CONGRESS SESSIONS
Maternal Health

Converging Epistemologies: Critical Issues in Canadian Inuit Childbirth and Pregnancy

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Objectives: To relate the cultural beliefs and environmental issues surrounding pregnancy and childbirth among the Canadian Inuit to the critical issues facing maternal and child health in the Inuit population. **Study Design:** This is a literature based comparative historical study. **Methods**: Anthropological, historical, biomedical and first person narratives were analyzed to determine Inuit beliefs concerning pregnancy and childbirth. These were compared with the risk factors for Inuit maternal and child health identified in the biomedical literature. **Results**: Inuit beliefs concerning pregnancy and childbirth are rooted in an epistemological framework that differs in important ways from Southern/ biomedical theoretical norms. Evacuation to Southern hospitals for childbirth and the environmental contaminants discourse have both clashed in significant ways with Inuit beliefs, to the detriment of Inuit physical and social health. **Conclusions:** Inuit beliefs concerning pregnancy and childbirth are incompatible with biomedical theory, but are not incompatible with biomedical practice. As long as researchers and practitioners become aware of Inuit concerns and adapt biomedical practices to accommodate Inuit cultural and social priorities satisfactory clinical outcomes may be expected.

Key words: Inuit, childbirth, beliefs, outcomes

INTRODUCTION

Pregnancy and birthing are hot issues in the Canadian Arctic and have been since the 1950s[1]. During this period childbirth in the Arctic has undergone a profound epistemological shift. Southern techniques and technology, in combination with a modern concern with perinatal mortality and morbidity rates and, more recently, environmental contamination, as is evident in the most recent AMAP[2] assessment of human health in the Arctic, have forced southern concepts and priorities in pregnancy and birthing upon the Inuit.

The Inuit, however, have their own cultural beliefs and environmental concerns, which are not necessarily those of southern scientists or policy makers. The interaction of Inuit and southern perspectives defines the critical issues facing maternal and child health in the Inuit population.

MATERIAL AND METHODS

This study analyzed anthropological, historical, biomedical and first person narratives in order to determine Inuit beliefs concerning pregnancy and childbirth. These beliefs were compared with the risk factors for Inuit maternal and child health identified in the biomedical literature. Sources for data were identified through a general review of the literature concerning Inuit childbirth.

RESULTS

I. SOUTHERN HEALTH CARE IN THE CANADIAN ARCTIC

Forty years ago Canadian Inuit were almost all supervised by the Department of Indian Affairs and Northern Development (DIAND). However, in the 1970's and 80's a policy of devolution was gradually put into place[3]. Today the Inuit are divided between four different political jurisdictions, the North West Territories, Nunavut, Quebec and Labrador.

Medical services are even more complicated, since each region of Nunavut has a different medical services arrangement with a provincial medical system: the Kitikmeot with the North-West Territories and Alberta, the Kivalliq with Manitoba, while Baffin has its own general hospital at Iqaluit which handles most births. In Nunavik health services are provided by the Régie Régional de la Santé et des Services Sociaux Nunavik/Nunavik Regional Board of Health and Social Services, one of Quebec's provincial networks of regional health boards[4] According to Baikie[5], community health and non-insured health benefits are delivered to the Labrador Inuit by the Labrador Inuit Association. Medical services are the responsibility of the Grenfell Regional Health Services, the provincial successor to the Grenfell Mission.

This patchwork of jurisdictions is surprisingly recent. Until 1976 Inuit everywhere but Labrador were administered by the Department of Indian Affairs and Northern Development's Medical Services Branch. Quebec assumed responsibility for health in Nunavik in 1976[4], while the various regions of the North West Territories also experienced considerable devolution. As a result of fragmentation there are considerable regional differences in health policy, particularly between Nunavik and the Inuit outside of Quebec. In contrast, traditional Inuit beliefs and practices regarding pregnancy and birth experience only minor regional variations.

II. TRADITIONAL KNOWLEDGE AND INUIT BIRTH

Traditional Inuit culture bears few similarities to southern culture. First, traditional knowledge does not recognize the modern division between nature and society described by Latour[6]. In common with other premodern peoples (including premodern Europeans), the Inuit conflated natural phenomena with society. It was common, for example, for a shaman to be asked to find an occult explanation for a natural event – such as a miscarriage, or other illness. This tendency

is still present in Inuit culture, the immanence of spirits is still widely recognized, and even Christianised Inuit have transposed old beliefs into thriving cults of demonic and divine possession[7].

Beyond this characteristic, the harsh environment of the North led to an emphasis on survival, particularly group survival. Inuit society stresses co-operation and the avoidance of conflict. The most powerful members of the community were the elders, and yet, while their accumulated knowledge gave them considerable influence, decisions were ultimately based on consensus. It is important not to underestimate this. Inuit society was not hierarchical in the sense that most southern societies are. Elders were valued for their accumulated knowledge, but had no more temporal power than this conveyed.

Traditionally, there were few large settlements, and the standard living unit was the nuclear family, which engaged in a lifestyle centred around nomadic subsistence activities such as hunting, fishing and gathering useful and edible plants and herbs. Religion was animistic, with a vast pantheon of major and minor spirits associated with different environments and geographical locations. Shamans, often self-trained, mediated between the spirit world and the other Inuit, but played only a minor role in pregnancy, unless supernatural interference was suspected[8].

