Original Research

NUTRITIONAL STATUS AND PREVALENCE OF SARCOPENIA USING THE DIFFERENT CLASSIFICATION SCALES AMONG THE ELDERLY IN A RURAL COMMUNE IN THAI BINH PROVINCE

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ABSTRACT

Aims: To describe the prevalence of sarcopenia using different classification scales among the elderly in Dong Hoang commune, Dong Hung district, Thai Binh province.

Methods: A cross-sectional study was conducted on 224 elderly individuals. The nutritional status of the participants was assessed and classified using the Mini Nutritional Assessment (MNA), body mass index (BMI), and physical activity levels (IPAQ-SF). Sarcopenia was diagnosed using AWGS, SARC-F, SARC-CalF, and Ishii criteria.

Results: The prevalence of malnutrition, based on BMI and MNA criteria, was 12.9% and 19.6%, respectively. The highest sarcopenia rate was observed when using the Ishii criteria (49.1%), followed by SARC-CalF (42.4%), AWGS 2019 (39.3%), and SARC-F (33.5%). The sarcopenia prevalence was highest in the ≥ 80 age group. Chronic energy deficiency, low physical activity level, and MNA-based malnutrition were statistically significantly associated with sarcopenia (p<0.05).

Conclusion: Sarcopenia is prevalent among the elderly and increases rapidly with age. Malnutrition, chronic energy deficiency, and low physical activity level are key factors associated with sarcopenia. Enhancing screening for early detection and implementing nutritional interventions, and physical activity promotion are essential to reducing the risk of sarcopenia in this population.

Keywords: *sarcopenia, elderly, rural, Thai Binh province.*

I. INTRODUCTION

Population aging is a global trend, including in Vietnam, and has become a significant social issue that profoundly impacts the overall development process of all nations worldwide in political, economic, cultural, and social aspects. Consequently, health issues like malnutrition, muscle mass loss, and weakness are increasingly prevalent among the elderly.

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These conditions affect mobility, increase the risk of falls, injuries, and chronic diseases, and ultimately lead to a decline in the quality of life for older adults [1-3]. In response, the Healthy Aging strategy has been a central focus of the World Health Organization (WHO) on aging for the period 2015–2030. This strategy has introduced a new approach to elderly healthcare, emphasizing the optimization of intrinsic capacity and functional ability as individuals age.

Sarcopenia is a common condition in the elderly, which can occur earlier in chronic diseases, inflammatory conditions, organ failure, or sedentary lifestyles of long-term hospitalized patients. Sarcopenia is also the cause of many adverse health events, including falls and injuries, reduced daily functional activities, hospitalization, re-hospitalization, and lower mortality rate [1]. Sarcopenia is a disease with a code M62.84 according to the International Classification of Diseases ICD-10-CM since September 2016. However, there is still no global consensus on a unified diagnostic standard for sarcopenia. Different associations worldwide have different criteria for diagnosing this condition. The most commonly used criteria in both research and clinical practice are the Asian Working Group for Sarcopenia (AWGS), the European Working Group on Sarcopenia in Older People (EWGSOP), and the National Institutes of Health (NIH) in the United States. In addition, some other sarcopenia screening tools are also recommended for application in the community, such as SARC-F, SARC-CalF, and the Ishii formula. In 2019, AWGS proposed a diagnostic criterion for sarcopenia based on data from the Asian population [2].

The estimated prevalence of sarcopenia in older adults ranges from 5% to 50% depending on gender, age, medical conditions, and diagnostic criteria [3]. Early diagnosis of sarcopenia is essential for effective treatment and management. However, currently, most clinicians do not fully understand the necessary diagnostic tools to identify the disease for prevention and treatment of patients. In addition, studies on sarcopenia in Vietnam are limited, although emerging evidence suggests that the prevalence increases with age. A community-based study in 2020 showed the sarcopenia prevalence of 20% in the elderly Vietnamese in urban areas [4], and an hospital-based study in 2022 showed that the prevalence of sarcopenia in elderly inpatients at Hanoi Medical University Hospital was 67.5% [5]. There has been no report of sarcopenia prevalence in rural areas of Vietnam. Besides sarcopenia, malnutrition is a geriatric syndrome with multiple etiologies, very common in older adults, and causes serious consequences for health and quality of life [6]. According to the 2019 Population and Housing Census, Thai Binh has the highest aging index in Vietnam and is currently entering the stage of population aging. The majority of older adults reside in rural areas and share similar economic, cultural, and social characteristics. Therefore, the study aimed to describe the nutritional status and prevalence of sarcopenia according to different diagnostic criteria in the elderly in a rural commune in Thai Binh province.

