Original Article

J Prev Med Public Health 2023;56:164-171 • https://doi.org/10.3961/jpmph.22.399

pISSN 1975-8375 eISSN 2233-4521

Journal of Preventive Medicine & Public Health

Knowledge of Sarcopenia and Associated Factors Among the Malaysian General Public: A Cross-sectional Study

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Objectives: Sarcopenia has emerged as a significant aging-related disease that affects many facets of societal-level and patient-level public health. This study analysed knowledge of sarcopenia and associated socio-demographic factors among the general public of Malaysia in order to effectively improve its prevention and countermeasures.

Methods: A cross-sectional online survey was conducted in Selangor, Malaysia, using Google Forms among 202 Malaysian adults from January 1, 2021 to March 31, 2021. Descriptive statistics were used to analyse the socio-demographic characteristics and knowledge scores. The continuous variables were evaluated using the independent *t*-test, Mann–Whitney test, and one-way analysis of variance test. The Spearman correlation coefficient was employed to determine the correlation between socio-demographic characteristics and knowledge score levels.

Results: The final analysis included 202 participants. The mean±standard deviation age was 49.03±12.65. Only 6.9% of participants had good knowledge of sarcopenia and were aware of sarcopenia's characteristics, consequences, and treatments. Post-hoc comparisons using the Dunnett T3 test showed statistical significance in mean knowledge score and age group ($p=0.011$) and education level ($p\leq0.001$). The Mann–Whitney test revealed that gender ($p=0.026$) and current smoking status ($p=0.023$) significantly influenced knowledge scores.

Conclusions: The general public's knowledge of sarcopenia was found to be poor to moderate and associated with age and education status. Therefore, education and interventions by policymakers and healthcare professionals to improve public knowledge of sarcopenia in Malaysia are needed.

Key words: Sarcopenia, Adult, Aging, Malaysian people, Malaysia

INTRODUCTION

Sarcopenia has emerged as a significant aging-related health problem affecting many facets of public health. Sarcopenia is a generalised, progressive condition of the skeletal muscles that affects the occurrence and prognosis of numerous unfavourable comorbidities, including falls and fractures, increases the need for medical services, and raises the risk of death [1,2]. Sarcopenia was recognised as a muscle disease in September

Received: September 6, 2022 Accepted: February 20, 2023

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2016 with an International Classification of Disease Clinical Modification code used for medical care billing in some countries [3,4].

Sarcopenia, a geriatric disease, is one of the leading health issues in older adults and a significant public health concern. It is caused by adverse muscle changes that accumulate across a lifetime and is prevalent in elderly persons, although it can also happen earlier in life [5,6]. Sarcopenia, which means "poor of the flesh," was initially identified as an age-related reduction in lean body mass in the 1980s [6-8]. Today, the incapacitating effects of sarcopenia are widely recognised. This geriatric disease is typically associated with major unfavourable health consequences such as an increased chance of falling, functional decline, frailty, loss of autonomy, and mortality [9,10]. In addition, while sarcopenia has been linked to illnesses observed in the old, its onset has been documented to start at a younger age [9,11]. After the age of 30, muscle mass falls by 3% to 8% every decade. This decline further accelerates after the age of 60, depending on diet and physical activity [7,11]. Between 2000 and 2030, the worldwide over-65 population is predicted to increase from 443 million to 973 million [12]. As the global population ages, the presence of sarcopenia and its associated muscle loss and incapacitating effects will increase in prevalence [6].

In 2010, the European Working Group on Sarcopenia in Older People supported improvements in the recognition and treatment of those with or at risk of sarcopenia by adopting a global definition of sarcopenia [1,2]. However, a study in the Netherlands discovered that most local communities had little understanding of the disease, and suggested that community dwellers' knowledge and awareness of sarcopenia may be crucial to boosting adherence and desire for lifestyle adjustments [13]. Furthermore, Iskandar et al. [14] discovered a high prevalence of sarcopenia among elderly Malaysians aged 60 years to 70 years (5 to 13%) and 80 years and older (11 to 50%). These discoveries reveal the necessity for public adherence to preventive and control measures against sarcopenia, which in turn is affected by knowledge of the disease. Therefore, there is a need for this study, which aimed to assess knowledge of sarcopenia and its associated factors among the general public of Selangor, Malaysia.