Different camps were usually located in close enough proximity to allow frequent visits and assistance with pregnancy and birthing, creating a social support network potentially much greater than the family unit. In addition, families gathered together periodically for cultural and economic exchange. Generally the immediate family (grandparents, parents, children) remained the key resource for survival and transmission of traditional knowledge[9].

According to the Traditional Medicine Research Project[10], funded by the Avataq Cultural Institute in Nunavik there were some general prescriptions for a healthy pregnancy among the Inuit:

> A pregnant woman should always get up and go outside as soon as she wakes. She shouldn't sleep during the daytime and should avoid stopping in and looking out through doorways. It is very important that she exercise and not stop doing her normal chores, otherwise the birth will be difficult. She should not urinate or defecate indoors. A miscarriage can be stopped in the second or third month through the application of a heated stone or sand to the lower stomach region. This should not be done later in the pregnancy.
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> During the actual childbirth a midwife assists. She is usually a woman who has attended many births from a young age and is carefully trained by older midwives. For a prolonged labour the woman is held from behind and supported on each side, with her hands holding ropes. If this continues for a few days, an adult would be chosen to run as fast as possible out of the tent, around it twice and back in - to encourage the baby to follow. If this didn't work, the baby would be given a name and would be called, until it answered and came out.
>
> When about to deliver, the woman kneels, leaning forward and grasping two poles stuck in the ground. A flat piece of wood, wrapped in a cloth, is placed at the base of the spine. The midwife stands behind her, a knee on the board and her arms reaching around under the woman's breasts, lifting a little. Someone else places their fingers into the woman's mouth to make her cough – this helps push the baby out. So as not to embarrass the woman, the vagina is covered up, and if the baby is having difficulty coming out someone else washes their hands in seal oil and helps the baby emerge from the womb. An animal skin is placed for the baby to drop down on. The umbilical cord is tied near the baby's navel and cut with a bone, but if the sac has trouble coming out, the cord is first tied around the mother's knee and is very gently and slowly pulled. The baby's navel is covered with burnt moss or a mixture of Arctic cotton grass and charcoal to heal the cut. The baby is picked up by the right hand for the first time, so it will be right-handed, and is fed a piece of raw meat for strength.[10-12]

Pre-contact infants were, of course, breast-fed – sometimes for over two years. Raw meat and fish were used to supplement the milk from a very early age. In general, the Inuit diet consisted largely of meat or fish products, supplemented by Labrador tea and berries. The practice of breast-feeding may have acted to restrict population growth – an epidemiologically important factor in an environment in which contagious diseases were rare. Anecdotal evidence suggests that infant mortality was low and that the resource base could not support a large population. This was also a compelling reason for the diffusion of the population over the land in small family units[11].

Within this marginal socio-economic matrix there were few clearly defined occupational roles. Even shamans had to hunt for a living like everyone else. An ideal pregnancy might involve the conditions listed but depending on the circumstances, midwifery might be undertaken by an experienced midwife, a shaman, the husband, or any other available individual. Midwives were culturally very important, second only to a mother in an Inuk s life, but all women possessed some knowledge of midwifery; so did many men. Usually the entire family would be present at a birth, as well as women experienced in midwifery and younger women learning by observing the experience themselves[12]. However, there is also some evidence of birthing rituals. In Nunavik, both Saladin d'Anglure[13] and Dufour[14] noted that a

traditional attendant known as the *sanaji* was responsible for cutting the infant's umbilical cord and thereafter assumed an important role in the child's life. Guemple[15] also recognised the role of this attendant among the Belcher Island Inuit, where the term used is *sanariak*. In addition to cutting the infant's umbilical cord, the *sanariak* was responsible for providing the first set of clothes for the child and maintained a close familial relationship thereafter. The *sanaji/sanariak* is a role distinct from that of the midwife, although midwives could also act as *sanaji* on occasion and Kootoo[16] does identify the *sanaji* with the midwife.

According to Dufour[17], the role of men in birthing varied. In Igloolik men were excluded from the birthing process altogether, while in Nunavik men were only involved if no women were available. Accounts by Inuit elders indicate that all of these practices were commonly modified for individual circumstances[8]. Some of these regional variations may also have occurred due to differences in resources and settlement patterns.

Regional differences in birthing techniques aside, the Inuit tradition of pregnancy and childbirth, like other aspects of Inuit life, is subject to a high degree of community involvement. In their model of health care, healing is a process mediated between the individual (the mother) and the community. As this suggests, medical knowledge was immanent in Inuit society rather than being restricted to a small group of technical professionals, as in the biomedical model. Even the specialised abilities of the shamans had more to do with an innate talent for communication with the spirit world, than specialised knowledge or training. Thus, Inuit prescriptions for a healthy pregnancy and techniques for childbirth are subject to a wide degree of variation, depending on the knowledge available in each community, the community consensus on what was a healthy course of action, and the desires of the mother in question. In general, contemporary Inuit concerns with health care are more focused on maintaining (or regaining) this community involvement, than with specific techniques, positions or prescriptions. The birthing positions mentioned were the most commonly used, but in interviews with former midwives they repeatedly stressed that each woman chose the position most comfortable for her, as it was not the midwife s role to choose the birthing position (Napayok, as cited in [18]).

