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Maternal and Neonatal Outcomes in Trial of Vaginal Delivery Versus Cesarean Section in Preterm Pregnancies

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Abstract

Background and objectives: A trial of labor after cesarean is a vital strategy to reduce neonatal morbidity associated with cesarean section. Thus, this study aimed to compare the effects of planned cesarean and vaginal delivery on neonatal outcomes in preterm pregnancies.

Methods: This prospective observational study was conducted on 100 pregnant women with previous cesarean section at Sulaimani Maternity Teaching Hospital from May 2022 to May 2023. Patients' data with neonatal outcomes were collected and the correlation between the mode of delivery and various causes (preterm vaginal birth to preterm planned cesarean) was determined.

Results: The maternal age, using steroids during pregnancy, and antenatal care not affected the delivery mode (p=0.195, p=0.517, and 0.16, respectively). In contrast, gestational age (p=0.02), past medical history (p=0.05), and causes of delivery (p=0.037) significantly was affecting the delivery mode. Additionally, fetal morbidity (p=0.806) and appearance/pulse/grimace/activity/and respiration score (p=0.509) were not related to delivery modality. The leading cause of fetus admission to the neonate intensive care unit in both groups was respiratory distress syndrome (n=43), followed by sepsis (n=14), while the leading causes of neonatal death in both groups was sepsis (n=10) and respiratory distress syndrome (n=6) (p≥0.05).

Conclusions: The mode of delivery is affected by gestational age, past medical history, and delivery causes. Respiratory distress syndrome and sepsis were the leading causes of neonatal admission to the intensive care unit, and sepsis with respiratory distress syndrome was the leading cause of neonatal death.

Keywords: Cesarean trial, Neonatal outcome, Preterm pregnancy, Trial of labor (VBAC)

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Introduction

The level of cesarean section (C/S) has increased globally as the most common operative delivery technique, especially in those women who have a history of previous C/S.[1] Based on the World Health Organization (WHO) recommendation, the optimal rate of C/S should not exceed 15%.[2] Repetitive C/S are related to the increased risk of maternal morbidities, such as placenta accreta, injury, and hysterectomy. The trial of labor (vaginal birth after C/S) plays a vital role in decreasing repeated C/S and allied maternal/fetal morbidities.[3] National medical associations have provided practice guidelines for vaginal delivery after C/S, but these fluctuate among countries. Generally, vaginal delivery is relatively safer than repeated C/S. However, vaginal delivery rates have dropped significantly worldwide in recent years.[4] In women with a history of C/S, a trial of labor frequently represents her last chance to practice a normal birth. An unsuccessful vaginal delivery enhances the risk of maternal/perinatal impediments more than an elective repeated C/S.[5] The rate of trial of labor after C/S is 5% in Japan, 12–14% in the USA/Australia, 29–36% in Ireland, Italy, and Germany, and 45–55% in Finland, Sweden, and the Netherlands, and 75.6% in Israel. Cultural alterations may offer some details for the variable trial of labor after C/S.[6] American College of Obstetricians and Gynecologists (ACOG) recommends that most women with one previous C/S and a low-transverse incision are nominees to offer trial of labor after C/S. However, there is restricted or uneven scientific evidence concerning trial of labor after C/S in women with two previous C/S.[7] Controversy remains on whether a trial of labor or an elective repeated C/S is preferable for premature fetuses. Historically, concerns regarding the increased risk of uterine rupture and perinatal asphyxia in the trial of labor after C/S compared with planned repeated C/S. This is the obstetrical way to recommend a vaginal birth after cesarean section (VBAC), especially for preterm fetuses.[7] Factors affecting successful delivery are maternal age, gestational age, past medical history, comorbidities, metabolic diseases during pregnancy, obesity, individual psychology, fetal weight and health, and mode of delivery.[8] This topic needs to be researched in Iraq, including the Kurdistan region. Thus, we planned to depict neonatal morbidity succeeding preterm trial of labor compared to elective C/S among singleton pregnant women with a history of one C/S.[8]

