

# Insulin Resistance Seen in 54% of Overweight Teens

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Contributing Writer

WASHINGTON — At least 13% of all adolescents and 54% of overweight teens are insulin resistant, and a significant proportion of these adolescents have metabolic syndrome—even according to adult definitions.

These findings, reported in various presentations at the annual meeting of the Pediatric Academic Societies, add to knowledge of the increasing prevalence of metabolic syndrome in U.S. youth.

The findings come from analyses of 1999-2000 data from the National Health and Nutrition Examination Survey (NHANES), and thus represent a national sample of U.S. adolescents.

The prevalence of the syndrome, using age-specific criteria applied to the National Cholesterol Education Program (NCEP) definition, has been reported as 4% of U.S. adolescents in 1988-1994, and 7% in 1999-2000.

The new analyses show that rates of metabolic syndrome remain sizable when teens are identified according to the two known adult definitions of the syndrome, rather than with the use of age-specific criteria.

"There is a controversy about how we should define [metabolic syndrome] in kids. Here we treated teens like adults, and we still found a significant number," said Stephen Cook, M.D., who presented most of the findings at the meeting, in a later interview.

"These are kids who are already manifesting adult cardiovascular health problems ... who could potentially be

very disabled by their health early on," he said. "You're not going to prescribe statins, but these kids need to improve their lifestyle."

Dr. Cook and his colleagues at the American Academy of Pediatrics' Center for Child Health Research at the University of Rochester (N.Y.) analyzed the NHANES data for almost 940 adolescents, aged 12-19 years, who had not eaten for 6 hours.

Less than 5% had metabolic syndrome using the NCEP definition, and more than 5% had the syndrome according to the definition of the World Health Organization. Among overweight teens, 25% met the NCEP criteria, and 30% met the WHO criteria, Dr. Cook reported at the meeting sponsored by the American Pediatric Society, the Society for Pediatric Research, the Ambulatory Pediatric Association, and the American Academy of Pediatrics.

The NCEP defines metabolic syndrome as three or more of five criteria: high triglycerides, low HDL, high blood pressure, abdominal obesity, and high fasting glucose.

The WHO requires a finding of insulin resistance—by either high fasting glucose or homeostasis model assessment (HOMA) of at least the 75th percentile—plus any two of the other criteria.

In looking specifically at insulin resistance, which Dr.

Cook describes as "driving" the metabolic syndrome, the investigators used two validated surrogate markers: elevated fasting insulin levels and HOMA (insulin  $\times$  glucose/22.5).

The markers have been shown to correlate well with euglycemic clamp techniques in children and adolescents. Insulin resistance is defined according to these markers as fasting insulin equal to or greater than 20  $\mu$ U/mL, or HOMA greater than or equal to the top quartile of the non-diabetic population.

The investigators found that insulin resistance affected 25% of U.S. teens when it was defined by HOMA (predictably, since it's a statistical definition) and 13% when it

was defined by hyperinsulinemia. There were no gender or age differences.

Overweight and at risk for overweight were significantly associated with insulin resistance by both definitions. By the HOMA definition, 39% of teens at risk for overweight and 72% of overweight teens were insulin resistant. By the hyperinsulinemia definition, these numbers were 18% and 54%, respectively.

The NHANES sample was "well distributed" in terms of weight, noted Dr. Cook of the Golisano Children's Hospital at Strong, part of the University of Rochester. He is trained in pediatrics and internal medicine.

In another analysis, Dr. Cook and his associates sought to determine the association of insulin resistance with the prevalence of metabolic syndrome (defined with age-specific criteria) for this U.S. sample.

They found that more than 25% of adolescents who were insulin resistant by HOMA, and more than 40% of adolescents who were insulin resistant by the hyperinsulinemia definition had the metabolic syndrome.

"Insulin resistance is independently associated with not only the metabolic syndrome, but also with each of its components," said Todd Florin, M.D., at the meeting. Dr. Florin, who worked with Dr. Cook as a medical student, is now a resident at the Children's Hospital of Philadelphia.

Measuring fasting insulin levels may be a "quick, inexpensive" method for assessing insulin resistance, and risk for metabolic syndrome, in adolescents, he said.

