Evaluation of the relationships between simple anthropometric measures and bioelectrical impedance assessment variables with multivariate linear regression models to estimate body composition and fat distribution in adults: preliminary results

D. da C. de Sá-Caputo, A. Sonza, A. C. Coelho-Oliveira, J. Pessanha-Freitas, A. S. Reis, A. Francisca-Santos, E. M. dos Anjos, L. L. Paineiras-Domingos, T. de R. B. Guerra, A. da S. Franco, V. L. Xavier, C. J. Barbosa e Silva, M. C. Moura-Fernandes, V. A. Mendonça, A. C. R. Lacerda, A. da R. PinheiroMulder, A. Seixas, A. Sartorio, R. Taiar, M. Bernardo-Filho

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Background: overweight and obesity are conditions associated with sedentary lifestyle and accumulation of abdominal fat, determining increased mortality, favoring chronic diseases, and increasing cardiovascular risk. Although the evaluation of body composition and fat distribution are highly relevant, the high cost of the gold standard techniques limits their wide utilization. Therefore, the aim of this work was to explore the relationships between simple anthropometric measures and BIA variables using multivariate linear regression models to estimate body composition and fat distribution in adults.

Methods: in this cross-sectional study, sixty-eight adult individuals (20 males and 48 females) were subjected to bioelectrical impedance analysis (BIA), anthropometric measurements (waist circumference (WC), neck circumference (NC), mid-arm circumference (MAC)), allowing the calculation of conicity index (C-index), fat mass/fat-free mass (FM/FFM) ratios, body mass index (BMI) and body shape index (ABSI). Statistical analyzes were performed with the R program. Nonparametric Statistical tests were applied to compare the characteristics of participants of the groups (normal weight, overweight and obese). For qualitative variables, the Fisher's exact test was applied, and for quantitative variables, the pairedWilcoxon signed-rank test. To evaluate the linear association between each pair of variables, the Pearson correlation coefficient was calculated, and Multivariate linear regression models were adjusted using the stepwise variable selection method, with Akaike Information Criterion ($p \leq 0.05$).

Results: BIA variables with the highest correlations with anthropometric measures were total body water (TBW), body fat percentage (BFP), FM, FFM and FM/FFM. The multiple linear regression analysis showed, in general, that the same variables can be estimated through simple anthropometric measures.

Conclusions: The assessment of fat distribution in the body is desirable for the diagnosis and definition of obesity severity. However, the high cost of the instruments (dual energy X-ray absorptiometry, hydrostatic weighing, air displacement plethysmography, computed tomography, magnetic resonance) to assess it, favors the use of BMI in the clinical practice. Nevertheless, BMI does not represent a real fat distribution and body fat percentage. This highlights the relevance of the findings of the current study, since simple anthropometric variables can be used to estimate important BIA variables that are related to fat distribution and body composition.