

Prevalence of Sarcopenia in Healthy Korean Elderly Women

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Background: We evaluated the prevalence of sarcopenia, presarcopenia, and severe sarcopenia in healthy Korean elderly women. **Methods:** We measured the muscle mass and muscle function of 196 ambulatory women over the age of 65 years who visited the University Hospital Menopause Clinic. Appendicular skeletal muscle mass was measured by dual energy X-ray absorptiometry to measure skeletal muscle mass index (SMI). Assessment of hand grip strength (HGS) of the dominant hand was performed to measure the muscle strength, and 4-m straight on-way path was used to measure gait speed for physical performance. The values used to define the presarcopenia, sarcopenia, and severe sarcopenia were based on the cutoff values proposed by the Asian Working Group for Sarcopenia (AWGS). **Results:** The mean age of women was 71.2 years, and the mean SMI in 196 women was 5.94 kg/m². The average HGS was 20.3 kg, and the mean gait speed was 1.08 m/sec. In 41 out of the 196 women (20.9%), the SMI was reduced to less than 5.4 kg/m². Fifty-nine women (30.1%) had HGS of less than 18 kg, and gait speed was less than 0.8 m/sec in 12 women (6.1%). Twenty-six women (13.3%) were classified into the presarcopenia stage, and 15 women (7.6%) were classified into the sarcopenia stage. There was no case of severe sarcopenia. **Conclusions:** One out of five relatively healthy women aged more than 65 years showed a decrease in muscle mass, and 7.6% of women showed a decrease in muscle mass and strength. The sarcopenia stage was also intensified with aging.

Key Words: Prevalence, Sarcopenia, Skeletal muscle

INTRODUCTION

The prevalence and measurable impact of sarcopenia depends crucially on how sarcopenia is defined. A proper definition is the necessary base for clinical diagnosis and development of tailored treatment.

The most commonly used definition of sarcopenia is the one proposed by the European Working Group on Sarcopenia in Older People (EWGSOP).[1] The EWGSOP definition included measurements of muscle mass, muscle strength, and physical performance for the diagnosis of sarcopenia. However, the cutoff points of the EWGSOP sarcopenia criteria were based on the white population. The EWGSOP-suggested definition of sarcopenia should be evaluated for its clinical implications in other populations, including the Asian population.

The sarcopenia experts and researchers from some Asian countries including

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South Korea organized the Asian Working Group for Sarcopenia (AWGS). This group proposed a diagnostic algorithm based on the currently available evidence in Asia. Although recommended approaches for measurements of muscle mass, muscle strength, and physical performance by AWGS are similar to the EWGSOP definition, the cutoff values proposed by AWGS are different from those proposed by EWGSOP considering the difference in ethnicities, body size, lifestyles, and cultural background.[2]

In this study, we evaluated the prevalence of presarcopenia, sarcopenia, and severe sarcopenia in healthy Korean elderly women. The cutoff values used to define were based on the values proposed by AWGS.

METHODS

1. Materials

From December 2011 to June 2014, we measured the muscle mass and muscle function (muscle strength and physical performance) of 196 ambulatory women over the age of 65 years who visited the University Hospital Menopause Clinic. This study was approved by the Institutional Review Board of Chung-Ang University Hospital. All subjects provided their informed consent.

2. Methods

1) Muscle mass

The AWGS recommended using height-adjusted appendicular skeletal muscle mass (skeletal muscle mass index, SMI), and suggested cutoff values of 5.4 kg/m² for women by using dual energy X-ray absorptiometry (DXA). Appendicular skeletal muscle mass was measured by DXA (Lunar Prodigy Advance, GE Lunar, Madison, WI, USA). Appendicular skeletal muscle mass was calculated as the sum of the lean soft tissue mass in both arms and legs.

2) Muscle strength

The AWGS recommended using the lower 20th percentile of handgrip strength in the study population as the cutoff value for low muscle strength. Low handgrip strength was defined as <18 kg for women by AWGS. Assessment of hand grip strength (HGS) of the dominant hand was performed according to the standardised testing procedure of the American Society of Hand Therapists with the Jamar hand-held dynamometer (Sammons Preston Inc.,

Bolingbrook, IL, USA), which has been established as a reliable measure in community-dwelling older adults.[3] The individuals were seated with their shoulders adducted, their elbows flexed at 90°, and their forearms in neutral position. The mean of the three trials was recorded in kg.[4]

3) Physical performance

The AWGS suggested using ≤0.8 m/sec as the cutoff for low physical performance with 6 m gait speed for measurement of physical performance. In this study, 4-m straight on-way path was used for measurement of gait speed. Participants were asked to walk 4 m at their usual pace. Participants completed one practice and then two timed trials. Raw scores were recorded as the time in seconds required to walk four meters on each of the two trials, with the better trial used for scoring.[5]

