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Prevalence of sarcopenia and its associated factors in patients attending geriatric clinics in Vietnam: a cross-sectional study

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ABSTRACT

Objectives This study aims to investigate the prevalence of sarcopenia and its associated factors in patients attending geriatric clinics in Vietnam.

Design and setting A cross-sectional study was conducted in consecutive patients aged ≥60 visiting outpatient clinics of the National Geriatric Hospital in Hanoi, Vietnam, from January 2018 to October 2018. Handgrip strength was measured with a hand dynamometer. Whole-body dual-energy X-ray absorptiometry was applied to measure the appendicular skeletal muscle mass. Sarcopenia was defined by the criteria proposed by the Asian Working Group for Sarcopenia (AWGS 2019) and by the Foundation for the National Institutes of Health (FNIH) Sarcopenia Project.

Results There were 600 participants, mean age 70.0±8.0, 60.8% female. The prevalence of sarcopenia was 54.7% according to AWGS 2019 criteria and 40.5% according to FNIH. In multivariate logistic regression, age (adjusted OR 1.08, 95% CI 1.05 to 1.11), male (adjusted OR 2.03, 95% CI 1.29 to 3.21), underweight (adjusted OR 2.32, 95% CI 1.22 to 4.41), being malnourished (adjusted OR 3.77, 95% CI 1.19 to 11.91), chronic lung diseases (adjusted OR 3.48, 95% CI 2.10 to 5.77) and lower physical activity were significantly associated with sarcopenia defined by AWGS 2019 criteria. With FNIH definition, the significantly associated factors were age (adjusted OR 1.07, 95% CI 1.04 to 1.11), male (adjusted OR 6.78, 95% CI 4.12 to 11.17), low education (adjusted OR 2.15, 95% CI 1.27 to 3.63), being malnourished (adjusted OR 3.35, 95% CI 1.28 to 8.76), chronic lung diseases (adjusted OR 2.58, 95% CI 1.56 to 4.28) and lower physical activity level.

Conclusion The prevalence of sarcopenia in patients attending geriatric clinics was high. Further studies are needed to examine the impact of sarcopenia on adverse outcomes in this population.

INTRODUCTION

Sarcopenia, defined as low muscle mass in combination with a decline of grip strength or in walking speed, can increase the risk of functional impairment, falls, mortality and healthcare expenditure.[1][2] In 2016,

Strengths and limitations of this study

► This is the first study to examine the prevalence of sarcopenia and its associated factors in older patients attending geriatric clinics in Vietnam.
► This study contained a large sample of older patients with high-quality detailed clinical information and muscle mass was measured using dual energy X-ray absorptiometry.
► This study was conducted at one geriatric hospital in Vietnam, which may not be representative for all older people in Vietnam.

sarcopenia was regconised as a disease by the WHO and received an International Classification of Diseases 10th Revision (ICD-10) code (code ICD-10-CM: M62.84).[3] The global prevalence of sarcopenia was around 6%–22% in people aged 65 years or older, which increased with age and varied across regions.[4] In Asia, the reported prevalence of sarcopenia was around 10%–30% in community setting[2] and was about 50% in hospitalised patients.[5][6] However, there is limited evidence on the prevalence of sarcopenia in older patients attending primary care and geriatric clinics. Older patients with multiple chronic diseases are at higher risk of having sarcopenia.[7]

The population in Vietnam, a country in Asia, is rapidly ageing.[8] The percentage of people aged 60 or over is estimated to be 26.1% in the next 30 years.[8] Nearly 40% of older people in the community in Vietnam had multiple chronic diseases.[9][10] Due to the ageing population, the population size, and the high prevalence of multimorbidity, the impact of sarcopenia in older people in Vietnam may be significant. However, the evidence of sarcopenia in older people attending outpatient clinics in Vietnam is

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Table 1 Participant general characteristics

