

Estimation of Pre-Sarcopenia Among A Sample Aged 60 Years and Older From Baghdad\Iraq

Israa M. Al-Taglubee¹ MBChB, Atheer J. Al-Saffar² FICMS

¹Ministry of Health, Iraq, ²Dept. of Family and Community Medicine, College of Medicine, Al-Nahrain University, Baghdad, Iraq

Abstract

Background	The pre-sarcopenia is a preclinical state of sarcopenia; which was identified as an age associated muscle disease detected by low muscle mass only and normal muscle function. It can predict the subsequent functional decline.
Objective	To estimate the prevalence of presarcopenia in Iraqi sample aged ≥60 years old and determines some socio-demographic factors that may be related.
Methods	A descriptive cross-sectional community dwelling study. The data obtained from a questionnaire (socio-demographic and behavioral data) in addition to anthropometry and muscle strength measurements. The muscle mass was estimated by anthropometry equation and cutoff points were derived from The European Working Group on Sarcopenia in Older People 2019.
Results	The result revealed that near quarter of the sample was pre-sarcopenia; 38.3% male and 8.2% female. It was significantly associated with male, single, retirement, smokers, alcoholic, diabetic and normal body mass index elderly, it negatively related to age and fall history and positively with schooling and physically activate.
Conclusion	Pre-sarcopenia, which is an age associated condition was presented as a considerable prevalence among a sample of older age participants from Baghdad and association with all independent variables.
Keywords	Fragile, old age, disability
Citation	Al-Taglubee IM, Al-Saffar AJ. Estimation of pre-sarcopenia among a sample aged 60 years and older from Baghdad\Iraq. Iraqi JMS. 2023; 21(2): 269-277. doi: 10.22578/IJMS.21.2.15

List of abbreviations: BMI = Body Mass Index, DM = Diabetes mellitus, EWGSOP = The European Working Group on sarcopenia in older people

Introduction

Ageing is unavoidable process described as a progressive changes in skeletal muscle and function ⁽¹⁾. Age accompaniment poverty of muscle mass and function represented in terms sarcopenia derived from Greek origin by Dr. Irwin Rosenberg in 1989 cited by Clark and Manini ⁽²⁾. It is a hidden new global widespread syndrome, even that this condition is looked benign, but in fact, it is a

serious condition often led to significant frailty, fragility, and subsequent increased risks of morbidity and mortality ⁽³⁾.

Pre-sarcopenia is a preliminary stage of sarcopenia, demonstrates evidence of decline of skeletal muscle mass only and normal muscle function ^(4,5).

Numerous prior researches are being done to find the cardinal explain of the mechanism of these age-associated muscle disease; they mentioned many pathways of hormonal, nutritional, and neuromuscular junction declines, that lead to cause the disease ^(4,6).

The next generation of researches suggested a bio-molecular findings attached to apoptosis activity, mitochondrial decay, and angiotensin system in muscle have a role in mechanism of progressive and generalize loss of skeletal mass and strength, thus need more studies to approved ⁽⁷⁾.

Pre-sarcopenia may correlate with other condition synergistically; like diabetes mellitus (DM), cancer, inflammatory diseases, obesity, and decrease vitamin D level, which cause decline in muscle mass ⁽⁶⁾.

However, diagnosis of pre-sarcopenia occurs according sarcopenia definition used. Until now, there is no unified standardized diagnosis protocol and the epidemiological studies of this condition across the world reported varied prevalence rates. The working groups of sarcopenia definition have utilized an operational diagnosis criteria suited their special population and factors related to them ⁽⁵⁾. Particularly, The European Working Group on sarcopenia in older people (EWGSOP)2 in 2019 was declared its simplified diagnosis of sarcopenia in clinical application, in meaning, it has been depend on muscle strength and muscle mass measurements in definition; in addition to staging process of sarcopenia into pre-sarcopenia, sarcopenia and severe sarcopenia; thus, to be pre-sarcopenia referred to preclinical appearing of sarcopenia and defined as low muscle mass with normal muscle strength and physical performance ⁽⁸⁾.

