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## Risk reduction for type 2 diabetes in Aboriginal children in Canada

Type 2 diabetes mellitus is increasingly being recognized as a disease affecting the paediatric population as well as the adult population (1). In Canada, one group that has been clearly identified as being at high risk for developing type 2 diabetes is the children of First Nations descent in northwestern Ontario and northern Manitoba (2,3). This trend has also been observed in several areas around the world, most notably among the Pima Nation in Arizona (4), Hispanic, African-American and Asian/Pacific Islander children. The rates of type 2 diabetes in Aboriginal children in Canada are rising. This rise is mirrored by an increasing trend toward childhood obesity and physical inactivity (5-7). Type 2 diabetes is a preventable disease characterized by insulin resistance and insulin deficiency. Type 1 diabetes mellitus is a different disease that involves the failure of insulin production and is not discussed in this statement. The present statement provides a brief summary of the current state of the problem, summarizes some of the initiatives currently underway in Aboriginal communities and offers some feasible recommendations.

### ADULTS

Although still evolving, the history of type 2 diabetes in adults of Aboriginal descent is well-documented. The Pima Indian Nation of the American southwest region has shown rates of close to 50% in those 35 years of age and older (8).

In Canada, the prevalence of type 2 diabetes in the Ojibwe Nation of northern Manitoba and northwest Ontario has been reported to be 46 cases per 1000 people (9). Among the Mohawks on the Kahnawake reserve in Quebec, the prevalence rate of type 2 diabetes has been reported to be 12% in adults 45 to 60 years of age (10).

### CAUSES AND ASSOCIATIONS

The cause of type 2 diabetes mellitus is multifactorial but several trends have become obvious and some genetic markers have been identified. The Sandy Lake study has revealed at least four genetic markers that may be associated with diabetes (11-13). Gestational diabetes is increasingly being recognized as a risk factor for children to develop type 2 diabetes later in life (11,14-17). Obesity is a known risk factor for type 2 diabetes, as is physical inactivity and a positive family history for type 2 diabetes. Obesity is on the rise in Canada and is thought to be related to an increased intake of high-caloried food and a decrease in physical activity (5).

The physical signs of insulin resistance and metabolic syndrome (acanthosis nigricans, polycystic ovarian syndrome [PCOS], hypertension, dyslipidemia and steatohepatitis) are not causative factors, but are associated with glucose intolerance and early-onset type 2 diabetes mellitus. Acanthosis nigricans refers to a hyperpigmentation and thickening of the skin, seen most commonly in the neck and axillary regions. PCOS in adolescent girls is a manifestation of insulin resistance and is associated with hyperandrogenemia. Hirsutism and irregular menses are two of the main features of PCOS. Despite having higher rates of obesity, PCOS is rare in Aboriginal adolescent girls in Canada.

### COMMUNITY ACTION AND PRIMARY PREVENTION

Several communities have initiated diabetes prevention campaigns to try to slow the accelerating rates of obesity and type 2 diabetes. The Kahnawake Schools Diabetes Prevention Project (KSDPP) (18) has been underway since the mid-1990s. It is a collaborative effort between the community and the researchers and involves several goals. The long-term goal is to decrease the incidence of type 2 diabetes by raising awareness of the disease throughout the community, and promoting healthy eating and a healthy, active lifestyle. The local community schools offer the means to reach the children, and the ongoing presence of a community advisory board keeps the research on track to serve the needs of the community. It is a model program not only because of the collaboration with the community but also because of the holistic approach it takes in dealing with diabetes prevention. Mohawk culture, language and beliefs are at the core of every intervention initiated by the project (18,19).

The KSDPP has played a major role in healthy changes at the schools in Kahnawake. Healthy lunches are now being emphasized, vending machines (if present) serve healthy food, and weekly teaching sessions related to healthy lifestyles and healthy eating, and which teach the basic concept of diabetes, have been instituted. These teaching sessions have been instituted in each grade level and are now a core part of the curriculum. Physical activity is also encouraged and has been adopted into the school curriculum. Emphasis is placed on daily physical activity. Healthy snacks are served at school events, including report card days.