Characteristics	All (N=600)	AWGS definition			FNIH definition		
		Non-sarcopenia (N=272)	Sarcopenia (N=328)	P value	Non-sarcopenia (N=357)	Sarcopenia (N=243)	P value
Age (years)	70.0±8.0	67.2±6.6	72.2±8.5	<0.001	67.8±6.8	73.2±8.6	<0.001
Age groups:							
60–69 years	323 (53.8)	184 (67.6)	139 (42.4)	<0.001	230 (64.4)	93 (38.3)	<0.001
70–79 years	184 (30.7)	76 (27.9)	108 (32.9)		102 (28.6)	82 (33.7)	
≥80 years	93 (15.5)	12 (3.7)	81 (24.7)		25 (7.0)	68 (28.0)	
Female	365 (60.8)	199 (73.2)	166 (50.6)	0.001	275 (77.0)	90 (37.0)	<0.001
Low education	118 (19.7)	46 (12.9)	72 (29.6)	<0.001	46 (12.9)	72 (29.6)	<0.001
Living alone (defined as single/divorced/widow)	114 (19.0)	32 (11.8)	82 (25.0)	<0.001	47 (13.2)	67 (27.6)	<0.001
Rural living	276 (46.0)	109 (40.7)	167 (51.2)	0.002	145 (41.1)	131 (54.4)	0.002
Body mass index:							
Underweight	88 (14.7)	20 (7.4)	68 (20.4)	<0.001	32 (9.0)	56 (23.0)	<0.01
Normal	422 (70.3)	196 (72.1)	226 (68.9)		273 (76.5)	149 (61.3)	
Overweight	90 (15.0)	56 (20.6)	34 (10.4)		52 (14.6)	38 (15.6)	
Grip strength (kg)	18.50±7.53	22.67±7.71	15.05±5.31	<0.001	21.25±7.45	14.47±5.58	<0.001
ASM (kg)	11.39±3.02	12.68±3.51	10.41±2.13	<0.001	12.07±3.27	10.46±2.36	<0.001
Hospitalisation in the last 12 months	231 (38.5)	68 (25.3)	163 (50.3)	<0.001	97 (27.6)	134 (55.4)	<0.001
Malnourished	48 (8.0)	4 (1.5)	44 (13.7)	<0.001	8 (2.3)	40 (16.7)	<0.001
Physical activity level							
High	120 (20.0)	75 (28.7)	45 (14.3)	<0.001	92 (27.3)	28 (11.8)	<0.001
Moderate	317 (52.8)	149 (57.1)	168 (53.5)		191 (56.7)	126 (52.9)	
Low	138 (23.0)	37 (14.2)	101 (32.2)		54 (16.0)	84 (35.3)	
Charlson comorbidity index	1.51±1.15	1.27±1.05	1.71±1.19	<0.001	1.29±1.11	1.85±1.13	<0.001
Details of chronic diseases:							
Chronic kidney disease	291 (48.5)	99 (41.4)	192 (63.4)	<0.001	138 (44.5)	153 (65.9)	<0.001
Hypertension	285 (47.5)	114 (41.9)	171 (52.1)	0.042	151 (42.3)	134 (55.1)	0.001
Chronic lung diseases (COPD/asthma)	284 (47.3)	90 (33.1)	194 (59.1)	<0.001	126 (35.3)	158 (65.0)	<0.001
Diabetes	106 (17.7)	47 (17.3)	59 (18.0)	0.544	56 (15.7)	50 (20.6)	0.131
PVD	39 (6.5)	13 (4.8)	26 (7.9)	0.032	17 (4.8)	22 (9.1)	0.033
Stroke	6 (1.0)	0 (0.0)	6 (1.8)	0.165	2 (0.6)	4 (1.6)	0.184
Myocardial infarction	16 (2.7)	5 (1.8)	11 (3.4)	0.273	7 (2.0)	9 (3.7)	0.185

Continued

Table 1 Continued

Characteristics	All (N=600)	AWGS definition			FNIH definition		
		Non-sarcopenia (N=272)	Sarcopenia (N=328)	P value	Non-sarcopenia (N=357)	Sarcopenia (N=243)	P value
Heart failure	9 (1.5)	4 (1.5)	5 (1.5)	0.763	4 (1.1)	5 (2.1)	0.525
Cancer	7 (1.2)	0 (0)	7 (2.1)	0.044	1 (0.3)	6 (2.5)	0.006
Dementia	3 (0.5)	1 (0.4)	2 (0.6)	0.691	1 (0.3)	2 (0.8)	0.349

Continuous data are presented as mean±standard deviation. Categorical data are shown as n (%).
ASM, appendicular skeletal muscles mass; AWGS, Asian Working Group for Sarcopenia; COPD, chronic obstructive pulmonary disease; MNA, mini nutritional assessment; PVD, peripheral vascular disease.

scarce. Therefore, this study aims to investigate the prevalence of sarcopenia and its associated factors in older patients attending geriatric clinics in Vietnam.

