Migration and Diabetes in British Columbia and Quebec: Prevalence and Health Service Utilization

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ABSTRACT

Objectives: This study describes prevalence of diabetes among immigrants and health service utilization among diabetic immigrants in British Columbia (BC) and Quebec (QC).

Methods: Immigrants to BC and QC between 1985 and 1999 were identified. Using age-standardized rate ratios, they were compared with a matched comparison group with respect to their diabetes prevalence and, among those with diabetes, physician service utilization.

Results: Immigrant women in both provinces and men in BC had higher rates of diabetes compared to the matched comparison group. Rates varied by region of birth and language ability. Diabetes prevalence rate ratios increased with length of stay in BC. Diabetic immigrants had lower rates of physician visits than diabetic comparisons. This gap decreased commensurate with immigrants' length of stay in BC. Diabetic immigrants who spoke neither official language had similar or higher rates of physician visits compared with immigrants who spoke one or both official languages.

Conclusions: Genetic predisposition, lifestyle changes, acculturation, resettlement stress and differential health care access may explain increased prevalence of diabetes among many immigrants. These results can inform diabetes prevention and management programs tailored to the needs of specific immigrant groups. The gap in health service use between diabetic immigrants and comparisons does not appear to be related to language ability. Further studies are required to identify reasons.

Key words: Migration; diabetes mellitus; prevalence; co-morbidity; health services

La traduction du résumé se trouve à la fin de l'article.

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The number of people with type 2 diabetes is increasing and has become a global health priority. It is estimated that the prevalence of diabetes for all age groups worldwide will increase from 2.8% in 2000 to 4.4% in 2030.¹ Diabetes can lead to complications such as blindness, renal disease, cardiovascular diseases, amputations, and premature death. It is a significant economic burden in both developing and developed countries.²

Studies from several countries have shown that immigrants have higher rates of diabetes compared to residents in their host countries.³⁻⁵ The important contributory and interactive factors with regard to this phenomenon are genetic predisposition, changes in nutrition and lifestyle behaviours, stress related to migration and settlement, and greater acculturation and stronger integration within the host country.^{3,4,6} Furthermore, available literature suggests that immigrants experience more barriers to health care due to lack of culturally adapted programs, lack of provider awareness of cultural health preferences, and language barriers.⁷⁻⁹ These findings emphasize the need to identify those immigrant populations most vulnerable to diabetes and to better understand the gaps in health care access experienced by immigrants.

Immigrants account for a large and increasing proportion of the population in Canada. In recent years, approximately 250,000 immigrants arrived in Canada annually. In 2006, the proportion of Canada's population who were born outside the country reached its highest level in 75 years and represented approximately 20% of the total population.¹⁰ Research exploring diabetes prevalence and health service utilization among Canadian immigrants is limited.¹¹

BC and QC are two provinces that receive large numbers of immigrants. French is the dominant language in QC, thus attracting more immigrants with ability to speak this language. BC, where English is the dominant language, attracts far fewer French-speaking immigrants.

The present study examines the prevalence of diabetes among immigrants as well as physician service utilization by diabetics in the immigrant population in general, and in specific immigrant population subgroups in British Columbia (BC) and Quebec (QC). The objective is to identify excess diabetes risk and vulnerability in health service utilization among diabetic immigrants.

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METHOD

Data sources

The immigrant population of interest comprised all immigrants who landed in Canada between 1985 and 1999 and who indicated BC or QC as their intended destination province.

Immigration data were extracted from the Citizenship and Immigration Canada administrative data systems. This database contains information about age, sex, country of birth, date of landing, immigration category, and self-declared language ability at the time of application for immigration. Immigration data were then linked with health insurance databases in each province.

A comparison group of equal number was randomly selected from the unlinked portion of the provincial health insurance databases, and comprised either Canadian-born citizens or immigrants landing in Canada prior to 1985. Individuals were matched to the immigrant cohorts on age at landing, sex and region of residence. Data on health service utilization for immigrants and comparison group were then extracted from provincial health care administrative databases (physician claims and hospital discharge databases). These were used to obtain follow-up information from 1994 to 1999 for each cohort. A description of the data has been published in a report of the National Diabetes Surveillance System (NDSS).¹²