Patients and methods

Using a simple random sampling method, this prospective observational study was conducted on 100 pregnant women diagnosed with preterm labor at Sulaimani Maternity Teaching Hospital, Sulaimaniyah, Iraq, from May 2022 to May 2023. Singleton pregnant women with 24 to <37 weeks of gestation that had a history of one previous C/S who were diagnosed to had preterm labor were enrolled in this study. Whereas pregnant women with twin fetuses, intrauterine fetal death and those with documented congenital malformation, birth weight of <500 g. Also, those pregnancies that ended with macerated stillbirth before the onset of labor were not included in this study. A validated questionnaire collected patients' sociodemographic data (age, occupation, residency, and education level). Also, the women's clinical data were obtained, including gestational age, antenatal care, and past medical history. Ethical clearance was obtained from the scientific and ethical Committees at the Kurdistan Higher Council of Medical Specialties (KHCMS), Sulaimaniyah, Iraq. Verbal consent was obtained from patients. The gestational age and the fetal condition of the studied pregnant women were confirmed using ultrasound (U/S). Then, a questionnaire was filled out

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for all patients, and the mode of delivery was estimated based on patients' various factors. Half of the patients (n=50) have C/S, and another half (n=50) gave birth to their baby by vaginal delivery. Then, comparisons between fetal outcomes in both groups were studied thoroughly using different variables. The Statistical Package for the Social Sciences (SPSS, IBM, Chicago, USA, version 27), including Shapiro-Wilk and Kolmogorov–Smirnov tests, were used to determine the normal distribution of the data. The Chi-square test was used for categorical variables. Independent sample t-test and analysis of variance (ANOVA) were used for parametric variables. Meanwhile, Mann–Whitney U and Kruskal–Wallis tests were used for non-parametric variables. $P \leq 0.05$ was considered a significant difference, and $p \leq 0.001$ was set as a highly significant difference.

Results

The mean age of studied pregnant women was 32.19 ± 5.3 years, aged 18 - 41 years. The majority of the patients aged 30 - 40 years (56%), followed by <30 years (36%), then > 40 years (8.0%). Regarding occupation, 83% were housewives, and 17% were employees. Regarding residency, 56% were from urban areas, 34% were from suburban areas, and 10% were from rural regions. Regarding the education status, primary school graduates recorded the highest level (35%), followed by illiterate (27%), then preparatory school graduates (18%), while secondary school and university/institute graduates were 10%. Regarding antenatal care, 53% had poor, and 47% had regular antenatal care. Most women had no past medical history (75%); on the other hand, 14% had diabetes mellitus, and 11% were hypertensive, as shown in Table (1).

Table (1): Sociodemographic and clinical data of patients.

Variable	Vaginal Delivery		Planned Delivery (C/S)		Total	
	Number	%	Number	%	Number	%
Age (Years)						
< 30	20	40	16	32	36	36
30-40	25	50	31	62	56	56
> 40	5.0	10	3.0	6.0	8.0	8.0
Occupation						
Housewife	42	84	41	82	83	83
Employee	8.0	16	9.0	18	17	17
Residency						
Urban	29	58	27	54	56	56
Suburban	17	34	17	34	34	34
Rural	4.0	8.0	6.0	12	10	10
Education						
Illiterate	16	32	11	22	27	27
Primary school	18	36	17	34	35	35
Secondary school	3.0	6.0	7.0	14	10	10
Preparatory school	9.0	18	9.0	18	18	18
University or Institute	4.0	8.0	6.0	12	10	10
Antenatal care						
Poor	30	60	23	46	53	53
Regular	20	40	27	54	47	47
Past medical history						
None	42	84	33	66	75	75
Hypertension	2.0	4.0	9.0	18	11	11
Diabetes Mellitus	6.0	12	8.0	16	14	14

