Prevalence of diabetes mellitus among the James Bay Cree of northern Québec

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Objective: To determine the prevalence of diabetes mellitus among the James Bay Cree in northern Quebec.
Design: Chart survey of physician-diagnosed cases of diabetes. The biochemical criteria of the World Health Organization were used to confirm the diagnoses.
Setting: Eight James Bay Cree communities: six remote and two rural.
Subjects: All James Bay Cree with diabetes whose names were in a chronic disease registry or on a diabetes clinic list kept at each community clinic.
Outcome measures: Prevalence rates, both crude and standardized to the 1986 Canadian population, were estimated by sex, age group and type of diabetes.
Results: A total of 235 cases of diabetes were confirmed, for a crude prevalence of 2.7%. The age-standardized rate of non-insulin-dependent diabetes mellitus was 6.6% among people 20 years and over. The prevalence increased as the latitude decreased.
Conclusions: Our crude prevalence resembles that in similar native linguistic and cultural groups elsewhere in Canada. Diabetes is becoming an important disease in the Cree population of Quebec. A better understanding of the socioculturel changes in this population is necessary.

Objectif : Quantifier la prévalence du diabète sucré chez les Cris de la baie James, dans le Nord du Québec.
Conception : Examen des dossiers de cas de diabète diagnostiqués par les médecins. Les auteurs ont utilisé les critères biochimiques de l'Organisation mondiale de la santé pour confirmer les diagnostics.
Cadre : Huit collectivités Cris de la baie James, six éloignées et deux rurales.
Sujets : Tous les Cris de la baie James atteints de diabète et dont les noms étaient inscrits à un registre des maladies chroniques ou à la liste clinique des cas de diabète conservée dans chaque unité communautaire.
Mesures de résultat : Taux de prévalence, brut et normalisé par rapport à la population canadienne en 1986, établis comparativement selon le sexe, le groupe d'age et le type de diabète.
Résultats : Au total, 235 cas de diabète ont été confirmés, pour un taux brut de prévalence de 2,7 %. Le taux de diabète sucré non insulino-dépendant normalisé selon l'age était de 6,6 % chez les 20 ans et plus. Le taux de prévalence augmentait avec la diminution de la latitude.
Conclusions : Notre taux brut de prévalence se compare à des groupes linguistiques et culturels autochtones analogues ailleurs au Canada. Le diabète devient une maladie importante dans la population de Cris du Québec. Il est essentiel de mieux comprendre les changements socio-culturels dans cette population.

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The pattern of health and disease among native people in Canada has changed substantially since World War II. This seems to be the result of rapid social and cultural changes due to Euro-Canadian influences on traditional lifestyle.[1] Chronic diseases such as diabetes mellitus, hypertension, ischemic heart disease and stroke have become important and, along with injuries, are replacing infectious diseases as the main cause of illness and death. [2,3]

The published prevalence rates of diabetes in Canadian native populations vary widely and seem to fluctuate within and between linguistic and, cultural groups ac-cording to their geographic location.[4] From a traditional hunter-gatherer economy the Cree, like many other First Nations, have experienced tremendous social and cultural pressures over the last 20 years[2] through the influence of sedentary lifestyle and population aggregation, increased consumption of processed foods and increased opportunities for earning a living through wage labour.[1]

We undertook this study in response to growing concerns in the James Bay Cree communities of northern Quebec about the extent of diabetes, for which there were no data. We present a population-based profile of the prevalence of known diabetes in this population and compare our observations with those in other Canadian native populations.

