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Type 2 Diabetes in Canadian Aboriginal Adolescents: Risk Factors and Prevalence

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ABSTRACT

Purpose: To identify the risk factors and prevalence rates of prediabetes and type 2 diabetes among northern Canadian Aboriginal adolescents.
Design and Methods: In this novel exploratory, quantitative study, 160 high school students (aged 13–21) from three northern, predominantly Canadian Aboriginal communities were screened for risk for prediabetes and type 2 diabetes including demographic data, family medical history, anthropometric measurements, blood pressure, and hemoglobin A1c (HbA1c). Descriptive and inferential statistics, in addition to chi-square analysis, were used to establish risk and prevalence rates for prediabetes and type 2 diabetes in Aboriginal adolescents.
Results: At least half of the adolescents presented with multiple risk factors for type 2 diabetes. In this sample, 10% had an HbA1c > 5.7%, 22.5% were overweight, 17.5% were obese, and 26.6% had prehypertension or hypertension.
Conclusions: Prediabetes and type 2 diabetes are emerging as serious health concerns for young Aboriginal Canadians. This is troubling because both result from modifiable risk factors. As this study is the first to examine the prevalence of prediabetes in Canadian Aboriginal adolescents in the last decade, the findings underscore the necessity for early screening of Aboriginal adolescents for both prediabetes and type 2 diabetes.
Practice Implications: Recommendations toward positive health outcomes include the introduction of early age screening programs, followed by culturally relevant interventions, specific to the modifiable risk factors (overweight/obesity and hypertension), and developed in collaboration with the communities. Such approaches have the potential to prevent the progression of prediabetes to diabetes and reduce complications related to type 2 diabetes.

An estimated 422 million people worldwide were living with diabetes in 2014; this represents a four-fold increase over the estimated 108 million in 1980 (World Health Organization (WHO), 2016), and this number is expected to climb to 552 million by 2030 (International Diabetes Foundation, 2016). While type 2 diabetes has typically impacted middle-aged populations and the elderly, it has also become increasingly prevalent in children and adolescents (WHO, 2016). Overall, type 2 diabetes is increasing in adolescents worldwide (Amed et al., 2010; Nadeau & Dabelea, 2008), with a projected 49% incidence increase over the next 40 years (Imperatore et al., 2012). Children who come from marginalized groups, including Aboriginal descent, are disproportionately affected by type 2 diabetes (Panagiotopoulos, Riddell, & Sellers, 2013). Canadian Aboriginals (First Nation, Métis, and Inuit) in particular are excessively affected by diabetes and related complications, with a rate of incidence that is 3–5 times higher than the general Canadian population (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2013b; Frohlich, Ross, & Richmond, 2006). Among Canadian Aboriginals, the incidence of type 2 diabetes is estimated at 1.54 per 100,000 per year in children and adolescents < 18 years of age (Amed et al., 2010). However, Amed et al.'s (2010) study is based on census population data collected from physician visits and incidents rates that were calculated based solely on the diagnosis of type 2 diabetes. In the present study, community-based screening was undertaken to identify undiagnosed cases of prediabetes and type 2 diabetes. The prevalence of prediabetes in adolescents has not been explored in the last 20 years in Canada (Dean, 1998a).

Of the risk factors for type 2 diabetes, the primary ones for children and adolescents are poor nutrition and limited physical activity, which result in an unhealthy body weight (WHO, 2016). Additional risk factors include ethnicity (Aboriginal decent), family history, smoking, genetic predisposition, and gestational diabetes (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2013a). The majority of the abovementioned risk factors are modifiable, and are therefore critical to explore and address at early stages of development when healthy habits can be established and then maintained into adulthood.

Early intervention in Aboriginal communities necessitates access to multi-disciplinary health care services including nursing, nutrition,

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exercise therapy, and eye-related services, which are essential for at-risk and diabetic individuals (Kim & Driver, 2015). However, Aboriginal communities are often remote and therefore geographically isolated, resulting in limited access to primary, secondary, and tertiary care (Kim & Driver, 2015). Therefore, initial screening for prediabetes must be completed in conjunction with routine follow-up and ideally performed as early as possible. Optimally, these screening clinics could be led by pediatric, community, and diabetes nurses, nurse educators, nurse practitioners, and certified diabetes educators, already located in communities, and who have specialized knowledge and clinical expertise in the prevention, detection, and treatment of type 2 diabetes.

