ISSN: 2474-1353

Ferede et al. Int J Womens Health Wellness 2023, 9:150
DOI: 10.23937/2474-1353/1510150
Volume 9 | Issue 1
Open Access

International Journal of
Women's Health and Wellness

ORIGINAL ARTICLE

Successful Vaginal Delivery after Caesarean Section and its Associated Factors among Women Delivered in the University of Gondar Comprehensive Specialized Referral Hospital, Northwest Ethiopia, 2022

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Abstract

Background: For a majority of women who have had one prior lower segment caesarean section Vaginal delivery after caesarean section is proper route of delivery. However, little is known about vaginal delivery after caesarean section in Ethiopia.

Objectives: To determine the magnitude and associated factors of successful vaginal birth after one cesarean section in University of Gondar Comprehensive Specialized Hospital.

Methods: Institutional based cross-sectional study was conducted among 409 women who were randomly selected and had one previous cesarean section delivery and underwent trial of labor. Data was analyzed and computed using Stata version 14 Software. Multivariable logistic regression analysis was performed to identify the factors associated with successful vaginal birth after caesarean section. A crude and adjusted odds ratio with a 95% confidence interval was used to interpret the results. A P value of < 0.05 indicated statistically significant results.

Results: Of 385 completed charts reviewed, the success rate of vaginal birth after cesarean section was 38.2%, (95%CI; 33.3%-43.1%). The factors associated with successful vaginal birth after cesarean section were: Prior history of spontaneous vaginal delivery at any point time (AOR = 1.84, 95% CI; 1.02-3.33), prior successful vaginal birth after previous cesarean section (AOR = 2.12, 95%CI; 0.97-4.64), no history of still birth (AOR = 1.78, 95% CI; 1.03-3.07), cervical dilation on admission ≥ 3 cm (AOR = 2.22, 95% CI; 1.14-4.35), station on admission ≥ 0 (AOR = 1.94, 95% CI; 1.12-3.37), and Antenatal care follow-up (AOR = 2.48,95% CI; 1.26-4.88).

Conclusions: The finding of current study was lower than other previous studies conducted in Ethiopia. Therefore, strong endeavour is needed to reduce repeated caesarean section among women who had one previous lower segment caesarean section by considering the above identified factors.

Keywords

Successful vaginal birth, Caesarean section, Prevalence, Factors, Gondar, Ethiopia

Abbreviations

AOR: Adjusted Odds Ratio; APH: Antepartum Hemorrhage; CI: Confidence Interval; COR: Crude Odds Ratio; CS: Caesarean Section; EDHS: Ethiopian Demography and Health Survey; HDCP: Hypertensive Disorders Complicating Pregnancy; LSCS: Lower Segment Caesarean Section; RCS: Repeated Caesarean Section; SVD: Spontaneous Vaginal Delivery; TOL: Trial of Labour; TOLAC: Trial of Labor After Caesarean Section; U.S: United State; VBAC: Vaginal Birth after Previous Cesarean Section; WHO: World Health Organization

Citation: Ferede YA, Habitu YA, Bitew DA, Tassew WC (2023) Successful Vaginal Delivery after Caesarean Section and its Associated Factors among Women Delivered in the University of Gondar Comprehensive Specialized Referral Hospital, Northwest Ethiopia, 2022. Int J Womens Health Wellness 9:150. doi.org/10.23937/2474-1353/1510150

Accepted: April 27, 2023: **Published:** April 29, 2023

Background

Caesarean section rates have amplified over the last decade, with an estimated one third of women having delivered by caesarean section (CS) worldwide [1]. The World Health Organization recognizes that a CS rate above the ideal rate of 10-15% in any region is redundant, which leads to morbidity and mortality [2]. A recent study conducted in low- to middle-income countries, CS were found to be associated with an increase in adverse outcomes [3]. African countries experience significantly higher adverse outcomes compared to non-African countries [3]. In addition to this, maternal mortality after having a CS in Africa has been estimated to be 50 times higher than the rates in high-income countries [4]. In Ethiopia, the caesarean delivery rate among those who gave birth at the health facility was 29.55%, ranging from 11.03% to 63.75%, which is much higher than the World Health Organizations aim of a maximum caesarean section rate of 15% [2,5,6]. The main reason for this rise in CS rate is the failure of the rate of vaginal birth after caesarean section [7]. Repeated CS delivery is the most significant factor paying to overall increased rates [8]. Because of increased risk of maternal complications with repeat caesarean section, Vaginal birth after caesarean section (VBACs) is one of the strategies developed to control the increasing rate of caesarean sections (CS) [9]. It is a trial of vaginal delivery in selected cases of a prior CS in a well-resourced hospital [10]. although failed VBAC has an even worst maternal outcome [11]. Therefore, appropriate information about the risks and benefits of both trial of labor after caesarean section and repeat caesarean delivery are essential for an informed decision making [12,13].

