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Prevalence of sarcopenia and its association with functional and nutritional status among male residents in a nursing home in Turkey

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Abstract

The prevalence of sarcopenia differs between different populations, ages, gender and between settings such as the community and nursing homes. Studies on the association of sarcopenia with functional status revealed conflicting results whereas its association with nutritional status is well documented. We aimed at investigating the prevalence of sarcopenia and its association with functional and nutritional status among male residents in a nursing home in Turkey. Fat free mass (FFM) was detected by bioelectric impedance analysis. Functional status was evaluated with Katz activities of daily living (ADL) and Lawton Instrumental activities of daily living (IADL). Nutritional assessment was performed by Mini Nutritional Assessment Test (MNA®). One hundred fifty-seven male residents composed the study cohort. Mean age was 73.1 ± 6.7 years. The prevalence of sarcopenia was 85.4%. No significant correlation was found between sarcopenia and ADL or IADL. There was a weak but significant correlation between IADL score and FFM ($r = 0.18$; $p = 0.02$). Sarcopenic residents had lower MNA score than non-sarcopenic residents (18.1 ± 3.2 *vs.* 21.8 ± 0.8, $p = 0.02$). FFM was significantly lower in the residents with malnutrition compared to well-nourished residents (26.8 ± 1 kg/body surface area *vs.* 28.1 ± 1.8 kg/body surface area, $p < 0.05$). In conclusion, the prevalence of sarcopenia was very high among male nursing home residents in Turkey. Sarcopenia was associated with low nutritional status but not with functional status.

Keywords: *Sarcopenia, prevalence, male, nursing home, functional status*

Introduction

Sarcopenia is the reduction of skeletal muscle mass, strength and endurance. It is a well-defined common feature of aging affecting the quality of life and socioeconomic status with an estimated direct healthcare cost of $18.5 billion in the United States in 2000 [1]. Its prevalence differs among different populations, ages, gender and as well as between elders living in the community or nursing homes [2–6]. Malnutrition and disability are further prevalent pathologies in the elderly. Although there is well-documented relation between sarcopenia and malnutrition [3,7], there are conflicting results on the association between sarcopenia and functional status [5,7–12]. In this study, we aimed at investigating the prevalence of sarcopenia and its association with functional and nutritional factors among male residents in a nursing home in Turkey.

Materials and methods

Subjects and measurements

The study was conducted in a nursing home in Istanbul. Male residents > 60 years of age who were not bedridden were included in the study for the sake of proper anthropometric and bioimpedance analysis (BIA) measurement.

Fat free mass (FFM) was measured by BIA via BC 532 model body analysis monitor convenient for personal use. Assessment of body composition using BIA has been validated by underwater weighing and dual energy X-ray absorptiometry (DEXA) [13–17]. The heights and weights of the participants were measured and body mass indices (kg/m^2) were calculated. Body surface area (BSA) was calculated by DuBois formula ($BSA = (kg^{0.425} \times m^{0.725}) \times 0.007184$). Sixty young men served as the control group for FFM. FFM was calculated according to

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the BSA and the study participants were regarded to be sarcopenic if they had FFM lower than two standard deviation of the mean value of the control group [13,18].

Evaluation of functional and nutritional status was performed by a physician in the form of patient, nurse aide and nurse interviews. Functional status were evaluated with 5-items Katz activities of daily living (ADL) and 7-items Lawton Instrumental activities of daily living (IADL). Nutritional assessment was performed by Mini Nutritional Assessment Test (MNA®). Residents with an MNA score <17 were assessed as undernourished, with an MNA score of 17–23.5 as at risk of undernutrition and >24 as well nourished [19].

Statistical analysis

The statistical analysis was carried out with Statistical Package for Social Sciences for Windows version 14.0 (SPSS Inc, Chicago, IL). Numerical variables were given as mean $\pm$ standard deviation. Two groups were compared with paired Student's *t*-test or Mann–Whitney *U* tests when necessary. Chi-square test with Yates correction and Fisher's exact test were used for 2×2 contingency tables when appropriate for non-numerical data. Correlations between numerical parameters were analysed with Spearman's ρ correlation test. p values ≤ 0.05 were considered significant.

