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## Research paper

# Malnutrition and sarcopenia are associated with increased mortality rate in nursing home residents: A prospective study



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## ABSTRACT

**Background and aims:** The aim of this study was to determine the prevalence of malnutrition risk and sarcopenia in our elderly ( $\geq 65$  years) nursing home residents and find out their association with mortality.

**Material and method:** This prospective observational study with a follow-up of 12 months was done in 402 subjects (65 years old or older) living in a nursing home. Nutritional status was determined with Mini Nutritional Assessment (MNA). Sarcopenia was diagnosed according to European Working Group on Sarcopenia in Older People (EWGSOP) with the measurements of muscle mass, muscle strength and physical performance using mid upper arm muscle circumference (MUAC, cm), calf circumference (CC), a standardized handheld dynamometer and gait speed. Nutritional status and sarcopenia were compared with the 1-year mortality rate.

**Results:** According to MNA, 56.5% of the individuals were normal, 24.8% had malnutrition risk (MR) and 18.7% had malnutrition (MN). Sarcopenia was diagnosed in 73.3% of the residents. Reduced muscle strength was found in 94.5% of the population. MN/MR were found associated with sarcopenia ( $P < 0.0001$ ). After 12 months of follow-up, total mortality rate was 16.2%. MN, sarcopenia, BMI and MUAC were found well correlated with mortality (normal nutrition status: 10.6%, MR: 20.0% and MN: 28.0%,  $P < 0.001$ ; sarcopenic: 19.3% and non-sarcopenic: 7.5%,  $P = 0.012$ ). Malnutrition and sarcopenia were found related with mortality independent from other factors.

**Conclusion:** Malnutrition and sarcopenia are prevalent in nursing home residents. It is important to diagnose and treat malnutrition and sarcopenia in elderly nursing home residents for both can increase mortality independently.

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## 1. Introduction

Nearly one third of the old aged people fail to meet their daily dietary requirement for energy. Two out of three elderly people stated that they do skip meals. Malnutrition (MN) is related with variety of geriatric syndromes like sarcopenia, dependency, falls and fractures. It can increase the risk of pressure ulcers, cognitive decline, infections, hospital stay, costs and mortality [1]. The prevalence of malnutrition is different in various care settings. It is 5–30% in community-dwelling elderly, 30–50% in nursing homes, and 50–70% in the hospitals [2–7]. Ulger et al. found

increased 18-months mortality rate in nursing home residents with malnutrition risk (MR) or MN (N: 9.9%, MN risk: 24%, MN: 40.8%) [8]. Torma et al. also indicated increased mortality rate with malnutrition in nursing home independent from chronic diseases [9].

Anthropometric measurements, screening and assessment tests are used to diagnose MR and MN. Anthropometric measurements include weight, body mass index (BMI), circumferences of the extremities and skin-fold measurements. Height decreases with aging due the reasons such as senile kyphosis, shortening of spinal vertebrae and thinning of weight-bearing cartilage tissue. BMI  $< 21$  kg/m<sup>2</sup> was considered as an indicator of malnutrition (MN) [10]. International Dietetics and Nutrition Terminology defined BMI  $< 23$  kg/m<sup>2</sup> in elderly as underweight [11]. In elderly, calf circumference (CC) was found well correlated

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with muscle mass [12], and mid upper arm circumference (MUAC) was related with BMI [13].

Mini Nutritional Assessment (MNA) evaluates anthropometric measurements, BMI, weight loss, mobility, medical history (especially depression and cognitive disorders), medications, dietary intake and self-assessment of the patients. It can be used in all care settings including nursing homes [14,15].

According to definition by European Working Group on Sarcopenia in Older People (EWGSOP), sarcopenia is loss in muscle strength and function with extensive and progressive reduction in skeletal muscle mass [16]. Sarcopenia accelerates with age. In many studies, the prevalence is 5–25% in people aged between 60–70 years, and 11–50% in those over 80 years old. Halil et al. showed 68% sarcopenia in a national nursing home project including 711 elderly residents. They used handgrip strength for the diagnosis of sarcopenia according to Cardiovascular Health Study criteria [17]. Various studies about sarcopenia in nursing home residents showed prevalence between 29–85.4% [18–21]. Physical dependency and falls were associated with decreased quality of life in elderly [22]. As far as we know, few data exist in the literature about association between sarcopenia and mortality in nursing homes. Landi et al. showed association between sarcopenia and 6-months mortality rate in nursing home with hazard ratio of 2.34 [23]. Kimyagarov et al. could not find any significant relationship with sarcopenia and 1-year mortality rate [24].

