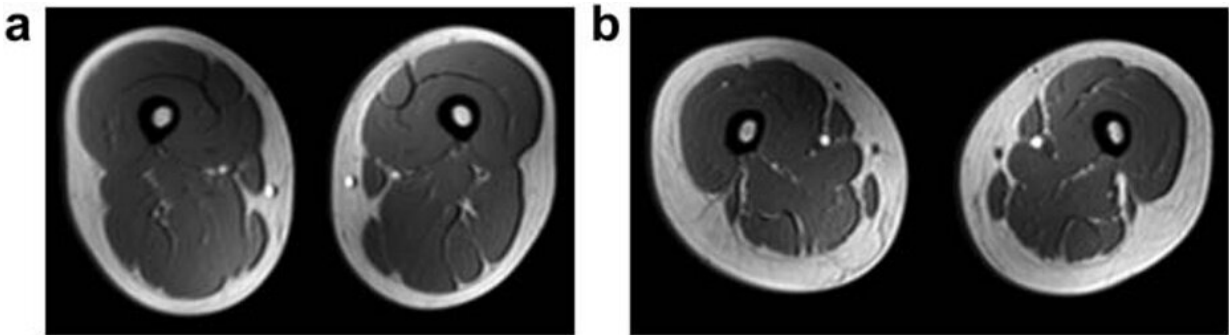


Fatty liver disease despite a normal weight examined

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Representative magnetic resonance images of the femoral region in a female subject without non-alcoholic fatty liver disease (NAFLD) (a) and that in a female subject with NAFLD (b). The NAFLD subject had greater s.c. fat thickness, decreased muscle cross-section, and marbled muscles (steatosis) on the images. Credit: University of Tsukuba

Non-alcoholic fatty liver disease (NAFLD) had long been thought to be a liver disease afflicting obese patients, while recent evidence has shown that non-obese individuals can be equally affected by NAFLD. In a new study, researchers from the University of Tsukuba revealed how NAFLD presents itself differently based on the sex and body mass index (BMI) of affected patients.

NAFLD is the most common chronic liver disease and often associated with obesity, type 2 diabetes and dyslipidemia. People living in Asia are

generally not as obese as those living in Europe or the U.S., yet NAFLD is becoming increasingly common in this area. These findings have led to the discovery of non-obese NAFLD, which surprisingly has a higher mortality rate than obese NAFLD. Consequently, an important question that has remained is how to identify the [risk factors](#) for the development for non-obese NAFLD.

"We know that an abnormal body composition—as in reduced [skeletal muscle mass](#) and increased visceral fat—is a strong risk factor for the development of NAFLD," says corresponding author of the study Professor Junichi Shoda. "We do not have this type of insight for non-obese NAFLD, so we wanted to characterize patients with non-obese NAFLD based on their sex and body composition."

To achieve their goal, the researchers included 404 patients with NAFLD in their study and divided them according to their BMI in non-obese, obese, and severely obese patient groups. As a comparison, they included 253 non-[obese patients](#) without NAFLD in their study.

The researchers found that of the male and female patients, one quarter of the members of each group had non-obese NAFLD. Surprisingly, these patients had lower skeletal muscle mass and muscle strength (pre-sarcopenia) compared with obese NAFLD patients. Although afflicted by fatty [liver disease](#), there was only a modest increase in liver fat accumulation and insulin resistance (a precursor to diabetes and often associated with NAFLD) in non-obese NAFLD patients compared with obese NAFLD patients. This was further corroborated by the fact the visceral, or belly, fat was overall low in non-obese NAFLD patients. Interestingly, fat accumulation in muscles was more common among women. An integrated analysis of the data showed that liver fat accumulation in non-obese NAFLD was mainly dependent on visceral fat content, leptin (a hormone produced in [visceral fat](#) tissue and that induces inflammation), myostatin (a protein produced by skeletal muscle

to suppress muscle regeneration) and HbA1c (a blood marker for how well the body manages blood sugar levels in the long term).

"These are striking results that show how there are important differences in how NAFLD presents itself in non-obese men and women. Our results provide a novel insight into the pathophysiological factors governing NAFLD development," says Professor Shoda.

More information: Takashi Shida et al. Clinical and anthropometric characteristics of non-obese non-alcoholic fatty liver disease subjects in Japan, *Hepatology Research* (2020). [DOI: 10.1111/hepr.13543](https://doi.org/10.1111/hepr.13543)

Provided by University of Tsukuba

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