METHODS

Participants

Consecutive patients aged 60 years or above visiting the Outpatient Clinics of the National Geriatric Hospital in Hanoi, Vietnam, were recruited from January 2018 to October 2018 (online supplemental figure). Exclusion criteria were: (1) blind or deaf, (2) severe dementia or delirium, (3) pace-maker implanted and (4) unable to provide consent or refused to participate in the study.

Written informed consent was obtained from all participants.

Sample size calculation

The sample size was determined using a single population proportion formula: $n=Z^2_{1-\alpha/2}\times[p\times(1-p)/d^2]$, with n=the required sample size, $Z_{1-\alpha/2}=1.96$ (with $\alpha=0.05\%$ and 95% confidence interval), p=prevalence of sarcopenia in older patients and d=precision (assumed as 0.05). As there has been no study on sarcopenia in geriatric patients in Vietnam, we assumed p to be 50%. Therefore, the sample size for our study was calculated to be at least 384 participants.

Data collection

Data were collected from medical records and patient measurement. Information from medical records were extracted using a predefined data collection form, including demographic characteristics (age, sex, marital status, education level, rural/urban living) and medical history. Low education level was defined as a completion of primary school or lower. Comorbidities were recorded based on a predefined list, and a Charlson Comorbidity Index was also calculated for each participant.[11] Nutritional status was assessed with the Mini Nutritional Assessment Short Form (MNA-SF) tool, the maximum score is 14 points and a total score ≤7 points indicating a malnourished status.[12]

Physical activity: The International Physical Activity Questionnaire (IPAQ) was used to measure physical activity level of the participants.[13] The IPAQ included questions regarding vigorous and moderate activity, and walking in the previous 7 days. The metabolic equivalent task (MET, in minutes per week) of each category was calculated by multiplying the reported weekly minutes spent by the corresponding MET score (8 for vigorous activities, 4 for moderate activities and 3.3 for walking). Then the total score (in MET-minutes per week) was generated by summing these three activity categories (vigorous and moderate activity and walking). Physical activity levels were classified based on the total score as follows: low, <600 MET-minutes per week; moderate, 600–3000 MET-minutes per week and high, >3000 MET-minutes per week.[13]
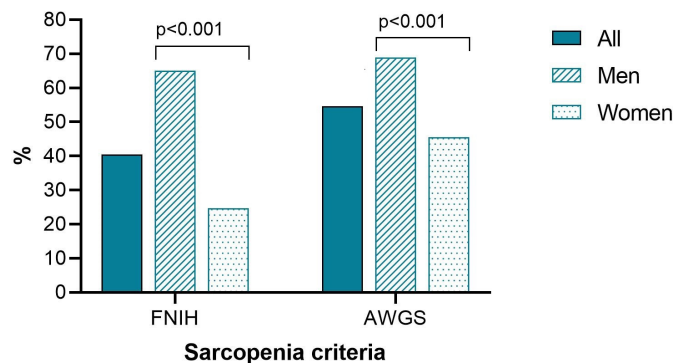
Figure 1 The prevalence of sarcopenia in men and women. AWGS, Asian Working Group for Sarcopenia; FNIH, Foundation for the National Institutes of Health.

Weight (kg): Participants' weight were measured using an electronic scale (Electronic Body Scale TCS-200-RT), in standing position, minimal clothing and barefoot. Weight was recorded to the nearest 0.1 kg.

Height (m): Participants were measured against a convenient flat wall. Participants were barefoot and height was recorded to the nearest 0.1 cm.

