

CONTRIBUTIONS TO CHRONIC DISEASE PREVENTION AND CONTROL: STUDIES AMONG THE KIVALLIQ INUIT SINCE 1990

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INTRODUCTION

During 1990-91 a population-based health survey of 8 Inuit communities in the Keewatin region of the Northwest Territories, Canada (now the Kivalliq region of Nunavut) was undertaken by scientists of the Northern Health Research Unit of the University of Manitoba, in collaboration with the Keewatin Regional Health Board (Co-principal investigators: Michael Moffatt, John O'Neil and Kue Young). While the overall objective of the Keewatin Health Assessment Study (KHAS) was to provide a comprehensive assessment of the current health status and health service needs of the population, a particular focus of the study was on the burden and risk factors of the chronic, non-communicable diseases, particularly ischemic heart disease, stroke, diabetes, and hypertension. The Inuit population of Nunavut, similar to their kins elsewhere in the circumpolar North, are undergoing rapid sociocultural changes. The emergence of these health problems can serve as "markers" of the health transition, and understanding their causes and consequences in the population is prerequisite to the planning of intervention programs to prevent and control their occurrence.

The Kivalliq Study was conducted in close collaboration with scientists of the Siberian Branch of the then USSR Academy of Medical Sciences, who were conducting a similar survey among the Chukchi and Inuit of the Chukotka Autonomous Region on the western shores of the Bering Sea. For comparison with a population with predominantly European origins, data from the Manitoba Heart Health Survey, completed at about the same time and using a comparable methodology, were used.

In this paper, I shall review what has been learned regarding the epidemiology and genetics of chronic diseases among the Kivalliq Inuit from the rich data that were collected.

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DESIGN AND METHODS

Details of the KHAS have previously been published in this journal (1). The survey was preceded by a complete census of the 8 communities, which enumerated 1146 households with 5666 inhabitants of all ages. From this list a 20% random sample was selected. The overall response rate among those invited to participate was 77%. Although both children and adults were surveyed, only data pertaining to adults aged 18 and over (n=434) are presented in this paper. The survey comprised an interviewer-administered questionnaire, clinical examination, and laboratory tests. The field data collection took place during 1990-91. In addition to the health survey, a review was also undertaken of existing statistical databases on mortality and hospitalizations and selected disease registries.

The study was approved by the ethics review board of the University of Manitoba Faculty of Medicine. Informed consent was obtained from all participants. After the completion of the survey, a 2-day workshop was held to provide preliminary results to members of the Keewatin Regional Health Board and to discuss their implications for health services planning. Summary reports were prepared in non-technical language and amply illustrated by graphs with both English and Inuktitut captions.

Cardiovascular Mortality and Morbidity

In our original study, we compared the age-standardized mortality rates for cardiovascular diseases of the three major ethnic groups in the Northwest Territories from 1978 to 1986 (2). Among men, the rates for both Inuit and Indians were approximately 60% of the non-Aboriginal rate in the NWT and the all-Canada rate. Among women, the Indian rate was the highest, and approached parity with the Canadian rate, whereas the Inuit rate was only 75%. The low Inuit mortality was corroborated by the age-adjusted hospitalization rate for cardiovascular diseases in the Kivalliq region, which was 0.54 among men and 0.73 among women, relative to Canada as a whole.

In the 1990s, ethnospecific data were not generally available in the NWT. However, Statistics Canada does release data according to health regions, and in Canada, the Nunavut Territory and the Nunavik region of Québec are inhabited predominantly by Inuit, who constitute some 85% and 95% of the population of these regions. For all car-

diovascular diseases, the age-standardized mortality rate in these two Inuit regions did not differ significantly from the Canadian national rate. However, the mortality risk for ischemic heart disease was decreased, whereas that for stroke was increased among the Inuit. As has been pointed out, statistics derived from death certificates among residents of remote Arctic communities need to be treated with caution (3).