Research Questions

The following research questions were generated to guide the study: (1) What are the levels of knowledge of sarcopenia among the general public of Selangor, Malaysia? (2) What are the associations between socio-demographic characteristics and levels of knowledge of sarcopenia among the general public of Selangor, Malaysia?

Null Hypothesis

The following null hypothesis was formulated to guide the study and was assessed at a significance level of 0.05: There would be no significant association between socio-demographic characteristics (such as age, gender, ethnicity, educational level, current smoking status, use of a walking aid, difficulty in walking 100 m, a history of falls in the last 12 months, a history of injuries due to falls, self-reported balance problems, activities of daily living [ADL] dependence, weight, and height) and levels of knowledge of sarcopenia among the general public.

METHODS

Data and Participants

A cross-sectional online survey was carried out in the Selangor state of Malaysia, which encompasses the capital city of Kuala Lumpur. A survey was deemed appropriate, since this design allows large populations to be assessed relatively easily [15] and surveys and questionnaires have been used to collect data at single time points during the coronavirus disease 2019 (COVID-19) pandemic [16,17]. Furthermore, it allowed researchers to compare different variables simultaneously—for example, age, gender, and education level—against knowledge of sarcopenia. The study population comprised the general public residing in Selangor, Malaysia's most populous metropolitan state, which stands at approximately 6.56 million people [18]. The inclusion criteria were those of the general public aged 18 years and older, living in Selangor, and literate in English or Bahasa Malaysia. The exclusion criteria were individuals with a personal history of sarcopenia. A priori G*Power analysis was used to generate the minimum sample size required to detect a medium effect size, with a desired statistical power level of 0.80. The calculated sample size was 150. Accounting for a 30% dropout rate, the total sample size calculated was 200. G*Power is a recommended software for calculating sample size and power for various statistical methods. Hence, the sample size calculated for this study was sufficient to draw pertinent implications on the topic.

Study Tool

The questionnaire covered 2 sections, A and B. Section A consisted of socio-demographic data (age, gender, ethnicity, educational level, current smoking status, use of a walking aid, difficulty in walking 100 m, history of falls in the last 12 months, suffering of injuries due to falls, self-reported balance problems, ADL dependence, weight, and height). Section B contained four domains: causes of sarcopenia (questions 1 to 6), characteristics of sarcopenia (questions 7 to 9), consequences of sarcopenia (questions 10 to 12), and treatments of sarcopenia (questions 13 to 16). Each question asked participants to respond with "yes" or "no." Each correct answer received 1 point, while incorrect answers received 0 points. The total number of points received was converted into a percentage knowledge score: (actual score×100)/total number of questions. The level of knowledge was interpreted based on the percentage marks obtained and classified into three categories: poor (<50%), moderate (≥50 to <80%), and good (≥80%) knowledge. The survey questionnaire utilised in this study was based on research on sarcopenia knowledge [13]. The survey was made available in English and Bahasa Malaysia to ensure linguistic and conceptual equivalence [19]. The translated version was checked and verified by 2 academicians, 1 physician, 1 orthopaedic expert, and 1 bilingual language expert. Discrepancies between the survey (English and Bahasa Malaysia) and the back translation were discussed, and the finalised version of the instrument was utilised. The study tool's reliability was assessed by completing a pilot test with 38 people who met the inclusion criteria, but were not included in the final sample analysis. A Cronbach's α of 0.710 was obtained, indicating a good level of item reliability [20]. The wording of the questions was not changed after the pilot study.

