

Contents lists available at [ScienceDirect](#)

Canadian Journal of Diabetes

journal homepage:
www.canadianjournalofdiabetes.com

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Original Research

Dietary Patterns and Type 2 Diabetes Mellitus in a First Nations Community



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ARTICLE INFO

Article history:

Received 2 May 2016

Accepted 3 May 2016

Keywords:

indigenous
food patterns
type 2 diabetes mellitus
nutrition
First Nations

ABSTRACT

Background: Type 2 diabetes mellitus is a growing concern worldwide, particularly in Indigenous communities, which have undergone a marked nutrition transition characterized by reduced intakes of traditional foods and increased intakes of market foods. Few studies have assessed the relationships between differing dietary patterns and risk for type 2 diabetes in Indigenous communities in Canada. The objective of the study was to characterize dietary patterns using factor analysis (FA) and to relate these patterns to the incidence of type 2 diabetes after 10 years of follow up in a First Nations community in Ontario, Canada. **Methods:** We conducted a prospective analysis of 492 participants in the SLHDP who did not have diabetes at baseline (1993 to 1995) and were followed for 10 years. A food-frequency questionnaire was administered, and FA was used to identify patterns of food consumption. Multivariate logistic regression analyses determined associations of food patterns with incident type 2 diabetes, adjusting for sociodemographic and lifestyle confounders.

Results: At follow up, 86 participants had developed incident type 2 diabetes. FA revealed 3 prominent dietary patterns: Balanced Market Foods, Beef and Processed Foods and Traditional Foods. After adjustment for age, sex, waist circumference, interleukin-6 and adiponectin, the Beef and Processed Foods pattern was associated with increased risk for incident type 2 diabetes (OR=1.38; 95% CI 1.02, 1.86). In contrast, the Balanced Market Foods and Traditional Foods Patterns were not significantly associated with type 2 diabetes.

Conclusions: Dietary interventions should encourage reduced consumption of unhealthful market foods, in combination with improvements in local food environments so as to increase access to healthful foods and reduce food insecurity in Indigenous communities.

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R É S U M É

Introduction : Le diabète sucré de type 2 est une préoccupation croissante dans le monde entier, particulièrement dans les communautés autochtones, qui ont subi une transition alimentaire marquée caractérisée par la réduction de l'apport en aliments traditionnels et l'augmentation de l'apport en aliments du marché. Peu d'études ont évalué les associations entre les différents modèles de consommation alimentaire et le risque de diabète de type 2 chez les communautés autochtones du Canada. Définir les modèles de consommation alimentaire à l'aide de l'analyse factorielle (AF) et associer ces modèles à l'incidence du diabète de type 2 après 10 ans de suivi dans une communauté des Premières Nations de l'Ontario, au Canada.

Mots clés :

autochtone
modèles de consommation alimentaire
diabète sucré de type 2
alimentation
Premières Nations

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Méthodes : Nous avons réalisé une analyse prospective de 492 participants au Sandy Lake Health and Diabetes Project (SLHDP) qui n'étaient pas diabétiques au début (1993 à 1995) et qui avaient été suivis durant 10 ans. Nous avons fait remplir un questionnaire de fréquence alimentaire et avons utilisé l'AF pour définir les modèles de consommation alimentaire. Les analyses multivariées de régression logistique ont déterminé les associations de modèles de consommation alimentaire à l'incidence du diabète de type 2, à l'ajustement des facteurs confusionnels sociodémographiques et de la qualité de vie.

Résultats : Lors du suivi, 86 participants avaient développé un diabète de type 2. L'AF a révélé 3 modèles de consommation alimentaire importants : les aliments équilibrés du marché, la viande de bœuf et les aliments transformés, et les aliments traditionnels. Après l'ajustement selon l'âge, le sexe, le tour de taille, l'interleukine 6 et l'adiponectine, le modèle « Viande de bœuf et aliments transformés » a été associé à l'augmentation du risque d'incidence du diabète de type 2 (RIA=1,38; IC à 95 % 1,02, 1,86). En revanche, les modèles « Aliments équilibrés du marché » et « Aliments traditionnels » n'ont pas été associés de manière significative au diabète de type 2.

Conclusions : Les interventions sur le régime alimentaire en association avec l'amélioration de l'environnement alimentaire local devraient favoriser la réduction de la consommation des aliments malsains du marché de façon à augmenter l'accès aux aliments sains et de réduire l'insécurité alimentaire des communautés autochtones.