A number of studies have examined the projected incidence rates and potential risk factors for type 2 diabetes in the adolescent population (Amed et al., 2010; Dart et al., 2014; Dean, 1998a). However, the majority of data available comes from reviews of diabetic clinics, and few studies are population based (Nadeau & Dabelea, 2008). Of these studies, only one focused on an Aboriginal adolescent population (Dean, 1998b). As such, the true prevalence rate of type 2 diabetes and prediabetes may be underestimated specifically in the Aboriginal adolescent cohort. This paper reports findings from a quantitative study conducted with adolescents living in northern Canadian communities. The purpose of this study was to investigate the risk factors and prevalence rates of prediabetes and type 2 diabetes among adolescents living in northern Canadian communities of which the majority were of Aboriginal decent. In this article, new and unique findings are reported from a population-based investigation into the risk factors and prevalence of prediabetes and type 2 diabetes. To our knowledge, this is the first study examining the prevalence of prediabetes in Canadian Aboriginal adolescents in the last decade. Aboriginal peoples are a constitutionally recognized population in Canada. Those who self-identify as being Aboriginal include First Nations (North American Indian), Metis or Inuit peoples, and/or those who registered under the Indian Act of Canada, and/or those who reported membership in a First Nation or Indian band (Statistics Canada, 2015). For the purpose of the article, the general term "Aboriginal" was used. This research was guided by the following questions:

1) Are the following risk factors present in adolescents attending secondary school and living in three northern Canadian, predominantly Aboriginal communities: ethnicity; elevated body mass index; elevated blood glucose tolerance; and, elevated blood pressure?
2) What are the prevalence rates of prediabetes and type 2 diabetes in adolescents attending secondary school and living in three northern Canadian, predominantly Aboriginal communities?

Methods

Ethical approval from the University Research Ethics Board, the Northern Inter-tribal Health Authority, and the Keewatin Yatthe and Mamawhetan Health Regions were obtained along with permission from the superintendent of the school systems, the principals of the participating schools, and the parents of the adolescent participants. The principles of OCAP™ (ownership, control, access, possession) were adhered to throughout the project. Participants including, parents, adolescents, teachers, and community members, were consulted regarding, and agreed to the importance of undertaking this study. Meetings were held to consult with parents of the adolescent participants, the principals, and the band leader to ensure ownership, appropriate involvement, and direction in the research project, enabling Aboriginal peoples with self-determination over research that concerns their well-being (The First Nations Information Governance Centre, 2014). Prior to data collection, the principal spoke to the adolescents and provided opportunities for involvement and understanding the research at each school. All students enrolled in the participating schools were invited to take part in this study through an informed and signed consent. Results were explained in person and in writing to the parents by the project nurses.

Study Design

In this exploratory quantitative study, participants were screened for identification of risk for prediabetes and type 2 diabetes through the collection of demographic data, family history, anthropometric measurements, blood pressure (BP), and a Hemoglobin A1c (HbA1c) blood glucose test.

The Sample

High school students (n = 160) in three northern Canadian communities were assessed for risk and prevalence of type 2 diabetes. Response rates for all sites are outlined in Table 1. Extending the sample to three northern communities allowed for a broad sample that was predominantly representative of the Aboriginal populations. A purposeful sample of adolescents who met the inclusion criteria was recruited. The inclusion criteria were as follows: a) 13–21 years old, b) in grades 9–12, c) enrolled in at least one class in the high school, and d) present in school on the day of data collection.

Procedures

Three nursing faculty completed the screening process at each of the participating schools. A research assistant (RA) distributed and collected prepackaged consent forms to the students prior to the assessment. To maintain confidentiality, all participants were provided with a unique identifying code by the RA.

Informed, written consent was obtained from each participant prior to their involvement in the study. In addition, parental consent was obtained for each child who participated. During informed consent the purpose and related procedures, potential benefits and risks, confidentiality, right to withdraw, and contact information for the research team and ethics board were provided and described in detail to the participants, parents, and teachers. Additionally, students were informed that their participation in, or withdrawal from the study would not impact their academic standing in any way. Participants were told that if they had any questions, or if they wanted to find out about the results of this study they could contact a research team member at any time.

Anthropometry, Blood Pressure, and Diabetes Measurements

As recommended by the Canadian Diabetes Association (CDA) (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2013a), anthropometric measurements included weight,

Table 1
Demographics by community.

	Site 1		Site 2		Site 3		Total	
	N	%	N	%	N	%	N	%
Response rate	59	21%	52	60%	49	46%	160	34%
Gender								
Male	29	49%	27	52%	25	51%	81	51%
Female	30	51%	25	48%	24	49%	79	49%
Ethnicity								
Aboriginal	48	81%	52	100%	48	98%	148	93%
Non-Aboriginal	11	19%	0	0%	1	2%	12	8%
Age								
13	0	0%	6	12%	3	6%	9	6%
14	1	2%	15	29%	10	20%	26	16%
15	16	27%	9	17%	13	27%	38	24%
16	13	22%	7	14%	4	8%	24	15%
17	13	22%	7	14%	8	16%	28	18%
18	11	19%	5	10%	5	10%	21	13%
19+	5	8%	3	6%	6	12%	14	9%