Assessment of supplement use (including vitamin D) in Inuvialuit adults in the Northwest Territories, Canada

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Abstract

Background: Inuvialuit of Arctic Canada are at high risk for inadequate vitamin D status as a result of rapid dietary transitions and a lack of solar ultraviolet B exposure. This may have implications for the development of adverse skeletal diseases, cardiovascular diseases and cancers. Data are limited regarding supplement use in Arctic Aboriginal populations. The present study aimed to describe the type and extent of supplement use, emphasising vitamin D, and to identify differences between supplement users and non-users.

Methods: Supplement information was collected from a population-specific quantitative food frequency questionnaire in three communities in the Northwest Territories, Canada, as part of a cross-sectional study. Data were analysed for frequency of supplementation and types of supplements. Users and non-users were compared in terms of age, sex, body mass index, education, marital status, income support, employment and chronic disease diagnosis using nonparametric tests and the chi-squared test.

Results: Response rates ranged from 65% to 85%. Included in the analysis were 192 Inuvialuit (45 males, 147 females) with a mean (SD) age of 43.6 (13.9) years. Twenty-three percent reported using a supplement, with multivitamins being the most common. Three percent indicated taking a vitamin D-containing supplement. No significant differences between supplement users and non-users were found.

Conclusions: Despite limited sun exposure for many months of the year, a small proportion of Inuvialuit adults were using supplements, and specifically vitamin D-containing supplements. Future population-based intervention strategies should promote consumption of vitamin D rich foods and encourage the use of vitamin D supplements if diet alone is unable to meet recommendations.

Introduction

In recent years, vitamin D has emerged as a key nutrient in the development and treatment of nonskeletal diseases, including diabetes, cancer and cardiovascular disease (Plum & DeLuca, 2010). In high latitude nations such as Canada, a high proportion of the population have inadequate vitamin D status throughout the winter and spring (Greene-Finestone et al., 2011). Arctic Aboriginal populations (Inuit, Inuvialuit, First Nations and Métis) (Indian & Northern Affairs Canada, 2000) are at an even higher risk for vitamin D deficiency than the general Canadian population because of recent dietary transitions (Kuhnlein et al., 2004; Sharma, 2010), limited solar ultraviolet B exposure (Webb et al., 1988; Huotari & Herzig, 2008; Sharma et al., 2011), darker skin pigmentation (Holick, 2004; Greene-Finestone et al., 2011) and a high prevalence of obesity (Leslie et al., 2007; Sharma et al., 2011).
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Inuvialuit peoples are indigenous to the Northwest Territories (NT) of Canada at latitude 69°N. Recently, Inuvialuit have been undergoing a dietary transition characterised by an increased intake of processed foods high in refined carbohydrates, fats and salt, and a lower intake of nutrient dense traditional foods (Kuhnlein & Receveur, 2007; Sharma et al., 2007; Erber et al., 2010a; Sharma, 2010). Consequently, chronic diseases associated with diet change are increasing in this population (Sharma, 2010).

It has been estimated that nutrient dense traditional foods comprise 28% of daily energy intake of Inuvialuit (Kuhnlein et al., 2004). A significantly higher mean intake of vitamin D has been shown on days with traditional versus nontraditional food consumption (approximately 23 and 9 μg day⁻¹, respectively) (Kuhnlein et al., 2004; Kuhnlein & Receveur, 2007). The mean intake of vitamin D from food among Inuvialuit adults has shown to be below the Dietary Reference Intake of 15 μg day⁻¹, ranging from 3.0 to 7.7 μg day⁻¹ (Erber et al., 2010b) and 1.9–6.4 μg day⁻¹ (Sharma et al., 2009). With a limited ability to synthesise vitamin D year round and an inadequate intake from food, supplementation may be needed (Huotari & Herzig, 2008; Sharma et al., 2011).

General supplementation (Hoggatt et al., 2002; Troppmann et al., 2002; Foote et al., 2003; Fennell, 2004; Berti et al., 2008; Robson et al., 2008; Guo et al., 2009; Poliquin et al., 2009; Greene-Finestone et al., 2011; Whiting et al., 2011) and characteristics of supplement users (Hoggatt et al., 2002; Troppmann et al., 2002; Foote et al., 2003; Fennell, 2004; Robson et al., 2008; Guo et al., 2009; Vatanparast et al., 2010) have been investigated within Canada and the USA in various adult populations. However, these findings have limited applicability to the Inuvialuit population, which is undergoing rapid dietary and lifestyle changes, in the context of a unique geography and culture.

