Relationship Between Interpregnancy Interval and Adverse Perinatal and Neonatal Outcomes in Northern Alberta

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Abstract

Background: Birth outcomes are known to be associated with birth spacing, but there are population differences. The purpose of this study was to examine the association between interpregnancy intervals and perinatal and neonatal outcomes in a Canadian population during the era of mandatory folate fortification of food.

Methods: We conducted a study of 46 243 women who had two consecutive singleton births in northern Alberta between 1999 and 2007, using a linked provincial dataset. Perinatal outcomes of interest were preterm birth, low birth weight (LBW), small for gestational age, and perinatal death. Neonatal outcomes were low Apgar score, low arterial blood gas pH, need for neonatal resuscitation or admission to NICU, and neonatal death. Multivariable logistic regression was used to control for maternal demographic and obstetrical characteristics.

Results: The risk of preterm birth was increased for multiple interpregnancy intervals: for an interval of 0 to 5 months, the adjusted odds ratio (aOR) was 1.37 (95% CI 1.18 to 1.59), for 6 to 11 months the aOR was 1.18 (95% CI 1.04 to 1.34), for 24 to 35 months the aOR was 1.16 (95% CI 1.02 to 1.31), and for 36+ months the aOR was 1.36 (95% CI 1.20 to 1.53), compared with the reference interval of 12 to 17 months. The risk of LBW was increased with interpregnancy intervals of 0 to 5 months (aOR 1.48; 95% CI 1.23 to 1.80), 6 to 11 months (aOR 1.21; 95% CI 1.03 to 1.42), 24 to 35 months (aOR 1.21; 95% CI 1.03 to 1.41) and 36+ months (aOR 1.48; 95% CI 1.27 to 1.73). The risk of SGA was increased with intervals 0 to 5 months (aOR 1.29; 95% CI 1.09 to 1.52), 24 to 35 months (aOR 1.15; 95% CI 1.01 to 1.31), and 36+ months (aOR 1.26; 95% CI 1.11 to 1.44). The risk of perinatal death was increased with an interval of 36+ months (aOR 1.60; 95% CI 1.06 to 2.43). Similar associations were also observed for neonatal outcomes.

Conclusion: This study suggests that both short and long interpregnancy intervals are associated with adverse perinatal and neonatal outcomes, and it provides risk estimates for a Canadian population in the era of folate fortification of food.

Key Words: Birth spacing, interpregnancy interval, perinatal outcomes, preterm birth, low birth weight, small for gestational age, perinatal death, neonatal death

Competing Interests: None declared.

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Résumé

Contexte : Bien qu'il soit reconnu que les issues de grossesse sont associées aux intervalles intergrossesses, certaines différences sont constatées d'une population à l'autre. Cette étude avait pour objectif d'examiner l'association entre les intervalles intergrossesses et les issues périnatales et néonatales au sein d'une population canadienne, au cours des années suivant la décision qui a rendu obligatoire l'enrichissement des aliments en folate.

Méthodes : Nous avons mené une étude auprès de 46 243 femmes qui ont mené deux grossesses monofœtales consécutives à terme dans le nord de l'Alberta entre 1999 et 2007, en utilisant un ensemble de données liées provinciales. L'accouchement prétermе, le faible poids de naissance (FPN), l'hypotrophie fœtale et le décès périnatal ont été les issues périnatales sur lesquelles nous nous sommes penchés. Pour ce qui est des issues néonatales, nous nous sommes penchés sur le faible indice d'Apgar, le faible pH mis au jour par gazométrie du sang artériel, la nécessité de procéder à une réanimation néonatale ou à une admission à l'UNSI et le décès néonatal. Une régression logistique multivariée a été utilisée pour neutraliser l'effet des caractéristiques démographiques et obstétricales maternelles.

Résultats : Nous avons constaté que de multiples intervalles intergrossesses ont été marqués par une hausse du risque d'accouchement prétermе : un intervalle de 0 à 5 mois était associé à un rapport de cotes corrigé (RCc) de 1,37 (IC à 95 %, 1,18 - 1,59), un intervalle de 6 à 11 mois était associé à un RCc de 1,18 (IC à 95 %, 1,04 - 1,34), un intervalle de 24 à 35 mois était associé à un RCc de 1,16 (IC à 95 %, 1,02 - 1,31) et un intervalle de plus de 36 mois était associé à un RCc de 1,36 (IC à 95 %, 1,20 - 1,53), par comparaison avec l'intervalle de référence (de 12 à 17 mois). Le risque de FPN a connu une hausse dans le cas des intervalles intergrossesses de 0 à 5 mois (RCc, 1,48; IC à 95 %, 1,23 - 1,80), de 6 à 11 mois (RCc, 1,21; IC à 95 %, 1,03 - 1,42), de 24 à 35 mois (RCc, 1,21; IC à 95 %,