II. METHODS

2.1. Study design

A cross-sectional study was conducted from September 2023 to October 2023 on elderly individuals aged 65 and older living in Dong Hoang commune, Dong Hung district, Thai Binh province.

2.2. Sample size and sampling method

Sample size was calculated using the the following formula:

$$n = (z^2_{(1-\alpha/2)}) \times \frac{p(1-p)}{d^2}$$

$Z_{(1-\alpha/2)}$=1.96 with α=0.05; d=0.07 was absolute error; p = 0.492 was the rate of elderly diagnosed with sarcopenia in the previous study at the National Geriatric Hospital [7]. The sample size was calculated as n = 196. An extra 15% was considered for potential study attrition, the study aimed to recruit 230 participants.

* Simple random sampling. The sampling steps include: Step 1: List all subjects who are elderly people aged 65 and over in Dong Hoang commune, Dong Hung district, Thai Binh province; Step 2: From the list of elderly people aged 65 and over in Dong Hoang commune, Dong Hung district, Thai Binh province, use Excel software to randomly select 230 study subjects. Step 3: Compile a list of the selected study subjects and send it to the Head of the Commune Health Station and the Village Head. Then, divide the subjects into groups according to their village/hamlet units to send invitations to invite them to the village cultural house for health examinations and consultations in order to collect data.

*Inclusion criteria: Elderly individuals who are registered residents and regularly live in the study area, voluntarily participate, cooperate, and are cognitively sound enough to be interviewed.

* Exclusion criteria: (i) having physical disabilities that are not conducive to anthropometric measurements, such as hunchback, limb amputation, cases of difficulty walking or inability to walk; (ii) being too frail, hearing impaired, visually impaired, or undergoing treatment for serious illnesses that prevent participation in the study; (iii) having medical conditions that prevent answering interview questions (such as Alzheimer's disease, mental disorders, etc.) or refusing to participate in the study; (iv) using a pacemaker or having metal implants in the body.

2.3. Data collection methods

The investigators directly interviewed the study subjects to collect their general information. Height was measured using a SECA 213 height scale (China). The measuring scale was graduated in millimeters, and the height measurement was recorded in centimeters with one decimal place. Muscle mass (kg) was assessed using a bioelectrical impedance analysis (BIA) device, InBody 270. Handgrip strength (HGS) was measured using a Camry dynamometer model EH101; and the results were classified as reduced muscle strength (males < 28 kg, females < 18 kg) [2].

Physical performance: The 6-meter walk test (measuring walking speed) was performed on a flat, non-slippery surface with a clearly marked 6-meter distance. A time of ≥ 6 seconds was considered as reduced physical performance. Nutritional status was classified according to the WHO 2002 BMI (kg/m^2) for Asians: Normal (18.5 - 22.9), chronic energy deficiency (CED) degree I (17.0 – 18.49), CED degree II (16.0 – 16.99), CED degree III (<16), overweight (≥ 23), obese (≥ 25) [8].

The MNA (Mini Nutritional Assessment) method was used to screen for malnutrition, the score was classified as: Normal (23.5–30 points), at risk of malnutrition (17–23.5 points), malnourished (< 17 points) [9].

The level of physical activity was assessed using the IPAQ-SF questionnaire, which includes 7 questions about activity in the past 7 days. The total MET-minutes/week recorded was low: < 600 MET-minutes/week [10].

2.4. Sarcopenia assessment and classification

Individuals were classified as having sarcopenia based on the following criteria:

- AWGS criteria: Sarcopenia is diagnosed when there is (1) low muscle mass (ASM/ht2 < 7.0 kg/m^2 in men and < 5.7 kg/m^2 in women), and (2) Low handgrip strength (HGS < 28 kg in men and < 18 kg in women) or (3) gait speed <1m/s [5].