Data Collection

Data collection spanned from January 1, 2021 to March 31, 2021, in Selangor, Malaysia. A systematic nationwide sampling procedure was impossible during the COVID-19 pandemic and the Movement Control Order enforcement. Therefore, snowball sampling was used as an alternative recruitment strategy. However, there is no way to estimate the overall population size via snowball sampling, which in our case involved a sample size of 202. Moreover, it is challenging to make inferences about the sampled population with snowball sampling when researchers have difficulty finding study participants [21]. Therefore, several other strategies were also utilised in order to reach as many members of the general public as possible throughout Selangor within the 2-month data collection period carried out online via the Google Forms platform. These strategies included relying on the researchers' professional and personal networks to publicise and disseminate the poll and reaching out to community leaders and social media influencers to share the survey. The two primary platforms for disseminating this survey were Facebook and WhatsApp. The information contained a brief introductory statement with an attached link to the survey for participants to post and repost, and included instructions to complete the Google Form questionnaire online by clicking on the link, followed by the "Continue" button. The link was provided in both English and Bahasa Malaysia, and clicking the "Continue" button indicated consent to participate in the survey. Participants were limited to 1 response in order to avoid duplicated or exaggerated data. The survey took an average of 10-15 minutes to complete. All completed surveys were kept by the first author in a lockable room, saved on her computer, and restricted by a code only known to her. All survey files and research data will be destroyed 2 years after publication.

Statistical Analysis

All data were analysed using the SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to analyse the socio-demographic and knowledge scores and presented as means and frequencies. The independent *t*-test, Mann–Whitney test, and 1-way analysis of variance were used to assess the continuous variables after checking normality. The Spearman correlation coefficient was employed to determine the relationship between socio-demographic characteristics and knowledge scores. Values of *p*-value ≤0.05 were considered significant.

Ethics Statement

Ethical approval was obtained from the Sunway University Human Research Ethics Board (SUREC 2020/086). The study was guided by the Declaration of Helsinki with its institutional requirements. All participation was voluntary. No information was collected regarding participants' identities, and completed consent forms and responses were collected separately to ensure confidentiality and anonymity. For anonymity and confidentiality purposes, coded numbers were used during data collection.

RESULTS

Table 1 summarises the participants' sarcopenia knowledge levels as equally poor and moderate (46.5%). Of the 202 participants, only 6.9% had good knowledge of sarcopenia. Table 2 shows the socio-demographic characteristics and their associated sarcopenia knowledge scores. The mean ± standard deviation age of the 202 participants was 49.03 ± 12.65 years. 151 (74.8%) were women, 120 (59.4%) were Chinese, and 90 (44.6%) had a degree. More than three-quarters were non-smokers (91.1%), did not use a walking aid (92.1%), and had no difficulty walking 100 m (92.1%). In addition, findings show more than three-quarters had no history of falls in the last 12 months (95.5%), had not suffered any injuries due to falls (93.6%), had no self-reported balance problem (98.0%), and were independent in ADLs (89.6%). The mean weight was 60.49 kg, and the mean height was 160.25 cm. Post-hoc comparisons using the Dunnett T3 test showed statistical significance in mean knowledge score and age group ($p=0.011$) and education levels ($p \leq 0.001$). The mean ± SD knowledge score of participants aged 31-40 years (7.51 ± 1.72) was statistically significant compared to participants aged 61-70 years (8.78 ± 2.04; $p=0.004$). Significant differences were reported between participants aged 31-40 years and 61-70 years; the mean knowledge score of the older age group was higher than that of the younger age group. The mean ± SD knowledge score of participants with the highest education level of diploma (9.06 ±

Table 1. Participants' knowledge levels regarding sarcopenia (n = 202)

Knowledge level	n (%)
Poor	94 (46.5)
Moderate	94 (46.5)
Good	14 (6.9)

Table 2. Socio-demographic characteristics of participants and their associations with knowledge scores (n = 202)

