

# Narcotic-exposed neonates in a First Nations population in northwestern Ontario

## *Incidence and implications*

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### Abstract

**Objective** To document the incidence of neonatal abstinence syndrome (NAS) and the rate of narcotic use during pregnancy in northwestern Ontario, where narcotic abuse is a growing social and medical problem.

**Design** Retrospective chart review.

**Setting** The Sioux Lookout Meno Ya Win Health Centre catchment area in northwestern Ontario.

**Participants** Mothers and neonates for the 482 live births that took place in the 18-month study period (January 2009 to June 2010).

**Main outcome measures** Maternal drug use and neonatal outcomes were documented.

**Results** The incidence of narcotic (oxycodone) abuse during pregnancy increased from a low of 8.4% at the beginning of the study period to a high of 17.2% by mid-2010. Narcotic-using mothers were more likely to also use nicotine and alcohol, to have premature deliveries, and to be episodic users. Narcotic-exposed neonates experienced NAS 29.5% of the time; daily maternal use was associated with a higher rate of NAS (66.0%). While all infants roomed in with their mothers, exposed infants were more likely to require transfer to a tertiary care nursery. Infants with severe NAS were treated with oral morphine and had significantly longer hospital stays compared with the entire cohort (4.5 vs 1.5 days,  $P = .004$ ). Narcotic abuse during pregnancy in our region is not currently associated with increased rates of HIV or hepatitis C infection, as intravenous route of administration is less common at present than intranasal and oral ingestion.

**Conclusion** Narcotic abuse during pregnancy is a considerable problem in First Nations communities in northwestern Ontario. Community-based initiatives need to be developed to address this issue, and medical and nursing staff need to develop surveillance, assessment, and therapeutic responses. Passive neonatal addiction and withdrawal result from maternal narcotic use during pregnancy. Rates of opioid use among pregnant Canadian women are unknown.

#### EDITOR'S KEY POINTS

- Narcotic abuse is a growing social and medical problem in northwestern Ontario, particularly in First Nations communities. Narcotic use during pregnancy can lead to neonatal abstinence syndrome. The researchers undertook this study to document the incidence and outcomes of oxycodone exposure during pregnancy in their region. It is the first incidence report about narcotic use during pregnancy in Canada.

- By the end of the study period, more than 17% of pregnant women were using opioids. Most used opioids occasionally, likely because access in their remote regions was often limited or episodic. As a result, few of the neonates required pharmacologic treatment for withdrawal. However, narcotic-exposed pregnancies had significantly more premature births ( $P = .001$ ), had longer lengths of stay in hospital ( $P = .004$ ), and were more likely to need transfer to tertiary care facilities ( $P = .005$ ).

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# Exposition des nouveau-nés aux narcotiques dans une population des Premières Nations du Nord-Ouest de l'Ontario

## Incidence et répercussions

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### Résumé

**Objectif** Établir l'incidence du syndrome de sevrage néonatal (SSN) et le taux de consommation de narcotiques durant la grossesse dans le Nord-Ouest de l'Ontario, où l'abus de narcotiques est un problème social et médical sans cesse croissant.

**Type d'étude** Revue rétrospective de dossiers.

**Contexte** La région desservie par le centre de santé Meno Ya Win de Sioux Lookout, dans le nord-ouest de l'Ontario.

**Participants** Les mères et les nouveau-nés de 482 naissance vivantes survenues au cours des 18 mois de l'étude (entre janvier 2009 et juin 2010).