4) Definition of presarcopenia, sarcopenia, and severe sarcopenia

The 'presarcopenia' stage was characterized by low muscle mass without impact on muscle strength or physical performance. The 'sarcopenia' stage was characterized by low muscle mass, plus low muscle strength or low physical performance. 'Severe sarcopenia' was defined when all three criteria of the definition were met (low muscle mass, low muscle strength, and low physical performance) as suggested by EWGSOP.[1]

5) Statistical analysis

Data are expressed as the mean ± standard deviation (SD) and as a percentage. Differences between groups were tested using a Student t-test or the Mann-Whitney test, and the χ^2 -test was used to test the difference in the distribution of categorical variables. A *P*-value <0.05 was considered statistically significant in all analyses. Data were

Table 1. Clinical characteristics

	Total (N=196)	<75 years old (N=162)	≥75 years old (N=34)
Age (mean ± SD)	71.2 ± 4.6	69.5 ± 2.6	79.3 ± 2.8
Body mass index (kg/m ²)	24.2 ± 3.3	24.1 ± 3.2	24.2 ± 3.3
Skeletal muscle index (kg/m ²)	5.94 ± 0.68	5.95 ± 0.68	5.88 ± 0.67
Hand grip strength (kg)	20.3 ± 4.3	20.8 ± 4.4	17.9 ± 3.2
Gait speed (m/sec)	1.08 ± 0.27	1.06 ± 0.27	1.16 ± 0.22

SD, standard deviation.

Table 2. Prevalence of abnormal muscle mass and muscle function

Age	Total number	SMI < 5.4 kg/m ²		HGS < 18 kg		GS ≤ 0.8 m/sec	
		Number	%	Number	%	Number	%
All ages	196	41	20.9	59	30.1	12	6.1
< 75 years old	162	33	20.4	38	23.5	12	7.4
≥ 75 years old	34	8	23.5	21	61.8 ^{a)}	0	0

^{a)}Significantly different from that in the other group.

SMI, skeletal muscle mass index; HGS, hand grip strength; GS, gate speed.

analyzed using SPSS for Windows (version 12.0; SPSS Inc., Chicago, IL, USA).

RESULTS

The mean age of women was 71.2 years, and the mean SMI in 196 women was 5.94 kg/m². The mean HGS was 20.3 kg, and the mean gait speed was 1.08 m/sec (Table 1). In 41 out of the 196 women (20.9%), the SMI was reduced to less than 5.4 kg/m². Fifty-nine women (30.1%) had HGS of less than 18 kg, and gait speed was less than 0.8 m/sec in 12 women (6.1%).

The target group was divided into two groups based on age 75 years and older or less than 75 years. There were a total of 162 women in the 65- to 74-year-old age group, and there were a total of 34 women in the 75 years and older age group. A reduction in SMI to less than 5.4 kg/m² was observed in 33 women (20.4%) of the less than 75 years age group and in 8 women (23.5%) of the 75 years and older age group. Thirty-eight women (23.5%) in the less than 75 years age group and 21 women (61.8%) in the 75 years and older age group had low HGS, and 12 women (7.4%) in the less than 75 years age group and none of the women in the 75 years and older age group had low physical performance (Table 2).

Twenty-six women (13.3%) were classified into the presarcopenia stage, which is defined as decreased muscle mass only without lower muscle strength and lower physical performance.

Sarcopenia was defined as decreased muscle mass with one of the two parameters (lower muscle strength or lower physical performance), and 15 women (7.6%) were classified into the sarcopenia stage. There was no case of severe sarcopenia, which is defined as decreased skeletal muscle mass with both parameters (lower muscle strength and lower physical performance).

According to the age groups, in the less than 75 years

age group, 24 women (14.8%) had presarcopenia, 9 women (5.6%) had sarcopenia, and none of the women had severe sarcopenia. In the 75 years and older age group, 2 women (5.9%) had presarcopenia, 6 women (17.6%) had sarcopenia, and none of the women had severe sarcopenia. This finding indicated that, with an increase in age, the prevalence of sarcopenia was significantly increased compared to that of presarcopenia ($P=0.032$).

DISCUSSION

The term 'sarcopenia' was first used in 1995 by Rosenberg and Roubenoff [6]; he made this word by combining two Greek words, Sarx (flesh) and penia (loss).

Sarcopenia initially referred to only lowered skeletal muscle mass, but it evolved as a clinical terminology combined with the concept of not only quantity of skeletal muscle mass but also quality and physical performance, then the term becomes more specific and keeps changing.

