

Research Article

# Success Rate of Vaginal Birth After Cesarean Section and Associated Factors Among Women Who Gave Birth at Adama Hoapital Medical College

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## Abstract

**Background;** Vaginal Birth After cesarean section (VBAC) is considered a viable and safe option for many women who have previously undergone a cesarean section, particularly when the initial cesarean section was performed for a non-recurring indication. Studies indicates that VBAC can lead to lower rates of maternal complications and faster recovery times with success rate of 60-80% compared to elective repeat cesarean deliveries. **Objective;** to assess success rate of vaginal birth after cesarean section and factors associated with VBAC in woman who gave birth at AHMC in 2024. **Method;** institutional based cross-sectional study was conducted at AHMC involving 208 mothers who had undergone one previous cesarean section. Data were collected using a structured checklist that was pretested prior to the study. The collected data were entered and cleaned using Epi-data version 3.7 and analyzed with SPSS version 24 to determine frequency distributions, means, and standard deviations. Bivariate and Multivariate logistic regression analyses were performed to evaluate the success rate of vaginal birth after cesarean section and to identify factors associated with VBAC. A 95% confidence interval and 5% level precision were used to determine the presence of associations between and independent variables in the final model. **Result;** the total number of mothers with one previous cesarean section who were offered trial of labor and included in this study were 208. Out of these 86 (41.3%) with CI (34.59%-48.09%) had successful vaginal birth. Independent variables history of pervious VBAC [AOR=6.306 [1.143-34.802]], rupture of membrane at admission [AOR=5.758 [2.588-12.812] and Low station at admission [AOR=6.807 [2.34-19.796] are highly associated with VBAC. **Conclusion;** The study concluded that the overall success rate of Vaginal Birth after Cesarean (VBAC) in this research is consistent with findings from earlier studies conducted in Ethiopia. Key factors identified as predictors of VBAC success include a prior history of vaginal delivery following a cesarean section (C/S) scar, low fetal station, and membrane rupture. These elements play a significant role in determining the likelihood of a successful VBAC.

## Keywords

Success Rate, Previous C/S, Vaginal Birth, VBAC, AHMC

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**Received:** 13 January 2025; **Accepted:** 5 March 2025; **Published:** 21 March 2025



## 1. Background

Cesarean delivery, defined as the surgical extraction of a fetus via abdominal and uterine incisions, represents the most frequently performed surgical procedure on a global scale. This intervention, although instrumental in reducing maternal mortality and morbidity, exhibits substantial inter-country variation in rates (10–40%). Such high rates of cesarean delivery impose a considerable economic burden on both national health systems and individuals. Recurrent cesarean delivery represents the predominant factor contributing to the rising rate. Given the increased risk of maternal morbidity associated with repeat cesarean procedures and the demonstrable safety of vaginal birth after cesarean section (VBAC) in carefully selected patient cohorts, a trial of labor is now regarded as the preferred strategy for eligible individuals with a prior uterine scar [1].

In response to this efforts have been made to reduce the rates of repeated cesarean delivery and trial of labor after cesarean section (TOLAC) has been there commended method as successful vaginal birth after cesarean section (VBAC) is proved to have better maternal and fetal outcome compared with elective repeated cesarean delivery [1].

By choosing the natural birth route to decrease repeated cesarean section, the potential complications of surgical procedures are avoided. The benefits of natural birth are multiple such as avoiding a new uterine incision, a fact that increases the chances of a vaginal birth in the future [2].

In addition, each cesarean scar on the uterine wall the risk of complications of subsequent pregnancies increases, like pregnancy implanted in the uterine scar, placenta previa, placental fixation abnormalities [2].

The blood loss is considerably lower in the case of natural birth; the risk of thrombotic accidents is lower, while the postpartum mobilization is achieved in a much shorter time. The patient's recovery is considerably faster, so that the hospitalization period is also shorter [3].

## 2. Methods and Materials

### 2.1. Study Design and Period

Institutional based retrospective cross-sectional study design was conducted at Adama Hospital Medical College which is located at Adama town, Oromia regional state, East shewa zone 100 km southeast to Addis Ababa. The study was conducted from November 01 to December 01/2024 among mothers who gave birth at AHMC from November 01/2023 to November 01/2024.

### 2.2. Study Population

Allmothers who had one previous cesarean scar and who were candidates for TOLAC and fulfill inclusion and exclusion criteria at AHMC labor ward within the study period.

