
< 6 hour	301	28	329
	91.5%	8.5%	100.0%
≥6 hour	114	57	171
	66.7%	33.3%	100.0%
Total	415	85	500
	83.0%	17.0%	100.0%

According to our study those who had meconium stained liquor VBAC success rate was 50%, but they should be counseled thoroughly if they have meconium stain liquor in early labour or thick meconium or meconium with reduced liquor volume (see Table 11).

Table-11: Meconium stained liquor and VBAC success rate p: < 0.001

		successful VBAC	failed TOLAC	Total
meconium	yes	21	21	42
		50.0%	50.0%	100.0%
	no	394	64	458
		86.0%	14.0%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of blood transfusion was significantly (P:<0.001) much higher 66.7% among women with failed TOLAC compared with 33.3% among women with successful VBAC, so patient should have blood cross matched and ready who undergo TOLAC and duration of labour close to 6hr or more (see Table 12).

Table-12: Blood transfusion

		successful VBAC	failed TOLAC	Total
blood transfusion	yes	4	8	12
		33.3%	66.7%	100.0%
	no	411	77	488
		84.2%	15.8%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of scar dehiscence and uterine rupture was significantly (P: 0.001) higher among women undergo failed TOLAC compared to those with successful VBAC, only one case diagnosed as scar dehiscence post-delivery, patient presented with massive postpartum hemorrhage and collapse, on bimanual examination there was a defect at site of scar. Prolonged labour, short interdelivery interval, birth weight 3.5kg and more, gestational age more than 38wk were risk factors for scar dehiscence and uterine rupture (see Table 13).

Table-13: Scar dehiscence and uterine rupture

		successful VBAC	failed TOLAC	Total
scar dehiscence and uterine	yes	*1	10	11
rupture		9.1%	90.9%	100.0%
	no	414	75	489
		84.7%	15.3%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

*diagnosed postpartum (both baby and mother were alive).

The incidence of low Apgar score was significantly (P: 0.001) higher (52.8%) among women with failed TOLAC, possibly due to scar dehiscence and uterine rupture, meconium, prolonged labour, antepartum hemorrhage, compared with (47.2%) among women with successful VBAC, (see table 14).

Table-14: Apgar score of new born

		successful VBAC	failed TOLAC	Total
Low Apgar score	yes	17	19	36
		47.2%	52.8%	100.0%
	no	398	66	464
		85.8%	14.2%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of successful VBAC was significantly (P:0.001) higher among women with birth weight <4kg compared to those with higher birth weight, lower the birth weight the higher success rate ,fetal ultrasound suggested weight should be taken in to consideration before deciding on trial of labour(see table 15).

Table-15: Birth weight

		successful VBAC	failed TOLAC	Total
birth weight (Kg)	< 2.5 kg	16	2	18
		88.9%	11.1%	100.0%
	2.5 - 4 kg	391	73	464
		84.3%	15.7%	100.0%
	> 4 kg	8	10	18
		44.4%	55.6%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

The incidence of admission to NCU was higher among failed TOLAC compared to successful VBAC with (P: 0.001) (see table 16).

Table-16: Admission to NCU

		successful VBAC	failed TOLAC	Total
admission to NCU	yes	23	25	48
		47.9%	52.1%	100.0%
	no	392	60	452
		86.7%	13.3%	100.0%
Total		415	85	500
		83.0%	17.0%	100.0%

Table-17: Causes of failed TOLAC

	failed TOLAC
fetal distress	44
	100.0%
deep transverse arrest	4
	100.0%
prolonged first stage	13
	100.0%
occiput posterior	4
	100.0%
APH	9
	100.0%
prolonged second stage	4
	100.0%
meconium	7
	100.0%
Total	85
	100.0%

We assessed the relevance, if any, of parity and cervical dilatation at the time of admission. Neither of them impacted the likelihood of successful vaginal delivery (see Table 18).

Table-18: Parity and cervical dilatation on admission

Variables	mode of delivery	N	Mean	Std. Deviation	p-value	t - test
parity	successful VBAC	415	2.26	1.38	0.074	Non-significant
	failed VBAC	85	1.96	1.39		
cervical dilatation at	successful VBAC	415	1.07	0.28	0.092	Non-significant
admission(cm)	failed VBAC	85	1.15	0.69		

We had 11 cases of Scar dehiscence and uterine rupture, term pregnancy, birth weight more than 3.5kg, interdelivery interval less than 2 year duration of labour more than 6 hour, are predisposing factors (see Table 19).

