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Differences in Body Composition and Skeletal Muscle Mass Index between Community-Dwelling Older Adults in Japan and Northern Thailand

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Abstract

Background: Over the past 50 years, the number of adults over age 65 has tripled, and by 2050, older people will represent 25% of the population worldwide. This study was designed to compare body composition and skeletal muscle mass index (SMI) between Thai and Japanese older adults. By analyzing the future prevalence of obesity, sarcopenia, and sarcopenic obesity in older populations, this research aims to investigate ethnic differences and provide valuable insights for health guidance.

Methods: A total of 60 healthy adults age ≥ 60 years in Thailand and 93 healthy adults age ≥ 65 years in Japan were included in the study. Body fat mass (Kg), protein (Kg), body water (L), soft lean mass (Kg), minerals (Kg) and SMI were measured using bioelectrical impedance analysis. To define the upper and lower limits of body composition for Thais, data provided by the InBody device were utilized. The cutoff values for SMI were set at 7 for men and 5.7 for women in both countries. Participants were classified into four patterns based on SMI, body fat mass, protein, and muscle mass.

Results: It was found that, compared with the Japanese participants, Thai participants showed a lower prevalence of Pattern I (all values were within the reference range), a higher prevalence of Pattern II (body fat mass and SMI were above the reference range), and a lower prevalence of Pattern IV (body fat mass and SMI were below the lower limit). The chi-square test revealed a statistically significant difference in the distribution of these patterns between the two populations ($p < 0.001$).

Conclusion: Adjusted for baseline physique values, this four-pattern classification offers a gender-independent and highly practical approach. These findings suggest that Thais need to be vigilant against obesity, whereas Japanese individuals should focus on managing sarcopenia as they age.

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Introduction

Over the past 50 years, the number of adults over age 65 has tripled, and by 2050, older people will represent 25% of the population worldwide [1,2]. Physiological aging increases the risk of increased fat mass (obesity), changes in body composition due to redistribution of fat, changes in metabolism, and decreased muscle mass and muscle function (sarcopenia) [3].

Obesity increases the risk of many health problems, including diabetes, metabolic syndrome, cardiovascular diseases and cancer, and hence leads to a higher mortality [3]. A decrease in muscle mass reduces muscle strength, thereby reducing walking ability and balance in older adults [4]. Delaying this decrease in muscle mass and muscle strength, which is associated with aging in older adults, plays an important role in improving their activities of daily living [5].

Sarcopenic obesity is defined as a functional and clinical condition characterized by the coexistence of loss of skeletal muscle mass and function and an excess of adipose tissue. The incidence of sarcopenic obesity is increasing rapidly, mainly owing to the aging of the worldwide population and the current obesity epidemic [6].

Bioelectrical impedance analysis has become a quite popular method for estimating body composition, including muscle mass. The skeletal muscle mass index (SMI) is calculated by dividing the appendicular skeletal muscle (kg) by the square of the height (m^2), and a low SMI is considered indicative of possible sarcopenia. In previous studies, SMI was significantly lower among Thai women than among Japanese woman [7] and in Thailand the prevalence of overweight was 20.3%, and that of obesity was 35.2% [8].

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This study was designed to compare body composition and SMI between Thai and Japanese individuals. By analyzing the prevalence of obesity, sarcopenia, and sarcopenic obesity in older populations, this research aims to investigate ethnic differences and provide valuable insights for health guidance.

Materials & Methods

Subjects and setting

Prior to conducting this study, approval was obtained from the ethics committee of the Toyama Prefectural University Ethics Review Board (approval number: R6-19) in Japan and the Human Research Ethics Committee of Boromarajonani College of Nursing in Lampang (approval number: E2567-055). The study was conducted in accordance with the principles of the Declaration of Helsinki.

A total of 60 Thai healthy adults including 1 male (age: 64.9 ± 3.7) were included in the study. The participants were from Lampang province, where they were recruited based on recommendations from the directors of Subdistrict Health Promotion Hospitals. Participants were drawn from three communities: Ban Tha Tok (Thung Fai Subdistrict, Mueang Lampang District), Ban Kluai Phae (Kluai Phae Subdistrict, Mueang Lampang District), and Ban Hong Ha (Nam Cho Subdistrict, Mae Tha District), with 20 participants from each community. Overall, 66.7% of participants were from urban/peri-urban areas (Mueang Lampang District), while 33.3% were from rural areas (Mae Tha District), reflecting a community-based sample with both urban and rural representation.

A total of 93 Japanese healthy adults including 34 males (age: 77.2 ± 6.5) were included in the study. Study researchers were present at the adult day-care centers where the study was performed to ensure the proper management of safety and confidentiality. The managers of the adult day-care centers invited clients to participate in the study, and subjects were enrolled. The Japanese participants comprised 46.8% from cities surrounding metropolitan areas (Kyotanabe, Anjo, and Kiyosu Cities), 20.7% from core cities (Toyama City), and 53.4% from core cities surrounding peripheral cities (Imizu City) according to the National Urban Transport Survey [9].

Subjects were enrolled from September 2024 and September 2025 after obtaining informed consent in Thailand and Japan, respectively.

