Skeletal muscle mass reference values based on body mass index in healthy children – a new approach

Kriszta Katinka Boros 1*, Gábor Veres† 2, 3, Hajnalka Oláh 3, Éva Richter 1, Áron Cseh 1, Antal Dezsőfi 1, András Arató 1, György Reusz 1, Dóra Dohos 4 and Katalin Eszter Müller 4,5 AND Orsolya Cseprekál 6

1 1st Department of Paediatrics, Semmelweis University, Budapest, Hungary

2 Gábor Veres†, Pediatrics Clinic University of Debrecen, Clinical Center ÁOK, DEKK, Debrecen, Hungary

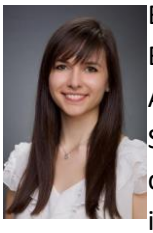
3 Semmelweis University, School of Ph.D. studies, Budapest, Hungary

4 Institute for Translational Medicine, University of Pécs, Hungary

5 Heim Pál National Pediatric Institute, Budapest, Hungary

6 Department of Transplantation and Surgery, Semmelweis University, Budapest, Hungary

Biography



Boros Kriszta Katinka, MD., Paediatric residence Doctor, Ph.D. student, was born in Budapest, Hungary. At 2010 she started the Semmelweis University in Budapest, Hungary. As a medical student she joined to a research group at the Ist Department of Paediatrics, Semmelweis University, investigating the role of micro-RNAs in inflammatory bowel disease. After graduating from university at 2016, she started her Ph.D. studies with main interest in body composition and body composition analysis. At 2018 she started the paediatrician training.

Abstract

Backgroud: Sarcopenia is associated with poor clinical outcome in patients with chronic diseases. BIA (bioimpendance analysis) is a widely accessible, easy to use measure of muscle mass based on whole-body electrical conductivity, and eligible for the diagnosis of sarcopaenia, however no recommendation to adjust for body size have yet available in pediatric population. Standard deviation (SD) score are frequently used in growth follow-up and to compare anthropometrical variables to detect the presence of malnutrition in children with chronic wasting disease. Our aim was to characterize the body composition parameters in patients with inflammatory bowel disease and to compare muscle mass (SMM) parameters with general pediatric population.

Methods: Body composition of normal population (n=307, aged between 9.9 and 19.3 years; 143 males) and of patients with inflammatory bowel disease (IBD) (n=57, aged between 6.7 and 18.7 years; with Crohn's disease, n=31, with ulcerative colitis n=26) were measured via bioelectrical impedance (InBody 720 device) in a cross-sectional manner. Effect of sex, age, height, weight and BMI were assessed. Reference tables

from body composition parameters were generated using a maximum-likelihood curve-fitting technique for calculating SD scores in accordance with the skewed distribution of the raw data (LMS method) using the Statistica Software.

Results: SMM was higher in patients (24.4+-6.34 vs 22.34+-8.38kg; p=0.03) compared to healthy controls. SMM showed a moderately strong correlation with age (R= 0.65; p<0.05) and a strong correlation with weight (R= 0.9; p<0.05, respectively) and height (R= 0.87; p<0.05). There was a moderately strong correlation between SMM and BMI (R=0.66 p<0.05). In multivariate stepwise, ridge regression analysis, sex and BMI remained the major predictors of SMM (sex: ß= -0.17 p<0.05; BMI: -0.6p<0.05), but not height. SMM of gender-age and BMI adjusted controls did not differ from patients, therefore BMI SD score based reference charts were generated for SMM values. SMM SDS was 0.00±0.08 in the patient population.

Conclusion: SMM could be an easy to measure biomarker of sarcopenia in patients with chronic inflammatory bowel disease. Calculation of BMI based SMM SD score serves as an objective estimation of loss in muscle mass in children with wasting diseases. Further follow up studies are needed to determine cut-off values and to prove the predictive role of this novel approach of SMM SDS for sarcopenia diagnostic.

Importance of research

As sarcopenia is associated with poor clinical outcomes, measuring body composition, especially muscle mass, will get a high importance in clinical care. There is a lack of uniform definition and diagnostic criteria of sarcopenia in children, therefore we hope this BMI based SMM SD score may contribute to the more precised diagnosis among paediatric patients.

Corresponding author:

Orsolya Cseprekál, Nephrologist, Department of Transplantation and Surgery, Semmelweis University, Budapest, Hungary. E: cseprekal.orsolya@gmail.com

References:

1. Orsso CE, Tibaes JRB, Oliveira CLP, et al. Low muscle mass and strength in pediatrics patients: Why should we care? *Clin Nutr*. 2019;38(5):2002-2015.

2. Cruz-Jentoft AJ, Bahat G, Bauer J, et al. Writing Group for the European Working Group on Sarcopenia in Older People 2 (EWGSOP2), and the Extended Group for EWGSOP2. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019 Jan 1;48(1):16-31.

3. Kim KM, Jang HC, Lim S. Differences among skeletal muscle mass indices derived from height-, weight-, and bodymass index-adjusted models in assessing sarcopenia. Korean J Intern Med 2016; 31: 643–50.

4. Gonzalez MC, Heymsfield SB. Bioelectrical impedance analysis for diagnosing sarcopenia and cachexia: what are we really estimating? J Cachexia Sarcopenia Muscle 2017; 8: 187–89.

5. Hwai Ooi P, Thompson-Hodgetts S, Pritchard-Wiard L, Pediatric Sarcopenia: A Paradigm in the Overall Definition of Malnutrition in Children? JPEN J Parenter Enteral Nutr. 2020 Mar;44(3):407-418.