The NDSS methodology was adapted to detect probable cases of diabetes using physician claims and hospital discharge data.¹² All physician and hospitalization records with an ICD-9 diagnosis code of "250" were identified. The NDSS algorithm for identifying those with diabetes requires either 1) one diagnosis of diabetes on a hospital discharge record, or 2) one diagnosis of diabetes on a physician billing record with an additional physician billing or a hospital discharge citing diabetes within a two-year period. Any diabetic diagnoses recorded between 120 days before and 90 days after a gestational event (ICD-9 code 650.0-669.9) were deleted to eliminate transitory gestational diabetes cases. Those under the age of 20 are not included in this study because the case definition has not been validated for this age range according to the NDSS report.¹³

Prospective immigrants with diabetes would likely be denied entry to Canada if their disease status would in all probability require health and/or social services with anticipated costs that would exceed the average Canadian per capita health and social services costs, or would add to existing waiting lists. The legislation permitted assessment exemptions for defined members of the family class and refugees.¹⁴

Canada's landed immigrants comprise primarily three categories: Economic, Family class and Refugees. Immigrants who applied as economic immigrant class are called primary applicants of immigration in this study.

The co-morbidity status of diabetic patients could affect their health service utilization. Diabetic immigrants might have different rates of co-morbidity from diabetic comparisons for various reasons, such as screening during immigration application and differences in health care access. To address this issue, stratified analyses were performed among people with and without co-morbidity. The co-morbidities associated with diabetes included acute amputation, ischemic heart disease, heart failure, hypertension, renal disease, and stroke. Diabetic patients with one or more of these co-morbidities were classified as having co-morbidity. The information about co-morbidity was obtained from the administrative data-

Table 1. The Characteristics of Immigrant Population in British Columbia and Quebec, 1999

	British Columbia		Quebec	
	n	%	n	%
Sex				
Male	132,445	48.1	146,205	50.7
Female	143,072	51.9	141,900	49.3
Age group				
20-44	172,746	62.7	208,085	72.2
45-64	73,623	26.7	60,768	21.1
≥65	29,148	10.6	19,252	6.7
Language				
English	146,274	53.2	68,832	23.9
French	932	0.3	72,509	25.2
Bilingual	3702	1.3	49,686	17.2
Neither official language	124,609	45.2	97,078	33.7
Education (years)				
0-9	69,811	25.3	80,996	28.1
10-12	72,403	26.3	71,231	24.7
Non-university	47,467	17.2	52,530	18.2
University	85,836	31.2	83,348	28.9
WHO Region				
African Region	7144	2.6	23,822	8.3
Americas	17,391	6.3	63,087	22.0
Eastern Mediterranean	13,362	4.9	64,219	22.4
European	35,119	12.8	68,401	23.8
S-E Asia	45,809	16.6	22,028	7.7
Western Pacific	156,388	56.8	45,463	15.8
Immigration Category				
Refugee abroad	14,113	5.1	24,686	8.6
Refugee in Canada	5351	1.9	34,135	11.8
Non-R* sponsored spouse/fiancé	53,813	19.5	60,612	21.0
Non-R parents and grandparents	54,192	19.7	28,008	9.7
Non-R family others	5421	2.0	8398	2.9
Non-R economic component†	125,612	45.6	127,611	44.3
Non-R other	17,015	6.2	4655	1.6
Immigration period				
1985-1988	33,988	12.3	60,403	21.0
1989-1992	65,428	23.8	107,456	37.3
1993-1996	109,666	39.8	74,117	25.7
1997-1999	66,435	24.1	46,129	16.0

* Non-R stands for non-refugee.

† Economic component: refers to economic class immigrants.

Figure 1. Age-standardized diabetes prevalence rate ratios among immigrants by WHO region of origin, 1999

* Statistically significant at $p < 0.05$.

Comparison group: Canadian-born citizens or immigrants arriving in Canada prior to 1985.

bases. Physician service use was compared between diabetic immigrants and comparisons with and without co-morbidity.

