DIABETES MELLITUS IN THE FIRST NATIONS POPULATION OF BRITISH COLUMBIA, CANADA
Part 2. Hospital morbidity

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ABSTRACT

Objectives: To describe hospitalization rates from diabetes mellitus or its complications among residents of the province of British Columbia, Canada during the 5-year period 1993 to 1997, comparing people with Indian Status to rest of the population. ***Study design:*** A data base of all acute-care hospital discharges with diabetes mellitus anywhere among the discharge diagnoses was created. Case definitions of diabetes-related hospitalization were based on logical combinations of ICD-9 coded discharge diagnoses. Indirect standardization was used to adjust for age differences between the two populations. ***Results:*** Among persons aged 35 years or older, Status Indian males and pregnant females were twice as likely to be hospitalized for diabetes-related illness than other males or pregnant females. Status Indian non-pregnant females were three times as likely to be hospitalized as their non-Status Indian counterparts. Under age 35 years there was no difference in risk. Older First Nations women have a higher risk of diabetes during pregnancy but this analysis cannot distinguish gestational diabetes from pre-existing Type 2 diabetes. *(Int J Circumpolar Health 2002; 61: 254-259)*

Key words: Diabetes Mellitus (MeSH); Morbidity (MeSH); Hospitalization (MeSH); Indians, North American (MeSH); Canada, British Columbia (MeSH)

This study describes rates of acute care hospitalization from diabetes mellitus or its complications among residents of the province of British Columbia, Canada during the 5-year period from 1993 to 1997, comparing people with Indian Status to rest of the province's population.

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METHODS

From data extracts provided by the British Columbia Ministry of Health's Information and Analysis Branch, we created a database of all acute care hospital discharges occurring in British Columbia from January 1, 1993 to

December 31, 1997, inclusive, with at least one ICD-9 code of 250, 648.0, 775.0 or 775.1 anywhere among the discharge diagnoses. From this database, we tabulated numbers of diabetes-related discharges and person-days spent in hospital, in categories defined by gender, 5-year age group, pregnancy status, and Indian Status.

We defined a case of "diabetes-related" hospitalization to be a hospital discharge that met at least one of the following conditions (Table I):

(i) an ICD-9 code from List A was recorded as the diagno-

Table I. ICD-9 codes for diabetes, diabetes complications, and pregnancy.

List A: Diabetes mellitus	
250	diabetes mellitus (excludes 648.0 and 775.1)
648.0	diabetes mellitus, complicating pregnancy, childbirth or puerperium
775.1	neonatal diabetes mellitus
List B: Complications of diabetes mellitus	
251.0	hypoglycemic coma (iatrogenic hyperinsulinism, insulin coma)
354	mononeuritis of upper limb and mononeuritis multiplex
355	mononeuritis of lower limb
357	inflammatory and toxic neuropathy
357.2	polyneuropathy in diabetes
358.1	myasthenic syndromes in diseases classified elsewhere (includes diabetic amyotrophy)
362.0	diabetic retinopathy
366	cataract
410-414	ischemic heart disease
430-438	cerebrovascular disease
440	atherosclerosis
441	aortic aneurysm
442	other aneurysm
443	other peripheral vascular disease
581	nephrotic syndrome
582	chronic glomerulonephritis
583	nephritis and nephropathy, not specified as acute or chronic
585	chronic renal failure
586	renal failure, unspecified
775.0	maternal diabetes mellitus affecting fetus or newborn (with hypoglycemia)
785.4	gangrene
962.3	poisoning (includes overdose) by insulins and antidiabetic agents
E932.3	adverse effects in therapeutic use of insulins and antidiabetic agents
List C: Pregnancy	
630-676	complications of pregnancy, childbirth and the puerperium
V22	normal pregnancy
V23	supervision of high-risk pregnancy
V24	post partum care
V27	outcome of delivery
V28	antenatal screening
V61.6	illegitimate pregnancy
V61.7	other unwanted pregnancy

sis most responsible *for the hospitalization, or*

(ii) an ICD-9 code from List B was recorded as the diagnosis most responsible *for the hospitalization and an ICD-9 code from List A was anywhere else in the discharge record, or*

(iii) an ICD-9 code of 775.0 (maternal diabetes affecting the fetus or newborn) was anywhere in the discharge record, or

(iv) a pregnant woman with an ICD-9 code from List A anywhere in her discharge record.