Concerned Arab world, lack of studies to explore the prevalence and related factors of pre-sarcopenia; the fundamental point that it is a new condition and lack the standardized protocol in diagnosis, add to that lack a cutoff point suited to Arab population and depend usually on EWGSOP definition in the researches evaporated from ⁽⁹⁾. Considerably, grow in elderly population will cause grow in prevalence of pre-sarcopenia, which turn to cause a monstrous impact on health system ⁽¹⁰⁾.

This study aimed to estimate the prevalence of pre-sarcopenia in Iraqi sample aged ≥ 60 years

old and determines some socio-demographic factors that may be related

Methods

Study design and setting

A descriptive cross-sectional population-based study designed. The participants are elderly, aged ≥ 60 years, the data collection was carried on from 16th of January 2022 till 20th may 2022 in a community dwelling and Senior Citizen Centers in Baghdad- Iraq.

Study participants and sampling

The study involved old aged 60 years and more that have been chosen by convenience sampling from Karkh and Rasafah districts from residents of Senior Citizen Centers in Baghdad, all the six Citizen Centers had been included; the two governmental Senior Citizen Centers (Al-Rashad and Al-Suleikh Centers) hold over 200 residents, 150 of them had been included in the study, others were private Senior Citizen Centers; approximately, they kept 250 residents, 225 of them were included in the study. Other samples were collected from community dwelling seniors' pool as from coffee shops, public parks, the holy places, retirement office and salary payment after their agreement to participate.

Inclusion criteria

- Age ≥ 60 years old.
- Ability to mobilize independently.

Exclusion criteria

- Physical or mental incapacity to perform the request test.
- Refuse to participate in the study.
- Have a condition affect the muscles and/or its function like spinal problem (neuropathic cause of muscles dysfunction) and thyroid problems based on participant report.
- Long term drug intake of Statin (atorvastatin) and angiotensin converting enzyme inhibitor; more than 6 months ago, because they affect muscle mass directly.

Data collection and study tools

Data was been collected by direct interview, using a questionnaire, which was designed and prepared by the researcher and the supervisor after reviewing studies in same theme ⁽²⁻¹⁰⁾, in addition, taking measurements of muscle power and anthropometry. Equipment used were weight scale, height tap measure, handgrip dynamometer.

Questionnaire collected information

It consisted of demographic data; asking about (age, sex, marital status, education, past-occupational history, current job, smoking, alcohol consumption, past-medical history, sport activity and fall history during the last year). It is designed to identify socio-demographic and behavioral aspects related to muscle disease and mention them in the studies.

Anthropometry measurements

Body weight was measure by calibrated non-digital NOVA (NBS-1704BSC) scale, made in China, the individual being barefoot and light clothing as possible, and taking reading in kilogram.

The height is measured by a wall-mounted stadiometer, the individual being barefoot and stand straight, back supported to the wall with neutral head up, and taking reading in centimeter.

Body mass index (BMI) calculation was done by dividing weight in Kg by the square of height in meters.

$BMI = \text{Weight in Kg} / (\text{Height in meter})^2$

BMI scale according to World Health Organization classification can divide into:

- Normal: if it was between (18-24.9) kg/m²
- Overweight: if it was between (25-29.9) kg/m²
- Obese: if it was between (30-34.9) kg/m². ⁽¹¹⁾

Muscle strength

Muscle strength measurement done by Hand grip assessment. It has been performed by using a manual hydraulic TTM Smedley 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 asked to use his dominant hand and grip the device in maximum power. The test was done two times with 60 seconds rest between trials and takes the highest value. The measurement was in kilogram and cutoff points of <27 kg for men and <16 kg for women ⁽¹²⁾.

Pivotaly, low muscle strength may reflect dynapenia if other measures are normal, and consider sarcopenia if combined with low muscle mass ⁽¹³⁾.