Women with one previous lower segment cesarean section, singleton pregnancy, vertex presentation, term gestation week pregnancy and in spontaneous labor were included in the study. Whereas women with twin pregnancy, post term pregnancy, preterm pregnancy, malpresentation, malposition, medical complication and other type of cesarean section other than listed above are excluded from the study.

### 2.3. Sample Size Determination

The single population proportion formula was used for the first objectives to estimate the required sample size for the study, with the confidence interval estimated to be at the 95% level, the marginal error being 5% and the proportion of success of VBAC being 48%, as observed from a study conducted in three different hospitals Addis Ababa, Ethiopia [4]; with 10% non responsive rate, the final sample size for the study was 208.

The sample size for the second objective was calculated by using Epi-data version 3.7 for those factors that can influence success rate of VBAC. During calculation 95% CI, 80% power, 1:1 ratio of exposed to unexposed group, percent outcome in unexposed group and adjusted odds ratio was used. The sample size for the second objective was 190 which were smaller than the first objective.

A systematic random sampling technique was applied to select patient charts. All charts with one previous cesarean section delivery from November 01/2023 to November 01/2024 were listed based on the sequence of their registration date. The sampling interval was calculated by dividing the total patient charts by the estimated sample size ( $n=208$ ) leading to a skip interval ( $k=2$ ). Then every 2<sup>nd</sup> chart was included for data collection.

### 2.4. Sampling Technique

Data was collected from charts of randomly selected women who has previous C/S scar and opted for TOLAC by using prepared checklist developed specifically for this study. The checklist consisted of socio demographic data o women, obstetric history, outcome of VBAC and patient related variables. Data was collected after 5% was pretested at Geda Health Center and necessary amendments were incorporated.

Once the collected data was checked manually, entered to Epi-data version 3.7 then exposed to SPSS version 24 for cleaning and analysis. Descriptive statistics such as frequency, central tendency and lists of variables were analyzed by SPSS version 24 software. Bivariate logistic regression was used to identify candidate variables for further analysis with multivariate type of binary logistic regression. Crude Odds Ratio (COR) and adjusted Odds Ratio (AOR) with corresponding 95% confidence interval were used to interpret the

regression results. Statistically significant results were obtained with  $p < 0.05$ .

## 2.5. Operational Definition

**Gestational Age:** is the age of pregnancy from the first day of the woman's last menstrual period until the delivery of the baby.

**Cesarean Section:** is the delivery of the fetus and placenta after 28 weeks of gestation by surgical incision over abdomen and uterus.

**Successful VBAC:** is vaginal delivery in a woman who had previous cesarean section without both maternal and fetal complication.

**Failed VBAC:** is delivery of a fetus via C/S after labor was tried for a woman who had previous cesarean section.

**Station:** refers to the relationship of the presenting part of the fetus (usually the baby's head) to the ischial spines of the mother's pelvis.

**CPD:** is a condition where a baby's head get difficulty to pass safely through the mother's pelvis during labor.

**Cervical dilatation status:** latent stage is when cervical dilatation  $< 4$  cm and Active stage  $\geq 4$  cm cervical dilatation and 100% effacement.

**Uterine rupture:** is when all layers of the uterine wall are separated.

**APGAR:** a tool used to evaluate newborn based on Appearance, Pulse, Grimace, Activity and Respiration.

**Neonatal Death:** refers to the death of a newborn infant within the first 28 days of life.

## 3. Result

### 3.1. Sociodemographic Characteristics

A total of 9968 deliveries were conducted at Adama Hospital Medical College during the study period. From this 5375 (53.9%) was by vaginal delivery and 4593 (46.1%) by cesarean section. From a total deliveries 408 (7.6%) had one previous cesarean scar which was offered trial of labor. 208 of them were included in the study from thus 86 (41.3) with CI (34.59% - 48.09%) had successful vaginal birth.

Out of a total of 208 mothers with one cesarean scar who were delivered, approximately 125 (60.1%) were aged between 25 and 30 years, with a mean age of  $28 \pm 3$  years. The majority of these mothers resided in urban areas, accounting for 182 (87.5%), and 91 (43.8%) identified as Orthodox Christians. More than half of the mothers, 123 (59.1%), were housewives, and the majority were literate, with 167 (80.3%) having some level of education. Additionally, 186 (89.4%) of the mothers were married. (Refer to the table below for more details).