Table-19: Factors associated with Scar dehiscence and uterine rupture

Variables	Categories	Frequency	Percent
Gestational age (week)	pre-term	2	18.2
	term	8	72.7
	post-term	1	9.1
birth weight (Kg)	2.5 - 4 kg	7	63.6
	> 4 kg	4	36.4
inter delivery intervals	< 2 years	6	54.5
(year)	2-4 years	5	45.5
duration of labour(hour)	<6 hour	2	18.2
	≥6 hour	9	81.8
	Total	11	100

DISCUSSION

In our study we found that maternal age, regular antenatal care visit, gestational age <40wk, interdelivery interval >2yr, previous history of successful VBAC or previous vaginal delivery, duration of labour <6hr, birth weight <4kg, were strongest predictors for successful VBAC . The following factors associated with failed TOLAC, advance age, irregular or no antenatal care, post term pregnancy, short interdelivery interval <2yr, prolonged duration of labour>6hr , birth weight >4kg, having the same indication of previous cesarean section.

Previous studies found that variation in VBAC rates between and within countries due to variation in intrapartum management during labour [9]. Our study confirmed the finding of previous research that having previous vaginal delivery is positive predictor for successful VBAC, and lower risk of uterine rupture [10]. Our study show that women with regular ANC visit have higher rate of successful VBAC compared to

those who did not, perhaps to use this as more encouraging for patient to have regular visit as required as high risk group. Women with short duration of labour, they have quicker delivery and more likely to have successful VBAC in our study. In contrast other studies show that labour lasted longer associated with low CS rates [11]. Previous indication of CS could help us to choose candidate suitable to undergo TOLAC [12]. Increased age decrease chance of successful VBAC [13]. Our study show women with age <20 have 100% success rate compared to those above age 40. Our study shows that, interdelivery interval >2yr associated with successful VBAC, there is only one study show that inter delivery interval not associated with successful VBAC. WE couldn't conduct a meta-analysis to make sure whether the inter delivery <2yr is risk for failed TOLAC [14]. Our study found successful VBAC higher among gestational age <40wk, although there is some study showing gestational age not against successful VBAC [15]. Among 85 cases of failed TOLAC 15 cases (15/85) had the same indication of previous CS mostly due to poor progress of labour, others due to different indications such as: incidental fetal distress, meconium, antepartum hemorrhage….etc .The strength of the uterine scar and its capacity to withstand the stress of subsequent pregnancy and labor cannot be completely assessed or guaranteed in advance, these cases require the assessment and supervision of a senior obstetrician during labor. [16] Birth attendant should be aware of risk of scar dehiscence and uterine rupture could be associated with TOLAC. TOLAC should be conducted at a place where continuous monitoring and emergency cesarean section is available 24hr, to guarantee the safety of delivery [12]. In our study 500 cases participated among them 11 cases presented with scar dehiscence and uterine rupture all diagnosed at CS, only one case with scar dehiscence diagnosed after vaginal delivery, woman was in 2nd pregnancy previous one CS before 1yr and half, 39wk,shortly after delivery presented with massive post-partum hemorrhage, examination done by senior on call there was continuous fresh bleeding coming out from uterus on bimanual examination there was a defect at the site of previous uterine scar immediately preparation done for theater and patient transferred there was scar dehiscence ,and big hematoma formed at lower segment, later fortunately both mother and baby became well and were alive. Women with Short interdelivery interval, prolonged labour, birth weight 3.5kg and more, gestational age more than 38wk, are at high risk of uterine rupture.

This occurrence of rupture uterus and bad perinatal outcomes possibly due to women refusing to have another repeat CS [17] or delays reaching or in seeking care [18]. This challenges women to face these complications due to lack of facilities to basic intrapartum care in low-income countries [19]. Women should be counseled by an experienced obstetrician early in the 3rd trimester to agree a plan of care which should involve patient, husband, GP, midwife, senior obstetrician, when all factors should be considered and an agreed plan of care should be documented. Involving anesthetists early in labour should also be considered. The objective is to ensure the best outcome for the patient and her baby. Women with previous uterine scar thus need to be encouraged to attend to hospital at onset of labour [20]. In addition, for the women and babies to have favorable outcome, clinicians should be present and take responsibility in the labor wards to offer appropriate monitoring of labour.

CONCLUSION

Our study suggests that age of mother, regular antenatal visit, gestational age, interdelivery interval, previous vaginal delivery, indication of previous CS, duration of labor, birth weight could be considered as factors that predicting successful VBAC. Women with previous one CS who are pregnant or who have plan to become pregnant can get benefit from our study results. The results show that women without contraindication to vaginal delivery can undergo TOLAC safely with high success rate.

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