**Principaux paramètres à l'étude** On a documenté la consommation de drogues par les mères et les issues néonatales.

**Résultats** L'incidence de l'abus du narcotique oxycodone durant la grossesse a augmenté d'un minimum de 8,4% au début de l'étude à un sommet de 17,2% au milieu de 2010. Les mères consommant des narcotiques étaient plus susceptibles de consommer aussi de la nicotine et de l'alcool, d'avoir des accouchements prématurés et d'être des utilisatrices épisodiques. Les nouveau-nés exposés aux narcotiques ont présenté un SSN dans 29,5% des cas; une utilisation quotidienne par la mère augmentait ce taux à 66,0%. Alors que tous les nouveau-nés partageaient la même chambre que la mère, les nourrissons exposés ont plus souvent dû être transférés à une unité de soins néonataux tertiaires. Les nouveau-nés présentant un SSN sévère ont été traités par de la morphine orale et ont dû rester à l'hôpital plus longtemps que l'ensemble de la cohorte (4,5 vs 1,5 jours,  $P = ,004$ ). Jusqu'à présent dans notre région, l'abus de narcotiques ne s'est pas accompagné d'une augmentation des taux de SIDA ou d'hépatite C, la voie d'administration intraveineuse étant pour l'instant moins fréquente que la voie intra-nasale ou orale.

**Conclusion** La consommation de narcotiques durant la grossesse est un problème majeur dans les communautés des Premières Nations du Nord-Ouest de l'Ontario. Il faudra, conjointement avec ces communautés, élaborer des projets pour contrer ce problème, et le personnel médical et infirmier devra apporter des réponses sous forme de surveillance, d'évaluation et de traitement. La consommation de narcotiques par la mère durant la grossesse entraîne chez le nouveau-né de l'accoutumance et un syndrome de sevrage. On ignore le taux de consommation d'opiacés chez les femmes enceintes au Canada.

### POINTS DE REPÈRE DU RÉDACTEUR

- La consommation de narcotiques est un problème social et médical qui ne cesse de croître dans le Nord-Ouest de l'Ontario, particulièrement dans les communautés des Premières Nations. La consommation de narcotiques durant la grossesse peut entraîner un syndrome de sevrage chez le nouveau-né. Dans cette étude, les auteurs voulaient établir l'incidence et les conséquences de l'exposition à l'oxycodone durant la grossesse dans leur région. C'est la première étude sur l'incidence de la consommation de narcotiques durant la grossesse au Canada.
- Vers la fin de l'étude, plus de 17% des femmes enceintes consommaient des opiacés, la plupart de façon occasionnelle, probablement parce que dans ces régions éloignées, la disponibilité est souvent limitée ou épisodique. Pour cette raison, peu de nouveau-nés ont nécessité un traitement pharmacologique pour sevrage. Toutefois, les grossesses exposées aux narcotiques se sont accompagnées d'un nombre significativement plus élevé de naissances prématurées ( $P = ,001$ ) et d'un plus long séjour à l'hôpital ( $P = ,004$ ), et elles étaient plus susceptibles de nécessiter un transfert dans un service de soins tertiaires ( $P = ,005$ ).

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Neonatal withdrawal from narcotics and other medications or drugs of abuse was first described as *neonatal abstinence syndrome* (NAS) in 1975 by Dr Loretta Finnegan. She described a generalized disorder of hyperirritability of the central nervous system, gastrointestinal and respiratory dysfunction, and vague autonomic nervous system symptoms.<sup>1</sup>

In Australia the occurrence of NAS has increased dramatically from 0.97 per 10 000 live births to 42.4 per 10 000 live births in the past 25 years.<sup>2</sup> In northern Ontario, narcotic abuse (in particular oxycodone in long-acting OxyContin or short-acting Percocet) has become an increasing problem.<sup>3</sup> Remote First Nations communities with high rates of unemployment, poverty, and overcrowding bear the additional social and economic burden of narcotic abuse and addiction, with profound narcotic abuse in some of these communities.<sup>4</sup> A 2008 survey carried out in the northern Ontario reserve of Constance Lake revealed that 46.3% of respondents abused prescription drugs and 39.6% abused illegal or street drugs.<sup>4</sup>

Narcotic abuse among First Nations populations affects the entire community, as well as the physical, mental, emotional, and spiritual well-being of the individuals.<sup>4</sup> Self-identified risks for drug use in these communities include peer pressure, cultural loss, grief, lack of self-esteem, trauma, housing problems, domestic violence, and mental health issues.<sup>4</sup>

Female drug abusers are often of reproductive age—in the United States, 90% of female drug abusers are in that age group.<sup>5</sup> The birth rate in First Nations communities is double that of the rest of Canada (23.0 per 1000 women vs 11.1 per 1000 women), and women who abuse oxycodone might well do so during pregnancy.<sup>6</sup>

The Sioux Lookout Meno Ya Win Health Centre (SLMHC) provides health care and maternity services to a widely dispersed population of 25 000 primarily First Nations patients in northwestern Ontario.<sup>7</sup> The researchers at SLMHC undertook this study to document the incidence and outcomes of oxycodone exposure during pregnancy in our region. It is the first incidence report about narcotic use during pregnancy in Canada.

