

The Prevalence of Metabolic Syndrome and Associated Risk Factors in Northern Plains and Southwest American Indians

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OBJECTIVE — To estimate the prevalence of metabolic syndrome by age, sex, and diabetes status in Northern Plains and Southwest American Indians.

RESEARCH DESIGN AND METHODS — Data for this analysis came from the Education and Research Toward Health (EARTH) study, a 5-year cross-sectional study of Southwest and Northern Plains American Indian adults. The National Cholesterol Education Program's Adult Treatment Panel III (NCEP/ATP III) guidelines were used to identify adults with metabolic syndrome.

RESULTS — The age-adjusted prevalence of the metabolic syndrome was 49.8% among 4,457 participants aged 18–88 years. Age-adjusted prevalence was 42.4% for participants without diabetes and 86.6% for participants with diabetes. In participants aged <40 years, the overall prevalence of metabolic syndrome was 53.1%; 44.9% after excluding individuals with diabetes.

CONCLUSIONS — This study confirms a high prevalence of the metabolic syndrome among Northern Plains and Southwest American Indians of all ages.

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The metabolic syndrome is a constellation of physiological abnormalities that increase the risk of developing type 2 diabetes (1) and cardiovascular disease (2). Data from the National Health and Nutrition Examination Survey (NHANES) indicates that the prevalence of metabolic syndrome among U.S. adults aged 20 years or older has increased from 22% in 1988–1994 (3) to 34.5% in 1999–2002 (4). NHANES included whites, African Americans, Mexican Americans, and “others,” but not American Indians. The Strong Heart Study, which enrolled 4,549 American Indians aged 45–74 years, reported an overall prevalence of the metabolic syndrome of 55%; 35% among 2,283 nondiabetic participants (5). Although American Indians have a high prevalence of type 2 diabetes (6) and obesity (7,8), few studies have re-

ported data on metabolic syndrome in younger adults. Furthermore many prevalence studies aggregate data to include individuals with and without type 2 diabetes. The objective of this study was to estimate the prevalence of metabolic syndrome by age, sex, and diabetes in Northern Plains and Southwest American Indians aged 18–88 years.

RESEARCH DESIGN AND METHODS

Data for this analysis came from the Education and Research Toward Health (EARTH) study, a 5-year cross-sectional study of 5,166 adults aged 18–88 years and residing on two Northern Plains American Indian reservations and a Southwestern American Indian community. The methods of the EARTH study have been described in detail elsewhere (9). Briefly, EARTH study partici-

pants in both regions were enrolled, examined, and interviewed between December 2003 and April 2006. Study eligibility included: ≥18 years of age, American Indian or Alaska Native descent or a tribal member, eligible to receive care through the Indian Health Service or tribal health system, residing in the study area, not pregnant at baseline, not undergoing cancer treatment, and being physically and mentally able to read and understand a consent form and complete survey instruments and medical tests. The study was approved by the participating tribes and both the Aberdeen and Phoenix Area Indian Health Service Institutional Review Boards. The University of Hawaii Committee on Human Studies determined this secondary analysis of the EARTH study data were exempt from review.

The EARTH survey instrument consisted of 62 questions on health status and self-reported chronic diseases including diabetes, diet, and physical activity. Medical measurements included seated blood pressure, height, weight, waist and hip circumference, serum lipids, and fasting blood glucose. Study participants fasted for 8 h prior to the study visit. The National Cholesterol Education Program/Adult Treatment Panel III (NCEP/ATP III) revised guidelines were used to identify participants who had metabolic syndrome (10). Participants met the criteria for high blood pressure or high fasting glucose concentration if they reported a physician diagnosis of hypertension or diabetes.

Data were de-identified to assure participant confidentiality. Of 5,166 individuals, we excluded 709 (14%) who were 1) not fasting within 8 h of the blood draw; 2) missing data for any of the clinical variables that comprise the metabolic syndrome criteria; or 3) missing data for age, sex, or diabetes status. The prevalence of the metabolic syndrome was calculated by sex, age, and diabetes status. Age was categorized into four groups for comparison with national data. These four categories were also used in the age-adjustment procedure (11). Data were

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Table 1—Prevalence of the metabolic syndrome among Northern Plains and Southwest American Indians, EARTH study