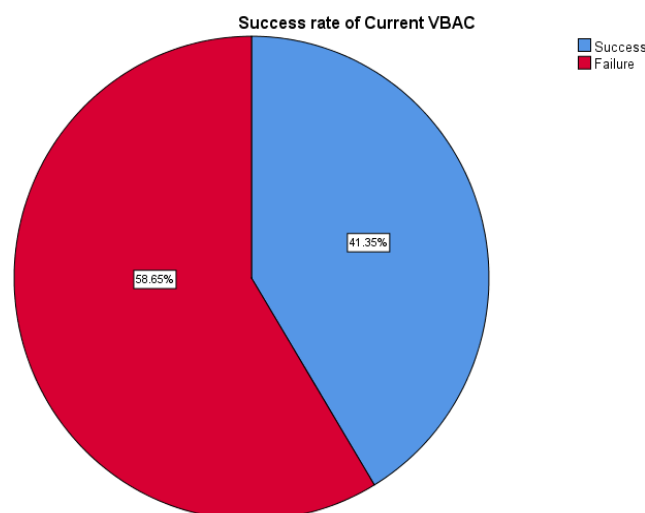


Figure 1. Success rate of VBAC at AHMC in 2024.

### 3.2. Obstetric Characteristics

Most of the study subjects 197 (94.7%) were gravid 2-5. Majority of them 187 (89.9%) were term (37- 40 wks) by their gestational age from early ultrasound and most of them did not remember their LNMP 173 (83.2%). Majority of them arrived with cervical dilatation of  $< 4$  cm of 160 (76.9%), rupture of membrane at admission 90 (43.3%) and high station of 149 (71.6%). The common indication for the previous C/S was unknown 163 (78.4) followed by NRFHRP 29 (13.9%). 23 (11.1%) mothers had history of Previous VBAC. (See table below).

### 3.3. Maternal and Fetal Outcome Characteristics

The success rate of VBAC during the study period was 86 (41.3%). The common indications for failed VBAC were NRFHRP 34 (27.9%), prolonged Labor 30 (24.6%) and others 41 (33.6%). There was no maternal death among women who had trial of labor after cesarean section during the study period. Laparotomy was done for uterine rupture 01 (0.5%) and PPH 03 (1.4%). Majority of neonates were with birth weight in between 2500 gm - 4000 gm 185 (88.9%), from thus neonates 197 (94.7%) had APGAR score of  $\geq 7$  and 2 (1.0%) fetal deaths occurred. (See table below)

### 3.4. Association of Factors with VBAC

In binary logistic regression analysis, Known LNMP, Cervical dilatation, Rupture of membrane, Level of station at admission, Meconium stained amniotic fluid, previous history of VBAC and Indication of previous failed VBAC variables were statistically significant at 0.25 level of significance. (See table below).

**Table 1.** Frequency distribution of sociodemographic characteristics at AHMC, 2024.

	Category	Frequency	Percent (%)
Age of the Patient	<25	46	22.1
	25-30	125	60.1
	>30	37	17.8
Place they live	Urban	182	87.5
	Rural	26	12.5
Religion	Orthodox	91	43.8
	Muslim	73	35.1
	Protestant	41	19.7
	Others <sup>a</sup>	3	1.4
Marital status	Others <sup>b</sup>	8	3.8
	Married	186	89.4
	Divorced	14	6.7
Occupation	Housewife	123	59.1
	Employee	38	18.3
	Others <sup>c</sup>	47	22.6
Educational status	Literate	167	80.3
	Illiterate	41	19.7

Others<sup>a</sup> (Catholic, Wakefeta); Others<sup>b</sup> (single, widowed); Others<sup>c</sup> (daily laborer, merchant)

**Table 2.** Frequency distribution of Obstetric characteristics at AHMC, 2024.

	Category	Frequency	Percent
Gravidity	Gravida 2-5	197	94.7
	Gravida >5	11	5.3
Did she remember her LNMP?	Yes	35	16.8
	No	173	83.2
Gestational Age from early ultrasound in weeks	<37 weeks	1	0.5
	37-40 weeks	187	89.9
	>40 weeks	19	9.1
	No U/s	1	0.5
How many times ANC follow up?	<4	162	77.9
	>=4	46	22.1
Cervical Dilatation at time of Admission	<4 cm	160	76.9
	>4 cm	36	17.3
	>=7 cm	12	5.8
Station at Admission	Above Zero	149	71.6

	Category	Frequency	Percent
ROM at Admission?	At Zero	31	14.9
	Below Zero	28	13.5
	Yes	90	43.3
	No	118	56.7
Presence of MSAF	Yes	24	11.5
	No	184	88.5
She Has History of Pervious VBAC	Yes	23	11.1
	No	185	88.9
Indication of Pervious Caesarean Section	Malpresentation	6	2.9
	NRFHRP	29	13.9
	CPD	3	1.4
	APH	7	3.4
	Unknown	163	78.4