We considered a woman to be "pregnant" if an ICD-9 code from List C appeared anywhere among the diagnoses in her discharge record.

We considered a person to be "Status Indian" if this was so recorded in his or her discharge record. This would have occurred if the person had been registered with the Medical Services Plan of British Columbia (the province's universal health insurance program) and was eligible to have his or her premiums paid by Health Canada on the grounds of having Indian status as defined by the Indian Act of Canada.

For each year in the 5-year period 1993-1997, we obtained counts (in gender and 5-year age categories) of the Status Indian population of British Columbia and the population of British Columbia who were not Status Indian from estimates previously published by the British Columbia Vital Statistics Agency.

To fairly compare hospitalization rates, we used indirect standardization to adjust for age and gender differences between the Status Indian population and the larger reference population (British Columbia residents who are not Status Indian). We calculated the Standardized Morbidity Ratio (SMR) and the corresponding 95% confidence interval (CI).

RESULTS

Table II shows numbers and crude (unadjusted) rates of diabetes-related acute-care among Status Indians and others in British Columbia. The diagnostic categories in Table 2 are not mutually exclusive. The vast majority of cases were clearly diabetes-related (i.e., diabetes mellitus as the most responsible diagnosis, or some form of atherosclerosis as the most responsible diagnosis with a co-diagnosis of diabetes mellitus.) For the rest of the analysis all diabetes-

Table II. Diabetes-related acute-care hospitalization in British Columbia, 1993-1997 by diagnostic category.

Most Responsible diagnosis	Discharges from hospital[c]				Person*weeks in hospital[c]			
	Status Indian		Other		Status Indian		Other	
	N	Rate[d]	N	Rate[d]	N	Rate[d]	N	Rate[d]
Diabetes mellitus (250 or 775.1)	927	164	16,920	93	933	165	22,169	122
Pregnancy[e] and diabetes mellitus[b]	69	12	1,190	7	51	9	924	5
Maternal diabetes affecting newborn (775.0)[a]	28	5	436	2	20	4	475	3
Hypoglycemia (251.0, 962.3 or E932.3)[b]	14	2	542	3	6	1	379	2
Neuropathy and amyotrophy (354, 355, 357, 357.2 or 358.1)[b]	4	1	124	1	1	0	142	1
Diabetic retinopathy (362.0)[b]	0	0	0	0	0	0	0	0
Cataract (366)[b]	20	4	520	3	7	1	125	1
ischemic heart disease (410-414)[b]	297	53	14,672	81	242	43	14,455	80
Cerebrovascular disease (430-438)[b]	156	28	5,801	32	393	70	14,327	79
Other atherosclerosis (440-443 or 785.4)[b]	22	4	1,384	8	40	7	2,925	16
Nephropathy (581-583, 585 or 586)[b]	32	6	565	3	59	10	939	5
Any of above	1,567	278	42,123	232	1,751	310	56,840	313

Note:

a) ICD-9 code 775.0 anywhere among discharge diagnoses is sufficient;
b) must also have ICD-9 code 250, 648.0 or 775.1 elsewhere among discharge diagnoses;
c) number during the 5-year period 1993-1997;
d) crude rate (i.e., number per 100,000 person* years, without adjustment);
e) a pregnancy code may appear anywhere among the discharge diagnoses;

related hospitalizations (as defined previously) are considered to be the same.