In this study, our aim was to examine the prevalence of MR/MN and sarcopenia in our elderly ( $\geq 65$  years) nursing home residents and find out their association with mortality after 12 months of follow-up.

## 2. Material and method

### 2.1. Study design and patients

This was a prospective observational study, performed in a nursing home between May 2012 and May 2013. All residents over 65 years and older were included into the study. Exclusion criteria were age  $< 65$  years, residing in the center for less than a month, acute medical problem or trauma in the last month and severe cognitive impairment (Mini mental state examination score  $< 10/30$ ) that impaired MNA and muscle strength examination were

excluded. At the beginning, there were 539 residents in the center and 402 participated in the study according to inclusion/exclusion criteria.

### 2.2. Data collection

Demographic data, medical history, anthropometric measurements such as height, weight, mid upper arm circumference (MUAC), calf circumference (CC) and triceps skin-fold (TSF), MNA, a standardized handheld dynamometer and gait speed were used to assess nutritional status and sarcopenia. Demographic data and medical history were learned from residents, medical reports of the center and caregivers. Medical history of chronic diseases including dementia and depression was reported for each resident.

### 2.3. Assessment of nutrition status

Nutritional status was evaluated with MNA. It includes a short form with 6 questions (MNA-SF; screening test) and a second part including 12 more questions that is for the assessment [14]. MNA-SF score  $\geq 12$  was defined as normal nutritional status and no further assessment was done to those patients. Residents with MNA-SF  $\leq 11$  indicated further evaluation with the remaining 12 questions. The sum of the score of 18 questions was the result of MNA long form (MNA). According to MNA, score  $\geq 24$  indicated normal nutritional status, score between 17–23.5 showed MR and score  $< 17$  was MN.

### 2.4. Sarcopenia diagnosis: assessment of muscle mass and physical activity

Sarcopenia was diagnosed according to definition of European Working Group on Sarcopenia in Older People (EWGSOP), using muscle mass, muscle strength and physical performance [16] (Fig. 1). Muscle mass was predicted with the anthropometric measurements such as MUAC, TSF and CC [12,25]. MUAC is measured from the middle point of the upper arm between acromion of the scapula at the posterior part of the shoulder and olecranon process of ulna at elbow. CC is measured from the widest point of the calf, and  $< 31$  cm was related with decreased muscle mass [26]. TSF was measured with a Lange Skin-fold Caliper having a pressure of 10 g/mm<sup>2</sup> of contact surface area. The measurement

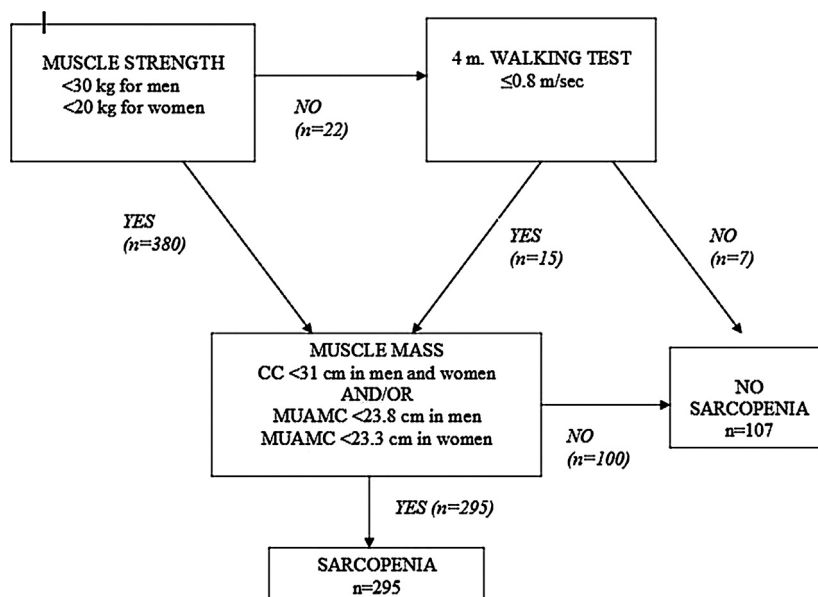


Fig. 1. Sarcopenia diagnosis algorithm.

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