

EDITORIAL

Conicity index: an anthropometric indicator of abdominal obesity

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Abstract

The Brazil, as well as the world, is in a transition process, with changes in the nutritional, epidemiological and lifestyle profiles. At the same time, a progressive increase in life expectancy and the growth of chronic non-communicable diseases (NCDs) have been observed in recent decades. Among them are cardiovascular diseases whose main risk factor is obesity. In this scenario, anthropometric indicators are essential for the early identification of obesity, especially obesity accumulated in the abdominal region. The conicity index is one of the recommended tools for identifying the distribution of body fat, as it is associated with cardiovascular and metabolic complications in the population, especially in individuals with NCDs. Therefore, the use of the anthropometric indicator as a screening tool both in primary care and in epidemiological studies is recommended for the early identification of abdominal obesity.

Keywords: abdominal obesity; noncommunicable diseases; anthropometry

The changes in eating habits and lifestyle, in addition to higher life expectancy, have contributed to the growing increase in the incidence of chronic non-communicable diseases (NCDs) in Brazil and in the world¹. The NCDs are characterized by their multiplicity of risk factors, asymptomatic course and generally slow and prolonged clinical history, which can progress to varying degrees of disability or death. These include, mainly, cardiovascular diseases (CVD), diabetes mellitus (DM), hypertension (SAH) and chronic kidney disease (CKD)². This group of diseases has common risk factors and demands continued assistance from health services, which significantly affects the financial resources of public policy programs².

The NCDs are collectively responsible for 74% of all deaths worldwide, with 86% of the 17 million individuals dying each year in low- and middle-income countries¹. Most NCDs are considered preventable, as the main risk factors are modifiable: alcohol abuse, physical inactivity, smoking,

unhealthy diet and obesity. Among them, CVDs are the main cause of mortality in Brazil, corresponding to 28% of the population (381,428 individuals)¹. The excessive weight, hypertension and physical inactivity are, respectively, the first (57%), the second (45%) and the third (47%) main cardiovascular risk factors in the Brazilian population¹.

Excess weight plays an important negative role in the development of CVD and it is estimated that more than 1 billion people in the world are obese with a progressive increase in the younger population¹. In this context, easy-to-handle nutritional diagnostic indicators are essential for the early identification of obesity. Given the high health risk related to obesity, it is relevant that simple and accurate methods for its diagnosis are developed and used. Among them, the body mass index (BMI) is one of the anthropometric indicators widely used in epidemiological research and clinical settings, however, it does not differentiate between fat mass and muscle mass and/

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or the distribution of body fat, which can lead to errors. obesity classification. Therefore, methods that measure the distribution of body fat may represent a better alternative to determine obesity.

In this scenario, the conicity index (CI) was proposed by Valdez in 1991³ with the objective of identifying the distribution of body fat and the health risks related to abdominal obesity. The indicator uses simple and easy-to-perform anthropometric measurements: weight, height and waist circumference. As a result, it is a viable method due to its easy application, low operation cost and speed. This index is based on the hypothesis that people accumulate fat in the abdominal region, with the consequent change in body design from the shape of a cylinder to a double-cone (two cones with a common base), arranged one on top of the other, while the people with less fat in the central region have a cylinder appearance, representing an indicator of abdominal obesity. The increase in CI promotes the progression of the body from a cylindrical shape (A) to a biconic or double cone shape (B) (Figure 1).

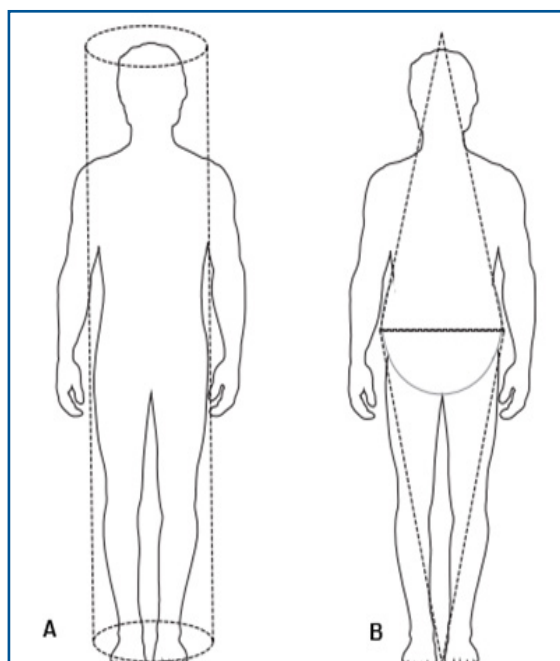


Figure 1: Conicity index concept theory⁴

The index is determined using the following mathematical equation:

$$\frac{\text{Waist circumference (m)}}{0.109 \sqrt{\frac{\text{Weight (kg)}}{\text{Height (m)}}}}$$

The value 0.109 is the constant that results from the root of the ratio between 4π (from the deduction of the perimeter of the circle of a cylinder) and the average human density of 1.050 kg/m^3 . The denominator is the cylinder produced by the weight and height of a given individual. Thus, when we calculate the CI, we have the following interpretation: for example, if the person has a CI of 1.20, this means that the waist circumference, taking into account their height and weight, is 1.20 times greater than the perimeter it would have if there were no abdominal fat (cylindrical person).

