Delivery at Term: Impact of University Education by Week of Gestation

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Abstract

Objective: Data on risk factors for early term delivery are scant despite greater complications in infants born at 37 and 38 weeks' gestation. We determined the probability of delivery by gestational week at term according to level of maternal education, an established risk factor for preterm birth.

Methods: We analyzed 2 319 697 live singleton births at term (≥37 weeks) in Quebec from 1981 to 2010. We estimated hazard ratios with 95% confidence intervals (CI) of delivery according to level of maternal education, adjusting for individual characteristics. The main outcome measure was the probability of delivery at term by week of gestation for women with university education versus high school education.

Results: Early term birth at 37 and 38 weeks of gestation was less common for university-educated women (23.1%) than for high school-educated women (25.8%; $P < 0.001$). Compared with women with a high school education, university-educated women had a 15% lower probability of delivery at 37 to 38 weeks (95% CI: 0.84 to 0.86), a 4% lower probability of delivery at 39 weeks (95% CI: 0.96 to 0.97) and a 2% lower probability of delivery at 40 weeks (95% CI: 0.97 to 0.98). University-educated women were, however, more likely to deliver at 41 weeks.

Conclusion: A higher level of education was associated with longer duration of pregnancy at term. Women who were university-educated had a lower chance of delivery at 37, 38, 39, and even 40 weeks of gestation. Clinicians should be aware that women with lower levels of education are more likely to deliver earlier at term.

Résumé

Objectif : Nous ne disposons que de peu de données sur les facteurs de risque de l'accouchement à 37-38 semaines de gestation, et ce, malgré le fait que les enfants qui naissent à 37 et à 38 semaines de gestation connaissent des complications accrues. Nous avons déterminé la probabilité d'accouchement pour chacune des semaines de gestation à terme, en fonction du niveau de scolarité maternel (un facteur de risque reconnu en ce qui concerne l'accouchement préterme).

Méthodes : Nous avons analysé 2 319 697 accouchements d'un enfant vivant à terme (≥ 37 semaines) à la suite d'une grossesse monofœtale au Québec entre 1981 et 2010. Nous avons estimé, en ce qui concerne l'accouchement, les rapports de risque selon des intervalles de confiance à 95 %, en fonction du niveau de scolarité maternel (en neutralisant les effets des caractéristiques individuelles). La probabilité d'accouchement pour chacune des semaines de gestation à terme, en fonction du niveau de scolarité maternel (études universitaires versus études secondaires), a constitué le principal critère d'évaluation.

Résultats : L'accouchement à 37 et à 38 semaines de gestation était moins courant chez les femmes de niveau de scolarité universitaire (23,1 %) que chez les femmes de niveau de scolarité secondaire (25,8 %; P < 0,001). Les femmes de niveau de scolarité universitaire présentaient une probabilité d'accoucher à 37-38 semaines de gestation de 15 % inférieure à celle des femmes de niveau de scolarité secondaire (IC à 95 % : 0,84 à 0,86); à 39 semaines, cette probabilité était de 4% inférieure (IC à 95 % : 0,96 à 0,97) et à 40 semaines, elle était de 2 % inférieure (IC à 95 % : 0,97 à 0,98). Les femmes de niveau de scolarité universitaire étaient, cependant, plus susceptibles d'accoucher à 41 semaines.

Conclusion : Le fait de détenir un niveau de scolarité supérieur a été associé à une durée prolongée de la grossesse à terme. Les femmes de niveau de scolarité universitaire présentaient une probabilité moindre d'accoucher à 37, à 38, à 39 et même à 40 semaines de gestation. Les cliniciens devraient être avisés du fait que les femmes de niveau de scolarité moindre sont plus susceptibles d'accoucher plus tôt à terme.

