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Perinatal outcomes in low-risk term pregnancies: do they differ by week of gestation?




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# Perinatal outcomes in low-risk term pregnancies: do they differ by week of gestation?

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**OBJECTIVE:** The objective of the study was to examine whether the risk of perinatal complications increases with increasing gestational age among term pregnancies.

**STUDY DESIGN:** This is a retrospective cohort study of low-risk women with term, singleton births in 2003 in the United States. Gestational age was subgrouped into 37, 38, 39, 40, and 41 completed weeks. Statistical comparison was performed using $\chi^2$ test and multivariable logistic regression models, with 39 weeks' gestation as the referent.

**RESULTS:** There were 2,527,766 women meeting study criteria. Compared with 39 weeks, delivery at 37 or 38 weeks had lower risk of febrile morbidity but slightly higher risk of cesarean delivery. Delivery at 40 or 41 weeks was also associated with higher overall maternal morbidity. For neonates, delivery at 40 or 41 weeks had higher risk of birthweight greater than 4500 g, neonatal injury (40 weeks: adjusted odds ratio [aOR] 1.11 [95% confidence interval (CI), 1.05-1.18]; 41 weeks: aOR 1.27 [95% CI, 1.17-1.37]) and meconium aspiration (40 weeks: aOR 1.55 [95% CI, 1.43-1.69]; 41 weeks: aOR 2.12 [95% CI, 1.91-2.35]). Delivery at 37 or 38 weeks had higher risk of hyaline membrane disease (37 weeks: aOR 3.12 [95% CI, 2.90-3.38]); 38 weeks: aOR 1.30 [95% CI, 1.19-1.43]) but lower risk of meconium aspiration.

**CONCLUSION:** The risk of cesarean delivery and neonatal morbidity in low-risk women increases at 40 weeks and beyond, whereas the odds of serious neonatal pulmonary disease were highest at 37 weeks. Recognition of such variation in term outcomes should lead providers to avoid iatrogenic morbidity and consider interventions to prevent complications of late-term pregnancy.

**Key words:** complications, gestational age, term pregnancy

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Pregnancy complications are significantly higher in postterm pregnancy, defined as gestation that extends beyond 42 completed weeks, or 294 days.[1] It has been well established that postterm pregnancy is associated with increased risk of labor dystocia, severe perineal injury, and cesarean delivery with associated morbidity for the mother,[2-4] and perinatal mortality (intrauterine fetal demise plus neonatal deaths), meconium aspiration, infectious morbidity, birth trauma, low umbilical artery pH levels, and low Apgar scores for the neonate.[5-7] Currently the American College of Obstetricians and Gynecologists (ACOG) recommends initiation of antenatal surveillance between 41 weeks and 42 weeks of gestation because perinatal morbidity and mortality increase with advancing gestational age.[1]

★ EDITORS' CHOICE ★

Most research on outcomes of term pregnancy focuses on perinatal complications associated with postterm pregnancy and its management thereof. There is less information regarding outcomes in term pregnancy at 37-42 weeks of gestation. Studies of perinatal mortality have reported the rate of stillbirth is lowest at 37-38 weeks of gestation and increases 6-fold from 0.35 per 1000 ongoing pregnancies at 37 weeks to 2.12 per 1000 ongoing pregnancies at 43 weeks.[5,8] Because perinatal morbidity and mortality in postterm pregnancy may be partly related to the slow deterioration of placental function and the progressive increase in fetal size that both occur during the term period of pregnancy, the risk of perinatal complications might be expected to increase with advancing gestational age in a continuous, rather than threshold, fashion.[9] Indeed,

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there is increasing evidence to support that the risk of maternal and neonatal complications increases as pregnancy progresses beyond 40 weeks of gestation.[9-11]

To further examine this association at the population level, we conducted a population-based study of all low-risk, singleton, live-born, term pregnancies delivered in the United States in 2003 using birth certificate data. We hypothesized that pregnancy complications increase with increasing gestational age, and this occurs prior to 42 weeks of gestation.

## Materials and Methods

This was a retrospective cohort study of all low-risk women with term, singleton live births delivered in 2003 in the United States using the Vital Statistics Natality birth certificate registry provided by the Center of Disease Control and Prevention. The 2003 natality data include births to US and non-US residents that occurred in the 50 United States, the District of Columbia, the Virgin Islands, and US territories.