Characteristics	n (%)	Knowledge score	
		Median (IQR)	*p*-value
Age mean ± SD (y)[3]	49.03 ± 12.65		0.011[1]
31-40	53 (26.2)	7.51 (1.72)	
41-50	51 (25.2)	7.71 (2.41)	
51-60	44 (21.8)	8.25 (2.34)	
61-70	54 (26.7)	8.78 (2.04)	
Gender			0.026
Men	51 (25.2)	7.00 (2.00)[2]	
Women	151 (74.8)	8.00 (2.12)[2]	
Ethnicity			0.837[1]
Malay	55 (27.2)	8.20 (2.53)	
Chinese	120 (59.4)	8.04 (1.97)	
Indian	21 (10.4)	7.71 (2.33)	
Other	6 (3.0)	8.33 (2.58)	
Highest education level[4]			< 0.001[1]
Lower	3 (1.5)	7.00 (0.00)	
Secondary	25 (12.4)	6.60 (0.65)	
Diploma	84 (41.6)	9.06 (1.70)	
Degree	90 (44.6)	7.57 (2.47)	
Current smoking status			0.023
No	184 (91.1)	8.00 (2.12)[2]	
Yes	18 (8.9)	6.00 (2.19)[2]	
Use of a walking aid			0.148
No	186 (92.1)	8.00 (2.13)[2]	
Yes	16 (7.9)	6.00 (2.72)[2]	
Difficulty in walking 100 m			0.069
No	186 (92.1)	8.00 (2.00)[2]	
Yes	16 (7.9)	6.00 (5.00)[2]	
History of falls in the last 12 mo			0.339
No	193 (95.5)	8.00 (3.00)[2]	
Yes	9 (4.5)	8.00 (7.00)[2]	
History of injuries due to falls			0.605
No	189 (93.6)	8.00 (3.00)[2]	
Yes	13 (6.4)	7.00 (6.00)[2]	
Self-reported balance problems			0.148
No	198 (98.0)	8.09 (2.18)	
Yes	4 (2.0)	6.50 (1.29)	
Activities of daily living dependence			0.146
No	181 (89.6)	8.00 (2.17)	
Yes	21 (10.4)	8.71 (2.15)	
Weight, mean ± SD (kg)	60.49 ± 12.63		0.090
Height, mean ± SD (cm)	160.25 ± 9.67		0.401

[1]One-way analysis of variance.
[2]Z-statistics.
[3]Post-hoc analysis of age groups using Dunnett T3: 31-40 vs. 41-50, $p \geq 0.95$: 31-40 vs. 51-60, $p=0.408$: 31-40 vs. 61-70, $p=0.004$: 41-50 vs. 51-60, $p=0.841$: 41-50 vs. 61-70, $p=0.092$: 51-60 vs. 61-70, $p=0.807$.
[4]Post-hoc analysis of highest education level using Dunnett T3: Lower secondary vs. secondary, $p=0.028$; Lower secondary vs. degree, $p=0.175$; Secondary vs. degree, $p=0.007$; Diploma vs. lower secondary, secondary, and degree, p-value ≤ 0.001.

1.70) was statistically significant compared to participants with the highest education level of lower secondary (7.00±0.00), secondary (6.60±0.65), and degree (7.57±2.47; $p \leq 0.001$). Knowledge scores significantly differed across education levels ($p < 0.001$). Participants with diplomas had higher sarcopenia knowledge scores than degree holders and secondary and lower education level participants. Gender ($p = 0.026$) and current smoking status ($p = 0.023$) were significantly associated with knowledge scores. Women had higher median knowledge scores (median, 8.00) than men (median, 7.00), with a significant difference ($p = 0.026$). Non-smokers had higher median knowledge scores (median, 8.00) than current smokers (median, 6.00), with a significant difference ($p = 0.023$). There were no significant differences in knowledge scores according to ethnicity, use of a walking aid, difficulty in walking 100 m, a history of falls in the last 12 months, a history of injuries due to falls, self-reported balance problems, ADL dependence, weight, or height. In addition, the Spearman correlation test indicated no significant correlations between the knowledge score and weight or height. Table 3 shows the participants' responses concerning sarcopenia. Findings show that most participants were unaware of sarcopenia's aetiology, characteristics, consequences, or treatments.