Key Words: Educational status, gestational age, pregnancy, term birth

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INTRODUCTION

Most women deliver at term, but the definition of term birth is increasingly under scrutiny.[1,2] Infants born at 37 or 38 weeks of gestation have more respiratory

complications,[3–7] admissions to intensive care,[3,5,7] and mortality than infants born later during term.[5,8,9] Children and young adults born at 37 or 38 gestational weeks have a higher risk of mortality,[10] hospital admission,[11] and chronic illness.[11] In consequence, the five weeks spanning term are increasingly divided into two periods (early [37–38 weeks] and full term [39–41 weeks]) in an effort to identify optimal timing of delivery in uncomplicated pregnancies.[12] However, delivery at 39 weeks may also be associated with poor outcomes, including lower rates of breastfeeding in infancy,[13] delayed cognitive and physical development in childhood,[14] and higher systolic blood pressure in adulthood.[15] This growing evidence suggests that risk is not homogeneous throughout term, and that infants delivered after 39 weeks of gestation have more favourable outcomes.

Risk factors for the timing of delivery at term are, however, not fully understood and may not be uniform over the entire five weeks of term. This knowledge gap makes it difficult to identify women who may be susceptible to early term delivery. In contrast, determinants of preterm delivery are better established.[16] Although several factors are associated with preterm delivery, level of education is one of the strongest known predictors in public health.[17,18] Maternal level of education is more strongly associated with preterm delivery than income or employment.[18,19] It is entirely plausible that level of maternal education also influences the timing of delivery at term, although to our knowledge no study has assessed this possibility. A higher level of education may benefit women during pregnancy in multiple ways,[17,20,21] and the impact of education most likely does not cease once the 37-week preterm cutoff is passed. Determining the association between level of maternal education and timing of delivery at term can clarify risk factors for early term birth, and may ultimately contribute to improving public health interventions. We therefore sought to evaluate the relationship between educational attainment and the probability of delivery at term by week of gestation.

METHODS

We used data on all 2 319 697 singleton live births at 37 weeks of gestation or more in the province of Quebec over a 30-year period. All data were drawn from birth registration certificates in the live birth file, which contain information on maternal education, gestational age in completed weeks, and other demographic characteristics. Quebec has approximately one quarter of Canada's population, and data were available for the 30-year period spanning 1981 to 2010. These data are used by Statistics Canada, the Public Health Agency of Canada's Perinatal Surveillance System, and the Institut national de santé publique du Québec for monitoring the gestational age of infants at delivery. The main outcome measure was live birth by completed weeks of gestation from 37 to 41 weeks, including the early term (37–38 weeks) and full term (39–41 weeks) periods.[7,8] Post-term births at ≥42 weeks were rare, and were included in the population at risk. Gestational age in Quebec is determined by ultrasound assessment before 20 weeks,[22] although menstrual dating may have been used in earlier time periods.

We identified women as having a high school diploma or less, post-secondary collegiate training, or university education or more. In Quebec, these categories correspond to at least 11, 12–13, or 14 years or more of formal education, respectively. Level of maternal education was unknown for 129 147 births (5.6%), and these births were included in a separate category in analyses. Other covariates selected for their potential to confound the relationship between level of education and timing of delivery included maternal age (<20, 20–34, ≥35 years), marital status (legally married or not), immigrant born outside of Canada (yes, no, unknown), mother tongue as a proxy for ethnicity (French, English, other language, unknown), parity (0, 1, ≥2 previous deliveries), and time period (1981-1990, 1991-2000, 2001-2010).

In addition to analyzing early term and full term births, we carried out a week-by-week analysis to ensure that underlying trends were not masked through use of two single categories. We examined the proportion of births for each week of gestation by level of education. In addition, we calculated the cumulative proportion of births at each week. Using Cox proportional hazards regression, we estimated hazard ratios (HR) and 95% confidence intervals (CI) for early term and full term delivery, comparing university education with high school education in unadjusted models, and in models adjusted for maternal age, marital status, immigration, language, parity, and time period. We used week of gestation as the time scale in the models. For early term delivery, we used 37 weeks as the start of the risk period, and censored all deliveries at 39 weeks or more. For full term delivery, we began the risk period at 39 weeks, and censored deliveries at 42 weeks or more. In addition, we computed HRs of delivery for each completed week of gestation. For example, we estimated the HR for delivery at 39 weeks by starting the risk period at that week, and censoring all deliveries occurring at 40 weeks or more. We confirmed that hazards were non-proportional over gestational age by testing an interaction term with education ($P < 0.001$).