RESEARCH PAPER

Prevalence of Sarcopenia among Perimenopausal Women: A Cross-Sectional Study

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ABSTRACT

Background: Sarcopenia is characterised by age related loss of muscle mass, strength, physical performance, can impair functional performance and increase risk of fall. Among women, menopausal transition is a particularly susceptible window due to decline in estrogen levels, which is responsible for maintaining musculoskeletal balance.This leads to decline in muscle strength, impairing protein synthesis and thereby accelerating muscle loss.However, data focusing on perimenopausal women with sarcopenia remains limited.

Objective: To determine the prevalence of sarcopenia among perimenopausal aged between 40 and 55 years and to determine the relationship between sarcopenia and body mass index among perimenopausal women.

Materials and Methods: A cross-sectional study was conducted among 120 perimenopausal women with a mean age of 47.6 ± 3.73 years. According to the Asian Working Group for Sarcopenia (AWGS 2019) criteria, assessment included preliminary screening for sarcopenia using SARC-F questionnaire followed by muscle strength (handgrip) using hand-held dynamometer and push-pull dynamometer (quadriceps strength), muscle mass using body composition analyser (BCA), and physical performance using TUG test, Chair sit-to-stand and 6-meter gait speed test. Statistical analysis included independent t-test and Pearson correlation.

Results: Among 120 women, overall prevalence of sarcopenia was 44.2 %. The mean muscle mass, mean hand grip strength were 5.96±1.4kg/m^2 and 11.02±2.73 kg respectively. The physical performance assessed using TUG test and the gait speed were 10.98± 1.95 seconds and 0.58± 0.12 m/s respectively. There was positive association between BMI and muscle mass ($r = 0.354$, $p < 0.001$).

Conclusion: The present study reveals a notable prevalence of sarcopenia highlighting that this transitional phase is a critical period for early muscle decline. A decreased muscle mass, strength, and physical performance observed among the participants underscore the growing risk of functional impairment. The positive association between BMI and muscle mass suggests that body composition plays a significant role in sarcopenia status. These findings emphasize the need for early screening, preventive strategies, and targeted physiotherapy interventions during the perimenopausal period to mitigate the progression of sarcopenia and improve overall functions in women.

Keywords: *ASMI, AWGS, Muscle mass, Muscle strength, Perimenopause Physical performance, Sarcopenia*
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INTRODUCTION

Sarcopenia is a progressive, generalized loss of skeletal muscle mass, strength and physical performance and carries real consequences for daily life and health. It is linked with impaired mobility, risk of falls and poor quality of life [4]. While often associated with older age, mounting evidence indicates it can begin earlier especially in women undergoing a stage of menopause transition [1,2].

During perimenopause, a stage of the menopause transition, a woman's hormone levels change significantly. Estrogen declines while follicle-stimulating hormone (FSH) rises. These hormonal changes interfere with the body's ability to maintain muscle mass and composition [2,3]. Previous literature studies states that muscle loss may begin before menopause, especially during late perimenopause [3].

In practical terms, women going through this transition often face an accelerated reduction of skeletal muscle mass. This might lead to weakness, reduced physical activity and greater risk of adverse outcomes if unrecognised. Though there is an extensive research on sarcopenia, many have focused on older and post menopausal women rather than perimenopausal women [1]. The muscle mass, muscle strength and physical performance are the key elements in diagnosis of sarcopenia as per AWGS 2019 criteria [6]. Reduction in physical performance increases risk of fall and dependency among women during menopausal transition.

Globally, prevalence of sarcopenia varies depending on the population studied, diagnostic criteria used. Among old women, prevalence rates have been reported to range from 5% to 13%, increasing in the high risk population. Previous literature has reported that the prevalence of sarcopenia ranges from 5% to 13% among community-dwelling middle aged adults and 20% to 30% among postmenopausal women, depending on diagnostic criteria used [16]. Evidence states that sarcopenia is more prevalent among postmenopausal women than perimenopausal women, reporting an overall prevalence of 6.4%. which suggests that menopause and surrounding years affect muscle health [5].

Body Mass Index (BMI) is associated with muscle health. During the perimenopausal period, a decline in estrogen leads to alterations in body composition. Women often experience increased fat mass and decreased muscle mass. Although BMI does not directly measure muscle mass, it provides a general indicator of changes in body weight that may be associated with the development of sarcopenia. Increased adiposity may lead to reduced muscle quality and functional capacity, a condition also referred as sarcopenic obesity. Perimenopausal women with higher BMI may still have reduced muscle quality and function, making them vulnerable to sarcopenia despite appearing overweight or obese [6].

Conversely, a low BMI may also be associated with reduced muscle mass and nutritional deficiencies, both of which are considered as major risk factors for sarcopenia. Women with lower BMI may have inadequate protein intake or poor nutritional status, contributing to accelerated muscle wasting. Relationship between BMI and sarcopenia provide valuable insight into potential risk factors during the menopausal transition.

In India, epidemiological data on sarcopenia are still developing. Literature studies among older Indian adults have reported prevalence range appropriately from 10% to 25%. However, studies specifically evaluating sarcopenia among perimenopausal Indian women remain limited and the prevalence and associated factors remain poorly understood. The 2019 consensus of the Asian Working Group for Sarcopenia (AWGS 2019) recommends population appropriate cut-off values for Asian individuals [6], which may provide more accurate estimates in Indian populations.