Methods

Study population

The traditional way of life of the James Bay Cree falls into what anthropologists call the "subarctic" culture area of North American Indians, and the Cree language is part of the Algonquian language family.[5] As of January 1989 the population of Cree Indians who were beneficiaries of the James Bay and northern Quebec agreement[6] and lived in the territory was 8840. More than 52% of the population was less than 25 years old, as compared with 31% of the total population of Quebec.[7]

The eight Cree villages are located in the boreal forest on relatively flat land close to waterways (Fig. 1). They vary in population (from 384 inhabitants in Eastmain to 2419 in Chisasibi) and accessibility. The five coastal communities and the inland community of Nemaska are relatively isolated and could be defined as remote. Transportation in and out of these six communities is mostly by air, although Chisasibi and Nemaska are accessible by roads built for the James Bay hydroelectric project. The other inland communities, Mistissini and Waswanipi, lie further south and are easily accessible by road from towns such as Val d'Or and Chibougamau. These two communities can be considered rural. The definitions of remote and rural reflect the degree of access to large urban centres and indirectly provide a measure of change of lifestyle.[4]

Case finding

During July and August 1989 we obtained a list of physician-diagnosed cases of diabetes from the chronic disease registry and the diabetes clinic list kept at each community clinic for follow-up. Any potentially missing case was discussed and documented with the local nurses and interpreters. Clinical information was obtained from the patients' medical records.

The biochemical criteria of the World Health Organization (WHO) were used to confirm the diagnosis of diabetes.[8] Cases not meeting the criteria were excluded. Also excluded were cases defined as gestational diabetes, secondary diabetes or impaired glucose tolerance. Deceased patients identified because their names were still in a chronic disease registry were not included. Eligible subjects had to usually reside in one of the communities and be of Cree origin.

Diagnoses of insulin-dependent diabetes mellitus (IDDM) were accepted only if the following criteria were found: juvenile onset as noted by a primary physician, continual management with insulin and a history of either ketoacidosis or a labile glycemic response to insulin consistent with IDDM. The histocompatibility antigen (HLA) phenotype and the autoinsulin antibody titre were not determined for confirmation of the diagnosis.

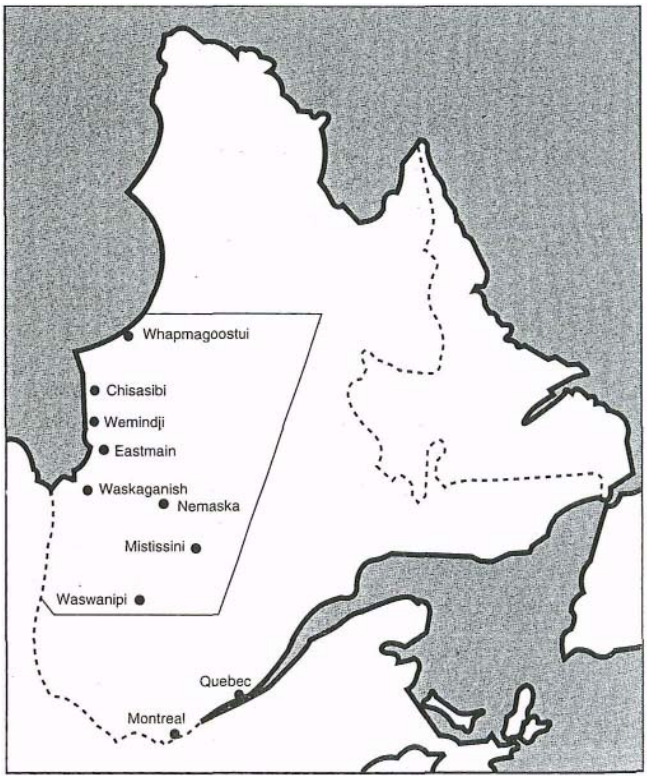

Fig. 1: Location of the eight James Bay Cree communities in northern Québec.

The principal investigator, with the help of a research assistant, collected data in each community. To minimize interobserver variation a clear operational definition of the inclusion and exclusion criteria as well as a standard procedure were used.

