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Prevalence of successful vaginal birth after caesarean section and its associated factors among women delivered in the university of Gondar comprehensive specialized referral hospital, Northwest Ethiopia

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Abstract

Introduction Caesarean section (CS) is an essential, life-saving surgical intervention used to address obstetric complications. Nonetheless, its excessive use has raised global concerns. In low- and middle-income countries (LMICs) like Ethiopia, the challenges of repeat CS and the limited success of VBAC are particularly problematic. Despite this, there is a significant gap in knowledge regarding vaginal births following a cesarean delivery in Ethiopia, especially in the specific study area.

Objectives To determine the prevalence and associated factors of successful vaginal birth after one caesarean section in the 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 caesarean section delivery and underwent a trial of labor. Data were 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 caesarean section was 38.2%,(95%Cl;33.3-43.1%). The factors associated with successful vaginal birth after caesarean section were: prior history of spontaneous vaginal delivery at any point time (AOR = 1.84,95% Cl;1.02–3.33), prior history of successful vaginal birth after previous cesarean section (AOR = 2.12, 95%Cl;0.97-4.64), no history of stillbirth (AOR = 1.78, 95% Cl;1.03–3.07), cervical dilation on admission \geq 3 cm (AOR = 2.22, 95% Cl; 1.14–4.35), station on admission \geq 0(AOR = 1.94, 95% Cl; 1.12–3.37), and Antenatal care follow-up (AOR = 2.48,95%Cl;1.26–4.88).

Conclusions Our study demonstrated a low prevalence of successful VBAC, highlighting that factors such as a prior history of VBAC, spontaneous vaginal delivery at any time, cervical dilatation at admission, history of stillbirth,

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ANC follow-up, and fetal station at admission are significantly associated with positive outcomes. This evidence clearly indicates that targeted, evidence-based interventions are urgently needed to improve VBAC success rates. Therefore; the Federal Ministry of Health (FMOH), policymakers, and relevant stakeholders should collaborate to develop, implement, and continuously review comprehensive policies and guidelines that support these targeted interventions.

Keywords VBAC, Caesarean section, Prevalence, Success rate, Ethiopia

Introduction

Caesarean section (CS) is a life-saving surgical procedure widely used to manage obstetric complications [1]. However, its overuse has become a global concern, leading to a dramatic increase in repeat CS, which carries a higher risk of maternal morbidity and mortality. The World Health Organization (WHO) recommends a CS rate of 10–15%, yet Ethiopia has a facility-based CS rate of 29.55%, with regional variations ranging from 11.03–63.75% [2–4]. This rising trend is largely attributed to the low rate of successful Vaginal Birth After Caesarean (VBAC)—a safe and effective alternative that remains underutilized due to inconsistent clinical practices, fear of complications, and a lack of clear evidence-based guidelines.

The burden of repeat CS and limited VBAC success is particularly concerning in low- and middle-income countries (LMICs) like Ethiopia [1, 5]. Studies show that maternal complications and mortality following CS are significantly higher in African nations compared to high-income countries [6, 7]. A meta-analysis of hospitals in Sub-Saharan Africa reported VBAC success rates between 60 and 80%, while a study from three teaching hospitals in Addis Ababa found a 69.4% VBAC success rate [8–10]. Despite these findings, comprehensive data on VBAC prevalence and its associated factors remain scarce, particularly in referral hospitals in Northwest Ethiopia.

The failure to improve VBAC rates results in an unnecessary increase in repeat caesarean sections, leading to several negative consequences [5]. These include higher maternal morbidity and mortality due to surgical complications, as well as increased risks of uterine rupture, infections, and abnormal placental attachment in future pregnancies [11, 12]. The financial and healthcare system burden also rises due to prolonged hospital stays and resource-intensive surgeries. Additionally, women who undergo multiple caesarean sections face long-term reproductive health challenges, including infertility and a higher likelihood of developing conditions such as placenta previa and placenta accreta [13, 14]. Promoting VBAC success can significantly improve maternal health outcomes and reduce the overall burden of unnecessary cesarean procedures [15, 16].

Research on vaginal birth after caesarean (VBAC) in Ethiopia is limited, with most studies focusing on Addis

Ababa or other African countries, leaving a significant knowledge gap in Northwest Ethiopia [5, 17]. While some studies have explored VBAC prevalence, key maternal and obstetric factors influencing its success remain under examined [5, 18]. Additionally, the absence of standardized VBAC protocols in Ethiopian hospitals has led to inconsistencies in clinical decision-making. This study seeks to bridge these gaps by determining the prevalence of successful VBAC at the University of Gondar Comprehensive Specialized Referral Hospital and identifying key maternal and obstetric factors associated with VBAC success. The findings will provide locally relevant evidence and offer valuable recommendations to healthcare providers and policymakers to improve VBAC rates and reduce unnecessary repeat cesarean sections. By assessing VBAC prevalence and its determining factors among women who delivered at the University of Gondar Comprehensive Specialized Referral Hospital, this study will generate crucial insights for maternal health services. The results will enhance VBAC counseling and contribute to the development of national guidelines aimed at optimizing safe and effective obstetric care in Ethiopia.

