An evaluation of the prevalence of probable sarcopenia in older adults in a single centre in Trinidad and Tobago

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Abstract

Objectives

To assess the prevalence of probable sarcopenia, defined as weak handgrip strength, in community dwelling older adults, for a cohort in Trinidad and Tobago, using guidelines issued by the European Working Group on Sarcopenia in Older People 2 (EWGSOP2). Secondly, to investigate the association between probable sarcopenia and factors such as sex, age, ethnicity, diabetes, metformin usage, protein intake, multiple comorbidities, level of alcohol consumption and physical activity.

Method

This was a cross-sectional cohort study comprising of adults aged ≥ 60 years. SARC-F scores ≥ 4 were used to screen for probable sarcopenia and the EWGSOP2 criteria, low grip strength (< 27 kg for males and < 16 kg for females) were used for assessment. Statistically significant associations were determined using both Chi Squared and Logistic Regression analysis.

Results

A total of 143 adults were enrolled. The prevalence of probable sarcopenia within the cohort was 30.8% overall. In females it was 22.6% [n=84, mean age 75.9 years, standard deviation (8.07)] and in males 42.4% [n =59, mean age 75.7 years (6.28)]. Factors associated with probable sarcopenia were female sex ($p = 0.01$), age ($p = 0.001$), East Indian ethnicity ($p = 0.001$), SARC-F score >4 ($p<0.001$), number of diseases ($p = 0.04$), and minimal physical activity ($p=0.01$). In multivariate analyses, only socio-demographic variables and SARC-F but no lifestyle factors were significantly associated with probable sarcopenia.

Conclusion

This study found that almost 1 in every 3 persons of age above 60 years had probable sarcopenia, which was more common in males than in females. Age, sex, race, and SARC-F were significantly associated with probable sarcopenia in adjusted analyses.

Introduction

Sarcopenia is a condition which is characterized by deteriorating skeletal muscle health. It manifests as loss of muscle mass and strength with ageing.[1]The global prevalence of sarcopenia is approximately 10%.[2,3] Assessing the prevalence of this condition in any older adult population provides an indication of the vulnerability of these individuals to decreased mobility, loss of independence, diabetes mellitus, cardiovascular disease[4], falls and fractures[1] along with the greater risk of hospitalization[5,6], poor cognitive function and dementia[7]. The advantage of such an evaluation is that this age-related condition can be treated or reversed through resistance training exercises[8] and increased protein consumption, both of which are very low cost methods of treatment which focus upon maintaining functional ability.[9,10] One American study estimated that a 10% reduction in the prevalence of sarcopenia would result in annual savings of $1.1 billion in US health care costs.[11]

In 2018, the European Working Group on Sarcopenia in Older People 2 (EWGSOP2) adjusted the criteria required to make this diagnosis. The primary indicator of sarcopenia is low muscle strength.[1] Diagnostic criteria for sarcopenia include the following:

Diabetes and sarcopenia are two prevalent conditions that often coexist and have a common pathogenesis. Sarcopenia is increasingly recognized as a risk factor for type 2 diabetes (T2D).[13] Individuals with T2D are at higher risk for sarcopenia due to insulin resistance and oxidative stress[14]. These conditions further exacerbate each other, leading to decreased mobility, increased falls, and ultimately, impaired quality of life.[15] More than 13% of the population of Trinidad and Tobago has been diagnosed with diabetes and over 13% of the population is over the age of 60 years, inevitably putting this population at risk of probable sarcopenia.[16, 17]

The aim of this study was to assess the prevalence of probable sarcopenia in older adults in one clinic in Trinidad and Tobago and to determine which factors were associated with probable sarcopenia.

Methods

This study was conducted at the Gerontology Clinic located at the St. James Medical Complex, Trinidad. A cross sectional study design was used to collect data over a two-month period from July to August 2021. Patients were eligible to participate if they were registered to attend the clinic and were over the age of 60 years. Patients were excluded if they were not registered to attend the clinic, under the age of 60 years, known to

Criteria	Test and Cut-Off	Diagnosis
Low muscle strength by chair stand and grip strength *	Grip strength (males) < 27 kg Grip strength (females) < 16 kg Chair standing > 15 s for five rises	Probable Sarcopenia
Low muscle quantity or quality **	ASM (males) < 20 kg ASM (females) < 15 kg ASM/height2 (males) < 7.0 kg/m^2 ASM/height2 (females) < 5.5 kg/m^2	Sarcopenia
Low muscle performance ***	Gait speed ≤ 0.8 m/s Short Physical Performance Battery (SPPB) ≤ 8 points score Timed Up-and-Go Test ≥ 20 s 400 m walk test, noncompletion or ≥6 min for completion	Severe Sarcopenia

* Probable sarcopenia is identified by Criterion 1 (Low muscle strength).
** The diagnosis is confirmed by additional documentation from Criterion 2 (Low muscle quantity or quality).

