Original Article

Prevalence and Factors Associated with Sarcopenia among a Sample Aged 60 Years and Older in Iraq

Israa M. Al-Taghlubee, Atheer J Al-Saffar

Department of Family and Community Medicine, College of Medicine, Al-Nahrain University, Baghdad, Iraq

Downloaded from http://journals.lww.com/ircm by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC4/OAVpDDa8KKGKV0Ymy+78= on 12/06/2024

Abstract

Background: Aging is an unavoidable process characterized by a progressive decline in body organs and skeletal muscle. Sarcopenia is defined as low muscle mass and function; it is diagnosed according to the working group of sarcopenia definition; also, it can predict the adverse disability outcome and subsequent functional deterioration. **Objectives:** This study aims to estimating the prevalence of sarcopenia in old Iraqi adults and determines some sociodemographic factors that may be related. **Methods:** A descriptive cross-sectional study was conducted on 500 elderly aged ≥60 years in a community-dwelling and senior citizen center in Baghdad. The data were obtained from a questionnaire (sociodemographic and behavioral data) in addition to anthropometry measurements. The cut-off point score was derived from the European Working Group on Sarcopenia in Older People 2. **Results:** Sarcopenia was present in 15%, 21.5% in males and 8.2% in females. It was positively associated with aging, significantly associated with males, marital state, retirement, nonsmoker, alcoholic, fall history, normal body mass index, and elderly. While it was negatively related to educational level and physical activity. **Conclusions:** Sarcopenia prevalence was presented with a considerable prevalence among old adults, as well as had a great association with all behavioral and lifestyle variants studied.

Keywords: Disability, muscle mass, weakness

Introduction

Age-associated decrease of muscle mass and strength is represented in terms of sarcopenia, which was derived from Greek origin by Irwin Rosenberg in 1989.[1,2] It is a hidden new global widespread syndrome, even though this condition is looked benign, in fact, it is a serious condition that often leads to significant frailty, fragility, and subsequently increased risks of morbidity and mortality.[3,4]

This age-related muscle condition is mainly caused by poor protein intake (malnutrition) and decreased physical activity. Other possible causes may be predicted such as low hormone levels, comorbidity, and others.[5,6] Potentially, early lifestyle interventions, especially exercise and protein-rich nutrition are the main preventive issues.[7]

In the beginning, the definition of sarcopenia was stipulated as decreased muscle mass, after that the definition was modulated to be refined by the insertion of muscle function into the concept, to be defined by the European Working Group on Sarcopenia in Older People (EWGSOP) 2010, as the decline in both muscle mass and muscle function; thus, the term muscle function is referred to both muscle strength and physical performance.[8] Sarcopenia is a serious condition, which have a repulsive effect on health as well as high social and economic costs, it also may lead to death.[9] After 9 years, the revised EWGSOP2 was declared as it simplified the diagnosis of sarcopenia in clinical application, in meaning; it has been depending on muscle strength more in the definition of sarcopenia.[10,11]

Numerous articles showed a prevalence range between 5% and 13% of sarcopenia in 60–70 years old, whereas the prevalence in >80 years old was reported as 11%–50%, that inevitable result of aging equally to increased prevalence rate.[12] Concerned the Arab world, few studies done to explore

Access this article online

Quick Response Code:

Website: www.journalijcm.org

DOI: 10.4103/IRJCM.IRJCM_4_24

Address for correspondence: Dr. Israa M. Al-Taghlubee, Department of Family and Community Medicine, College of Medicine, Al-Nahrain University, Baghdad, Iraq.
E-mail: dr.israataglub@gmail.com

Submitted: 25-Feb-2024 **Revised:** 29-Feb-2024
Accepted: 02-Mar-2024 **Published:** 27-Jun-2024

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Al-Taghlubee IM, Al-Saffar AJ. Prevalence and factors associated with sarcopenia among a sample aged 60 years and older in Iraq. IRAQI J COMMUNITY MED 2024;37:11-5.

Downloaded from http://journals.lww.com/ircm by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC4/OAVpDDa8KKGKV0Ymy+78= on 12/06/2024

the prevalence and related factors, the fundamental point here is lacking a special cutoff point suited to the Arab population and depends usually on EWGSOP definition in the research evaporated from.

Methods

This is a descriptive cross-sectional population-based study; it involved elderly aged 60 years and older, who were chosen by consecutive convenience sampling from residents of senior citizen centers in Baghdad, and was carried on from January 16th, 2022, to May 20th, 2022.

