THE SUCCESS RATE OF VAGINAL BIRTH AFTER CESAREAN SECTION USING VAGINAL BIRTH AFTER CESAREAN SECTION SCORE

Taban Aziz Sidiq [a] and Sallama Kamel Nasir [b]

Submitted: 18/6/2019; Accepted: 17/2/2020; Published: 21/3/2020

ABSTRACT

Background

Increasing cesarean section (C/S) rate had been led to the creation of many models for assessing the success of vaginal birth after cesarean section (VBAC) with the aim of reducing C/S.

Objectives

Assessment of VBAC success by VBAC score (Flamm Model); including each of its items, maternal body weight and fetal outcomes.

Patients and Methods

This is a cross-sectional study including 106 pregnant ladies who had history of previous C/S and admitted to Sulaimani Maternity Teaching Hospital, Sulaimani, Kurdistan/Iraq, during April the 1st, 2018 to April the 1st, 2019. Flamm Model [Maternal age, history of vaginal birth, reasons other than failure to progress for first C/S, cervical effacement, and cervical dilatation] scoring was used for assessment of VBAC success. The body mass index (BMI), mode of delivery, fetal and maternal outcomes were also recorded.

Results

There was significant association of Flamm Model scores with VBAC success rate {P-value "Pearson's R Correlation (r)" = <0.001 (-0.742)}, i.e., the success rate was higher when the score was high. There were significant association of VBAC success rate with vaginal birth history, cervical effacement, cervical dilatation, fetal health, and BMI {P-value (r) = 0.047 (-0.101), <0.001 (-0.632), 0.001 (-0.329), <0.001 (0.39), and 0.001 (0.271)}, respectively. There were insignificant association between VBAC success rate with maternal age, reasons other than failure to progress for first C/S, and fetal weight {P-value (r) = 0.59 (0.053), 0.126 (0.148), and 0.21 (0.121)}.

Conclusion

Flamm Model is effective way of assessing VBAC and it can be used in our population.

Keywords: *Cesarean section, Flamm model, Vaginal birth after cesarean section (VBAC).*

[a] Sulaimani Maternity Teaching Hospital, Kurdistan Region, Iraq.
Correspondence: tabansam11@gmail.com
[b] Department of Surgery, College of Medicine, University of Sulaimani, Kurdistan Region, Iraq.

https://doi.org/10.17656/jsmc.10242

INTRODUCTION

Nowadays, undergoing cesarean section (C/S) for the first pregnancy became popular and it is about one-third of births [1-4]. The most widely accepted indication for C/S is having history of previous C/S; therefore, most of pregnant women with history of prior C/S are giving birth by elective repeated C/S [1, 5]. Moreover, a planned vaginal birth after cesarean section (VBAC) is safe clinically for the majorities of women with single previous lower segment C/S delivery [6]. The decision between trial of labor after cesarean section (TOLAC) and repeated elective C/S can be difficult because a failed TOLAC is associated with greater morbidity than repeated elective C/S [7-10].

Vaginal birth after cesarean section (VBAC) is a delivery of the baby through birth canal in women who had at least one previous C/S [6]. Although VBAC is usually performed for singleton pregnancies, it has about the same success and complication rates as compared with twin pregnancies [5-7]. Successful VBAC is associated with less maternal mortality, shorter recovery time after delivery, and fewer complications of subsequent pregnancies in comparison with repeated elective C/S [3, 9]. The success rate of VBAC is ranged from 70-83% in the literature [1, 3, 5-7, 9, 11]. The successful predictors of VBAC includes previous vaginal delivery (especially previous VBAC; is the single best predictor), not having the same indication as previous C/S or having history of C/S for multiple pregnancies or fetal malpresentation, gestational age of less than 40 weeks (preterm delivery has lower risk of uterine rupture), fetal weight of less than four kilograms, favorable initial pelvic examination and spontaneous onset of labor without augmentation [5-7, 11].

The complications associated with VBAC are predominantly present in women who had unsuccessful delivery and the most serious morbidity is uterine scar rupture [1, 5-8, 12]. Other complications of VBAC are scar dehiscence, postpartum hemorrhage, emergency hysterectomy and to a lesser extent, hypoxic ischemic encephalopathy and neonatal mortality especially if they were performed outside hospitals [5-8, 11]. However, C/S, as compared to vaginal delivery, is associated with longer period of recovery, higher rate of maternal visceral injuries and injuries to the infant (principally skin lacerations), infections, thromboembolism, blood loss, placenta previa and placental adhesion disorders in next pregnancy, and neonatal respiratory distress [1, 3, 5, 8, 12].

