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Original Study

The Prevalence of Sarcopenia in Chinese Elderly Nursing Home Residents: A Comparison of 4 Diagnostic Criteria

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A B S T R A C T

Objectives: To investigate the prevalence and associated factors of sarcopenia defined by different criteria in nursing home residents.
Design: A cross-sectional study.
Setting: Four nursing homes in Chengdu, China.
Participants: Elderly adults aged 65 years or older.
Measurements: We applied 4 diagnostic criteria [European Working Group on Sarcopenia in Older People (EWGSOP), Asia Working Group for Sarcopenia (AWGS), International Working Group on Sarcopenia (IWGS), and Foundation for the National Institutes of Health (FNIH)] to define sarcopenia. Muscle mass, strength, and function were measured based on bioimpedance analysis, handgrip strength, and walking speed, respectively. Nutrition status, activities of daily living, calf circumference (CC), and other covariates were evaluated.
Results: We included 277 participants. The prevalence of sarcopenia was 32.5%, 34.3%, 38.3%, and 31.4% according to the EWGSOP, AWGS, IWGS, and FNIH criteria, respectively. Fifty-eight participants (20.9%) were sarcopenic by all the 4 criteria. Regardless of the diagnostic criteria of sarcopenia, malnutrition was independently associated with sarcopenia [EWGSOP: odds ratio (OR) 4.02, 95% confidence interval (CI) 1.05-15.39; IWGS: OR 2.46, 95% CI 1.23-4.90; AWGS: OR 3.29, 95% CI 1.49-7.28; FNIH: OR 4.52, 95% CI 1.28-16.00], whereas CC was negatively associated with sarcopenia [EWGSOP: OR per standard deviation (SD) 0.32, 95% CI 0.20-0.52; IWGS: OR per SD 0.26, 95% CI 0.15-0.43; AWGS: OR per SD 0.32, 95% CI 0.19-0.52; FNIH: OR per SD 0.39, 95% CI 0.25-0.60]. Furthermore, falls ≥1 time in the past year were associated with AWGS-defined sarcopenia (OR 2.92, 95% CI 1.04-8.22).
Conclusion/Implications: Sarcopenia is highly prevalent in elderly Chinese nursing home residents regardless of the diagnostic criteria. Malnutrition and CC are associated with sarcopenia defined by different criteria. Therefore, it is important to assess sarcopenia and malnutrition in the management of nursing home residents. Prospective studies addressing the outcomes of sarcopenia in nursing home residents are warranted.

Sarcopenia is a new geriatric syndrome that is featured by the loss of muscle mass, muscle strength, and physical function.[1] There is growing evidence that sarcopenia is associated with many negative outcomes, such as falls, functional disability, poor quality of life, and death, in not only elderly adults but also patients with different chronic diseases, such as cancer and diabetes.[2–4]

The prevalence of sarcopenia in community-dwelling older adults has been well documented in previous studies.[5,6] However, there are limited data addressing the prevalence of sarcopenia in nursing home residents, although sarcopenia was supposed to be highly prevalent in this special population according to not only study data[7,8] but also clinical experience. For example, a cross-sectional study showed that 41 (40.2%) participants were sarcopenic in 11 long-term nursing homes in Australia.[8]

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One of the major obstacles in the research of sarcopenia is the lack of unique diagnostic criteria.[9] There are currently at least 6 diagnostic criteria developed by the international groups, such as the European Working Group on Sarcopenia in Older People (EWGSOP) criteria[10] and the Asia Working Group for Sarcopenia (AWGS) criteria.[11] It is obvious that the prevalence of sarcopenia varies when using different diagnostic criteria. For example, the prevalence of sarcopenia in community-dwelling elderly adults varied from 8.72% to 28.5 % according to different criteria.[12] Even using the same diagnostic criteria, the use of different cutoff points may have an impact on the results. For example, Beaudart and colleagues reported that following the EWGSOP criteria, the prevalence of sarcopenia varied from 9.25% to 18% according to the different cutoff points.[13]

To our knowledge, there are no published data regarding the prevalence of sarcopenia in elderly nursing home residents in mainland China. In addition, there are no published data with respect to the comparison of different diagnostic criteria for sarcopenia in nursing home residents. More importantly, it is unclear whether the risk factors of sarcopenia alter when sarcopenia is defined by different criteria. Therefore, we conducted this study to investigate the prevalence and associated factors of sarcopenia defined by different diagnostic criteria in a study population of Chinese elderly nursing home residents.

