

ABSTRACT OF THE DOCTORAL DISSERTATION

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Application of Bioelectrical Impedance Analysis (BIA) and Biochemical Markers in the Comprehensive Assessment of Nutritional Status and Functional Performance in Older Adults

prepared under the supervision of

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Malnutrition in older adults constitutes a significant clinical and public health concern. It is associated with increased comorbidity, mortality, and deterioration of both functional performance and quality of life. Despite growing awareness of the clinical significance of malnutrition in the geriatric population, the condition remains underdiagnosed. One of the reasons for this is the limitation of commonly used nutritional assessment methods, which are primarily based on anthropometric indicators and selected biochemical markers. Parameters such as body mass index (BMI), weight loss, or serum albumin concentration may be substantially affected by chronic inflammation, comorbidities, polypharmacy, and age-related changes in body composition.

The aim of this dissertation was to evaluate the relationships between bioelectrical impedance analysis (BIA) parameters, nutritional status, biochemical markers, and functional performance in older adults, as well as to assess the potential usefulness of BIA parameters in the comprehensive characterization of nutritional status in the geriatric population.

The dissertation was prepared in the form of a series of three thematically related publications. The first publication was a review paper that included a critical analysis of current diagnostic criteria for malnutrition in older adults and their limitations. The remaining two publications were

cross-sectional studies based on data obtained from the project “Ocena stanu zdrowia seniorów we Wrocławiu - Zdrowie Złotych Lat”.

The study included 195 older adults, 126 of whom additionally underwent laboratory biomarker assessment. Nutritional status was evaluated using the Mini Nutritional Assessment (MNA), while body composition was assessed using multifrequency bioelectrical impedance analysis (BIA). The evaluated parameters included fat-free mass (FFM), skeletal muscle mass (SMM), body fluid distribution, the extracellular water to total body water ratio (ECW/TBW), and phase angle. Selected biochemical markers, inflammatory parameters, and data regarding functional performance, frailty, and chronic diseases were also analyzed.

The analyses demonstrated that the risk of malnutrition in older adults was associated with reduced muscle mass, disturbances in body fluid distribution, and impaired cellular integrity reflected by lower phase angle values. No significant association was observed between the risk of malnutrition and fat mass. Parameters obtained by bioelectrical impedance analysis were associated both with nutritional status assessed using the MNA scale and with selected laboratory markers related to inflammation, metabolic status, and cellular integrity. Furthermore, in the cross-sectional analysis, poorer nutritional status was associated with greater functional limitations, higher frailty severity, and poorer self-rated health status.

The obtained findings indicate the multifactorial nature of malnutrition in the geriatric population and highlight the limitations of traditional anthropometric indicators in the assessment of nutritional status in older adults. Bioelectrical impedance analysis, particularly the assessment of phase angle and the ECW/TBW ratio, may constitute a valuable complement to geriatric assessment by providing additional information regarding body composition, fluid distribution, and parameters related to cellular integrity. Moreover, the combination of BIA parameters, biochemical markers, and functional assessment may provide a more comprehensive characterization of nutritional status in older adults.