Therefore, it is wise to assess the women prenatally and decide the preferred method of delivery; either VBAC or elective C/S [5-6, 11].

There is a trend to decrease the rate of C/S because it has burden on the mothers, babies, health-care providers and government and VBAC scoring is an effect way to reach this goal [2, 13].

Nowadays, there are numbers of VBAC prediction models and one of them is Flamm model. The Flamm Model is easy and practical for use because it only needed reasons other than failure of progress for first C/S for its assessment [14].

The aims of this study was to find out the success rate of VBAC scoring in our population by using Flamm model in order to help in decreasing the need for second C/S and encouraging vaginal birth for pregnant ladies who have history of prior C/S. We also assessed the association of each items of the Flamm Model score, maternal weight and fetal outcomes with the success rates of VBAC.

PATIENTS AND METHODS

This was an observational cross-sectional study included 106 pregnant ladies who had history of previous C/S admitted to Sulaimani Maternity Teaching Hospital, Sulaimani city, Kurdistan Region, Iraq, during the period from the 1st of April 2018 to the 1st of April 2019. The women were randomly selected by using simple random sampling method which is a method of drawing samples from the target population using lottery method, i.e., every woman in the targeted population had equal chance of being selected [15].

Research Ethical Committee of Kurdistan Board of Medical Specialties (KBMS) approved the study proposal (No. 542, October 10, 2019), and a formal acceptance letter was obtained from Sulaimani Maternity Teaching Hospital before starting the study. In addition, written informed consent has also been taken from the patients for their inclusion in this study.

The inclusion criteria included the following:

1- Women with previous one lower segment C/S with or without previous vaginal birth**.**

2- Parturient who desired and accepted the trial of VBAC and had single viable fetus.

3- Vertex presentation.

4- Spontaneous onset of labor.

5- Gestational age equal or more than 37 weeks.

The exclusion criteria, including the contraindications to VBAC, were:

1. Previous classical C/S.
2. Previous two or more repeated C/S.
3. Less than 37 weeks of gestational age.
4. Twin or higher multiple pregnancies.
5. Past history of rupture uterus.
6. Short interpregnancy interval from the previous C/S of less than one year.
7. Any indication for elective C/S in current pregnancy e.g. placenta previa, fetal malposition, and postdate pregnancy.
8. Maternal complications such as preeclampsia and gestational diabetes mellitus that require emergency C/S.
9. Refusal to participate.

The VBAC scoring of Flamm Model system was used for the assessment of success of VBAC. Moreover, the Flam Model scores from (1 to 10) and consists of five components which are as follows [14]:

1- Maternal age of less than 40 years (no = 0, yes = 2).

2- History of having vaginal birth:

a- Before and after first C/S = 4.

b- After first C/S = 2.

c- Before first C/S = 1.

d- None = 0.

3- Reasons other than failure to progress for first C/S (no = 0, yes = 1).

4- Cervical effacement at admission:

a- >75% = 2.

b- 25% to 75% = 1.

c- <25% = 0.

5- Cervical dilatation of four centimeters or more at admission (no = 0, yes = 1).

The demographic features including maternal age and body mass index (BMI), parity and gravidity, history of previous vaginal birth and C/S, causes of previous C/S were recorded. Concurrently, the cervical dilatation and effacement with VBAC score were also assessed and recorded. In addition, the mode of delivery, fetal and maternal outcomes were also assessed and recorded.

The "GPower 3.1" statistical program was used for the estimation of sample size and the effect size of (0.43) was chosen. The estimation yielded 106 samples; thence, the sample size for the study was equal to 106 women. By this, the power of the study became (>95%).

Furthermore, the "IBM SPSS Statistics version 25" statistical program was used for the analysis of the data and both descriptive and inferential statistics were used. Furthermore, a P-values of ($\leq$0.05, and <0.001) were considered as statistically significant, and highly significant associations, respectively. In addition, Pearson Chi-Square was used to find out the significancy of association between independent and dependent variable pairs, and Pearson's R Correlation (r) was used to calculate the direction of the correlation between the two variables.

RESULTS

The demographic features of the study participants were shown in (Table 1).

