

# Do They Stand a Chance? Vaginal Birth after Cesarean Section in Adolescents Compared to Adult Women



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## ABSTRACT

**Study Objective:** To determine the rate of elective repeat cesarean delivery (CD), vaginal birth after cesarean (VBAC) attempt, and VBAC success in adolescent mothers presenting for delivery of a second child after a prior CD compared to their adult counterparts.

**Design:** Retrospective cohort study analyzing data from the Consortium on Safe Labor Database which includes data for 228,668 deliveries from 2002 to 2008.

**Setting:** 19 hospitals within 12 institutions in the United States.

**Participants:** 10,791 women age  $\leq 35$  (428 adolescents, age  $\leq 19$  and 10,363 adults age 20-35) with history of prior CD presenting for delivery of a second child.

**Methods:** The database was accessed for information on patient characteristics, prenatal comorbidities, and delivery data. Rates of repeat CD, VBAC attempt, and VBAC success were calculated. Multiple logistic regression was applied to identify predictors of VBAC success.

**Results:** Adolescents had a lower overall repeat CD rate and higher VBAC attempt rate compared to adults (80.61% vs 85.32%,  $P = .0072$ ; 40.42% vs 30.09%,  $P < .0001$  respectively). VBAC success was similar between adolescents and adults (47.98% vs 48.78%  $P = .8368$ ). Delivery at a teaching hospital and greater gestational age were predictive of VBAC success. Gestational diabetes mellitus, induction of labor, and higher maternal body mass index were predictive of VBAC failure. Adolescence was not an independent predictor of VBAC outcome.

**Conclusions:** Adolescents are more likely to attempt VBAC and are likely to be as successful as their adult counterparts. Adolescents should be encouraged to attempt a trial of labor after prior CD when appropriate to lower the risks of lifelong maternal morbidity from numerous repeat CDs.

**Key Words:** Adolescent pregnancy, Vaginal birth after cesarean section, Trial of labor after cesarean section

## Introduction

At present, the cesarean delivery (CD) rate in the United States is at a record high of 32.8%,<sup>1</sup> which is significantly higher than the average rate of 21.1% for developed countries worldwide.<sup>2</sup> The primary CD rate has increased steadily from 14.5% in 1996 to 23.4% in 2007 while rates of vaginal birth after cesarean (VBAC) dropped from 27.3% to only 8.3% (data based on a 22-state reporting area).<sup>3</sup> A history of prior CD poses increased risks to future pregnancies including abnormal placentation, uterine rupture, blood transfusion, hysterectomy, and maternal death.<sup>4-6</sup>

The rate of adolescent pregnancy, though currently at the lowest recorded rate of 29.4 births per 1,000 among women age 15-19 in 2012,<sup>1</sup> remains significantly higher than in other developed countries.<sup>7</sup> Adolescents differ from their adult counterparts in having longer reproductive lives with the potential for undergoing numerous repeat CDs. Previous reports have associated young maternal age with certain adverse obstetrical outcomes such as preterm delivery, low birth weight, neonatal intensive care unit admission, anomalies, stillbirth, and post-neonatal death.<sup>8-12</sup> Data on similar disparities regarding rates of repeat CD, VBAC attempt, and VBAC success have not been reported.

The objective of this study was to determine the rates of elective repeat CD, VBAC attempt, and VBAC success in adolescent mothers presenting for delivery of a second child after prior CD compared to their adult counterparts.

## Materials and Methods

This is a retrospective cohort study analyzing data from the Consortium on Safe Labor Database, Eunice Kennedy Shriver National Institute of Child Health and Human Development, which includes information on 228,668 deliveries of 233,844 neonates from 2002-2008, encompassing 19 hospitals from 12 institutions in the United States.

This study was conducted at MedStar Washington Hospital Center in Washington, DC, and MedStar Health Research Institute, Hyattsville, MD.

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The study was approved by the MedStar Health Research Institutional Review Board. Data included patient characteristics, prenatal complications, labor and delivery information, and maternal and neonatal outcomes.

The database was queried to determine the rates of primary CD in nulliparous women and repeat CD and VBAC in women with 1 prior CD delivering their second child. Women older than 35 were excluded to eliminate the potential confounder of advanced maternal age. Deliveries at a gestational age  $\leq 24$  weeks were excluded as these pregnancies generally are considered pre-viable. In addition, we excluded women with contraindications to trial of labor: history of prior uterine rupture, previous classical CD, abnormal placentation, malpresentation, active herpes infection, and conditions that are valid medical indications for planned repeat CD: pregnancies with multiple gestations, fetal anomalies, history of shoulder dystocia, known HIV infection, syndrome of hemolysis, elevated liver enzymes and low platelets, and eclampsia.

All deliveries to nulliparous women age  $\leq 35$  years were analyzed to determine the primary CD rate. The primary CD rate for nulliparous adolescents age  $\leq 19$  was compared to that of adult women age 20 to 35.