Body mass index (BMI) was calculated as weight/height^2 (kg/m^2) and was categorised into three groups underweight (<18.50), normal (18.50–24.99) and overweight (≥25.00).

Grip strength (kg): Handgrip strength was measured using a dynamometer (Jamar Hydraulic Hand Dynamometer 5030 J1 made in USA). The participants were instructed to sit upright on a chair without armrest, with the elbows flexed at 90°. The measurement was conducted once in the right hand, and once in the left hand. The highest value of the two measurements was used for the analysis.

Muscle mass: Each participant received a whole body dual X-ray absorptiometry scan (DXA Medix DR C12, Mauguio, France) to measure regional lean mass (kg), total body fat (kg) and total body fat percentage (%). Appendicular skeletal muscle (ASM, in kg) was defined as the sum of the lean soft tissue masses of the arms and legs.[14]

Sarcopenia definition
In this study, sarcopenia was defined as low muscle mass plus low grip strength,[2] using cut-points suggested by the Asian Working Group on Sarcopenia (AWGS 2019) and the Foundation for the National Institutes of Health (FNIH).[15 16]

According to AWGS 2019, low muscle mass was defined with ASM/height^2<7.0 kg/m^2 in men and <5.4 kg/m^2 in women, and cut-points for low grip strength were <28 kg in men and <18 kg in women.[16]

According to FNIH, the recommended cut-points for low grip strength were <26 kg in men and <16 kg in women, and low muscle mass was defined as ASM adjusted for BMI (ASM/BMI)<0.789 in men and <0.512 in women.[15]

Statistical analysis
Analysis of the data was performed using SPSS for Windows V.20.0 (IBM Corp., Armonk, New York, USA). Continuous variables are presented as mean (±SD), and categorical variables as frequency and percentage. Comparisons between participants with and without sarcopenia were assessed using X^2 tests for categorical variables and Student's t-tests for continuous variables. Two-tailed p values<0.05 were considered statistically significant.

The kappa statistic was applied to investigate the agreement between the two sarcopenia definition. The degrees of agreement were defined as: poor (kappa coefficient ≤0.20), fair (0.21≤kappa coefficient <0.40), moderate (0.41≤kappa coefficient <0.60), good (0.61≤kappa coefficient <0.80) and very good (0.81–1.00).[17]

Multivariate logistic regression was applied to identify associated factors for prevalence of sarcopenia. Univariate logistic regression was performed on sociodemographic factors (age, sex, education, marital status, living areas) and other potential factors that can be associated with sarcopenia based on the literature such as BMI, nutritional status, physical activity level, comorbidities and recent hospitalisation (in the past 12 months). Only variables that had a p value<0.20 on univariate analysis were selected for multivariate analysis. A backward elimination method was applied and the final model retained variables significant at p<0.05. All variables were examined for interaction and multicollinearity.

Patient and public involvement
Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS
There were 600 participants. They had a mean age of 70.0±8.0 years and 60.8% were female. Overall, the most common chronic diseases were chronic kidney disease, hypertension, chronic lung disease and diabetes. Table 1 presents the general characteristics of the participants.

The prevalence of sarcopenia according to AWGS criteria was 54.7%, and 40.5% according to FNIH. The

Table 2 The agreement between the AWGS and FNIH definitions of sarcopenia

	Non-sarcopenic (AWGS) N=272	Sarcopenic (AWGS) N=328
Non-sarcopenic (FNIH) N=357	259	98
Sarcopenic (FNIH) N=243	13	230

AWGS, Asian Working Group for Sarcopenia; FNIH, Foundation for the National Institutes of Health.