The mean ± SD (standard deviation) of cervical dilatation was 4.1 ± 1.4 cm (ranged from 1 to 8), the mean ± SD of cervical effacement was 70.7% ± 23.1% (ranged from 20% to 100%), and the mean ± SD of baby weights was 3.38 ± 0.4 kg (ranged from 2.3 to 4.3 kg). In addition, the mean ± SD of VBAC score using Flamm Model was 5.8 ± 1.64 (ranged from 2 to 10).

There was statistically highly significant association between the scores of VBAC (Flamm Model) and the success rate; the success rate was higher when the score was high (Table 2).

There was also statistically weak negative, but significant association between vaginal birth history and VBAC success rate i.e. better outcomes were present when the women had history of vaginal delivery (42.5% out of 70.8%) (Table 4).

There was statistically weak positive and insignificant association between reasons other than failure to progress for first C/S and VBAC success rate i.e. no association was found between these two variables (Table 5).

There was statistically moderate negative and highly significant association between cervical effacement and VBAC success rate i.e. success rate became better when the value of cervical effacement became more (Table 6).

There was statistically weak negative and highly significant association between cervical dilatation and VBAC success rate i.e. success rate became better when

the value of cervical dilatation became more (Table 7).

There was statistically weak positive but significant association between BMI and VBAC success rate—the success rate was more among normal BMI group participants (Table 8).

The fetal health was well when the VBAC was successful and this association was statistically positive highly significant; while this association was statistically insignificant for the fetal weight and the success rate of VBAC (Table 9).

Table 1. Demographic characteristics of the participants.

Demographic feature		Mean ± SD	Range
Maternal age (year)		30.3 ± 5.4	20 to 46
Parity		2.2 ± 1.3	1 to 6
Residency	Inside the city	74.5%	
	Outside the city	25.5%	
BMI (kg/m²)		25.7 ± 2.3	21.3 to 32.8
Gravida		3.4 ± 1.5	1 to 7

SD = standard deviation

Table 2. Association of VBAC score using Flamm Model with the success rate of VBAC.

VBAC score (Flamm Model)	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
<5	2	1.9	22	20.8	24	22.6	
≥5	73	68.9	9	8.5	82	77.4	<0.001 (-0.742)
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 3. Association of maternal age groups with VBAC success rate.

Maternal age groups (year)	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
<40	72	67.9	29	27.4	101	95.3	
≥40	3	2.8	2	1.9	5	4.7	0.59 (0.053)
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 4. Association of vaginal birth history with VBAC success rate.

Vaginal birth history	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
None (0)	30	28.3	17	16	47	44.3	
Before first C/S (1)	11	10.4	4	3.8	15	14.2	
After first C/S (2)	11	10.4	2	1.9	13	12.3	0.047 (-0.101)
Before and after first C/S (4)	23	21.7	8	7.5	31	29.2	
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 5. Association of reasons other than failure to progress for the first C/S with the VBAC success rate.

Reasons other than failure to progress for first C/S	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
Yes	46	43.4	14	13.2	60	56.6	
No	29	27.4	17	16	46	43.4	0.126 (0.148)
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 6. Association of cervical effacement with the VBAC success rate.

Cervical effacement groups	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
<25%	0	0	6	5.7	6	5.7	
25-75%	22	20.8	23	21.7	45	42.5	<0.001 (-0.632)
>75%	53	50	2	1.9	55	51.9	
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 7. Association of cervical dilatation with the VBAC success rate.

Cervical dilatation groups (cm)	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
1-3	16	15.1	17	16	33	31.1	
≥4	59	55.7	14	13.2	73	68.9	0.001 (-0.329)
Total	75	70.8	31	29.2	106	100	

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 8. Association of BMI with VBAC success rate.

BMI groups (kg/m²)	VBAC success rate				Total		P-value (r)
	Success		Failure				
	No.	%	No.	%	No.	%	
Normal BMI (18.5-24.9)	42	39.6	6	5.7	48	45.3	0.001 (0.271)
Overweight (25-29.9)	29	27.4	24	22.6	53	50	
Obese (30-40)	4	3.8	1	0.9	5	4.7	
Total	75	70.8	31	29.2	106	100	

BMI = body mass index; r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

Table 9. Outcomes of fetus in relation to the mode of delivery.

