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Sex differences in obesity prevalence and cardiometabolic factors among Western Alaska Native people

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Abstract *Background and aims:* Obesity is associated with increased risks of cardiovascular disease, type 2 diabetes, and other chronic diseases. Prevalence estimates for metabolic disorders are well documented in many populations, but Alaska Native groups are understudied. The Western Alaska Tribal Collaborative for Health Study combines data from three Alaska Native study cohorts to assess differences in obesity prevalence and associations with cardiometabolic risk factors by sex.

Methods and results: Analyses were based upon a sample of 3985 adult Yup'ik and Inupiat participants with a mean age of 40 years. Prevalence of obesity and metabolic risk factors was assessed according to nationally recognized guidelines. Regression analysis was used to evaluate the association between obesity and cardiometabolic risk factors, including lipids, blood pressure and glucose. The prevalence of obesity (BMI $\geq$ 30) was significantly higher in women (40%) than men (20%). Only 18.6% of men had a waist circumference (WC) $>$ 102 cm, while 58% of women had a WC $>$ 88 cm ($p < 0.001$). Women had higher mean HDL-C and triglyceride levels compared to men, while systolic and diastolic blood pressure, LDL-C, and glucose means were higher in men than in women. In multivariate analyses, BMI and WC were significantly associated with all of the cardiometabolic risk factors, although these associations were more pronounced in men than women.

Conclusion: The high prevalence of obesity and central adiposity among AN women is an important public health concern. Differences in associations between obesity and cardiometabolic risk factors by sex warrants further investigation to develop effective intervention programs.

Abbreviations: AN, Alaska Native; ATP, Adult Treatment Panel; BMI, body mass index; CANHR, Center for Alaska Native Health Research; CVD, cardiovascular disease; DBP, diastolic blood pressure; EARTH, Alaska Education and Research Toward Health; GOCADAN, Genetics of Coronary Artery Disease in Alaska Natives; HDL-C, HDL-cholesterol; IRB, Institutional Review Board; LDL-C, LDL cholesterol; NHANES, National Health and Nutrition Examination Survey; NS, Norton Sound; SBP, systolic blood pressure; T2D, type 2 diabetes; WATCH, Western Alaska Tribal Collaborative for Health; WC, waist circumference; YK, Yukon-Kuskokwim.

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Introduction

Obesity is associated with an increased risk of cardiovascular disease (CVD), type 2 diabetes (T2D), certain types of cancer, and other chronic diseases [1–3]. Although the prevalence of obesity and obesity-related comorbidities is high among most ethnic groups, significant disparities exist in the United States. In particular, black, Hispanic, and American Indian groups are at higher risk for the development of obesity, CVD and T2D [4,5]. While prevalence of obesity is well documented in European (non-Hispanic) Americans, black and Mexican American populations [5,6], Alaska Native (AN) groups are understudied. A few reports have noted that the prevalence of obesity among indigenous people living in the circumpolar regions of Alaska, Canada, and Greenland is a growing health concern [7–9]. One study of AN people conducted almost two decades ago in the Norton Sound region of western Alaska found that the prevalence of obesity was 32.8% for women and 15.6% for men, less than in American Indian populations, although the prevalence of overweight, 27.9% for women and 36.2% for men, was high [9,10].

Abdominal obesity has been observed among Canadian Inuit people, and Inuit women have a higher prevalence of obesity and central body fat than men [11]. Since abdominal obesity is highly correlated with metabolic diseases, efforts to increase physical activity and reduce or prevent the deposition of intra-abdominal body fat might serve to reduce or prevent the onset of obesity, CVD and T2D among Arctic populations. However, the relationship between obesity and disease risk has not been fully explored in western Alaska Native peoples.

Over 120,000 Alaska Native people live in Alaska and belong to one of approximately 230 federally recognized tribes [12]. The Western Alaska Tribal Collaborative for Health (WATCH) study seeks to rigorously assess prevalence and incidence of obesity, CVD and T2D and their risk factors in western AN people residing in the Norton Sound (NS) and Yukon-Kuskokwim (YK) regions of Alaska [13]. In this manuscript, we report the prevalence of overweight, obesity, and cardiometabolic risk factors, and the relationship between obesity and these risk factors, by sex and by cohort, in the WATCH study population.

Methods

The WATCH study was approved by the Alaska Area Institutional Review Board (IRB) and the Alaska Native Tribal Health Consortium, as well as by the IRBs of all participating institutions and tribal community review boards from the NS and YK regions.

Study population

The WATCH study combines four large cohort studies in AN communities from the NS and YK regions of Alaska. Together, the four studies comprise a cohort of more than 4500 individuals living mostly in remote communities in western and southwestern Alaska [14].

The analyses presented here are based on data from 3985 adult participants (≥18 years of age) from the three most recently recruited WATCH study cohorts. The study methods have been previously published [13,14]. The Center for Alaska Native Health Research (CANHR) study [15,16] is a longitudinal community-based participatory study recruited from 2003 until 2010. The Alaska Education and Research Toward Health (EARTH) study [17] is a multi-center community-based observational study recruited between 2004 and 2006. These two studies were conducted in the YK region with participants predominantly of Yup'ik descent. The Genetics of Coronary Artery Disease in Alaska Natives (GOCADAN) study [18] was conducted between 2000 and 2004 in the Norton Sound region of Alaska; participants were predominantly of Inupiat descent. All participants who were non-pregnant, and self-reported AN descent, including those individuals reporting a mixed AN ancestry, were included in the analysis.

Study procedures and data consolidation

Age, gender, and ethnicity were self-reported at baseline, defined as first clinic visit after enrollment in the study. In all three cohorts, body composition and blood pressure were assessed by physical exam [13,15–18]. Height and waist circumference (WC) were calculated from the two of three measurements that were the most similar. In CANHR and GOCADAN studies, weight was measured with bio-impedence analyzers (TANITA TBF-300A, Tanita Corporation of America Inc., Arlington Hills, Illinois; Impedance Meter #BIA101, RJL Equipment Company, respectively). In EARTH, weight was measured by using a Tanita digital scale (BWP800/BWP627A; Tanita Corporation of America Inc., Arlington Hills, Illinois). BMI was calculated using weight (kg)/height (meters)^2. In the GOCADAN study, WC was measured supine, while in EARTH and CANHR it was measured erect. In all studies, resting blood pressure was measured three times after a 5-minute rest period with participants in a seated position. CANHR and EARTH studies used the Omron HEM-907® (Omron Healthcare, Kyoto, Japan) automated blood pressure system; the GOCADAN study obtained blood pressures with a mercury sphygmomanometer. An average of the last two of the three blood pressure readings were used for this analysis.

Blood lipids and blood glucose were determined from fasting blood samples. GOCODAN and CANHR used venous blood samples to measure LDL-cholesterol (LDL-C), triglycerides, HDL-cholesterol (HDL-C), and plasma glucose levels. EARTH used capillary blood from a finger stick for lipids and glucose analysis. Both CANHR and EARTH determined lipid and glucose values using the Cholestech LDX Analyzer (Hayward, USA) on site. GOCODAN used a conventional enzymatic chemistry analyzer to assess blood lipids and glucose from a venous blood sample; fasting glucose was assessed using the Accu-Chek Advantage. For CANHR and GOCODAN cohorts, lab values from frozen stored samples were used for analyses; Cholestech LDX Analyzer values were used for the EARTH cohort.