Most maternal deaths are due to anaesthesia complications, which is recorded with a mother who undergoes CS [12,14]. A potential solution to the fears related to VBAC would be a more accurate selection of patients opting for TOLAC [15].

In a meta-analysis of hospitals in sub-Saharan Africa found that women with one prior CS had a VBAC success rate between 60% to 80% [16]. Institution-based cross-sectional study conducted in Addis Ababa three teaching hospital revealed that VBACs success rate was 69.4% [17].

Many studies suggested that the factors of successful vaginal birth after one previous cesarean section are age, marital status, residence, fetal outcome of past cesarean section, history of spontaneous vaginal delivery, history of successful vaginal birth after cesarean section, history of still birth, indication for previous cesarean section, membrane status, cervical dilation, parity, NC follow-up, fetal station, fetal weight, fetal position, Meconium-stained [9,17-21]. VBAC has many more benefits than CS, starting from satisfying the mothers' preference individually up to reducing maternal morbidity and mortality, risk of complications in the next pregnancy and the rate of caesarean sections at a population level [7]. However, the number of mothers who experienced trial of labor after caesarean section (TOLAC) is declining, resulting in an overall rise in CS rate [7]. No published article was existed that show the success rate of VBAC among women's with previous cesarean section in this region. In addition to this, no previous study has focused on the influences of diabetes, hypertensive disorders complicating pregnancy (HDCP) and gestational weeks on the chance of VBAC. Evidence on the success rate of VBAC and associated factors in Ethiopia in general and the study area in particular are limited. Therefore, research on the success rate of VBAC and the associated factors among women who gave birth previously by lower-segment caesarean is needed. Thus, the purpose of this study aims to assess the success rate of VBAC and its associated factors among women with one previous cesarean section in University of Gondar Comprehensive Specialized Hospital.

Methods

Institutional based cross-sectional study was conducted in the University of Gondar Comprehensive Specialized Hospital from May 25, to June 30, 2022. Simple random sampling was employed to select participants for the study. Women who had one lower segment transverse cesarean section with single ton pregnancy, cephalic presentation and no current indication for cesarean section were included from the study. A total of 409 participants chart were reviewed using single population proportion formula by assuming: 95% level of confidence, 5% margin of error and P (proportion) of 0.41 [21] and considering a 10% for incomplete charts.

Instruments Used

Data were collected, using checklist adapted from different literatures, from medical charts after tracing the patients Card number in the University of Gondar comprehensive specialized hospital. The checklist contained socio-demographic, obstetric, reproductive, medical and behavioral related factors. Delivery registration book and patient card were reviewed. A medical record number of patients on the data collection period were taken from registration book by a simple random sampling to select charts. Then data was collected from the selected patient's medical charts by using the prepared checklist. Data quality was controlled through the provision of training to the data collectors and the supervisor about the overall data collection tool and procedures. The data collection checklist was pre-tested for consistency of the tool and completeness of data items on 20 patient charts at the same hospital before the actual data collection and these charts were included in the final study. The data collection process was monitored closely by the

supervisor. Finally, completeness of the questionnaire was checked and correction was made on a daily basis before the chart is returned.

Statistical Analysis

Data were entered and analyzed using STATA version 14 and summarized using descriptive statistics. Bivariable and multivariable logistic regression analysis were employed to verify the presence and strength of association between dependent and independent variables. Variables with p-value < 0.20 in the bivariable logistic regression model were transferred to the multivariable logistic regression for further analysis. In the final model, statistical association was declared by considering the p-value less than 0.05 and the respective AOR with its 95% CI.

Results

Socio-demographic and behavioural characteristics

A total of 385 charts were included in the analysis. The median age of participants was 29.0 years with interquartile range (26.0-32.0). Among study participants almost three- fourth, 306(79.48%) of them were married, about 162 (42.08%) were in the age group of 25 to 29 years and more than three-fourth 315(81.82%) were urban residents. Eighty (20.78%) had alcohol drinking history and 21(5.45%) had history of cigarette smoking (Table 1).