Body composition

Body fat mass (Kg), protein (Kg), body water (L), soft lean mass (Kg), minerals (Kg) and SMI were measured using Inbody (Inbody, Japan) in Japan and ACCUNIQ (Wellcle, Thailand) in Thailand.

The results were converted into percentages and visualized using a radar chart, with everyone's minimum and maximum values scaled to 0% and 100%, respectively. Therefore, the model proposed in this paper can be utilized regardless of gender. The data for Thailand and Japanese participants were also represented based on the same criteria. To define the upper and lower limits of body composition for Thais, data provided by the InBody device were utilized. The participants were categorized into 4 groups based on their body composition and SMI characteristics. The original cutoffs of the Asian Working Group for Sarcopenia (AWGS) 2019 were used for height-adjusted muscle mass: bioimpedance of <7.0 kg/m^2 in men and <5.7 kg/m^2 in women, based on bioimpedance analysis [10].

Results

Study subjects

Obesity was defined as a BMI of ≥25.0 kg/m^2. The prevalence of obesity judged from BMI was 22.9 ± 3.2 (SD) and 22.7 ± 3.3 for Japan and Thailand, respectively. This showed a tendency to be in the normal range in comparison with the standard for all 65 - 74-year-old Japanese (21.5 – 24.9 kg/m^2) [11].

Classification of body composition

Based on the results, the participants were classified into the following four patterns (Table 1 and Figure 1)."

Table 1: Classification of body composition.

	Body composition		
Pattern	Body fat mass	Protein/Muscle	SMI
I	within the upper and lower limits		above the reference
II	above the reference range	near the upper limit	above the reference
III	above the reference range	near the lower limit	below the reference
IV	below or near the lower limits		below the reference

Compared with the Japanese, Thais exhibited 0% for Pattern I, a higher prevalence of Pattern II (68.0%), and a lower prevalence of Pattern IV (8.3%). The chi-square test revealed a statistically significant difference in the distribution of these patterns ($p < 0.001$).

Of these four patterns, Patterns II, III, and IV can be classified as obesity, sarcopenic obesity, and sarcopenia, respectively (Figure 3).

These findings suggest that Thais need to be vigilant against obesity, whereas Japanese should focus on managing sarcopenia as they age.

Discussion

The global aging population is increasing rapidly. According to a WHO survey, the proportion of the population aged 60 years and over will almost double by 2050 compared to 2015 [12].

Depression, Type 2 diabetes and mild cognitive impairment have been found to be associated with sarcopenia [13,14,15]. There is some evidence of beneficial effects of protein supplementation ≥ 0·8 g/kg body weight/d on muscle mass when combined with exercise training in intervention studies of healthy and sarcopenic older adults [16]. Adequate intake of high-quality protein rich in leucine, together with sufficient vitamin D intake and resistance exercise, may contribute to the prevention of sarcopenia and the maintenance of physical performance in older adults [17]. Nutritional strategies for sarcopenia should emphasize not only total protein intake but also protein quality and balanced dietary patterns to support muscle protein synthesis in older adults.

Obesity is the most extensive metabolic alteration worldwide, increasing the risk for the development of cardiometabolic alterations

Figure 1: Four typical patterns.