Patients with age ≥60 years old were included in the study, while those who refused to participate in the study, or having any cause affect directly to skeletal muscle such as spinal problems and long-term drug intake of statin and angiotensin-converting enzyme inhibitors more than 6 months ago were excluded from the study.

Data were collected by direct interview, using a questionnaire and measurement.

Questionnaire collected data: Consists of two parts

- Demographic data: age, sex, marital status, schooling, past occupational history, current job, smoking, alcohol, past medical history, and sports activity.

Measurements

Body mass index (BMI) = weight in kg/(height in meter) ^{2}

According to the WHO, classification can be divided into;

- Normal: Between (18 and 24.9)
- Overweight: Between (25 and 29.9)
- Obese: Between (30 and 34.9).[13]

Muscle strength measurement was done using hand grip assessment. It has been performed by using a manual hydraulic TTMS medley Type Dynamometer 100 kg 103-S (Made in 2010, Tokyo, Japan). The measurement was made in a comfortable sitting position, with the arm close to the trunk and the elbow flexed at 90°; the individual was asked to use his dominant hand and grip the device with maximum power. The test was labored twice times with 60 s rest between trials and took the highest value. The measurement was in kilograms and cutoff points of <27 kg for men and <16 kg for women.[9]

The study employs a mathematical equation using age and anthropometric measures to elicit a skeletal muscle mass (SMM) according to the calculation below:

10.05 + 0.35 × weight – 0.62 × BMI – 0.02 × age (+5.10 if men).

Weight in kg, BMI in kg/m^2, age in years.

Then, skeletal muscle index was calculated by dividing SMM by the squared height in meters, and cutoff points were 8.39 kg/m^2 (sensitivity 85.4% and specificity 68.9%) and 5.97 kg/m^2 (sensitivity 96.2% and specificity 36.9%) among men and women, respectively.[14]

The study proposal was approved by the Institutional Review Board of Al-Nahrain College of Medicine, as well as the agreement of the Family and Community Medicine Department of Al-Nahrain College of Medicine was taken before starting the study. The patient's verbal consent was taken before their enrollment. All data were kept confidential and used exclusively for research purposes and individuals were asked to participate on a voluntary basis.

Data were collected and analyzed using the Statistical Package for the Social Sciences version 22, SPSS Inc., Chicago, IL, USA. Categorical variables were presented as numbers and percentages, while numerical variables were presented as mean and (±) standard deviation. Chi-squared and Fisher's exact tests were used accordingly to compare variables between groups. Statistical significance was considered whenever the *P* value was ≤ 0.05.

Results

Five hundred subjects were enrolled in the study with an age mean of 69.18 ± 6.73 years, and the sample consisted of 256 males and 244 females [Table 1]. The study estimated sarcopenia by muscle mass calculation and hand grip measurement, and the results discerned that 75 people were sarcopenic (15.0%) [Figure 1]; 21.5% were male and 8.2% were female. Furthermore, it showed significant associations with age, sex, marital state, educational level, current job, youth job, smoking, alcohol habit, past medical history, physical exercise, fall history, and BMI [Table 2].

Discussion

The current research may be more likely considered an individual study; the goal is to target the newly recognized sarcopenia syndrome in our zone; the prevalence was 15.2%. The prevalence of sarcopenia was not well recognized worldwide, pursuant to sample collection, community profile, lifestyle setting, region, instrument used, cutoffs plus definition scheme, and assessment methods;[15] for epitome,

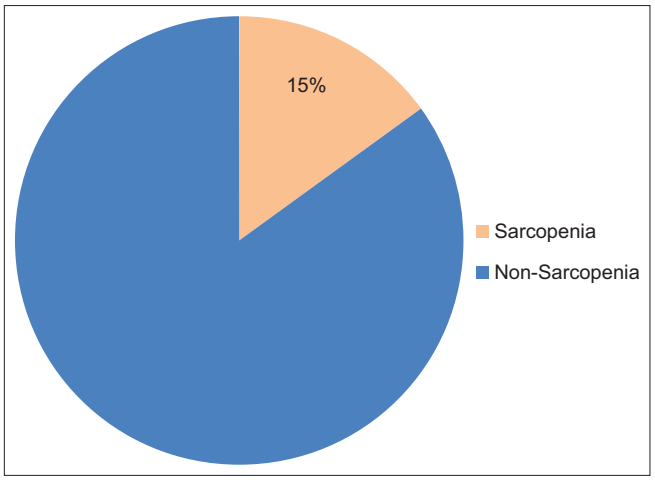

Figure 1: Prevalence of sarcopenia by muscle mass and muscle strength measurements