Obstetric and reproductive related characteristics

Among study participants, 64(16.6%) of them has previous history of spontaneous vaginal delivery at any point time, 36(9.4%) of them has previous history of successful VBAC, about their cervical dilatation status at admission, 150(39.0%) had cervical dilation of < 3 cm, followed by 121(31.4%) had cervical dilation of ≥ 3 cm and 114(29.6%) admitted with closed cervix. Almost one-fourth (25.2%) of them had history of still birth, less than one-third (27.79%) of them had fetal station ≥ 0. Among study participants, more than two-third (83.4%) of them had history of antenatal follow-up, of which 70.4% of them had ANC follow-up ≥ four visit (Table 2).

Medical related factors

Among study participants about twenty six (6.8%) of them had history of diabetes mellitus, while 48(12.5%) had history hypertension, and 117(30.4%) of participant had history of anemia (Table 3).

Magnitude of successful vaginal birth after cesarean section

The prevalence of successful VBAC among women with one previous cesarean section was found to be 38.2% (95%CI; 33.3%-43.1%).

Factors associated with successful vaginal birth after cesarean section

Bivariable and multivariable logistic regression models were employed to verify factors that had significant statistical association with VBAC. First the Bivariable regression model was fitted and those variables (ten variables) with p-value of < 0.2 in this model were selected and fitted in to the final multivariable model. In the multivariable analyses prior history of spontaneous vaginal birth at any point time, prior history of successful VBAC, cervical dilation on admission, ANC follow-up, history of still birth, and station on admission were associated successful VBAC. The odds of having successful VBAC among women who had history of SVD at any point time were 1.84 times higher compared to those who had no history of SVD at any point time. The odds of having successful VBAC among women who had prior successful VBAC were 2.12 times higher compared to those who hadn't history

Table 1: Sociodemographic and behavioral related characteristics of successful vaginal birth among women with one previous cesarean section underwent trial of labor from Jan 1, 2 018 to April 30, 2022 in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2022 (n = 385).

Variable	Category	Frequency(n)	Percent (%)
Age group	20-24 years	37	9.61%
	25-29 years	162	42.08%
	30-34 years	111	28.83%
	35+	75	19.48%
Marital status	Married	306	79.48%
	Divorced	49	12.73%
	Widowed	30	7.79%
Residence	Urban	315	81.82%
	Rural	70	18.18%
History of Alcohol	Yes	80	20.78%
	No	305	79.22%
History of Smoking	Yes	21	5.45%
	No	364	94.55%

Table 2: Obstetric and Reproductive related factors for successful vaginal birth among women with one previous cesarean section underwent trial of labor in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2022 (n = 385).

Variables	Category	Frequency(n)	Percent (%)
Fetal outcome of past baby	Live	293	76.1%
	Died	92	23.9%
History of spontaneous vaginal delivery	Yes	64	16.6%
	No	321	83.4%
Prior successful VBAC	Yes	36	9.4%
	No	349	90.7%
History of Still birth	Yes	97	25.29%
	No	288	74.8%
Indication for previous CS			
	Fetal distress	134	34.8%
	Patient's request	29	7.5%
	Obstructed labor	53	13.8%
	Malpresentation	57	14.8%
	Others	112	29.1%
History of APH	Yes	99	25.7%
	No	286	74.3%
History of PPH	Yes	55	14.3%
	No	330	85.7%
Membrane status	Yes	174	45.2%
	No	211	54.8%
Cervical dilation	Closed	114	29.6%
	< 3	150	39.0%
	≥ 3	121	31.4%
Effacement	< 50%	176	45.7%
	≥ 50	209	54.3%
Birth weight	< 2500g	51	13.3%
	2500-4000g	251	65.2%
	≥ 4000g	83	21.6%
Fetal station	≥ 0	107	27.8%
	≤ -1	278	72.2%
Fetal position	OA	142	36.9%
	OP	137	35.6%
	UK	106	27.5%
Meconium-stained	Yes	130	33.8%
	No	255	66.2%
ANC follow-up	Yes	321	83.4%
	No	64	16.6%
Parity	I	178	46.2%
	≥ II	207	53.8%
Gestational age	< 40 wks	234	60.8%
	40 wks	21	5.5%
	> 40 wks	130	33.8%

AO: Occiput-Anterior; OP: Occiput-Posterior; Uk: Unknown; PPH: Postpartum hemorrhage.

- Others includes

Macrosomia 11.2% twine pregnancy 5.7% APH 12.2%

Table 3: Medical Related Factors for successful vaginal birth after previous cesarean section among women underwent trial of labor in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2022 (n = 385).