Some degree of insulin resistance is associated with puberty and is transient, Dr. Cook noted. "So while there may be 54% of overweight kids with insulin resistance, we might find it's less if we could follow them over time."

Still, he said, the rates would remain significant—as would the fact that "metabolic syndrome and insulin resistance do predict diabetes and heart disease." ■

## Metabolic Syndrome: Not Just for Teens Anymore

Nearly 4% of children ages 5-11 years, and 17% of overweight children, met criteria for metabolic syndrome in a separate analysis performed by Dr. Cook and his associates.

Here they used data from the National Health and Nutrition Examination Survey III, which spanned from 1988 to 1994, rather than the more recent NHANES data that they used for their study of adolescents.

The more recent survey data did not contain enough of the elements needed to evaluate age-specific criteria for metabolic syndrome for children under 8 years

of age, explained Dr. Cook.

Although the data are older, the study is the first to document metabolic syndrome in a national sample of children, he said.

Another study reported recently at the annual meeting of the American College of Sports Medicine documented metabolic syndrome in as many as 5% of 7- to 9-year-olds in Kansas. ("Insulin Resistance in 5% of Youngsters," July 1, 2005, p. 1).

The NHANES study did not reveal any significant differences in the prevalence of metabolic syndrome by age, region of the country, or poverty level.

Gender and ethnic differences were significant, however. Almost 3% of boys and 6% of girls met criteria for the syndrome.

Metabolic syndrome was also identified in approximately 7% of Mexican Americans, 5% of whites, and 3% of African Americans.

Less than 1% of normal-weight children met the criteria, as opposed to 6% of those at risk for overweight, and 17% of overweight children.

Among overweight children, 41% had one risk factor for the syndrome, and 24% had two risk factors, Dr. Cook reported.

## Metabolic Syndrome and Components Increase PAD Risk

BY MIRIAM E. TUCKER  
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WASHINGTON — Metabolic syndrome increases the risk for peripheral arterial disease as well as coronary artery disease, Andy Menke and his associates reported in a poster at a conference on cardiovascular disease epidemiology and prevention sponsored by the American Heart Association.

The relationship between metabolic syndrome and coronary artery disease are well established.

Now, data from 2,175 participants in the 1999-2002 National Health and Nutrition Examination Survey (NHANES) suggest that the association also extends to the peripheral arteries, and in a dose-response

fashion—that is, the more metabolic syndrome components a person has, the greater the risk for peripheral arterial disease (PAD), said Mr. Menke, a doctoral student in the department of epidemiology at Tulane University, New Orleans.

A total of 827 participants had metabolic syndrome, defined as the presence of three or more of the following:

- ▶ Systolic blood pressure greater than or equal to 130 mm Hg, and/or diastolic blood pressure greater than or equal to 85 mm Hg, and/or the use of antihypertensive medication.

- ▶ Serum HDL cholesterol less than 40 mg/dL for men and less than 50 mg/dL for women.

- ▶ Serum triglyceride level greater than or equal to 150 mg/dL.

- ▶ Plasma glucose greater than or equal to 110 mg/dL and/or use of insulin or glucose-lowering medication.

- ▶ Abdominal obesity (waist circumference greater than 102 cm for men and greater than 88 cm for women).

Those with metabolic syndrome were significantly older, had a higher body mass index, and were more likely to have a low glomerular filtration rate.

The age-adjusted prevalence of PAD, defined as the average of the left and right ankle-brachial index being less than 0.9, was present in 5.3% of those with metabolic syndrome and in 3.2% of those without, a significant difference.

After adjustment for BMI, age, race/ethnicity, sex, high school education, physical inactivity, alcohol consumption, glomeru-

lar filtration rate, and current and former smoking, subjects with the metabolic syndrome were nearly three times more likely to have PAD than were those who did not.

Those with three metabolic syndrome components had an odds ratio of 1.68 for PAD, compared with subjects who had just 1 or 2 components, while the odds ratio for those with 4 or 5 components was 1.54.

Among the individual metabolic syndrome components, the subjects with elevated blood pressure had an odds ratio of 1.83 for PAD, compared with those who were normotensive, they said.

The conference was also sponsored by the National Heart, Lung, and Blood Institute. ■