In general, sarcopenia, which appears to be related with aging, includes loss of quantity and quality of skeletal muscle.[7]

In 2010, EWGSOP suggested a clinical definition and consensus diagnostic criteria for age-related sarcopenia. The EWGSOP also suggested a conceptual staging as 'presarcopenia', 'sarcopenia', and 'severe sarcopenia' according to the status of muscle mass, muscle strength, and physical performance. However, this diagnostic strategy has been based on white population, and body size and physical performance among Asian people might differ from Caucasians, and the definitions of muscle-related parameters should be redefined within each ethnic group.

Then, the Asian Working Group for sarcopenia published a consensus report about the diagnosis of sarcopenia and strategy for sarcopenia screening and assessment. This study used the diagnostic cutoff value suggested by the AWGS.

The strength of this study is that it is the first trial perform-

ed in Korea to measure muscle function including muscle strength and physical performance as well as muscle mass and then to analyze the data based on the criteria suggested by the AWGS.

One out of five relatively healthy postmenopausal women aged more than 65 years assessed according to the cutoff value suggested by the AWGS showed decreased muscle mass (presarcopenia), and 7.6% of women had decreased muscle mass and muscle strength (sarcopenia).

The prevalence of sarcopenia was significantly increased compared to that of presarcopenia in the 75 years and older age group than in the less than 75 years age group. This indicated that the sarcopenia stage was aggravated by aging, but no case of severe sarcopenia was found.

A variety of methods for measuring muscle mass, muscle strength, and physical performance have been suggested. The EWGSOP group recommends measuring muscle mass with computed tomography (CT), magnetic resonance imaging (MRI), and bioelectrical impedance analysis (BIA) in addition to DXA. With respect to measurement of muscle strength, knee flexion/extension and peak expiratory flow can also be a measure of muscle strength besides HGS. Short physical performance battery, the timed get-up-and-go test, and the stair climb power test are recommended for measuring physical performance in addition testing the gait speed. The AWGS recommends DXA or BIA for measurement of the muscle mass and proposed the cutoff value for each method. We have to keep in mind that the prevalence of presarcopenia and sarcopenia could be different when BIA tests are used because the measurement of muscle mass in this study was based on the standard of DXA. DXA measures body composition as bone mineral content, body fat mass, and lean body mass individually. The coefficient of variation could reach 0.9% for bone mineral content, 2% for fat mass, and 0.6% for the lean body mass, which represents the muscle mass, and it is possible to perform accurate measurement as the test is repeated.[8] Measurement of muscle mass by DXA showed good agreement with the result obtained using CT or MRI in the DXA verification research. Therefore, DXA is considered the standard method for measurement of muscle mass taking into account its cost-effectiveness.[9]

HGS, a measure of the maximum voluntary force of the hand, has been described as a simple method in assessing muscle function.[10] Grip strength is used not only to de-

scribe the status of the hand but also to characterise overall upper extremity strength.[11,12] The American Society of Hand Therapists (ASHT) has recommended that grip strength should be measured using the Jamar dynamometer with its handle in the second position.[3]

Many studies have reported that HGS begins to decline when women become more than 50 years old, and it declines even further after the age of 60 years.[13-16] This study also showed lower HGS in the 75 years and older age group than in the less than 75 years age group and the prevalence of low HGS was significantly increased in the older age group whose HGS was less than 18 kg, which was the cutoff value.

Among the available physical performance measures, gait speed is suitable to be implemented in the standard clinical evaluation of older persons because it is a quick, inexpensive, reliable measure of functional capacity, with high interrater and test-retest reliability.[17-19]

A recent systematic review proposed a gait speed of 0.8 m/sec as a predictor of poor clinical outcomes and 0.6 m/sec as a threshold to predict further functional decline in those older adults already impaired.[20] This value is consistent with our cutoff value suggested by the AWGS.

It is known that the distance walked during the gait speed test does not affect the recorded gait speed.[21-23] Hence, although the AWGS suggests a cutoff value of gait speed using the 6 m gait speed test, the result obtained with the 4 m gait speed test in this study is considered to be unaffected even we used the same cutoff value suggested by the AWGS.

The first limitation of this study is that it does not represent the whole Korean elderly women population since this study targeted relatively healthy women capable of walking independently among those aged more than 65 years.

Second, the number of women enrolled in this study is not enough to predict the change according to the age, so there are limitations in analyzing the difference between the two groups because the number of women aged 75 years or older was too small. Therefore, a large-scale population-based study is necessary in the future.

Third, for measuring the gait speed, this study measured the 4 m speed rather than 6-m speed recommended by the AWGS. However, it can be considered that this does not cause any difference in the results.

In conclusion, one out of five relatively healthy women aged more than 65 years showed a decrease in muscle mass in South Korea, and 7.6% of women showed a decrease in muscle mass and strength. The sarcopenia stage was also intensified with aging, but severe sarcopenia was not observed.

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