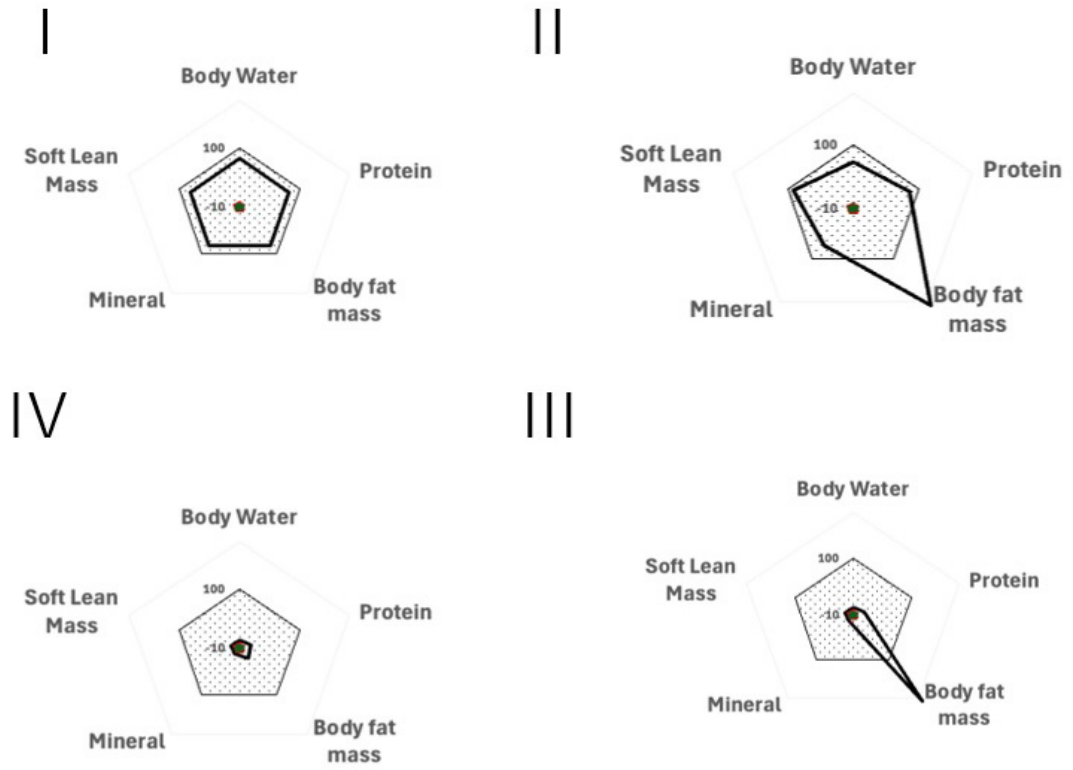


Figure 2: Differences in body composition patterns in Japan and Thailand.

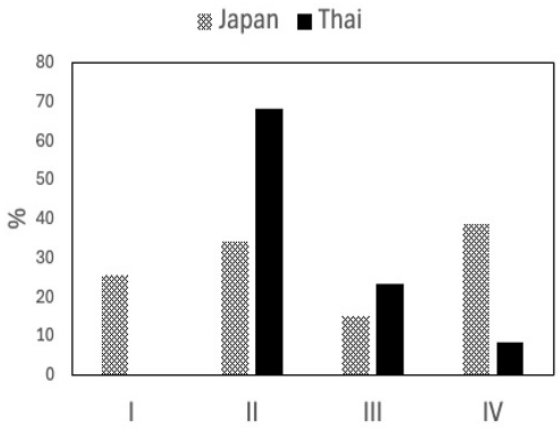
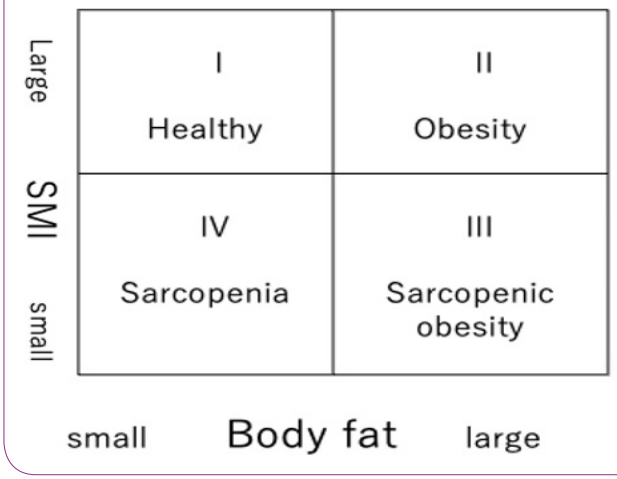


Figure 3: The clinical significance of the four patterns.



such as type 2 diabetes, hypertension, and dyslipidemia. BMI remains the most frequently used tool for classifying patients with obesity, but it does not accurately reflect body adiposity [18]. In older adults, obesity management should not focus solely on weight reduction, because excessive caloric restriction may accelerate the loss of skeletal muscle mass and physical function. Therefore, interventions aimed at reducing body fat while preserving muscle mass are particularly important in aging populations.

Sarcopenic obesity may occur due to either muscle loss leading to fat accumulation or obesity-induced muscle decline caused by metabolic issues [19]. Sarcopenic obesity in older subjects may require a dietary approach based on caloric restriction, with proportionally higher protein intake [20]. Therefore, the nutritional approach differs for each of these three types.

In this study, a prediction model was established based on body composition and SMI. These models achieved good performance and may extend healthy life expectancy. These findings suggest that Thais need to be vigilant against obesity, whereas Japanese individuals should focus on managing sarcopenia as they age.

Although we only used a small number of cases, the model was satisfactory for the prediction task. Future longitudinal studies will be required to evaluate the accuracy of the model patterns.

Our findings should be able to serve as a foundation for larger prospective studies.

Conclusion

Applying this model, individuals may be able to extend their healthy life expectancy by focusing on dietary interventions to reduce body fat, as well as on protein intake and exercise to increase muscle mass. This model could serve as a tool to aid nurses in the clinical decision-making processes.

Competing Interest

The authors declare that they have no competing interests.

Author Contributions

Dr. Hasegawa was responsible for the study conception, design, interpretation of data, and drafting of the manuscript.

Dr. Kobayashi was involved in structuring the manuscript.

Dr. Shimizu was responsible for data acquisition and checking the manuscript.

Dr. Yamada was responsible for checking the manuscript.

Dr. Umemura was responsible for checking the manuscript.

Ms. Kato was responsible for checking the manuscript.

Dr. Yorozuya was responsible for checking the manuscript.

Dr. Rene was responsible for checking the manuscript.

Dr. Suzuki was responsible for checking the manuscript.

Mr. Katsuya was responsible for checking the manuscript.

Dr. Piyathorn was responsible for the research plan.

Dr. Pattaranai was responsible for the research plan.

Dr. Pattana was responsible for the research plan.

Dr. Kamolthip was responsible for the research plan.

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