III. TRANSITION TO COLONIALISM

Traditional Inuit culture and society began to come under attack from without shortly after contact with the first explorers, fur traders and missionaries in the 19th century. This process accelerated in the 20th century, as the Inuit increasingly became concentrated in settlements around trading posts. The introduction of epidemic disease changed the epidemiological environment dramatically, leading to a vastly increased mortality rate, and increasingly discrediting traditional forms of healing. The decline in traditional healing was encouraged by medical missionaries, who were interested in suppressing Inuit spirituality, particularly shamanism[19]. Inuit vulnerability to tuberculosis led to a programme of mass evacuations to southern sanitaria in the 1950's that further eroded the fabric of Inuit life[20].

From the Second World War on the Canadian government sought to extend its power over the Inuit through forms of state surveillance and control. The biomedical model of medicine was a major means of accomplishing this. According to Smith[21] the creation of the Eskimo Disk List system, in which all Inuit were assigned identity disks, ostensibly for medical identification purposes, was one of a number of exercises in the extension of state power over the Inuit. The disk list system was soon also used to distribute state benefits, control access to health care and provide a means of ethnic identification.

The concentration of Inuit population in settlements, coupled with a decline in breast-feeding due to official policies discouraging the practice, led to an enormous increase in the birth rate. However, poor nutrition, crowded and unsanitary living conditions in the settlements, and epidemic disease led to a matching increase in the infant mortality rate. The federal government responded by building nursing stations in each Inuit settlement, beginning in 1960. These were initially staffed by trained nurse-midwives, often hired from Britain. As employees of the federal government, they were expected to carry out government health policy and maintain and improve the public health of the Inuit. As part of this programme, they were expected to apply the biomedical model to pregnancy and to assume control of childbirth by ensuring that birthing took place in the nursing station[22]. High-risk cases were evacuated to southern hospitals for medical intervention[23]. Yet, in practice, many births continued to take place in the community. Early nurse-midwives were often too overworked to handle pregnancies that the community seemed well equipped to care for anyway. Nonetheless, between 1950 and 1970, more and more children were born in nursing stations, often under the care of both the nurse-midwife and members of the community[24].

However, from about 1970, medical evacuations of pregnant women increased steadily everywhere in the Canadian Arctic as the number of trained nurse-midwives working in the nursing stations decreased[18,25,26]. Community childbirth was also strongly discouraged, with the result that by 1980 almost all Inuit children were born in hospital obstetric wards[27]. This process was probably due to a number of factors, including the greater availability of transportation for evacuation, fewer trained nurse-midwives as overseas recruitment declined, and changing ideologies in the nursing profession itself[28]. In the Kivalliq region, community and nursing station births were limited to cases identified too late for evacuation. O'Neil *et al*[18] identify this as primarily due to passive resistance by the Inuit to evacuation. In these cases pregnancies were concealed from medical and nursing personnel in order to allow a community birth to take place.

IV. BIRTHING ISSUES IN THE ARCTIC: PLACE OF BIRTH

Resistance to medical evacuation for birth is strongly linked to traditional Inuit culture. Inuit identity is strongly tied to the land. This extends to childbirth. The place of birth is highly important to the Inuit sense of self-identity and moreover to the individual's place within Inuit society. Thus, place of birth is a particularly sensitive political issue. This can be seen in the Kivalliq where children, since the 1970's, have been born

in Manitoba, even though the Kivalliq is politically a part of Nunavut. Those Kivalliq Inuit old enough to have been born in their communities now sometimes refer to themselves as 'Inumarik' – or 'real Inuit', while the younger Manitoban born Inuit are not[29]. On the political level, these concerns have manifested themselves as fears that children born in Manitoba will be disadvantaged with respect to land claims agreements and benefits[29].

Although there have been attempts to institute community birthing in Nunavut by creating a midwifery centre in Rankin Inlet[30], the most interesting case of changes to birthing styles is in Nunavik, where community birthing is now thriving.

The first birthing centre in the Arctic was, in fact, the Inuulitsivik Maternity that was established in 1987 in Puvurnituq, PQ. The community is unusual in having been the only Inuit community to reject the James Bay and Northern Quebec Agreement (JBNQA). As a result of this stance, Puvurnituq was chosen as the site for a regional hospital. However, initial plans to incorporate an obstetric ward into the hospital were opposed by the local Inuit women's society[4], which threatened to boycott the hospital unless it incorporated a maternity with trained midwives, community involvement, and a training programme for Inuit midwives as well. The community has generally built on its initial resistance to the JBNQA to establish an unusual level of assertiveness with respect to southern authority[31].

The maternity initially hired southern midwives, who then established a training programme to provide Inuit women with midwifery training[32]. The programme has been a resounding success. The midwives are now all Inuit, and the Inuulitsivik Maternity has now been renamed the Inuulitsivik Maternities, with branches in two other communities and aggressive plans for expansion throughout Nunavik, even to Kuujuak, which already has an obstetric ward[33].