- SARC-F tool [11]: The questionnaire consists of 5 criteria, Assesses a questionnaire with each domain scoring 0 to 2 points. The total score ranges from 0 to 10. If the total score is ≥ 4, it is considered to be Sarcopenia.

- SARC-CalF tool [12] was developed from the SARC-F questionnaire by adding points for calf circumference: Men: > 34 cm = 0 points ≤ 34 cm = 10 points; Women: > 33 cm = 0 points ≤ 33 cm = 10 points. The total score of 2 components (i) SARC-F questionnaire and (ii) calf circumference is calculated. A total score ≥ 11 is diagnosed as Sarcopenia.

- Ishii formula [13] is based on sex, age, calf circumference, and HGS with the following total score: Men: 0.62 × (age − 64) – 3.09 × (HGS − 50) – 4.64× (CC − 42); Women: 0.80 × (age − 64) – 5.09 × (HGS − 34) – 3.28× (CC − 42). The total Ishii score for diagnosing Sarcopenia is: ≥ 105 in men; ≥ 120 in women.

2.5. Statistical analysis

The study data were entered using Epi-data 3.1 software and analyzed with SPSS 20.0 software. Descriptive statistics, including frequency and percentage, were used for categorical variables. For quantitative variables, if the data were normally distributed, the mean and standard deviation (SD) were used. If the distribution was not normal, the data were described using the median. Chi-square test with a significance level of $p < 0.05$ was used in this study.

2.6. Ethical issues

Before conducting the study, the participants were explained the purpose and significance of the study and provided their consent to to participate. The collected information were used solely for research purposes and was kept strictly confidential. The study was approved by the Medical Ethics Committee in Medical Research of Thai Binh University of Medicine and Pharmacy (Decision No. 663/QĐ-YDTB dated March 28, 2024).

III. RESULTS

Finally, the study recruited 224 elderly individuals aged 65 and above who met the criteria of inclusion and exclusion. The results obtained from these 224 participants are as follows:

Table 1. *General information of the study subjects (n=224)*

Variables	Males (*n*=90)	Females (*n*=134)	Overall (*n*=224)
Age group			
65-69 years	31 (34.4)	45 (33.6)	76 (33.9)
70-79 years	33 (36.7)	54 (40.3)	87 (38.8)
≥ 80 years	26 (28.9)	35 (26.1)	61 (27.2)
Low education level (≤ high school)	59 (65.6)	92 (68.7)	151 (67.4)
Living alone	5 (5.6)	11 (8.2)	16 (7.1)
Malnutrition according to MNA	14 (15.6)	30 (22.4)	44 (19.6)
Undernutrition (BMI<18.5)	11 (12.2)	18 (13.4)	29 (12.9)
Low physical activity level	45 (50.0)	69 (51.5)	114 (50.9)
History of hospitalization in the past 12 months	10 (11.1)	18 (13.4)	28 (12.5)

MNA: mini nutritional assessment; BMI: body mass index. Data are in frequency (%)

Table 1 shows that the 70-79 age group had the highest proportion at 38.8%, while those aged 80 and above accounted for 27.2%. A total of 67.4% had an education level below high school. About 7.1% of older adults lived alone. CED was observed in 12.9%, and 19.6% were malnourished according to the MNA. Additionally, 50.9% had a low level of physical activity (IPAQ-SF, < 600 MET-minutes/week).

Table 2. *Anthropometric values of the study subjects*

Characteristics	Males (*n*=90)	Females (*n*=134)	*p-value*
Body Mass Index (BMI), kg/m^2	22.3±2.8	21.9±2.8	>0.05
ASM (appendicular skeletal muscle mass), kg	16.5±3.1	11.7±2.3	<0.001
ASM/Ht^2 (height-adjusted muscle mass), kg/m^2)	6.5±0.9	5.4±0.8	<0.001
Calf circumference, cm	31.7±3.5	29.5±3.8	<0.001
Handgrip strength, kg	27.5±7.8	17.5±4.1	<0.001

Data are in mean (standard deviation). p-value by t-test.

