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Protocol paper

Sarcopenia and its associated factors in Iranian older individuals: Results of SARIR study

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ABSTRACT

Background: Sarcopenia, an age- related loss of muscle mass, is a significant associating factor for functional impairment among older adults. The aim of this study was to investigate the prevalence of and associated factors for sarcopenia and severe sarcopenia among older adults in Iran.
Methods: A total of 300 individuals aged over 55 years were randomly selected from the 6th district of Tehran, Iran, in 2011. Sarcopenia was defined according to the European Working Group on Sarcopenia in Older People (EWGSOP) algorithm. The skeletal muscle mass was assessed using DXA. Muscle strength and muscle performance were assessed according to hand grip strength and 4-m usual walking gait speed test. A logistic regression analysis was performed.
Results: The prevalence values of presarcopenia, sarcopenia, and severe sarcopenia were 52.7%, 20.7%, and 6%, in men and 25.3%, 15.3%, and 5.3% in women, respectively. The prevalence of sarcopenia was higher in men older than 75 years than women in the same age range (36.7% versus 20%, respectively). Using multiple logistic regression models, age, sex, smoking, and body mass index (BMI) were independently associated with different stages of sarcopenia.
Conclusions: The prevalence of sarcopenia is high in Iranian older adults. The older age, male sex, smoking and lower BMI were independently associated with presarcopenia, sarcopenia and severe sarcopenia.

1. Introduction

Sarcopenia refers to the decline in skeletal muscle mass caused by ageing (Baumgartner et al., 1998). It is associated with dependency and fall and imposes a high cost to health systems (Houston, Nicklas, & Zizza, 2009). Recent studies have estimated the cost of dealing with complications of sarcopenia to be more than 18.5 billion dollars in 2000 (Roth, Metter, Ling, & Ferrucci, 2006). The increase in life expectancy and growth in elderly population has further added to the need for studying the ageing related health issues and its outcomes such as sarcopenia (Morley et al., 2011).

The prevalence of sarcopenia is dependent on the definition of sarcopenia that is used. Several definitions have been discussed in the literature, including the Baumgartner's definition which only uses low muscle mass in its diagnosis of sarcopenia and the more recent definition of the European Working Group on Sarcopenia (EWGSOP) which recommends using the presence of low muscle mass and low muscle function (Cruz-Jentoft et al., 2010) for diagnosis of sarcopenia.

Several cross country analysis has measured the prevalence of sarcopenia across the world. In Europe, Volpato et al. (2014) evaluated sarcopenia using EWGSOP definition (Volpato et al., 2014). In Asia, the literature has mainly focused on China, Japan, and Korea. Using bioelectrical impedance, Edith et al. reported the prevalence of sarcopenia among Chinese men and women over 70 years old as 12.3% and 7.6%, respectively (Lau, Lynn, Woo, & Kwok, 2005). The prevalence of sarcopenia in Korean population

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over 60 years are measured as 6.3% in men and 4.1% in women (Kim et al., 2009) according to the Baumgartner definition (Baumgartner et al., 1998). YAMADA, et al. used EWGSOP definition and reports the prevalence of sarcopenia among Japanese men and women aged 65–89 years at 21.8% and 22.1% (Yamada et al., 2013). Unlike the extensive studies on the East Asian countries, the literature is quite thin on the issue of sarcopenia in the Middle East.

In this study, we aimed to fill this gap in the literature by measuring the prevalence of sarcopenia in Iran, one the largest courtiers in the Middle East which is facing a rapidly growing elderly population. It is estimated that 24.9% of Iran population will be over 65 years of the 2050. We evaluated the prevalence of sarcopenia according to EWGSOP recommendations in Iranian population.

2. Method

The Sarcopenia and its determinants among Iranian elderly (SARIR) study was a cross-sectional population-based study designed to determine the frequency of sarcopenia in the subjects aged 55 years and older living in the 6th district of Tehran, the capital of Iran (Hashemi et al., 2012). The data were collected in a 6-month period from May to October of 2011 and in collaboration with Nutrition School and Endocrinology and Metabolism Research Institute of Tehran University of Medical Sciences. All of the participants completed the informed consent and the Endocrinology and Metabolism Research Institute ethics committee approved the study (code: E-00148).The study protocol and methods have been described in detail (Hashemi et al., 2012).