1,03 - 1,41) et de plus de 36 mois (RCc, 1,48; IC à 95 %, 1,27 - 1,73). Le risque d'hypotrophie fœtale a connu une hausse dans le cas des intervalles intergrossesses de 0 à 5 mois (RCc, 1,29; IC à 95 %, 1,09 - 1,52), de 24 à 35 mois (RCc, 1,15; IC à 95 %, 1,01 - 1,31) et de plus de 36 mois (RCc, 1,26; IC à 95 %, 1,11 - 1,44). Le risque de décès périnatal a connu une hausse dans le cas de l'intervalle intergrossesse de plus de 36 mois (RCc, 1,60; IC à 95 %, 1,06 - 2,43). Des associations semblables ont également été constatées pour ce qui est des issues néonatales.

Conclusion : Cette étude laisse entendre que les intervalles intergrossesses tant courts que longs sont associés à des issues indésirables périnatales et néonatales, et elle offre des estimations du risque pour une population canadienne au cours des années suivant la décision qui a rendu obligatoire l'enrichissement des aliments en folate.

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INTRODUCTION

Since the 1920s report by Woodbury,[1] numerous studies in developed and developing countries have shown both short and long interpregnancy intervals to be associated with adverse birth outcomes.[2] Mechanisms proposed to explain this prevailing phenomenon include maternal folate deficiency, postpartum nutritional stress, and postpartum hormonal imbalance.[3–5] A systematic review of 67 observational studies (11 091 659 pregnancies) and a meta-analysis of 26 cohort and cross-sectional studies demonstrated that the relationship was J-shaped, with both short and long interpregnancy intervals associated with preterm birth, low birth weight, small for gestational age, fetal death, and early neonatal death.[2]

While the relationship between interpregnancy intervals and adverse perinatal outcome has been observed to be a cross-cultural and multiethnic phenomenon, population differences in the effects have been documented.[5,6] At present, very limited data are available on the relationship between interpregnancy intervals and adverse perinatal outcomes in Canadian populations. One retrospective cohort study conducted in Quebec found an association between short interpregnancy interval and small for gestational age infants, with modification by marital status.[7] However, the study did not include other measures of adverse perinatal outcome, such as preterm birth and fetal and perinatal death, and did not control for other clinically important confounding factors such as smoking, maternal disease, and pregnancy complications.

A Canadian study of the association between interpregnancy intervals and adverse perinatal and neonatal outcomes would assist in quantifying the magnitude of this phenomenon in a Canadian population. Given the health, social, and economic burdens associated with adverse perinatal and neonatal outcomes, the results from such a study have implications for clinicians who provide family planning and preconceptual counselling and policy makers for women's reproductive health.

METHODS

The Alberta Perinatal Health Program is a province-wide program that collects perinatal data from provincial delivery records for all hospital births and registered midwife attended births in Alberta.[8] Patient records from this database were linked to the Alberta Health and Wellness Database—which holds extensive information on patients in the Alberta health care system[9]—to obtain more detailed maternal demographic information. Study data were derived only from northern Alberta, which includes the provincial capital Edmonton and surrounding regions, as information regarding gravidity was incompletely captured for the southern Alberta region during the study period.

The study included any woman who had given birth to an infant in northern Alberta between January 1, 1999, and December 31, 2007, identified from the Alberta Perinatal Health Program database. The year 1999 was chosen as the starting point for the study to ensure that the study cohort was drawn from the era of mandatory folate fortification of food in Canada, which began in 1998.[10] The study excluded women with multiple pregnancies. We also excluded records with incomplete information on maternal age, gravidity, parity, or gestational age, since the validation of interpregnancy intervals was dependent on these data.

Interpregnancy intervals were calculated as the interval between two consecutive deliveries minus the gestational age of the second infant. Interpregnancy intervals were categorized as follows: 0 to 5 months, 6 to 11 months, 12 to 17 months, 18 to 23 months, 24 to 35 months, and 36 months or more. To further characterize our study population and to evaluate potential confounders, additional information was obtained with respect to maternal demographic variables (age, use of social assistance) and maternal obstetrical history (age, gravidity, parity, maternal diseases including pre-existing diabetes, previous anomaly, or perinatal death).

The primary outcomes of interest were preterm birth, low birth weight (LBW), small for gestational age, and perinatal death. Preterm birth was defined as birth less than 37 weeks of gestation, with very and extremely preterm defined as less than 34 and 28 weeks of gestation, respectively. Low birth weight, very LBW, and extremely LBW were defined as less than 2500 g, 1500 g, and 1000 g, respectively. Small for gestational age and very SGA were defined as having a