The 2003 birth data were compiled using either the 1989 revision or 2003 revision of the US standard certificate of live birth. The 2003 revision was used by 2 states (Pennsylvania and Washington) and the 1989 revision was used by the remaining 48 states and the District of Columbia.

Exclusion criteria for this study were multiple gestations, noncephalic presentation, prior cesarean delivery, and preterm deliveries (prior to 37 completed weeks of gestation) as well as postterm pregnancies (births after 42 completed weeks of gestation). Additionally, women with preexisting medical conditions were excluded; these included maternal cardiac diseases, lung diseases, chronic hypertension, and pregestational or gestational diabetes mellitus. Institutional review board approval was obtained from the Committee on Human Research at the University of California, San Francisco.

In the 2003 natality data, there were 2 entries for gestational age, 1 based on menstrual dates, the other based on obstetric/clinical dates. The source of a clinical estimate was unspecified and may include antenatal estimate (by clinical examination or ultrasonography) as well as newborn assessment. Methods for these edits on gestational age had been previously published.[12] For this study, the gestational age was based on the obstetric/clinical dating because studies have shown that obstetric/clinical estimates provide a good approximation to the menstrual dating, and when ultrasound dating is designated as the gold standard, menstrual dating tends to overestimate gestational age.[13,14] The gestational age at delivery was subgrouped into 37, 38, 39, 40, and 41 completed weeks of gestation.

The maternal outcomes examined included primary cesarean delivery (women with placenta previa, women who had cesarean for breech presentation, or repeat cesarean delivery were excluded), operative vaginal delivery (including both vacuum-assisted and forceps deliveries), and peripartum febrile morbidity. Neonatal outcomes examined were macrosomia (birthweight greater then 4000 g and birthweight greater then 4500 g), neonatal injury, 5 minute Apgar score less than 7 and less than 4, meconium-stained amniotic fluid, meconium aspiration syndrome, hyaline membrane disease, and the use of mechanical ventilation for more than 30 minutes' duration. In the 2003 natality data, 5 minute Apgar scores were collected by 48 states and the District of Columbia but not California or Texas. As a result, 5 minute Apgar scores were available for 77.5% of births in 2003, and births from California and Texas account for the remaining 22.5% of births missing information on Apgar scores.[15]

The definition and diagnostic criteria of outcomes in the birth data were based on definitions complied by a committee of federal and state health statistics officials for the Association of Vital Records and Health Statistics.[16,17] Both the 1989 and 2003 standard certificates of live birth use a check box format to collect the medical and health information available on the birth certificate. This format allows the designation of more than 1 risk factor or diagnosis and includes a choice of "none"; and if an item is not completed, it is classified as "not stated."[17]

The National Center for Health Statistics also tightly regulates the birth certificate information, which are automatically checked for completeness, individual item code validity, and unacceptable inconsistencies between data items. The registration area is then notified if irregularity exists and steps are taken to resolve inconsistency. This process is reviewed on an ongoing basis for overall quality control and assurance and is further augmented by analyses of year-to-year and area-to-area variations in the data.[17]

Incidence proportions of these outcomes were examined and compared by gestational age using $\chi^2$ testing. Multivariable logistic regression models were used to control for potential confounding by maternal factors, which included maternal age, parity, race/ethnicity, gestational weight gain, number of prenatal care visits, and cigarette use during pregnancy; additionally, mode of delivery was included for models that examined neonatal injury.

We designated 39 weeks of gestation as the reference comparison group because it was the mean and median gestational age at delivery for the population. Statistical analysis was performed using STATA version 9.0 (StataCorp, College Station, TX). Statistical significance was indicated using $P < .05$ and 95% confidence intervals (CIs).

## Results

There were 2,527,766 women with live, singleton, cephalic, term pregnancy meeting study criteria who delivered in the United States in 2003. Of these, 8.33% delivered at 37 completed weeks of gestation, 19.41% delivered at 38 weeks, 30.16% delivered at 39 weeks, 32.08% delivered at 40 weeks, and 10.02% delivered at 41 weeks. The maternal characteristics are shown in Table 1.