2.1. Study participants

We used cluster random sampling for 30 clusters in the 6th municipal division of district of Tehran identified by zip codes provided by Iran Postal Services. Clusters were chosen based on ten-digit postal code and subjects were asked for home interviews. Sampling was continued in each cluster in clockwise order until preferred sample size was achieved. In each cluster, one male and one female from each age group of 55–59, 60–64, 65–69, 70–74, and over 75 years were invited. During the home interviews, the interviewees were introduced to the project and its objectives. For those who agree to participate, the clinic appointments were set. Three groups of subjects were not invited to participate in the study: 1) subjects unable to move without crutches, walker or other assistive devices; 2) subjects with artificial limbs or limb prostheses; 3) subjects with a history of chronic disease (e.g. Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disorder (COPD), Chronic Renal Failure (CRF), cirrhosis liver failure and active cancer).

Demographic data, including socioeconomic status (e.g. Age, marital status, education), smoking and alcohol use, medical history, and drugs consumption history, such as sexual hormones, statins and angiotensin converting enzyme inhibitor that is shown in previous studies to affect muscle mass (Onder, Della Vedova, & Landi, 2009; Riechman, Andrews, Maclean, & Sheather, 2007) were noted by participants through general questionnaire. A short form physical activity questionnaire (IPAQ) was used to evaluate the participant's physical activity level (Ainsworth et al., 2000).

2.2. Measurement

2.2.1. Skeletal muscle mass

DXA scanner (Discovery model, manufactured by Hologic,Inc. Bedford USA: W S/N 84430) was used to determine body composition for each person. Participants were asked to lie supine without moving during imaging. Appendicular skeletal muscle mass (ASM) was measured for each participant as the sum of upper and lower limb muscle mass (kg) (Heymsfield et al., 1990) according to DXA results. The muscle mass index was then calculated as (Baumgartner et al., 1998):

$$\text{Muscle Mass Index} = \frac{\text{Appendicular Skeletal Muscle}}{\text{Height}^2}$$

Following the cut off points recommended by the European Working Group on Sarcopenia (EWGSOP), the muscle mass values of less than 5.45 (kg/m^2) for women and 7.26 (kg/m^2) for men were considered low (Cruz-Jentoft et al., 2010).

2.2.2. Hand grip strength

Hand grip strength was measured using a (baseline pneumatic squeeze bulb dynamometer,manufactured by Jamar,Inc. USA: c7489-02 Rolyan) which was a pneumatic instrument calibrated in pound per square (psi). The maximum voluntary contraction was measured three times for each hand with a 30-s rest in between measurements. The average measurements of the participant's left and right hands were calculated as their muscle strength. Age-gender specific thresholds suggested by Merkies et al. (2000) was used to identify people with low levels of muscle strength.

2.2.3. Muscle performance

Participants' muscle performance were evaluated using a 4-m walk gait speed test which is a part of the standard physical performance battery (SPPB) but it can also be used as a single parameter for clinical practice and research (Cruz-Jentoft et al., 2010). Each participant was asked to walk at his/her usual pace to the other end of the 4-m course, while the time was recorded by chronometer in seconds. Participants with gait speeds less than 0.8 m/s were considered to be cases with low muscle performance (Cruz-Jentoft et al., 2010).

2.2.4. Sarcopenia definition

Sarcopenia was defined according to EWGSOP definition which uses abnormality in three factors: 1) ASM, 2) Hand grip, and 3) Muscle performance. Based on this definition those with low ASM were considered as pre-sarcopenia. The pre-sarcopenic cases with either low hand grip or low muscle performance were considered as sarcopenia; and the pre- sarcopenic cases with both low hand grip and low muscle performance are considered as severe sarcopenia.

2.3. Statistical analysis

Data were analysed using SPSS (Statistical Package for the Social Sciences, Windows version16.0; SPSS, Inc., Chicago, IL). Mean (standard deviation: SD) values for continuous and frequencies (%) for categorical variables of the variables were compared between groups using student's t-test and x^2 test, respectively. Multiple logistic regression models were used to independently evaluate the associated factors between different stages of sarcopenia.

3. Results

Totally, three hundred individuals (equally divided based on gender) were recruited. Table 1 reports the general characteristics of people in our sample. The mean subjects' age was 66.8 ± 7.72 years and 50% of those were women. Rate of smoking and alcohol consumption was 12–13%. About one fifth of participants were identified with diabetes and more than one third had a history of using Statin.

Table 2 reports the characteristics of participants according to sarcopenia staging. No significant differences were found between