Downloaded from http://journals.lww.com/ircm by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC4/OAVpDDa8KKGKV0Ymy+78= on 12/06/2024

Table 1: Distribution of the studied sample according to the sociodemographic characteristics, body mass index, and personal behavioral aspects

Category	n (%)
Age	
≤70	317 (63.4)
>70	183 (36.6)
Mean±SD	69.18±6.73
Range	(96–60) year old
Sex	
Male	256 (51.2)
Female	244 (48.8)
Marital state	
Single	74 (14.8)
Married	170 (34.0)
Divorced	80 (16.0)
Widow	176 (35.2)
Educational level	
Illiterate	75 (15.0)
Primary school	146 (29.2)
Secondary	209 (41.8)
College and higher education	70 (14.0)
Youth job	
Sitting job	308 (61.6)
Exercised job	192 (38.4)
Current job	
Retirement	487 (97.4)
Exercised job	13 (2.6)
BMI	
Normal (18.50–24.9)	130 (26.0)
Overweight (≥25–29.9)	233 (46.6)
Obese (≥30)	137 (27.4)
Smoking	
Nonsmoker	378 (75.6)
Smoker	122 (24.4)
Alcoholic	
Yes	48 (9.6)
No	452 (90.4)
Physical activity	
Yes	83 (16.6)
No	417 (83.4)
Past medical history	
Non	233 (46.6)
Hypertension	100 (20.0)
DM	73 (14.6)
Others	20 (4.0)
Multimorbidity	74 (14.8)
Fall history	
Yes	64 (12.8)
No	436 (87.2)

SD: Standard deviation, BMI: Body mass index, DM: Diabetes mellitus

Table 2: Factors analysis of sarcopenia

Variable	Sarcopenia (75), *n* (%)	*P*
Age		
≤70	31 (9.8)	0.000
>70	44 (24.0)	
Sex		
Male	55 (21.5)	0.000
Female	20 (8.2)	
Marital state		
Single	13 (17.6)	0.000
Married	19 (11.2)	
Divorced	10 (12.5)	
Widow	33 (18.8)	
Educational level		
Illiterate	26 (34.7)	0.000
Primary	14 (9.6)	
Secondary	25 (12.0)	
College	10 (14.3)	
Youth job		
Sitting job	47 (15.3)	0.001
Exercised job	28 (14.6)	
Current job		
Retirement	76 (15.4)	0.002*
Exercised job	0	
Smoking		
Nonsmoker	59 (15.6)	0.000
Smoker	16 (13.1)	
Alcohol		
Yes	8 (16.7)	0.000
No	67 (14.8)	
Past medical history		
Non	36 (15.5)	0.000
Hypertension	19 (19.0)	
DM	8 (11.0)	
Others	5 (25.0)	
Multimorbidity	7 (9.5)	
Physical activity		
Yes	8 (9.6)	0.000
No	67 (16.1)	
Fall history		
Yes	17 (26.6)	0.000
No	58 (13.3)	
BMI		
Normal	43 (33.1)	0.000
Overweight	18 (7.7)	
Obese	14 (10.2)	

*Fisher's exact test. BMI: Body mass index, DM: Diabetes mellitus

the studies conducted in community-dwelling diverge in prevalence with the hospitalized individuals older; similarly, the definition of elderly may vary from country to other, in another hand choosing a sample aged 50 years and more will differ in prevalence of choosing sample aged 65 and more with fixed other factors; furthermore, sarcopenia is still a new concept need exceeding quest to get a consolidation diagnostic definition and cutoffs.

Comparing with world nation's prevalence of sarcopenia, the beginning will be from articles rather closet to us in the results: a 2015 case–control Egyptian study presented sarcopenia prevalence of 11.8%.[16] However; another Egyptian study published in 2014 presented sarcopenia prevalence of 17.3%.[17]

Downloaded from http://journals.lww.com/ircm by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC4/OAVpDDa8KKGKV0Ymy+78= on 12/06/2024

In a 2016 cross-sectional Pelotas/South American community-dwelling study, a sample aged ≥60 years old presented with 13.9% of sarcopenia.[18] Incrementally, 2016 cross-sectional Netherland community-dwelling study showed a prevalence of sarcopenia 17%.[19]