Although it could be argued that southern midwives simply trained Inuit successors in their modernist, biomedical paradigm, this is not how the Inuit themselves see their role in the Inuulitsivik Maternities. They readily agree that they gained knowledge from their teachers, but argue that they incorporated this knowledge into their culture: "we, as Inuit midwives, know our own people. We know things Qallunaaks(*sic*.) can't know." (Qumaluk, as cited in [32]\p. 72\) Another (anonymous) Inuit cited in Lavoie[4] reported a conversation with a southern health care professional: "Don't give us your theories, your philosophy: we don't need them. We don't need your culture, we need the facts. We get our information from other sources as well, from the elders, from other men and women" (p. 341). Obviously the Inuit themselves see their understanding of health care as different from biomedicine, whether in the form of hospital treatment or the gentler face of southern midwifery. This is not to say that they reject biomedical knowledge entirely. High-risk pregnancies are still evacuated to obstetric wards of major southern hospitals, and medical staff in the local hospitals or clinics still examine expectant mothers[34]. However, now it is the community, in consultation with the mother, the midwife and the doctor that makes the decision to evacuate expectant mothers. According to Chatwood's [35] epidemiological study of the maternity, both the number of evacuations and the number of complications have fallen since this change in jurisdiction was established. Significantly, communal control of childbirth is the explicit goal of Inuit from other regions as well, as one of the elders interviewed by Therrien and Laugrand[8] stated:

> I have been thinking that there could be a committee at the Health Centre that would decide whether a person should fly out to Iqualuit for medical attention … Some pregnant women have no reason to go out … Inuit should have more control over this (p. 107).

V. BIRTHING ISSUES IN THE ARCTIC: ENVIRONMENTAL CONTAMINANTS

In the 1980's testing for environmental contaminants in the Canadian Arctic found that predation chains, prevailing wind patterns and sea currents all concentrated man-made toxins in the Arctic. Levels of heavy metals, such as lead and cadmium, and persistent organic pollutants(POP) such as PCB'ss and dioxins, are actually much higher in the Arctic than in southern Canada. These toxins are deposited in the fatty tissues and thus tend to rise up the food chain. The Inuit, at the top of the food chain, are thus seen as highly at risk from environmental toxins[36]. By the 1990's significant levels of environmental contaminants were discovered in the breast milk and fetal blood supply of Inuit women – a direct result of their consumption of traditional country foods such as seal, Arctic char and caribou[2].

The Inuit Cohort Study in Canada has suggested that even high levels of contaminants pose less of a risk to Inuit health than a switch from country food to imported, processed foodstuffs[37]. As Bjerregaard has pointed out in the AMAP scientific report on human health in the Arctic[2] concerning the effects of environmental contaminants to Inuit health: "Clinical overt damage to health, however, has not yet been demonstrated"(p. 9). Thus, initial suggestions that pregnant and nursing Inuit mothers should avoid country foods[38] have since been conditionally reversed on the grounds that levels of environmental contaminants are not high enough to outweigh the health benefits of country food consumption for Inuit mothers and babies. The difficulty is that, although contaminant levels are present and often exceed those recommended by national guideline, they, as Bjerregaard noted in the most recent AMAP Assessment Report[36], have had no obvious health effects. The cohort study of Inuit in Nunavik[39] has documented only a marginal increase in otitis media in children with a high level of POPs, heavy metals and mercury.

Mercury, the contaminant whose adverse effects are most documented,[2] is known to be associated with high levels of selenium in the marine mammals that are central to the traditional Inuit diet. Yet, selenium may counter the effects on mercury on the bloodstream, suggesting that the physical effects of environmental contaminants are more complex than simple cause and effect relationships[40].

Official Inuit policy, as articulated by the Inuit Tapirisat

Kanatami, has been to oppose any changes to the traditional diet, unless unequivocal evidence of harmful effects is proved:

> So far as we are aware, the risks to public health from continuing to eat beluga and seal blubber are very small and are outweighed by the benefits to you of these foods. However, Inuit must judge for themselves what is acceptable risk for themselves and their families (Inuit Tapirisat Kanatami, as cited in AMAP Arctic Pollution, 2002 p. 95[36].

However, pressure for change can be both subtle and effective. Media reports, as documented by O'Neil, Elias and Yassi [41] are rarely as nuanced as the Northern Contaminants Programme. Its second Assessment Report[40] admits the presence of high levels of environmental contaminants in maternal cord blood and breast milk, but balances that against the nutritional benefits of a traditional diet and recommends no change in diet. The AMAP executive summary on Arctic Pollution[36], however, implicitly denigrates the Inuit position, by contrasting it to campaigns to modify traditional diets in Greenland and the Faroe Islands, which have reduced contaminants levels in infants and children.

For southern science the issue of environmental contaminants often boils down to numbers; physically measuring the levels of POPs and heavy metals in human tissues and then calculating their effects. The perception of environmental contaminants by the Inuit is considerably different. Country food is, as noted, central to Inuit self-definition. To suggest that it is "poisoned" is, as O'Neil, Elias and Yassi[41] have pointed out, perceived as an attack on the Inuit way of life. Effectively it challenges one of the central precepts of Inuit epistemology, since consumption of country food is also a means of maintaining the Inuit connection to the land and thus Inuit identity.

