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DEBATE

The BMI–adiposity conundrum in South Asian populations: need for further research

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Abstract
High body fat in apparently lean individuals is a commonly described phenotype in individuals of Asian descent, but very limited consolidated scientific literature is available on this topic. This phenotype is known as 'normal-weight obesity' and may explain the large disparity between the prevalence of obesity (as measured by BMI) and diabetes that occurs in these individuals. Routine use of obesity indicators that best predict body fat content would help to identify these individuals in clinical practice. In this debate, we would like to highlight that even though fat and BMI have a good correlation, as suggested by Kryst *et al.* (2019), clinicians, public health researchers and policymakers should consider the use of these indicators in conjunction with each other rather than individually. Future research is needed on pathogenic mechanisms, diagnostic modalities and therapeutic options in these individuals which will help to further characterize and manage these patients appropriately.

Keywords: Normal-weight obesity; Body mass index; Body composition

Further to a recently published paper in this journal on the variations in body mass index (BMI) and adiposity levels among young adults and children (Kryst *et al.*, 2019), we would like to highlight that there is yet another pertinent aspect that needs to be considered when using this information in clinical practice. Kryst *et al.* (2019) analysed the selected anthropometric features of children, adolescents and young adults from Indian middle-class families and found that there was a significant positive increment in adiposity (measured by skin fold thickness) with rising BMI. Though this is an important finding in keeping with previously published literature, it is important here to note that in this ethnicity the conventional indicators of obesity may sometimes fail to appropriately identify metabolically 'at risk' individuals (Yajnik & Yudkin, 2004). Furthermore, in comparison to Caucasian populations, individuals of South Asian descent have a poor capacity to store fat in the superficial subcutaneous compartment, which in turn leads to increased deposition of fat in the visceral tissue (Anand *et al.*, 2011). This is called the 'fat overflow hypothesis' and is peculiar to this ethnic body constitution. Moreover, fat overflow may also limit the utility of using skin fold thickness as an indicator of adiposity in this population, as this may not represent an individual's overall body fat content and fat distribution. This unique South Asian phenotype is probably determined by genetic make-up, lifestyle and environmental influences (Yoon *et al.*, 2006; Kurpad *et al.*, 2011; Kapoor *et al.*, 2019). The manifestation of this phenotype probably starts during *in utero* development and is reflected in the low birth weight of these individuals (Thomas *et al.*, 2012).

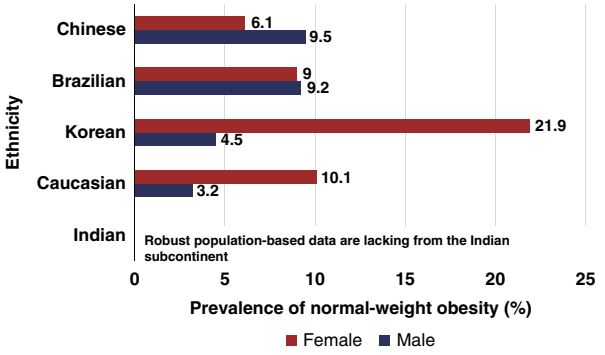

Figure 1. Prevalence of normal-weight obesity by ethnic group.

Though we agree with Kryst *et al.* (2019) that BMI and adiposity often change concurrently, it is important for the reader to understand that in certain ethnicities a significant proportion of individuals may have a normal BMI but high body fat percentage (normal-weight obesity). The term 'normal-weight obesity' is defined as a body mass index ≤25 kg/m^2 associated with an increased body fat percentage. The cut-offs used for body fat percentage depend on the ethnicity of the studied populations. The American Society of Endocrinologists propose body fat percentages of ≥35% for women and ≥25% for men as the thresholds for obesity, whereas the cut-offs for individuals of Asian Pacific origin are lower (≥33.4% for women and ≥20.6% for men) (Franco *et al.*, 2016). Recent estimates from different ethnicities suggest that the prevalence of normal-weight obesity varies a lot among different populations and ranges from 3% to 22% (Fig. 1). The highest prevalence is found in Korean women and robust data are lacking from the Indian subcontinent (Kim *et al.*, 2014; Franco *et al.*, 2016; Jia *et al.*, 2018).

Among the several methods available to estimate body fat content, the two most commonly used methods in clinical practice in countries like India include the DXA (Dual-energy X-ray Absorptiometry) scan and bioelectric impedance. At this point, it must also be acknowledged that there is lack of ethnicity-specific cut-offs to define obesity using these methods and more research is needed in this area. Future prospective studies that look at the follow-up of these individuals with normal BMI and high body fat would suggest appropriate cut-offs for different measures of assessing fat content and also the impact of therapeutic options in this cohort.

Therefore, in this debate, we would like to highlight that even though fat and BMI have a good correlation, as suggested by Kryst *et al.* (2018), clinicians, public health researchers and policymakers should consider the use of these indicators in conjunction with each other rather than individually.

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