Prevalence was calculated for the entire James Bay Cree population. Because the age structure differs between native and non-native populations of Canada, we followed the direct method of age standardization using the 1986 Canadian population as a standard. A confidence interval (CI) was added to the obtained crude and age-standardized rates to demonstrate the relative instability of these rates owing to small numbers.[9]

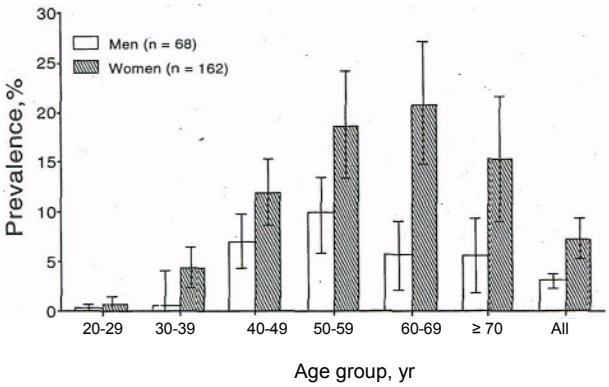

Fig. 2: Crude prevalence rates of non-insulin-dependent diabetes mellitus (NIDDM) in the James Bay Cree population aged 20 years and more in 1989. Vertical lines represent 95 % confidence intervals.

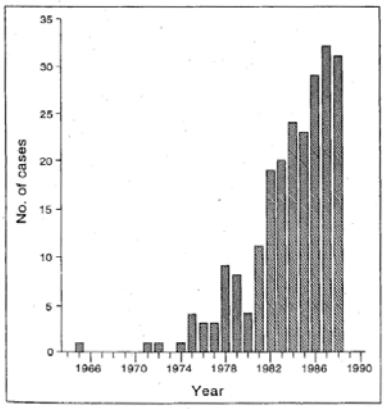

Fig. 3: Year of diagnosis.

Results

We found 235 cases of diabetes, for crude overall prevalence of 2.7% (95% CI 2.4% to 3.0%). Only five patients with IDDM (three men) were identified, for an overall prevalence of 0.06% (95% CI 0.01% to 0.10%). Three of the patients were less than 20 years old. The crude rates for non-insulin-dependent diabetes mellitus (NIDDM) were 5.2% (95% CI 4.5% to 5.9%) among people 20 years of age and over and 11.8% (95% CI 10.0% to 13.6%) among those 40 to 69 years. The rates were consistently higher among the women than among the men; the highest rate occurred among those aged 60 to 69 years and 50 to 59 years respectively (Fig. 2). More than 53% of the cases were diagnosed from 1984 to 1988 (Fig. 3). When standardized to the 1986 Canadian population the prevalence of NIDDM in the Cree population was 6.6% (95% CI 5.9% to 7.3%) among those 20 years and over.

A clear north-south gradient was observed. The rates of NIDDM varied from 1.9% in the nothernmost community to 9.0% in the southernmost (Fig. 4). The mean rate of NIDDM was significantly higher ($\chi^2 = 57.1$, $p < 0.001$) in the two rural communities than in the six remote communities (8.8% v. 3.4%). The female: male ratio for the eight communities combined was 2.4:1; for the rural and remote communities the ratios were 1.8:1 and 4.9:1 respectively.

Discussion

Within the last 40 years the prevalence of diabetes has increased steadily in many native populations in Canada and is now two to five times higher than the rate in the remaining Canadian population.[4,10,11] There is a general agreement that NIDDM, the most frequent form of diabetes, has a genetic basis, but environmental factors have also been recognized as important contributors to the increasing rate. Indeed, before the 1940s diabetes was rare in native populations. Then a sedentary lifestyle was adopted, accompanied by decreased physical activity, increased energy intake (especially in the form of carbohydrates) and high rates of obesity; all of these factors favoured the emergence of NIDDM.[1] Our findings are consistent with those from other studies in native populations of North America; this makes diabetes a truly continental phenomenon.[10-16]

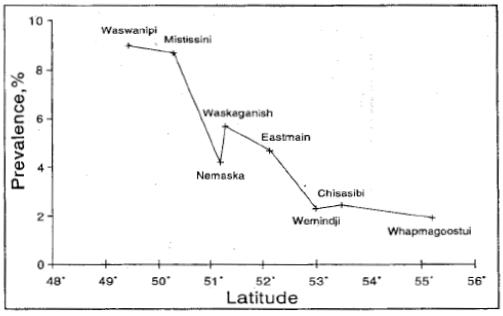

Fig. 4: Prevalence by latitude and community.