Table 3. Public responses about sarcopenia knowledge (n=202)

Domain	Correct response	Incorrect response
Causes of sarcopenia		
Malnutrition	141 (69.8)	61 (30.2)
Impaired muscle regeneration	108 (53.5)	94 (46.5)
Altered hormonal balance	73 (36.1)	129 (63.9)
Low regular physical activity	86 (42.6)	116 (57.4)
Failure to supply adequate energy demands	141 (69.8)	61 (30.2)
Body's inability to affect protein synthesis and degradation	69 (34.2)	133 (65.8)
Characteristics of sarcopenia		
Loss of stamina	115 (56.9)	87 (43.1)
Loss of muscle power	177 (87.6)	25 (12.4)
Loss of skeletal muscle mass	84 (41.6)	118 (58.4)
Consequences of sarcopenia		
An increased risk of falls	74 (36.6)	128 (63.4)
Loss of aerobic capacity with age	57 (28.2)	145 (71.8)
Inability to carry out daily living tasks	90 (44.6)	112 (55.4)
Treatments of sarcopenia		
Consume a high-protein diet	90 (44.6)	112 (55.4)
Take vitamin D supplements	118 (58.4)	84 (41.6)
Do muscle strength training	110 (54.5)	92 (45.5)
Do muscle resistance training	95 (47.0)	107 (53.0)

Values are presented as number (%).

DISCUSSION

Our study reported on knowledge of sarcopenia and associated socio-demographic factors among the general public of Selangor, Malaysia. The general public's knowledge of sarcopenia was found to be poor to moderate. A plausible explanation could be that sarcopenia has only recently been recognised as a muscle disease [1,2]. Another possible reason might be healthcare professionals' lack of knowledge of sarcopenia to enhance awareness and care; as a result, sarcopenia has gone unnoticed. For example, studies in Australia, New Zealand, and the Netherlands indicated that although healthcare professionals were familiar with sarcopenia, their application in practice was hampered, mostly by a poor understanding of the disease [22,23]. Evidence suggesting a lack of dissemination of knowledge to the public and insufficient promotion of sarcopenia awareness and care among healthcare professionals was furnished by a study that revealed that only one-tenth to one-fifth of healthcare professionals attending an educational event (the Sarcopenia Road Show) in the Netherlands, Australia, and New Zealand knew how to formally diagnose sarcopenia [22,23].

Our study showed that although most participants understood sarcopenia as a muscle disease and age as a risk factor, they did not recognise symptoms or risk factors for it, such as malnutrition and vitamin D deficiency. Instead, the participants viewed sarcopenia as a geriatric disease and a natural component of the aging process. An explanation of these misperceptions might be that the public was uninformed about its prevention and treatment (e.g., observing a healthy diet, moderate exercise, resistance training, and hormone replacement therapy) [24-26]. Significant differences were found between the average knowledge scores of different age groups, with the older group scoring better than the younger group. Our findings suggest that as people age, they are more likely to learn about health concerns, which may reflect the tendency for poor health as one ages. This possibility is supported by evidence that older people seem to be more aware of health matters, are more concerned about their health, and take greater responsibility for their health [27,28].

However, sarcopenia is not limited to only the elderly; it has

been reported even in young adults [29]. Sarcopenia, as previously mentioned, is a major public health concern and a natural part of the ageing process. Researchers have discovered a relationship between muscle pathology and adverse health outcomes, and studies have shown that specific treatment strategies can help prevent or delay adverse consequences [1,2]. Therefore, to convince health policymakers to fill the gaps in sarcopenia awareness, prevention, and treatment, it is critical to produce reliable data on current knowledge and associated factors among the general public. It can be argued that our findings have implications for healthcare professionals, hospital administrations, policymakers, and the general public.