The frequencies of primary cesarean delivery and operative vaginal delivery at 37 weeks, 38 weeks, and 39 weeks were similar for the entire cohort and when stratified by parity, both of which were higher in nulliparas (Table 2). This in-

**TABLE 1**
**Maternal characteristics (total n = 2,928,772)**

| | Number of women | % |
|---|---|---|
| Age, y | | |
| 19 or younger | 299,806 | 11.9 |
| 20-34 | 1,937,081 | 76.6 |
| 35 or older | 290,879 | 11.5 |
| Parity | | |
| Nullipara | 1,146,755 | 45.5 |
| Multipara | 1,373,256 | 54.5 |
| Race/ethnicity | | |
| Non-Hispanic white | 1,553,066 | 61.5 |
| African American | 372,019 | 14.7 |
| Latina/Hispanic | 469,123 | 18.6 |
| Asian | 107,274 | 4.2 |
| Native American | 26,284 | 1.0 |
| Education, y | | |
| 0-8 (less than high school) | 134,040 | 5.3 |
| 9-12 (some high school/graduate) | 1,149,030 | 45.5 |
| 13-16 (some college/graduate) | 954,347 | 37.7 |
| More than 16 (postgraduate) | 262,643 | 10.4 |
| Not stated/unknown | 27,706 | 1.1 |
| Marital status | | |
| Not married | 903,564 | 35.8 |
| Married | 1,624,202 | 64.2 |

Source: National Center for Health Statistics (2003).

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formation was also presented in graphic format (Figure 1). Febrile morbidity was also similar between deliveries at 37 and 38 weeks but increased with increasing gestation after 39 weeks. This association remained true when results were stratified by cesarean delivery (results not shown). For women who delivered beyond their due date, the frequency of primary cesarean delivery increased to 14.1% at 40 weeks and 19.8% at 41 weeks; trends similar to the increase in cesarean were seen for operative vaginal delivery and when stratified by parity and for maternal febrile morbidity (Table 2 and Figure 1).

When neonatal outcomes were examined by gestational age at delivery, we observed that neonates delivered at 37 weeks had higher frequency of low 5 minute Apgar scores (1.01% for Apgar less than 7 and 0.19% for Apgar less than 4) than those delivered at 38 or 39 weeks' gestation. In addition, the frequencies of hyaline membrane disease (0.45%) and need for mechanical ventilation greater than 30 minutes (0.57%) were highest at 37 weeks (Table 3 and Figure 2). There were increasing risks of high birthweight with increasing gestational age as well as higher risk of neonatal injury at 40 and 41 weeks. Meconium-stained amniotic fluid and meconium aspiration were more frequently seen with increasing gestation, whereas hyaline membrane disease occurred more frequently in the

**TABLE 2**
**Maternal outcomes by gestational age at delivery[a]**

| | 37 wks (n = 210,591), % | 38 wks (n = 490,572), % | 39 wks (n = 762,460), % | 40 wks (n = 810,916), % | 41 wks (n = 253,227), % |
|---|---|---|---|---|---|
| 1° cesarean delivery | 13.26 | 12.82 | 12.81 | 14.08 | 19.83 |
| 1° CD nullipara | 21.12 | 21.51 | 21.55 | 23.30 | 30.10 |
| 1° CD multipara | 7.30 | 6.82 | 6.22 | 5.46 | 6.82 |
| Operative vaginal delivery | 6.70 | 6.87 | 7.56 | 8.13 | 9.63 |
| Op VD nullipara | 11.68 | 12.30 | 13.26 | 13.61 | 15.11 |
| Op VD multipara | 3.49 | 3.72 | 3.98 | 3.99 | 4.44 |
| Febrile morbidity | 1.37 | 1.39 | 1.63 | 2.01 | 2.70 |

*CD*, cesarean delivery; *Op*, operative; *VD*, vaginal delivery.
Source: National Center for Health Statistics (2003).

[a] $P < .0001$ for all.

