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EDITORIAL COMMENT

How heavy is the impact of childhood obesity on cardiovascular risk?☆

Em idade pediátrica, o que pesa a obesidade quanto ao risco cardiovascular?

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Given the current high prevalence of childhood overweight and obesity and the limited resources available to manage this problem, it is vital to identify overweight/obese children who are at higher cardiometabolic risk, both during childhood and later in adult life. Not all of these children have the same degree of metabolic dysregulation, nor is this dysregulation necessarily proportional to the degree of excess adiposity.[1] Metabolic dysregulation may be associated with an individual's predisposition to develop low-grade inflammation and oxidative stress, which play a central role in the genesis and progression of atherosclerotic disease and other diseases associated with overweight/obesity.

Adipose tissue was long considered a passive storage organ, but it is now seen as a metabolically active endocrine organ that secretes hormones such as leptin, growth factors such as insulin-like growth factor 1 (IGF-1), inflammatory mediators, enzymes and metabolites. Adipose tissue dysfunction (adiposopathy) results in a chronic pro-inflammatory and pro-oxidative state, resulting in comorbidity.[2–5] Identifying children with this condition would enable targeted follow-up.

The article by Rodrigues et al. published in this issue of the *Journal*,[6] on the association between body adiposity and the risk of high blood pressure in school-aged children, is therefore of considerable interest, presenting representative data for mainland Portugal on this topic.

This cross-sectional study included 1555 children aged 6-9 years (mean age 7.58±1.10 years), recruited from public and private schools between 2009 and 2010. The authors conclude that excess body adiposity at such young ages appears to predict the development of high blood pressure (prevalence of high-normal blood pressure in 4.5% and hypertension in 3.7% of the children), which highlights the potential importance of this link.

The rising prevalence of primary pediatric hypertension and its tracking into adulthood demonstrate the importance of determining its pathogenesis in order to optimize management. The intricate control of blood pressure is governed by a myriad of complex anatomical, physiological, biochemical, and molecular biological systems, and an individual's propensity to develop hypertension is influenced by multiple genes. Inflammation, oxidative stress and insulin resistance due to obesity are clearly involved in the pathogenesis of hypertension, as early as the prenatal period or even prior to conception, due to parental nutrition, maternal exposure to toxins, placental insufficiency, and nutrition in the first two years of life, all of which can affect metabolic programming through epigenetic mechanisms, i.e., by modulating gene expression.[7]

Improving lifestyles, especially combating sedentary behavior, significantly improves metabolic and inflammatory status, even with small decreases in body mass index (BMI).[8] In obesity, changes in adipokine profile (bioactive substances secreted by adipose tissue) tend to disrupt the metabolic

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state, resulting in comorbidity and organ damage. Reversal of these changes appears to depend more on improving body composition (reducing excess fat mass) than simply on reducing BMI.[9,10]

In the article by Rodrigues et al.,[6] the risk of hypertension was greater in children with lower levels of physical activity.

Assessment of body composition, in particular measuring adiposity in children, is no easy task. Several techniques can be used, but they all have their limitations, and so a combination of methods should be used to increase reliability, since none of them measures adiposity directly. BMI is generally accepted as correlating with body adiposity, but it is nothing more than a weight-to-height ratio and does not take into account how weight is affected by muscle mass and bone mineral density. Waist circumference (WC) is used as an indicator of central (visceral) adiposity, and is directly associated with insulin resistance and an unfavorable lipid profile that continues into adulthood. However, WC varies with gender, age, and pubertal stage, and depends on the quantity not only of visceral fat, but also of subcutaneous fat, which is much less harmful in its metabolic effects. Skinfold testing requires training and expertise, and when using skinfold calipers in obese individuals the compressibility of the panniculus adiposus is highly variable. Furthermore, skinfold testing measures subcutaneous but not visceral fat, and therefore does not predict cardiovascular risk. However, some authors have suggested that the Slaughter equations for the sum of subscapular and triceps skinfolds can overcome this disadvantage. While this does not directly measure intra-abdominal fat, it appears to correlate with BMI and WC.[11] However, others see no advantages in these equations.[12]

To improve the accuracy of adiposity assessment in their study, Rodrigues et al.[6] used the adiposity index, calculated as a statistical construct of three anthropometric parameters: BMI, WC and the Slaughter equations. However, in clinical practice, anthropometric measures (mainly weight, height and waist circumference) appear to be sufficient to confirm a diagnosis of overweight/obesity, as well as to obtain information about body composition.[13]

Given the high prevalence of childhood overweight/obesity, it is not surprising that cardiovascular risk factors are also extremely frequent: 70% of obese children have at least one risk factor for cardiovascular disease, and 39% have two or more.[14] Recent studies have shown that activation of the inflammasome, a complex system of innate immune system sensors and receptors, leads to the maturation of proinflammatory cytokines that may be behind the pathogenesis of many diseases, particularly insulin resistance and arteriosclerosis, and hence in the clustering of risk factors so often seen in clinical practice.[1] Obesity-related cardiovascular risk factors are thus associated not only with heart disease in children (particularly atherosclerosis and left ventricular hypertrophy), but also with increased prevalence of cardiovascular risk factors in adulthood.[15,16]

The results obtained by Rodrigues et al.[6] are in agreement with those from a study in Brazilian school-aged children by Fraporti et al.,[17] who also found a correlation between overweight/obesity, waist circumference and high blood pressure. However, the populations and characteristics of the two studies were different, and so general inferences cannot be drawn, aside from their other limitations.[18]

In conclusion, promoting and assuring the best lifestyles for all children – not only those who are already overweight/obese – should be a priority for society in general and for health professionals in particular, in order to avoid abnormalities in body composition and resulting metabolic dysfunction. For this, systematic clinical monitoring of childhood health is essential and should include periodic blood pressure measurement. When treating overweight/obese children, pediatricians should not limit themselves to treating specific cardiometabolic risk profiles (particularly high blood pressure levels), but should continue to strive to ensure the health and well-being of all pediatric patients.[8] Cardiometabolic risk, and hypertension risk in particular, lie on a continuum of adiposopathy that includes the overall clinical characteristics of obese children.

Conflicts of interest

The author has no conflicts of interest to declare.

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