*** If Criteria 1, 2, and 3 (poor physical performance) are all met, sarcopenia is considered severe. ASM: appendicular skeletal muscle mass.

Cited from 'Sarcopenia; Diagnosis and Management, State of the Art and Contribution of Ultrasound' Journal of Clinical Medicine, Giovannini, Silvia, November 2021.[12]

have dementia, any acute illness or upper limb arthritis.

Data collection tools

1. Measurement techniques

Grip strength was used to determine muscle strength, using the Grip-X digital dynamometer. Based on EWGSOP 2 criteria, probable sarcopenia (low grip strength) was diagnosed based on cut-off values for maximum hand-grip strength [1]. These EWGSOP2 cut-off values were applied because there is no normative grip strength data for Trinidad or the Caribbean. All measurements were taken with participants seated on a chair with no arm rests and elbows flexed at 90 degrees. Grip strength was measured for each hand three times with a 15 second interval between hands. The maximum of all six values or maximum grip strength (MGS) was recorded.[18] The cut off values used were:

- Females: maximum hand-grip strength<16kg
- Males: maximum hand-grip strength<27 kg

2. Health Questionnaire

a. The SARC-F questionnaire (Strength, Assistance in walking, Rise from a chair, Climb stairs, and Falls) is a validated screening tool which was used to screen for probable sarcopenia.[1] This tool assessed the degree of difficulty experienced across five components: strength, requiring assistance in walking, ability to rise from a chair, climbing stairs and falls risk. Response scores ranged from 0-10 with scores ≥ 4 considered positive for probable sarcopenia.

A de novo questionnaire was developed based on existing literature and additional demographic data were collected: age, gender, ethnicity, co-morbidities, medications, diet, physical activity, smoking status and alcohol consumption.

COVID-19 restrictions

All data was collected during the COVID-19 pandemic. The restrictions mandated on movement and interaction during that time impacted the time allotted to participants and the amount and detail of data collected, as well as the type of patient allowed to visit the clinic. Non-ambulant and vulnerable patients were managed through Telemedicine and not encouraged to visit the clinic at that time.

Data Collection

Prospective participants were provided with a participant information sheet. Participants were informed about the voluntary nature of the study and assured that any information collected would remain confidential. The testing process and safety protocols were also explained. Written informed consent was obtained. The calculated sample size for this study was 140 participants. A pilot study could not be considered as all data was collected during the Covid-19 pandemic and Ethical Approval was granted by the North West Regional Health Authority, Trinidad and Tobago.

Data Analysis

Data was analysed using IBM SPSS v 27 (SPSS, IBM Corporation, Armonk, NY, USA). Descriptive statistics (frequencies, mean (M), standard deviation (SD)) were used to analyse the demographic data. Chi Squared test and logistic regressions were used to assess any associations with probable sarcopenia. A p value of less than 0.05 was considered statistically significant and 95% CI were used.

Logistic regression models were employed to investigate the odds of probable sarcopenia in relation to significant key socio-demographic, health and lifestyle variables. Sensitivity analyses were conducted to evaluate the robustness of the multivariate associations tested by adjusting Model 3 for lifestyle variables (alcohol intake, smoking, consumption of protein-rich foods) and the additional variance in grip strength data was examined.

Results

A total of 143 participants were evaluated. The mean age was 75 years (SD 7.36) and there were approximately 41 % males and 59% females. Of all participants, 37% (n=53) were diabetic. The Mean maximum grip strength was 20.73 (SD 5.24) kg for females and 30.35 (SD 8.78) for males. In the overall sample, 30.8% (n=44) met criteria for probable sarcopenia. The prevalence of probable sarcopenia by gender was, 42.4% (n=25) in males and 22.6% (n=19) in females.

Probable sarcopenia was highest in those patients over the age of 90 years (62.5%, n=5). Based on ethnicity, probable sarcopenia was seen in 22.7% (n=20) African descent, 58.6% (n=17) East Indian descent and 26.9% (n=7) Mixed. Further details are presented in Table 1.