Statistical analyses

Age-standardized sex-specific rates of diabetes and physician service utilization were calculated for the comparisons and for the

Table 2. Age-standardized Diabetes Rates and Rate Ratios for Immigrants and Comparisons in 1999

	British Columbia			Quebec		
	Prevalence		RR (immig/ comp)*	Prevalence		RR (immig/ comp)
	Immigrants	Comparison Group		Immigrants	Comparison Group	
Female	5.1	3.9	1.3	4.2	3.6	1.1
Male	5.5	5.1	1.1	3.9	4.4	0.9
			1.3-1.4			1.1-1.2
			1.0-1.1			0.8-0.9

* immig/comp=immigrants/comparisons

Table 3. Selected Highest and Lowest Significant Prevalence Rate Ratios of Diabetes by Country of Birth, 1999

Country of Birth	British Columbia		Quebec	
	Female	Male	Female	Male
Bangladesh			2.35	2.23
Cambodia	1.98		1.59	
El Salvador	1.75		1.75	
Fiji	4.37	3.62		
Guatemala			1.80	
Guyana			1.82	1.58
Haiti			2.23	
India	1.90	1.70		
Jamaica	2.09		2.12	
Malaysia	1.73			
Nicaragua	2.44			
Pakistan	1.96	2.00	1.98	1.50
Philippines	1.65	1.20		
Sri Lanka		2.66	1.98	1.82
Trinidad & Tobago	2.25		1.87	2.25
Turkey	2.30			
Bulgaria			0.43↓	0.37↓
Czechoslovakia		0.07↓		
England	0.55↓	0.56↓	0.09↓	
France			0.47↓	0.55↓
Federal Republic of Germany	0.53↓	0.52↓		
Poland	0.58↓	0.60↓	0.41↓	0.42↓
Russia			0.33↓	0.13↓
Republic of South Africa	0.63↓	0.60↓	0.09↓	
Taiwan		0.80↓		0.30↓

Only those with all age groups represented. Source countries with less than 1,000 immigrants a year were excluded for stable estimation. Table includes only results that are statistically significant at $p < 0.05$.

immigrants by World Health Organization region¹⁵ of birth, country of birth, length of time in Canada, and language ability upon arrival. Age-standardized rate ratios of diabetes and health service utilization were used to compare rates between immigrants and comparisons.¹⁶ Statistical Analysis Software (SAS) 9.1 was used for the analysis.

RESULTS

Characteristics of the study population

Demographic characteristics of the study population in BC and QC are shown in Table 1. The majority of immigrants included in this study were between the ages of 20 and 45 years. About 45% of immigrants in BC and 34% of immigrants in QC spoke neither official language at the time of immigration. Immigrants to BC came mostly from the Western Pacific region (56%) and South-East Asia (16%) while immigrants to QC came primarily from Europe (24%), the Eastern Mediterranean (22%) and the Americas (22%). Immigrants to BC were most likely to arrive under the categories of economic component (45%), non-refugee parents and grandparents (20%), and non-refugee sponsored spouse/fiancé (19%). However, in QC, immigrants were most likely to arrive under the categories of economic class (44%), sponsored spouse/fiancé (21%), and refugees who applied within Canada (12%). Overall, more refugees came to QC than to BC and more non-refugee parents and grandparents came to BC than to QC.

Diabetes prevalence overall and by WHO region

Immigrant women had higher rates of diabetes compared to the comparison women in both BC (RR 1.3, 95% CI 1.3-1.4) and QC (RR 1.1, 95% CI 1.1-1.2). Immigrant men in QC had a lower rate of diabetes than the comparison group (Table 2). Compared with matched Canadians, both men and women from the South-East Asian region (RR women: 1.8, RR men: 1.7) and women from the Eastern Mediterranean Region (RR women: 1.4) showed the highest rates of diabetes in BC. In QC, women from the Americas had the highest rate ratio of diabetes (RR: 1.7) followed by women and men from South-East Asia (RR women: 1.5, RR men: 1.4). Consistently lower rates of diabetes were seen in both men and women from the European Region in both BC and QC (Figure 1). Immigrants from the African Region had similar or higher prevalence of diabetes relative to comparisons. At the country level, the highest prevalence rate ratios were found among immigrants from selected countries in the Americas (e.g., Nicaragua, Jamaica, and Republic of Trinidad and Tobago), Southeast Asia (e.g., India, Bangladesh, and Sri Lanka), East Mediterranean (e.g., Pakistan) and West Pacific (e.g., Fiji, Cambodia, and Malaysia). The lowest prevalence rate ratios were identified for immigrants from countries in Europe (e.g., Bulgaria, England, France, Germany, Russia), South Africa (Republic of South Africa) and West Pacific (Taiwan). For easy presentation, some selected highest and lowest rate ratios of diabetes among immigrants were displayed in Table 3.

Figure 2. Age-standardized diabetes prevalence rate ratios by language ability, 1999

Comparison group: Canadian-born citizens or immigrants arriving in Canada prior to 1985.

* Statistically significant at $p < 0.05$.