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The maternal age who had a successful expected VBAC was 31.5 ± 6.31 years, which is slightly lower than those required C/S (32.88 ± 4.0 years) (p=0.195). Similarly, antenatal care did not affect the mode of delivery (p=0.16); although most patients who had successful VBAC had poor antenatal care (60%), most patients who experienced C/S had regular antenatal care (54%). In contrast, there was a significant association between gestational age and mode of delivery, as VBAC had higher gestational age (33.44 ± 2.14 weeks) than those experienced C/S (32.52 ± 1.99 weeks) (p=0.02). Also, past medical history was associated with the delivery mode (p=0.05); since 84% of those who had successful VBAC had no past medical history, 4.0% had hypertension, and 12% were diabetic. On the other hand, 66% of patients who had C/S did not have a past medical history; 18% were hypertensive, and 16% had diabetes mellitus. Using steroids during pregnancy did not affect the delivery mode (p=0.517), although most patients in both groups used steroids (72% in the VBAC group and 66% in the C/S group). Notably, causes of delivery significantly affected the delivery mode (p=0.037) since 12% of VBAC was due to antepartum hemorrhage (APH) and other causes, 20% was due to preeclampsia toxemia (PET), 46% was due to preterm premature rupture of the membranes (PPROM), and 10% was due to chorioamnionitis. Paradoxically, 30% of C/S was APH and PET, 22% was PPROM, 12% was chorioamnionitis, and only 6.0% was due to other causes, as shown in Table (2).

Table (2): Comparison between factors related to the delivery modality.

Variable	VBAC	C/S	p-value
	(Number, %)		
Antenatal care			
Regular	20 (40)	27 (54)	0.16
Poor	30 (60)	23 (46)	
Using steroid			
Yes	36 (72)	33 (66)	0.517
No	14 (28)	17 (34)	
Medical history			
None	42 (84)	33 (66)	0.05*
Gestational Hypertension	2.0 (4.0)	9.0 (18)	
Gestational Diabetes millets	6.0 (12)	8.0 (16)	
Cause of delivery			
APH	6.0 (12)	15 (30)	0.037*
PET	10 (20)	15 (30)	
PPROM	23 (46)	11 (22)	
Chorioamnionitis	5.0 (10)	6.0 (12)	
Others	6.0 (12)	3.0 (6.0)	
Total	50 (100)	50 (100)	

VBAC: Vaginal birth after cesarean; C/S: Cesarean; APH: Antepartum hemorrhage; PET: Preeclampsia toxemia; PPROM: Preterm premature rupture of the membranes; *: Significant difference using Chi-square test

Most fetuses from VBAC were alive (80%), and 20% were early neonatal deaths, while 78% of the C/S fetuses were alive and 22% were dead, without significant difference (p=0.806). Most fetuses from VBAC and C/S were females (58% and 54%, respectively) without substantial correlations (p=0.687). Also, the mode of delivery was not affected by the appearance, pulse, grimace, activity, and respiration (APGAR) score (p=0.509); the score after one minute and five minutes was 5.26 ± 1.48 and 8.42 ± 1.26, respectively, in VBAC and was 5.30 ± 1.09 and 8.41 ± 0.64, respectively in C/S. The birth weight in both groups was also non-significantly correlated (p=0.354), as shown in Table (3).

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Table (3): Comparison of neonatal outcomes among studied groups.

Variable	VBAC	C/S	p-value
Fetal outcome (Number, %)			
Alive	40 (80)	39 (78)	0.806
Early neonatal death	10 (20)	11 (22)	
APGAR score (Mean ± SD)			
After 1 minute	5.26 ± 1.48	5.30 ± 1.09	0.509
After 5 minutes	8.42 ± 1.26	8.41 ± 0.64	
Admission to NICU	30 (60)	27 (54)	0.65
Perinatal death (Number, %)			
Stillbirth	2.0 (4)	3.0 (6)	
Early neonatal death	8.0 (16)	9.0 (18)	
Birth weight (Kg)	2.13 ± 0.29	2.07 ± 0.32	0.354
Fetal gender (Number, %)			
Male	21 (42)	23 (46)	0.687
Female	29 (58)	27 (54)	

VBAC: Vaginal birth after cesarean; C/S: Cesarean section

Most of the fetuses that were admitted to NIUC in VBAC (n=40) and C/S (n=39) groups were mainly due to respiratory distress syndrome (RDS), followed by sepsis, asphyxia, and then transient tachypnea. On the other hand, the most abundant cause of neonatal death in VBAC (n=10) and C/S (n=11) groups was sepsis, followed by RDS, then asphyxia. Neonatal death due to transient tachypnea was found only among VBAC cases (30%). There were no significant differences between causes of neonate admissions to NICU (p=0.814) or neonatal death (p=0.258) between the 2 studied groups, as shown in Table (4).