Table 1: Patient Demographics

Variables	All n (%)	Males n (%)	Females n (%)
Overall	143 (100)	59 (41.0)	84 (59)
Age (Range) 60-69 70-79 80-89 90 and over	 24 (16.0) 77.53 (53.8) 34 (23.8) 8 (5.6)	 8 (13.6) 34 (57.6) 17 (28.8) 0 (0.0)	 16 (19.0) 43 (51.2) 17 (20.2) 8 (9.5)
Race African East Indian Mixed	 88 (61.5) 29 (20.3) 26 (18.2)	 35 (59.3) 9 (15.3) 9 (15.3)	 53 (63.1) 20 (23.8) 17 (20.2)
Protein Intake < 3 Times Weekly Daily	 73 (51.0) 70 (49.6)	 29 (49.2) 30 (50.8)	 44 (52.4) 40 (47.6)
Diabetic Status Yes No	 53 (37.1) 90 (62.9)	 18 (30.5) 41 (69.5)	 35 (41.7) 49 (58.3)
Level of Exercise Minimal Moderate Vigorous	 49 (34.3) 71 (49.7) 23 (16.1)	 17 (28.8) 32 (54.2) 10 (16.9)	 32 (38.1) 39 (46.4) 13 (5.5)
EWGSOP2 Probable Sarcopenia: Yes Probable Sarcopenia: No	 44 (30.8) 99 (69.2)	 25 (42.4) 34 (57.6)	 19 (22.6) 65 (77.4)
Age (years) [Mean (SD)]	75.83 (7.36)	75.65 (6.28)	75.93 (8.07)
Maximum Grip Strength [Mean (SD)] Range	24.70 (8.37) (7.5 - 64.7)	30.35 (8.78) (13.4 – 64.7)	20.73 (5.24) (7.5-32.4)

EWGSOP2 = European Working Group on Sarcopenia in Older People 2.

Factors Associated with Probable Sarcopenia

Factors associated with probable sarcopenia are presented in Table 2. Among participants, 42.4% (n=25) of men had probable sarcopenia compared to 22.6% (n=19) women (p= 0.01). A higher proportion of East Indian participants (58.6%, n=17, p< 0.001) had probable sarcopenia compared to African 22.7%, n=20) and Mixed participants (26.9%, n=7). A lower proportion of participants with higher levels of physical activity had probable sarcopenia (21.3% versus 49%, p< 0.001)

Chi Squared x^2 test of Independence was used to test association between prevalence of probable sarcopenia based on the EWGSOP2 cut-offs for handgrip strength and Sex, Age, Race, Protein Intake, Diabetic Status and Level of Exercise.

Determinants of probable Sarcopenia

For every 1-unit increase in age, the odds of having probable sarcopenia increased proportionately (1.10 .95% CI 1.04-1.16, p=0.001). Compared to males, females were less likely to have probable sarcopenia (OR 0.4, 95% CI 0.19-0.82, p=0.01). Participants of East Indian descent were at an increased risk of developing probable sarcopenia compared with those of African descent (OR 4.82 95% CI 1.98-11.75, p=0.001). Probable sarcopenia was also associated with health-related variables SARC-F score (OR 0.18 95% CI 0.44-0.70, p<0.001) and having chronic diseases (OR 1.53 95% CI 1.01-2.31, p=0.04). A significant association was only observed between probable sarcopenia and engaging in minimal physical activity (OR 4.56 95% CI 1.35-15.37, p=0.01).

Table 2: Factors associated with Probable Sarcopenia

Variable	Probable Sarcopenia (n=44)	Non-Probable Sarcopenia (n=99)	p-value
Sex n (%)			
Male	25 (42.4)	34 (57.6)	.01
Female	19 (22.6)	65 (77.4)	
Age n (%)			
60-69	2 (8.3)	22 (91.7)	.00
70-79	22 (28.6)	55 (71.4)	
80-89	15 (44.1)	19 (55.9)	
90 and Over	5 (62.5)	3 (37.5)	
Race n (%)			
African	20 (22.7)	68 (77.3)	.00
East Indian	17 (58.6)	12 (41.4)	
Mixed	7 (26.9)	19 (73.1)	
Protein Intake n (%)			
< 3 Times Weekly	20 (27.4)	53(72.6)	.37
Daily	24 (34.3)	46(65.7)	
Diabetic Status n (%)			
Diabetic	18 (34.0)	35 (66.0)	.53
Not Diabetic	26 (28.9)	64 (71.1)	
Physical Activity n (%)			
Minimal	24 (49.0)	25 (51.0)	.00
Moderate to vigorous	20 (21.3)	74 (78.7)	

EWGSOP2 = European Working Group on Sarcopenia in Older People 2.

