Caesarean Section Rates in Southwestern Ontario: Changes Over Time After Adjusting for Important Medical and Social Characteristics

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Abstract

Objective: To compare Caesarean section rates in a cohort of women in Southwestern Ontario over time, overall, and in patient subgroups defined by the Robson criteria, after adjusting for important medical and social characteristics.

Methods: We obtained data from a perinatal database on deliveries at ≥ 22 weeks' gestation at a level II centre and a level III centre in London, Ontario between 1999 and 2010. Caesarean section rates were examined overall and in subgroups defined by parity, presentation, plurality, gestational age, and history of previous Caesarean section. Multivariable modified Poisson regression was used to compare Caesarean section rates in 2003–2006 and 2007–2010 versus 1999–2002.

Results: In the fully adjusted models, the overall Caesarean section rate was significantly higher in 2007–2010 than in 1999–2002 for the level II centre (adjusted relative risk [aRR] 1.12; 95% CI 1.05 to 1.21). An increase was also seen in the level III centre in both 2003 to 2006 (aRR 1.19; 95% CI 1.14 to 1.24) and 2007 to 2010 (aRR 1.17; 95% CI 1.12 to 1.22). Similar increases were seen over time among patient subgroups. Notably, repeat Caesarean sections without labour increased at the level II centre (2003 to 2006 aRR 1.21; 95% CI 1.01 to 1.45, and 2007 to 2010 aRR 1.44; 95% CI 1.21 to 1.71) and the level III centre (2003 to 2006 aRR 1.72; 95% CI 1.53 to 1.94, and 2007 to 2010 aRR 1.77; 95% CI 1.57 to 2.00).

Conclusion: There has been a significant increase over time in the Caesarean section rate overall and in important subgroups. This increase remains even after controlling for other factors which may explain the trend.

Key Words: Caesarean section, primary Caesarean section, repeat Caesarean section, obstetrics

Competing Interests: None declared.

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Résumé

Objectif : Comparer les taux de césarienne constatés dans une cohorte de femmes du Sud-Ouest de l'Ontario au fil du temps, de façon globale et au sein de sous-groupes de patientes définis au moyen des critères de Robson, à la suite de la neutralisation de l'effet d'importantes caractéristiques médicales et sociales.

Méthodes : Nous avons obtenu, auprès d'une base de données périnatale, des données sur les accouchements à ≥ 22 semaines de gestation s'étant déroulés dans un centre de niveau II et un centre de niveau III de London, en Ontario, entre 1999 et 2010. Les taux de césarienne ont été examinés de façon globale et dans le cadre de sous-groupes définis en fonction de la parité, de la présentation, de la pluralité, de l'âge gestationnel et des antécédents de césarienne. Une régression de Poisson multivariée modifiée a été utilisée pour comparer les taux de césarienne constatés au cours des périodes 2003-2006 et 2007-2010 à ceux qui ont été constatés au cours de la période 1999-2002.

Résultats : Dans le cadre des modèles entièrement corrigés, le taux global de césarienne a été considérablement plus élevé pour la période 2007-2010 que pour la période 1999-2002 au sein du centre de niveau II (risque relatif corrigé [RRc], 1,12; IC à 95 %, 1,05 - 1,21). Une hausse a également été constatée au sein du centre de niveau III tant au cours de la période 2003-2006 (RRc, 1,19; IC à 95 %, 1,14 - 1,24) qu'au cours de la période 2007-2010 (RRc, 1,17; IC à 95 %, 1,12 - 1,22). Des hausses semblables ont été constatées au fil du temps au sein des sous-groupes de patientes. Notamment, le taux de césarienne itérative sans travail a connu une hausse au sein du centre de niveau II (2003-2006 : RRc, 1,21; IC à 95 %, 1,01 - 1,45 et 2007-2010 : RRc, 1,44; IC à 95 %, 1,21 - 1,71) et du centre de niveau III (2003-2006 : RRc, 1,72; IC à 95 %, 1,53 - 1,94 et 2007-2010, RRc, 1,77; IC à 95 %, 1,57 - 2,00).

Conclusion : Au fil du temps, nous avons constaté une hausse significative du taux de césarienne, tant de façon globale qu'au sein d'importants sous-groupes. Cette hausse est demeurée la même à la suite de la neutralisation de l'effet d'autres facteurs qui auraient pu expliquer la tendance.