Table (4): Causes of neonatal admission to NICU and early neonatal death among patients.

Causes	Admission of neonate to NICU (n=79) (Number, %)		p-value	Neonatal death (n=21) (Number, %)		p-value
	VBAC (n=40)	C/S (n=39)		VBAC (n=10)	C/S (n=11)	
Sepsis	7.0 (17.5)	7.0 (17.9)	0.814	4.0 (40)	6.0 (54.5)	0.258
Respiratory distress syndrome	23 (57.5)	20 (51.3)		2.0 (20)	4.0 (36.4)	
Birth asphyxia	6.0 (15.0)	5.0 (12.8)		1.0 (10)	1.0 (9.1)	
Transient tachypnea	2.0 (5.0)	2.0 (5.1)		3.0 (30)	0.0 (0.0)	
Others	2.0 (5.0)	5.0 (12.8)		0.0 (0.0)	0.0 (0.0)	

NICU: Neonatal intensive care unit; VBAC: Vaginal delivery after cesarean; C/S: Cesarean section

Regarding the maternal outcomes, most women who underwent C/S used analgesia (98%) and antibiotics (100%), stayed for more extended periods in the hospital (82%), had late mobilization (20%), and slower recovery (10%) with postpartum endometritis (14%) compared to women had VBAC. There were significant (p=0.014) and highly significant correlations (p<0.001) between both groups regarding maternal outcomes, as shown in Table (5).

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Table (5): Maternal outcomes in the trial of vaginal delivery versus cesarean section.

Variable	VBAC (n=50)	CS (n=50)	p-value
	Number, %		
Using analgesia	42 (84)	49 (98)	0.014*
Using antibiotics	35 (70)	50 (100)	<0.001**
Long hospital stay	8.0 (16)	41 (82)	<0.001**
Early mobilization	43 (86)	10 (20)	<0.001**
Rapid recovery	45 (90)	5.0 (10)	<0.001**
Postpartum endometritis	1.0 (2)	7.0 (14)	0.027*

VBAC: Vaginal delivery after cesarean; C/S: Cesarean section
*: Significant difference and **: Highly significant difference, using Chi-square test

Discussion

Generally, one of the most dreaded complications of the trial of labor after C/S is uterine rupture, which may account for 0.5–1%; however, the trial of labor after a C/S offers some advantages over an elective repeated C/S for women with a previous C/S; even though both are associated with some risks.[9] In Iraq and specifically in our locality, there needs to be more data regarding neonatal outcomes, with more data about factors that might affect the use and success of VBAC. This is the first attempt to stratify neonatal outcomes after elective repeat cesarean delivery versus trial of labor in women with previous cesarean delivery. Thus, factors associated with successful vaginal delivery and C/S were examined by multivariable analysis. This study investigated the patients' personal and clinical data.[10] The mean age of women was 32.19 ± 5.3 years. Most patients aged 30 - 40 years (56%), housewives (83%), from urban areas (56%), graduated from primary school (35%), had poor antenatal care (53%) with no past medical history (75%) and had 32.98 weeks' gestational age. Some of these findings are similar to another study that reported 31.1 ± 5.3 years for maternal age; however, their patient's gestational age was higher (38.7 ± 0.8 weeks), and most patients had adequate antenatal care (50.8%).[11] Also, Tefera et al. reported that most pregnant women aged 24-35 years old, had primary education (36.69%), were housewives (71.6%), were from urban areas (65.8%), and with a gestational age of 29-36 weeks.[12] Moreover, in this study, the maternal age, steroid usage during pregnancy, and antenatal care were not correlated to the delivery mode (p=0.195, p=0.517, and 0.16, respectively). In contrast, gestational age (p=0.02), past medical history (p=0.05), and causes of delivery (p=0.037) significantly correlated to the delivery mode. In this regard, Dombrowski et al. stated that patients' characteristics showed that women who attempted VBAC differed substantially from those who had planned C/S by gestational age, parity, race, ethnicity, prenatal care, and comorbidities.[11] Additionally, in the present study, the leading cause (indication for the preterm labor) for trial labour in VBAC was PPROM (46%), while it was PET and APH in the C/S group; thus, causes of delivery significantly impacted the delivery mode (p=0.037). In this regard, Vecchioli et al. mentioned that the primary indication of trial labor was maternal medical causes (34.2%), followed by prolonged pregnancy (26.1%), then PPROM (15.3%) and fetal indications (9%).[13] Interestingly, in the current study, fetal morbidity (p=0.806) was not related to delivery modality, which is not agreed with Tefera et al. study, which mentioned that the risk of adverse neonatal outcome was higher among babies born through the C/S than those born via vaginal delivery.[12] The main leading cause of fetus admission to NIUC in VBAC and C/S groups was RDS, followed by sepsis. In contrast, the leading cause of neonatal death in both groups was sepsis,

