ORIGINAL ARTICLE

Demographics, prevalence and outcomes of diabetes in pregnancy in NW Ontario

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This article has been peer reviewed.

Access this article online

Quick Response Code:

Website: www.cjrm.ca

DOI: 10.4103/CJRM.CJRM_71_19

Abstract

Introduction: Diabetes in pregnancy confers increased risk. This study examines the prevalence and birth outcomes of diabetes in pregnancy at the Sioux Lookout Meno Ya Win Health Centre (SLMHC) and other small Ontario hospitals.

Methods: This was a retrospective study of maternal profile: age, parity, comorbidities, mode of delivery, neonatal birth weight, APGARS and complications. Data were compared to other Ontario hospitals offering an equivalent level of obstetrical services.

Results: Type 2 diabetes mellitus in pregnancy is far more prevalent in mothers who deliver at SLMHC (relative risk [RR]: 20.9, 95% confidence interval [CI]: 16.0–27.2); the rates of gestational diabetes (GDM) are double (RR: 2.0, 95% CI: 1.7–2.3). SLMHC mothers with diabetes were on average 5 years younger and of greater parity with increased substance use. Neonates largely had equivalent outcomes except for increased macrosomia, neonatal hypoglycaemia and hyperbilirubinaemia in GDM pregnancies.

Conclusion: Patients with diabetes in pregnancy at SLMHC differ substantially from mothers delivering at Ontario hospitals with a comparable level of service. Programming and resources must meet the service needs of these patients.

Keywords: Diabetes, First Nations, pregnancy

Résumé

Introduction: Le diabète durant la grossesse élève le risque. Cette étude s'est penchée sur la prévalence des issues liées à l'accouchement causées par le diabète durant la grossesse au centre de santé SLMHC (Sioux Lookout Meno Ya Win Health Centre) et dans d'autres petits hôpitaux ontariens.

Méthodologie: Il s'agissait d'une étude rétrospective du profil de la mère : âge, parité, comorbidités, méthode d'accouchement, poids du bébé à la naissance, score APGAR et complications. Les données ont été comparées à celles d'autres hôpitaux ontariens qui offrent un niveau équivalent de services obstétriques.

Résultats: Le diabète de type 2 durant la grossesse est beaucoup plus répandu chez les femmes qui accouchent au SLMHC (risque relatif [RR] : 20,9; intervalle de confiance [CI] à 95 % : 16,0–27,2); le taux de diabète gestationnel est deux fois plus

Received: 29-08-2019 **Revised:** 11-09-2019 **Accepted:** 31-10-2019 **Published:** ***

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How to cite this article: Hummelen R, Kattini R, Poirier J, Madden S, Ockenden H, Dooley J, *et al*. Demographics, prevalence and outcomes of diabetes in pregnancy in NW Ontario. Can J Rural Med 2020;3:99-104.

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élevé (RR : 2,0; IC à 95 % : 1,7–2,3). Les femmes diabétiques ayant accouché au SLMHC étaient en moyenne 5 ans plus jeunes, avaient eu plus de naissances et elles consommaient des drogues en plus grand nombre. L'état des nouveau-nés était grandement équivalent, à l'exception d'un plus grand nombre de macrosomies, d'hypoglycémies néonatales et d'hyperbilirubinémies dans les cas de diabète gestationnel.

Conclusion: Les patientes diabétiques durant la grossesse vues au SLMHC diffèrent substantiellement des femmes qui accouchent dans les hôpitaux ontariens offrant un niveau comparable de services. La programmation et les ressources doivent répondre aux besoins en matière de services de ces patientes.

Mots-clés: Diabète, Premières Nations, grossesse

INTRODUCTION

Diabetes in pregnancy increases maternal and neonatal adverse events.[1,2] The high prevalence of type 2 diabetes mellitus (T2DM) in many First Nations populations includes women in their reproductive years, conferring increased risk in pregnancy.[3] Rural obstetrical programmes serving First Nations in Canada operate in this environment of diabetes-related challenges and their programme needs may be unique.

The adverse event risk begins at conception for women with pre-existing T2DM. Hyperglycaemia at conception and during organogenesis increases the risk for stillbirth and congenital anomalies.[4,5] Gestational diabetes (GDM) developing later in pregnancy affects foetal growth, with resultant increases in macrosomia, shoulder dystocia and caesarean section.[6-8] GDM diagnosed in the first trimester is assumed to be newly recognised 'overt', or pre-existing diabetes and these pregnancies share the risk profile associated with T2DM.[9,10]

Rural hospitals serving First Nations populations may encounter higher rates of diabetes in pregnancy compared to other obstetrical programmes. This study examined the demographics, prevalence and outcomes of diabetes in pregnancy for women who delivered at the Sioux Lookout Meno Ya Win Health Centre (SLMHC) in comparison to other Ontario hospitals with a similar level of obstetrical services.