Consistent with studies near us, 2018, the Iranian SARIR study reported prevalence of sarcopenia was 21%.[20] Furthermore, a 2018 cross-sectional community-dwelling Mexican adults aged ≥50 years old presented prevalence with two cutsoff; first by EWGSOP cutoff points which was sarcopenia 15.2%, in contrast, the prevalence was less with Mexicans' specific cutoff point had been used; sarcopenia 6.6%.[21]

In a 2018 Brazilian study, which is an exploratory cross-sectional study conducted in 2009–2010 in 17 Brazilian regions, sarcopenia was 15.3%.[15] The 2002 Danish study showed that the prevalence of sarcopenia was 12%,[3] where a Turkish study revealed a result lower than those observed in the present study, it was 5.2%.[22] Furthermore, 2013 UK community dwelling study present with 7.8% sarcopenia prevalence, notably, the study used skin-fold method in estimation muscle mass.[3] While in 2014 cross sectional Italian study sampled age 27-97 years old; the prevalence was 7.5%; the prevalence was 7.5%.[23] In addition, a 4-year prospective study 2006–2010 aged ≥60, data obtained from SABA study, sarcopenia was 13.4%.[24]

A systemic review and meta-analysis study, in 2022, showed a global prevalence of sarcopenia as 10%; 8% were <60 years; and 10% were ≥60 years.[25] Particularly, some studies showed a high prevalence of sarcopenia; like 2012 cohort Mexico study; the prevalence was 33.6%, actually, it used age sampled >70 year old.[26] Furthermore, 2017 Eastern Sydney cohort community-dwelling study the prevalence was 22%.[27] And in 2018, in a Danish geriatric out-patient sample, the Prevalence of sarcopenia was 26%; the prevalence of sarcopenia was 26%.[28] Inquisitively, a 2022 cross-sectional study in which 26 studies were included in Chinese community-dwelling elderly aged over 65 year old, the prevalence of sarcopenia was 17.4%.[29]

According to bivariant factors analysis, sarcopenia was associated with whole independent variables, and the statistics find the sarcopenia presented as just like we used to in most compatible articles; high with increased age, it presented higher in >70 year old. The distribution reached a rate of 21.5% in males and 8.2% in females, this is matched with the 2014 Cairo study among nursing homes older, which was 22.6% in males and 13.6% in female,[17] much the same as 2013 Egypt and 2019 Palestine studies showed association with male too.[16,30] These results make them looked like as a male disease, but in fact, some articles showed higher distribution among female than among male; likewise, 2019 Saudi Arabia study showed a sarcopenia prevalence 65.7%, and 71.9% female significant association.[31]

Regarding educational agents, sarcopenia was high among illiterate people. This result resembles the outcomes in the 2015 Turkish study and 2016 Pelotas study about sarcopenia and related factors;[18,22] schooling was preferred as an agent that can indirectly influence sarcopenia since those with illiterate schooling or low education level may imitate faulty behaviors and lifestyle habits that are hurtful to health, due to poverty of access to qualified information, as well as due to the poverty of its conception, which can interfere with the cause and effect factors of the disease.

Concerning marital state, sarcopenia attended to be prevalent among single elderly, those who lived alone without partner, this resemble result of Pelotas study;[18] in our opinion, the weak sociality and loss of caring could be a point of attention on it.

Concerning job of seniors, sarcopenia was prevalent among retirement current job, it may demonstrate that since we were seen the retired people in Iraq did not have facilities of enjoying; a lack of public exercise clubbing and geriatric habilitation centers as founded in developed countries was redound in such diseases. About past youth jobs, sarcopenia had an equal prevalence in both sitting and exercised work; meanwhile, the Egyptian study among nursing home elderly showed no relation between job and sarcopenia.[17]

Synchronously to past medical history, there was a significant association between past medical chronic disease history and these muscle diseases, and the results showed prevalent sarcopenia among patients who had miscellaneous other chronic diseases. The sarcopenia studied in Turkey had found the same association,[22] while the study in Egypt found a nonsignificant association with past medical history.[17]

Sequentially, our study observed an association between tobacco smoking and alcohol habits of the elderly in the study sample; sarcopenia was prevalent among nonsmoker and alcoholic elderly which was dissonant with other studies that showed a significant association of sarcopenia with smoking,[18,20] because smoking had an a generalize effect on body organs, muscular system may be included, that the smoking can cause ischemic changes, atrophy alteration, catabolism effects and also lead to chronic disease problem, it may lead to muscle fatigue and reduction in muscle mass and function.

