OBSTETRICS

Population trends in cesarean delivery for breech presentation in the United States, 1997-2003

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OBJECTIVE: The objective of the study was to determine whether cesarean delivery for breech has increased in the United States.

STUDY DESIGN: We calculated cesarean rates for term singletons in breech/malpresentation from 1997 to 2003 using National Center for Health Statistics data. We compared rates by sociodemographic groups and state. Multivariable logistic regression models were constructed to see whether factors associated with cesarean delivery differed over time.

RESULTS: Breech cesarean rates increased overall from 83.8% to 85.1%. There was a significant increase in rates for most sociodemographic groups. There was little to no increase for mothers younger than 30 years old. There was wide variability in rates by state, 61.6-94.2% in 1997. Higher breech incidence correlated with lower cesarean rates, suggesting potential state bias in reporting breech.

CONCLUSION: In the United States, breech infants are predominantly born by cesarean. There was a small increase in this trend from 1998 to 2002. There is wide variability by state, which is not explained by sociodemographic patterns and may be due to reporting differences.

Key words: breech, cesarean delivery, malpresentation, United States

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Obstetricians have long debated the role of cesarean delivery for breech infants as a potentially safer mode of delivery. However, the large majority of term breech infants in developed countries are now delivered by cesarean, and evidence generally supports this practice. The largest randomized trial to date, the Term Breech Trial, the results of which were published in October 2000, demonstrated improved outcome for selective cesarean delivery.[1] However, follow-up data from this trial did not demonstrate improvement in outcomes for cesarean delivery for neither infants at 2 years nor mothers.[2,3] Since that time, the methodology and implications of the initial publication have been questioned.[4]

Nevertheless, the initial publication outlining the potential benefits of cesarean delivery for term breech was followed by subsequent changes in practice patterns in various countries.[1,5,6] In Sweden, the cesarean section rate for term breech infants increased from 75.3% to 86.0% from 1999 to 2001.[5] In The Netherlands, the cesarean section rate increased from 50% to 80% within 2 months after publication of the Term Breech Trial, which was associated with improvement in neonatal outcome.[6]

In the United States, there remains controversy regarding the necessity for cesarean section for all breech infants, with the latest committee opinion from the American College of Obstetricians and Gynecologists (ACOG) in July 2006 stating that vaginal breech delivery may still be a viable option with appropriate operator experience, rigorous hospital protocols, and a thoroughly counseled patient.[7]

We wanted to study the patterns of cesarean section rates for breech in the United States in the years surrounding the publication of the Term Breech Trial, expecting an increase in the cesarean rate as seen in other countries. We also were interested in potential variation in cesarean rates by state and sociodemographic factors and changes in these variations over time. To this end, we examined births recorded in the National Center for Health Statistics (NCHS) birth certificate datasets for the years 1997-2003 to assess trends in cesarean section rates for breech infants in the United States.

Materials and Methods

This is a population study using the US Birth Cohort datasets of 1997-2003 published by the NCHS.[8-14] In this 7 year cohort, 1,067,989 of 28,012,013 total infant births (3.8%) were recorded as breech/malpresentation. Although we sometimes refer to the subjects of this analysis as breech infants, it is important to note that the actual item recorded on the US standardized birth certificate is "breech/malpresentation," defined as "the presentation of the fetal buttocks rather than the head or other malpresentation."[15-17] As such, an unspecified proportion of infants may not be true breech

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TABLE 1
Cesarean rates for breech 1997 to 2003

		State groups[a]		
Year	Overall	Low (less than 80%)	Middle (80% to less than 90%)	High (90% or greater)
1997	83.8%	71.5%	86.3%	91.5%
1998	83.0%	69.8%	86.3%	91.0%
1999	83.1%	69.2%	86.2%	91.6%
2000	83.4%	69.8%	86.7%	92.2%
2001	84.4%	71.0%	87.7%	92.7%
2002	85.1%	72.0%	88.3%	93.1%
2003	85.1%	73.5%	87.8%	92.8%

Data source: National Center for Health Statistics.[8-14]
P values for χ^2 test for overall rates and for each group were all less than .0001.