Prevalence of Diagnosed Diabetes

We also investigated registry data for diagnosed diabetes (4). Within northern Canada, Inuit in the NWT had a lower age-standardized prevalence than Indians in the NWT and Yukon, lower than that among Canadians in general, and far lower than rates reported from First Nations in southern Canada (5).

In the KHAS we also obtained fasting blood samples for plasma glucose from 123 individuals. Among these, 5 were cases of previously diagnosed diabetes and 1 had newly detected diabetes with fasting plasma ≥ 7.0 mmol/L. The combined prevalence of diabetes was thus 4.8%.

Prevalence of Hypertension

The KHAS included blood pressure measurement. When defined as diastolic blood pressure equal to or exceeding 90 mm mercury or currently under treatment, the prevalence of hypertension was lower among Kivalliq Inuit than the people of Manitoba, with the exception of young men aged 25-44, where the Inuit prevalence was higher (2).

When compared with other Inuit populations in Greenland, Nunavik and Alaska, there is considerable variation, with Kivalliq reporting the highest mean systolic blood pressure. The Inuit as a whole have low systolic BP compared with most European populations but higher than in several Asian populations and Amazonian Indians, based on data from the INTERSALT Study (6).

Prevalence of Obesity and Pattern of Fat Distribution

Judging by body mass index (BMI) and two skinfold thicknesses, obesity among the Inuit is as prevalent as it is in Manitoba. This appears to be a new development compared to historical data. Obesity is more prevalent among women, among whom there is also a higher degree of central fat patterning based on the waist-to-hip ratio. When different categories of obesity are compared, blood pressure and one or

more of the plasma lipids show an increasing trend but glucose or insulin level shows no significant change. Even where a relationship exists, as with TG and HDL cholesterol levels, the magnitude of the response is lowest among the Inuit compared to other populations (7).

The social and behavioural determinants of obesity also show an interesting pattern among Inuit. In general Inuit men tend to show the pattern observed in developing societies, where obesity is more prevalent among those with higher socioeconomic status, whereas Inuit women are more characteristic of developed societies, where obesity is associated with a lower SES. The different sex roles in a rapidly modernizing population is likely to be responsible for this phenomenon (8).

Plasma Lipids

The age-sex-specific mean total and low-density-lipoprotein (LDL) cholesterol levels among Kivalliq Inuit either do not differ significantly from the Canadian national population, or, in the case of younger Inuit women, are higher than in Canadians (9). This represents a temporal change from the results of earlier studies, such as the Nutrition Canada Survey of the mid 1970s. However, the Inuit still enjoyed lower levels of triglycerides (TG) and higher levels of high-density-lipoprotein (HDL) cholesterol than observed in Canada, with the exception of younger Inuit women whose mean TG levels are not significantly different from those of Canadians. The proportion of individuals with a TG level greater than or equal to 2.3 mmol/L (defined as high risk) is quite low among the Inuit – 2% in men and 6% in women, compared to 20% among Canadian men and 11% among Canadian women.

Plasma Fatty Acids and Diet

Pioneering studies among the Inuit in Greenland by Dyerberg, Bang and colleagues in the 1970s stimulated worldwide interests in the association between dietary and plasma fatty acids with the risk of ischemic heart disease. In the KHAS plasma samples were analysed for phospholipids fatty acid composition. Compared to non-Inuit, the Inuit have reduced levels of dihomo-gamma-linoleic (DGLA) and arachidonic acid (ratios of 0.41 and 0.46) and the sum of all n-6 fatty acids (ratio of 0.65), but increased level of eicosapentaenoic (EPA) acid (ratio of 1.37). These trends are consistent with those reported from other circumpolar Inuit populations, especially the reduce arachidonic acid and increased EPA, although the Inuit excess in EPA is much less

pronounced due to the greater importance of caribou rather than sea mammals in most of the Kivalliq communities (10).

