Preterm delivery among Inuit women in the Baffin Region of the Canadian Arctic

Elizabeth Muggah 1, Daniel Way 2, Margaret Muirhead 3, Bruce Baskerville
1 University of Geneva, Department of Community Medicine, Geneva, Switzerland
2 University of Ottawa, Department of Family Medicine, Ottawa, Canada
3 Baffin Regional Hospital, Iqaluit Canada

ABSTRACT

Objective. To evaluate the rate and causes of preterm (before 37 weeks gestation) and very preterm (before 32 weeks gestation) delivery among a population of Inuit living in Canada. Study design. Three-year retrospective cross-sectional review of charts for patients delivering in the Baffin Region of Canada. Results. There were 938 births over the study period; 95% to Inuit women. Inuit women had a preterm delivery rate of 18.2% and a very preterm delivery rate of 2.4%, more than twice the Canadian national average. Sociodemographic risk factors for preterm delivery including substance use, young age, single marital status, and poor nutrition, occurred more frequently among Inuit women compared to non-Inuit women, but were not independently associated with prematurity. Known medical and obstetrical risk factors were associated with preterm delivery among Inuit women; history of prior preterm delivery, multiple pregnancy, placenta previa, poor weight gain and vaginal bleeding after 20 weeks gestation. Hospitalization rates and infant mortality were higher among preterm infants. The most common indication for hospitalization was respiratory infection (51.1%) followed by other infection (15.8%). Conclusion. Inuit women had preterm and very preterm delivery rates more than twice the Canadian national average. Preterm delivery was associated with several medical risk factors and resulted in significant increases in infant hospitalization and mortality.

Keywords: preterm birth, Inuit, Canada

INTRODUCTION

Preterm birth is the most important cause of perinatal morbidity and mortality in industrialized countries (1,2). In Canada the national rate of preterm delivery (less than 37 completed weeks gestation) and very preterm delivery (less than 32 completed weeks gestation) was 7.1 and 1.2 per 100 live births in 2000 (3).

Very little is known about preterm delivery among the Canadian Inuit population. We do know that many of the known preventable risk factors for preterm delivery occur at higher rates in this population including: low socioeconomic status, high rates of sexually transmitted diseases, cigarette smoking, psychological stress, and poor nutrition (4-7).

The largest population of Canadian Inuit live in the territory of Nunavut in the Canadian Arctic (prior to 1997 the territory of Nunavut was part of Northwest Territory (NWT) of Canada, and the health statistics reported in this text will reflect this). This study explores the preterm delivery rates of women living in the Baffin Region (Qikiqtaaluk) of Nunavut. The most recent national statistics on prematurity indicate that the highest rates of premature delivery in Canada are in the former Northwest Territories (9.3%) and Ontario (8.5%) (8). Very preterm births also occurred most frequently in the former NWT at a rate of 1.38% of live births.

This study was designed to:
1. Describe the incidence of preterm delivery among a population of Inuit women living in the Baffin Region.
2. Explore the maternal medical and sociodemographic characteristics of this population focusing on known risk factors that are associated with preterm delivery in other populations.

3. Describe the morbidity and mortality related to preterm delivery in this population; specifically looking at infant hospitalizations and medical evacuations.

**METHODS**

All live births of greater than 20 weeks gestation, to women living in the Baffin Region included in the review were occurring between January 1, 1998 and December 31, 2000. Case identification was performed through a computer search of the Baffin Regional Hospital records and the Vital Statistics records of the Nunavut and Northwest Territories Health Departments. In addition, the death reports from the Baffin Regional Hospital were hand-searched to identify infant deaths. All charts were reviewed by two researchers.

There were 982 births identified by all search methods. Twenty-seven births (2.7%) were excluded, and 938 (98.2%) cases, with available charts, were reviewed.

Categorical variables were compared using Pearson’s X² and continuous variables with one-way analysis of variance (ANOVA). All analyses were conducted in SPSS for Windows.

Race and ethnicity were recorded in the prenatal charts as Inuit, Metis, Indian or Other by the health care provider. Premature was defined as any delivery before 37 completed weeks and Very Premature as delivery before 32 completed weeks. Gestational age was determined by the caregiver’s prenatal assessment as recorded in the prenatal chart.

**RESULTS**

Of the 938 births included in the study 95% were to Inuit women and 5% to non-Inuit women (Table I). Deliveries at the Baffin Regional Hospital accounted for 95.1% of all deliveries, 4.05% (n=38) of deliveries were in communities in the Baffin Region and 0.85% (n=8) at tertiary care centres in Ottawa.

