

## LIVER

# Nonobese individuals in the developing world are at risk of nonalcoholic fatty liver and liver disease

The stereotypical image of a person with nonalcoholic fatty liver (NAFL) may need to be re-evaluated, at least in the developing world, according to the findings of a new study by Abhijit Chowdury and colleagues.

The prevalence of obesity and diabetes is rising in the developing world as a result of economic prosperity and the westernization of diet and lifestyle. However, community-based epidemiological data are lacking on the prevalence of NAFL (a hepatic manifestation of metabolic syndrome) in nonaffluent populations in the developing world.

Chowdury and co-workers chose to study the population point prevalence of NAFL in Nagari Gram Panchayat in the Birbhum district of West Bengal, India. As Chowdury explains, they selected this rural population to be "... representative of the teeming multitude of those living in less developed regions of the world."

Most of the 1,911 individuals included in the final population sample lived below the poverty line and were agricultural workers and/or manual laborers. At 19.6 kg/m<sup>2</sup>, the mean BMI of the study population was low; just 7% were classed as overweight and 11% were defined by Asian standards as having abdominal obesity. Despite that fact that 47% of the population were malnourished and had a BMI of <18.5 kg/m<sup>2</sup>, the prevalence of NAFL was high (8.7%). The prevalence of NAFL plus elevated levels of alanine aminotransferase—suggestive of nonalcoholic steatohepatitis—was 2.3% and the prevalence of cryptogenic cirrhosis was 0.2%. Of those individuals who had NAFL, 75% had a BMI <25 kg/m<sup>2</sup> and 54% were neither overweight nor had abdominal obesity.

Multivariate analysis adjusted for age and sex revealed that a BMI >25 kg/m<sup>2</sup> conferred the greatest risk of NAFL. Indeed, the risk of NAFL increased twofold in individuals who had a normal



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BMI (18.5–24.9 kg/m<sup>2</sup>) compared with individuals who had a BMI <18.5 kg/m<sup>2</sup>. Other independent risk factors for NAFL were abdominal obesity, dysglycemia, increasing income and an income >US\$2.00 per day.

A case-control analysis revealed that, compared with individuals who didn't have NAFL, those who had NAFL but were neither overweight nor had abdominal obesity had increased anthropometric markers of adiposity—height, weight, BMI and waist circumference—and higher body fat content, blood sugar and triglyceride levels.

12% of individuals with NAFL had a BMI <18.5 kg/m<sup>2</sup> and were underweight. These underweight individuals were significantly younger, had a significantly lower body fat content and a lower prevalence of abdominal obesity compared with normal weight and overweight NAFL counterparts. Interestingly, NAFL in underweight individuals was associated with increased anthropometric measures of adiposity and higher body fat content, blood sugar and triglyceride levels when compared with controls who had a similar BMI.

"We have shown that a non-obese, even non-overweight, supposedly physically active individual with or without a bulging waistline, can have fatty liver accompanied by subtly elevated body adiposity," explains Chowdury, who proposes that this be known as the 'third-world NAFL

phenotype'. Chowdury goes on "[This] study ... extends the NAFL ambit beyond its classical overweight-obesity paradigm. It also provides evidence, for the first time, that [NAFL] will be an important determinant of liver disease burden even in poor and emerging economies..."

So, what is next for Chowdury and colleagues? There are many questions to be answered, mostly pertaining to the similarities and differences that may exist between NAFL in the developing world and NAFL in the West. For example, will the long-term risk of adverse outcomes in the form of cryptogenic cirrhosis be similar? What will the risk of cardiovascular disease, stroke or cancer be? Will the pathophysiological mechanisms be the same?

The authors are also interested in whether the NAFL phenotype in the study population really is representative of other ethnic groups living in other developing countries. They are now planning to study its genetics to try to uncover the factors "... that predispose Indians to NAFL even with a clinically subtle increase in total body adiposity".

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**Original article** Das, K. *et al.* Nonobese population in a developing country has a high prevalence of nonalcoholic fatty liver and significant liver disease. *Hepatology* 51, 1593–1602 (2010)