Results

Demographic data, sarcopenia prevalence, functional and nutritional status

One hundred fifty-seven male residents composed the study cohort. Their mean age was 73.1 ± 6.7 years. Twenty-seven (17.2%) residents were >80 years of age and 73 (46.5%) residents were >75 years of age. The mean ADL score was 8.9 ± 2.0 and IADL score was 8.7 ± 4.6.

Sixty healthy men with a mean age of 34 ± 5 years (24–45 years) participated in the study as control group. The control group's mean FFM calculated for 1 m^2 of body surface area was 31.0 kg/body surface area (standard deviation: 0.7) and the cut-off level for sarcopenia (mean – 2 SD) was 29.6 kg/body surface area.

One hundred thirty-four (85.4%) residents were considered sarcopenic compared to the control group. Fourteen (8.9%) residents had overt malnutrition, 36 (22.9%) were under malnutrition risk and 107 (68.2%) were well nourished. Additional demographic data and functional status of the study cohort are outlined in Table I.

There was a significant negative correlation between age and FFM ($r = -0.20$; $p = 0.01$).

Association of sarcopenia with functional and nutritional status

ADL scores and IADL scores were not significantly different between sarcopenic and non-sarcopenic residents (8.9 ± 2.0 *vs.* 8.7 ± 1.9, $p > 0.05$ for ADL and 8.7 ± 4.7 *vs.* 8.8 ± 4.3, $p > 0.05$ for IADL, respectively). There was no correlation between ADL score and FFM ($r = 0.07$, $p = 0.34$) but there was a weak, but significant correlation between IADL score and FFM ($r = 0.18$; $p = 0.02$).

MNA scores were significantly lower in sarcopenic males compared to non-sarcopenic residents (18.1 ± 3.2 *vs.* 21.8 ± 0.8, $p = 0.02$). Among sarcopenic residents, 14 (10.4%) were malnourished, 33 (24.6%) residents were under malnutrition risk and 87 (64.9%) residents were well nourished. There were no malnourished non-sarcopenic residents, 3 (13.0%) residents were under malnutrition risk and 20 (87.0%) residents were well nourished. FFM was significantly lower in residents with malnutrition compared to well-nourished residents (26.8 ± 1 kg/BSA *vs.* 28.1 ± 1.8 kg/BSA, $p < 0.05$).

The data on FFM, functional and nutritional status of the sarcopenic and non-sarcopenic residents are outlined in Table II.

Table I. Demographic data, sarcopenia prevalence, functional status and nutritional status of the study cohort.

Age (year)	73.1 ± 6.7 (60–90)
Weight (kg)	67.0 ± 14.1 (38.9–105)
Height (cm)	162.2 ± 7.7 (145–181)
BMI (kg/m^2)	25.4 ± 5.0 (14.3–38.1)
No of chronic diseases	3.7 ± 1.8 (1–9)
No of drugs	7.5 ± 4.2 (0–18)
ADL score	8.9 ± 2.0 (2–10)
IADL score	8.7 ± 4.6 (0–14)

BMI, body mass index; ADL, activities of daily living; IADL, instrumental activities of daily living. Data are given as mean $\pm$ standard deviation (minimum—maximum) when available.

Table II. The comparison of fat free mass, ADL scores, IADL scores, MNA scores, number of chronic diseases and number of currently used drugs in sarcopenic *versus* non-sarcopenic residents.

	Sarcopenic residents ($n = 134$) (85.4%)	Non-sarcopenic residents ($n = 23$) (14.6%)	p
FFM (kg/BSA)	27.3 ± 1.6	30.7 ± 0.9	<0.0001*
ADL score	8.9 ± 2.0	8.7 ± 1.9	0.36
IADL score	8.7 ± 4.7	8.8 ± 4.3	0.94
MNA scores	18.1 ± 3.2	21.8 ± 0.8	0.02*

FFM, fat free mass; ADL, activities of daily living; IADL, instrumental activities of daily living; MNA, Mini Nutritional Assessment Test. Data are given as mean $\pm$ standard deviation.
*Statistically significant p values.