All participants	Total	Men	Women
<i>n</i>	4,457	1,952	2,505
Unadjusted	52.4 (51.3–53.9)	47.2 (45.0–49.3)	56.4 (53.5–57.6)
Age-adjusted	49.8 (47.8–50.7)	44.6 (41.9–46.7)	53.2 (50.8–55.0)
No diabetes			
<i>n</i>	3,575	1,652	1,923
Unadjusted	43.1 (41.5–45.0)	40.0 (38.1–42.4)	45.8 (44.0–47.9)
Age-adjusted	42.4 (40.7–43.8)	37.4 (35.0–39.5)	46.3 (43.7–49.0)
≤19 years	23.9 (19.0–29.6)	24.2 (16.8–32.7)	23.7 (16.8–31.5)
20–39 years	39.5 (36.8–42.0)	39.2 (36.0–41.8)	39.8 (37.2–42.9)
40–59 years	52.3 (49.1–55.8)	45.5 (40.8–49.5)	58.3 (54.4–63.4)
≥60 years	63.3 (55.6–69.9)	44.0 (32.7–55.1)	77.4 (68.9–85.2)
Diabetes			
<i>n</i>	882	300	582
Unadjusted	89.8 (88.4–91.7)	87.0 (82.6–91.1)	91.2 (89.0–92.8)
Age-adjusted	86.6 (83.7–88.8)	83.6 (79.3–88.0)	88.3 (84.7–91.4)
≤19 years	77.8 (39.8–97.4)	75.0 (19.9–99.3)	80.0 (27.7–98.6)
20–39 years	89.7 (85.1–92.7)	86.7 (78.4–93.1)	91.2 (86.2–95.2)
40–59 years	88.6 (85.3–91.0)	87.3 (80.9–91.5)	89.4 (84.6–93.0)
≥60 years	93.4 (88.6–97.1)	87.5 (76.1–94.9)	96.0 (91.4–99.1)

Data are percent (95% CI).

analyzed using SPSS for Windows, version 18.0.

RESULTS— Our selection criteria yielded an analysis sample of 4,457 individuals. The 709 excluded individuals did not differ significantly in age or sex from the 4,457 individuals included in the analyses. Sixty percent of the participants were <40 years of age. The overall age-adjusted prevalence of the metabolic syndrome was 49.8% (95% CI 47.8–50.7) (Table 1). The age-adjusted prevalence was 53.2 (50.8–55.0) for women and 44.6 (41.9–46.7) for men. The age-adjusted prevalence of metabolic syndrome among nondiabetics was 42.4 (40.7–43.8) and increased with advancing age. Prevalence of the metabolic syndrome was markedly higher among nondiabetic women >40 years of age compared with men of the same age. The overall age-adjusted prevalence of metabolic syndrome in participants aged <40 years was 53.1 (51.0–54.7); 44.9 (42.6–46.9) after excluding individuals with diabetes (data not shown in the table). Among the EARTH study participants with diabetes, the prevalence of the metabolic syndrome was 86.6 (83.7–88.8) with little difference between men and women. The prevalence of metabolic syndrome in diabetic participants aged 20–39 years was similar to that of participants aged ≥40 years.

CONCLUSIONS— This study confirms a high prevalence of the metabolic syndrome among Northern Plains and Southwest American Indians in all age categories. The overall prevalence of metabolic syndrome among the EARTH study participants was 49.8% compared with 34.0% reported in NHANES 2003–2006 (12). The prevalence of the metabolic syndrome in nondiabetic EARTH study men aged 20–39 years was 39.2% compared with NHANES white, black, and Mexican American men with prevalences of 20, 11, and 22%, respectively. Nondiabetic EARTH study women had a higher prevalence of the metabolic syndrome compared with NHANES white, black, and Mexican American women in all age categories. More than half of the EARTH study participants aged <40 years had the metabolic syndrome compared with 20.3% of NHANES 2003–2006 participants aged <40 years (12).

This study has several limitations. Inherent to the EARTH study design, the principal limitation is the use of cross-sectional data, thus causal pathways could not be examined. In addition, although the EARTH study is a community-based sample, the sample was not randomly selected. Lastly, self-reported diabetes was not confirmed through a medical chart review. However, studies indicate that the reliability of self-reported diabetes is high (13,14).

In summary, we found the metabolic syndrome was common among American Indians residing in the Northern Plains and the Southwest. Our work extends the findings of the Strong Heart Study to younger American Indians. Recognizing and intensively treating metabolic syndrome can reduce diabetes and cardiovascular disease (15). The increasing number of overweight and obese individuals combined with the aging population ensures that the metabolic syndrome will continue to be widespread. This unsettling situation may have serious economic implications for the Indian Health Service unless more resources can be devoted to lifestyle interventions.

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K.A.S. analyzed data and wrote the manuscript. A.B. researched and analyzed data. D.B. contributed to discussion and reviewed/edited the manuscript. J.A.H. researched data and reviewed/edited the manuscript.

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