Obese adults with excess abdominal fat, insulin resistance may have higher risk of type 2 diabetes

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Dr. Ian Neeland, a cardiology fellow and first author of the paper (left); and Dr. James de Lemos, professor of internal medicine. Credit: UT Southwestern Medical Center

Obese adults with excess visceral fat (fat located inside the abdominal cavity, around the body's internal organs) and biomarkers of insulin resistance had an associated increased risk for the development of type 2 diabetes mellitus, while obese individuals with higher amounts of total body fat and subcutaneous fat (underneath the skin) did not have this

increased risk, according to a study in the September 19 issue of *JAMA*, and theme issue on obesity.

James A. de Lemos, M.D., of the University of Texas Southwestern Medical Center, Dallas, presented the findings of the study at a *JAMA* media briefing.

"A marked increase in the prevalence of overweight and obesity has contributed to a doubling in type 2 diabetes mellitus incidence over the past three decades," according to background information in the article. "Prediabetes, an intermediate hyperglycemia phenotype and risk factor for diabetes, is also associated with obesity and carries an excess risk for cardiovascular disease (CVD) and death. Although increased body mass index (BMI) is associated with diabetes at the population level, it does not adequately discriminate diabetes risk among obese individuals. Indeed, many obese persons appear resistant to the development of metabolic disease. Because the metabolic disease risks associated with obesity are heterogeneous [dissimilar], there remains an unmet clinical need for tools that differentiate obese persons who will ultimately develop prediabetes and diabetes from those who will remain metabolically healthy."

Dr. de Lemos and colleagues examined the associations of adipose (body fat) tissue distribution, lipids, and biomarkers of insulin resistance and inflammation with the risk of prediabetes and diabetes in obese adults. The study included 732 obese participants (body mass index 30 or greater) ages 30 to 65 years without diabetes or cardiovascular disease enrolled between 2000 and 2002 in the Dallas Heart Study.

The researchers measured body composition by dual energy x-ray absorptiometry (low dose x-ray to determine amounts and distribution of body fat) and magnetic resonance imaging (MRI); circulating adipokines (proteins secreted by fat tissue) and biomarkers of insulin resistance,

dyslipidemia (abnormal cholesterol levels), and inflammation; and subclinical atherosclerosis and cardiac structure and function by computed tomography and MRI.

Over a median (midpoint) follow-up of 7 years, 84 participants (11.5 percent) developed diabetes. In multivariable analysis, higher measures of visceral fat mass at the beginning of the study, fructosamine level (a measurement used to estimate the average plasma glucose concentration over several weeks), fasting glucose level, family history of diabetes, systolic blood pressure, and weight gain over the follow-up period were independently associated with the development of diabetes.

The composite outcome of prediabetes or diabetes occurred in 39.1 percent of 512 participants with normal baseline glucose values, and was independently associated with baseline measurements of visceral fat mass; levels of fasting glucose, insulin, and fructosamine; older age; non-white race; family history of diabetes; and weight gain over follow-up, but not with measurements of general adiposity.

Diabetes incidence increased significantly among individuals with higher categories of visceral fat mass, but no association was seen for abdominal subcutaneous fat, total body fat or body mass index.

"These findings suggest that clinically measurable markers of adipose tissue distribution and insulin resistance may be useful in prediabetes and diabetes risk discrimination among obese individuals and support the notion of obesity as a heterogeneous disorder with distinct adiposity subphenotypes," the authors write.

"Further research is needed to determine whether assessment of adipose tissue distribution and function using imaging tools, circulating biomarkers, or both can improve clinical risk prediction in obese individuals."

More information: JAMA. 2012;308[11]:1150-1159.