Fetal outcomes		VBAC success rate				Total		P-value (r)
		Success		Failure				
		No.	%	No.	%	No.	%	
Fetal health	Well	59	55.7	12	11.3	71	67	<0.001 (0.39)
	Poor	16	15.1	19	17.9	35	33	
Fetal weight (kg)	<4	69	65.1	26	24.5	95	89.6	0.21 (0.121)
	≥4	6	5.7	5	4.7	11	10.4	
Total		75	70.8	31	29.2	106	100	—

r = Pearson's R Correlation; VBAC = vaginal birth after cesarean section

DISCUSSION

Most of the patients (68.9%) who had successful VBAC had a Flamm Model score of more than five and the association between the Flamm Model scores and successful VBAC were statistically significant (Table 2). These results are comparable to the study of Sahu et al. [16] in India in which they found that most of the patients who had Flamm Model score of four or more had successful VBAC and the associations between these variables were statistically significant with a P-value of (0.006). Although the results of current study were comparable with the study of Sahu et al. [16], the successful VBAC was 40% in their study. The difference in the successful rate of VBAC was due to the fact that, the study of Sahu et al. [16] was considered Flamm Model scores of four and more as successful VBAC but we considered a scores of five and more as successful. Furthermore, the study of Patel et al. [17] found results near to ours; they found a 67% successful VBAC and they used a cutoff point of five as successful for the Flamm Model and the association between the two were statistically significant.

The difference in successful rate between the studies of Sahu et al. [16] and Patel et al. [17] may be due to their sample size collection; Sahu et al. [16] collected only 75 pregnant ladies while Patel et al. [17] selected 280 pregnant women. The sample size of the current study had been estimated by "GPower 3.1" program in order to choose the best sample to biostatistically yield the results correctly. Therefore, the results of the current study were near to the results of what had been found in the previous literature as we mentioned them earlier [1, 3, 5-7, 9, 11] and they were also near to what had been found by the study of Patel et al. [17].

All the parts and items of Flamm Model have been studied separately to find out their effect on the success of VBAC. In this regard, the association of age of the pregnant women with VBAC success rate was firstly calculated and it yielded statistically insignificant association although most of those who had successful VBAC aged less than 40 years (Table 3). Supportingly, the result of current study was comparable to the study of Sakiyeva et al. [18] in which they found insignificant association of maternal age with the success rate of VBAC (P-value = 1).

Another item of Flamm Model is having history of vaginal birth. The results showed statistically significant association between successes of VBAC and having history of vaginal birth; 42.5% of the participants had history of vaginal birth before or after C/S or both (Table 4). This finding was comparable to the study performed by Patel et al. [17] and found statistically significant association of success rate of VBAC with having history of vaginal birth.

Although in the 43.4% of the women who had successful VBAC had reasons other than failure to progress for first C/S, this association was not statistically significant (Table 5). This result was comparable to the study of Birara et al. [19] although they could not know the indications for the past C/S for all of their study participants. In their study they found no statistically significant association of indications of past C/S with the success rate of VBAC except for fetal distress and failed inductions [19].

The other two components of Flamm Model were cervical effacement and dilatation. The results of current study showed statistically significant association of the success rate of VBAC with both cervical effacement (Table 6) and cervical dilatation (Table 7). These results were also comparable to the results found by Sahu et al. [16] and Patel et al. [17], there were statistically highly significant association of VBAC success rate with both cervical effacement and dilatation [16-17]. Cervical effacement and dilatation will help in the development and progress of delivery through birth canal; therefore, these can be the explanation of their significant association with the success rate of VBAC.

There was a statistically significant association of BMI and success rate of VBAC and the success rate were more common among those participants who had normal BMI (Table 8). This finding was comparable to the results found in the literature i.e. normal body weight associated significantly with the success rate of VBAC [18]. Furthermore, this may be due to an increase in the intra-abdominal pressure because of increased BMI and weak abdominal muscles; hence, failure to progress of the vaginal delivery.

Those babies who delivered vaginally had better outcome than failed VBAC and their association was statistically significant, but the association of VBAC success rate was statistically insignificant with fetal body weight (Table 9). Conversely, the association of fetal body weight with success rate of VBAC was found to be statistically significant in the study of Kalok et al. while this association with fetal health was statistically insignificant [11]. In addition, the results of the current study were supported by the study of Birara et al. [19] and they found insignificant associations between fetal body weight and success rate of VBAC.

In conclusion, Flamm Model is an effective method of assessing VBAC success rate and it can be used in our population. Although few items of Flamm Model do not have significant association with the successful VBAC; but, overall, the Flamm Model is statistically significantly associated with it.

Acknowledgements

We are thankful for "Tropk for Computer and Scientific Research" for their help in the analysis of our data and edition and proofreading for the manuscript.