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INTRODUCTION

Caesarean section rates have increased over the last 25 years in Canada[1–3] and elsewhere.[4–8] There is debate surrounding the reasons for this increase[2,9]; possible explanations include changing maternal demographics and medical characteristics,[2,10,11] and shifts in clinical and patient decision-making practices.[12–14]

Several studies have examined the effect of controlling for maternal characteristics on the magnitude of the increase in Caesarean section rates over time. For example, in a study examining changes in the rate of primary Caesarean sections between 1988–1991 and 1998–2000 in Nova Scotia, Joseph et al. showed that adjusting for maternal characteristics reduced the apparent increase from 21% to 2%.[2] This finding adds evidence to the hypothesis that changes over time in maternal characteristics, such as maternal age, BMI, and smoking status, could explain some of the increase in Caesarean section rates. In a more recent study using data from a single level III centre in Nova Scotia, Allen et al. showed that a statistically significant increase in Caesarean section rates among maternal subgroups persisted after controlling for sociodemographic, obstetrical, and fetal characteristics.[15]

To our knowledge, a similar analysis has not been conducted in Ontario. Since there is considerable variation in both obstetrical practice and maternal characteristics across regions,[16–18] further studies in different geographic areas are needed to determine whether a significant increase in the Caesarean section rate remains after controlling for medical and social characteristics. Therefore, the objectives of this study were to compare the overall rates of Caesarean section at a level II centre and a level III centre in London, Ontario in 2003–2006 and 2007–2010 versus 1999–2002 after controlling for important medical and social characteristics, and to compare the rates of Caesarean section in 2003–2006 and 2007–2010 versus 1999–2002 among subgroups of interest (defined according to the Robson classification system[19,20]).

METHODS

We conducted a retrospective cohort study of births over three four-year time periods from January 1, 1999, to December 31, 2010, using data obtained from a city-wide perinatal database currently housed at London Health Sciences Centre-Victoria Hospital (LHSC-VH) in London, Ontario. This database contains information on all births in London at ≥ 20 weeks' gestation or with ≥ 500 grams birth weight. At the time of data collection, these deliveries occurred either at LHSC-VH (a level II centre) or at St. Joseph's Health Care (a level III centre). The database contains information on mothers' sociodemographic characteristics, health during pregnancy, labour and delivery, and on basic neonatal outcomes. All information is taken from the antenatal and delivery charts and is entered into the database following the infant's birth. The database, used mostly for clinical audits and research,[21–23] is maintained as a part of hospital protocol. London, Ontario is the largest city in Southwestern Ontario[24] and serves the tertiary care needs of Southwestern Ontario, which has more than 1.2 million residents and approximately 17 000 births per year. Before 2011, London had both level II and level III obstetrical care units. St. Joseph's Health Care was the level III centre and had approximately 3400 births per year, while LHSC-VH was the level II centre, with approximately 2000 births per year. The study population therefore reflects both a high-risk obstetrical population (in the level III centre) and a more general obstetrical population (in the level II centre).

The study sample included all pregnancies delivering between 22 and 43 weeks' gestation; deliveries before and after this range were excluded so that size for gestational age could be calculated using Kramer's Canadian population-based standards.[25] This resulted in a sample size of 28 258 pregnancies in women delivering at the level II centre, and 38 907 pregnancies in women delivering at the level III centre, after exclusions.

Delivery by Caesarean section was the outcome of interest. This was stratified according to Robson's classification system,[19,20] which groups deliveries into mutually exclusive groups according to parity, previous Caesarean section, presentation, gestational age, and singleton versus multiple gestation (Table 1). Robson's classification system has been used previously to examine Caesarean section rates among maternal subgroups of clinical importance.[3,26–29] The Society of Obstetricians and Gynaecologists of Canada recommends further stratification of Robson's groups according to the nature of labour onset (i.e., spontaneous, induced, or Caesarean section before labour).[30] This was done where sample size allowed.

To make comparisons over time, the study period was divided into three four-year time periods (1999–2002, 2003–2006, and 2007–2010); 1999 to 2002 served as the reference period. Characteristics which could explain some of the increase in Caesarean section rates over time were divided into medical and social factors. Medical factors included hypertension (chronic hypertension, gestational hypertension, preeclampsia, or eclampsia), diabetes (gestational or overt), previous perinatal death, previous Caesarean section, breech presentation, regional anaesthesia,