Inuit response to the scientific discourse on environmental contamination has varied from outright rejection to ill-advised attempts to modify traditional lifestyles to accommodate popular perceptions of scientific criticism[41]. This response has in turn influenced the direction of Canadian scientific discourse on environmental contamination[40], without really attacking the fundamental issue; to the Inuit any claim that the traditional diet is unhealthy is tantamount to an allegation that the Inuit way of life is unhealthy, and by extension that the southern way of life is superior and should be adopted instead[42]. Organic contaminants may indeed pose a threat to perinatal and postnatal health, but southern science and the Inuit must find ways to express that threat in a manner that is both acceptable and comprehensible to both Inuit epistemology and southern discourse.

DISCUSSION

The issues surrounding pregnancy and childbirth have two components, southern and Inuit. Southern priorities are physical perinatal and maternal health. The social determinants of health receive much less attention and are correspondingly more significant in affecting Inuit health. It is significant that across all the Inuit populations in the Arctic (Canadian or not) infant mortality rates look very different when divided into neonatal (0-28 days after birth) and post-neonatal (28 days to one year) components. In every case the neonatal rates are significantly lower and much closer to national norms. Reducing perinatal and neonatal mortality and morbidity rates has been a priority of southern medical care since it was introduced to the Arctic[22, 23]. However, post-neonatal rates have received much less attention (Spady, 1982). This discrepancy in mortality rates is due to poor living conditions, something that the governments of all the Arctic nations have problems addressing[43].

Inuit concerns are both rooted in their own epistemology and in a naturally more holistic attitude toward health, in which the health of the family and the community is as important as the health of the individual[44]. Evacuation and environmental contamination are both issues of physical health and social health. Meeting their challenges will require compromise between the Inuit point of view and that of southern science and medicine.

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Use of Fetal Fibronectin in the Management of Preterm Labour in Nunavut

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Objectives: To manage suspected preterm labour in the Baffin Region of Nunavut safely and more conservatively utilizing the Fetal Fibronectin Assay™. **Study Design**: Chart Review. **Methods:** The trial of Fetal Fibronectin™ took place in the Baffin Region of Nunavut. An initial chart review of all admissions for "false labour" to Baffin Regional Hospital was performed. An analysis of the cases was done to determine when the women delivered and whether they had been Medevaced. The Fetal Fibronectin™ test was implemented at five sites in the Baffin Region and data on each use of the assay were collected by the laboratory at Baffin Regional Hospital. A review of the data for the first 13 months of the trial was then done. **Results:** The test was used 38 times between July 2004 and September 2005. There were 31 negative results. Most of the cases with negative results were managed conservatively, with a total of 18 Medevacs avoided. There were no false negative tests. Cost savings for avoided Medevacs were in the order of $200,000. **Conclusions:** The Fetal Fibronectin Assay™ has proven to be a valuable adjunct in the management of suspected preterm labour in Nunavut.

Key words: Inuit, preterm labour, fetal fibronectin, Nunavut

INTRODUCTION

Nunavut is a large territory (2 million square kilometers area) with a small population of 29,000 people who live in 26 small communities. The Baffin Region of Nunavut has a population of approximately 14,000 mostly Inuit inhabitants, half of whom live in Iqaluit and the rest in the other 12 communities which are from 150 to 2,000 km from Iqaluit where Baffin Regional Hospital is located. Iqaluit is 2,000 km north of Ottawa, the nearest tertiary care centre. Health care is delivered through community health centres run by Community Health Nurses and one hospital in Iqaluit, Baffin Regional Hospital (BRH) where most of the physicians are based. BRH is a 26-bed hospital which offers a full range of services including obstetrics, surgery, pediatrics, psychiatry. However, there are no intensive care facilities for very preterm infants in the Territory. Such infants must be transported by air 2-3,000 km south to tertiary care centres in Ottawa, Winnipeg and Edmonton.

A review of preterm births by Muggah et al in 2003 confirmed the impression that there was a high rate of preterm birth in the Baffin Region (20% vs. 7% nationally in Canada)[1]. Preterm births result in 75% of perinatal mortality[1] and in small health facilities often have a poor outcome. Such births also cause a great deal of emotional and financial strain to the families, caregivers, and to the health care system. Management of suspected preterm labour in Nunavut has been problematic for both Community Health Nurses and physicians. In view of the risks associated with the birth of a preterm infant in a small health centre the default management strategy for cases of suspected preterm labour has been to Medevac the mother to BRH initially and then further on to Ottawa if necessary, and if time permits. The Medevacs themselves are disruptive to the lives of the families involved, cause a good deal of strain to the health centre staff and cost anywhere from $1,500 to $22,000 depending on the distance traveled by the Medevac aircraft, not to mention staffing costs, in hospital costs, repatriation costs etc.

A review of the admissions for "false labour" at Baffin Regional Hospital over 12 months in 2001-02 revealed that there were over 20 cases of "false" preterm labour (ie the woman admitted in suspected preterm labour did not deliver a baby for at least another 7 days). Further, there were at least 10 "unnecessary" Medevacs (i.e. Medevacs of women in suspected preterm labour who did not deliver for at least another 7 days). These Medevacs were managed appropriately given the resources available at the time.

