Women's deep belly fat more strongly linked to diabetes and cardiovascular diseases

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A comprehensive study from Uppsala University, with over 325,000 participants, shows that deep belly fat is a major contributing risk factor for developing diabetes and cardiovascular disease. The study also shows that deep belly fat is a larger risk factor in women compared to men. Moreover, the scientists investigated how genes affect the accumulation of fat and present a new, simpler method to estimate the amount of deep belly fat.

Visceral fat—fat stored around the organs in the belly and around the intestines—is known to be associated with a higher risk of developing diabetes and cardiovascular disease. In the new study, published in *Nature Medicine*, the scientists took it one step further and showed, using genetic data, that there is an actual causal relationship between visceral fat and increased risk of diabetes, heart attack, hypertension and hyperlipidemia.

The scientists developed a method to more easily estimate visceral fat content. The method is not only useful for research purposes, but may also be useful in health care.

"To measure the amount of visceral fat, advanced and costly diagnostic imaging techniques are required. We have developed a simple method which instead estimates an individual's amount of deep belly fat from other parameters, more easily measured than the visceral fat itself, and the method can therefore be used in most clinics," says Dr. Torgny Karlsson, statistician at the Department of Immunology, Genetics and Pathology, Uppsala University, and one of the leading researchers of the study.

The method also enabled the researchers to study the effects of visceral fat on a much larger scale than before.

"We were surprised that visceral fat was more strongly linked to risk of disease in women compared to men," says one of the co-authors, Dr. Åsa Johansson, associate professor of molecular epidemiology at the Department of Immunology, Genetics and Pathology, Science for Life Laboratory, Uppsala University.

"Adding an extra kilogram of visceral fat can increase the risk of type 2 diabetes more than seven times in women, while the same amount of fat accumulation only increases the risk a little more than two times in men," says Dr. Johansson.

The scientists also found that the risk of disease increases most rapidly in people with small or moderate amounts of deep belly fat, but that it does not increase nearly as much if a person with large amounts of fat in the abdomen puts on additional fat.

"Nonlinear effects like this are very interesting to study and may help us to understand the biology behind the link between visceral fat and disease," says Dr. Karlsson.

The scientists also examined millions of positions in the genome to identify genes that affect the amount

of visceral fat, and found more than two hundred different genes. Among these, there was a large proportion of genes that are linked to our behavior, which suggests that the main contributor to abdominal obesity is, after all, that we eat too much and exercise too little. However, there are individual differences in how the fat is distributed in the body, and a person who appears not to be overweight may still have accumulated a harmful amount of visceral fat.

"The findings of this study may enable us to simplify measurements of visceral fat, and thus more easily identify people at high risk of developing diabetes and cardiovascular disease," says Dr. Karlsson.

More information: Contribution of genetics to visceral adiposity and its relation to cardiovascular and metabolic disease, *Nature Medicine* (2019). DOI: 10.1038/s41591-019-0563-7 , https://nature.com/articles/s41591-019-0563-7

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