

# Health disparities: Diabetes prevalence in Indigenous populations

Isma Ishtiaq, Simon Fraser University

## Abstract

The prevalence of diabetes is on the rise across Canada and has reached epidemic levels in Indigenous communities. Socio-economic inequities, and historical factors may be contributors to the higher burden of diabetes in Indigenous populations. This literature review outlines the relationship between Indigenous ancestry and the likelihood of developing type 2 and gestational diabetes in women. This review also focuses on the effects of colonization, specifically the intergenerational impact of residential school attendance and the passing of gestational diabetes from mother to child. The objective of this review was to investigate the prevalence of diabetes within Indigenous female populations and reveal factors that may be amplifying its burden. To better understand this issue, bibliographic research was conducted using PubMed and EBSCOhost databases. From the eight studies selected, results revealed that in women of Indigenous ancestry, diabetes was more prevalent than in women of non-Indigenous background. Results also suggest that the effects of colonization have transcended time and place as Indigenous ancestry was found to be related to a higher risk of developing diabetes. Programs aiming to decrease the prevalence of type 2 and gestational diabetes among Indigenous women must consider the historical, economic, and social factors faced by Indigenous communities and incorporate traditional health and wellness practices.

**Keywords:** diabetes mellitus; Indigenous populations; disease burden; type 2 diabetes; gestational diabetes

## Introduction

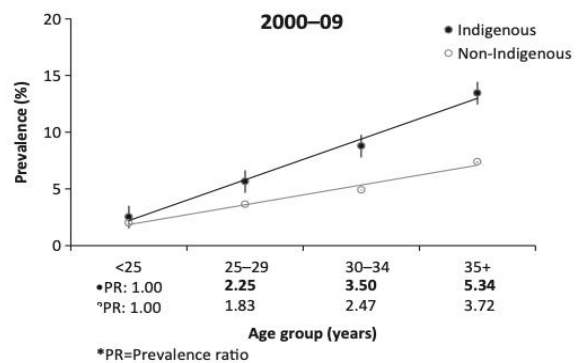
*Diabetes Mellitus* affects approximately 2.4 million Canadians today. However, in Indigenous populations specifically, diabetes cases have reached epidemic levels (Turin et al., 2016). The diabetes epidemic disproportionately affects Indigenous populations, resulting in a two to five times higher prevalence rate than the general Canadian population (Oster et al., 2014). Turin and colleagues suggest that the lack of access to healthcare and geographic factors, such as living in rural areas, may be contributing to the higher observed prevalence. In addition, inequities in the social determinants of health are also widespread in Indigenous communities, leaving the populations at an increased risk of developing diabetes (Turin et al., 2016). These social and economic inequalities attributable to colonization, include poor access to food, low education attainment, poverty, substandard housing, etc. (Dyck et al., 2015; Turin et al., 2016).

A study conducted by Mosby and Galloway in 2017 also revealed that the high trend of diabetes in Indigenous populations today may be in part, due to the poor diet forced upon Indigenous children in residential schools. These residential boarding schools, which operated between 1883 and 1996, were boarding schools where Indigenous children were sent to undergo forced cultural assimilation and where many children suffered prolonged caloric restriction (Mosby & Galloway, 2017). Altogether, various social, economic, and historical factors may be contributing to the vulnerability to diabetes in Indigenous populations today. This paper will explore how being Indigenous increases the likelihood of developing type 2 and gestational diabetes. It will focus specifically on the disparity of diabetes prevalence affecting Indigenous women, its high disease burden, as well as the factors contributing to this burden.

## Literature Review

### *The Disease Burden of Diabetes on Indigenous Peoples*

Diabetes places a large burden both socially and economically on populations all around the world. However, in some populations, the burden of diabetes is greater than in others. Unfortunately for Indigenous populations, studies have established an association between Indigenous ancestry and an increased likelihood of developing type two diabetes during one's lifetime (Turin et al., 2016). A prospective cohort study conducted by Shen et al., in 2015 focused on how First Nations ancestry may impact the association between gestational and subsequent type two diabetes in Canadian women. The researchers found that within 30 years of having their first child, First Nations women were four times more likely to develop diabetes (Shen et al., 2015). Shen and colleagues (2015) further reported that depending on if the woman is of First Nations heritage or not, the relationship between gestational diabetes and subsequent type two diabetes could vary. Gestational diabetes also increased with age and was found to be higher in Indigenous women, as compared to non-Indigenous women (Chamberlain et al., 2014; Shen et al., 2015). After adjusting for age, Indigenous women still had higher rates of gestational diabetes (Oster et al., 2014). As seen in figure one, from 2000-2009, the prevalence of gestational diabetes increased more than five times in women aged 25 or less to women aged 35 or older. Data from before 1990 and after 2009 was not included in this study to maintain the integrity and reliability of the results (Chamberlain et al., 2014). Furthermore, Oster and



