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Agreement between Basal Metabolic Rate Measured by Bioelectrical Impedance Analysis and Estimated by Prediction Equations in Obese Groups

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Abstract : Basal metabolic rate (BMR) is widely used and an accepted measure of energy expenditure. Its principal determinant is body mass. However, this parameter is also correlated with a variety of other factors. The objective of this study is to measure BMR and compare it with the values obtained from predictive equations in adults classified according to their body mass index (BMI) values. 276 adults were included into the scope of this study. Their age, height and weight values were recorded. Five groups were designed based on their BMI values. First group (n = 85) was composed of individuals with BMI values varying between 18.5 and 24.9 kg/m². Those with BMI values varying from 25.0 to 29.9 kg/m²constituted Group 2 (n = 90). Individuals with 30.0-34.9 kg/m², 35.0-39.9 kg/m², > 40.0 kg/m² were included in Group 3 (n = 53), 4 (n = 28) and 5 (n = 20), respectively. The most commonly used equations to be compared with the measured BMR values were selected. For this purpose, the values were calculated by the use of four equations to predict BMR values, by name, introduced by Food and Agriculture Organization (FAO)/World Health Organization (WHO)/United Nations University (UNU), Harris and Benedict, Owen and Mifflin. Descriptive statistics, ANOVA, post-Hoc Tukey and Pearson’s correlation tests were performed by a statistical program designed for Windows (SPSS, version 16.0). p values smaller than 0.05 were accepted as statistically significant. Mean ± SD of groups 1, 2, 3, 4 and 5 for measured BMR in kcal were 1440.3 ± 210.0, 1618.8 ± 268.6, 1741.1 ± 345.2, 1853.1 ± 351.2 and 2028.0 ± 412.1, respectively. Upon evaluation of the comparison of means among groups, differences were highly significant between Group 1 and each of the remaining four groups. The values were increasing from Group 2 to Group 5. However, differences between Group 2 and Group 3, Group 3 and Group 4, Group 4 and Group 5 were not statistically significant. These insignificances were lost in predictive equations proposed by Harris and Benedict, FAO/WHO/UNU and Owen. For Mifflin, the insignificance was limited only to Group 4 and Group 5. Upon evaluation of the correlations of measured BMR and the estimated values computed from prediction equations, the lowest correlations between measured BMR and estimated BMR values were observed among the individuals within normal BMI range. The highest correlations were detected in individuals with BMI values varying between 30.0 and 34.9 kg/m². Correlations between measured BMR values and BMR values calculated by FAO/WHO/UNU as well as Owen were the same and the highest. In all groups, the highest correlations were observed between BMR values calculated from Mifflin and Harris and Benedict equations using age as an additional parameter. In conclusion, the unique resemblance of the FAO/WHO/UNU and Owen equations were pointed out. However, mean values obtained from FAO/WHO/UNU were much closer to the measured BMR values. Besides, the highest correlations were found between BMR calculated from FAO/WHO/UNU and measured BMR. These findings suggested that FAO/WHO/UNU was the most reliable equation, which may be used in conditions when the measured BMR values are not available.

Keywords : adult, basal metabolic rate, fao/who/unu, obesity, prediction equations
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