The Sandy Lake First Nation School Diabetes Prevention Program (20) was established in 1998 and is

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designed to educate grade 3 and 4 students on ways to prevent type 2 diabetes. The program has four components: a classroom curriculum, family outreach, student activities, and advocacy for changes in the school and store environment. They have 17 lessons on healthy eating and physical activity, a school breakfast and snack program, health promotion in local stores, a show called *Diabetes Kids* on the local radio station, articles in the local newspaper, information booths during school parent night events and letters are sent to the homes (20).

Several Manitoba and northern Saskatchewan communities have also instituted community-wide efforts similar to the KSDPP (18) and the Sandy Lake Project (21,22). A *K-12 Diabetes Curriculum* (23) has been put together that includes a teacher's manual and an extensive resource kit with videos, games, cookbooks and other resource material.

### SCREENING

A logical next step after instituting community action is to screen the population for undetected cases of type 2 diabetes. Many of the Aboriginal communities have asked for screening within the communities as part of diabetes awareness prevention. The efficacy and utility of screening have been discussed many times (1,3). There are only two published reports of results from the screening in children in Canada. One study (24) in northern Manitoba measured fasting glucose values in Native children and found no new cases of diabetes but did find several cases of carbohydrate intolerance. An unpublished study by the Diabetes Special Screening Project of the Cree Nation of Eastern James Bay found new cases of diabetes in adults but none in children. In the same study, 44% of youth were found to be overweight.

Given the rapidly expanding number of new cases of diabetes in young people each year, several researchers have suggested initiating some form of screening. Some of the concerns with mass screening programs include the following:

- Who do you screen – the entire population?
- What becomes of the people who are identified as having type 2 diabetes?
- Are there resources to deal with the new cases?
- How much will it cost?
- Can the resources be better used in prevention strategies?
- Will mass screening identify many new cases of diabetes?
- Does early detection (presymptomatic) in this age group provide an opportunity to improve long-term outcomes?

To date, there are little data to answer these questions. Thus, there does not appear to be enough evidence at this time to support mass screening efforts in Aboriginal communities.

Manitoba has initiated a program of 'opportunistic screening' for children. Not all children are screened but if a child presents to a health care provider and meets several predetermined risk factors for type 2 diabetes, then that child is screened for type 2 diabetes (25). The American

Diabetes Association released a similar set of screening guidelines in 2000 (1). The Canadian Diabetes Association recently released similar guidelines (26). The 'opportunistic screening' method gives a sufficient answer to most of the questions raised above. Only 'high-risk' individuals are screened, and because these people are already connected to a health care system, costs should be minimized if the guidelines are followed.

The Canadian Paediatric Society is thus supporting an 'opportunistic screening' guideline for type 2 diabetes in Aboriginal children in Canada (Table 1).

### CONCLUSIONS AND RECOMMENDATIONS

Type 2 diabetes mellitus is increasingly being recognized as a disease affecting the paediatric population. Aboriginal children in Canada are at high risk for developing this disease, which was once felt to be an adult-onset metabolic disorder. Many of the First Nations communities have instituted diabetes prevention programs in an effort to decrease the rising incidence of type 2 diabetes. These prevention programs have been instituted and run by the Aboriginal communities with the health care sector as partners. Some communities have been requesting mass screening but this idea remains controversial. Until 'mass screening' is better defined, the Canadian Paediatric Society believes that resources should be prioritized toward prevention efforts and case-finding or 'opportunistic screening'.

The Canadian Paediatric Society recommends:

- Culturally based and community-run diabetes prevention programs should be established in First Nations communities, with each being unique to the community and run by the community. Our vision is for community groups to take charge and implement these recommendations within their own communities (evidence level III, C [Table 2]).
- Traditional values, including traditional diets, activities and lifestyles, should be encouraged in an effort to prevent and/or control type 2 diabetes. Group activities, including those with elders, may be most effective (evidence level III, C).
- Breastfeeding is the most natural component of a traditional diet and should be encouraged as a proven method of reducing obesity in children (evidence level II-2, A).
- Daily physical activity for at least 60 min to 90 min, as outlined in Canada's Physical Activity Guide (27), is recommended for all children. Activities for endurance, flexibility and strength should be encouraged and one-third of the activity should be of moderate intensity (evidence level III, A).
- Schools, daycares and Head Start programs should implement incorporate at least 30 min of high-energy, daily physical activity for all students (evidence level III, C).