**Figure 1** Crude prevalence of GDM in Indigenous and non-Indigenous women by age: 1990–1999 and 2000–2009.

colleagues (2014) found that one of the key drivers of the type two diabetes epidemic within First Nations populations in Canada is gestational diabetes. Although researchers state that the

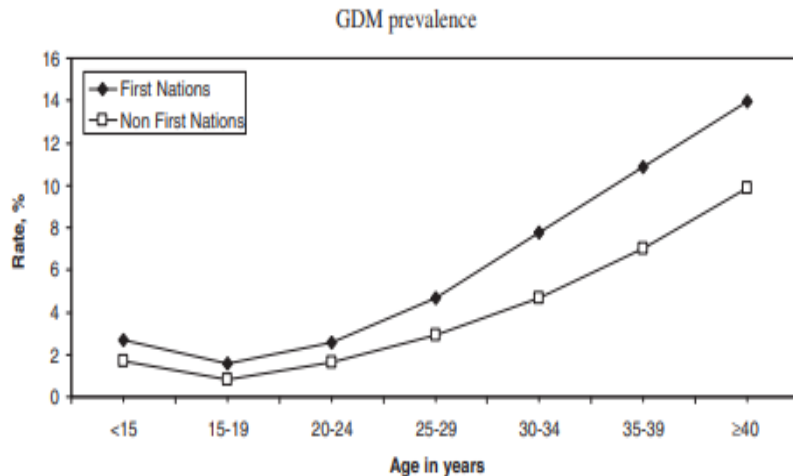


Figure 2 Age-specific prevalence of diabetes for all years in pregnancy, by ethnic and age groups.

prevalence of gestational diabetes

is not on an increasing trend in

First Nations populations, they

agree that the prevalence of

gestational diabetes is higher in

First Nations women compared to

non-First Nations populations, as

shown in figure two.

### *Factors contributing to the high burden of diabetes in Indigenous populations*

Social, historical, and economic inequalities can increase one's susceptibility to various diseases, including diabetes. These inequalities can also give rise to high burdens of disease in populations. In Indigenous communities, studies have found many complex factors contributing to the high burden of diabetes. One such study, conducted by Turin et al., in 2016, revealed that First Nations people had a significantly higher lifetime risk for developing diabetes if they lived in rural areas compared to those living in urban areas. Similarly, for First Nations women, geographical factors, such as living in a rural community, majorly contributed to an increased risk of developing diabetes (Oster et al., 2014; Shen et al., 2015). As shown in table #1 below,

**Table 1 Selected maternal characteristics, antenatal risk factors, and pregnancy outcomes for First Nations pregnancies, by diabetes in pregnancy status and type, Alberta, Canada, 2000–2009 (n = 28,306)**

	Women without diabetes (n = 26,793)	Women with diabetes (n = 1,513)	P-value	Women with pre-existing diabetes (n = 289)	Women with GDM (n = 1,224)	P-value
Maternal characteristics and risks						
Age (years)	24.7 (5.8)	28.9 (6.2)	<0.001	29.2 (6.03)	28.8 (6.27)	0.407
Rural	51.8 (51.2-52.4)	52.5 (49.9-55.0)	0.614	55.4 (49.43-61.18)	51.8 (48.96-54.63)	0.275
Weight ≥ 91 kg	10.8 (10.5-11.2)	31.7 (29.3-34.1)	<0.001	37.0 (31.44-42.87)	30.4 (27.85-33.08)	0.030
Pre-existing hypertension	0.9 (0.8-1.0)	4.2 (3.3-5.4)	<0.001	9.3 (6.25-13.30)	3.0 (2.14-4.14)	<0.001
Pregnancy induced hypertension	4.4 (4.2-4.7)	8.1 (6.7-9.7)	<0.001	10.0 (6.82-14.09)	11.3 (9.56-13.18)	0.545
Proteinuria	2.4 (2.2-2.6)	5.6 (4.5-6.9)	<0.001	7.6 (4.83-11.30)	5.2 (3.98-6.54)	0.102
Anemia	2.3 (2.1-2.5)	1.3 (0.8-2.0)	0.013	0.7 (0.08-2.48)	1.5 (0.87-2.31)	0.297
Smoker	54.7 (54.1-55.3)	49.4 (46.8-51.9)	<0.001	48.1 (42.21-54.02)	49.7 (46.83-52.51)	0.630
Alcohol anytime	10.4 (10.0-11.0)	7.8 (6.2-9.8)	0.001	6.9 (3.71-12.33)	7.9 (6.15-10.08)	0.285
Drug dependant	6.6 (6.3-6.9)	3.5 (2.6-4.6)	<0.001	4.9 (2.69-8.05)	3.2 (2.25-4.32)	0.155
Antepartum risk ≥ 7	10.4 (10.1-10.8)	30.7 (28.4-33.1)	<0.001	47.1 (41.19-52.99)	26.9 (24.41-29.46)	<0.001

