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Even mildly excessive body iron stores increase the risk of type 2 diabetes

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Even mildly elevated body iron contributes to the prevalence and incidence of type 2 diabetes, according to research from the University of Eastern Finland. Excess body iron accumulation is a known risk factor of type 2 diabetes in hereditary hemochromatosis, but the results presented by Dr Alex O. Aregbesola in his doctoral thesis show that elevated iron is a risk factor in the general population as well, already at high levels within the normal range.

Men accumulate more iron and are more at risk

In addition, a gender difference was observed in the risk and prevalence of type 2 diabetes, to some extent due to different body iron accumulation between men and women. Men had 61% higher prevalence and 46% increased risk of developing type 2 diabetes when compared to women. At comparable age groups, men were found to accumulate more iron than women, and iron explained about two-fifths and one-fifth of the gender difference in type 2 diabetes prevalence and incidence respectively.

Moderate iron stores are safer than depletion toward iron deficiency

Body iron predicted the risk of type 2 diabetes. There was a slight variation in the risk of type 2 diabetes over a wide range of serum ferritin (sF) concentrations that reflect body iron stores, with a marked

increase in the risk observed at high normal range of sF concentrations in men (>185 μg/L). However, iron depletion toward deficiency as reflected by serum-soluble transferrin receptor concentrations did not offer protection against type 2 diabetes; rather, there was a U-shaped type of association between iron stores and the risk of type 2 diabetes which showed that the risk was lowest on moderate levels.

"Hence, a safe range of body iron stores in men with regard to the risk of type 2 diabetes may be 30-200 μg/L of serum ferritin," Dr Aregbesola says.

The association between body iron and impaired glucose metabolism was strongest among people in prediabetes states.

Excess iron disturbs glucose metabolism

Abnormalities in glucose metabolism and type 2 diabetes are on the increase globally, and the prevalence of diabetes among adults is estimated at 642 million by 2040. Reduced quality of life and increased mortality due to type 2 diabetes and its complications are of great concern. Preventive measures targeted at established risk factors of type 2 diabetes, such as excess body weight or obesity, physical inactivity and poor nutrition need further exploration.

Unhealthy dietary habits associated with the surge of type 2 diabetes include excess dietary intake of iron and unregulated iron supplement use. Iron is a micronutrient that is required in the formation of some essential body proteins and enzymes, like hemoglobin, cytochromes and peroxidase. However, it is harmful when stored in excess in the body. It promotes the release of free radicals that damage the secretory capacity of beta cells of pancreas to produce insulin. It also decreases insulin sensitivity in peripheral tissues and organs involved in glucose metabolism.

The doctoral thesis is based on studies where the main aim was to examine the associations between body iron stores and glucose homeostasis and type 2 diabetes among middle-aged men and women representing the general population and living in the eastern part of Finland. The thesis investigated the risk of type 2 diabetes over a wide range of body iron stores, as well as whether iron depletion toward mild iron deficiency offers protection against type 2 diabetes risk. The types of associations between body iron stores and glucose homeostasis were examined in the three glycemic states ? normoglycemia, prediabetes and type 2 diabetes, using markers of insulin resistance and beta cell function. Gender differences and the contribution of body iron accumulation to any gender difference in type 2 diabetes were also investigated.

"This study provides a new body of evidence that mildly elevated body iron is an important risk factor of glucose metabolism derangement, which contributes to the increase in the prevalence and incidence of type 2 diabetes," Dr Aregbesola concludes.

More information: A. Aregbesola et al, Gender difference in type 2 diabetes and the role of body iron stores, *Annals of Clinical Biochemistry: An international journal of biochemistry and laboratory medicine* (2016). DOI: 10.1177/0004563216646397

Provided by University of Eastern Finland