![Table I. Infant births by gestational age for Inuit and non-Inuit women.](image)

| Gestational Age | Inuit (n=835) | Non-Inuit (n=45) |
|-----------------|---------------|------------------|
| 22-32 weeks     | 20 (2.4)      | 0 (0)            |
| 33-37 weeks     | 132 (15.8)    | 8 (17.8)         |
| >37 weeks       | 683 (81.8)    | 37 (82.2)        |

Among the Inuit women, there were 152 (18.2%) preterm births and 20 (2.4%) very preterm births. (Table I).

**Gestational Age Calculation**

Less than half of the Inuit women were certain of the dates of their last menstrual period, although two thirds had an ultrasound during their pregnancy which was felt to correlate with gestational age (Table II). There was no difference between the rate of prematurity and the use of ultrasound or certainty of menstrual dates. Birthweight was compared to gestational age calculations to verify accurate dating, and was found to be significantly correlated.

**Preterm Delivery among Inuit Women**

Births were examined to identify potential sociodemographic, medical and obstetrical risk factors for preterm birth in this population (Table II). Inuit women who delivered preterm did not differ from those who delivered at term in many respects. In particular, despite high rates of reported smoking, alcohol and drug use in pregnancy there was no relationship to prematurity. Women who delivered preterm had fewer prenatal visits and poorer weight gain, but they initiated prenatal care at the same point in their pregnancy, on average at 14 weeks gestation.

Known medical and obstetrical risk factors for premature delivery were higher among Inuit women who delivered preterm including: a history of prior preterm delivery, multiple pregnancy, placenta previa, and vaginal bleeding after 20 weeks gestation. Women who delivered very preterm were more likely to have been induced than women who delivered term (Table II).

Urogenital and sexually transmitted infections
occurred no more frequently in pregnancy among women who delivered preterm.

**Neonatal Outcomes**

Premature infants fared worse across all health indicators (Table 3). Hospitalization rates for infants up to 3 months after discharge from hospital at the time of birth were more frequent among preterm infants. The most common indication for hospitalization at Baffin Regional Hospital was respiratory infection (51.1% of all hospitalizations), followed by other infection (15.8% of all hospitalizations).

| Variable                                      | Preterm                  | Term                      |
|-----------------------------------------------|--------------------------|---------------------------|
| Mother's age (mean ± SD (95% CI))             | 22.9 ± 5.5 (21.9-23.7)   | 23.6 ± 5.8 (23.2-24.1)    |
| Parity (mean ± SD (95% CI))                   | 1.7 ± 1.6 (1.4-1.9)      | 1.9 ± 2.0 (1.7-2.0)       |
| Gestational age at first prenatal visit in weeks (mean ± SD (95% CI)) | 13.8 ± 5.0 (12.9-14.6)   | 14.4 ± 5.8 (13.9-14.8)    |
| Number of prenatal visits (mean ± SD (95% CI)) | 8.9 ± 3.8 (8.3-9.5)      | 10.7 ± 4.1 (10.4 – 11.0)  |
| Weight gain in kg (mean ± SD (95% CI))        | 7.8 ± 4.0 (7.1-8.5)      | 9.6 ± 4.9 (9.3-10.1)      |
| Prenatal Care Location, % (95% CI)            |                          |                           |
| Baffin Regional Hospital                      | 16.7 (11.6-23.4)         | 22.9 (19.9-26.3)          |
| Community Nursing Station                     | 83.3 (76.5-88.4)         | 77.1 (73.7-80.1)          |
| Marital Status, % (95% CI) **                 |                          |                           |
| Married/Common Law                            | 44.0(36.2-52.0)          | 54.1(50.3-57.8)           |
| Single                                        | 36.0(28.7-44.0)          | 35.9(32.4-39.6)           |
| Other                                         | 20.0 (14.4-27.1)         | 10.0 (7.9-12.5)           |
| Smoking in pregnancy, % (95% CI)              | 87.0 (80.6-91.5)         | 85.6 (82.7-88.1)          |
| Alcohol in pregnancy, % (95% CI)              | 12.1 (7.7-18.4)          | 11.5 (9.2-14.2)           |
| Drugs in pregnancy, % (95% CI)                | 15.9 (10.8-22.7)         | 15.0 (12.5-18.0)          |
| Nutrition, % (95% CI)                         |                          |                           |
| Good                                          | 39.3 (31.7-47.5)         | 39.4 (25.8-43.2)          |
| Fair                                          | 27.6 (20.9-35.4)         | 26.3 (23.2-29.9)          |
| Poor                                          | 11.0 (6.9-17.2)          | 6.6 (4.9-8.8)             |
| Don’t know                                    | 22.1 (16.1-29.5)         | 27.5 (24.2-31.0)          |
| Domestic Violence, % (95% CI)                 | 1.4 (0.04-4.8)           | 1.3 (0.07-2.5)            |
| Prior preterm delivery (95% CI) **            | 25.0 (18.7-32.5)         | 12.8 (10.5-15.5)          |
| Prior voluntary abortion (95% CI)             | 18.2 (12.7-25.3)         | 24.5 (21.5-28.0)          |
| Certain of last menstrual period (95% CI)     | 47.6 (33.8-49.6)         | 45.3 (39.3-46.8)          |
| Ultrasound to confirm gestational age (95% CI) | 66.2 (58.2-73.4)         | 63.0 (59.3-66.6)          |
| Multiple pregnancy (95% CI)                   | 4.6 (2.2-9.2)            | 0.1 (0.03-0.8)            |
| Multiple birth (95% CI)                       | 4.1 (1.9-8.6)            | 0.0 (0.0 – 0.4)           |
| Fetal anomaly (95% CI)                        | 2.0 (0.7-5.6)            | 3.1 (2.0-4.6)             |
| Pregnancy induced hypertension (95% CI)       | 11.9 (7.7-18.1)          | 11.7 (9.5-14.3)           |
| Previa ≥ 36 weeks (95% CI)                    | 2.6 (1.1-6.6)            | 0.0 (0.0-0.5)             |
| Antenatal bleeding ≥ 20 weeks (95% CI) *      | 13.2 (8.7-19.5)          | 7.1 (5.4-9.3)             |
| Abruption (95% CI)                            | 1.3 (0.4-4.6)            | 0.4 (0.1-1.3)             |
| Any urogenital infections in pregnancy (95% CI) | 16.6 (11.5-23.3)         | 13.9 (11.5-16.8)          |
| Chlamydia (95% CI)                            | 10.6 (6.7-16.5)          | 8.6 (6.7-10.9)            |
| Gonorrhea (95% CI)                            | 2.0 (0.7-5.6)            | 1.2 (0.6-2.3)             |
| Other STD (95% CI)                            | 2.6 (1.1-6.5)            | 2.4 (1.5-3.8)             |
| Bacterial Vaginosis (95% CI)                  | 4.6 (2.3-9.2)            | 4.6 (3.3-6.4)             |
| Other vaginal infection (95% CI)              | 26.8 (20.4-34.3)         | 25.6 (22.4-29.0)          |
| Place of Delivery – Baffin Reg. Hospital (95% CI) * | 83.0 (76.2-88.1)         | 97.5 (96.0-98.4)          |
| Labour Induction (95% CI) *                   | 15.1 (10.1-21.6)         | 9.5 (7.4-11.9)            |
| Medical evacuation to Baffin Reg. Hospital (95% CI) * | 20.3 (14.7-27.3)         | 1.9 (1.1-3.3)             |
| Medical evacuation to tertiary care facility (95% CI) * | 3.9 (1.8-8.3)            | 0.1 (0.04-0.8)            |