Fortunately IDDM is still infrequent in native populations;[13,17] it accounted for only 2% of the cases in our study. We believe that our classification of the IDDM cases was appropriate, although we did not determine the HLA phenotypes or the autoinsulin antibody titres to confirm the diagnosis. These cases may have been not truly insulin dependent but, rather, insulin using, since the differentiation between IDDM and NIDDM has been difficult in young natives.[18]

Studies in which the method of case finding for NIDDM was similar to ours revealed that for subjects of the same age the James Bay Cree had a rate of diabetes higher than that among the Aleuts, Indians and Inuit of Alaska[13] but similar to that among the Cree and Ojibwa of northern Ontario" and the Mohawks near Montréal.[12] Our results are almost identical to those in other native populations of Québec reported by Young and associates,[4] who used a federal chronic disease registry without case validation. Also, our crude prevalence rate was very close to the average rates reported for similar aboriginal linguistic and cultural groups elsewhere in Canada.[4]

Prevalence rates based on data from chronic disease registries most likely underestimate the true rates, because cases in the communities may not have come to medical attention. Our study was based on cases that had been diagnosed in a well-defined remote population. Our method of case selection had a high specificity, since the application of the WHO criteria to previously identified cases probably eliminated false-positive ones. Some surveys have suggested that for every known case of diabetes there is at least one undetected case.[19] The magnitude of the underestimation in the James Bay Cree population could be as high as 30%, since in other studies in Canadian native populations[14,15] mass screening yielded rates 25% to 30% higher than those obtained through chart diagnosis.

In the James Bay Cree population the prevalence of diabetes increased with age and then decreased around 60 years. This decrease has been observed in other Canadian native populations [11,15,20] and might reflect a survival effect; that is, an overrepresentation of people without diabetes in older groups because of their better health.[21] It could also reflect resistance to adopting Western lifestyle by the elders. Further, more than 53% of the cases of diabetes in our study were diagnosed from 1984 to 1988; this confirms previous observations in another northern native population" and indicates a probable high incidence. Our crude rate was higher than that from a 1982-84 study involving the Cree population in which blood samples were collected from a random sample of 20% of the people aged 15 years or more.[22] The estimated prevalence of NIDDM in that study was 2.9%. In comparison, our results support only the recent (1984-88) increase in NIDDM diagnosis. There were no changes in policy regarding screening for diabetes in the Cree population, although with increased awareness, testing has probably increased recently.

Our female: male ratios were consistent with those of Zimmet,[23] who reported that they were often as high as 3:1 in partly urbanized Pacific populations but approached 1 in the fully urbanized populations. West[24] pointed out that changes in the ratio can be explained by differences in the degree of obesity and the frequency of testing. It is generally accepted that both the degree and the duration of obesity increase the risk of diabetes.[25] In our study the women with diabetes were more obese than the men[26] and tended to visit the health care facilities more often. Indeed, women account for 72.5% of the recorded visits to the local health clinics to participate in community health programs devoted to chronic diseases.[7] These tendencies could explain some of the sex differences observed in our study.

A high prevalence of diabetes has been associated with urbanization in other high-risk populations.[27,28] Certain populations seem to harbour a genetic susceptibility to diabetes that is more likely to express itself when changes from traditional lifestyle occur. [29-31] We found that the prevalence clearly increased as the latitude decreased; to a certain degree this reflected alterations in traditional lifestyle. Young and associates[4] recently reported similar findings on a nationwide scale in native groups of different culture and language.

It is difficult to compare our findings with those from recent studies that used similar case-finding criteria in the general Canadian population, [10,32] because different age groups were used to express the rates. Nevertheless, the extent of diabetes is definitely increasing in the Cree population. Additional studies in this population may help in estimating the magnitude of the increase now that baseline rates are available. Prevalence data can be used to estimate the impact of diabetes on the community, to place this disease in perspective with other competing priorities and to determine the appropriate allocation of resources for diabetes. Furthermore, change in lifestyle seems to be an important factor, as shown by the north-south gradient and the rural-remote dichotomy. A better understanding of these sociocultural changes is vital for the James Bay Cree population.

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