Muscle mass estimation

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

$10.05 + 0.35 * \text{weight} - 0.62 * \text{Body Mass Index} - 0.02 * \text{age} (+ 5.10 \text{ if men})$

(Weight in kg, Body Mass Index in kg/m², age in years)

Then skeletal muscle index (SMI) was calculated through dividing SMM by the squared height in meter, and cut-off points were 8.39 Kg/m² (sensitivity 85.4% and specificity 68.9%) and 5.97 Kg/m² (sensitivity 96.2% and specificity 36.9%) among men and women, respectively ⁽¹⁴⁾.

Definition of variables

Pre-sarcopenia was the dependent variable in the article, whereas age, sex, marital state, education level, youth job, current job, smoking, alcohol consumption, past-medical history, physical activity, fall history and BMI were the independent variables.

Pre-sarcopenia: normal hand grip and low muscle mass.

Youth job: mean past occupational history.

Current job: refer to the person meanwhile job.

Smoking: all cases either non-smoker at all or 5 years and more smoking, so divided according that into smoker and non-smoker.

Alcohol intake: has been asked about regular consumption.

Multi-morbidity: when there is 2 and further chronic medical diseases, which taken by past medical history.

Others in past medical history: refer to other diseases not mention in major categories like heart problems, renal disease, rheumatoid arthritis ... etc.

Physical activity: every week, at least 3 times, different multi component physical exercised that emphasizes functional balance achievement and muscle strength activity at moderate or vagarious intensity; 150 min/week in moderate activity and 75 min/week in vagarious intensity.

Fall history: fall accident history during last year ago.

Pilot study

A sample of tens elderly (Age ≥ 60 years), were included after meeting the inclusion and exclusion criteria. Data collected by direct interview by researcher and consent is taken from all participants; meanwhile the questionnaire is filled, discussion how the tests must be done was pending. The test was done by the researcher firstly to give a full picture to the participant then the participant did it after. Measurements are recorded (weight, height and hand grip). The pilot study was useful in estimating the time taken to each subject data collecting, time ranged from 20 min. to 30 min. for every subject.

Ethical consideration

The study proposal was approved by the Institutional Review Board of College of Medicine, Al-Nahrain University as well as to the agreement of Family and Community Medicine Department of College of Medicine, Al-Nahrain University was taken before starting the study.

Patient's verbal consent was taken prior to their enrollment. All information kept confidential and data used exclusively for research purposes and individuals were asked to participate on a voluntary basis.

Statistical analysis

Data were collected and analysed using Statistical Package for Social Sciences (SPSS) version 22. Categorical variables were presented as number and percentage, while numerical variables were presented as mean and standard deviation (\pm SD). Chi square and fisher exact tests were used accordingly to compare variables between groups. Statistical significance was considered whenever the P value was equal or less than 0.05.

Results

Sample's characteristics

Among 590 elderly in the senior citizen centers and community dwelling who were asked to participate in the study, 90 were not included because, either they refused to be part in the study or have exclusion criteria; most excluded cases were be cerebrovascular accident cause, thus, the final sample was composed of 500 Subjects were included in the study, approximately 63% was ≤ 70 years with mean age of participants was 69.18 ± 6.728 years old. The male elders constituted 51.2%, 66% of the participant lived without partner, and 41.8% had secondary education level. Among them 97.4% were retired, however, 61.6% of them had sitting gobs during their past youth (Table 1).

Regarding their BMI, only about quarter of them 26.0% had normal BMI. According to the personal behavioral aspects, three quarters of the sample 75.6% were nonsmoker and 90% were nonalcoholic, however, only 16.6% had regular physical exercise and 12.8% had history of fall during the last 12 months (Table 2).

Prevalence of pre-sarcopenia

The study estimated pre-sarcopenia by muscle mass calculation and hand grip measurement, the results discerned that 23.6% were detected as pre-sarcopenic (Figure 1).

