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Relationship between the phase angle, a measure of cellular health and integrity, and nutritional status in hemodialysis patients

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Objectives : Phase angle (PA), as measured by bioimpedance analysis, is considered to reflect the status of cell membranes and somatic cell mass. It has gained attention as a predictor of sarcopenia and indicator of muscle quality. We conducted this study to investigate any gender differences in the relationship between the PA and nutritional status in hemodialysis patients.

Methods : The subjects were in-center hemodialysis patients (201 males and 113 females; age: 73.6 ± 12.3 years) who underwent body composition analysis using the bioelectrical impedance analysis (BIA) method between 2017 and 2025. The following variables were examined: gender; age; dry weight (DW); body mass index (BMI); skeletal muscle index (SMI); and the Geriatric Nutritional Risk Index (GNRI). Body composition analysis was measured using the BIA with the Inbody S10 (Inbody Japan).

Results : A significant correlation between the PA and GNRI was observed in all the subjects ($r = 0.584$, $p < 0.01$). PA also exhibited positive correlations with the BMI, DW, skeletal muscle mass, and SMI (0.503, 0.590, 0.595, and 0.546 respectively, all $p < 0.01$), and negative correlations with age and the edema rate (ECW/TBW) (-0.592 and -0.883 respectively; both $p < 0.01$). PA was significantly higher in males ($3.5 \pm 1.3^\circ$) than in females ($2.8 \pm 0.9^\circ$) ($p < 0.01$). Correlations between PA and each variable (albumin, GNRI, DW, skeletal muscle mass, SMI, and age) were stronger in males, suggesting that gender may influence the relationship between PA and nutritional indicators in hemodialysis patients.

Conclusions : The relationship between the phase angle and nutritional status could be affected by the gender in hemodialysis patients. Body composition measurements may be particularly effective for assessing the nutrition of male patients.