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Introduction

The global prevalence of type 2 diabetes mellitus is increasing rapidly (1), and the condition is of particular concern in Indigenous populations, including those in Canada (2–4). Although susceptibility genes may predispose specific population groups to an increased risk for type 2 diabetes (5), numerous metabolic (6) and lifestyle factors, such as diet (7), appear to mediate the risk for disease. In Indigenous Canadian populations, a dramatic lifestyle transition has occurred over the past century, from a physically active hunter-gatherer lifestyle to one that is more sedentary (8). These communities have also undergone a relatively recent and rapid nutrition transition, which has been characterized by a shift from a diet rich in wild meats, fish, roots and berries to a diet that is high in saturated and trans fats and simple carbohydrates and is low in fibre (10,11). In addition, this nutrition transition has been accompanied by an increase in food insecurity (11,12).

The majority of previous studies investigating the association between diet and type 2 diabetes have focused on single nutrients, foods and food components (12–14). Although this approach has generated vital knowledge, it is important to consider that foods are not consumed in isolation, and the effects of single foods on health outcomes are often modest. Furthermore, there are likely to be important interactions within and between foods and food groups, which makes examining the separate effects of individual foods difficult (15). As a result, there is increasing interest in assessing the impact of food patterns on health outcomes (12–14) because this approach may represent a more integrated analysis of food and nutrient consumption and may be more predictive of health outcomes (15).

Previous research has reported that individual foods and nutrients have been associated with increased risk for diabetes, obesity and insulin resistance in Indigenous communities in Canada (16,17). However, few studies have assessed the association between food patterns and health outcomes in this population (9,18,19), and none, to date, have used prospective designs. The purpose of this study was to characterize distinct food patterns by using factor analysis and to relate these patterns to incident type 2 diabetes after 10 years of follow up. It was hypothesized that patterns composed of traditional foods and energy-dense market foods would emerge, and that these patterns would have opposing effects on risk for type 2 diabetes at follow up.

Methods

The Sandy Lake Health and Diabetes Project (SLHDP) is a population-based prospective study designed to determine the

incidence of diabetes and its associated risk factors in an Indigenous Canadian population. The methodology has been described in detail in a previous publication (20). The study has been approved by the Sandy Lake First Nation Band Council and the University of Toronto Research Ethics Board. Briefly, at baseline (1993 to 1995), data were obtained from 728 (71.5%) of 1018 eligible residents aged 10 to 79 years (21). At follow up (2003 to 2005), 540 (89.1%) of 606 participants who were free of diabetes at baseline participated in follow-up assessments (20). Of the 540 participants contacted, data from 492 participants were used in this analysis as a result of exclusions due to death from cancer (n=6), pneumonia (n=5), liver cirrhosis (n=3), cardiovascular disease (n=2), brain tumour or aneurysm (n=2), suicide (n=2) and other causes, including accidents (n=7). Further, 9 subjects with diabetes were excluded at baseline as determined by 1999 World Health Organization diagnostic criteria for diabetes (22). In addition, participants who had missing baseline fasting and 2-hour postload glucose values (n=12) were excluded.

Baseline measurements

Data collected at baseline included dietary intake via a 34-item food frequency questionnaire (FFQ). For the FFQ, subjects were asked to recall their usual diet over the previous 3 months (21). The FFQ was developed using ethnographic interviews and was pilot-tested to ensure cultural appropriateness and acceptability (21). The instrument included both traditional foods, such as moose, rabbit and wild berries, as well as market foods, including meats, fruit, vegetables, baked goods and candy (21). Respondents selected a frequency of consumption of more than once per day, once per day, 3 to 6 times per week, 1 to 2 times per week, 1 to 3 times per month or rarely or never (9). For each item, respondents were asked whether their frequency of consumption varied by season (21).

Anthropometric data were collected in the morning during the baseline research centre visit (21). Measurements were made with participants in cotton examination gowns or light athletic clothing and no shoes (21). All measures were performed twice, and the average of the 2 measures was used for analyses. Height was measured to the nearest 0.1 cm using an Accustat wall-mounted stadiometer (Genentech, San Francisco, California, USA) with heels together and buttocks, back, shoulders and head touching the wall. Weight was measured to the nearest 0.1 kg using a standard hospital balance beam scale (Health-o-Meter, Bridgeview, Illinois, USA) (21). Body mass index (BMI) was calculated using weight (in kilograms) divided by squared height (in metres) as measures of obesity (21). Nonelastic measuring tapes were used to measure waist and hip circumferences to the nearest 0.5 cm (21). Waist circumferences (WCs) were measured at the natural waist (minimal circumference

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