Table 1. Distribution of the socio-demographic characteristics of the sample

	Variable	No.	Percent
Age (yr)	≤70	317	36.4
	>70	183	36.6
	Mean±SD Range		69.18±6.73 (96-60)
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

Table 2. Distribution of body mass index, personal habits, past medical history and fall history characteristics of the sample

	Variable	No.	Percent
BMI (kg/m ²)	Normal (18.5-24.9)	130	26.0
	Overweight (25-29.9)	233	46.6
	Obese (≥30)	137	27.4
Smoking	Non smoker	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	None	233	46.6
	Hypertension	100	20.0
	Diabetes mellitus	73	14.6
	Others	20	4.0
	Multi-morbidity	74	14.8
Fall history	Yes	64	12.8
	No	436	87.2

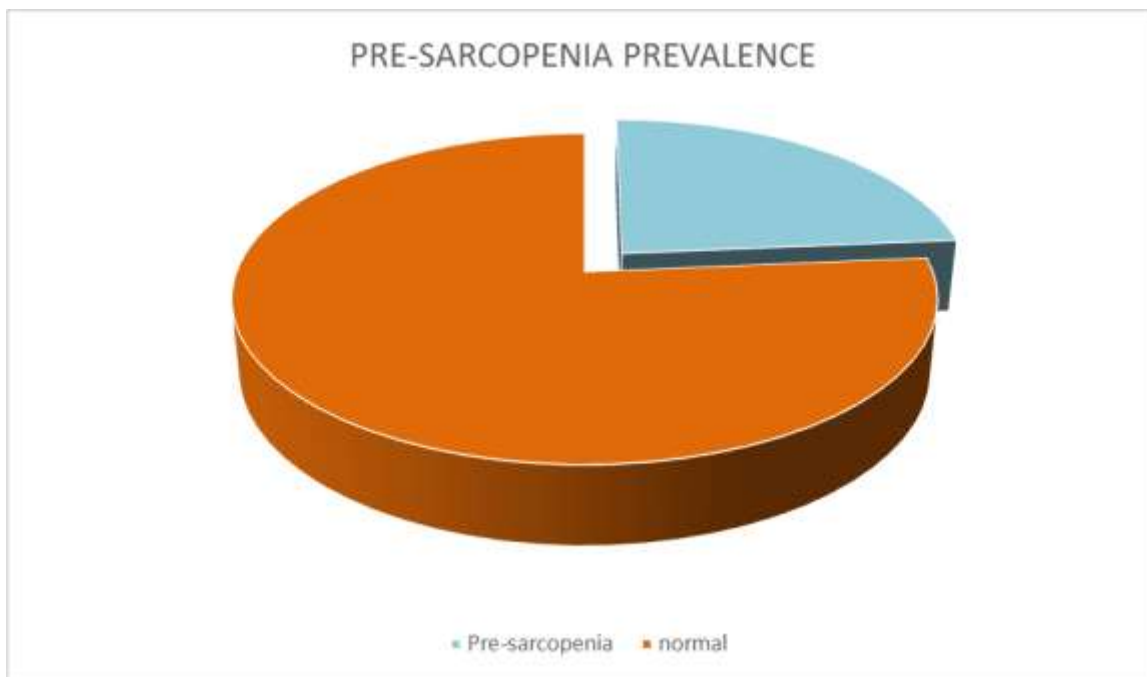


Figure 1. Prevalence of pre-sarcopenia condition among a sample older age in Baghdad

Factors related to muscle conditions

Pre-sarcopenia 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.

Pre-sarcopenia was negatively associated with age and significantly related to male 38.3%, single, retirement. Pre-sarcopenia was linked with college and higher education level 38.6%. Similar to marital state, the results of youth job revealed a high prevalence of pre-sarcopenia was high in exercised past job, nevertheless Sarcopenia was high in both sitting and exercised job equally.

Regarding analysis of personal habits, high prevalence of pre-sarcopenia had 45.1% among smokers. Although, alcoholic habit had been presented more in pre-sarcopenia 77.1%.

The study results set forth high distribution of pre-sarcopenia was highest among DM patients 39.7%. In another hand, pre-sarcopenia was highest in non-past fall history. Concerning BMI, the prevalence of pre-sarcopenia was highest in normal BMI 60.8% (Table 3).