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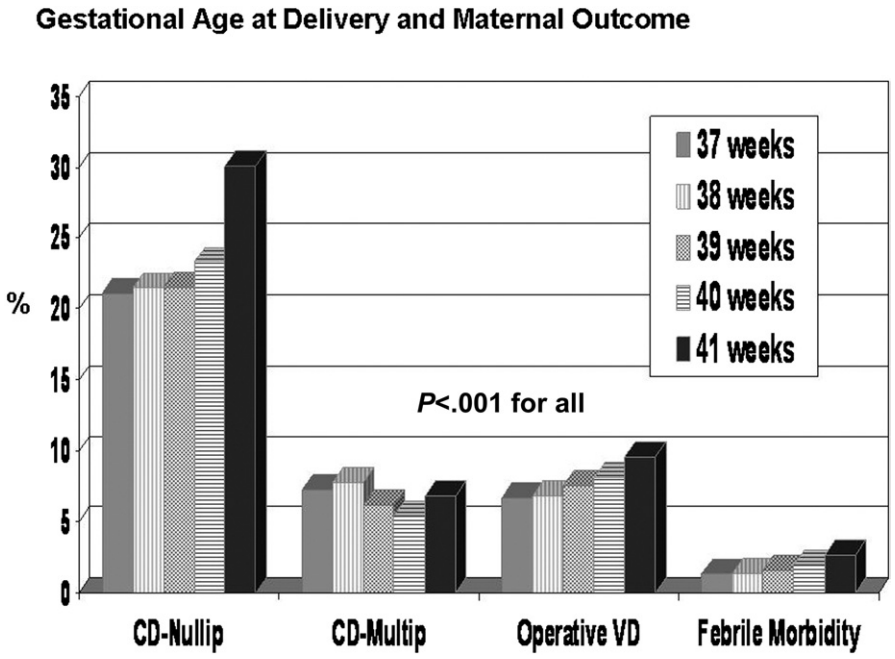
FIGURE 1
**Maternal outcomes by gestational age**

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early term period (37 and 38 weeks of gestation).

The association between gestational age and perinatal outcomes was further examined using multivariable logistic regression models; in these analyses, the adjusted odds ratio approximates the relative risk. Compared with delivery that occurred at 39 weeks' gestation, women who delivered at 41 weeks had a 40% increase in the risk of cesarean delivery (adjusted odds ratio [aOR] 1.46; 95% CI, 1.44-1.48).

A subgroup analysis by parity indicated that this association was mostly driven by the increased risk in nulliparas (aOR 1.56 [95% CI, 1.53-1.58]; Table 4), although the risk of cesarean delivery in multiparas was also higher at 41 weeks than 39 weeks. Whereas the risk of operative vaginal delivery was lower in women who delivered at 37 or 38 weeks and slightly higher at 41 week, the odds ratios were only modestly different from the baseline when examined using both the entire cohort as well as subgroup analysis by parity (Table 4). Compared with delivery at 39 weeks, women who delivered at 41 weeks had higher risk of febrile morbidity (Table 4).

Neonates delivered at 37 weeks had nearly a 70% increase in risk of having a low 5 minute Apgar score (aOR 1.69 [95% CI, 1.59-1.79] for 5 minute Apgar less than 7 and aOR 1.87 [95% CI, 1.63-2.15] for 5 minute Apgar less than 4), compared with those delivered at 39 weeks (Table 4). The risk of macrosomia was lower with delivery at 37 or 38 weeks' gestation than at 40 or 41 weeks such that the risk of having a neonates weighing greater than 4500 g was more than 3-fold that of delivery at 39 weeks (aOR 3.57 [95% CI, 3.45-3.69]; Table 4). Perhaps due to increases in fetal weight, neonates delivered at 41 weeks were at higher risk of neonatal injury, compared with those delivering at 39 weeks (aOR 1.27 [95% CI, 1.17-1.37]).

TABLE 3
**Neonatal outcomes by gestational age at delivery[a]**

| | 37 wks (n = 210,591), % | 38 wks (n = 490,572), % | 39 wks (n = 762,460), % | 40 wks (n = 810,916), % | 41 wks (n = 253,227), % |
|---|---|---|---|---|---|
| 5 minute Apgar less than 7 | 1.01 | 0.69 | 0.61 | 0.70 | 0.93 |
| 5 minute Apgar less than 4 | 0.19 | 0.13 | 0.11 | 0.12 | 0.14 |
| Macrosomia | | | | | |
| Birthweight greater than 4000 g | 1.98 | 4.56 | 7.88 | 12.64 | 19.23 |
| Birthweight greater than 4500 g | 0.25 | 0.53 | 0.92 | 1.63 | 3.09 |
| Neonatal injury | 0.28 | 0.28 | 0.31 | 0.35 | 0.40 |
| Meconium-stained amniotic fluid | 2.27 | 3.24 | 5.20 | 7.39 | 10.33 |
| Meconium aspiration | 0.07 | 0.08 | 0.12 | 0.19 | 0.27 |
| Hyaline membrane dz | 0.45 | 0.19 | 0.14 | 0.14 | 0.18 |
| Mechanical vent greater than 30 min | 0.57 | 0.32 | 0.28 | 0.29 | 0.38 |

*Dz*, disease; *vent*, ventilation.
Source: National Center for Health Statistics (2003).