METHODS

SLMHC has a catchment population of 29,000 living in the town of Sioux Lookout and 26 remote fly-in communities.[11] Obstetrical services are provided by family physicians at the integrated pregnancy programme (IPP) with an average of 400 annual deliveries. Tertiary level care is available in Thunder Bay, Ontario, or Winnipeg, Manitoba, each over 300 km away, as accessed by air transportation.

This retrospective study compares the maternal and neonatal populations at SLMHC and other Ontario obstetrical programmes, providing a similar level of service, from April 1, 2012, to March 31, 2017. Live birth data from the Better Outcomes Registry and Network (BORN) Ontario was accessed for SLMHC and other maternity level 1B Ontario hospitals.[12] This designation by the Provincial Council for Maternal and Child Health identifies low-risk obstetrical programmes with a minimum standard of C-section availability and family physicians or midwife provision of intrapartum and neonatal care.[13] These 30 comparable provincial hospital programmes averaged 416 deliveries annually; three were rural (Ontario rurality index ≥75).[14]

Maternal data for patients with GDM or T2DM included age, parity, pre-pregnancy weight, comorbidities and mode of delivery. Neonatal variables included gestational age, birth weight, APGAR scores and complications. The study was reviewed and approved by the BORN Indigenous consultant and the local Sioux Lookout First Nations Health Authority and received ethics approval from the SLMHC Research Review and Ethics Committee.

RESULTS

There were 2,084 live births at SLMHC during the 5-year study period. Diabetic status was available for 2,073 patients. Most patients (1,833; 88%) were non-diabetic; GDM was present in

Table 1: Characteristics of gestational diabetes mellitus patients at Sioux Lookout Meno Ya Win Health Centre and other Ontario Maternity 1B hospitals, April 1, 2012-March 31, 2017

	SLMHC	Ontario 1B Hospitals	RR (95% CI)	*P*
GDM, *n* (% live births)	164 (8)	2690 (4)	2.0 (1.7-2.3)	**<0.001**
Maternal				
Age				
Mean±SD	27.5±6.33	32±5.07	N/A	**<0.001**
<20 (%)	16 (10)	25 (0.9)	10.5 (5.7-19.3)	**<0.001**
>35 (%)	21 (13)	636 (24)	0.5 (0.4-0.8)	**<0.001**
Obstetrical history				
Primiparous (%)	30 (18)	947 (35)	0.5 (0.4-0.7)	**<0.001**
Previous vaginal births	2±2.09	0±1.29	N/A	**<0.001**
Pre-pregnancy weight	77.6±16.96	74.9±20.29	N/A	0.095
Comorbidities				
Insulin in current pregnancy (%)	37 (23)	868 (33)	0.7 (0.5-0.9)	**0.009**
Hypertension (%)*	17 (10)	259 (10)	1.1 (0.7-1.7)	0.772
Opioid replacement therapy (%)	17 (10)	24 (0.9)	11.6 (6.3-21.2)	**<0.001**
Illicit opioids (%)	14 (9)	5 (<0.2)	45.9 (16.7-126.0)	**<0.001**
Alcohol (%)	30 (19)	56 (2)	8.8 (5.8-13.3)	**<0.001**
Smoking (%)	86 (52.4)	366 (14)	3.8 (3.2-4.6)	**<0.001**
Marijuana (%)	9 (6)	20 (1)	7.4 (3.4-15.9)	**<0.001**
Mode of delivery				
Induced labour (%)	83 (51)	1006 (37)	1.3 (1.1-1.6)	**<0.001**
Planned C-section (%)	28 (17)	614 (23)	0.7 (0.5-1.1)	0.089
Unplanned C-section (%)	28 (17)	407 (15)	1.1 (0.8-1.6)	0.490
Total C-section (%)	56 (34)	1021 (38)	0.9 (0.7-1.1)	0.332
Neonatal				
Gestational age at delivery				
Mean±SD	38±1.3	39±1.28	N/A	**<0.001**
<37 weeks (%)	13 (8)	141 (5)	1.5 (0.9)	0.136
37-39 weeks (%)	77 (47)	1145 (43)	1.1 (0.9-1.3)	0.267
39-41 weeks (%)	74 (45)	1396 (52)	0.9 (0.7-1.0)	0.091
>41 weeks (%)	0	8 (0.3)	0.9 (0.1-16.5)	
Newborn outcomes				
5 min APGAR <7 (%)	4 (<4)	49 (2)	1.3 (0.5-3.6)	N/A
Birth weight <2500 g	7 (5)	69 (3)	1.7 (0.8-3.6)	0.107
Birth weight >4000 g	33 (22)	326 (12)	1.7 (1.2-2.3)	**<0.001**
Resuscitation (%)	26 (16)	317 (12)	1.3 (0.9-1.9)	0.099
Hypoglycaemia (%)	25 (15)	197 (7)	2.1 (1.4-3.1)	**<0.001**
Hyperbilirubinaemia (%)	13 (8)	117 (4)	1.8 (1.0-3.2)	**0.031**