Discussion

In this study, we used two tools in detection of pre-sarcopenia; muscle strength by hand grip dynamometer, and muscle mass by An Anthropometric Prediction Equation for Appendicular Skeletal Muscle Mass. Each of these parameters used is a cardinal tool in definition; they are simple, non-invasive and applicable, notably, the use of gold standard measurement of muscle mass is uneasy in this study especially in a sample of community dwelling people, for that the research depends on a novel anthropometric prediction equation.

The prevalence of pre-sarcopenia was not well recognized locally and worldwide, due to it is still a new concept need exceeding quest to get a consolidation diagnostic definition and cutoffs.

The prevalence, in our study was 23.6%, comparing with world nations prevalence of pre-sarcopenia, beginning will be from articles rather closet to us in the results like: a 2015 case-control Egyptian study presented pre-sarcopenia prevalence was 18.4%⁽¹⁵⁾.

Table 3. Factors analysis of groups muscle conditions by measurement of muscle mass and muscle strength

Variable		Pre-sarcopenia N = 118		Non- presarcopenic N = 382		P value
		N	%	N	%	
Age (yr)	≤70	86	27.1	231	72.9	<0.001*
	>70	32	17.5	151	82.5	
Sex	Male	98	38.3	158	61.7	<0.001*
	Female	20	8.2	224	81.8	
Marital state	Single	30	40.5	44	59.5	<0.001*
	Married	41	24.1	129	75.9	
	Divorced	23	28.8	57	71.2	
	Widow	24	13.6	152	86.4	
Educational level	Illiterate	4	5.3	71	94.7	<0.001*
	Primary	35	24.0	111	76.0	
	Secondary	52	24.9	157	75.1	
	College	27	38.6	43	61.4	
Youth job	Sitting job	57	18.5	251	81.5	<0.001*
	Exercised job	61	31.8	131	68.2	
Current job	Retirement	118	24.2	369	75.8	0.002**
	Exercised job	0	0	13	100	
Smoking	Non-Smoker	72	19.0	306	81.0	<0.001*
	Smoker	46	37.7	76	62.3	
Alcohol	Yes	37	77.1	11	22.9	<0.001*
	No	81	17.9	371	82.1	
Past medical history	None	59	25.3	174	74.7	<0.001*
	Hypertension	22	22.0	78	78.0	
	D.M	29	39.7	44	60.3	
	Others	4	20.0	16	80.0	
	Multi-morbidity	4	5.4	70	94.6	
Physical activity	Yes	42	50.6	41	49.4	<0.001*
	No	76	18.2	341	81.8	
Fall history	Yes	3	4.7	61	95.3	<0.001*
	No	115	26.4	321	73.6	
BMI	Normal	79	60.8	51	39.2	<0.001*
	Overweight	39	16.7	194	83.3	
	Obese	0	0	137	100	

* Chi square test, ** Fisher Exact test

Consistent with studies near us geographically, a 2018 Iranian study reported prevalence of Pre-sarcopenia was 12.38%⁽¹⁶⁾.

Also, 2018 cross sectional community-dwelling Mexicans adults aged ≥50 years old presented prevalences with two cuts-off; firstly, by EWGSOP cut-off points, which was pre-sarcopenia 38.1, in contrast the prevalence was

less by Mexicans' specific cut-off point which had been used; pre-sarcopenia was 12.8⁽¹⁷⁾.

Additionally, in comparison with studies had results much lower than our current result; a 2019 São Paulo- a part of cohort SABE project, which is the biggest data reference study in Brazil, the prevalence reported 4.8% as Sarcopenia; yet, when reviewing their

methodology, they refer to pre-sarcopenia in the current definition of the condition ⁽¹⁸⁾.

A 2018 Denmark geriatric outpatient sampled; the prevalence for pre-sarcopenia was 10% ⁽¹⁹⁾. Inquisitively, a 2016 cross sectional in community dwelling elderly in Japan presented with the rate of pre-sarcopenia as 23% in females, and 22% in males were use Asian Working Group for Sarcopenia (AWGS) operational approach ⁽²⁰⁾.