out of all the maternal characteristics and risks, the most shared characteristic among First Nations women with diabetes, was rural residence (Oster et al., 2014). The exact reason that

First Nations populations living in rural areas are at an increased risk for developing diabetes is unknown. However, it has been suggested to be a result of a combination of geographical isolation, lack of regular healthcare providers, and language barriers when trying to communicate with health professionals in rural areas (Shen et al., 2015).

### *The residential school legacy on diabetes prevalence*

In Canada, Indigenous peoples have faced a history of dislocation from traditional land, resources, and forced cultural assimilation. The intergenerational effects of this displacement can be linked to the high burden of diabetes that Indigenous populations face today (Kaspar et al., 2014). While Indigenous children were displaced to residential schools, they often suffered prolonged caloric deficiency. Long-term calorie restriction diets are linked to metabolic changes that can increase one's likelihood of developing chronic diseases, such as type 2 diabetes (Mosby & Galloway, 2017). These changes include an increased adrenal stress response to prolonged hunger, and if sustained over a long period, can eventually hinder insulin response. Not only was hindered insulin response found to increase the risk of Indigenous children developing diabetes but, most children who attended residential schools also never fully recovered from malnutrition (Kaspar et al., 2014). This lack of recovery is suggested to have a biological effect on the

children and grandchildren of the residential school survivors (Mosby & Galloway, 2017). These effects include an increased risk of female residential school survivors, passing on insulin resistance, and diabetes to their offspring. Mosby and Galloway (2017) further reported that residential schools deprived children of their traditional Indigenous diets and substituted them with an unhealthy diet of starch-heavy and nutritionally deficient foods. Patterns of overeating, hoarding, and eating too fast in residential school survivors today were also attributed to the limiting diet at residential schools (Neufeld & Richmond, 2020). These unhealthy eating practices were then passed on to the children of residential school survivors, making the impact of residential schools on Indigenous health multi-generational (Mosby & Galloway, 2017; Neufeld & Richmond, 2020).

## **Discussion**

Findings from studies conducted by Chamberlain et al. (2014), and Shen et al. (2015), determined that diabetes disproportionately affects First Nations populations. In the former study, researchers found that during postpartum follow-up, the prevalence of diabetes was more than three times higher in First Nations women, and they were four times more likely to develop diabetes (Shen et al., 2015). These findings are congruent with the cohort study conducted by Chamberlain and colleagues in 2014, which also found that the prevalence of gestational diabetes was greater in First Nations women. The two studies concluded that Indigenous women are more susceptible to developing diabetes and are at an increased risk compared to their non-Indigenous counterparts. These findings also suggest that there are underlying factors that are disproportionately affecting the health of First Nations women and are leading to a high number of diabetes cases. Indeed, studies done by Dyck et al., in 2014 and Turin et al., in 2016, have

demonstrated that there are underlying social and economic inequalities, such as poverty, lack of access to food, and low levels of education that are responsible for the high prevalence of diabetes in Indigenous populations.

Mosby and Galloway (2017) present another perspective by suggesting that the main underlying factor affecting diabetes prevalence is the prolonged malnutrition at residential boarding schools that children faced. Findings from the study conducted by Oster and colleagues in 2014 also found that one of the main drivers of the diabetes epidemic in Indigenous populations is gestational diabetes in women. These findings agree with previous studies done by Chamberlain et al., in 2014 and Shen et al., in 2015 that the prevalence of gestational diabetes is higher in First Nations women.

Furthermore, Oster and colleagues (2014) argue that the prevalence of gestational diabetes is not on an increasing trend in First Nations populations. However, in their study, they only focused on First Nations people within Alberta. Furthermore, Oster and colleagues (2014) acknowledged that there was data collected from First Nations people who were not officially registered as First Nations. Since they were not registered, their data was included in the Non-First Nations group. Therefore, the disparities between both groups may have been underestimated. They also state that the results of the study may be underestimated since gestational diabetes may have been misdiagnosed in some First Nations women with pre-existing diabetes (Oster et al., 2014).