The present study aimed to describe the type and extent of vitamin and mineral supplement use, with an emphasis on vitamin D, among Inuvialuit adults from three communities in the NT, Canada. Furthermore, our objective was to characterise supplement users and identify whether age, sex, body mass index (BMI), education, marital status, income support, employment and chronic disease diagnosis differ among supplement users and nonusers.

Materials and methods

The sample was derived from participants of the Healthy Foods North nutrition and lifestyle intervention programme, as described previously (Sharma, 2010). Briefly, three Inuvialuit communities located in the NT were assessed in a cross-sectional study as part of a baseline data collection for Healthy Foods North from July 2007 to 2008. Community populations ranged from 400 to 3500 people, with approximately 40–90% self-identifying as Inuvialuit.

Participants were aged ≥ 19 years and excluded pregnant and breastfeeding women. Communities were small and houses were in close proximity to each other. Potential households were first randomly selected from each corner of the community and the community centre using up-to-date government housing maps. Household proximity to food stores was then taken into account so that households both near and far from food stores were included in the study. Every other household was then selected and the main food shopper and preparer in the household was targeted for data collection. Interviews were conducted mainly in English, with local translators being available. All participants provided their written informed consent.

Supplement information was collected as part of a population-specific quantitative food frequency questionnaire, which was developed (Sharma et al., 2009) and validated (Pakseresht & Sharma, 2010) for use within the Inuvialuit population using a pre-established method (Sharma, 2011). Supplement users were defined as those answering ‘yes’ to supplement use within the past 30 days. Supplement type was described. Height and weight were measured in duplicate by trained staff. BMI (kg m⁻²) was calculated and participants were classified in accordance with World Health Organization BMI categories (World Health Organization, 2000). An interviewer-administered Adult Impact Questionnaire was used to collect data on education level, marriage status, income support, employment and chronic disease diagnosis. Response rates for questionnaires ranged from 65% to 85% and varied by community.

Ethical approval was obtained from the Office of Human Research Ethics at the University of North Carolina at Chapel Hill. A research licence was granted by the Aurora Research Institute (Inuvik, NT, Canada).

The Mann–Whitney test was used to compare characteristics of supplement users and non-users. The chi-squared test was used to compare BMI categories, sex, education level, marital status, income support, employment status and chronic disease diagnosis among users and non-users. P < 0.05 was considered statistically significant. All statistical analysis was performed using spss, version 18 (SPSS Inc., Chicago, IL, USA).

Results

A total of 45 Inuvialuit males and 147 females participated in the present study. The mean (SD) age of the study population was 43.6 (13.9) years. Most participants were overweight (65%) and obese (45%) (Table 1). Twenty-three percent of participants reported using one or more
nutrient supplements in the past 30 days. Three percent of all participants indicated taking a vitamin D-containing supplement and 20% reported using supplements other than vitamin D (Fig. 1). Eleven different types of supplements were reported, with multivitamins being the most common supplement (39%), followed by vitamin C and iron (24% and 8%, respectively) (Fig. 2). Vitamin D-containing supplements accounted for 10% of supplements used. There were no significant differences between the characteristics of users and non-users (Table 2).

Discussion

The present study describes supplement use in Inuvialuit of Arctic Canada, with a specific emphasis on vitamin D. The majority of Inuvialuit were not taking supplements and even fewer were taking supplemental vitamin D. Moreover, there were no significant differences in age, sex, BMI, education, marital status, income support, employment and chronic disease diagnosis between supplement users and non-users.

Forty percent of Canadians (excluding the NT and Nunavut) in the Canadian Community Health Survey cycle 2.2 took supplements compared to 23% of Inuvialuit adults in the present study (Guo et al., 2009). The lower supplement use in Arctic Canada may be attributed to the accessibility and cost of supplements, cultural acceptability of supplement use, lower socio-economic status compared to the rest of Canada, and limited nutrition education and media influence encouraging the use of nutrient-specific supplements.

In the present study, there was no information collected on the vitamin D content of multivitamin supplements. However, Health Canada’s Licensed Natural Health Products Database showed that 264 products in
Canada are listed as multivitamins, of which 245 contained (on average) 10 μg of vitamin D, whereas sole vitamin D supplements contain either 10 or 25 μg (Health Canada, 2011). Thus, all people taking any type of supplement were categorised as ‘users’. This method is not unique to the present study and has been used by other groups (Guo et al., 2009; Vatanparast et al., 2010).

Three percent of participants reported taking a vitamin D-containing supplement. This is in contrast to data from the Canadian Health Measures Survey (2007–2009), which reported that 31% of Canadians used at least one vitamin D-containing supplement in the past month (Whiting et al., 2011). The survey represented approximately 96% of the Canadian population and included a data collection site in Yellowknife, NT. However, there was no comparison between vitamin D supplement users in the different regions or by Aboriginal status.

The present study shows that a small number of this sample of Inuvialuit took supplements and very few were taking vitamin D specifically. Overall, there is limited research on the use of vitamin D supplements in Canada and, more specifically, among adult Arctic Aboriginal populations, who may be at higher risk for vitamin D

| Table 2 Characteristics of adult Inuvialuit supplement users and nonsupplement users in the Northwest Territories, Canada |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Characteristic                  | Supplement users (n = 45) | Nonsupplement users (n = 147) | P-value |
| Age (years)                     | Mean ± SD | Median (range) | Mean ± SD | Median (range) | 0.14 |
| BMI (kg m⁻²)                    | 41.3 ± 14.4 | 41 (21–84) | 44.3 ± 13.7 | 43 (19–83) | 0.96 |
| Sex                             | 7 (15.6) | 38 (25.9) | 0.15 |
| BMI                             | 30.3 ± 8.9 | 28.6 (19.6–59.8) | 30.1 ± 8.5 | 27.8 (17.4–57.1) |
| Education*                      |          |          |          |          |          |
| Underweight (<18.5 kg m⁻²)      | 0 (0.0) | 3 (2.0) | 0.80 |
| Normal weight (18.5–24.9 kg m⁻²) | 15 (33.3) | 49 (33.3) |          |          |          |
| Overweight (≥ 25.0 kg m⁻²)      | 10 (22.2) | 29 (19.7) |          |          |          |
| Obese (≥ 30.0 kg m⁻²)           | 20 (44.4) | 66 (44.9) |          |          |          |
| % of household on income support‡ |          |          |          |          |          |
| 0                               | 33 (75.0) | 97 (66.0) | 0.28 |
| 1–50                            | 9 (20.5) | 31 (21.1) |          |          |          |
| >50                             | 2 (4.5) | 19 (12.9) |          |          |          |
| % of household working§         |          |          |          |          |          |
| 0                               | 11 (25.0) | 41 (27.9) | 0.93 |
| 1–50                            | 23 (52.3) | 75 (51.0) |          |          |          |
| >50                             | 10 (22.7) | 31 (21.1) |          |          |          |
| Chronic disease§                |          |          |          |          | 0.24 |
| Yes                             | 18 (40.0) | 45 (30.6) |          |          |          |
| No                              | 27 (60.0) | 102 (69.4) |          |          |          |

Differences between age and BMI tested using Mann-Whitney test. Sex, BMI category, education, marital status, income, employment and chronic disease differences tested using chi-squared test.

*Junior high = none, some elementary school, elementary school completed, some junior high school; ≤ High school = junior high school completed, some high school, high school completed; Post-secondary = some college or trade school, college or trade school completed, some university, university completed.

†Yes = married, common law; No = never married, separated, divorced, widowed.

‡Information missing for one participant; n = 191.

§Yes = doctor/nurse diagnosed chronic disease, has at least one of following: heart attack/disease, hypertension, cancer, diabetes.
inadequacy. Information from the present study can be used to promote evidence-based, population-specific public health interventions among Arctic Aboriginal populations encouraging the consumption of traditional dietary sources of vitamin D, such as fatty fish, and nontraditional sources, such as fortified orange juice. Additionally, there may be a need for vitamin D supplements if diet alone is unable to meet nutrient recommendations.

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Conflict of interests, source of funding and authorship

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SKK was responsible for data analysis and interpretation, as well as manuscript write-up. NM and JLB were responsible for data analysis and interpretation, as well as manuscript editing. AC was responsible for the study conception and manuscript editing. TMH was responsible for data analysis and interpretation, as well as manuscript write-up. SS was responsible for manuscript editing. Richards, J.B. & Goltzman, D. (2011) 25-Hydroxyvitamin D in Canadian adults: biological, environmental, and behavioral correlates. Osteoporos. Int. 22, 1389–1399.


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