## METHODS

This is a retrospective descriptive study of neonatal exposure to oxycodone. Maternal and neonatal chart reviews on all 482 deliveries at the SLMHC from January 2009 to June 2010 were undertaken by physicians and researchers involved in the maternity program at the SLMHC. We examined the most recent 18 months divided into 6-month periods, as we had noted a clinical increase in maternity patients who admitted to narcotic abuse. Ethics approval was obtained from the Research Review Committee of the SLMHC. Our First

Nations Special Advisor (H.C.) was involved from planning to synthesis and approval of the final paper. Our findings were shared with our regional First Nations Health Authority before submission for publication.

Data were collected in Excel and imported into PASW Statistics, version 18.0, for statistical analysis. Descriptive analysis of the overall obstetric program was followed by bivariate analysis according to oxycodone exposure using  $\chi^2$  tests for categorical data (Pearson or Fisher exact tests, as appropriate) and independent-samples *t* tests for continuous data. Our chart review included summaries of charts from patients' home communities, twice weekly prenatal clinics held in Sioux Lookout from 38 weeks' gestation onward, and patient hospital records. We asked about daily use and occasional use (defined as from several times per week to monthly, which we described as episodic or "binge" use) of opioids. Infant Finnegan scores were recorded and categorized by whether or not they were greater than 7, as that is the protocol value above which more serious withdrawal is noted and pharmacologic treatment might be required. This scoring system is widely used but not yet validated.

A priori sample size calculations were not completed, as the parameters to estimate power and sample size did not yet exist. However, post hoc power calculations on the primary outcomes revealed that the power ranged from 64% (prematurity) to 84% (length of stay).

## RESULTS

During our study period we had 482 live births; 61 of the neonates were exposed to oxycodone in utero. The incidence of oxycodone exposure during pregnancy increased significantly in the study period ( $P = .050$ ) from an initial 8.4% in the first 6 months of 2009 to a high of 17.2% in the first 6 months of 2010 (**Figure 1**), with most of those who used oxycodone being occasional users (**Figure 2**). Narcotic-using mothers were typically smokers and used more alcohol than nonusing mothers did, and there was a trend toward increased parity. The 2 groups were otherwise similar with regard to comorbidities (**Table 1**).

There were 61 narcotic-exposed infants in this cohort. Exposed and nonexposed groups of newborns showed equivalent birth weight and Apgar scores. Narcotic-exposed pregnancies had significantly more premature births ( $P = .001$ ), had longer lengths of stay in hospital ( $P = .004$ ), and were more likely to need transfer out ( $P = .005$ ) to tertiary care facilities (**Table 2**). Among these 482 deliveries there were no neonatal deaths and no HIV or hepatitis C infections. Length of stay was longer among neonates with higher Finnegan scores. Infants with scores greater than 7 had a mean length of stay of 4.5 days versus 1.5 days for the total cohort ( $P = .004$ ).

Figure 1. Percentage of exposed neonates (n=61) over consecutive 6-month periods (January 2009 to June 2010): *Pearson  $\chi^2$  for differences in proportions  $P=.05$ .*