The average BMI was within the normal range (22.3±2.8 kg/m^2 in males and 21.9±2.8 kg/m^2 in females). The average calf circumference in males and females was 31.7±3.5 cm and 29.5±3.8 cm, respectively. Appendicular skeletal muscle mass and handgrip strength in males were significantly higher than those in females, p <0.001.

Table 3. *Prevalence of sarcopenia according to different criteria and by sex, age group (n=224)*

Prevalence of sarcopenia	AWGS	SARC-F	SARC-CalF	Ishii
Sex				
Males (*n*=90)	40 (44.4)	31 (34.4)	34 (37.8)	43 (47.8)
Females (*n*=134)	59 (44.0)	44 (32.8)	61 (45.5)	67 (50.0)
Age group				
65-69 years (*n*=76)	15 (19.7)	12 (15.8)	14 (18.4)	17 (22.4)
70-79 years (*n*=87)	32 (36.8)	21 (24.1)	37 (42.5)	39 (44.8)
≥ 80 years (*n*=61)	52 (85.2)	42 (68.9)	44 (72.1)	54 (88.5)
Total	99 (44.2)	75 (33.5)	95 (42.4)	110 (49.1)

Data in frequency (%).

Table 3 shows that the prevalence of sarcopenia according to the criteria of AWGS 2019, SARC-F, SARC-F, and SARC-CalF was 44.2, 33.5, 42.4, and 49.1%, respectively. The prevalence of sarcopenia diagnosed using different criteria did not differ between genders but varies by age group.

Figure 1 shows that 75.0% of elderly people with CED were diagnosed with sarcopenia. Sarcopenia was diagnosed in 47.4% of elderly individuals with low physical activity and in 61.4% of malnourished elderly individuals as determined by MNA. The prevalence of sarcopenia was higher in the group with CED, low physical activity, and malnutrition according to MNA.

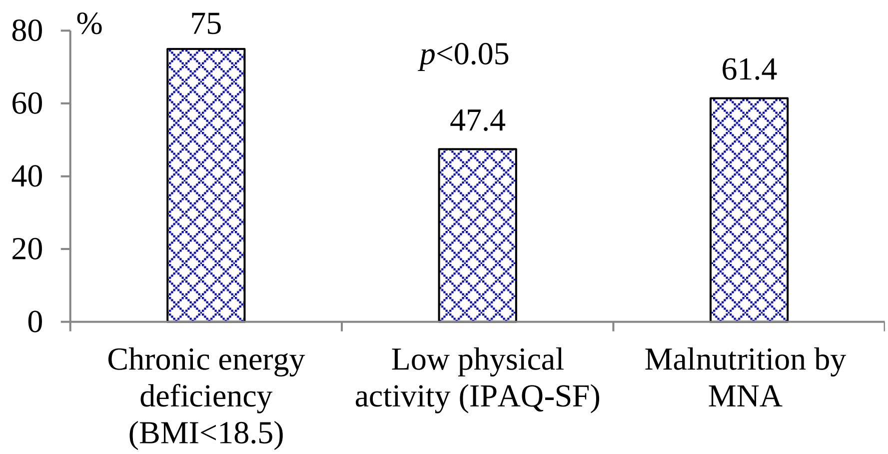

Figure 1. *Prevalence of sarcopenia (AWGS 2019) by nutritional status and physical activity*

IV. DISCUSSION

This study population comprised 224 elderly individuals (59.8% females) in Dong Hoang rural commune, Dong Hung district, Thai Binh province. Chronic energy deficience was found in 12.9% of participants, and MNA-based malnutrition in 19.6%. The prevalence of elderly people with muscle loss according to the AGWS criteria of the Asian Sarcopenia Association was 44.2% (44.4% in males and 40% in females, $p > 0.05$).