Diabetes prevalence and health service use by official language ability

Immigrants who spoke neither official language upon arrival had higher diabetes prevalence rates than the comparisons in BC. In QC, diabetes prevalence was higher among immigrant women who did not speak an official language compared to the comparison group (RR 1.3, 95% CI 1.2-1.4). In both BC and QC, the rate ratios of physician visits for those with diabetes were significantly lower among immigrants than comparisons regardless of their language ability and co-morbidity status. Immigrants who speak neither official language had equal or slightly higher rate ratios of physician visits than immigrants with one or both official languages (Figures 2 and 3).

Diabetes prevalence and health service use by length of time in Canada

In BC, the diabetes prevalence rate ratios increased with length of time in Canada for both men and women. Higher rate ratios were found among immigrant women who had lived in Canada for more than 3 years and for immigrant men who had lived in Canada for more than 5 years (Figure 4). Among those with diabetes, the rate ratios of physician visits increased with increasing years in Canada. However, the rates of physician visits were significantly lower among diabetic immigrants than among the diabetic comparisons in all groups except men who had no co-morbidity and had lived in Canada for 9 years or longer. In QC, immigrant women in Canada for more than 1 year had similar or higher diabetes prevalence rates relative to the comparison group. Low prevalence rate ratios were observed among immigrant men except those who had lived in Canada between 7 and 9 years, for which group the rates were similar. The rate ratios of physician visits were significantly lower among diabetic immigrants as compared with diabetic comparisons in all length-of-stay groups. There is no trend of increasing physician visits with prolonged stay in QC (Figure 5).

DISCUSSION

With the exception of men in QC, immigrants had higher prevalence rate ratios of diabetes in both BC and QC. The results support the findings from previous studies.^{3,5,11} Genetic predisposition, lifestyle changes, acculturation, resettlement stress and differential

Figure 3. Age-standardized physician visit rate ratios for those with diabetes by language ability and co-morbidity, 1999

Comparison group: Canadian-born citizens or immigrants arriving in Canada prior to 1985.

Statistical significance ($p < 0.05$) found in all categories regardless of language ability and co-morbidity status.

health care access may at least partially explain increased prevalence of diabetes among many immigrants.^{3,4,6-9} The low prevalence rate ratio of diabetes among immigrant men in QC may be explained by higher proportion of immigrants from Europe and lower proportion of immigrants from South-East Asia in QC.^{3,11}

The rates of diabetes were found to be higher among immigrant women relative to comparison women. Diabetes subsequent to gestational diabetes may partially explain the higher rates. Maternal and fetal undernutrition may increase gestational diabetes for immigrant women from countries with a long history of poor nutrition. Maternal insulin resistance during pregnancy may protect against fetal malnutrition by pushing available calories toward the fetus. The result of such a tendency could contribute to the high rate of diabetes among women later in life.¹⁷

High diabetes prevalence rate ratios were found among immigrant women from the Eastern Mediterranean Region in BC and men and women from the South-East Asian Region in both provinces. These results are consistent with reports of diabetes prevalence in the WHO Regions from which they came.^{18,19} Genetic predisposition and health behaviour change after immigration could contribute to higher rate of diabetes among these immigrants.^{20,21} These results can inform diabetes prevention and management programs tailored to the needs of specific immigrant groups. These could include screening programs and community-based educational programs to help to reduce the burden of diabetes among immigrants.

Immigrants from the African Region experience equivalent or higher rates of diabetes relative to comparisons. The African Region reported much lower prevalence of diabetes than the American Region in a previous study.¹⁹ The increased prevalence of diabetes among African immigrants may be related to lifestyle change, nutrition, and acculturation. Further studies are required to explore the reasons.

Except for immigrant men in QC, immigrants who speak neither official language had higher prevalence rate ratios of diabetes than immigrants able to speak one or both official languages. The healthy immigrant effect may partially explain the results as immigrants with official language ability are more likely to be primary

Figure 4. Age-standardized immigrant diabetes prevalence rate ratios by length of stay in Canada, 1999

Comparison group: Canadian-born citizens or immigrants arriving in Canada prior to 1985.

* Statistically significant at $p < 0.05$.

LOS: length of stay in Canada.

Figure 5. Age-standardized physician visit rate ratio for immigrants with diabetes by length of stay in Canada and co-morbidity, 1999

Comparison group: Canadian-born citizens or immigrants arriving in Canada prior to 1985.