Table 3 Univariate logistic regression of potential factors associated with sarcopenia

Variables	AWGS definition		FNIH definition	
	Unadjusted ORs for sarcopenia (95% CI)	P value	Unadjusted ORs for sarcopenia (95% CI)	P value
Age	1.09 (1.07 to 1.11)	<0.001	1.09 (1.07 to 1.12)	<0.001
Male	2.66 (1.89 to 3.76)	0.001	5.70 (3.98 to 8.16)	<0.001
Low education	1.99 (1.30 to 3.04)	<0.01	2.85 (1.90 to 4.31)	<0.001
Living alone (defined as single/divorced/widow)	2.49 (1.59 to 3.89)	<0.001	2.50 (1.65 to 3.80)	<0.001
Rural living	1.53 (1.11 to 2.12)	0.002	1.71 (1.23 to 2.38)	0.002
Underweight	3.29 (1.94 to 5.59)	<0.001	3.04 (1.90 to 4.87)	<0.001
Hospitalisation in the last 12 months	2.99 (2.11 to 4.25)	<0.001	3.25 (2.30 to 4.59)	<0.001
Malnourished	10.37 (3.67 to 29.25)	<0.001	8.45 (3.90 to 18.41)	<0.001
Physical activity level				
High	1 (reference)	<0.001	1 (reference)	<0.001
Moderate	1.88 (1.22 to 2.89)		2.17 (1.34 to 3.50)	
Low	4.55 (2.69 to 7.71)		5.11 (2.96 to 8.80)	
Charlson comorbidity index	1.42 (1.22 to 1.65)	<0.001	1.56 (1.34 to 1.81)	<0.001
Chronic kidney disease	2.45 (1.73 to 3.46)	<0.001	2.41 (1.70 to 3.43)	<0.001
Hypertension	1.51 (1.10 to 2.09)	0.013	1.68 (1.21 to 2.33)	0.002
Chronic lung diseases (COPD/asthma)	2.93 (2.09 to 4.9)	<0.001	3.41 (2.42 to 4.80)	<0.001
Diabetes	1.05 (0.69 to 1.60)	0.821	1.39 (0.91 to 2.10)	0.124
PVD	1.72 (0.86 to 3.41)	0.123	2.00 (1.03 to 3.83)	0.039

Only variables with the number of cases ≥30 were selected for univariate analysis.
AWGS, Asian Working Group for Sarcopenia; COPD, chronic obstructive pulmonary disease; FNIH, Foundation for the National Institutes of Health; PVD, peripheral vascular disease.

prevalence of sarcopenia was significantly higher in men compared with women (figure 1).

The Kappa coefficient value was 0.64 (95% CI 0.58 to 0.70), indicating a moderate–good correlation between the two sarcopenia definitions. Table 2 shows the overlap between the two definitions.

Univariate logistic regression of potential associated factors for sarcopenia is presented in table 3.

In multivariate logistic regression, age (adjusted OR 1.08, 95% CI 1.05 to 1.11), male (adjusted OR 2.03, 95% CI 1.29 to 3.21), underweight (adjusted OR 2.32, 95% CI 1.22 to 4.41), being malnourished (adjusted OR 3.77,

Table 4 Factors associated with sarcopenia on multivariate logistic regression

	Sarcopenia AWGS 2019		Sarcopenia FNIH	
	Adjusted odds ratios (95% CI)	P value	Adjusted odds ratios (95% CI)	P value
Age	1.08 (1.05 to 1.11)	<0.001	1.07 (1.04 to 1.11)	<0.001
Male	2.03 (1.29 to 3.21)	0.002	6.78 (4.12 to 11.17)	<0.001
Low education	–	–	2.15 (1.27 to 3.63)	0.004
Underweight	2.32 (1.22 to 4.41)	0.010	–	–
Malnourished	3.77 (1.19 to 11.91)	0.024	3.35 (1.28 to 8.76)	0.013
Physical activity levels				
High (reference group)	1	<0.001	1	<0.001
Moderate	4.12 (2.34 to 7.26)		6.27 (3.33 to 11.81)	
Low	7.02 (3.52 to 14.01)		10.75 (5.10 to 22.65)	
Chronic lung diseases (COPD/Asthma)	3.48 (2.10 to 5.77)	<0.001	2.58 (1.56 to 4.28)	<0.001

AWGS, Asian Working Group for Sarcopenia; ; COPD, chronic obstructive pulmonary disease; FNIH, Foundation for the National Institutes of Health.

95% CI 1.19 to 11.91), chronic lung diseases (adjusted OR 3.48, 95% CI 2.10 to 5.77) and lower physical activity were significantly associated with sarcopenia defined by AWGS criteria. Similarly, the significantly associated factors with sarcopenia defined by FNIH criteria were age, male, low education, being malnourished, chronic lung diseases and lower physical activity level (table 4).