Bold=<0.05. RR: Relative risk, GDM: Gestational diabetes mellitus, SLMHC: Sioux Lookout Meno Ya Win Health Centre, CI: Confidence interval, SD: Standard deviation, N/A: Not available, *Includes Gestational and Pre-Gestational Hypertension

164 (7.9%) and T2DM in 76 (3.7%) patients. Other maternity level 1B hospitals had 69,149 deliveries, 96% of whom were non-diabetic, 4% GDM and 0.24% T2DM.

Women with both classes of diabetes who delivered at SLMHC were on average 5 years younger and of greater parity than at other maternity level 1B hospitals. Increased neonatal macrosomia, hypoglycaemia and hyperbilirubinaemia were identified solely in SLMHC patients with GDM.

Substance exposure (smoking, alcohol and opioids) was substantially more common in the NW Ontario obstetrical population. Labour inductions and delivery before 39 weeks were more common at SLMHC for both classes of diabetes, with equivalent overall C-section rates. Planned C-sections were less common at SLMHC (relative risk [RR]: 0.5, 95% confidence interval [CI]: 0.3–0.9) maternal and neonatal characteristics and birth outcomes are listed for GDM [Table 1] and T2DM [Table 2].

Table 2: Characteristics of type 2 diabetes mellitus patients in pregnancy at Sioux Lookout Meno Ya Win Health Centre and other Ontario Maternity 1B hospitals, April 2012-March 2017

	A SLMHC (*n*=2084)	B Ontario 1B Hospitals (*n*=69,149)	RR (95%CI)	*P*
T2DM, *n* (% live births)	76 (3.7)	168 (0.2)	20.9 (16.0-27.2)	**<0.001**
Maternal				
Age				
Mean±SD	29.5±5.64	33±5.42	N/A	**<0.001**
<20 (%)	3	2	3.3 (0.6-19.4)	N/A
>35 (%)	12 (16)	57 (34)	0.5 (0.3-0.8)	**0.004**
Obstetrical history				
Primiparous (%)	11 (15)	53 (32)	0.5 (0.2-0.8)	**0.005**
Previous vaginal births	2.5±2.39	0±1.41	N/A	**<0.001**
Pre-pregnancy weight	86.3±17.01	82±23.94	N/A	**<0.001**
Comorbidities				
Insulin in current pregnancy (%)	30 (40)	94 (56)	0.7 (0.5-1.0)	**0.017**
Hypertension (%)*	14 (18)	27 (16)	1.1 (0.6-2.1)	0.645
Opioid replacement therapy (%)	18 (24)	0 (0)	81.2 (5.0-1330.2)	**<0.001**
Illicit opioids (%)	14 (18)	0 (0)	63 (3.8-1053.3)	**<0.001**
Alcohol (%)	15 (20)	<6 (<4)	N/A	**<0.001**
Smoking (%)	49 (65)	30 (18)	3.6 (2.5-5.2)	**<0.001**
Marijuana (%)	5	4	2.7 (0.7-10.0)	N/A
Mode of delivery				
Induced labour (%)	46 (61)	57 (34)	1.8 (1.3-2.4)	**<0.001**
Planned C-section (%)	12 (15)	54 (32)	0.5 (0.3-0.9)	0.041
Unplanned C-section (%)	21 (28)	36 (21)	1.3 (0.8-2.0)	**<0.001**
Total C-section (%)	33 (43)	90 (54)	0.8 (0.6-1.1)	0.138
Neonatal				
Gestational age at delivery				
Mean±SD	38±1.08	38±1.44	N/A	1.0
<37 weeks (%)	<6 (<8)	21 (13)	N/A	<0.289
37-39 weeks (%)	58 (76)	90 (54)	1.4 (1.2-1.7)	**<0.001**
39-41 weeks (%)	12 (16)	54 (32)	0.5 (0.3-0.9)	**<0.001**
>41 weeks (%)	<6	<6	N/A	N/A
Newborn outcomes				
5 min APGAR <7 (%)	1	7 (4)	0.32 (0.04-2.5)	0.277
Birth weight <2500 g	0 (0)	<6 (<4)	N/A	<0.095
Birth weight >4000 g	15 (21)	21 (13)	1.6 (0.9-2.9)	0.105
Resuscitation (%)	12 (16)	34 (20)	0.8 (0.4-1.4)	0.424
Hypoglycaemia (%)	20 (26)	30 (18)	1.5 (0.9-2.4)	0.116
Hyperbilirubinaemia (%)	13 (17)	13 (8)	2.2 (1.1-4.5)	**0.025**