**Table 3.** Obstetrics Outcome characteristics at AHMC, 2024.

	Category	Frequency	Percent
Success rate of Current VBAC	Successful	86	41.3
	Failed	122	58.7
Current Complication During VBAC	Rupture of uterus	1	0.5
	PPH	3	1.4
	Other	1	0.5
	No Complication	203	97.6
Fetal Outcome	Alive	206	99
	Dead	2	1
APGAR score of fetal	$\geq 7$	197	94.7
	$< 7$	11	5.3
Current birth weight	$< 2500$ gm	17	8.2
	$< 2500$ – $4000$ gm	185	88.9
	$> 4000$ gm	6	2.9
What is maternal outcome?	Good	207	99.5
	Poor	1	0.5
Did the Mother Transfuse Blood?	Yes	28	13.5
	No	180	86.5
How many units of blood transfused?	1 unit	24	11.5
	$> 2$ units	4	1.9

**Table 4.** Binary logistic regression analysis characteristics at AHMC, 2024.

Category		Outcomes of VBAC		ODD RATIO	
		Failed	Successful	COR	AOR
Known LNMP	No	106	61	1	
	Yes	14	21	2.607 [1.236- 5.496]	
Cervical Dilatation	<4 cm	111	49	1	
	>4 cm	8	28	7.929 [3.373-18.636]	
	≥7 cm	3	9	6.796 [1.763- 26.194]	
Station	High	113	36	1	
	Zero	6	25	13.079 [4.974- 34.389]	6.807 [2.34-19.796]
	Low	3	25	26.157 [7.457- 91.749]	14.907 [3.576-62.144]
ROM	No	95	23	1	
	Yes	27	63	9.638 [5.077- 18.293]	5.758 [2.588- 12.812]
MSAF	No	105	79	1	
	Yes	17	7	0.547 [0.217- 1.383]	0.322 [0.104- 1.004]
Previous VBAC	No	120	65	1	
	Yes	2	21	19.385 [4.406- 85.281]	6.306 [1.143- 34.802]

## 4. Discussion

The findings of this study revealed that out of 208 mothers with one previous cesarean section who were offered a trial of labor and included in the study, 41.3% (with a 95% confidence interval of 34.59% to 48.09%) achieved a successful vaginal birth. Additionally, the results indicate that the success of Vaginal Birth after Cesarean (VBAC) was not associated with the maternal death.

The VBAC success rate varies from place to place. In this study success rate of VBAC is 41.3% which was approximately similar to 170 (41%) with 95% CI (36.2%, 45.6%) [5] and 44.7% had a successful VBAC at 3 teaching Hospitals in Addis Ababa 48.42% [6] and in Taiwan 86.0% [7] but higher when we compare with research done by Addis D, 2018 at Mettu Karl Referral Hospital with success rate of 24.7%, Philippines 9.5% (95% CI: 8.3%-10.7%) [8] and report from Iran in 2019 shows 25.6% [9].

The higher success rate of VBAC in this study might be due to the time gap between the years of the studies. As seen through time, the numbers of women who utilized maternal health care services increases and this could increase and this could increase their chance of getting information.

The lower successful VBAC rate in this study could be a reflection of the increasing use of continuous electronic fetal monitoring, which helps to detect early things like NRFHRP

and differences in the utilization of maternal health care services.

This discrepancy may also be from a lack of awareness about vaginal birth after cesarean section, insufficient encouragement for attempting vaginal birth post-cesarean and inadequate follow-up during labor and antenatal care (ANC).

The study identified the strongest predictors of successful Vaginal Birth after Cesarean (VBAC) as a prior history of successful VBAC, rupture of membranes at admission, and low fetal station.

Women who experienced rupture of membranes at admission were five times more likely to achieve a successful VBAC (AOR=5.758 [2.588-12.812]) compared to those without rupture of membranes. Additionally, a history of previous vaginal birth after cesarean section increased the likelihood of successful VBAC by six times (AOR=6.306 [1.143-34.802]) compared to those without such a history. Furthermore, a low fetal station at admission was significantly associated with a higher VBAC success rate, being six times more likely (AOR=6.807 [2.34-19.796]) than a high station. These factors were found to be strongly correlated with the success rate of VBAC.