[a] $P < .0001$ for all.

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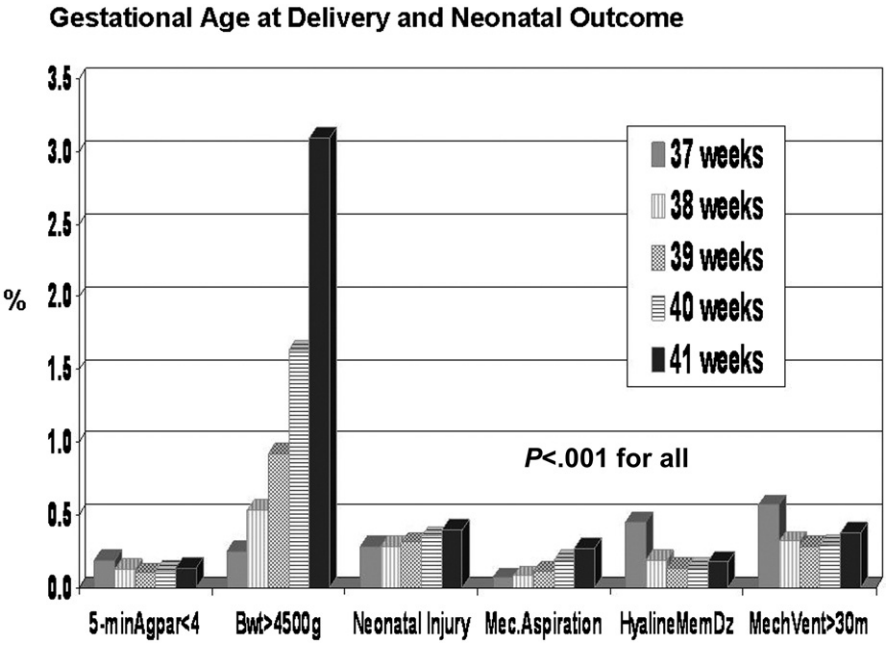
Whereas the risk of meconium stained amniotic fluid and neonates having meconium aspiration syndrome were higher at 40 or 41 weeks of gestation, compared with 39 weeks, the risk of hyaline membrane disease was greatest at 37 weeks (aOR 3.12 [95% CI, 2.90-3.38]). Neonates delivered at 37 weeks' gestation were also more likely to require mechanical ventilation use for more than 30 minutes (aOR 2.21 [95% CI, 2.05-2.38]), compared with deliveries at 39 weeks (Table 4). The greatest overall risk of neonatal respiratory morbidity occurred at the extremes of the term period (ie, at 37 and 41 weeks).

FIGURE 2
**Neonatal outcomes by gestational age**

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## Comment

This was a population-based study of low-risk women who delivered at term in the United States in 2003. In these women, pregnancy complications differed by gestational age at delivery. The risk of operative delivery and other maternal morbidity is lower during 37 through 39 weeks of gestation and increases at 40 and 41 weeks. However, although some of the neonatal morbidities exhibit a similar pattern of rising incidence with increasing gestational age throughout term pregnancy (macrosomia and meconium aspiration), others decrease down to 39 weeks of gestation but do not rise thereafter (hyaline membrane disease), and still others appear bimodal with a nadir at 39 weeks of gestation (low Apgar scores, mechanical ventilation).

The common theme for most of these outcomes is a minima at 39 weeks of gestation. Because the macrosomia risk is lower at 37 and 38 weeks of gestation, so is the risk of neonatal injury. The risk of meconium aspiration is also lower at 37 and 38 weeks of gestation, which contrasts the finding of higher rates of hyaline membrane disease among these deliveries and, overall, produces higher rates of mechanical ventilation use at these gestational ages.