Methods

During October to December 2017, we invited elderly adults (≥65 years of age) living in 4 nursing homes in Chengdu City, China, to participate in this study. Subjects with the following conditions were excluded: (1) refusing to participate in the study, (2) unable to walk, (3) unable to communicate with others, (4) having an implanted pacemaker, (5) renal failure, and (6) clinically visible edema. All participants (or legal proxies for those who were unable to sign their names) signed the informed consent. The study protocol was approved by the Research Ethics Committee of our university.

Definitions of Sarcopenia

We defined sarcopenia according to 4 internationally diagnostic criteria: (1) the EWGSOP,[10] (2) the AWGS,[11] (3) the International Working Group on Sarcopenia (IWGS),[14] and (4) the Foundation for the National Institutes of Health (FNIH) Sarcopenia Project.[15] The detailed information of these criteria and the relevant cutoff points are presented in Supplementary Table 1.

All the 4 criteria defined sarcopenia according to low skeletal muscle mass, low strength, and/or low physical function. Skeletal muscle mass was estimated according to the skeletal muscle index, which was calculated using the following equation: appendicular skeletal muscle mass (ASM)/height^2. The ASM was estimated by a trained nurse using a bioimpedance analysis (BIA) device (InBody 230, Biospace, Korea). The handgrip strength (HS) was measured by trained nurses using strain gauge sensors (EH101, Xiangshan Inc, Guangdong, China). For each participant, the HS was measured 3 times for each hand, and the highest value was recorded. The physical function was estimated using gait speed (GS) through a 4-m walking test. Trained nurses asked the participants to walk 4 m with their usual speed; canes and walkers were allowed if necessary.

Nutrition Status Assessment

The nutrition status of each participant was evaluated by trained nurses using the Mini Nutritional Assessment questionnaire.[16] Its total score ranges from 0 to 30. The higher the score, the better is the nutrition status. Scores of 0-17, 17-23.5, and 23.5-30 indicate malnutrition, malnutrition risk, and normal nutrition status, respectively.

Assessment of Activities of Daily Living

Trained nurses applied the Physical Self-Maintenance Scale developed by Lawton and Brody[17] to assess the activities of daily living (ADL) of each participant. The Physical Self-Maintenance Scale has 6 items (ie, eating, toileting, dressing, grooming, walking, and bathing) and 4 options for each item (ie, "can do by myself," "some difficulty but can do by myself," "need some help from other people," and "cannot do by myself"). The participants who chose "cannot do by myself" or "need some help from other people" on any of the 6 items were considered having ADL disability.

Other Covariates

We collected the following data from the medical records in the nursing homes: age, gender, smoking status, alcohol drinking status, and comorbidities (hypertension, ischemic heart disease, chronic obstructive pulmonary disease, diabetes, stroke, cancer of any type, osteoarthritis, Parkinson's disease, falls in the past year, cognitive impairment, and depression). The calf circumference (CC), body weight, and height of each participant were also measured by trained nurses.

Body mass index was calculated as body weight (in kilograms) divided the square of body height (in meters). We also collected the fasting blood samples from all participants. The following variables were then tested: serum creatinine, serum cystatin C, serum albumin, and hemoglobin.

Statistical Analyses

The data analyses were performed using SPSS version 20.0 (SPSS Inc, Chicago, IL). $P < .05$ indicates statistical significance. We presented the categorical data as counts (percentages), the normal distributed continuous data as mean (standard deviation [SD]), and the abnormal distributed continuous data as median (interquartile range). The group differences of the 3 types of data were compared using chi-square test or Fisher exact test, 1-way analysis of variance, and Mann-Whitney *U* test, respectively. We also performed subgroup analyses according to gender.

The overlap of sarcopenia defined by the 4 diagnostic criteria was presented using a Venn diagram. The relationship between sarcopenia and the potentially associated factors was estimated by deriving odds ratios (ORs) and 95% confidence intervals (CIs) from univariate logistic regression models. In these models, age, serum creatinine, serum cystatin C, serum albumin, hemoglobin, body mass index, and CC were treated as continuous data (per year for age and per SD for the other covariates), whereas the other covariates were treated as categorical data.

We also performed the backward stepwise multivariate logistic regression models to identify the independently associated factors. We included the covariates of age and gender in the initial model, and the covariates with a $P < .1$ in the univariate logistic regression models. The probability of stepwise entry and removal of variables were $P < .05$ and $P > .10$, respectively. We also checked the multicollinearity among the covariates using Spearman correlations.

Results

Characteristics of Participants

We included 277 participants (83 men and 194 women) with a mean age of 81.6 ± 3.3 years. The characteristics of the study population are presented in Table 1. Women were significantly older than men (mean age: 82.0 vs 80.7 years, respectively). Not surprisingly, serum creatinine, serum cystatin C, hemoglobin, CC, HS, GS, and ASM were all significantly lower in women than in men (Table 1).