Methods

Study setting

The study was conducted at the University of Gondar Comprehensive Specialized Hospital in Northwest Ethiopia, focusing on women who had undergone one previous caesarean section and chose to attempt a trial of labor. Located in Gondar town, within the Central Gondar Zone of the Amhara Regional State, the hospital is situated about 727 km from Addis Ababa, the capital city of Ethiopia, and 175 km from Bahir Dar, the capital of the Amhara region. The hospital has over 700 beds and serves as a tertiary referral center for a population of over five million people in and around Gondar town. Each year, it supports around 420 trials of labor for consenting women, attracting patients from various regions.

Study design and period

Institutional based cross-sectional study was conducted from May 25, to June 30, 2022.

Sample size and sampling procedure

The sample size was determined using the single proportion formula, considering a proportion of 41% from a previous study. The initial sample size was calculated to be 372, factoring in a 95% confidence interval (z = 1.96) and a 5% marginal error (d = 0.05). Additionally, a 10% nonresponse rate was accounted for, resulting in a final sample size of 409. Charts were chosen from the logbook using a computer-generated simple random sampling (SRS) method. The medical registration numbers served as the sampling frame, encompassing patients who underwent a trial of labor with one previous caesarean section between January 1, 2018, and April 30, 2022.

Study population

The study populations were women's with one previous caesarean scar underwent trial of labor at university of Gondar comprehensive specialized hospital from Jan 1 2018 to April 30, 2022.

Inclusion and exclusion criteria

The study included women who met specific criteria: they had one prior lower-segment transverse caesarean section, were experiencing a singleton pregnancy with cephalic presentation, and had no medical indication for a current caesarean section. Women who opted for a repeated caesarean section and those with unrecorded outcome variables were excluded from the study.

Operational definition

Successful VBAC Is delivery of the fetus through Vagina after undergoing a trail of labor regardless of fetal and maternal complications which recorded as VBAC [19].

Failed VBAC Women who failed to deliver vaginally and ended up with repeat caesarean delivery after undergoing a trail of labor [19].

Antenatal care follow-up Women who had at least one ANC services provided by skilled health personnel in the health institution [20].

Drinking alcohol Clients classified as drinkers if Patients has/have a history of alcohol drink including, Beer, Arki, and Tela [21, 22].

Smoking cigarette Never a smoker; if patients had no history or currently no smoke cigarette, Past smoker; if patients had a history of the smoking habit, but he or she stops smoking currently if patients know currently smoking a cigarette at least once within the last 30 days was classified as the current user [23].

Missed charts Refers to a patient medical record that is expected to be available in the facility's documentation system but is either completely absent or not retrievable at the time of review [24].

Incomplete charts Refers to a patient medical record that lacks essential components or required documentation, such as missing demographic details, physician notes, diagnoses, treatment plans, medication records, or signatures [25].

Instruments used

Data were gathered from medical records using a checklist that was modified from various literatures after finding the patient's card number at the comprehensive, specialized hospital run by the University of Gondar. A socio-demographic, obstetric, reproductive, medical, and behavioral check list was included. Both the patient card and the delivery registration book were examined. A simple random selection was used to choose charts from a registration book that contained the medical record numbers of patients throughout the data collecting period. Then, using the specified checklist, information was gathered from the medical records of the chosen patient. The supervisor and data collectors received training on the general data collecting tool and methods, which helped to regulate the quality of the collected data. Prior to the actual data collection, the data collection checklist was pre-tested on 20 patient charts at the same hospital to determine its consistency and the completeness of its data items. These charts were then used in the final study. The supervisor kept a tight eye on the data collecting procedure. Before the chart is returned, the questionnaire's accuracy was lastly verified and daily corrections were made.

Statistical analysis

Descriptive statistics were used to summarize the results of the data entry and analysis performed using STATA version 14. To confirm the existence and strength of the link between the dependent and independent variables, bivariate and multivariate logistic regression analysis was used. For additional analysis, variables from the bivariable logistic regression model with a *p*-value less than 0.20 were moved to the multivariable logistic regression. By taking into account the corresponding AOR with its 95% CI and the *p*-value less than 0.05 in the final model, statistical relationship was declared.

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. 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.

Results

Socio-demographic and behavioral characteristics

Charts of 385 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 \geq 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 \geq 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 \geq four visits (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).

Table 1 Sociodemographic and behavioral related characteristics of successful vaginal birth among women with one previous caesarean 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). (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%

Prevalence of successful vaginal birth after Cesarean section

The prevalence of successful VBACs among women with one previous caesarean 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 VBACs were 2.12 times higher compared to those who hadn't history of successful VBAC. The odds of having successful VBACs 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 who had no ANC follow-up. Bivariable and Multivariable logistic regression analysis for factors associated with successful VBAC were showed below (Table 4).

Discussion

This study was carried out to assess the magnitude of successful VBAC and its associated factors in the University of Gondar Comprehensive Specialized Hospital. Completed data were reviewed from charts among women who gave birth between 2018 and 2022.

