

Cesarean Delivery in Adolescents



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ABSTRACT

Study Objective: To examine the effect of maternal age on indication for primary cesarean delivery in low-risk nulliparous women.

Design: Retrospective cohort study.

Setting: Urban academic tertiary care center.

Participants: Nulliparous women younger than 35 years of age delivering vertex-presenting singletons at term.

Interventions: Participants underwent spontaneous, operative or cesarean delivery.

Main Outcome Measures: Mode of delivery, indication, and timing of cesarean delivery.

Results: Adolescents were half as likely to undergo cesarean delivery overall (odds ratio [OR], 0.48; 95% confidence interval [CI], 0.43-0.54), and more than one-third less likely to undergo cesarean delivery in labor (OR, 0.59; 95% CI, 0.53-0.66). Adjustment for potential confounders did not alter the strength of these associations. Adolescents were half as likely to undergo cesarean delivery for failure to progress (OR, 0.49; 95% CI, 0.43-0.54). There was no difference in the odds of cesarean delivery for nonreassuring fetal status (OR, 0.91; 95% CI, 0.77-1.06), or genital herpes (OR, 1.44; 95% CI, 0.57-3.68). Induction, macrosomia, oxytocin augmentation, and any labor complication were all associated with increased risk of cesarean delivery. There was no difference in the duration of second stage for adolescents who delivered by cesarean delivery compared with adults (240.0 vs 237.7 minutes; $P = .84$), but adolescents who delivered vaginally had a second stage that was one-third shorter than adults (62.5 vs 100.3 minutes; $P < .001$).

Conclusion: Adolescents are half as likely to undergo primary cesarean delivery overall, and 40% less likely to undergo a primary cesarean delivery in labor, even after adjustment for multiple maternal, neonatal, and labor characteristics. This difference is not explained by differences in the duration of the second stage of labor.

Key Words: Pregnancy, Adolescents, Pregnancy in adolescence, Cesarean section, Obstetric delivery

Introduction

Adolescent pregnancy remains a significant public health challenge in the United States, with 273,105 babies born to women aged 15-19 years in 2013; nearly one-fifth of these are repeat pregnancies.¹ Although teen pregnancy is at a record low in the United States, rates of cesarean delivery among low-risk women of all ages have increased markedly over the past 2 decades, and adolescents are not immune to this trend.² The Centers for Disease Control and Prevention reports that in 2013 18.3% of low-risk women younger than the age of 20 years underwent a cesarean delivery, which is an increase of 51% since 1997 (12.1%).³ In subsequent pregnancies, nearly 90% of these women will deliver by repeat cesarean.³ Repeat cesarean delivery carries a significant risk to maternal and infant morbidity and mortality as a result of increased surgical risk secondary to adhesive disease, abnormal placentation, and uterine rupture.⁴⁻⁶

The most common indications for primary cesarean delivery in nulliparous women have consistently been found to be failure to progress in labor, with nonreassuring fetal status as the second most common indication.⁷ It is unclear

how these indications for cesarean delivery affect adolescent women; some have theorized that adolescent pelvic immaturity might anatomically predispose these patients to failure to progress or that emotional immaturity or fear might lead to worse maternal effort, and others suggest that provider reluctance to perform primary cesarean delivery on adolescents might decrease the frequency of a failure to progress diagnosis.⁸⁻¹¹ To date, understanding of risk factors for cesarean delivery in adolescents is limited, particularly in those who are nulliparous with singleton vertex-presenting pregnancies at term.

A better understanding of the risk factors for cesarean delivery in low-risk adolescent women is crucial to developing strategies to reduce the rate of primary cesarean delivery for this population. We therefore sought to examine how maternal age affects indication for primary cesarean delivery in a cohort of nulliparous women delivering vertex-presenting singletons at term.

Materials and Methods

Study Population

We performed a retrospective cohort study of all births ($n = 114,242$) between January 2000 and December 2012 at Brigham and Women's Hospital in Boston, MA. Exclusion

The authors indicate no conflicts of interest.

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criteria included women older than the age of 35 years (because of consistent evidence that they have a higher risk of cesarean delivery⁷), multiple gestations (twins or more), multiparous, preterm deliveries, and pregnancies not presenting in the vertex position. After restriction we had N = 32,901 women who fit criteria. The Brigham and Women's Hospital institutional review board approved this study.

Maternal and Clinical Characteristics

Maternal age was defined as age at time of birth. We defined adolescent women as those younger than 20 years of age, and adult women as those aged older than or equal to 20 years, but younger than 35 years of age. Birth outcomes, including mode of delivery and indication for cesarean delivery, were abstracted from the hospital's electronic labor and delivery record as recorded by the delivering provider. The primary outcome was cesarean delivery. A secondary outcome was timing of, and indication for, cesarean delivery. Indications for, and timing of, cesarean delivery were documented by the provider immediately after delivery. Indications included failure to progress, nonreassuring fetal status, previous uterine surgery, herpes outbreak, and missing/other. These categories were not exclusive, and more than 1 indication could be selected per patient. Records with a missing or other indication for cesarean delivery were classified as such. We reviewed all operative reports for adolescents missing coded indications for cesarean delivery and a randomly selected 10% sample of adults with missing coded indications, and found similarly low rates of misclassification for the main indications of interest, failure to progress and nonreassuring fetal heart tracing (1.4% vs 1.6% and 2.1 vs 2.0%, respectively).

