Diabetes Among the Métis of Canada: Defining the Population, Estimating the Disease

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ABSTRACT

Little is known about the epidemiology of diabetes mellitus among the Métis in Canada because of the lack of a health information system specific to this population. The authors extracted information on diabetes prevalence among the Métis from 2 sources: 1) the Aboriginal Peoples Survey (APS); and 2) a dataset linking the Manitoba Diabetes Database (MDD) and a list of members of the Manitoba Métis Federation (MMF). The prevalence of diabetes among the Métis is higher than in all Canadians nationally or all Manitobans provincially, regardless of the method of estimation. The prevalence of diabetes in the Métis is comparable to that in the First Nations in most age and sex groups. Survey-based estimates tend to be lower than those derived from healthcare administrative databases. Diabetes is associated with poor health status, limitation of daily activities and significant comorbidities. Further research using administrative data and screening in Métis communities should be initiated to establish a more complete understanding of the epidemiology of diabetes among the Métis.

RÉSUMÉ

Nous sommes très peu renseignés sur l'épidémiologie du diabète sucré chez les Métis du Canada puisqu'il n'existe pas de système d'information sur la santé particulier pour cette population. Les auteurs ont tiré de deux sources de l'information au sujet de la prévalence du diabète chez les Métis: 1) l'enquête auprès des peuples autochtones et 2) un ensemble de données établissant un rapport entre la base de données sur le diabète du Manitoba et une liste de membres de la Fédération des Métis du Manitoba. La prévalence du diabète est plus élevée chez les Métis que chez les Canadiens et les Manitobains en général, quelle que soit la méthode d'évaluation. La prévalence du diabète chez les Métis est comparable à la prévalence du diabète chez les Premières Nations dans la plupart des groupes d'âge et chez les deux sexes. Les chiffres issus de l'enquête semblent inférieurs à ceux qui sont dérivés des bases de données administratives sur les soins de santé. Le diabète est associé à un piètre état de santé, à un faible niveau d'activité quotidienne et à de graves maladies concomitantes. D'autre recherche fondée sur des données administratives et le dépistage dans des communautés métisses doit être faite pour améliorer la compréhension de l'épidémiologie du diabète chez les Métis.

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INTRODUCTION

Type 2 diabetes mellitus is becoming an increasingly common chronic health condition throughout the world, and has reached epidemic proportions among some Canadian Aboriginal populations (1). However, the extent of the problem has not been well established in all Canadian Aboriginal groups. Very little is known about the prevalence and impact of diabetes among the Métis, one of Canada's 3 constitutionally recognized Aboriginal groups (Inuit and First Nations peoples form the other 2 groups). In this paper, the authors describe examples of initial attempts to estimate the burden of disease among this diverse population, explore the issues surrounding assessment of diabetes in a high-risk population that is not well defined, and discuss options for further research.

The Métis identity

The Métis emerged through intermarriage between North American Aboriginals and Europeans, primarily in relation to the fur trade. Although a distinct identity for the offspring of mixed ancestry did not develop in all geographic regions, a group distinguished by culture and lifestyle flourished in the Red River region (now Southern Manitoba, Canada) by the early 19th century. However, by the late 19th century, the lives of the Métis were irreversibly changed as a result of a changing economy and increased settlement of the Canadian West by European-Canadians. Conflicts with the Canadian government resulted in 2 major dispersions and a loss of their land base, economic opportunities and nationhood (2-4).

The contemporary Métis population is not clearly defined. The Métis National Council has described the Métis as (5): "a distinct indigenous nation with a history, culture and homeland in Western Canada, consisting specifically of the descendants of those who were dispossessed by Canadian government actions from 1870 on." Others believe the term should apply more broadly to include all those of mixed Aboriginal and European-Canadian ancestry, regardless of whether or not ancestry can be traced back to the western Métis Nation (6). As a result, some data sources used for health research will be more inclusive than others. For example, estimates of the number of Métis from Statistics Canada are based on self-ascribed ethnic identity in the Canadian Census. In contrast, membership lists (or registries) of Métis individuals in Canada are maintained by the provincial Métis organizations of Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Inclusion on these lists is based on ancestry, which is established through family history. Application for membership is made at the provincial level (7). It is possible that some individuals who self-identify as Métis during a national census may not be considered Métis by provincial Métis organizations and, consequently, by the Métis National Council.

