Sex Differences in Cardiometabolic Risk Factors among Hispanic/Latino Youth

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Objective To determine the prevalence of obesity and cardiometabolic risk in US Hispanic/Latino youth and examine whether there are disparities by sex in cardiometabolic risk factors.

Study design Study of Latino Youth is a population-based cross-sectional study of 1466 Hispanic/Latino youth (8-16 years old) who were recruited from 4 urban US communities (Bronx, NY, Chicago, IL, Miami, FL, and San Diego, CA) in 2012-2014. The majority of children were US-born (78%) and from low-income and immigrant families. Cardiometabolic risk factors were defined by the use of national age- and sex-specific guidelines.

Results The prevalence of obesity was 26.5%. The prevalence of class II-III obesity, diabetes, and dyslipidemia was high (9.7%, 16.5%, and 23.3%, respectively). The prevalence of cardiometabolic risk factors increased with severity of obesity in both boys and girls. Boys had a greater prevalence of diabetes and of elevated blood pressure than girls (20.9% vs 11.8% and 8.5% vs 3.3%). In multivariable analyses, younger boys were more likely to have obesity class II-III than girls (OR 3.59; 95% CI 1.44-8.97). Boys were more likely to have prediabetes than girls (OR 2.02; 95% CI 1.35-3.02), and the association was stronger at older ages.

Conclusions The prevalence of cardiometabolic risk factors was high in this sample of Hispanic youth. Boys had a more adverse cardiometabolic profile compared with girls that may put them at higher risk of diabetes and cardiovascular disease later in life. Reasons for this disparity and the long-term clinical implications remain to be elucidated. *(J Pediatr 2016;176:121-7)*.

Hispanic/Latino youth are a fast-growing segment of the US population and make up 22% of all children younger than the age of 18 years in the US.[1] Data from National Health and Nutrition Examination Survey indicate that Hispanic youth have high rates of obesity,[2,3] but less is known about the burden of cardiometabolic risk factors in Hispanic/Latino children. Obesity and diabetes are leading cardiovascular disease (CVD) risk factors among Hispanic/Latino adults, raising concerns about whether an increased risk of these conditions also is manifested at younger ages. Furthermore, although studies in adults indicate that women are at greater risk of obesity than men, among Hispanic/Latino youth these sex differences appear to be reversed, with boys more likely to be obese than girls[3,4] Adult men, however, were found to have a greater prevalence of diabetes and CVD risk factors than women.[5,6] Recent studies also indicate that there are sex differences in cardiometabolic risk profiles, with boys being more likely to have impaired fasting glucose than girls, but girls being more insulin resistant.[7]

It is now well accepted that the process leading to atherosclerosis and other chronic conditions starts during childhood.[8-11] Therefore, describing the magnitude of these risk factors in youth is important for prioritizing prevention and public health efforts. This study expands the literature on the health status of Hispanic/Latino youth by reporting on the prevalence of obesity and cardiometabolic risk factors in a community-based sample of Hispanic/Latino youth living in 4 major US urban areas. Because previous reports suggest that there is a greater burden of cardiometabolic risk in Hispanic young men compared

BMI	Body mass index
CVD	Cardiovascular disease
HbA1c	Hemoglobin A1c
HCHS	Hispanic Community Health Study
HDL-c	High-density lipoprotein cholesterol
LDL-c	Low-density lipoprotein cholesterol
SOL	Study of Latino

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Supported by the National Heart, Lung, and Blood Institute (NHLBI; R01HL102130). The children in the SOL are drawn from the study of adults, the Hispanic Community Health Study/Study of Latinos, which was supported by contracts from the NHLBI to the University of North Carolina (N01-HC65233), University of Miami (N01-HC65234), Albert Einstein College of Medicine (N01-HC65235), Northwestern University (N01-HC65236), and San Diego State University (N01-HC65237). The following contribute to this study through a transfer of funds to NHLBI: National Center on Minority Health and Health Disparities, the National Institute of Deafness and Other Communications Disorders, the National Institute of Dental and Craniofacial Research, the National Institute of Diabetes and Digestive and Kidney Diseases, the National Institute of Neurological Disorders and Stroke, and the Office of Dietary Supplements. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funders. The authors declare no conflicts of interest.

http://dx.doi.org/10.1016/j.jpeds.2016.05.037

with women, this study examined sex differences in the prevalence of obesity and cardiometabolic risk factors.

Methods

The Hispanic Community Health Study (HCHS)/Study of Latino (SOL) is a population-based cohort study of 16 415 Hispanic/Latino adults (ages 18-74 years) who were selected via a 2-stage probability sampling design from 4 US communities (Chicago, IL; Miami, FL; Bronx, NY; San Diego, CA). SOL Youth is an ancillary study to HCHS/SOL that enrolled a subset of the offspring of HCHS/SOL participants from the same 4 field centers. Between 2012 and 2014, 6741 households were screened via a phone call with the use of a standardized script; the screening identified 1777 eligible children between the ages of 8 and 16 years, of whom 1466 were enrolled, achieving a participation rate of 82%. Of these 1466 children, 156 were excluded because they did not have values for 1 or more cardiometabolic factors or key covariates, leaving a final analytical sample of 1310 for the current study. Details about the methodology and protocols of HCHS/SOL and SOL Youth have been published elsewhere.[12,13] The study was conducted with approval from the institutional review boards of each of the institutions involved in the study. Written informed consent and assent were obtained from parent/caregivers and their children, respectively.