According to bi-variant factors analysis, pre-sarcopenia was associated with whole independent variables, the statistics find that pre-sarcopenia prevalence was high in adults aged 70 years old and below. Also, the distribution reaching a rate of 38.3% was male and 8.2% were female.

Regarding educational agent, pre-sarcopenia showed high distribution among college and advanced level of schooling, schooling was preferred as agent that can indirectly influence effect factors of the disease.

Concerning marital state, pre-sarcopenia attended to be prevalent among single elderly, those who lived without partner, this result in our opinion was refer to the weak sociality and loss of caring could be a point must attention on it.

Concerning job of seniors, pre-sarcopenia was prevalent among retirement current job, it may demonstrate that, since we were seen the retired people in Iraq did not have facility of enjoying; lack of public exercise clubbing and geriatric habilitation centers as founded in developed countries, was redound in such diseases. About past youth job, pre-sarcopenia was high in exercised work.

Synchronously to past medical history, there was a significant association between past medical chronic disease history and these muscle diseases, the results showed prevalent pre-sarcopenia among DM patients.

Sequentially, this study observed an association with tobacco smoking and alcohol habits of elderly in study sample; Pre-sarcopenia was prevalent among smoker and alcoholic individuals, possibly with rationalize explanation, 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 redaction in muscle mass and function. It needs a prospective study to determine if it a risk factor of pre-sarcopenia as it was in several diseases.

BMI relatively consider as indicator of nutrition state; as the catabolic effect cause decrease in muscle mass, despite that, in our analysis, the normal BMI was associated with pre-sarcopenia condition. Also, the statistical results of this study showed uncouth result; since it was highest in physical exercised seniors, however also in fall history pre-sarcopenia was showed uncouth result too, that it was associated with a negative fall history.

This study has some limitation, to begin with need to use of gold standard measurement in diagnosis of muscle mass. Second, this study had been carried out in Baghdad only; its results cannot generalize to all Iraqi people. Finally, and the important point was limited number of research in this topic.

The study also has some strength. First the study managed in large sample size, which gives some statistical power, second, the eligible participants were diversified in independent variables, not constricted to special group for bias minify.

In conclusion, the study demonstrated the prevalence of pre-sarcopenia among Baghdadian elderly with set of socio-demographic and general health issues. Implication of similar research could be carried out to utilizing longitudinal design, additionally the cardinal need is to validate a regional cut off points of sarcopenia specific to Arab population.

Acknowledgement

The authors are grateful to all the elderly people who allowed me to include them in this study.

Author contribution

Dr. Al-Taghlube: the concept of the study, collection of data, interpretation and writing of manuscript. Dr. Al-Saffar: the research plan and

study design, statistical analysis, final revision of the manuscript.

Conflict of interest

The author declares no conflict of interest.

Funding

This research didn't receive external funding.