Note: CI = confidence interval, * = p < 0.05, ** = p < 0.01, *** = p < 0.001, * = p < 0.0001
Among the 938 live births there were six infant deaths up to one year of age, all of them Inuit infants. Five were premature and in one case the gestational age was not identified.

DISCUSSION

Preterm Delivery
In this study premature delivery of an infant less than 37 weeks completed gestation occurred much more frequently among Inuit women living in the Baffin Region compared to the general Canadian population. The premature delivery rate of close to 18% was almost three times the national average. Very premature deliveries also occurred more frequently among Inuit women. These deliveries accounted for 2.2% of all Inuit births, a rate more than twice the Canadian national average.

Sociodemographic Risk Factors
Smoking among Inuit women was correlated with a lower birthweight but not with preterm delivery. Smoking is a known risk factor for premature delivery, but it is also associated with other negative health outcomes, including intrauterine growth retardation, increased rates of perinatal morbidity and mortality and neonatal morbidity (9).

Inuit women gained less weight in pregnancy and this lower weight gain was associated with prematurity. This is consistent with previous research showing that women who are underweight before pregnancy and those who gain little weight during pregnancy are at increased risk for preterm birth (10).

That the majority of the measured sociodemographic risk factors were not independently associated with preterm delivery in this population may be due to the fact that these factors affect premature delivery cumulatively. In addition, other unmeasured socioeconomic factors such as economic status, psychosocial stress and community support may be more related to premature delivery. Future analysis could consider the additive effects of multiple risk factors through the development of a weighted risk score, which has proven to be a much more effective tool to predict preterm delivery (11).

Medical and Obstetrical Risk Factors
Premature delivery was associated with several known obstetrical risk factors: prior preterm delivery, multiple pregnancy, placenta previa and bleeding at greater than 20 weeks.