Height (cm) was measured with a wall stadiometer (seca 222; seca, Hamburg, Germany) and weight (kg) was obtained with a digital scale (TBF 300, Tanita Body Composition Analyzer; Tanita, Tokyo, Japan). Guidelines from the Centers for Disease Control and Prevention were used to classify children into categories of underweight/normal weight (body mass index [BMI] <85th percentile), overweight (BMI 85th to <95th percentile), or obese (BMI ≥95th percentile).[14] Obese children were further classified by the severity of obesity using recommended pediatric thresholds.[4,15] Class I obesity was defined as ≥95% of the 95th percentile to <120% of the 95th percentile, class II obesity as ≥120% of the 95th percentile to <140% of the 95th percentile or BMI ≥35 to <40 kg/m^2, and class III obesity as ≥140% of the 95th percentile OR BMI ≥40 kg/m^2. Class II and III were combined to achieve adequate sample size for analyses.

Seated blood pressure was measured with an Omron HEM-907XL sphygmomanometer (Omron, Osaka, Japan) in patients after they had rested for 5 minutes. Three consecutive measures were obtained, and the average of the last 2 measures was used in the analyses. Age-, sex-, and height-specific systolic and diastolic blood pressure percentiles were derived according to established guidelines.[16] Elevated blood pressure was defined as having systolic or diastolic blood pressure ≥90th percentile.

Fasting plasma glucose was measured with a hexokinase enzymatic method (Roche Diagnostics, Indianapolis, Indiana). Hemoglobin A1c (HbA1c) was measured from whole blood with a Tosoh G7 Automated HPLC Analyzer (Tosoh Bioscience Inc, South San Francisco, California). Prediabetes/diabetes was defined as having fasting glucose ≥100 mg/dL or HbA1c ≥5.7%, according to the guidelines of the American Diabetes Association.[17]

Blood for lipid assays was obtained under fasting conditions. Total serum cholesterol was measured with a cholesterol oxidase enzymatic method (Roche Diagnostics), serum triglycerides with a glycerol blanking enzymatic method (Roche Diagnostics), and high-density lipoprotein cholesterol (HDL-c) with a direct magnesium/dextran sulfate method. Low-density lipoprotein cholesterol (LDL-c) was calculated with the Friedewald equation. Non-HDL cholesterol was calculated as the difference between total cholesterol and HDL-c. Cutoffs values for each lipid were chosen based on the Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents.[18] In addition, a triglycerides/HDL-c ratio ≥2.2 was used because this cutoff has been related to greater cardiometabolic risk in youth.[19] Lastly, dyslipidemia was defined as having total cholesterol ≥200 mg/dL, LDL-c ≥130 mg/dL; triglycerides ≥100 mg/dL for 8-9 years of age and ≥130 mg/dL for 10-16 years of age; or HDL-c <40 mg/dL.

An index of overall cardiometabolic risk was calculated by summing the presence of the following eight risk factors: obesity (BMI ≥95th percentile); systolic or diastolic blood pressure ≥90th percentile; fasting glucose ≥100 mg/dL; HbA1c ≥5.7%; total cholesterol ≥200 mg/dL; LDL-c ≥130 mg/dL; triglycerides ≥100 mg/dL for 8-9 years of age and ≥130 mg/dL for 10-16 years of age; or HDL-c <40 mg/dL. We then categorized participants as having 0, 1-2, or ≥3 CVD risk factors.

The Pubertal Development Scale consists of 5 questions for boys concerning changes in body hair, voice, skin, growth spurt, and facial hair and for girls questions about body hair, breast change, skin change, growth spurt, and menarche.[20,21] Children and their parents/caregivers reported their Hispanic/Latino background (Central American, Cuban, Dominican, Mexican, Puerto Rican, South American, and other/mixed), place of birth, date of birth and sex. Parents/caregivers reported their household income and their educational attainment.

Statistical Analyses

We calculated the weighted proportion of participants who had cardiometabolic risk factors overall and by sex. Test for linear trend was assessed with logistic regression with the binary variable for the CVD risk factor as the dependent variable and weight category as the independent variable. Multivariable logistic regression was used to assess the association of sex (boys vs girls) with the presence of cardiometabolic risk factors. Multinomial logistical regression was used for outcomes that were not binary (weight category and CVD risk factors). Models were adjusted for age, nativity, household income, parental education, and field center. Model 2 was adjusted for all variables included in Model 1, plus percentile BMI in analyses that did not include obesity as the outcome variable. Analyses were presented for the overall