Compared with women who delivered between 39 and 40 weeks, women who delivered beyond their due date had a higher risk of cesarean delivery and operative vaginal delivery. Particularly in nulliparas, we observed a nearly 60% increased risk of primary cesarean and a 14% increased risk of operative vaginal delivery when deliveries occurred at 41 weeks, compared with 39 weeks. These operative deliveries are likely, in turn, to be associated with higher rates of severe perineal lacerations,[18] postpartum hemorrhage,[19] and wound complications.[20]

Additionally, for those women undergoing cesarean, they have higher risks of maternal and neonatal complications in future pregnancies.[21,22] In an era of declining trial of labor after cesarean, once the first cesarean is performed, women will likely incur the increased morbidity because of repeat cesarean in the future.[23]

In addition to the increased risk of operative delivery associated with increasing gestational age, we also observed that the odds of meconium stained amniotic fluid is higher at 40 and 41 weeks, compared with 39 weeks gestation; furthermore, the risk of meconium aspiration syndrome in neonates were accordingly higher at 40 and 41 weeks. This finding is consistent with prior reports of the association between meconium/meconium aspiration and postterm pregnancies.[3,9-11]

Whereas the need for mechanical ventilation longer than 30 minutes was also higher in neonates delivered at 41 weeks, compared with delivery at 39 weeks, this increase was modest. In contrast, a 2-fold increase in the need for mechanical ventilation was seen in neonates delivered at 37 weeks, compared with 39 weeks. Although the exact indications for mechanical ventilation use were not available for analysis, this coincides with the risk of hyaline membrane disease at 37 weeks, which was approximately 3 times that of neonates delivered at 39 weeks. Furthermore, the risk of hyaline membrane disease and the need for mechanical ventilation longer than 30 minutes were both higher at 38 weeks, compared with 39 weeks. Perhaps some of these may include neonates that were incorrectly dated. Alternatively, this finding may reflect that, although rare, neonates delivered at 38 weeks may still experience respiratory distress more likely attributable to hyaline membrane disease than to meconium aspiration syndrome.

Although our findings support the ACOG practice guideline that fetal pulmonary maturity should be con-

**TABLE 4**
**Adjusted odds ratios of perinatal outcomes using multivariable logistic regression analyses[a]**

| | 37 wks, aOR, 95% CI | 38 wks, aOR, 95% CI | 40 wks, aOR, 95% CI | 41 wks, aOR, 95% CI |
|---|---|---|---|---|
| Maternal outcomes | | | | |
| Cesarean delivery | **1.05, 1.03-1.07** | **1.04, 1.03-1.05** | **1.05, 1.04-1.05** | **1.46, 1.44-1.48** |
| CD nullipara | 0.98, 0.96-1.00 | 1.00, 0.99-1.02 | **1.11, 1.10-1.12** | **1.56, 1.53-1.58** |
| CD multipara | **1.22, 1.19-1.25** | **1.12, 1.09-1.14** | **0.90, 0.88-0.92** | **1.16, 1.13-1.20** |
| Operative VD | **0.88, 0.86-0.90** | **0.93, 0.92-0.94** | 1.02, 1.00-1.03 | **1.14, 1.11-1.16** |
| Op VD nullipara | **0.87, 0.85-0.90** | **0.93, 0.91-0.94** | **1.02, 1.01-1.04** | **1.14, 1.12-1.17** |
| Op VD multipara | **0.88, 0.85-0.91** | **0.94, 0.91-0.96** | 1.00, 0.98-1.02 | **1.11, 1.07-1.15** |
| Febrile morbidity | **0.86, 0.82-0.89** | **0.87, 0.85-0.90** | **1.20, 1.17-1.23** | **1.49, 1.45-1.54** |
| Neonatal outcomes | | | | |
| 5 minute Apgar less than 7 | **1.69, 1.59-1.79** | **1.15, 1.09-1.21** | **1.09, 1.04-1.14** | **1.37, 1.29-1.45** |
| 5 minute Apgar less than 4 | **1.87, 1.63-2.15** | **1.18, 1.04-1.34** | 1.04, 0.93-1.16 | **1.23, 1.06-1.43** |
| Birthweight greater than 4000 g | **0.25, 0.24-0.25** | **0.56, 0.55-0.57** | **1.71, 1.69-1.73** | **2.95, 2.91-2.99** |
| Birthweight greater than 4500 g | **0.28, 0.26-0.31** | **0.59, 0.56-0.61** | **1.79, 1.74-1.85** | **3.57, 3.45-3.69** |
| Neonatal injury | 0.94, 0.85-1.04 | **0.93, 0.87-0.99** | **1.11, 1.05-1.18** | **1.27, 1.17-1.37** |
| Meconium | **0.42, 0.40-0.43** | **0.61, 0.60-0.63** | **1.44, 1.42-1.46** | **2.04, 2.00-2.07** |
| Meconium aspiration | **0.62, 0.52-0.74** | **0.70, 0.62-0.79** | **1.55, 1.43-1.69** | **2.12, 1.91-2.35** |
| Hyaline membrane dz | **3.12, 2.90-3.38** | **1.30, 1.19-1.43** | 0.96, 0.88-1.05 | **1.17, 1.05-1.31** |
| Mechanical ventilation greater than 30 min | **2.02, 1.88-2.18** | **1.15, 1.08-1.23** | 1.00, 0.94-1.06 | **1.28, 1.18-1.39** |