Furthermore, these results were established using a retrospective study method. Whereas a similar study done in the same year, by Turin and colleagues, which also focused only on the Albertan population, and used a population-based cohort study, indicated that over time, the prevalence, and incidence of diabetes, is increasing (Turin et al., 2014). Yet, Oster and

colleagues stated that their results regarding the trend of diabetes in Indigenous populations may have been underestimated, findings suggesting an increasing trend from the study conducted by Turin et al., may be considered more accurate. Overall, evidence from these studies suggests a higher prevalence and burden of diabetes in First Nations communities and reflects that being Indigenous increases the likelihood of developing diabetes.

## **Conclusion**

Indigenous ancestry increases one's risk of developing diabetes due to many underlying factors, such as poverty, low education attainment, and various socio-economic factors (Turin et al., 2016). As a result, Indigenous communities are affected at disproportionately high rates, and a large burden is placed on them. (Oster et al., 2014). These factors have also been associated with the colonial history of sending Indigenous children to residential schools, where children suffered from the devastating effects of prolonged caloric deficiency and became more susceptible to insulin resistance and diabetes (Mosby & Galloway, 2017). Not only did residential school attendance affect Indigenous children who attended the boarding schools, but it was also found to have a biological effect, which could be passed on from the female residential school survivor to her children, thus creating a multi-generational impact (Neufeld & Richmond, 2020).

To better understand the factors that influence the high burden of diabetes in Indigenous populations and to further investigate how diabetes will affect future generations, a more comprehensive Indigenous health framework, which considers the health effects of residential school attendance, should be established (Kaspar, 2014). Future and ongoing monitoring of diabetes in Indigenous populations is also recommended to determine what policies and



programs should be set into place to reduce the prevalence of diabetes in Indigenous communities (Oster et al., 2014). Overall, these measures can help both researchers and Indigenous populations to identify and alleviate the burden of diabetes for at-risk communities.

### References

- Chamberlain, C., Banks, E., Joshy, G., Diouf, I., Oats, J. J., Gubhaju, L., & Eades, S. (2014). Prevalence of gestational diabetes mellitus among Indigenous women and comparison with Non-Indigenous Australian Women: 1990-2009. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *54*(5), 433-440. doi:10.1111/ajo.12213
- Dyck, R. F., Karunanayake, C., Janzen, B., Lawson, J., Ramsden, V. R., Rennie, D. C., . . . Pahwa, P. (2015). Do discrimination, residential school attendance and cultural disruption add to individual-level diabetes risk among Aboriginal People in Canada? *BMC Public Health*, *15*(1). doi:10.1186/s12889-015-2551-2
- Kaspar, V. (2014). The lifetime effect of residential school attendance on Indigenous health status. *American Journal of Public Health*, *104*(11), 2184-2190. doi:10.2105/ajph.2013.301479
- Mosby, I., & Galloway, T. (2017). 'The abiding condition was hunger': Assessing the long-term biological and health effects of malnutrition and hunger in Canada's residential schools. *British Journal of Canadian Studies*, *30*(2), 147-162. doi:10.3828/bjcs.2017.9
- Neufeld, H. T., & Richmond, C. (2020). Exploring First Nation Elder Women's relationships with food from social, ecological, and historical perspectives. *Current Developments in Nutrition*, *4*(3). doi:10.1093/cdn/nzaa011
- Oster, R. T., King, M., Morrish, D. W., Mayan, M. J., & Toth, E. L. (2014). Diabetes in pregnancy among First Nations women in Alberta, Canada: A retrospective analysis. *BMC Pregnancy and Childbirth*, *14*(1). doi:10.1186/1471-2393-14-136
- Shen, G. X., Shafer, L. A., Martens, P. J., Sellers, E., Torshizi, A. A., Ludwig, S., . . . Dean, H. J. (2015). Does First Nations ancestry modify the association between gestational diabetes

and subsequent diabetes: A historical prospective cohort study among women in Manitoba, Canada. *Diabetic Medicine*, 33(9), 1245-1252. doi:10.1111/dme.12962

Turin, T. C., Saad, N., Jun, M., Tonelli, M., Ma, Z., Barnabe, C. C., . . . Hemmelgarn, B. (2016). Lifetime risk of diabetes among First Nations and Non-First Nations People. *Canadian Medical Association Journal*, 188(16), 1147-1153. doi:10.1503/cmaj.150787



This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/).