*Gestational and pre-gestational hypertension. Bold = <0.05. RR: Relative risk, SLMHC: Sioux Lookout Meno Ya Win Health Centre, CI: Confidence interval, SD: Standard deviation, N/A: Not available, T2DM: Type 2 diabetes mellitus

DISCUSSION

The prevalence of pre-existing T2DM and GDM is much higher at SLMHC compared to other Ontario hospitals with a comparable level of obstetrical services. Associated adverse outcomes were more common: unplanned C-sections, neonatal hypoglycaemia and macrosomia. Total C-section and neonatal resuscitation rates were equivalent.

The substantial difference in the rates of pre-existing T2DM (RR: 20.9, 95% CI: 16.0–27.2) speaks to the high diabetes prevalence in NW Ontario.[15] It may also reflect the transfer of care of pregnant patients with T2DM to specialists and/or larger facilities in other areas of the province, as the provincial prevalence of T2DM in pregnancy is double (0.4%) in other Ontario maternity 1B hospitals (0.2%).[16]

At SLMHC, both classes of diabetic patients delivered at a mean of 38 weeks and experienced more inductions of labour. This contrasted with comparable hospitals where only T2DM patients

were induced and delivered before 39 weeks. This highlights the clinical decision-making around time of delivery for patients with diabetes, with earlier deliveries occurring at SLMHC. It is not clear if other perceived risks also played a role in these decisions.[8]

Inductions for both classes of diabetes were more common at SLMHC: GDM (RR: 1.3, 95% CI: 1.1–1.6) and T2DM (RR: 1.8, 95% CI: 1.3–2.4). All cohorts had equivalent overall C-section rates, but a different pattern of care is evident for patients at SLMHC when analysing data for T2DM patients. Unfortunately, we cannot distinguish if a planned section was elective or a repeat, but the combination of more inductions and fewer planned C-sections in T2DM patients at SLMHC may indicate a physician and/or patient preference favouring a vaginal delivery.[17] These findings are consistent with the higher trial of labour and vaginal birth after delivery previously documented at SLMHC.[18] While C-section rates for T2DM patients in each cohort are equivalent, it is sobering to see that operative deliveries occur in almost one-half of the deliveries of women with pre-existing T2DM.

All neonates had similar APGAR and resuscitation rates. GDM neonates at SLMHC had increased rates of macrosomia and hypoglycaemia. This may indicate suboptimal glycaemic control during pregnancy; we note a lower rate of insulin use in these patients. At first glance, neonates of T2DM patients at SLMHC seem to have better outcomes, but the small number of patients (76) limits the ability to draw more informed conclusions.

Congenital anomalies and stillbirths are acknowledged adverse events associated with pre-existing T2DM, and neither are included in our data set; BORN supresses rare event data (<6) in respect of patient confidentiality.

Substance exposure, an order of magnitude higher at SLMHC, is comparable to other First Nations obstetrical populations in Quebec, Manitoba and Alberta.[19-21] The presence of a similar maternal risk profile across geographically distinct First Nations demonstrates the common inherited effects of colonisation and systemic discrimination and their ongoing contribution to health inequities.[22-24]

Youth, parity, diabetes and substance use contribute to the profile of mothers delivering at SLMHC, which is quite distinct from Ontario hospitals with a comparable level of obstetrical services. Programming needs to address this, and culturally relevant initiatives are developing. The scope of hospital-based IPP includes addiction medicine in prenatal care.[25] SLMHC participates in a 20-week pregnancy support workers' programme and the Sioux Lookout First Nations Health Authority hosts Full Scope Indigenous Doula training.[26,27] Beyond these efforts, the unique context and demographics of the SLMHC obstetrical population highlight the need for broad social and medical programming, including issues not typically associated with maternity care: food security, poverty and culturally appropriate care.[22-24,28] Not all small hospital obstetrical programmes need be created equal.

Limitation

Data not reliably available from BORN included congenital anomalies and oral hypoglycaemic use in pregnancy; only live births were included.

CONCLUSION

The SLMHC obstetrical population has higher rates of both gestational and pre-existing diabetes than other Ontario hospitals with a comparable level of service. Diabetic mothers at SLMHC are younger and of greater parity with increased substance use. Programming is required which recognises and accommodates the unique service needs of this population.

Financial support and sponsorship: This study was supported by the Northern Ontario Academic Medicine Association AHSC AFP Innovation Fund award.

Conflicts of interest: There are no conflicts of interest.

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