Conflict of interest

The authors declare no conflict of interest

REFERENCES

1- Mooney SS, Hiscock R, Clarke ID, Craig S. Estimating success of vaginal birth after caesarean section in a regional Australian population: Validation of a prediction model. Aust N Z J Obstet Gynaecol. 2019; 59: 66–70.

2- Wyckoff ET, Cua GM, Gibson DJ, Egerman RS. Efficacy of the NICHD vaginal birth after cesarean delivery calculator: a single center experience. J Matern Fetal Neonatal Med. 2018;10:1-5.

3- Haumonte JB, Raylet M, Christophe M, Mauviel F, Bertrand A, Desbriere R, et al. French validation and adaptation of the Grobman nomogram for prediction of vaginal birth after cesarean delivery. J Gynecol Obstet Hum Reprod. 2018;47(3):127-31.

4- Yang M, Guo ZW, Deng CJ, Liang X, Tan GJ, Jiang J, et al. A comparative study of three different forecasting methods for trial of labor after cesareansection. J Obstet Gynaecol Res. 2019;45(1):119-125.

5- Smith GCS. Delivery after previous cesarean section. In: James D, Steer PJ, Crowther CA, Weiner CP, Robson SC, Gonik B, (editors). High risk pregnancy management options. 4th ed. China: Elsevier; 2011.

6- Gupta JK, Smith GCS, Chodankar RR, Alfirevic Z, Baines SM, Bewley S, et al. Birth After Previous Caesarean Birth (Green-top Guideline No. 45). London: Royal College of Obstetricians and Gynaecologists; 2015.

7- Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Hoffman BL, Casey BM, et al. Williams Obstetrics. 25th ed. New York: McGraw-Hill Education; 2018.

8- Luesley DM, Kilby MD. OBSTETRICS & GYNAECOLOGY: AN EVIDENCE-BASED TEXT FOR MRCOG. 3rd ed. New York: Taylor & Francis Group; 2016.

9- Maykin MM, Mularz AJ, Lee LK, Valderramos SG. Validation of a Prediction Model for Vaginal Birth after Cesarean Delivery Reveals Unexpected Success in a Diverse American Population. Am J Perinatol Rep 2017;7:e31–e38.

10- Sudhof LS. Has P, Rouse DJ, Hughes BL. Choice of Trial of Labor after Cesarean and Association with Likelihood of Success. Am J Perinatol. 2018;35(9):892-7.

11- Kalok A, Zabil SA, Jamil MA, Lim PS, Shafiee MN, Kampan N, et al. Antenatal scoring system in predicting the success of planned vaginal birth following one previous caesarean section. J Obstet Gynaecol. 2018;38(3):339-43.

12- Xing YP, Qi XY, Wang XZ, Yang FZ. Development of a modified score system as prediction model for successful vaginal birth after cesarean delivery. Clin Transl Sci. 2019;12(1):53-7.

13- Tilden EL, Cheyney M, Guise JM, Emeis C, Lapidus J, Biel FM, et al. Vaginal Birth After Cesarean: Neonatal Outcomes and United States Birth Setting. Am J Obstet Gynecol. 2017; 216(4): 403.e1–403.e8.

14- Flamm BL, Geiger AM. Vaginal birth after cesarean delivery: an admission scoring system. Obstet Gynecol. 1997;90(6):907-10.

15- Elfil M, Negida A. Sampling methods in Clinical Research; an Educational Review. Emergency. 2017;5(1):e52.

16- Sahu R, Chaudhary N, Sharma A. Prediction of successful vaginal birth after caesarean section based on Flamm and Geiger scoring system a prospective observational study. Int J Reprod Contracept Obstet Gynecol 2018;7:3998- 4002.

17- Patel MD, Maitra N, Patel PK, Sheth T, Vaishnav P. Predicting Successful Trial of Labor After Cesarean Delivery: Evaluation of Two Scoring Systems. J Obstet Gynaecol India. 2018;68(4):276-282.

18- Sakiyeva KZ, Abdelazim IA, Farghali M, Zhumagulova SS, Dossimbetova MB, Sarsenbaev MS, et al. Outcome of the vaginal birth after cesarean section during the second birth order in West Kazakhstan. J Family Med Prim Care. 2018;7(6):1542–1547.

19- Birara M, Gebrehiwot Y. Factors associated with success of vaginal birth after one caesarean section (VBAC) at three teaching hospitals in Addis Ababa, Ethiopia: a case control study. BMC Pregnancy Childbirth. 2013;13:31.