References

- Orimo H. [Reviewing the definition of elderly]. *Nihon Ronen Igakkai Zasshi*. 2006; 43(1):27-34. Japanese. doi: 10.3143/geriatrics.43.27.
- Clark BC, Manini TM. Evolution of sarcopenia research. *Curr Opin Clin Nutr Metab Care*. 2010; 13(3): 271-6. doi: 10.1097/MCO.0b013e328337819e.
- Delmonico MJ, Beck DT. The current understanding of sarcopenia: Emerging tools and interventional possibilities. *Am J Lifestyle Med*. 2016; 11(2): 167-181. doi: 10.1177/1559827615594343.
- Kobayashi K, Ando K, Tsushima M, et al. Predictors of presarcopenia in community-dwelling older adults: A 5-year longitudinal study. *Mod Rheumatol*. 2019; 29(6): 1053-8. doi: 10.1080/14397595.2018.1551171.
- Rodríguez-García WD, García-Castañeda L, Vaquero-Barbosa N, 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(2): 219-25. doi: 10.1007/s41999-018-0032-8.
- Volpi E, Nazemi R, Fujita S. Muscle tissue changes with aging. *Curr Opin Clin Nutr Metab Care*. 2004; 7(4): 405-10. doi: 10.1097/01.mco.0000134362.76653.b2.
- Cao Y, Zhong M, Zhang Y, et al. Presarcopenia Is an Independent Risk Factor for Carotid Atherosclerosis in Chinese Population with Metabolic Syndrome. *Diabetes Metab Syndr Obes*. 2020; 13: 81-8. doi: 10.2147/DMSO.S235335.
- Scott D, Johansson J, McMillan LB, et al. Associations of sarcopenia and its components with bone structure and incident falls in Swedish older adults. *Calcif Tissue Int*. 2019; 105(1): 26-36. doi: 10.1007/s00223-019-00540-1.
- Yakout SM, Alkahtani SA, Al-Disi D, et al. Coexistence of Pre-sarcopenia and Metabolic Syndrome in Arab Men. *Calcif Tissue Int*. 2019; 104(2): 130-6. doi: 10.1007/s00223-018-0477-2.
- Yeh WS, Chiang PL, Kee KM, et al. Pre-sarcopenia is the prognostic factor of overall survival in early-stage hepatoma patients undergoing radiofrequency ablation. *Medicine (Baltimore)*. 2020; 99(23): e20455. doi: 10.1097/MD.00000000000020455.
- Janssen I, Heymsfield SB, Allison DB, et al. Body mass index and waist circumference independently contribute to the prediction of nonabdominal, abdominal subcutaneous, and visceral fat. *Am J Clin Nutr*. 2002; 75(4): 683-8. doi: 10.1093/ajcn/75.4.683.
- Arnal-Gómez A, Cebrià I Iranzo MA, Tomas JM, et al. Using the updated EWGSOP2 definition in diagnosing sarcopenia in Spanish older adults: Clinical approach. *J Clin Med*. 2021; 10(5): 1018. doi: 10.3390/jcm10051018.
- Meza-Valderrama D, Marco E, Dávalos-Yerovi V, et al. Sarcopenia, malnutrition, and cachexia: adapting definitions and terminology of nutritional disorders in older people with cancer. *Nutrients*. 2021; 13(3): 761. doi: 10.3390/nu13030761.
- Yu S, Appleton S, Chapman I, 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(1): 25-30. doi: 10.1016/j.jamda.2014.06.018.
- Azab BG, Youssif H, Maamoun M, et al. Association between physical performance and muscle strength among elderly. *Egyptian J Geriatr Gerontol*, 2015; 2(1): 33-40. doi: 10.21608/ejgg.2015.5344.
- Hashemi R, Shafiee G, Motlagh AD, et al. Sarcopenia and its associated factors in Iranian older individuals: Results of SARIR study. *Arch Gerontol Geriatr*. 2016; 66: 18-22. doi: 10.1016/j.archger.2016.04.016.
- Rodríguez-García WD, García-Castañeda L, Vaquero-Barbosa N, 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(2): 219-225. doi: 10.1007/s41999-018-0032-8.
- Alexandre TDS, Duarte YAO, Santos JLF, et al. Prevalence and associated factors of sarcopenia, dynapenia, and sarcodynepenia in community-dwelling elderly in São Paulo - SABE Study. *Rev Bras Epidemiol*. 2019; 21(Suppl 02(Suppl 02)): e180009. Portuguese, English. doi: 10.1590/1980-549720180009.supl.2.
- Christensen MG, Piper KS, Dreier R, et al. Prevalence of sarcopenia in a Danish geriatric out-patient population. *Dan Med J*. 2018; 65(6): A5485.
- Kobayashi K, Imagama S, Ando K, et al. Dynapenia and physical performance in community-dwelling elderly people in Japan. *Nagoya J Med Sci*. 2020; 82(3): 415-24. doi: 10.18999/nagjms.82.3.415.

Correspondence to Dr. Israa M. Al-Taglubee

E-mail: dr.israataglub@gmail.com

Received Apr. 2nd 2023

Accepted Apr. 25th 2023