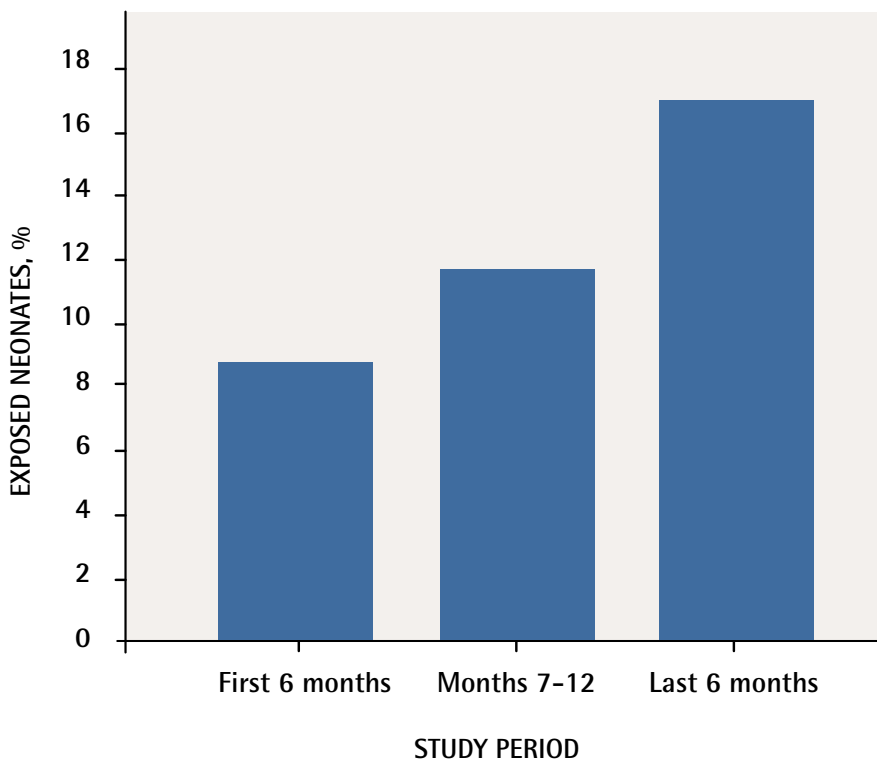
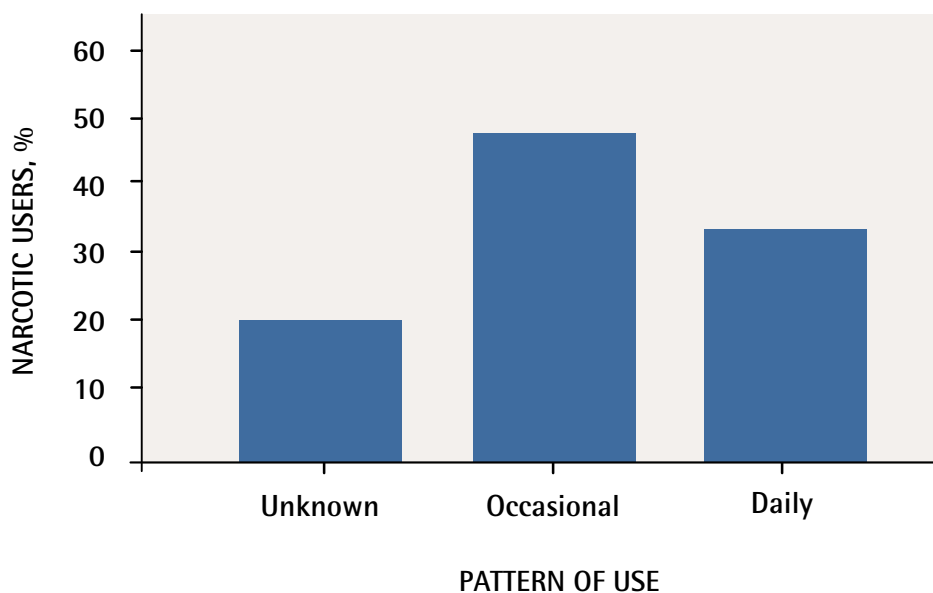


Figure 2. Patterns of narcotic use (n=61)



Twenty-one infants exhibited symptoms of NAS (4.3%) and had Finnegan scoring done; 18 of these neonates had been exposed to narcotics and 3 had been exposed to alcohol. Three required pharmacologic treatment of opioid withdrawal, 1 of whom was transferred to a tertiary care centre. Among narcotic-exposed infants the rate of NAS was 29.5%, and 11.5% were strongly affected, with at least 1 Finnegan score greater than 7. Daily maternal use of narcotics was associated with a higher rate (66.0%) of NAS-affected infants when compared with episodic users, even though occasional users were far more common (Figure 2). The exposed infants were more likely to be from remote First Nations communities and were also more likely to have been exposed to alcohol.