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followed by RDS, but without significant differences in both conditions (p≥0.05). In this respect, another study mentioned that neonates born to women undergoing a VBAC had no significant difference (p≥0.05) in outcomes, including composite neonatal outcome, NICU admission, RDS, necrotizing enterocolitis, hypoxic-ischemic encephalopathy, seizures, transient tachypnea, compared to those born by C/S, except decreased risk of proven/suspected sepsis.[14] At the same time, another study reported that neonates had an increased risk of NICU admissions, assisted ventilation, seizures, and death.[15] On the contrary, a modest increase in the risk of composite severe newborn complications among women who attempted labor compared to those who did not was seen in another study (2.0% versus 1.4%, p=0.04).[11]Regarding fetal mortality, in this study, most fetuses were born alive (79%), and only 21% died without a significant difference between the VBAC and C/S groups (p=0.806). Also, most born fetuses were females (56%). These outcomes are parallel to Tefera et al. study who stated that 7.52% of babies born through emergency C/S died before discharge from the hospital. In comparison, only 5.1% of babies died that were born naturally, but with a significant difference. However, most of their babies were males.[12] Rahman et al. observed that most women who had C/S had a higher history of hypertension and related pathologies. Also, these women had a higher age compared to women who had successful vaginal deliveries. Neonates of women who had C/S were at a greater risk of RDS than those who had vaginal deliveries.[16] These outcomes agree with our results except for past medical history, in which only 18% of our patients who C/S had hypertension, and most had no diseases. Furthermore, in this study, the APGAR score (p=0.509) was unrelated to the delivery modality. This finding is consistent with Rotem et al. study that concluded that neonatal outcomes were less favorable among the preterm group; however, preterm versus term trial of labour following a cesarean delivery was not associated with a low 5-minute APGAR score.[17] Collectively, understanding correlations between the trial of labour after C/S and successful vaginal delivery after C/S at the population level is essential for developing national guidelines that can be considered and individualized at the patient/provider level.[18] The limitation of this study is that the observational study is more prone to selection bias and often results in unbalanced baseline group differences, thus, a randomized control trial (RCT) is suggested in the future.

Conclusions

The mode of delivery is substantially affected by gestational age, past medical history, and delivery causes, while delivery modality does not affect fetal morbidity and APGAR score. RDS and sepsis were the leading causes of fetus admission to NICU and fetal death. Premature infants born by either VBAC or C/S are at increased risk for developing respiratory problems, sepsis, and congenital anomalies. However, the trial of labour was associated with increased rates of respiratory distress. We recommend using this obtained information to counsel and manage the increasing number of trial labour in women with previous C/S.

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Conflict of interest

The authors declare no conflict of interest in this study.

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