

## Circulating micronutrients and clinical biomarkers of ageing in the context of skeletal muscle performance: a cross-sectional analysis using data from the Baltimore longitudinal study of ageing

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Sarcopenia's prevalence is predicted to rise dramatically over the next few decades<sup>(1)</sup>. There is an urgent need to accurately identify individuals at risk and develop preventative strategies<sup>(2,3)</sup>. Loss of skeletal muscle function with age is a key component of sarcopenia<sup>(4)</sup>. While many micronutrients are important for muscle function, and common clinical biomarkers, which are indicators of metabolic dysfunction, influence muscle physiology, their relationships with muscle performance have not been extensively investigated. Therefore, the aim of this study was to investigate associations between blood concentrations of micronutrients (vitamin B12, vitamin D, calcium, magnesium, potassium and iron) or routinely measured clinical biomarkers (albumin, haemoglobin and HbA1c) and measures of skeletal muscle strength and function (extended short physical performance battery (extSPPB) score, grip strength, and knee extension isokinetic and isometric peak torque). Cross-sectional data were obtained for 1,761 men and women, aged 22–103 years, from the Baltimore Longitudinal Study of Aging (BLSA). We investigated associations between age and all micronutrients, biomarkers and skeletal muscle strength and function measurements via univariate linear regression. Associations between each micronutrient or clinical biomarker and each muscle performance measurement were also investigated using unadjusted and adjusted linear regression models. Age was negatively associated with all measures of muscle strength and function ( $p < 0.0001$  for all). Positive relationships were observed between age and vitamin B12, vitamin D, calcium, magnesium, potassium and HbA1c, except for calcium ( $p = 0.06$ ) and magnesium ( $p = 0.95$ ) in men. Negative associations were observed between age and iron, albumin and haemoglobin, except for iron ( $p = 0.70$ ) and haemoglobin ( $p = 0.15$ ) in women. After adjustment for age, BMI, race and smoking status, haemoglobin was positively associated with extSPPB score in men ( $B = 0.11$ ,  $p < 0.0001$ ) and women ( $B = 0.08$ ,  $p < 0.0001$ ). In men, positive associations were observed between serum iron and extSPPB score ( $B = 0.002$ ,  $p = 0.002$ ), haemoglobin and grip strength ( $B = 0.85$ ,  $p < 0.0001$ ) and serum potassium and knee extension isokinetic ( $B = 16.94$ ,  $p = 0.002$ ) and isometric ( $B = 20.93$ ,  $p = 0.001$ ) strength. In women, positive associations were observed between serum magnesium and extSPPB score ( $B = 0.49$ ,  $p < 0.0001$ ) and serum vitamin D and isokinetic knee extension strength ( $B = 0.14$ ,  $p = 0.044$ ). These findings suggest that specific biomarkers indicating nutritional status or measures of metabolic dysfunction are positively associated with higher skeletal muscle performance. They may also be useful in identifying individuals at risk of sarcopenia. Further research in different populations could help inform potential preventative strategies that include nutrition.

### References

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