Plasma fatty acids reflect dietary intake. Although no detailed dietary assessment was included in the KHAS, an abbreviated food frequency questionnaire was administered. Meat is still a major component of the diet and more than half of the population eats meat obtained from the land on a daily basis. Local fish (mostly arctic char) also makes up a high proportion of the protein intake, and about 50% of the people eat it at least weekly. Sea mammals (seal and walrus) are not available in all communities, and less than 20% are able to get it more than once a week. There is a clear difference in the food consumption pattern, with the older age groups more likely to consume a more "traditional" diet (11).

Metabolic Syndrome

The clustering of cardiovascular risk factors such as obesity, glucose intolerance, dyslipidemia and hypertension in the same individuals is a well recognized phenomenon, and increasingly they are considered to constitute a distinct metabolic syndrome, perhaps unified under insulin resistance as the primary defect. In a merged dataset of Inuit, Amerindians and non-Aboriginal Canadians from central Canada, factor analysis of 10 anthropometric and metabolic variables yielded three uncorrelated factors – an "obesity" factor, a "blood pressure" factor, and a "lipid/glucose factor". Factor scores generated by the procedure differ according to ethnic group, with Amerindians having the highest scores for all three factors, while the Inuit had the lowest obesity scores and did not differ from non-Aboriginal people with regard to the other two factors (12).

Genetic Susceptibility

The genetics of atherosclerosis is complex, involving many genes which also interact with environmental determinants. A variety of candidate genes have been shown to be associated with atherosclerosis and its intermediate traits (such as plasma lipids). The cardiovascular genetics laboratory of Robert Hegele at the Robarts Research Institute of London, Ontario, Canada undertook a series of analyses of the Kivalliq samples (13-20). The picture that emerges is not clear cut in terms of whether the Inuit were genetically at higher or lower risk of atherosclerosis. Of 15 alleles examined, comparing with Canadians of

European descent, 5 were significantly less prevalent among the Inuit, 5 were more frequent, with another 5 not significantly different. (A summary table is provided in (3)).

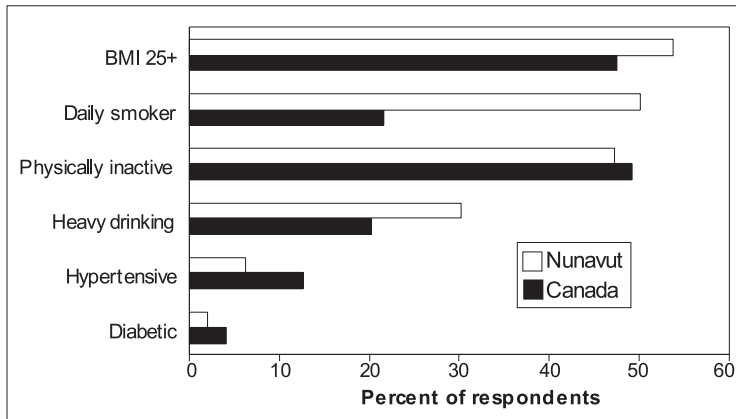


Figure 1. Prevalence of selected cardiovascular risk factors from the Canadian Community Health Survey 2000/2001: Nunavut and Canada.

A Decade Later

In 2000/2001 the Canadian Community Health Survey was conducted across Canada. It was solely an interview survey with no clinical examination or blood tests. Figure 1 provides an update of several cardiovascular risk factors, comparing the whole of Nunavut with all Canadians. As with the Kivalliq Survey done a decade earlier, the Inuit still enjoy some advantages (lower level of diabetes and hypertension) and disadvantages (higher level of smoking, obesity, and alcohol drinking). The pattern of health and disease among the Inuit is rapidly evolving, as the traditional lifestyle becomes further eroded. There is an urgent need to monitor such changes over time. An Inuit Health in Transition Study, a long-term, prospective cohort study to be conducted in Inuit communities across the circumpolar north from Greenland to Alaska, is currently under active consideration. When implemented, it will not only provide important clues to the etiology of the chronic diseases, but also provide the data needed to design effective strategies to prevent and control the emergence of these health problems.

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