All our infants roomed in with their mothers, and all mothers were encouraged to breastfeed.

## DISCUSSION

We have documented for the first time a very high rate of narcotic exposure during pregnancy in northwestern Ontario. Currently we are seeing a binge pattern of use, dictated perhaps by the geographic remoteness of many of our patients, where access to illicit drugs is episodic. The increasing incidence of oxycodone abuse during pregnancy is consistent with our observations and with media reports of a pervasive abuse of this specific drug in our region.

Methadone, often referenced as optimal treatment for opioid-addicted mothers, is not readily available in remote communities and might not even be the best maternal strategy for episodic users like those most commonly found in our area. The literature also supports long-acting morphine as equivalent maternal

prenatal maintenance therapy if such is required.<sup>8</sup> We generally use MS Contin, a long-acting opioid that can only be ingested orally and cannot be snorted or used intravenously. Only a few of our patients received it antenatally, usually self-identified daily or intravenous opioid abusers. Breastfeeding and rooming-in are standard care at our facility for these patients.<sup>9-11</sup>

Oxycodone, the common drug of abuse in our region, is generally taken as a tablet or crushed and snorted, but it can also be injected intravenously. Our area generally has low rates of HIV and hepatitis C infection, but community physicians are seeing increasing intravenous injection use of this drug of abuse. In such closed communities, this raises concerns about a changing pattern of infectious disease, including risk of HIV, hepatitis C, and methicillin-resistant *Staphylococcus aureus* infections and Gram-positive sepsis, which will further challenge maternal and child health in this region. An urban-based Australian study noted rates of hepatitis C in intravenous narcotic-abusing mothers of NAS infants to be greater than 80%.<sup>12</sup>

Our low rate of NAS requiring pharmacologic treatment is likely a function of the pattern and dosage of oxycodone use. Half of our patients were self-described occasional users. Infants of methadone-treated mothers described in the literature traditionally have much higher rates of NAS. The infants of our daily users did have a higher rate of NAS (66%), which is similar to these studies of methadone-treated mothers.

Our typical narcotic-exposed neonate appears well at birth. The neonates in our study had normal Apgar scores and did not have significantly lower birth weight. These findings are common to most other recent studies. The normal Apgar score is expected, as withdrawal generally occurs some time after delivery, and the change in

**Table 1. Maternal characteristics: Characteristics that were statistically different between exposed and nonexposed women are boldface.**

CHARACTERISTIC	ALL BIRTHS (N = 482)	EXPOSED MOTHERS (N = 61)	P VALUE*
Mean (SD) age, y	24.4 (6.03)	24.5 (6.2)	.326 <sup>†</sup>
Mean (SD) parity	1.67 (1.72)	1.82 (1.47)	.474 <sup>†</sup>
<b>Mean (SD) gestational age, wk</b>	<b>39.1 (1.3)</b>	<b>38.8 (1.5)</b>	<b>.045<sup>†</sup></b>
<b>Smoking, n (%)</b>	<b>278 (57.7)</b>	<b>50 (83.3)</b>	<b>&lt;.001</b>
<b>Alcohol use, n (%)</b>	<b>116 (25.3)</b>	<b>21 (34.4)</b>	<b>.050</b>
Hypertension, n (%)	37 (7.7)	6 (10.5)	.418
Type 2 diabetes mellitus, n (%)	11 (2.3)	1 (1.7)	.735
Gestational diabetes, n (%)	26 (5.4)	2 (3.4)	.454
Hepatitis B, n (%)	2 (0.4)	0 (0)	.590
<b>First Nations community, n (%)</b>	<b>379 (78.6)</b>	<b>58 (95.1)</b>	<b>.004</b>
Cesarean section, n (%)	118 (24.5)	14 (23.0)	.935
Nonelective cesarean section, n (%)	83 (17.2)	10 (16.4)	.924
Out-of-hospital deliveries, n (%)	13 (2.7)	3 (5.0)	.244
Postpartum hemorrhage, n (%)	70 (14.5)	7 (11.5)	.462

\*Significance calculated using  $\chi^2$  tests, except as marked.