The theoretical range of the IC is 1.00 to 1.73, starting from a perfect cylinder for a perfect double cone.

The CI increases according to the accumulation of fat in the central region of the body, that is, the closer to 1.73, the greater the accumulation of abdominal fat.

In practice, CI verification is still not popular among health professionals, but the literature has already ensured that it is a useful, effective tool with good specificity in predicting cardiovascular risk and a good predictor of high coronary risk, as it detects changes in the distribution of body fat, allowing comparisons between individuals despite different measures of weight and height^{5,6}.

The Brazilian and international studies recommend that the CI be included in the general risk assessment for individuals with SAH, as this proved to be a useful clinical tool in estimating cardiovascular risk and propose its routine incorporation into clinical practice rather than solely depending on BMI. The excess fat, especially abdominal fat, is associated with the possibility of the individual to develop SAH as a result of their relationship with different mechanisms that raise blood pressure levels. These include renal dysfunction, endocrine changes, inflammation, and vascular injury⁷.

In addition to SAH, studies demonstrate the association of fat accumulation in the abdominal region with low-grade inflammation and one of the important causes for the development of insulin resistance and, consequently, DM. The use of an anthropometric method to identify abdominal fat in this population is of paramount importance and the CI is an efficient indicator for making this diagnosis.

Another important point is the identification of visceral obesity, as it is associated with a higher incidence of the aforementioned chronic diseases, especially CVD⁸. The quantification of visceral obesity is best determined by imaging exams such as computed tomography, gold standard method, but it requires high cost and specialized professionals. On the other hand, anthropometric indicators are easily obtained and, if accurate, offer possibility of diagnosis and monitoring in primary care, which is the main gateway to the public health system in Brazil. The CI proved to be one of the most accurate anthropometric indicators of abdominal obesity in discrimination of visceral obesity, mainly in men⁸.

Obesity and CKD are prevalent worldwide, and obesity among the dialysis population has steadily increased in recent years⁹. Studies show that the presence of abdominal obesity despite adequate BMI results in worse clinical outcomes in individuals with CKD^{10,11}. Based on this, the clinical practice guideline for nutrition in CKD recently suggests the use of CI in individuals with CKD on hemodialysis to assess nutritional status and as a predictor of mortality¹².

The increase in CI in individuals with CKD on hemodialysis was associated with worse survival, inflammation, reduced muscle mass and increased fat mass, regardless of age, sex and duration of dialysis⁴. These data suggest that assessing body fat distribution appears to be more important due to negative metabolic consequences than just assessing generalized obesity. In a recent study with these individuals, high CI was significantly associated in those with low weight measured by BMI compared to those in a eutrophic and overweight state, which suggests a

possible change in the pattern of nutritional status¹³.

Thus, the reflection on Public Health as an inter, multi and transdisciplinary field of investigation is evidenced by the studies listed in this issue¹⁴⁻²⁸. The methodological questions that are guided in the field of public health, converging to the rational of scientific activity, allow the experience of different approaches, but without explicit denial of that experienced by common sense.

In the Public Health field, there is no set of scientific subjects, that is specific to this field and, that is, able to approach different health problems. Thus, the publications listed in this issue¹⁴⁻²⁸ of the Journal of Human Growth

and Development, cover these methodological issues and subsidize the field of public health as being inter-trans-multi-disciplinary.

■ CONCLUSION

The CI proves to be an important indicator of body fat distribution, in addition to allowing comparisons between individuals with body weight and height differences. The literature recommends that the CI, a practical and low-cost indicator, be included in clinical routine and epidemiological research, as it is a useful screening tool for cardiovascular risk and metabolic complications.

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Resumo

O Brasil, bem como o mundo, está em processo de transição, com alterações no perfil nutricional, epidemiológico e de estilo de vida. Paralelamente, observa-se nas últimas décadas o aumento progressivo da expectativa de vida e crescimento das doenças crônicas não transmissíveis (DCNT). Entre elas, estão as doenças cardiovasculares que possuem como principal fator de risco a obesidade. Nesse cenário, os indicadores antropométricos são essenciais para a identificação precoce da obesidade, principalmente daquela acumulada na região abdominal. O índice de conicidade é uma das ferramentas recomendadas para a identificação da distribuição da gordura corporal, pois está associado as complicações cardiovasculares e metabólicas da população, principalmente dos indivíduos com DCNT. Portanto, a utilização do indicador antropométrico como ferramenta de rastreamento tanto na atenção primária quanto nos estudos epidemiológicos é aconselhada para a identificação precoce da obesidade abdominal.

Palavras-chave: obesidade abdominal, doenças crônicas não transmissíveis, antropometria

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