Fig.1 shows the age-specific rates of diabetes-related acute-care hospitalization by sex and Indian status. It can be seen that, between the ages of 35 and 80, the Indian

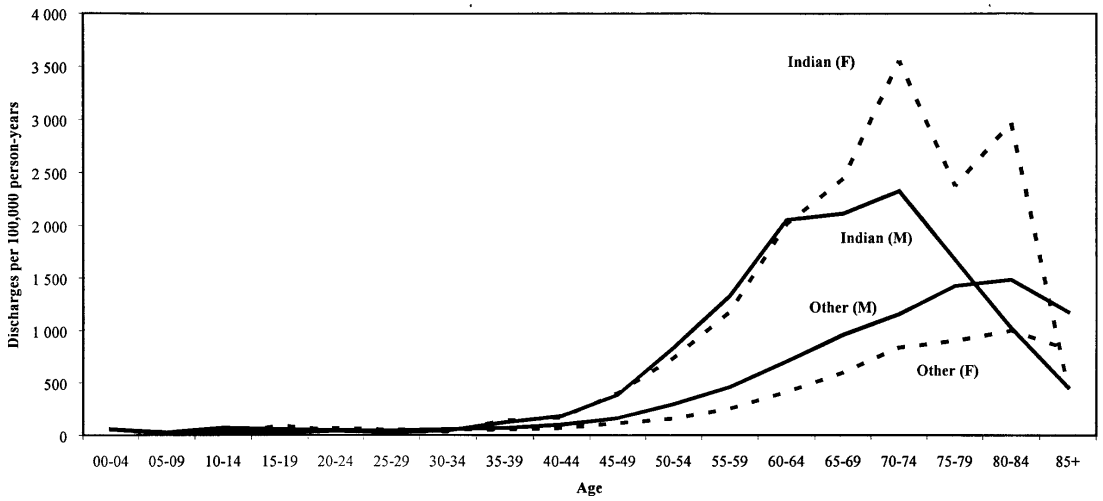

Fig. 1. Age-specific rates for diabetes-related hospitalization, British Columbia, 1993-1997 (F= female, M= male).

rates exceeded the non-Indian ones.

Status Indian men were almost twice as likely (SMR 1.7, 95% CI: 1.6 to 1.9) to be admitted to hospital for diabetes-related conditions than non-Indians. Considering only those aged 35 years or older, the SMR was 2.1 (95% CI: 1.9 to 2.3) for discharges, and 1.9 (95% CI: 1.7 to 2.1) for person-weeks in hospital. Status Indian men under 35 years of age were not at any higher risk than males of the same age who were not Status Indian.

For non-pregnant Status Indian women, the risk of being hospitalized for diabetes was 2.7 times (95% confidence interval 2.4 to 3.1) than non-Indian women. For those aged 35 years or older, the SMR was 3.6 (95%CI: 3.1 to 4.1) for discharges, and 2.9 (95%CI: 2.6 to 3.3) for person-weeks in hospital.

For pregnant women, there was no significant difference in age-adjusted diabetes-related hospitalization rates between Status Indian and non-Indian women (SMR: 0.8, 95% CI: 0.7 to 1.1). However, for women older than age 35 years, the SMR was 2.2 (95% CI: 1.2 to 10.8) for discharges, and 4.6 (95% CI: 2.1 to 19.3) for person-weeks in hospital.

DISCUSSION

The pattern of diabetes-related acute-care hospitalization among the Status Indian population of British Columbia, compared to the population of British Columbia who are not Status Indian, may be summarized as follows:

- Status Indian males aged 35 years or older are twice as likely to be hospitalized for diabetes-related illness as males of the same age who are not Status Indian,
- Status Indian non-pregnant females aged 35 years or older are three times as likely to be hospitalized for diabetes-related illness as non-pregnant females of the same age who are not Status Indian,
- Status Indian pregnant females aged 35 years or older are twice as likely to be hospitalized for diabetes-related illness than pregnant females of the same age who are not Status Indian (and they stay in hospital longer, too). Our database does not allow the distinction between gestational diabetes and pre-existing diabetes.
- Status Indian males, non-pregnant females and pregnant females under 35 years of age are no more likely to be hospitalized for diabetes-related illness than males, non-pregnant females and pregnant females of the same age who are not Status Indian.

The rate of hospitalization reflects both incidence of disease and health care factors affecting access to and use of hospital facilities. When considered in conjunction with our mortality analyses, this study on hospital morbidity further confirms the high risk for diabetes among Canadians of Aboriginal ancestry.

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