The prevalence of sarcopenia in this study is lower than that reported by the National Geriatric Hospital (2017-2020) using AGWS criteria (61.2%; males: 72.3%; females: 54.7%, p<0.001) and by Phung Thi Le Phuong (2022) at Hanoi Medical University Hospital (67.5%). However, it is higher than the 20% prevalence found in a 2020 study of the elderly community in Ho Chi Minh City [7]. It is lower than the 70% prevalence of sarcopenia determined using the AWGS criteria in 266 people aged ≥60 years in Surabaya City, Indonesia [14]. This sarcopenia prevalence (44.2%) was higher than that of 19.1% in 298 elderly individuals in Spain [15]. In another study on 189 elderly individuals in Denmark, the prevalence of sarcopenia was 26% [16]. The high prevalence of sarcopenia in our study can be partly explained by the higher average age of our study population (mean age 73.6 ± 7.7 years and up to 27.2% were ≥ 80 years old).

We also found that CED is a risk factor for sarcopenia; among the elderly with CED, up to 75.0% were diagnosed with sarcopenia. This is because, in the elderly, a diet that does not provide enough energy and protein can lead to weight loss and CED, while those with higher weight and BMI may have more muscle mass, protecting against sarcopenia. Similarly, a study by Nguyen Ngoc Tam also indicated that patients with a low BMI below 18.5 had an increased risk of sarcopenia with high reliability of 99.9% [7].

In this study, malnutrition was associated with an increased prevalence of sarcopenia. In the group of malnourished elderly according to MNA, the prevalence of sarcopenia was 61.4%, while the sarcopenia prevalence was 33.9% in the non-malnourished group ($p < 0.05$). Malnutrition is a consequence of energy and protein deficiency, which has adverse effects on body composition, activates the immune system, and increases the synthesis of inflammatory cytokines, amplifying the chronic catabolic process, thereby reducing muscle mass [1]. Therefore, raising awareness and guiding the elderly on a diverse diet with adequate food groups is one of the useful measures to help prevent sarcopenia.

In this study, the highest diagnosed prevalence of sarcopenia was according to Ishii (49.1%) and gradually decreased according to SARC-CalF (42.4%), AWGS (39.3%), and SARC-F (33.5%). Several studies have shown different values for the sensitivity and specificity of sarcopenia screening tools [17]. In Vietnam, a study at the National Geriatric

Hospital on 764 people aged 60 years using the AWGS gold standard with muscle mass measured by DXA showed that the highest concordance rate with the AWGS gold standard of the three methods was 79.6% when using the Ishii formula, 68.1% when using SARC-CalF, and 65.8% when using SARC-F. To balance sensitivity and specificity, SARC-CalF is a reasonable choice because it maintains a good detection rate (42.4%) compared to the gold standard diagnosis (44.2%) without too many false positives, leading to a high diagnosis rate (49.1%) like Ishii.

The above findings further reinforce the recommendation that SARC-F, a 5-item, self-reported, quick-to-administer questionnaire, is valuable in screening for sarcopenia in elderly patients in outpatient settings. Moreover, the Ishii formula is more complex to implement because it requires determination based on age, gender, handgrip strength index, and calf circumference, without using X-rays. This tool can be used to screen for sarcopenia in healthcare settings with the best screening diagnostic value [7].

This study in rural Thai Binh province has the limitation of using bioelectrical impedance analysis (BIA) to measure muscle mass (kg) for the AWGS criteria, while the AWGS gold standard requires muscle mass measurement by DXA. This BIA method for measuring muscle mass is not the gold standard; however, it is a low-cost method that can be widely applied in the community to detect individuals at high risk of sarcopenia. Furthermore, the device does not pose a risk of X-ray exposure and is easy to use in the community. Further research is needed to determine the appropriate muscle mass measured by bioelectrical impedance analysis corresponding to the threshold determined by DXA for Vietnamese populations.

V. CONCLUSION

The study was conducted on 224 older adults living in rural areas of Thai Binh province using four diagnostic criteria: AWGS, SARC-F, SARC-CalF, and Ishii. The results indicated that the AWGS and SARC-CalF criteria yielded comparable prevalence rates. The SARC-F identified the lowest sarcopenia prevalence, whereas the Ishii score produced the highest. Older age, malnutrition, and low level of physical activity were associated with sarcopenia. Therefore, early screening and diagnosis of both nutritional status and sarcopenia in the elderly are essential for implementing appropriate solution aimed at improving quality of life, reducing disease rates, and mitigating other adverse health effects in this population.

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