Variable	Category	Number (n)	Percent (%)
Diabetes mellitus	Yes	26	6.8%
	No	359	93.25%
Hypertension	Yes	48	12.5%
	No	337	87.53%
Anemia	Yes	117	30.4%
	No	268	69.61%

of successful VBAC. The odds of having successful VBAC among women who hadn't history of still birth were 1.78 times higher compared to those who had history of still birth. The odds of having successful VBAC among women who had cervical dilation on admission ≥ 3 cm were 2.22 times higher compared to those women closed cervix's on admission. The odds of having successful VBAC among women who had station on admission ≥ 0 were increased by 94% compared to those who had station on admission < 0. Finally from reproductive health related factors, the odds of having successful VBAC among women who had history of ANC follow-up were 2.48 times higher compared to those women

Table 4: Bivariable and Multivariable logistic regression analysis for factors associated with successful VBACS after one previous cesarean section in University of Gondar Comprehensive Specialized Referrals Hospital, Northwest Ethiopia, 2022 (n = 385).

Variable	Successful VBAC		COR (95%CI)	AOR (95%CI)
	Yes	No		
Hx of SVD				
Yes	35	29	2.25(1.30-3.87)*	1.84(1.02-3.33)**
No	112	209	1	1
Hx prior VBACS				
Yes	20	16	2.19(1.09-4.36)*	2.12(1.97-4.64)**
No	127	222	1	1
Hx of still birth				
Yes	29	68	1	1
No	118	170	1.63(0.99-2.66)*	1.78(1.03-3.07)**
Cervical dilation				
0	31	83	1	1
< 3	52	98	1.42(0.83-2.41)	
≥ 3	64	57	3.01(1.74-5.18)*	2.22(1.23-4.06)**
Meconium-liquor				
Yes	42	88	1	1
No	105	150	1.47(0.94-2.28)*	0.76(0.46-1.26)
ROM Membrane				
Yes	73	101	1.34(0.88-2.02)*	0.96(0.56-1.65)
No	74	137	1	1
Birth weight				
< 2500g	25	26	1.79(0.87-3.64)*	1.50(0.67-3.32)
2500-4000g	93	158	1.09(0.65-1.84)	
> 4000g	29	54	1	1
Position				
OA	69	73	1.62(0.97-2.71)	1.60(0.92-2.81)
Op	39	98	0.68(0.39-1.17)*	
Uk	39	67	1	1
ANC follow-up				
Yes	130	191	1.88(1.03-3.42)*	2.48(1.26-4.88)**
No	17	47	1	1
Station				
≥ 0	55	52	2.14(1.35-3.36)*	1.94(1.12-3.37)**
< 0	92	186	1	1

P-Value < 0.2*, statistically significant P-Value < 0.05 SVD: Spontaneous Vaginal Delivery**

who had no ANC follow-up. Bivariable and Multivariable logistic regression analysis for factors associated with successful VBACS were showed below (Table 4).

Discussion

This study was conducted to assess the magnitude of VBAC and its associated factors in the University of Gondar Comprehensive Specialized Hospital. Completed data were reviewed from charts among women who gave birth in the University of Gondar Comprehensive Specialized Hospital between 2018 and 2022. Prior successful VBAC, history of spontaneous vaginal delivery at any time point, cervical dilatation at admission, history of still birth, station and ANC follow-up were significantly associated with the success of VBAC [22].

The current study showed that the prevalence of successful vaginal birth among women with one previous cesarean was 38.2% (95%CI; 33.3%-43.1%). This study is in line with the studies conducted in, Mizan-Tepi 41% [21] and Bahrain 41.5% [23].

However, the finding of this study was lower than studies conducted in Addis Ababa 69.4% [17], Tanzania 55% [24], Egypt 72% [25]. The difference in Addis Ababa might be due to the difference in measurement tool and study setting, in which participants had 100% ANC follow-up making them more aware about the advantage of VBAC [17].

The discrepancy in the Tanzania might be due to the difference in the presence of more senior doctor that make decision for labor, 99% attended antenatal care and decisions for suggested mode of delivery indicated on their antenatal cards [24]. The discrepancy in the Egypt might be due to the difference in the hospital protocol, in this hospital augmentation of labor was taken by a consulting Obstetrician and eligibility criteria difference (clinically estimated fetal weight ≤ 3.5 kg) [25]. The discrepancy in the Anatolia might be due to the difference in, cultural resistance of Cs [19]. The discrepancy in the Taiwan might be due to the advancement of modern medical aids improves most aspects of obstetric care [26].