Although there was a trend towards greater incidence of some sexually transmitted diseases among very premature deliveries this did not reach statistical significance. A larger study would be important to clarify this relationship which is of particular importance because urogenital infections are one of the few modifiable risk factors for preterm delivery.

| Table III. Infant and neonatal outcomes of preterm (N=152) and term (N=683) Inuit births. |
| Variable | Preterm | Term |
|          | Preterm | Term |
|          | % (95% CI) | % (95% CI) |
| Neonatal Resuscitation * | 40.3 (32.7-47.9) | 19.1 (16.2-21.9) |
| Nutrition at Birth – Breast *** | 44.5 (40.1-48.9) | 61.5 (57.2-65.8) |
| Infant deaths (up to 1 year of age) *** | 3.3 (0.4 – 6.1) | 0.1 (0 - 0.3) |
| Hospitalized at birth BRH | 91.8 (87.5-96.1) | 92.7 (90.8-94.6) |
| Hospitalized in tertiary care facility at birth * | 11.2 (6.2-16.2) | 1.1 (0.3-1.9) |
| Medical Evacuation to BRH at birth * | 11.3 (6.4-16.2) | 1.0 (0.2-1.7) |
| Medical Evacuation to tertiary care facility at birth * | 6.0 (2.2-9.8) | 0.1 (0-0.3) |
| Re-hospitalized BRH 1 day –3 months * | 32.3 (25.0-39.6) | 17.0 (14.3-19.7) |
| Re-hospitalized tertiary care facility 1 day –3 months * | 16.7 (10.7-22.6) | 3.9 (2.5-5.3) |
| Medical evacuation to Baffin Hospital 1 day-3 months | 15.5 (9.7-21.3) | 5.9 (4.2-7.6) |
| Medical evacuation to tertiary care facility 1 day-3 months | 7.1 (3.0- 11.2) | 1.7 (0.7-2.6) |

Note: CI = confidence interval, *= p < .05, ** = p < 0.01, *** = p < .001, * = p< 0.001

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Multiple pregnancies are an important cause of preterm births and have been implicated as a major contributing factor in the overall rise in prematurity rates which are being seen in developed countries (12). However, among the Inuit in this population only 5% of preterm infants were multiple births, which suggests it is a less important cause of preterm birth.

Predicting preterm delivery based on medical and obstetrical risk factors has proven to be difficult. However, there have been recent advances in using simple ultrasonographic and biochemical markers, such as foetal fibronectin, to identify women at risk for preterm delivery. These technologies would be easily adapted for use in this remote population.

**Neonatal Outcome**

Our study confirms that premature infants suffer from high rates of morbidity, particularly from respiratory infections which require both medical evacuation and re-hospitalization after birth. This was seen in both premature and very premature infants. Many studies have focused on the negative health outcomes facing very preterm infants; however mild and moderate preterm birth infants are also at high risk for morbidity and mortality (13).

By three months of age one third of all premature infants had been re-hospitalized at the Baffin Hospital and more than half of very premature infants had been re-hospitalized in a tertiary care facility, mostly for respiratory infections for which premature infants are particularly at risk. The rates of admission to hospital for respiratory infection for Inuit children in the Baffin region have been found to be among the highest in the world (14).

The medical and broader social costs for the care of these premature infants are very high. For example the annual expenditures for medical evacuations alone are 2.8 million dollars in the Baffin Region, which represents 10 percent of the Nunavut health budget. Each flight from the Baffin Regional Hospital out to a southern tertiary care hospital costs 18,000 dollars (15).

Mortality was higher among premature infants, with five deaths occurring among premature infants up to one year old born over the three-year study period. Overall the infant mortality in this population was 6.4 per 1,000 live births. It is encouraging that despite the higher rates of preterm birth the average infant mortality was significantly less than that reported in the Northwest Territories (12.2 per 1,000) and was similar to the Canadian average (5.6 per 1,000) (16). However, these results should be interpreted with caution as the three-year time period of the study may not be sufficient to accurately determine infant mortality rates.

**Study Limitations**

The small sample size limits the validity of the analysis of uncommon outcomes such as infants’ deaths or certain sexually transmitted diseases. Case finding was particularly difficult for births and infant deaths which occurred in the community outside of the Baffin Regional Hospital. A challenge in this study, and one which confronts all research on prematurity, is the accurate ascertainment of gestational age.

**CONCLUSION**

This study found a preterm and very preterm delivery rate of twice the Canadian national average among Inuit women in the Baffin Region. Many of the known sociodemographic risk factors for premature delivery occurred more frequently among Inuit women in the Baffin but did not appear to be related to preterm delivery. Although some medical and obstetrical risk factors were associated with preterm delivery the precise aetiology of this problem in the Baffin remains unclear. There were some important trends identified which may point to preventable risk factors in this population, and these areas require further study, including the role of urogenital infections and multiple births. A larger study will be critical to further exploring this important problem to help identify ways to intervene and prevent this important problem.
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