The current study showed that the magnitude of successful vaginal birth among women with one previous caesarean section was 38.2% (95%CI; 33.3-43.1%). This study is in line with the studies conducted in, Mizan-Tepi 41% [26] and Bahrain 41.5% [27]. However, the finding of this study was lower than studies done in Addis Ababa 69.4% [28], Tanzania 55% [29], Egypt 72% [30].

Variables	Category	Frequency (<i>n</i>)	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	Ruptured	174	45.2%
	Intact	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	< 2500 g	51	13.3%
	2500–4000 g	251	65.2%
	≥4000 g	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%
	2	207	53.8%
Gestational age	< 37wks	34	8.8%
	37-42wks	321	83.4%
	>42wks	30	7.8%

Table 2 Obstetric and reproductive related factors for successful vaginal birth among women with one previous caesarean section underwent trial of labor in university of Gondar comprehensive specialized hospital, Northwest Ethiopia, 2022(n = 385)

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

Others includes

Macrosomia 11.2% twine pregnancy 5.7% APH 12.2%

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 [28]. 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 [29]. 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

Table 3 Medical related factors for successful vaginal birth after previous caesarean 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%

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

(95%Cl) Variable	Successful VBACs		COR (95%CI)	AOR
	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				
<2500 g	25	26	1.79(0.87-3.64)*	1.50(0.67-3.32)*
2500–4000 g	93	158	1.09(0.65-1.84)	
>4000 g	29	54	1	1
Position				
OA	69	73	1.62(0.97-2.71)*	1.60(0.92-2.81)*
Ор	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

 $P\mbox{-}Value\ <\ 0.2^*,\ statistically\ significant\ P\mbox{-}Value\ <\ 0.05^{**}\ SVD,\ spontaneous\ vaginal delivery$

fetal weight \leq 3.5 kg) [30]. The discrepancy in the Anatolia might be due to the difference in, cultural resistance of Cs [31]. The discrepancy in the Taiwan might be due to the advancement of modern medical aids improves most aspects of obstetric care [32]. 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 [19]. 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 Sect [33].

On the other hand, The finding of this study was higher than a studies conducted in Pakistan 34% [34]. The difference might be due to differences in hospital settings or protocols for trial of labor after caesarean section across countries and population characteristics [26].

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 VBACs as compared to women who had no history of ANC follow-up. This study is consistent with the study conducted in Ethiopia [26]. 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 [35].

Those who were admitted with cervical diameter greater \geq 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 [26, 36]. In Egypt, a similar finding was reported [30]. 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 VBACs [36]. 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 [19, 36]. For example, a study conducted in Attar Lord Merry Primary Hospital, Gurage Zone, and South Ethiopia revealed that women with a prior history of VBACs were more likely to undergo successful VBAC than those without prior history of vaginal birth after Caesarean Sect [36]. The rate of uterine rupture decreased after the first successful VBAC and did not increase with subsequent vaginal deliveries

[37]. The possible explanation for this is multiparous women was develop efficient uterine contractions in labor and will have less problem with cephalopelvic disproportion [38].

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 [39]. The possible explanation for this is multiparous women was develop well-organized uterine contractions in labor and would have less difficulty with cephalopelvic disproportion [38].

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 [40]. 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 [41].

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 [40], and China [42]. 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 [43].

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 and recommendation

The prevalence of VBAC among study participants in the study area was low, with significant associations found between successful VBAC and factors such as a prior history of VBAC, any previous spontaneous vaginal delivery, cervical dilatation at admission, history of stillbirth, regular ANC follow-up, and the fetal station at admission. Given this low prevalence, it is crucial to implement targeted interventions that address these key factors. Enhanced counseling should be provided to women with a history of VBAC or spontaneous vaginal delivery, emphasizing their higher likelihood of success in subsequent trials. In addition, rigorous and regular antenatal care is essential to monitor and optimize maternal health while preparing women for VBAC. Upon admission, healthcare providers should standardize the assessment

of cervical dilatation and fetal station by developing clear protocols that facilitate the selection of suitable candidates for VBAC. Moreover, women with a history of stillbirth should receive tailored management plans to mitigate potential risks during labor. By focusing on these specific areas, healthcare facilities can improve the overall rate of successful VBAC, thereby reducing cesarean section rates and enhancing maternal and neonatal outcomes. Furthermore, the Federal Ministry of Health (FMOH), policymakers, and relevant stakeholders should collaborate to develop, implement, and continuously review comprehensive policies and guidelines that support these targeted interventions.

Acronyms/Abbreviations

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

WHO World Health Organization

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Author contributions

YAF: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing– original draft, Writing– review & editing. YAH: Methodology, Supervision, Writing– original draft, Writing– review & editing. WCT: Supervision, Writing– original draft, Writing– review & editing. DAB: Formal analysis, Writing– original draft, Writing– review & editing.

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Data availability

all relevant data generated and analyzed is included in this article.

Declarations

Ethics approval and consent to participate

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. 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.

Competing interests

The authors declare no competing interests.

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