<sup>†</sup>Significance calculated using *t* tests.



**Table 2. Neonatal characteristics: Characteristics that were statistically different between exposed and nonexposed neonates are boldface.**

CHARACTERISTIC	ALL BIRTHS (N = 482)	EXPOSED NEONATES (N = 61)	P VALUE*
Mean (SD) birth weight, g	3591 (519)	3516 (577)	.229
Mean (SD) 1-min Apgar score	8.48 (0.98)	8.5 (1.0)	.856
Mean (SD) 5-min Apgar score	9.00 (0.36)	8.95 (0.6)	.259
Mean (SD) head circumference, cm	34.9 (1.7)	34.9 (1.5)	.772
Mean (SD) length, cm	51.1 (3.3)	51.1 (3.2)	.768
Mean (SD) arterial pH	7.25 (0.01)	7.26 (0.8)	.539
Mean (SD) venous pH	7.30 (0.08)	7.31 (0.07)	.132
<b>Preterm (&lt;37 wk), n (%)</b>	11 (2.3)	5 (8.2)	.001 <sup>†</sup>
<b>NAS, n (%)</b>	21 (4.3)	18 (29.5)	<.001 <sup>†</sup>
<b>Finnegan score &gt; 7, n (%)</b>	9 (1.9)	7 (11.5)	<.001 <sup>†</sup>
Males, n (%)	261 (54.1)	40 (65.6)	.055 <sup>†</sup>
<b>Transfer to tertiary care, n (%)</b>	7 (1.5)	4 (6.8)	.005 <sup>†</sup>

NAS—neonatal abstinence syndrome, pH—acidity.

\*Significance calculated using *t* tests, except as marked.

<sup>†</sup>Significance calculated using  $\chi^2$  tests.

the infant's clinical presentation is one of the hallmarks of NAS. Birth weight was low in studies of heroin users in the 1970s and 1980s, but such low birth weight has not been seen in more recent studies, likely owing to improved provision of obstetric care to addicted patients.

We did find an increased risk of prematurity in the narcotic-exposed group (8.2%,  $P = .001$ ). Other NAS studies have showed similarly higher rates of prematurity.<sup>13</sup>

Follow-up care for mother and child at our centre is arranged through community-based medical, nursing, and counseling services and referral to regional programs, including the Children's Aid Society when appropriate.

Physicians in our practices have ceased prescribing oxycodone-containing medications (ie, Percocet and OxyContin), and these medications have also been removed from the hospital formulary.

## Limitations

Our study is limited by the retrospective methodology of chart review. Also, the topic is a difficult one to explore and we believe that many patients would choose not to disclose substance abuse during pregnancy. This would explain the 3 infants with symptoms of NAS whose mothers did not self-report oxycodone use. The Finnegan scoring system was just introduced at the beginning of the study period. This semi-objective instrument is open to great interobserver variability. Nursing orientation is also an ongoing process, particularly in a general nursery with low rates of NAS. The time frame of our study marked the initiation of physician diagnosis and treatment of NAS and, therefore, might reflect a degree of under-reporting.

## Conclusion

Oxycodone abuse is a growing problem in northwestern Ontario. Obstetric units will need to be vigilant and well

prepared. Assessment tools such as Finnegan scoring and regional treatment protocols will need to be available in order to develop the expertise and comfort levels required for effective treatment of both mothers and infants. Remote First Nations communities might be hardest hit economically, socially, and spiritually.

A comprehensive approach to substance abuse in remote First Nations communities is needed. Because it is an in-community problem, in-community solutions need to be developed and appropriately supported. These could take different directions than traditional Western approaches to addictions, which would require travel to distant treatment centres, thus causing another level of social disruption. Communities will have to decide for themselves if First Nations healing traditions need to be combined with medical withdrawal management so that affected community members can safely stay home for treatment and healing.

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### Contributors

All authors contributed to the concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

### Competing interests

None declared

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