BMI is relatively considered an indicator of nutrition state, usually, many studies found a significant association with low BMI;[17,18,22,32] as the catabolic effect causes a decrease in muscle mass, despite that a Palestinian study preferred an association of sarcopenia with overweighed BMI.[30] In our analysis, normal BMI was associated with sarcopenia.

In addition, most studies incorporated that a physically inactive person was at risk for sarcopenia; the statistical results of this study showed sarcopenia had a strong association with accustomed; the study observed that it had a high distribution among physically inactive elderly, however, about fall history; sarcopenia had been associated with positive fall history; most articles had been said of this familiar association of sarcopenia with physical inactivity, and sarcopenia with fall history.[17,22]

Downloaded from http://journals.lww.com/ircm by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC4/OAVpDDa8KKGKV0Ymy+78= on 12/06/2024

Conclusions

The study demonstrated that sarcopenia is prevalent among the Baghdadian elderly with a set of sociodemographic and general health issues. Implications of similar research could be carried out by utilizing longitudinal design; in addition, the cardinal need is to validate regional cutoff points of sarcopenia specific to the Arab population and the need to use gold standard measurement in the diagnosis of sarcopenia.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Santilli V, Bernetti A, Mangone M, Paoloni M. Clinical definition of sarcopenia. Clin Cases Miner Bone Metab 2014;11:177-80.
2. Mitchell WK, Williams J, Atherton P, Larvin M, Lund J, Narici M. Sarcopenia, dynapenia, and the impact of advancing age on human skeletal muscle size and strength; a quantitative review. Front Physiol 2012;3:260.
3. Han A, Bokshan SL, Marcaccio SE, DePasse JM, Daniels AH. Diagnostic criteria and clinical outcomes in sarcopenia research: A literature review. J Clin Med 2018;7:70.
4. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, Boirie Y, Cederholm T, Landi F, *et al.* Sarcopenia: European consensus on definition and diagnosis: Report of the European working group on sarcopenia in older people. Age Ageing 2010;39:412-23.
5. Wallengren O, Bosaeus I, Frändin K, Lissner L, Falk Erhag H, Wetterberg H, *et al.* Comparison of the 2010 and 2019 diagnostic criteria for sarcopenia by the European working group on sarcopenia in older people (EWGSOP) in two cohorts of Swedish older adults. BMC Geriatr 2021;21:600.
6. Senior HE, Henwood TR, Beller EM, Mitchell GK, Keogh JW. Prevalence and risk factors of sarcopenia among adults living in nursing homes. Maturitas 2015;82:418-23.
7. Delmonico MJ, Beck DT. The current understanding of sarcopenia: Emerging tools and interventional possibilities. Am J Lifestyle Med 2017;11:167-81.
8. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, *et al.* Sarcopenia: Revised European consensus on definition and diagnosis. Age Ageing 2019;48:16-31.
9. Arnal-Gómez A, Cebrià I Iranzo MA, Tomas JM, Tortosa-Chuliá MA, Balasch-Bernat M, Sentandreu-Mañó T, *et al.* Using the updated EWGSOP2 definition in diagnosing sarcopenia in Spanish older adults: Clinical approach. J Clin Med 2021;10:1018.
10. Bahat G, Tufan A, Tufan F, Kilic C, Akpinar TS, Kose M, *et al.* Cut-off points to identify sarcopenia according to European working group on sarcopenia in older people (EWGSOP) definition. Clin Nutr 2016;35:1557-63.
11. Wen X, An P, Chen WC, Lv Y, Fu Q. Comparisons of sarcopenia prevalence based on different diagnostic criteria in Chinese older adults. J Nutr Health Aging 2015;19:342-7.
12. Wang C, Bai L. Sarcopenia in the elderly: Basic and clinical issues. Geriatr Gerontol Int 2012;12:388-96.
13. Janssen I, Heymsfield SB, Allison DB, Kotler DP, Ross R. Body mass index and waist circumference independently contribute to the prediction of nonabdominal, abdominal subcutaneous, and visceral fat. Am J Clin Nutr 2002;75:683-8.