DISCUSSION

In this study, in 600 older community dwellers attending outpatient clinics at a geriatric hospital in Vietnam, the prevalence of sarcopenia was quite high and varied according to the criteria used. There was a moderate–good correlation between the two AWGS and FNIH definitions, and a higher prevalence of sarcopenia was identified using AWGS criteria (low muscle mass defined as ASM adjusted for height) compared with FNIH criteria (low muscle mass defined as ASM adjusted for BMI) (54.7% vs 40.5%, respectively). Older age, male, lower physical activity level, a malnourished status defined by MNA-SF and chronic lung disease were consistently associated with sarcopenia defined by either AWGS 2019 or FNIH.

Our findings were in line with previous studies in Asia, which showed that about half of geriatric patients were diagnosed with sarcopenia.[5 6] However, compared with several other studies in geriatric outpatients in Western countries, the prevalence of sarcopenia in our study was higher. In a study in 298 older patients attending geriatric clinics in Spain, the prevalence of sarcopenia defined by the criteria of the European Working Group on Sarcopenia in Older People (EWGSOP) was 19.1%.[18] In another study in 189 older outpatients in Denmark, the prevalence of sarcopenia (defined by EWGSOP) was 26%.[19] The high prevalence of sarcopenia in our study may be explained by the fact that our study population were old, (mean age 70, with 15% were 80 or older) and had high prevalence of chronic diseases. Several studies have reported higher sarcopenia prevalence in groups of older patients with chronic illnesses, 15%–50% in patients with cancer, 30%–45% with liver failure, 15%–33% with diabetes and 60%–70% for critically ill patients in the intensive care unit.[20]

Interestingly, in our study, male was associated with increased risk of sarcopenia. Previous studies showed that prevalence of sarcopenia was significantly higher in male compared with female.[21 22] There has been evidence that the rate of skeletal muscle loss was accelerated in men compared with women.[23 24] Sex hormones may contribute to this difference. At advanced stage of ageing, there is a substantial decrease of testosterone, a potent anabolic factor promoting the synthesis of skeletal muscle protein and muscular regeneration, in men.[25 26]

The findings from this study suggest that more effort is needed to increase awareness of sarcopenia and to implement sarcopenia screening in older patients in Vietnam, particularly in patients with chronic lung diseases. The relationship between lung function and sarcopenia was reported in several studies. In a study in 1907 participants in Korea, participants with low muscle mass had low forced vital capacity (FVC) or low forced expiratory volume in 1s (FEV1) values.[27] In another study in 605 community-dwelling older healthy women in Korea, hand grip strength was positively associated with pulmonary function.[28] There are several mechanisms that can explain the association between sarcopenia and pulmonary dysfunction. Chronic systematic inflammation, which is a common factor in chronic lung diseases, can cause myocyte apoptosis and muscle proteolysis.[29 30] Ventilation-perfusion mismatch and reduced physical activity in chronic lung disease may lead to poor muscular oxygenation.[31] In addition, respiratory skeletal muscles, including the diaphragm, are also affected by the generalised sarcopenic process as other skeletal muscles.[32]

Our findings also suggest that older patients should receive assessments of nutritional status and physical activity routinely. There was a high prevalence of physical inactivity and malnutrition in Vietnam.[10] According to the International Clinical Practice Guidelines for Sarcopenia, the prescription of resistance-based physical activity and conditionally recommend protein supplementation/a protein-rich diet were strongly recommended to treat sarcopenia.[4]

This study has several limitations. First, it was conducted in the geriatric clinics, where the prevalence of sarcopenia is likely to be higher than in the community. Second, this study was conducted at a single hospital in Vietnam, which may not be representative for all older patients in Vietnam. Therefore, results should be cautiously interpreted and generalised to all older patients.

CONCLUSION

In this study in older patients attending geriatric clinics in Vietnam, the prevalence of sarcopenia was high. Further studies are needed to examine the impact of sarcopenia on adverse outcomes in this population.

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