Reference comparison group was women who delivered at 39 weeks of gestation. **Bold** values represent those that were statistically significant.
*CD*, cesarean delivery; *Op*, operative; *VD*, vaginal delivery.
Source: National Center for Health Statistics (2003).

[a] Adjusting for maternal age, parity, race/ethnicity, maternal education, number of prenatal care visits, and cigarette smoking during pregnancy; mode of delivery was additionally adjusted for the examination of neonatal injury.

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firmed prior to elective delivery at less than 39 weeks' gestation,[24] it is important to point out that the composite risk of neonatal pulmonary morbidity (hyaline membrane disease and meconium aspiration syndrome) was similar in the 38th and 40th weeks of pregnancy. The odds of having a low 5 minute Apgar score (less than 7 and less than 4) is higher for neonates delivered at either 37 weeks or 41 weeks, compared with 39 weeks.

We speculate that a low 5 minute Apgar score at 37 weeks more frequently is associated with prematurity and hyaline membrane disease; whereas at 41 weeks, complications related to dysmaturity and meconium aspiration syndrome may be at play.

These data represent all low-risk women with live, term deliveries between 37 and 41 weeks' gestation who gave births in the United States in 2003. While this population-based study reflects obstetric and neonatal outcomes of births in the United States in 2003, it has several limitations.

Because this study examined perinatal outcomes associated with gestational age at delivery, the accuracy of gestational age dating is essential. The issue of gestational age dating in the natality data by menstrual or obstetric/clinical estimates has been examined. Obstetric/clinical estimates reportedly provide a close approximation to the menstrual dating. However, when ultrasound dating is designated as the gold standard, menstrual dating may systematically overestimate gestational age.[13,14]

Although we chose to use obstetric/clinical dating for this analysis to minimize such error in estimation, some women may have been misclassified such that they were assigned a higher gestational age than they should have been. For example, some women in the 41 week gestational age group might have delivered in their 40th week, and some women in the 37 week gestational age group might have delivered in their 36th week.

Although misclassification bias is usually unidirectional, the bias affects all groups so the comparisons of each week substrata with the others are still valuable. The advantage of using the Vital Statistics natality data is the representation of all live births in the United States, which truly reflects the obstetric care in this country. Although we were able to examine a number of immediate maternal and neonatal outcomes, birth certificate data do not contain information re-

garding postnatal outcomes that may provide further insights regarding gestational age at delivery and long-term health outcomes. Despite the fact that maternal and neonatal outcomes were reported with detailed definitions and routinely verified by the federal and state maternal and child health personnel for quality control checks to ensure accuracy and completeness, missing data and reporting error may still exist.

Despite these limitations, we report one of the largest cohorts in the literature to examine complications of term pregnancy by week of gestation. Consistent with prior studies, we found that delivery at 39 weeks of gestation appears associated with the lowest risk of overall maternal and neonatal morbidity. Although our study findings await further validation from large randomized controlled trials, we caution that elective delivery in low risk women prior to 39 weeks' gestation should be deferred at least until after 38 weeks of gestation.

Clinical and research efforts should focus on preventive efforts that minimize maternal and neonatal complications beyond 39 weeks. Such efforts could identify higher risk women (eg, antenatal testing) as well as encourage lower rates of achieving late-term gestation (eg, stripping membranes, elective induction of labor). Meanwhile, these findings may help determine the optimal timing of labor induction because each patient will have her own risk factors that need to be balanced with the perinatal risks presented. ■

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