In 2003 we were made aware of the availability of a new test, the Fetal Fibronectin Assay™ developed by Adeza Corporation. The Fetal Fibronectin Assay is a test based on the evidence that a glycoprotein chemical marker "fetal fibronectin" should not be present in the vaginal secretions of a pregnant woman between 24 and 35 weeks estimated gestational age (EGA). Fetal fibronectin is produced when fetal membranes are damaged, or when the chorion separates from the decidual layer of the uterus. The presence of this glycoprotein in the vaginal secretions is associated with premature labour. However, more significantly for our purposes, the absence of this marker is virtual assurance that labour will not occur in the subsequent seven days (99.6% negative predictive value).[2,3,4,5]

It was approved in the USA and Canada for use in women between 24 and 35 weeks. Estimated Gestational Age who presented with symptoms of labour.

This high negative predictive value held considerable promise for our region. So, the trial of the Fetal Fibronectin Assay™ was conducted to determine whether this test might allow caregivers to manage suspected preterm labour more conservatively and safely.

MATERIAL AND METHODS

The test kits for the Fetal Fibronectin Assay™ were purchased by the Department of Health and Social Services for Baffin Regional Hospital and four of the larger communities in Baffin Region: Pond Inlet, Pangnirtung, Igloolik and Cape Dorset. (Illustration 1) Training in the use of the equipment was provided by Adeza Corporation, the maker of the kits. A protocol for using the test was derived from that used at the Ottawa Hospital,[6] and a data sheet for tracking each use of the test was also adapted from that used in Ottawa. (Illustration 2) Candidates for the test were woman between 24 and 35 weeks EGA with symptoms of labour (abdominal pain, back pain, abdominal cramps, lower abdominal/pelvic pressure, etc). The data sheet was to be completed for each use and faxed to the laboratory at Baffin Regional Hospital where they were kept in a central binder. Nurses and physicians were educated about the Assay and the indications and contraindications for its use by in person and telehealth teaching sessions. The test, which consists of a simple vaginal swab came into service in mid July 2004.

In September 2005 a retrospective review was performed of all reported cases of use of the test based on the data sheets stored in the laboratory at BRH. Then a chart review of all so identified cases was performed to determine when the women actually delivered their babies, where they delivered, where they came from, and whether they were Medevaced or not. These results were then further analyzed in light of the accepted criteria for Medevacing cases of suspected preterm labour prior to the implementation of the Fetal Fibronectin Assay™. These criteria were that any woman in suspected preterm labour in a small health centre, and any woman at 33 weeks EGA or earlier at Baffin Regional Hospital would be Medevaced unless delivery was imminent. A determination of the number of "saved" Medevacs was made based on these criteria, and a calculation of the cost savings based on the distance from the woman's home community to Baffin Regional Hospital and/or from BRH to Ottawa and the known costs associated with such transfers.

RESULTS

The test was used 38 times with 33 different patients over the 13 month period from July 2004 to September 2005. Most tests (see Figure 1) were done at Baffin Regional Hospital. Pond Inlet was the next most frequent user. There were no reported uses of the test at the Cape Dorset Health Centre. The test was done by Community Health Nurses 18 times and 20 times by physicians either in Pond Inlet (one resident family physician) or at BRH. There were 31 negative results and seven positive results. Most of the cases with negative results were managed conservatively. A positive result played a significant role in hastening a Medevac in two cases. There were no cases where a woman who had a negative fetal fibronectin test delivered her baby in less than seven days post test. In three cases after a positive result the baby was born more than seven days post test.

Analysis of the cases in which the test was used showed that there would likely have been 21 Medevacs without the test, using the criteria outlined above in the Methods section. A total of 18 Medevacs were clearly averted, and three others were converted to transfers on scheduled flights in the days succeeding the test. The cost to the Department of the tests was approximately $18,800 and the net savings were just over $200,000.

DISCUSSION

The Fetal Fibronectin Assay™ appears to be safe, easy to use and reliable based on the results from this trial in health centres in the Baffin Region of Nunavut and at Baffin Regional Hospital. Clinicians successfully managed 21 more cases more conservatively than would have been done prior to introduction of the test. In this case, "conservatively" means that either there was no transfer to BRH or Ottawa, or that the woman was transferred by scheduled carrier in the days subsequent to the use of the test. Use of the test has resulted in significant savings in terms of human dislocation, workload for health centre staff and costs to the Department of Health and Social Services.

The estimated cost savings of $200,000 represents the costs of the Medevacs averted based on the distances between the involved communities less the cost of the tests conducted over the period of the review. Many other costs are associated with each of these cases, e.g. repatriation costs for woman who did not deliver, ambulance costs, overtime costs for staff, in hospital costs, hotel costs for women not admitted to hospital etc. None of these were included in the above estimated savings mainly due to the difficulty associated with making accurate estimates of these costs.

The reason for the lack of reported use of the test in Cape Dorset health centre is unclear. Some verbal communications indicated that the test was, in fact, used but the use was not reported. Staffing at the Cape Dorset health centre during the review period was very unstable, and that may have contributed to the lack of use.

Informal discussions with nurses and physicians indicated great enthusiasm for the test. The Chief of Staff for the region said that the test has "changed the way we manage preterm labour". Nursing and medical staff in other health centres in the Baffin region and in the Kivalliq and Kitikmeot regions of Nunavut have requested that the test kits be placed in their clinics.