The Métis population

The Métis are a diverse population who display wide variation in lifestyles and Aboriginal Canadian ancestry, both of which are risk factors for type 2 diabetes. In many respects, the Métis are more similar to First Nations populations than to the non-Aboriginal Canadian population. While the majority of self-identified Métis live in urban areas, 35% reside in rural areas, compared to 15% of the non-Aboriginal Canadian population and 48% of First Nations people (8). In fact, there are rural communities, especially in Manitoba, Saskatchewan and Alberta, that are composed primarily of Métis individuals and are locally identified as "Métis" communities. Some of these communities are situated close to, and often directly adjacent to, First Nations communities with which they share family histories. Similar to Canadian First Nations populations, the Métis are young: more than half (56%) are <25 years of age, compared to 35% of the non-Aboriginal Canadian population (8). Similar to First Nations populations, the Métis have lower levels of educational attainment and participation in the labour force than the non-Aboriginal Canadian population. Only 10% of Métis report completing high school, compared with 16% of the non-Aboriginal population, and while 70% of the non-Aboriginal population reported having a job in 1991, only 52% of the Métis did (8). The Métis also share with First Nations populations the characteristic of being economically disadvantaged. The average annual income from all sources reported by Métis in 1991 was less than half that reported for non-Aboriginal Canadians. In addition, one-third (33%) of Métis ≥15 years of age and 41% of children <15 years of age live with incomes below Canada's low-income cutoff, compared with 15% of the non-Aboriginal Canadian population ≥15 years of age and 17% of children <15 years of age (8).

Within Canada, 75% of self-identified Métis live in the 3 western provinces (Alberta, Saskatchewan and Manitoba). Smaller proportions of Métis live in other areas of the country, ranging from 9% in Ontario to <1% in the Yukon and Maritime provinces (8).

METHOD

The authors investigated 2 sources of information to derive estimates of the prevalence and impact of diabetes on the Métis: 1) the Aboriginal Peoples Survey (APS) (9); and 2) the Manitoba Diabetes Database (MDD) (10). In the APS, both Métis and diabetes status were based on self-report. The MDD contains records of physician visits and hospitalizations attributed to diabetes. Identification of Métis individuals in the database was achieved through linkage with a sample of the Manitoba Métis Federation (MMF) membership list (11). This research was approved by Research Ethics Boards at the University of Manitoba Faculty of Medicine and Faculty of Arts, Winnipeg, Manitoba, the MMF and Manitoba Health.

APS

The APS was conducted as a post-census survey by Statistics Canada in 1991 to provide comprehensive data on the lives of Aboriginal peoples in Canada. Individuals eligible for

inclusion in the APS were those who claimed Aboriginal ancestry in the 1991 Canadian General Census of the Population. The final APS sample consisted of those individuals identified in the 1991 census who also claimed to identify with an Aboriginal group and/or were registered under the Indian Act of Canada (9). APS participants were asked the following question to determine diabetes status: "Have you been told by a healthcare professional that you have diabetes?" Available responses were "yes" and "no." No distinction was made between type 1 and type 2 diabetes.

The APS has a multistaged, complex sampling design. A record weight was assigned by Statistics Canada to every record in the dataset to account for selection probability, nonresponse and noncoverage. In addition, the adult microdata file that is available to the public is a sample of the entire APS dataset to prevent breech of confidentiality in those communities with a large sampling fraction. The record weights were adjusted accordingly. In estimating the prevalence of diabetes, the weighted number of cases and populations were used.

Linked administrative databases

In Manitoba, virtually all residents are insured for hospital and physician services through 1 agency, the Manitoba Health Services Insurance Plan (MHSIP). The MHSIP databases include a population registry and databases of hospital separations and physician visits for almost all Manitoba residents. These databases have been maintained since 1970. The Epidemiology Unit of Manitoba Health has created an MDD that contains all physician claims and hospital separation records with the International Classification of Diseases,

Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic code 250. Longitudinal records for each individual are created using their personal health insurance number (PHIN) to link all physician claims and hospital abstracts. Individuals are considered to have received a diagnosis of diabetes if they had at least 2 separate physician claims for diabetes within 2 years of each other, or at least 1 hospital separation record with a diagnosis of diabetes. The method and its validation have been described in detail elsewhere (10).

