Obesity

https://doi.org/10.1038/s41574-025-01191-z

# Global patterns of visceral adiposity and cardiometabolic disease

By the mid-20th century, researchers began to recognize that body adipose tissue distribution, rather than total adipose mass alone, was a key determinant of cardiometabolic risk. Building on Jean Vague's seminal observations, subsequent studies confirmed that central obesity, particularly abdominal adipose tissue, was closely linked to insulin resistance, type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD). In the 1980s, work by Ahmed Kissebah in the USA and Per Björntorp in Sweden demonstrated that waist-to-hip ratio, a surrogate for abdominal adiposity, was more predictive of CVD and T2DM than body mass index (BMI) was. More advanced imaging further distinguished between subcutaneous adipose tissue and visceral adipose tissue, with the latter now recognized as a particularly pathogenic adipose depot owing to its strong association with systemic metabolic dysfunction. Subsequent work highlighted the utility of other anthropometric measurements such as waist circumference in identifying CVD risk and T2DM.

Despite mounting evidence of the importance of body adipose distribution, global epidemiological data on abdominal adiposity were sparse. The International Day for the Evaluation of Abdominal Obesity (IDEA) study, launched in 2005, was a landmark cross-sectional investigation that aimed to fill this gap, culminating in a key paper published by Beverley Balkau and colleagues in 2007. Conducted across 63 countries, the IDEA study measured waist circumference and BMI in >168,000 adults seen in primary care settings, and assessed the associations between these anthropometric markers, CVD and T2DM.

The IDEA study found that rates of overweight and obesity were high across all regions, and that abdominal obesity was especially prevalent among women. Importantly, both BMI and waist circumference were independently associated with an increased risk of CVD and T2DM, with waist circumference emerging as the stronger predictor. A striking finding was that even among individuals with a BMI in the normal category, an elevated waist circumference was linked to a statistically significantly increased cardiometabolic risk, underscoring the limitation of BMI as a sole indicator of health.

These findings prompted a paradigm shift in risk stratification. IDEA provided compelling evidence that BMI alone is insufficient to assess cardiometabolic risk, and that waist circumference should be integrated into routine clinical evaluations. The study's consistent results across geographical and cultural boundaries bolstered its global relevance and helped to catalyse changes in clinical guidelines. Since IDEA, numerous studies (such as that by Feller et al. in 2010) have further validated the study's findings, particularly among populations often overlooked by BMI when assessing the risk of prediabetes and CVD. Waist circumference has since been incorporated into recommendations from the American Heart Association (such as those by Cornier et al. in 2011), Endocrine Society, International Diabetes Federation, WHO and numerous international task forces, including the 2025 *Lancet* Commission on the Definition and Diagnosis of Clinical Obesity.

Pathophysiological research has since illuminated why central obesity, particularly visceral adipose tissue, confers such high risk. Visceral adipose tissue is highly lipolytic, releasing free fatty acids into the portal circulation and promoting hepatic insulin resistance, dyslipidaemia and gluconeogenesis. Visceral adipose tissue also acts as an endocrine organ, secreting inflammatory cytokines (such as tissue necrosis factor and interleukin-6) and adipokines (such as leptin and resistin) that impair insulin signalling, foster systemic inflammation and contribute to endothelial dysfunction. Moreover, visceral adipose tissue expansion is associated with ectopic adipose deposition in non-adipose tissues such as the liver, skeletal muscle and pancreas, which results in lipotoxicity and impaired metabolic flexibility.

The IDEA study ultimately helped to reshape how clinicians and public health experts conceptualize obesity. Its global scope and consistent findings across diverse populations reinforced the limitations of relying solely on BMI and provided compelling evidence that central obesity is a universal marker of cardiometabolic risk. As the prevalence of obesity and related comorbidities continue to rise worldwide, especially in low-income and middle-income countries, the IDEA study's findings remain profoundly relevant for clinical practice and public health prevention today.

**John C. Lin**[1] ✉ **& Clara E. Tandar**[2]

[1]Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA. [2]Warren Alpert Medical School, Brown University, Providence, RI, USA.

✉e-mail: john.lin@pennmedicine.upenn.edu

## Competing interests

The authors declare no competing interests.

**Original article:** Balkau, B. et al. International Day for the Evaluation of Abdominal Obesity (IDEA): a study of waist circumference, cardiovascular disease, and diabetes mellitus in 168,000 primary care patients in 63 countries. *Circulation* **116**, 1942–1951 (2007)

**Related articles:** Cornier, M. A. et al. Assessing adiposity: a scientific statement from the American Heart Association. *Circulation* **124**, 1996–2019 (2011); Feller, S., Boeing, H. & Pischon, T. Body mass index, waist circumference, and the risk of type 2 diabetes mellitus: implications for routine clinical practice. *Dtsch. Arztebl. Int.* **107**, 470–476 (2010)