This study is supported with other studies done in 2021 at MizanTepi Teaching Hospitals [5], Iraq [8], Taiwan [7]. Age less than 30 years (pooled odds ratio 3.75, 95% CI 1.92-7.33), previous history of vaginal birth [OR of 3.65, 95% CI (2.64-5.04)], ruptured amniotic membrane at admission [OR 2.87, 95% CI 1.94-4.26], 4 cm or more cervical dilatation at



admission [OR 4, 95% CI 2.33-6.8], a low station at admission [OR 5.07, 95% CI 2.08-12.34] and has no history of still birth [OR 4.93, 95% CI 1.82-13.36] were significantly associated with successful vaginal birth after cesarean section [4].

Many other authors reported that previous vaginal birth was the single best predictor for successful VBAC [7]. Those mothers with Rupture of membrane before admission has been found associated with high success than with unruptured membrane, and low station at admission has high success rate than those mothers with high station which is same result at three teaching Hospitals in Addis Ababa [10].

The most common indication for previous cesarean section in the patients who underwent repeat C/S was nonprogress of labor (17.53%) followed by fetal distress in 12.89% [11]. Repeat CS rate was 34.6% in multiparas and 65.4% in primiparas.

The commonest indication for the repeat C/S was failure to progress due to Cephalopelvic disproportion, 26.9%, malpositioning, 25.0% fetal distress and poor uterine contractions accounted for 13.5% each. Prior vaginal delivery especially a prior VBAC was associated with higher rate of successful VBAC, 40.5% compared to VBAC rate of 21.4% in those who had a vaginal delivery before cesarean section [6].

The study recorded perinatal and maternal outcomes among women who attempted VBAC. Uterine rupture rates were similar to those found in research conducted in Tanzania [12]. There were 2 (1%) perinatal deaths and no maternal deaths, which aligns with findings from Malaysia [13]. No perinatal or maternal deaths were reported in cases of repeated cesarean sections.

Another study conducted at Ali Ibn Abi Talib Hospital in Iran from 2016 to 2017 on pregnancy outcomes after cesarean section found complications of VBAC included transfusion (n=4, 2.3%), cervical rupture (n=3, 1.7%), neonatal death (n=4, 1.7%), and uterine rupture (n=1, 6%) (P=0.0) [14].

The majority of neonates had birth weights between 2500-4000 grams (185, 88.9%). Of these, 197 (94.7%) had an APGAR score of  $\geq 7$ , and 2 (1%) fetal deaths occurred, likely due to poor management and delayed intervention.

The independent variables identified through multivariate analysis that determine the success of VBAC include a history of successful VBAC, the indication for a past cesarean section, and MSAF. The highest VBAC success rate was associated with these factors. The successful VBAC rate was highest among those weighing 2.5 < 3.5 kg, 66.7% compared to fetal weight of < 2.5 kg and  $\geq 3.5$  kg birth weight [6, 7]. Birth weight of more than 3.5 kg was associated with a lower success rate of vaginal delivery. However, 94% of the cases were delivered vaginally after the C/S without postpartum complications and there was no neonatal or maternal mortality [15].

## 5. Conclusion

This study found that the rate of successful vaginal deliv-

ery after one previous cesarean scar was 86 (41.3%), which is comparable to other studies conducted in University Hospitals of Ethiopia. Given that a previous cesarean section was the primary maternal indication for cesarean delivery, it is crucial to focus on the reasons for cesarean sections and to prevent unnecessary procedures.

VBAC is a safe practice when candidates are carefully selected based on factors associated with a high success rate. Both repeat cesarean sections and planned vaginal births after cesarean sections have their own benefits and risks.

Proper management of these options remains one of the most significant and challenging aspects of obstetric practice.

The overall success rate of VBAC in this study is comparable to previous meta-analyses conducted in Ethiopia. The study identified that a prior history of vaginal birth after cesarean section, rupture of membranes at admission, and a low station upon arrival are the primary predictors of VBAC success.

## Abbreviations

ACOG	American College of Obstetrics and Gynecology
AHMC	Adama Hospital Medical College
ANC	Antenatal Care
AOR	Adjusted Odd Ratio
APH	Antepartum Hemorrhage
CI	Confidence Interval
CS	Cesarean Section
LNMP	Last Normal Menstrual Period
MSAF	Meconium Stained Amniotic Fluid
NRFHRP	Non Reassuring Fetal Heart Rate Pattern
TOLAC	Trial of Labor After Cesarean Section
VBAC	Vaginal Birth After Cesarean Section

## Acknowledgments

My gratitude must go to my advisors Dr. Tesfaye Getachew (PhD, Assistant professor in Epidemiology and Health statistics) and Dr. Heran Ararsa (MD, Assistant professor in obstetrics and Gynecology) for their encouragement and advice necessary to me to proceed throughout my thesis.

## Conflicts of Interest

The authors declare no conflicts of interest.

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