* Statistical significance ($p < 0.05$) for all categories except male with co-morbidity and stayed in British Columbia for more than 9 years.

LOS: length of stay in Canada.

applicants of immigration. The health status of primary applicants could be better than their spouse or family members as a result of self-selection and more restrictions on immigration based on health.²² Difference in country of origin and associated language skill among immigrants is another possible explanation. Similar or higher numbers of physician visits were found among diabetic immigrants who speak neither official language relative to other diabetic immigrants, though these were lower relative to comparisons. Immigrants who do not speak either official language may have benefitted from community support such that language did not emerge as a major barrier for physician service utilization. Other barriers for health care access among immigrants with diabetes need to be explored.

Diabetes prevalence rate ratios increase with length of stay in Canada in both BC and QC, however, the trend is more pronounced in BC. More immigrants to BC came from the South-East Asian and Western Pacific Regions. Ethnic differences, greater adaptation to Western lifestyle, and higher susceptibility to diabetes risks after lifestyle change among different ethnicities, and differences in health care provision may account for the trend observed in BC. An

increase of low-risk population and/or decrease of high-risk population among immigrants from the later years under study in BC is another possible explanation.

With few exceptions, the rate ratios of physician visits were significantly lower among diabetic immigrants as compared to their Canadian counterparts in both BC and QC, regardless of their length of time in Canada and co-morbidity status. Greater barriers and/or culture differences in health care access could contribute to the low service use among diabetic immigrants. The situation improved with length of stay in BC but generally a gap remained even after 9 years of immigration. No improvement can be seen with length of stay in Canada among diabetic immigrants in QC. Further studies are required to explore the reasons.

The present study has a few limitations. First, there is no differentiation between type 1 and type 2 diabetes in this study due to lack of availability of data on this. However, type 1 diabetes represents only a small proportion of all diabetes. Second, the estimation of prevalence rate ratios using administrative data will miss some undiagnosed diabetes and those who seek treatment outside the mainstream health care system in the study populations. Given the difference in health service utilization between immigrants and comparison group, the prevalence of diabetes among immigrants could be underestimated. Third, the available data do not allow us to identify early immigrants in the comparison group. Differences between immigrant and comparison groups may be underestimated by the inclusion of early immigrants (pre-1985) in the comparison group. Finally, the demographic information included in the analysis was acquired at the time of immigration application; some of this information is subject to change after immigration, such as language ability.

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RÉSUMÉ

Objectifs : Notre étude décrit la prévalence du diabète dans la population immigrante et l'utilisation des services de santé par les immigrants diabétiques en Colombie-Britannique (C.-B.) et au Québec (Qc).

Méthode : Nous avons répertorié les personnes ayant immigré en C.-B. et au Qc entre 1985 et 1999. À l'aide de rapports de taux standardisés selon l'âge, nous les avons comparées à un groupe témoin apparié en ce qui a trait à la prévalence du diabète et, chez les personnes diabétiques, à l'utilisation des services médicaux.

Résultats : Les femmes immigrantes (dans les deux provinces) et les hommes immigrants (en C.-B.) présentaient des taux de diabète supérieurs à ceux du groupe témoin apparié. Les taux variaient selon la région de naissance et la maîtrise de la langue. Le rapport des taux de prévalence du diabète augmentait avec la durée du séjour en C.-B. Les immigrants diabétiques présentaient des taux de visites chez le médecin inférieurs à ceux des personnes diabétiques du groupe témoin. L'écart diminuait en proportion de la durée du séjour des immigrants en C.-B. Les immigrants diabétiques qui ne parlaient aucune des deux langues officielles présentaient des taux de visites chez le médecin semblables ou supérieurs à ceux des immigrants qui parlaient au moins une langue officielle.

Conclusion : La prédisposition génétique, les changements d'habitudes de vie, l'acculturation, le stress de la réinstallation et l'écart dans l'accès aux soins de santé pourraient expliquer la prévalence accrue du diabète chez de nombreux immigrants. Nos résultats pourraient étayer des programmes de prévention et de prise en charge du diabète adaptés aux besoins de certains groupes d'immigrants. L'écart dans l'utilisation des services de santé entre les immigrants diabétiques et le groupe témoin ne semble pas lié à la maîtrise de la langue. D'autres études seraient nécessaires pour expliquer cet écart.

Mots clés : migration; diabète sucré; prévalence; comorbidité; services de santé