Timing was categorized as scheduled, unscheduled, and emergent; these categories were mutually exclusive. We defined cesarean delivery in labor as a cesarean delivery that was coded as "unscheduled" or "emergent" for the indications of "nonreassuring fetal status" or failure to progress." For women who achieved full dilation (n = 25,856), the duration of the second stage of labor was calculated. Labor complications recorded at the time of delivery included intrapartum fever, abruption, hypertensive disease of pregnancy, and cord prolapse. Postpartum hemorrhage was defined as 500 mL or more for those who delivered vaginally, and 1000 mL for those who delivered by cesarean delivery. Infant outcomes were also electronically recorded by delivering providers. We defined macrosomia as birth weight of 4000 g or more. Low birth weight was defined as birthweight less than 2500 g.

Statistical Analysis

Analysis was performed using SAS version 9.3 (SAS Institute Inc, Cary, NC) and SPSS version 22.0.0.0 (IBM Corp, Armonk, NY). Statistical significance was defined at a level of $\alpha < 0.05$. Associations between sociodemographic and clinical characteristics and age group (<20 years vs 20–34 years) were examined using χ^2 tests, or Fisher exact test

for categorical variables, and analysis of variance, or Wilcoxon rank sum test for continuous variables. We used univariate logistic regression to evaluate associations between age group and delivery outcomes. We used multivariate logistic regression to evaluate associations between age group and delivery outcome after adjusting for race/ethnicity (white vs nonwhite), induction status (yes/no), oxytocin augmentation (yes/no), macrosomia (yes/no), and presence of any labor complication at time of delivery (intrapartum fever, abruption, hypertensive disease of pregnancy, and/or cord prolapse). Covariates were chosen on the basis of clinical relevance and were included a priori. To evaluate whether a dose–response relationship was present, we divided the adolescent group into subgroups (<16 years, 16–17 years, and 18–19 years) and evaluated the association between these subgroups and obstetrical outcomes using with the aforementioned logistic regression models.

Results

Between 2000 and 2012, we identified 32,901 nulliparous women younger than the age of 35 years with singleton vertex-presenting pregnancies who delivered viable term infants at our institution; 2967 (9.0%) of them were adolescents and 29,934 (91.0%) of them were adults.

Patient and infant characteristics for adolescents and adults are shown in Table 1. Adolescent patients in our study were more likely to be African American (34.4% vs 12.5%) or Hispanic (47.3% vs 11.6%) and less likely to be

Table 1
Characteristics of Participants According to Age (N = 32,901)

	Adolescents Younger than 20 Years (n = 2967)	Adults 20 Years or Older (n = 29,934)	P*
Age group, years			<.001
<16	154 (5.2)	–	
16–17	818 (27.6)	–	
18–19	1995 (67.2)	–	
Race/ethnicity			<.001
White	342 (11.5)	17,441 (58.3)	
Black	1022 (34.4)	3743 (12.5)	
Asian	28 (0.9)	3343 (11.2)	
Hispanic	1402 (47.3)	3474 (11.6)	
Other/unknown	173 (5.8)	1933 (6.5)	
Induced labor	852 (28.7)	10,201 (34.1)	<.001
Oxytocin use	1680 (56.6)	19,411 (64.8)	<.001
Any labor complication [†]	415 (14.0)	4801 (16.0)	.004
Postpartum hemorrhage [‡]	215 (7.2)	5622 (18.8)	<.001
5-Minute Apgar score <7	25 (0.8)	205 (0.7)	.32
Birth weight, g	3294 (448)	3403 (454)	<.001
Low birth weight (<2500 g)	104 (3.5)	104 (2.2)	<.001
Macrosomia (\geq 4000 g)	170 (5.7)	170 (9.0)	<.001
Delivery mode			<.001
Spontaneous vaginal delivery	2371 (79.9)	18,723 (62.5)	
Surgical vaginal delivery	172 (5.8)	3511 (11.7)	
Cesarean delivery	424 (14.3)	7700 (25.7)	

Data are presented as n (%).

* Categorical variables were compared using either analysis of variance, χ^2 , or Fisher exact test and continuous variables using the Wilcoxon rank sum test.

[†] Labor complications recorded at the time of delivery included: intrapartum fever, abruption, hypertensive disease of pregnancy, and cord prolapse.

[‡] Postpartum hemorrhage was defined as \geq 500 mL for those who delivered vaginally, and 1000 mL for those who delivered by cesarean delivery.

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