Table 3: Association of variables with probable sarcopenia (n=44)

Risk Factor	OR	95% CI: Lower	Upper	p-values
Age				
Sex	1.10	1.04	1.16	0.001
Females	0.40	0.19	0.82	0.01
Race				
Mixed	1.25	0.46	3.40	0.66
East Indian	4.82	1.98	11.75	0.001
SARC-F ≤ 4 points				
≥ 4 points	0.18	0.44	0.70	<0.001
Diabetes	1			
Metformin				
Total number of chronic diseases	1.27	0.61	2.62	0.53
	0.76	0.36	1.63	0.48
	1.53	1.01	2.31	0.04
Physical Activity				
Minimal	4.56	1.35	15.37	0.01
Moderate	1.38	0.41	4.65	0.06
Smoking Status				0.1
Never	0.39	0.13	1.21	0.39
Former	0.50	0.10	2.46	
Alcohol Intake (current)				
None				
Occasionally	0.40	0.14	1.17	0.09
	0.68	0.23	2.03	0.49
Protein foods consumption				
<3 times a week	0.72	0.35	1.47	.37

Table 4: Multivariate Logistic Regression Model of risk factors for probable sarcopenia

Covariates	**Model 1**		**Model 2**		**Model 3**	
	Odds Ratio 95% CI	P value	Odds Ratio 95% CI	P value	Odds Ratio 95% CI	P value
Sex (Females)	0.37 0.16-0.85	0.02	0.25 0.1-0.66	0.005	0.22 0.08-0.59	0.003
Age	1.14 1.07-1.22	<0.001	1.13 1.05-1.21	0.001	1.12 1.05-1.20	0.001
Race (East Indian)	6.82 2.45-18.98	0.001	9.03 2.87-28.37	<0.001	8.56 2.60-28.16	0.001
Total number of chronic diseases			1.50 0.9-2.49	0.12	1.50 0.88-2.56	0.13
SARC-F (<4 points)			0.10 0.03-0.33	<0.001	0.15 0.43-0.54	0.004
Physical Activity Minimal Moderate					 2.89 0.57-14.56 1.33 0.29-6.16	0.28
Variance explained Cox & Snell R^2 Nagelkerke R^2	 0.23 0.32		 0.32 0.45		 0.33 0.47	

[a]Model 1 is adjusted for socio-demographic variables (age, sex, race)
[b]Model 2 is additionally adjusted for health variables (number of diseases and SARC-F)
[c]Model 3 is further adjusted for physical activity

Table 5: Sensitivity model additionally adjusting for other lifestyle variables

Covariates	Sensitivity Model		
	Odds Ratio	95% CI	P value
Sex (Females)	0.27	0.08-0.90	0.03
Age	1.14	1.06-1.23	0.001
Race (East Indian)	10.44	2.80-39.0	0.002
Total number of chronic diseases	1.43	0.82-2.49	0.2
SARC-F (< 4 points)	0.13	0.04-0.49	0.002
Physical Activity Minimal Moderate	 3.24 1.52	 0.59-17.78 0.32-7.33	 0.29
Protein foods (<3 times/week)	0.43	0.16-1.18	0.1
Alcohol intake None Occasionally	 0.70 1.34	 0.14-3.60 0.27-6.67	0.52
Smoking status Never Former	 0.66 0.64	 0.12-3.53 0.08-5.19	0.88
Variance explained Cox & Snell R^2 Nagelkerke R^2	 0.35 0.50	 0.35 0.50	

A forward stepwise logistic regression was used to identify possible predictors of probable sarcopenia, using the six significant indicators (p value < .05) from the univariate analysis, including gender, age, race, total number of chronic diseases, SARC-F score and level of physical activity. As shown in Table 4, across all three models, sex, age and race continued to have a statistically significant association with probable sarcopenia. These factors were independently associated and increased the odds of probable sarcopenia. These associations were relatively unchanged when the model was repeated for health-related variables SARC F and total number of chronic diseases and then again for lifestyle variables. SARC-F (≤ 4) score maintained a statistically significant association with probable sarcopenia OR of .10 (95% CI 0.03 – 0.33).

Sensitivity analysis was conducted to check the robustness of the model, adjusting for alcohol intake, smoking status and consumption of protein rich foods. The final model explained 35% - 50% of the approximate variants in probable sarcopenia (Cox and Snell R^2 0.35 and Nagelkerke R^2 0.50). None of the lifestyle covariates were found to be significantly associated with probable sarcopenia (P value >.05) (Table 5).

Discussion

This study evaluated the prevalence of probable sarcopenia in a gerontology clinic in Trinidad and Tobago. The study showed that there was an overall prevalence of 31% with prevalence in males twice as high as in females. The study also showed that age, ethnicity and physical activity were associated with probable sarcopenia. This result is substantially greater than the global prevalence of sarcopenia itself at 10%[2,3] but is similar to another local study as well as other countries. This greater risk observed in males is supported by recently conducted studies in Tobago, by Santanasto et. al. [20, 21] In these studies, it was documented that for males 75 years and older (similar to this cohort) loss of grip strength far exceeded loss of lean muscle mass.

For example, in Brazil and Colombia the prevalence of probable sarcopenia was found to be 33.7% and 46.5% respectively.[22, 23] In European countries, one Greek study showed a prevalence of probable Sarcopenia of 25.4% and a Swiss study looking at only octogenarian participants identified a prevalence of 44% in males and 53% in females.[24,25]

For this cohort the trend of decreasing grip strength (probable sarcopenia) with increasing age was maintained, for each additional year lived there was 12-13% increased odds of probable sarcopenia. This result may be explained by the fact that muscle strength declines faster than muscle mass, at an annual rate of 1.5-5%[26] The Swiss study, which only involved octogenarian participants supports this finding as the prevalence here was higher than those studies which included younger individuals.[25]

This current study also noted an association between probable sarcopenia and ethnicity with higher rates seen in patients of East Indian background. This finding is consistent with two other studies one conducted on a U.S population involving participants age 50-80 years and the other a study conducted in the Netherlands included 25,000 participants aged 18-70 years and of multiple ethnicities.[27,28] These studies found that there was a higher prevalence of sarcopenia observed in Asian people.

In our current study, minimal physical activity compared with higher levels of exercise were associated with a 4-5-fold increased risk of probable sarcopenia. Several recent studies have supported these findings along with confirming that moderate to vigorous exercise including resistance training is the best form of treatment or management in maintaining good health in older adults.[29,30]

Other variables considered in this study were diabetes, metformin usage, alcohol intake, smoking status and consumption of protein-rich foods. For this cohort there was no association found between diabetes and probable sarcopenia, however, several studies have documented the strong association. Even more relevant is that older adult diabetics are at greater risk of deteriorating muscle health and functional decline. It is well documented that as people age there is an increased risk of developing diabetes all due to physiological changes that come with aging including insulin resistance and impaired pancreatic islet function.[31]

The diabetic prevalence for this cohort was 37%. However, the association between diabetes and probable sarcopenia was not established. This may have been due to: The Covid-19 surge at the time of data collection, which limited access to patients as a result of lock-downs as well as the fairly standard use of metformin in

diabetes management accounting for approximately 80% of the diabetics in this cohort may have been protective.[32]

This is the first formal study assessing probable sarcopenia prevalence at a gerontology clinic in Trinidad and Tobago. Apart from this, at the Gerontology Clinic at the St. James Medical Complex this was the first study conducted on probable sarcopenia in the Caribbean. The study has contributed to the understanding of probable sarcopenia in Trinidad and Tobago, with implications for developing policies to manage the health care of older adults. The information gathered could be used to encourage further research with the ultimate intention of taking a more proactive approach in managing the health care of older adults in Trinidad and Tobago.

The major limitation faced by this study was that data was collected during the lockdown period of the Covid-19 pandemic. Protocols introduced during this period limited participation of those more vulnerable suggesting that the prevalence of probable sarcopenia could be even higher.

In conclusion, for this Trinidadian cohort of community-dwelling older adults it was found that approximately one in every three participants had probable sarcopenia, and it was almost twice as common in males than in females. The prevalence of probable also varied with race and suggested that those participants of East Indian descent were at greater risk than those of African descent. These findings suggest that screening older adults in Trinidad and Tobago for probable sarcopenia, could be beneficial as it would allow for implementation of strategies especially lifestyle adjustments that would promote maintenance of muscle strength and even cognitive ability resulting in better physical function and quality of life. This study provides a foundation from which further research can be conducted to explore the risk factors and preventative measures for sarcopenia in this population.

Ethical Approval statement: Ethical approval was granted by the North West Regional Health Authority Ethics Committee
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