The discrepancy in the Thailand might be due to the difference in guideline in Thailand doctors was responsible to give a monthly orientation on the TOLAC guideline as well as a counseling guide with visual aids to the team of physicians taking care of the antenatal clinic and the labor doctors [18]. The discrepancy in the United States might be due to the large prior successful VBAC (21.3%) and differences in hospital settings or protocols for trial of labor after caesarean section [27].

On the other hand, The finding of this study was higher than a studies conducted in Pakistan 34% [28]. The difference might be due to differences in hospital settings or protocols for trial of labor after caesarean section across countries and population characteristics [21].

In this study, the strongest predictor for the success of VBAC was history of ANC follow-up. Those women who had antenatal follow-up had two and half-times higher odds of successful VBAC as compared to women who had no history of ANC follow-up. This study is consistent with the study conducted in Ethiopia [21]. This might be because women who had been counseled regarding TOLAC during ANC follow-up have better knowledge on the benefits and risks of VBAC and better psychological readiness for vaginal birth which might be very supportive in attaining successful VBAC delivery when compared to women who had not been counseled [29].

Those who were admitted with cervical diameter greater ≥ 3 cm were associated with increased likelihood of successful VBAC compared to no cervical dilatation. Similar findings were reported that women with cervical dilatation at admission were more likely to experience successful VBAC than women without cervical dilatation in Ethiopia [21,30]. In Egypt, a similar finding was reported [25]. This might be due to the fact that women with cervical dilation zero (0) might had high frequency of false labor and slow progress of labor that makes less likely to experience successful VBAC [30]. In women who had Prior history of successful VBAC was significantly associated with the high success rate of VBAC in the current study (AOR = 2.12 CI; 1.97-4.64). Similar findings were reported by previous studies conducted in different time periods and places [18,30]. For example, a study conducted in Attar Lord Merry Primary Hospital, Gurage Zone, and South Ethiopia revealed that women with a prior history of VBAC were more likely to undergo successful VBAC than those without prior history of vaginal birth after Caesarean section [30]. The rate of uterine rupture decreased after the first successful VBAC and did not increase with subsequent vaginal deliveries [31]. The possible explanation for this is multiparous women was develop efficient uterine contractions in labor and will have less problem with cephalopelvic disproportion [32].

In women with a history of spontaneous vaginal delivery at any time point had nearly two times higher odds of successful VBAC than their counterparts. A history of vaginal delivery in addition to a CS would appear to be a positive indicator of success in following TOL and the chance of success increases with the increasing number of prior vaginal deliveries [33]. The possible explanation for this is multiparous women was develop well-organized uterine contractions in labor and would have less difficulty with cephalopelvic disproportion [32].

Furthermore; this study showed that women who had no history of still birth had around two times higher

odds of successful VBAC than women who had history of still birth. This study is consistent with the study conducted in Ethiopia [34]. History of still birth was one parameter which was associated with poor success in this study. This might be arising from the assumption that the cesarean route of Delivery would provide the mother a higher chance of having alive baby [9].

Moreover, this study showed that women who had station on admission ≥ 0 had two times higher odds of successful VBAC than those women who had station on admission ≤ 0. This study is consistent with the study conducted in Ethiopia [34], and China [35]. This is might be due to the fact that higher the station, the longer the duration of labor and the higher the risk of operative delivery [36].

Limitation of the Study

Since a secondary data source (patient chart) was used, some important demographic and clinical variables might be missed. This might affect the association of those missing variables with the dependent variable.

Conclusion

The magnitude of VBAC among study participants in the study area was low. Prior history of VBAC, history of spontaneous vaginal delivery at any point time, cervical dilatation at admission, History of still birth, ANC-follow-up and fetal station at admission were significantly associated with successful VBAC. VBAC would be a practical option to decrease caesarean section rates in Ethiopia. Therefore; we recommended to the concerned bodies to strongly work on the above identified factors so as to increase the success of VBAC. In addition, future researchers better evaluate the issue with a strong study design including a qualitative approach.

Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of the University of Gondar, College of Medicine and Health Sciences, Institute of Public Health (Ref No. 477/14). Besides, additional written permission letter to conduct the study on medical records of previous cesarean scar patients was obtained from the coordinator of MCH of the University of Gondar Comprehensive Specialized Hospital. Informed and written consent was obtained from each respondent. Confidentiality of the information was maintained through recording of the data without the patient's name of the used chart and keeping the records in locked shelves.

Acknowledgment

We would like to thank University of Gondar Referral Hospital administrative bodies and card room workers for their cooperation and permission to conduct the study. We are also thankful to the data collectors who participated in the study for their commitment.

Disclosure

The authors report no conflicts of interest in this work.

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