

# Hemoglobin reflects metabolic health: High levels are linked to common public health problems

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Haemoglobin. Credit: University of Oulu / Juha Sarkkinen

Hemoglobin is a protein found in the blood and a key oxygen transporter in the body. High hemoglobin levels have generally been considered desirable for a person's health. However, the latest research evidence appears to point in the opposite direction: high hemoglobin levels are

linked to metabolic morbidity and mortality, while low hemoglobin levels are an indication of better metabolic health.

Earlier this year, a research team led by Professor Peppi Karppinen from the University of Oulu, Finland, published [a study](#) which showed low hemoglobin levels to be associated with a lower body mass index and better metabolic health.

The researchers now wanted to investigate the effect of hemoglobin levels on metabolic morbidity and mortality in the elderly population.

The study subjects were members of the OPERA cohort study (Oulu Project Elucidating Risk of Atherosclerosis). Nearly a thousand middle-aged individuals were included in the study, and their health was monitored until old age.

The study examined hemoglobin values within the normal range, in other words, 117–155 grams/liter for Finnish women and 134–167 grams/liter for Finnish men.

During 20 years of follow-up, higher hemoglobin levels were linked to common metabolic disorders, such as diabetes and hepatic steatosis, and also associated with higher cardiovascular morbidity and total mortality.

"In our previous study, we demonstrated that low hemoglobin levels induce a hypoxic response in the body. The activation of this response leads to changes in [energy metabolism](#) and the [inflammatory response](#) which provide individuals with lower hemoglobin level protection against metabolic disturbances. The current results regarding the connection between higher hemoglobin levels and metabolic disorders and mortality are in line with our previous findings, supporting the idea that the body's hypoxic response plays a key role in the regulation of energy metabolism in humans," states principal investigator MD Joonas

Tapio.

Blood hemoglobin is one of the least expensive and most commonly tested laboratory parameters in the primary health care setting. According to Tapio, hemoglobin measurements could potentially be helpful in the early diagnosis of metabolic disorders.

The results could also help develop drug therapies for metabolic disorders. The hypoxic response is regulated by the HIF molecule which tries to ensure optimal oxygen uptake and energy metabolism in tissues under conditions of reduced oxygen availability. According to the researchers, drugs that act as inhibitors of HIF enzymes, which regulate a hypoxic response, could potentially be used as anti-obesity and metabolism drugs in humans. These medicinal agents are currently being used in the treatment of anemia caused by kidney disease.

Metabolic syndrome is a cluster of concurrent disorders involving high blood glucose, adverse blood lipids and high blood pressure. Over the last few decades, this syndrome has become a global epidemic, and the conditions associated with it, such as diabetes, are major public [health](#) problems in Finland. Over a billion people around the world have [metabolic syndrome](#), and it has been estimated that about one out of four adult Finns suffers from it.

The study was published in *Scientific Reports*.

**More information:** Joonas Tapio et al, Higher hemoglobin levels are an independent risk factor for adverse metabolism and higher mortality in a 20-year follow-up, *Scientific Reports* (2021). [DOI: 10.1038/s41598-021-99217-9](#)

Provided by University of Oulu

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