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Discussion

In this study, a very high prevalence of sarcopenia was detected in elderly men living in a nursing home. The prevalence of sarcopenia varies between different populations, age-groups, gender, as well as between elders living in the community or nursing homes [2–6,20]. In the USA, the prevalence of sarcopenia was reported to be 26.8% among 142 healthy community-dwelling males aged 64–92 years [3]; in Taiwan, it was reported 23.6% in 157 community-dwelling male elderly > 65 years of age [4] and in Hong Kong, it was reported very low as 12.3% in 262 elderly men > 70 years of age [21]. All of the aforementioned studies were conducted in community-dwelling, healthy elderly. The prevalence of sarcopenia, however, differs between community-dwelling and institutionalised elders [4,20]. In population-based surveys, not only including the community-dwelling elders, sarcopenia was found more prevalent. It was reported as high as >50% in male elders > 80 years of age in New Mexico [22], and 52% among male elders with a mean age of 70 years in USA [11]. However, the prevalence of 85.4% found in the present study is considerably higher than the aforementioned prevalences. Sarcopenia is reported as increasing with age [3,5,7]. Our study participants had a high mean age (73.1 ± 6.7 years). Almost half of the residents were >75 years of age. Also, the study was conducted in institutionalised elderly persons. Although none of the study participants was bedridden, they were very dependent in their ADL expressed by low ADL and IADL scores. They had more comorbidities and used more drugs than community-dwelling elderly and compared to other population-based studies. Undernutrition was frequent at around 30%. There is a well-documented relation between sarcopenia and malnutrition [3,7]. In our study, sarcopenic residents also had significantly lower MNA scores than non-sarcopenic residents and FFM was significantly lower in the residents with malnutrition compared to well-nourished residents indicating an association of sarcopenia with malnutrition also in our study cohort. Vitamin D has a unique place in the relation of malnutrition with sarcopenia [20]. The 25-hydroxyvitamin D level was found significantly lower in individuals both living in Turkey and Turkish emigrants living in other countries such as Germany [23]. Also, severe vitamin D deficiency has been found to be prevalent in institutionalised elderly persons in several countries [24]. On the other hand, some studies suggest sarcopenia as more prevalent among male elderly than the females especially in older ages as > 80 years [2,3]. It was reported as high as 52.9% even in community-dwelling men older than 80 years of age [3]. Another factor is, it was conducted in a different country: Turkey. In our previous study, sarcopenia prevalence was reported as 30%, among 120 active male community-dwelling healthy elders with a mean age of 69 ± 6.9 years – a figure also higher than in other community-based studies on elderly people [25]. We consider that high average age, being a study among pure nursing home residents, high undernutrition rate with a possibly low vitamin D status, male gender and population-based differences were the factors responsible from this very high sarcopenia prevalence in our study.

There are conflicting results on association of sarcopenia with functional status [5,7–12]. Some studies suggest that it is strongly associated with disability [5,7,11,12] whereas some other studies suggest that sarcopenia is not a risk factor for physical disability [9,10]. In a study on 1308 healthy community-dwelling elderly women aged > 75 years from French, sarcopenic women showed no decrease in physical function [9]. Also, the effect of sarcopenia on disability was found considerably smaller in longitudinal analyses than in cross-sectional analyses [12]. In the present study, no significant association between sarcopenia and functionality was found, but nevertheless a weak, but significant correlation between FFM and IADL score was detected which argues in favour of a connection between muscle mass and functional status. In a report from the USA, male sarcopenic elderly had lower associated functional impairment than the elder women [11]. Therefore, the weak association of muscle mass with functional status may be at least partly related to the male gender of our cohort.

In conclusion, this study represents the first one on prevalence of sarcopenia among institutionalised male elderly in Turkey – a country connecting Europe and Asia. The present examination highlights sarcopenia as an emergent health problem in this region and suggests that sarcopenia may not be so significantly associated with functional status as measured by ADL and IADL but with nutritional status. However, the relatively small number of subjects and its cross-sectional nature limits the present analysis.

Declaration of interest: The authors report no conflict of interest. The authors alone are responsible for the content and writing of the article.

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