In view of the results of this pilot project, and the results of the subsequent 12 months of use, and the enthusiasm of the nurses and physicians, the Department of Health and Social Services has decided to install the test kits in most of the health centres in Nunavut by January 2007.

Limitations of this review include the lack of information from health centres regarding apparent preterm labour when the test was not used, or when a patient was not admitted to BRH and the test not used. There was clearly some inconsistent reporting of test use by clinicians. Finally the main author made several assumptions about management strategies for preterm labour which could be questioned.

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Seasonality Bias in Adverse Pregnancy Outcomes in Siberia

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Abstract
Objective: To examine which months are unfavourable for conception in the region with the severe continental climate. **Design:** Retrospective population based study. **Methods:** Monthly data on incidence rate for gestose, maternal anaemia, pyelonephritis, threat to spontaneous abortion, stillbirth, perinatal death and infant death at age under one year were extracted from medical records of obstetric, delivery, and paediatric hospitals in Novosibirsk (1976–1980), Norilsk (Taimir peninsula), and Mirny (western Yakutia). Two latter towns were considered together as a northern setting. Edwards' method was applied to test seasonality. **Results:** In Novosibirsk as well as in northern towns, the monthly distribution of time of conception for preterm births, maternal pyelonephritis, and infant deaths displays significant seasonal pattern with maximum in summer. Additionally in the North, stillbirths' conceptions also tended to be concentrated in June. **Conclusion:** In Siberia, the polar day and summer months are an unfavourable time for conceiving in respect to obstetric complications and adverse pregnancy outcomes.
Key words: seasonality, stillbirth, polar day, adverse outcomes

INTRODUCTION

Although many papers have analysed a seasonal pattern of adverse pregnancy outcomes in various countries[1,2] including European part of Russia[3] we are not aware of any study on this subject in the Siberian North. A dissertation of one of the authors[4], unavailable for both Russian and English reading specialists, is the only source of data in question. Only two more papers deal with the annual rhythmicity in the incidence of obstetric complications[5] and stillbirths[6] in Novosibirsk. Meanwhile, in Siberia as a huge territory with the great length from the south to the north, variations in seasonality among climatically different regions in a socio-economically homogeneous area are to be expected.

The current study was undertaken to examine seasonal fluctuations in the most common obstetric complications and poor pregnancy outcomes and to compare the region located at the permafrost zone with the extreme northern temperature conditions and that situated in the southern Siberia with less cold continental climate. We therefore decided to examine a possible association between month of conception and the occurrence of adverse reproductive outcomes by adopting an assumption that this association depends on the severity of climate.

MATERIALS AND METHODS

Data were extracted from medical records of obstetric, delivery and children hospitals in Novosibirsk (55°N, 1976–1980), Mirny (western Yakutia, 62° 30'N, 1979–1980), and Norilsk (Taimir peninsula, 69°N, 1978–1980). Two latter towns locating at the permafrost area were considered together as a northern setting. They are characterised by a very long frosty winter and short cool summer. The polar night in Norilsk lasts for 47 days. In Novosibirsk, the seasonal variation in meteorological conditions is described as long cold winter (January, –20°C) and moderate summer (July, +20°C).

The analysis consisted of arraying each selected disorder or outcome and the control (normal) pregnancies by month of conception for the combined years. Since the monthly numbers of cases were rather small, they were combined into categories according to seasons. They were defined for both settings as winter (November, December, January, February, and March), spring (April and May), summer (June, July, August), and autumn (September, October) in accordance with the accepted temperature criteria.

The following complications and outcomes were selected for seasonal analysis as the most common in Siberia: gestose, maternal anaemia, pyelonephritis, threat to spontaneous abortion, stillbirths, perinatal deaths, and infant deaths from all causes at age under one year. Overall, 4,852 and 4,599 pregnancies were analysed in Novosibirsk and in the northern region, respectively.

The time of conception was determined according to the medical record for a pregnant woman and based upon the time of last menstrual cycle. The conception month for dead infants was calculated by subtracting 9 months from the date of birth.

The criteria for preterm birth during those years in Russia were gestational age less than 34 weeks, for perinatal death – death of live born foetus at age between 28 gestational weeks and seven days postpartum. Stillbirths were then defined as foetal deaths occurring at 28 or more weeks of gestation. Although the stillbirth cases in the considered northern cities appeared likely to be underreported, like elsewhere[7], there is no reason to believe that such underreporting varies by calendar month.

The Edwards' statistical model[8] for detecting seasonal trends was applied to the seasonal distribution of each outcome. The model uses chi-square to test for the presence of cyclic trend and fits a simple harmonic curve to the data. The

total number of pregnancies (live births) in a given season was used as a denominator for the corresponding number of outcomes/complications (infant deaths). To compare frequencies and odds we used the logistic regression method.

RESULTS

Table shows the number of cases of each complication and pregnancy outcome, the incidence rate per 1,000 pregnancies, and the Edwards' model chi-squares values with probability levels and the angle of maximum phase. The analysis revealed a peak of conceptions in summer period for the events demonstrating significant seasonal pattern and a trough in the remainder of the year. No major difference could be observed between the northern and southern places in the seasonal pattern.