A pilot study to derive estimates of selected health status indicators among the Métis in Manitoba was conducted by researchers at CancerCare Manitoba and Manitoba Health in collaboration with the MMF (11). The MMF provided CancerCare Manitoba and Manitoba Health with the full name, date of birth, sex and address of approximately 2500 individuals from their membership file. Almost 90% of this sample resided in 1 rural Regional Health Authority that has recognized Métis communities.

Using deterministic and probabilistic linkage techniques, the sample from the MMF membership list was linked to the MHSIP population registry. The registry contains dates of insurance coverage, family information and the PHINs (12,13). The linkage of the MMF membership list to the registry generated the PHINs for 87.4% of the sample, which allowed for extraction of information on healthcare utilization from the MDD. This linked MDD-MMF dataset was used to estimate the prevalence of diabetes (11). The Métis population accesses health services in the same manner as the general Manitoba population, thus the MDD algorithm to ascertain diabetes cases should perform equally as well among the Métis as in the general Manitoba population.

Figure 1. Prevalence of diabetes in the First Nations, Métis and Inuit populations of Canada, 1991
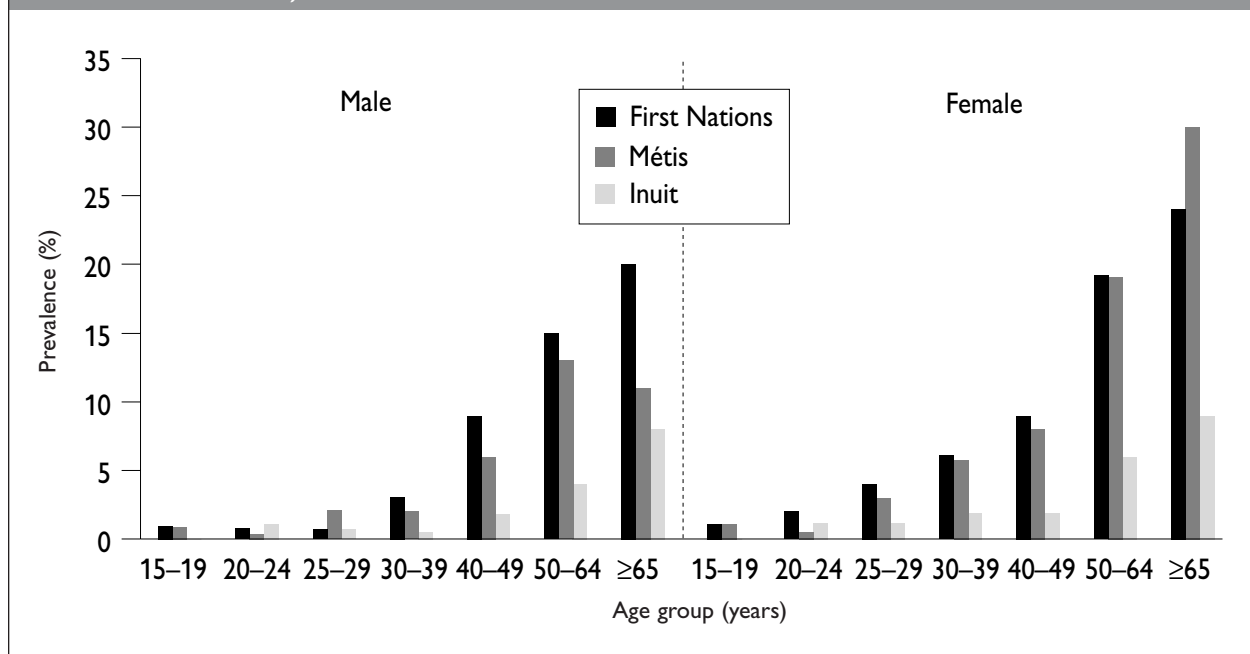
Data analysis

The authors compared the prevalence of diabetes among Métis, First Nations and Inuit in Canada, using data from the APS. For comparison, national data on Canadians were obtained from the General Social Survey (GSS) of 1991, which also contained questions on self-reported health (14). The GSS was chosen because both the GSS and APS were conducted during the same year. Self-reported diabetes status is also available from the various National Population Health Surveys conducted throughout the 1990s.