The significant gender gap in knowledge scores, with women recording higher median knowledge scores than men, aligns with a Finnish population-based survey on gender differences in health information, which found that women were more aware of health information than men [30]. On a cautionary note, this finding may reflect the gender disparity in the study sample. Therefore, more research is needed before these complex gender-related factors are fully understood.

Our study revealed that higher levels of education were associated with higher knowledge scores of the study participants, which aligns with previous studies showing correlations between education and increased knowledge, heightened awareness, and desire to improve one's lifestyle [31]. However, the significant association discovered in the study between smoking status and knowledge score, with non-smokers scoring much higher, is more difficult to explain due to the absence of related data. A plausible explanation may be that non-smokers are more interested in healthier lifestyles. However, further study is needed to make sense of this finding, as well as the lack of any significant association between knowledge scores and other variables, including ethnicity, use of a walking aid, difficulty in walking 100 m, a history of falls in the last 12 months, a history of injuries due to falls, self-reported balance problems, ADL dependence, weight, and height.

The present findings revealed that the overall knowledge of sarcopenia in the general population of Malaysia was low. From these results, we may surmise that health education plays a pivotal role in enhancing the public's knowledge of sarcopenia and informing them of their healthcare choices, such as emphasising the aetiology, characteristics, and consequences of sarcopenia, as well as and treatment and prevention modalities. In addition, the World Health Organization has emphasised that the world population is growing older [12,32]. Therefore, although sarcopenia may be prevented and reversed to some extent, the findings of this study serve as a wake-up call to healthcare authorities and policymakers to raise awareness of sarcopenia. In addition, the results provide data for future reference and research in health education to increase awareness and knowledge of sarcopenia among the general public and health authorities.

Good reliability, with a Cronbach's alpha value of 0.710, was demonstrated in this survey [20]. However, the current study has limitations that need to be considered. First, there is the possibility of bias affecting the representativeness of the findings. Snowball sampling was conducted through the researchers' networks, and information was disseminated through different social media platforms to which underprivileged populations may not have had access. One disadvantage of snowball sampling is that its representativeness cannot be ensured. Initial participants are more likely to nominate someone they know well. Hence, some participants may have comparable characteristics and be acquainted. As a result, sampling bias occurred, since not every member of the population has an equal probability of being chosen for the sample. Second, Malays, Chinese, and Indians are Malaysia's 3 primary ethnic populations. The majority ethnic group in the nation is Malay. However, our sample predominantly consisted of Chinese participants, women, and those under 50. As a result, this study has limitations to representativeness in terms of ethnicity, gender, and age. A more systematic and comprehensive sampling technique can increase the representativeness and generalisability of the results. Another drawback of the current study is the inability to compare its findings with those from other national or international settings due to the lack of information on public knowledge of sarcopenia.

In conclusion, our study revealed that the Malaysian general public's knowledge of sarcopenia was poor to moderate and associated with age and education status. Therefore, health education and interventions by policymakers and healthcare professionals to improve public knowledge of sarcopenia and its countermeasures are needed.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

FUNDING

None.

ACKNOWLEDGEMENTS

All authors would like to thank Professor Andrea B Maier for her material about sarcopenia. We would also like to thank all Malaysian public members residing in Selangor who participated in the online survey.

AUTHOR CONTRIBUTIONS

Conceptualization: Lean Keng S, Che Seman NH, Krishnan KM, Jack Bee C, Whye Sook JL, Ismail SF, Pei Boon O, Suat Cheng P. Data curation: Lean Keng S, Che Seman NH, Krishnan KM, Whye Sook JL. Formal analysis: Lean Keng S. Funding acquisition: None. Methodology: Lean Keng S, Che Seman NH, Krishnan KM, Jack Bee C, Whye Sook JL, Ismail SF, Pei Boon O, Suat Cheng P. Writing – original draft: Lean Keng S. Writing – review & editing: Lean Keng S, Che Seman NH, Krishnan KM, Jack Bee C, Whye Sook JL, Ismail SF, Pei Boon O, Suat Cheng P.

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