Total repeat CD rate, VBAC attempt rate, and VBAC success rate were calculated from the cohort of women with 1 prior CD who presented for delivery of a second singleton baby. Patients attempting VBAC were defined as women with 1 prior CD who presented for delivery of a second singleton baby with at least 2 vaginal examinations in the labor progression database. This definition of VBAC attempt has been previously used in other studies utilizing this database.<sup>13</sup> VBAC success was defined as vaginal delivery of a second baby to women with 1 prior CD. Rates for VBAC attempt and VBAC success were calculated for both groups (adolescents age  $\leq 19$  and adults age 20 to 35). It was assumed that patients not identified as attempting VBAC had declined VBAC, so they were excluded from further analysis. Characteristics including race (White, Black, Hispanic, and other), insurance (private, public, or self-pay), type of hospital (teaching or private), body mass index (BMI; at time of delivery), smoking, alcohol use, diabetes mellitus (pre-gestational a gestational), hypertension, intrauterine growth restriction (IUGR), labor induction, gestational age, estimated fetal weight, birth weight, and uterine rupture in those attempting VBAC were compared between the 2 groups. These same characteristics were compared in patients with successful VBAC and those with failed VBAC. Data were analyzed using simple percentage calculations, chi-square analysis, and Fisher exact test for categorical data where appropriate, Student t-test for continuous variables, and multiple logistic regression analysis to identify predictors of VBAC success. *P* values  $< .05$  were considered to indicate statistically significant differences. Statistical analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC).

## Results

A total of 82,765 deliveries to nulliparous women age  $\leq 35$  meeting the above mentioned exclusion and inclusion criteria were identified in the database. There were 16,681

**Table 1**

Total Repeat Cesarean Section, VBAC Attempt and VBAC Success Rates in Women With One Prior Cesarean Section Delivering a Second Baby

	Age $\leq 19$ N = 428	Age 20-35 N = 10363	P-value
VBAC Attempt	40.42 (173)	30.09 (3118)	$< .0001$
VBAC Success	47.98 (83)	48.78 (1521)	.8368
VBAC Declined	59.58 (255)	69.91 (7245)	$< .0001$
Total repeat cesarean section rate	80.61 (345)	85.32 (8842)	.0072

Data shown in % (n).

*P*-values calculated using chi-square.

adolescents age  $\leq 19$  and 66,084 adults age 20–35. The primary CD rate in the adolescent group was 21.08% compared to 29.88% in the adult group ( $P < .0001$ ).

Data for repeat CD, VBAC attempt, and VBAC success are shown in Table 1. A total of 428 adolescents age  $\leq 19$  and 10,363 adults age 20–35 were identified as presenting for delivery of their second pregnancy with a history of 1 prior CD. Overall, the repeat CD rate (includes planned repeat CD and failed VBAC) was 80.61% in the adolescent group compared to 85.32% in the adult group ( $P = .0072$ ). The VBAC attempt rates were 40.42% in the adolescent group and 30.09% in the adult group ( $P < .0001$ ). VBAC success rate was similar in both groups (47.98% in adolescents and 48.78% in adults;  $P = .8368$ ).

Baseline characteristics of those attempting VBAC were compared between the 2 age groups (Table 2). Adolescents were more often of Black or Hispanic race than adults (48.75% vs 22.59% and 28.75% vs 20.50%, respectively,  $P < .0001$ ). Adolescents were more likely to have public insurance (71.52% vs 33.62%,  $P < .0001$ ) and to be delivered at a teaching hospital (98.84% vs 93.49%,  $P = .0046$ ). There were no statistically significant differences in rates of pre-gestational or gestational diabetes, mean BMI, smoking, alcohol use, IUGR, gestational age, estimated fetal weight,

**Table 2**

Characteristics of Patients Attempting VBAC

	Age $\leq 19$ N = 173	Age 20-35 N = 3118	P-value
Race			
White/non-hispanic	20.63	49.17	$< .0001^*$
Black/non-hispanic	48.75	22.59	
Hispanic	28.75	20.50	
Other	1.88	7.73	
Insurance type			
Private	25.45	65.53	$< .0001^*$
Public	71.52	33.62	
Self-Pay	3.03	0.85	
Teaching Hospital	98.84	93.49	.0046*
BMI (kg/m <sup>2</sup> )	31.435	31.695	.6542†
Smoking	8.09	6.09	.2886*
Alcohol use	0.58	1.60	.5206‡
Diabetes			
Pregestational	0.58	2.37	.0861*
Gestational	1.16	3.27	
Hypertension	8.09	5.93	.2461*
IUGR	0.58	1.22	.7207‡
Induction of labor	20.00	25.58	.1085*
Gestational age (wks)	38.52	38.503	.9269†
Estimated fetal weight (g)	3238.3	3299.1	.3271†
Birth weight (g)	3140.1	3253.8	.0173†
Uterine rupture	1.29	0.40	.1098*

Data shown in % except where noted.

*P*-values calculated using \*chi-square, †t-test, ‡Fisher exact test.

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