Because of the different age structures of Aboriginal and non-Aboriginal populations, direct standardization of prevalence rates was performed using, as the standard, the age distribution of the combined male and female Canadian population according to the 1991 census. For Métis in Manitoba, the authors also compared the prevalence estimates derived from the 2 sources of data: the APS and the linked MDD-MMF dataset.

To investigate factors associated with diabetes, the authors restricted the analysis to the aggregated data for the 3 western provinces from the APS. Logistic regression was used to identify independent predictors of diabetes status. The initial list of independent variables includes sex, age, physical activity, body mass index (BMI), income, employment, education, language and degree of Aboriginal ancestry. A new relative weight was created by dividing each record weight by the overall average weight, thus rescaling each record, resulting in a sample size that was equal to the number of participants in the survey, while preserving the distribution of the weighted data. Details of the analyses have been described elsewhere (15,16).

Métis with and without diabetes were compared in terms of their self-rated health status, activity limitations and the presence of comorbidities. Survey respondents rated their overall health on a 5-point Likert scale, ranging from "excellent" to "poor." A dichotomous variable was created by combining "excellent," "very good" and "good" responses as a measure of good health, and the "fair" and "poor" responses as a measure of poor health. Individuals were considered to have a mobility disability if they experienced difficulty walking 350 m without resting, walking up and down stairs, walking from room to room or standing for >20 minutes. Individuals who indicated that they were limited in the kind or amount of activity they could do at home, at work or elsewhere, because of a long-term physical condition or health problem (≥6 months) were considered to have illness-related activity limitations. Individuals who indicated that, because of their health condition, they needed help with everyday housework or personal care (washing, grooming, dressing, feeding) were considered to require assistance with activities of daily living (ADL). To assess the presence of comorbidities, such as high blood pressure (BP) or heart disease, participants were asked if they had ever been told by a healthcare professional that they had such health problems (9).

Table 1. Crude and age-standardized diabetes prevalence by population						
	Manitoba		*Canada*			
Population	**Métis**	**All Manitobans**	**Métis**	**First Nations**	**Inuit**	**All Canadians**
Data source	MDD-MMF	MDD	APS	APS	APS	GSS
Crude prevalence (%), age ≥15 years						
Male	7.9	5.9	4.2	5.1	1.4	3.5
Female	9.0	6.2	6.7	7.3	2.2	3.3
Age-standardized prevalence (%), age ≥15 years						
Male	9.2	5.7	5.9	8.0	2.4	3.7
Female	10.7	5.4	10.8	10.5	3.5	3.2
Crude prevalence (%), age ≥25 years						
Male	9.6	7.1	5.7	7.1	1.8	4.3
Female	10.5	7.2	9.3	9.7	3.0	4.0
Age-standardized prevalence (%), age ≥25 years						
Male	11.1	6.8	7.1	9.6	2.8	4.6
Female	12.6	6.4	13.0	12.4	4.0	3.9

APS = Aboriginal Peoples Survey
GSS = General Social Survey
MDD = Manitoba Diabetes Database
MMF = Manitoba Métis Federation

RESULTS

Prevalence and age-sex distribution

The age-sex-specific prevalence of self-reported diabetes among Métis, First Nations and Inuit in Canada, based on the APS are compared in Figure 1. The prevalence of diabetes increased with age and was significantly greater among females than males. The prevalence of diabetes in the Métis is comparable to, or lower than, the rate in the First Nations in most age-sex groups, with the exception of women ≥65 years of age.

The crude and age-standardized prevalence of diabetes of the 3 Aboriginal groups, as well as that of all Canadians, according to the GSS, are shown in Table 1. Due to the small number of cases under age 25 years, rates are presented in both the ≥15 and ≥25 years age ranges. The prevalence of diabetes among Métis was higher than in the non-Aboriginal Canadian population. This is especially true of women, where the age-standardized rate of diabetes in the Métis was >3 times higher than in the general Canadian population.