In Novosibirsk, infants conceived in June have much higher probability to die before their first birthday compared with babies conceived during other months of the year.

Cases of threat to spontaneous abortion occurred more frequently in Novosibirsk (13.8%) than in the northern towns (7.9%) (odds ratio = 1.86; 99% confidence interval = 1.48–2.34) though no significant seasonal pattern was found in both settings for this type of complications.

DISCUSSION

In Siberia, the northern polar day and summer months are biologically an unfavourable time for conception in respect to obstetric complications and adverse pregnancy outcomes. No difference could be observed in the seasonal patterns between northern and southern regions considered.

L.S. Zamogilnaya and A.P. Solomatin[5] have also found an increased incidence rate of some obstetric complications and perinatal deaths among pregnancies occurred in summer in Novosibirsk. However, E.R. Boiko and V. Kozlovskaya[3] reported an increase in the rate of stillbirths and preterm births among pregnancies started in April and January–March, respectively, in rural but not urban population in Komi region near the northern Ural. They found no significant seasonal pattern in birth weight and height, rate of preterm and delayed births in urban setting. In Sweden, a monthly distribution of perinatal deaths has the major trough in June–August (conceptions in October–January)[9] which is out of phase compared with the pattern described here. In Europe, summer is the time subjectively preferred by family pairs for starting pregnancy though this bias has only a small impact on population reproductive statistics[10]. This comparison of the available data leads to the conclusion about the marked geographical variability in the seasonal fluctuation of pregnancy outcomes.

Table. Incidence of selected obstetric complications and adverse pregnancy outcomes in Novosibirsk, Mirny and Norilsk by season of conception and setting

Pregnancy outcome, complication	Incidence number/rate per 1000 pregnancies				Edwards' model		
	Spring	Summer	Fall	Winter	χ^2	P	Θ_{max}
Novosibirsk							
Pregnancies	804 / –	1270 / –	1053/ –	1725/ –	–	–	–
Preterm birth	24 / 30	91 / 72	45 / 43	85 / 50	8.41	0.015	August
Gestose	113 /141	225 / 177	137 / 130	262 / 153	2.83	NS	–
Maternal anemia	47 / 58	74 / 58	59 / 56	89 / 52	0.55	NS	–
Pyelonephritis	13 / 16	45 / 35	34 / 32	28 / 17	17.10	0.000	August
Threatened miscarriage	113 /142	178 / 140	139 / 132	238 / 139	0.41	NS	–
Perinatal death	11 / 13	33 / 26	19 / 18	33 / 19	6.00	0.049	August
Infant mortality *	– /29.2	– /34.3	– /23.7	– /24.3	26.70	0.000	June
Northern cities							
Pregnancies	785 / –	1221/ –	925 / –	1668 / –	–	–	–
Preterm birth	35 / 44	88 / 72	50 / 54	82 / 49	3.10	NS	–
Gestose	107 / 137	196 / 161	160 / 173	240 / 144	4.79	0.091	August
Maternal anemia	55 / 70	76 / 62	37 / 40	68 / 41	12.22	0.002	May
Pyelonephritis	31 / 40	32 / 26	33 / 36	50 / 30	3.52	NS	–
Threatened miscarriage	78 / 99	74 / 61	59 / 63	152 / 91	2.75	NS	–
Stillbirths	11 / 14	12 / 10	9 / 10	17 / 10	5.10	0.078	May

** Number of deaths at age under 1 year per 1000 live births. NS, nonsignificant.*

We can only speculate on the causes of the difference established in the present study between settings in the prevalence of threat to spontaneous abortions. First, it seems likely that cases manifesting as *threatened* miscarriage in Novosibirsk become *real* abortions in the northern towns, and that is why the number of potential abortions in the latter places is less than that in the southern Siberia. Unfortunately, we are unable to prove or reject this suggestion because of a lack of statistical data on the prevalence of spontaneous abortions in both settings. Second, the difference might be a consequence of better obstetric management in academic metropolis Novosibirsk in comparison with Mirny and Norilsk.

The causes of the excess summer conceptions in poor reproductive outcome are unknown. It is quite possible that more than one cause is responsible. Known seasonal factors such as sunshine intensity[11], photoperiod, melatonin secretion and geomagnetic activity[12], air temperature[13] have been linked to human reproductive success. According to the hypothesis of "seasonal preovulatory overripeness ovopathy"[14] the obtained results can be attributed to the prolonged follicular phase of menstrual cycle that occurs more often at the beginning and at the end of summer "fertile window" with some peculiarities in Siberia[15]. A fertilisation of the overripened ovum leads to a conceptopathology, fetopathy and therefore can exert poor effects on the maternal organism[16].

In conclusion, summer in Siberia and the polar day in the North are the unfavourable time for conceptions in respect to some adverse pregnancy outcomes and obstetric complications. The results aid the physicians in deciding on the appropriate management of high risk pregnancies especially of women who have had a preterm birth or stillbirth. Because conditions of early development are known to influence in later life[17], the time of conception during the year is associated with a broad range of important health outcomes. The seasonal exposures underlying these effects warrant further scrutiny from a public health perspective, not only in view of an individual reproductive success.

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