14. Yu S, Appleton S, Chapman I, Adams R, Wittert G, Visvanathan T, *et al.* An anthropometric prediction equation for appendicular skeletal muscle mass in combination with a measure of muscle function to screen for sarcopenia in primary and aged care. J Am Med Dir Assoc 2015;16:25-30.
15. Neves T, Ferriolli E, Lopes MB, Souza MG, Fett CA, Fett WC. Prevalence and factors associated with sarcopenia and dynapenia in elderly people. J Frailty Sarcopenia Falls 2018;3:194-202.
16. Azab BG, Youssif H, Maamoun M, Sweed H. Association between physical performance and muscle strength among elderly. *Egypt J Geriatr Gerontol* 2015;2:33-40.
17. Rahman TT, Elkholy NM, Mortagy AK. Prevalence of sarcopenia among nursing home older residents in Cairo. Egypt Adv Aging Res 2014;3:118.
18. Barbosa-Silva TG, Bielemann RM, Gonzalez MC, Menezes AM. Prevalence of sarcopenia among community-dwelling elderly of a medium-sized South American city: Results of the COMO VAI? Study. J Cachexia Sarcopenia Muscle 2016;7:136-43.
19. Reijnierse EM, Trappenburg MC, Blauw GJ, Verlaan S, de van der Schueren MA, Meskers CG, *et al.* Common ground? The concordance of sarcopenia and frailty definitions. J Am Med Dir Assoc 2016;17:371.e7-12.
20. Hashemi R, Shafiee G, Motlagh AD, Pasalar P, Esmailzadeh A, Siassi F, *et al.* Sarcopenia and its associated factors in Iranian older individuals: Results of SARIR study. Arch Gerontol Geriatr 2016;66:18-22.
21. Rodríguez-García WD, García-Castañeda L, Vaquero-Barbosa N, Mendoza-Núñez VM, Orea-Tejeda A, Perkisas S, *et al.* Prevalence of dynapenia and presarcopenia related to aging in adult community-dwelling Mexicans using two different cut-off points. Eur Geriatr Med 2018;9:219-25.
22. Simsek H, Meseri R, Sahin S, Kilavuz A, Bicakli DH, Uyar M, *et al.* Prevalence of sarcopenia and related factors in community-dwelling elderly individuals. Saudi Med J 2019;40:568-74.
23. Volpato S, Bianchi L, Cherubini A, Landi F, Maggio M, Savino E, *et al.* Prevalence and clinical correlates of sarcopenia in community-dwelling older people: Application of the EWGSOP definition and diagnostic algorithm. J Gerontol A Biol Sci Med Sci 2014;69:438-46.
24. da Silva Alexandre T, de Oliveira Duarte YA, Ferreira Santos JL, Wong R, Lebrão ML. Sarcopenia according to the European working group on sarcopenia in older people (EWGSOP) versus dynapenia as a risk factor for disability in the elderly. J Nutr Health Aging 2014;18:547-53.
25. Petermann-Rocha F, Balntzi V, Gray SR, Lara J, Ho FK, Pell JP, *et al.* Global prevalence of sarcopenia and severe sarcopenia: A systematic review and meta-analysis. J Cachexia Sarcopenia Muscle 2022;13:86-99.
26. Arango-Lopera VE, Arroyo P, Gutiérrez-Robledo LM, Pérez-Zepeda MU. Prevalence of sarcopenia in Mexico City. Eur Geriatr Med 2012;3:157-60.
27. Menant JC, Weber F, Lo J, Sturnieks DL, Close JC, Sachdev PS, *et al.* Strength measures are better than muscle mass measures in predicting health-related outcomes in older people: Time to abandon the term sarcopenia? Osteoporos Int 2017;28:59-70.
28. Christensen MG, Piper KS, Dreier R, Suetta C, Andersen HE. Prevalence of sarcopenia in a Danish geriatric out-patient population. Dan Med J 2018;65:A5485.
29. Ren X, Zhang X, He Q, Du L, Chen K, Chen S, *et al.* Prevalence of sarcopenia in Chinese community-dwelling elderly: A systematic review. BMC Public Health 2022;22:1702.
30. Badrasawi M, Jarradat A, Khodour Z, Lahaleh R, Irshaid A. Sarcopenia prevalence and its correlations with age-related disorders among community-dwelling Palestinian older adults. J Gerontol Geriatr 2020;68:126-35.
31. Alodhayani AA. Sex-specific differences in the prevalence of sarcopenia among pre-frail community-dwelling older adults in Saudi Arabia. Saudi J Biol Sci 2021;28:4005-9.
32. Scott D, Sanders KM, Aitken D, Hayes A, Ebeling PR, Jones G. Sarcopenic obesity and dynapenic obesity: 5-year associations with falls risk in middle-aged and older adults. Obesity (Silver Spring) 2014;22:1568-74.