[a] State groups divided into those with low (n = 18), middle (n = 22), and high (n = 11) baseline rates of cesarean for breech in 1997.

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but transverse lie or abnormal cephalic presentation.

To control for potential confounders in the decision to deliver by cesarean, our analysis included infants born only to US residents who were singleton infants, with estimated gestational age 37 weeks or older and less than 43 weeks. We also excluded infants born to mothers with a previous cesarean delivery or unknown method of delivery and infants with the following congenital anomalies: anencephaly, spina bifida, hydrocephalus, microcephaly, other central nervous system anomalies, heart malformations, other circulatory/respiratory anomalies, rectal atresia, tracheoesophageal fistula, omphalocele/gastroschisis, other gastrointestinal anomalies, malformed genitalia, renal agenesis, other urogenital anomalies, diaphragmatic hernia, musculoskeletal anomalies, Down's syndrome, and other chromosomal anomalies.

Of the 560,087 eligible records, 1.7% were excluded due to anomalies. (Congenital anomalies were not reported by New Mexico, and, therefore, potential cases with congenital anomalies from New Mexico would not have been excluded.) This resulted in an analytic cohort of 550,773 breech infants. This study was approved by the Stanford University Institutional Review Board.

We calculated national breech cesarean section rates for each year from 1997 to 2003 as well as state-specific rates for all 50 states and the District of Columbia. We then compared breech cesarean section rates for the years 1997 and 2003 for the following sociodemographic variables: maternal age, race, education, adequacy of prenatal care, and parity. Adequacy of care was measured by the Kessner index.[18] Adequacy was coded as a binary variable, with mothers who had intermediate, or low care classified as having inadequate prenatal care. Adequacy of care was not determined when certain variables such as the month of prenatal care initiation or number of visits were missing. We calculated percent change from 1997 to 2003 and made statistical comparisons using the χ^2 statistic. Whereas all states had uniform reporting requirements of demographic factors, various states did not have specific items on their certificate. For detailed information regarding completeness of data by state, refer to the Technical Appendix from the Vital Statistics of the United States.[15-17,19-22]

Using the percentage of breech infants delivered by cesarean in 1997, each of the 50 states and Washington, DC, states were assigned to a lower (less than 80%), middle (80 to less than 90%), or upper (90% or greater) cesarean rate performance group. These were cut off points that allowed a division into relatively equal number of states per group. Rates were calculated for each group across years based on the 1997 rate assignment.

We constructed multivariable logistic regression models for 1997 and 2003 to assess the impact associated with various sociodemographic and medical factors on mode of delivery and to assess whether such associations had changed between 1997 and 2003. We included the sociodemographic factors listed in earlier text as well as the following medical factors: maternal diabetes, hypertensive disorder, placental abruption, and precipitous delivery and the 1997 performance group of the state in which the birth occurred. Adjusted odds ratios were calculated with 95% Wald confidence intervals.

Because of the implementation of new birth certificate data forms, the states of Pennsylvania and Washington did not collect maternal education information in 2003 (n = 7200). Adequacy of prenatal care was not known for 1547 records in the 2003 records for the remaining states and 2384 records in 1997. These records were not included in the logistic regression analysis.

To assess variation in diagnosis of breech in this database, we calculated the incidence of breech in 1997 by individual states and performed correlation analysis between incidence and breech cesarean rates. We estimated the correlation coefficient R using simple linear regression and calculated the coefficient of determination R^2. We calculated 28 day mortality rates for vaginal vs cesarean delivered breech infants according to cesarean performance group as outlined above.

All statistical analyses were computed using SAS 9.1 (SAS, Cary, NC). We used $P < .05$ to confer statistical significance.

RESULTS

The percentages of term breech singletons delivered by primary cesarean section over the years 1997 to 2003 are listed in Table 1. Cesarean section rates decreased from 1997 to 1998 were stable from 1998 to 1999, increased from 2000