Development and validation of a population-specific prediction equation for total body water using deuterium dilution in adult males living in Colombo District

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Accurate assessment of body composition, fat mass (FM), fat free mass (FFM) and total body water (TBW) is vital in the early identification and management of non-communicable diseases (NCDs), which are rising rapidly in South Asia. Conventional indicators such as body mass index (BMI) inadequately reflect health risks in South Asians, who tend to have higher fat percentages at lower BMI cutoffs. Bioelectrical impedance analysis (BIA) offers a non-invasive method to estimate TBW, but its accuracy depends on population-specific equations. A cross-sectional study was conducted among 85 healthy adult males (≥18 years) in the Colombo District. TBW was measured using the gold standard deuterium (D_2O) dilution technique. Anthropometric (weight, height, BMI, waist circumference) and BIA derived parameters were collected. Participants were stratified into validation (n = 57) and cross validation (n = 28) groups. Multiple linear regression was used to derive a TBW prediction equation, which was then validated. Pearson's correlation and Bland Altman analyses were used to evaluate agreement with D_2O derived TBW. A new equation was developed: TBW (kg) = 8.96 + (0.497 × Weight) − (0.995 × BMI) + (0.197 × Waist Circumference). This showed a strong correlation (R^2 = 0.7815) and a small mean bias of –0.05 kg in Bland-Altman analysis. The newly developed anthropometry-based equation is accurate for use in clinical and field settings. The inclusion of weight and waist circumference as the only measured parameters makes it a practical field tool.

Keywords: *Total body water*, *Deuterium dilution*, *Body composition, Bioelectrical impedance*, *Sri Lankan male*