A similar pattern was observed according to the linked MDD-MMF dataset. The age-standardized rate of diabetes in the Métis was 1.6 times higher among men and 2.0 times higher among women than corresponding rates in the Manitoba population (Table 1).

The rate of diabetes in the Métis obtained from the APS was lower than that derived from the linked MDD-MMF dataset. Similarly, the survey-based prevalence for all Canadians (GSS) was lower than the rate for all Manitobans derived from healthcare databases (Table 1).

Factors associated with diabetes

Through logistic regression modelling, the factors found to be independently associated with diabetes among the Métis included sex, age, BMI and level of education (Table 2).

The risk of diabetes among the Métis was twice as high for females compared to males, with a sharp age gradient. An individual ≥50 years of age has an almost 13 times greater risk of having diabetes compared to those 15 to 24 years of age. Risk also increased 3-fold for those with BMI ≥30 kg/m^2 compared to those with BMI <30 kg/m^2. Finally, the risk for diabetes among those who had completed less than grade 9 was almost twice that of those who had completed at least grade 9.

Consequences of diabetes

The impact of diabetes and associated comorbidities on the daily lives of the Métis is profound. The crude prevalence of self-reported health status, activity limitations and comorbidities is presented in Figure 2. Métis with diabetes were significantly more likely to report their health status as poor, to have limitations in their daily activities and to report comorbidities compared to those without diabetes. The differences between those with and without diabetes in limitations to daily activities (i.e. mobility and activity limitations, and the need for assistance with ADL) remained even after control-

ling for the effects of age, sex, and other chronic conditions such as arthritis, high BP, heart disease and emphysema. In addition, after controlling for the effects of age, sex, participation in physical activity, BMI, education and income, the risk of having high BP was 3 times greater, and heart problems twice as great for those with diabetes compared to those who did not report having diabetes (high BP was controlled for in the regression model for heart problems).

DISCUSSION

Diabetes is a serious health problem for the Métis, as demonstrated in the present study using 2 different sources of data. The prevalence of diabetes among the Métis is generally similar to that reported for First Nations and was greater than in the non-Aboriginal Canadian population. Among the Métis, diabetes is not uniformly distributed across the population, but more frequently affects women, the elderly, the obese and the less educated. The disease has a negative impact on quality of life and is associated with significant comorbidity.

Each of the data sources has its limitations. Surveys such as the APS provide information on ethnic identity and disease status based entirely on self-report. Ethnic identity involves 2 important components: 1) self-identification; and 2) acceptance by a larger group. Because of the anonymous nature of the APS, it cannot be determined if those who self-identified as Métis would be accepted by the Métis Nation. In an attempt to capture members of the Métis Nation, the authors restricted some analyses to the 3 western provinces where

Table 2. Factors associated with diabetes among the Métis		
Risk factor	**Odds ratio***	**95% CI**
Sex		
Male	1.00	
Female	1.99	1.41, 2.80
Age group		
15–24	1.00	
25–49	4.20	2.98, 6.05
≥50	12.60	6.03, 26.4
BMI		
<30 kg/m^2	1.00	
≥30 kg/m^2	3.13	2.22, 4.41
Education		
≥Grade 9	1.00	
<Grade 9	1.81	1.26, 2.60

*Odds ratio adjusted for all other variables in model

BMI = body mass index
CI = confidence interval

75% of Métis reside and the history of the Métis Nation is heavily concentrated. Approximating the Métis Nation as closely as possible is desirable, considering this is the group of individuals for whom legal rights as Aboriginal peoples are being sought by official Métis organizations.

With respect to diabetes, prevalence estimates based on self-report or healthcare databases result in underestimation because only known cases are captured (17). In Manitoba, undiagnosed diabetes constitutes approximately one-third of all cases of diabetes (18). The diabetes prevalence estimates reported in this paper are likely underestimated. In addition, diabetes prevalence among the Métis derived from the MDD-MMF dataset was greater than that obtained from the APS. This may be due in part to the time periods of each study: prevalence estimates from the MDD-MMF dataset were for the time period of 1995 to 1997, while the APS estimates were from 1991. There are indications that the prevalence of diabetes among Aboriginal peoples has been increasing in Manitoba and elsewhere (1,19), possibly as a result of both increased surveillance and incidence.