**TABLE 1**  
**Screening for type 2 diabetes**

The Canadian Paediatric Society suggests screening for type 2 diabetes by obtaining a blood sugar level in all children encountered during any health care visit who have the following risk factors:

All of the following:

- Aboriginal descent\*
- Body mass index  $\geq 85$  percentile expected for age
- Age  $\geq 10$  years old

And any one of the following:

- Sedentary lifestyle
- Children born to mothers who had gestational diabetes
- First- or second-degree relative<sup>†</sup> with type 2 diabetes
- Acanthosis nigricans
- Dyslipidemia
- Hypertension
- Polycystic ovarian syndrome

Suggested screening method

- Fasting blood glucose<sup>‡</sup> (a value  $>7.0$  mmol/L is diagnostic for type 2 diabetes)
- A random glucose is another option (a value  $>11.1$  mmol/L is diagnostic for type 2 diabetes)
- An oral glucose tolerance test may also be considered with a fasting and a 2 h post-glucose load blood glucose test

*\*The incidence of type 2 diabetes is also known to be higher among other ethnic groups (Hispanic, Asian, African American and Pacific Islander); <sup>†</sup>Includes immediate family members or an aunt, uncle or grandparent; <sup>‡</sup>There is currently no evidence to recommend hemoglobin A<sub>1c</sub> as a screening method*

- Schools, daycares and Head Start programs should incorporate programs that explain the need for healthy active living and healthy eating into their curriculums (evidence level III, C).
- Schools should be discouraged from selling candy or other sweets for fundraising purposes (evidence level III, C).
- A healthy diet based on Canada's Food Guide (28) which incorporates traditional diets is the desired nutritional goal. A food guide for northern Aboriginal communities has been developed (29) (evidence level III, A).
- All Aboriginal community leaders (including band councils, health care providers, teachers, etc) should provide ample access to safe physical activities within the communities. Examples include, but are not limited to, parks with safe recreation equipment, playfields, seasonal recreational sports leagues, after-school physical activities, nonsports-oriented physical activities, gymnasiums, arenas and safe paths to walk to school. School equipment and gymnasiums should be available after hours for community use (evidence level III, C).
- Community members must be active role models for the children (evidence level III, C).

**TABLE 2**  
**New grades for recommendations from the Canadian Task Force on Preventive Health Care for specific clinical preventive actions**

Level of evidence	Description
I	Evidence obtained from at least one properly randomized trial.
II-1	Evidence obtained from well-designed, controlled trial without randomization.
II-2	Evidence obtained from well-designed cohort or case-controlled analytical studies, preferably from more than one centre or research group.
II-3	Evidence obtained from comparisons between times and places, with or without the intervention. Dramatic results in uncontrolled experiments could also be included in this category.
III	Opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees.

#### Grades

A	There is good evidence to recommend the clinical preventive action.
B	There is fair evidence to recommend the clinical preventive action.
C	The existing evidence is conflicting and does not allow making a recommendation for or against the use of the clinical, preventive action; however, other factors may influence decision-making.
D	There is fair evidence to recommend against the clinical preventive action.
E	There is good evidence to recommend against the clinical preventive action.
I	There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making.

*The task force recognizes that in many cases, patient-specific factors must be considered and discussed, such as the value the patient places on the clinical preventive action, its possible positive and negative outcomes, and the context or personal circumstances of the patient (medical and other). In certain circumstances in which the evidence is complex, conflicting or insufficient, a more detailed discussion may be required. Data from reference 30*

- Local stores should be encouraged to stock healthy foods and to place high-caloried 'junk' food in less obvious locations in the store (ie, not at the check-out counter) (evidence level III, C).
- Passive activities such as watching television, playing video games and using the computer should be limited to a maximum of 1.5 h to 2 h per day (evidence level III, A).
- Health care providers working with First Nations populations must be aware of the possibility of type 2 diabetes in this special population of children and initiate opportunistic screening for type 2 diabetes as per Table 1 (evidence level III, B).

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The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate.