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Similarities and differences in cardiometabolic risk factors among remote Aboriginal Australian and Canadian cohorts

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ABSTRACT

Aim: Indigenous populations of Australia and Canada experience disproportionately high rates of chronic disease. We hypothesized that despite the common outcome of increased diabetes prevalence, differences in cardiometabolic risk profile may exist between these populations.

Methods: We compared community-based data on cardiometabolic risks in Aboriginal Australians ($n = 297$ without, 45 with diabetes), and Aboriginal Canadians ($n = 409$ without, 87 with diabetes).

Results: Despite strikingly lower weight (62 vs 83 kg, $p < 0.0001$) and body mass index (BMI, 22 vs 29 kg/m^2, $p < 0.0001$), Aboriginal Australians without diabetes had similar waist–hip ratio (WHR, 0.91 vs 0.91, $p = 0.732$), lower HDL-cholesterol (0.97 vs 1.25 mmol/L, $p < 0.0001$) and higher HbA1c (5.4 vs 5.2%, $p < 0.0001$) than Aboriginal Canadians without diabetes. Waist was the obesity measure most strongly related to diabetes or cardiometabolic risk in Australians while BMI performed similarly to other obesity measures only in Canadians. Multiple regression of HbA1c revealed age and fasting glucose as independent predictors in each study group, with the addition of WHR in Aboriginal Australians.

Conclusion: The notable finding was that waist or WHR are preferred obesity measures to appropriately reflect cardiometabolic risk in Aboriginal Australians, who although leaner by BMI criteria, displayed a similarly adverse risk profile to Aboriginal Canadians. Waist or WHR should be routinely included in clinical assessment in these high-risk populations.

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1. Introduction

Indigenous populations of Australia and Canada experience similarly higher rates of chronic diseases (such as diabetes, renal and cardiovascular disease (CVD)) than non-Indigenous Australians and Canadians, with similar age of onset and premature mortality related to chronic diseases [1–5]. Aboriginal Australians from the Northern Territory have an adult life expectancy 14 years less than that of the non-Indigenous Australian population, with approximately 80% of the mortality gap attributable to non-communicable diseases (primarily CVD, followed by endocrine, nutritional and metabolic diseases) [1]. Age-specific diabetes prevalence among Indigenous populations is higher from a younger age and increases until age 50–60 years, then either plateaus [6,7] or declines [8–10]. The higher prevalence of conditions such as diabetes and CVD is most striking among the younger age groups of Indigenous Australians and Canadians [8,11]. Similar to Aboriginal Australians, Aboriginal Canadians have significantly higher rates of CVD, diabetes and risk factors for these conditions, than non-Aboriginal Canadians [2,3,6,8]. Chronic diseases are the greatest contributor to premature mortality for Metis, non-Status and Status Indians in Canada [12,13].

Reports comparing Australian and Canadian Indigenous health profiles, particularly life expectancy, are limited by different definitions and methods [14]. Higher HbA1c levels have been reported in Indigenous Australians and Canadians compared to non-Indigenous groups [15], and similarities between these two Indigenous populations have been reported for high rates of end stage kidney disease but lower rates of kidney transplantation compared to non-Indigenous Australians and Canadians [16,17]. Systematic reviews have highlighted the high prevalence of diabetes, CVD and chronic kidney disease among Indigenous populations globally but studies from detailed clinical examination of participants are limited, and much of the available data stems from medical records or administrative databases [18,19]. This is an important gap because studies which directly compare groups that have been characterized using similarly detailed clinical protocols may enhance our understanding of the nature and extent of cardiometabolic risk factors contributing to these conditions. Our hypothesis was that, despite the common outcome of increased prevalence of type 2 diabetes, differences in cardiometabolic risk profile may exist between these populations. This was assessed comparing community-based data on diabetes and related conditions in two communities: a remote Aboriginal community in Northeast Arnhemland, Northern Territory, Australia and a remote First Nations community from northwestern Ontario, Canada [20,21]. The primary outcome measures were diabetes prevalence and recognized cardiometabolic risk components (central obesity, dyslipidemia, LDL cholesterol, glycemia, hypertension, albuminuria).

2. Materials and methods

2.1. Participants

Methods for both studies have been described previously [20,21]. In brief, the Australian remote Aboriginal community is on an island in Northeast Arnhemland, 550 km from Darwin (the capital city of the Northern Territory) and has a population of approximately 1500. There are more than 20 language groups and English is a third or fourth language for most people. The community is accessible by air and sea, with a weekly barge service from Darwin delivering most food and supplies to the community. The community started as a mission in the early 1940s. Prior to the mission, people lived as family groups on their ancestral homelands. The Yolngu people along the coastal edges of Arnhemland had regular contact with sea traders prior to the arrival of Europeans and had maintained trading with the Macassan people for over 400 years. The government took over administration in the late 1960s which resulted in major changes in people's diet and a greater dependence on store foods. The protocol was approved by the Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research. This study, conducted from August 2001 to March 2002, was the first community-wide screening for diabetes and cardiovascular risk. Anthropometric measurements and a fasting blood sample were collected from 332 of 706 residents aged 15 years or older. The study population was representative of the census population in terms of gender distribution. However, proportionately more women $\geq$35 years of age participated than any other age group ($p = 0.01$) [16].

The Canadian study was the Sandy Lake Health and Diabetes Project Follow-Up Study, a population-based cohort study conducted from 2003 to 2005, involving participants aged 10 years and over. The follow-up study involved all participants who were free of diabetes at baseline (1993–1995 [22], where 72% of community members participated) as well as other community members who had not participated in the baseline study. Data from the follow-up study only are presented here. The study was approved by the Sandy Lake First Nation Band Council and the University of Toronto Ethics Review Committee, and is described here as an independent cross-sectional study. The community is located 2000 km northwest of Toronto, in the subarctic boreal forest region of central Canada, on the shores of a large lake that is part of the Severn River system draining into Hudson Bay. The population of approximately 2300 Oji-Cree mostly speak both Oji-Cree (a member of the Algonkian family of languages) and English, although many of the older individuals only speak Oji-Cree. The community is accessible only by air for most of the year, except for a winter road open for about six weeks in January and February. The community's history is similar to that of the Australian community in that both groups previously led a hunter-gatherer life in small, extended family groups, with rapid lifestyle changes beginning mid-twentieth century [23]. For the purposes of this manuscript, participants from the Australian community are referred to as ''Aboriginal Australians'' and participants of the Canadian community study referred to as ''Aboriginal Canadians''.

2.2. Assessment

Both studies included an interviewer-administered health questionnaire, collection of fasting blood and urine samples, blood pressure and anthropometric measurements. The