Métis individuals with diabetes reported significant comorbidities and limitations to activities and mobility. The rates reported by APS respondents were similar to those reported by United States citizens in the National Health Interview Survey (NHIS) (20). However, surveys such as the APS and NHIS are based on previously diagnosed cases of diabetes and probably represent the most advanced cases. This may account for the high levels of comorbidities and limitations.

The APS is a cross-sectional study for which data on risk factors and disease status were measured at the same time.

Figure 2. Health status, disabilities and comorbidities among Métis with and without diabetes, western provinces, 1991

ADL = activities of daily living
BP = blood pressure

Inferences on causation cannot be drawn because the temporal sequence of events cannot be established. Notwithstanding these limitations, APS data confirmed associations between diabetes and risk factors, comorbidities and complications that have been established in other Aboriginal populations. This is an important finding because of the lack of previous research among the Métis. Métis organizations can use this information for education and advocacy purposes.

This study also demonstrated that linked administrative databases can be used to estimate the burden of diabetes among the Métis. Almost 90% of a sample of the MMF membership list was successfully linked to the provincial population registry. Linkage could have been improved if current addresses and PHINs had been available for all individuals in the sample. Administrative data have been used extensively in health services and epidemiologic research (21). Considerable effort has been devoted to determining their quality and accuracy (12). For chronic diseases such as diabetes, a high degree of concordance between cases identified through administrative data and health interview surveys has been demonstrated (22). The usefulness of different databases can be enhanced when they are linked electronically through some common identifiers such as a personal number. Considerable experience in linking the Manitoba Health databases has accumulated (23).

Future research among the Métis using the MDD will allow for estimation of incidence and prevalence of diabetes, and morbidity and mortality related to diabetes and its complications. In addition, regional variations can be explored, and through linkage with other databases, factors associated with higher diabetes burden and poor outcomes can be investigated. In addition to education and advocacy, the regional data generated from this form of research can be used in the development of local, culturally relevant primary and secondary prevention interventions.

Ultimately, the best way to measure the burden and impact of diabetes in Métis communities is through community-based screening, as recommended in the 1998 Clinical Practice Guidelines for the Management of Diabetes in Canada for Aboriginal communities (24). The benefit of a screening program is that individuals will learn if they have diabetes, so follow-up with primary care providers can be initiated. There is growing evidence that early detection and treatment of diabetes and related cardiovascular risk factors may prevent or delay progression of complications (25-30). Early detection accomplished through screening is therefore recognized as an important public health strategy, especially in populations at high risk for diabetes and its associated complications (24,31). Information derived through community-based screening can be used in the development of local, culturally appropriate interventions. In the urban setting, primary care practitioners should be aware that the Métis are at higher risk for diabetes than the general population, and screen on an individual basis in their practices.
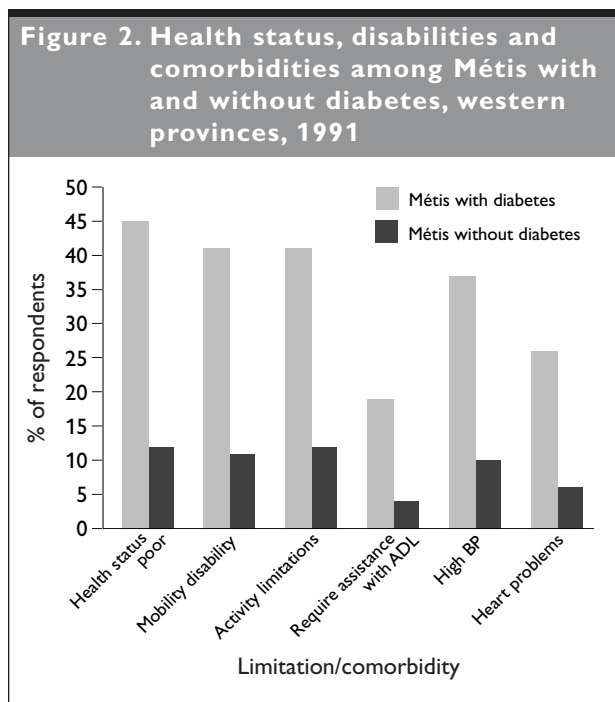
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