Both longitudinal and cross sectional data on body composition show appendicular lean mass (muscle in arm and legs) declines across menopausal stages. Hormonal level changes occur most significantly during the late menopause which forms the risk period of developing sarcopenia [3]. Because research specifically centered on perimenopausal women is limited, identifying those at higher risk and design targeted prevention strategies remains challenging.

Study on perimenopausal women within India is limited despite growing awareness. Few studies have assessed sarcopenia by including muscle mass, strength and physical performance. Furthermore, the association between sarcopenia and BMI has not been adequately explored. This gap limits early identification and early implementation of preventive strategies during menopausal transition.

Understanding the incidence of sarcopenia among perimenopausal women, who represent the next generation of older Indian adults and identifying factors associated with BMI with it, is essential for effective public health planning. Early screening and targeted intervention such as resistance training, adequate protein intake and structured physical activity may help function and reduce the risk of sarcopenia in perimenopausal women.

Therefore, the present study aims to estimate prevalence of sarcopenia based on muscle mass, strength, and functions, relationships between sarcopenia and BMI, functional ability, and health status in a sample of community-dwelling individuals living in the northern part of Chennai.

METHODOLOGY

A cross sectional study was conducted at the outpatient department of Sri Ramachandra Hospital from October 2025 to February 2026. Ethical approval for the study was obtained from the institutional ethics committee of Sri Ramachandra Institute of Higher Education and Research (CSP-III/25/DEC/32/557). Written informed consent was signed from participants before data collection. Participants were enlisted using a convenience sampling method. The sample size of 120 perimenopausal women was taken for study. Perimenopausal status was

determined based on menstrual history. Women in the age group of 40-55 years, those willing to participate were included in study, along with those meeting the requirements for sarcopenia, defined as a calf circumference < 33cm, handgrip strength < 18kg and SARC-F questionnaire score > 11 points. Participants with diagnosed neuromuscular disorders, users of hormonal contraceptive or hormone replacement therapy (HRT), polycystic ovary syndrome (PCOS), hysterectomy or premature ovarian insufficiency hormonal disorders affection accurate staging, mobility limiting conditions, recent musculoskeletal injuries or other chronic illness were excluded from the study.

The Baseline cut-off values for sarcopenia were applied corresponding to the AWGS 2019 criteria. Low muscle mass was identified as an ASMI of < 5.4 kg/m^2, low muscle strength was defined as a hand-grip strength of < 18 kg, reduced physical performance for 6-meter gait speed of < 1.0m/sec. SARC-F questionnaire score > 11points with calf circumference of < 33cm. These values were used to classify individuals for diagnosis of sarcopenia in the study.

Assessment of muscle parameters for sarcopenia

Sarcopenia was diagnosed according to the 2019 Asian working group for sarcopenia (AWGS 2019) criteria [6]. According the AWGS guidelines, sarcopenia is defined as presence of low muscle mass, combination with either low muscle strength or low physical performance. Apart from demographic data, screening for sarcopenia was done using SARC-F questionnaire and BMI was recorded for all participants [7,13]. Muscle mass was identified by Body Composition Analysis (BCA) (has 99%accuracy as DEXA scan) to determine the appendicular skeletal muscle mass index. The instructions provided by the manufacturer were followed to position the subjects in BCA. Appendicular skeletal muscle mass index (ASMI) was calculated by dividing appendicular skeletal muscle mass by height in meters squared.

AWGS recommends the use of handgrip strength to measure the muscle strength was measured using hydraulic-type JAMAR handheld dynamometer [6]. The gold standards procedure for measuring handgrip strength was followed using The American Society of Hand Therapists and the Southampton protocol [8, 9]. As per recommendation positioning in sitting with the elbow flexed at 90 degrees as the standard position for measuring handgrip strength using the Jamar dynamometer. Three repetitions were done for each hand. The average of the readings was recorded.

Assessment of physical performance

According the AWGS consensus, the physical performance was assessed using Timed up and Go test (TUG), Chair stand test and Gait speed test [6]. TUG test is done by recording the time needed to rise from a seated position and walk for 3 m away and return to the seated position [14]. Gait speed was measured by timing a 6-meter walk at the participant's usual pace [11]. In the chair stand test, participants were asked to rise from a standard chair (40 cm high, 30 cm deep) five times with their arms crossed over the chest [10].

Diagnosis of sarcopenia

Sarcopenia was defined as age-related loss of skeletal muscle mass and loss of muscle strength and/or reduced physical performance without any co-morbidity as per the AWGS-2019 revised guidelines [6]. Specifically, AWGS 2019 introduces "possible sarcopenia," defined by low muscle strength with/without reduced physical performance. To define low muscle mass, AWGS-2019 recommends use of cutoffs for low muscle mass as less than 7.0kg/m ^{2} and 5.4kg/m $^{2\ for}$ men and women by DXA [6]. AWGS-2019 does not propose dynamometer-specific cut-offs and recommends low muscle strength diagnostic-cut-offs of handgrip less than 28.0 kg for men and less than 18.0 kg for women.

Statistical analysis

Statistical analyses were carried out using the IBM-SPSS Statistics for Windows-(version 21.0, IBMCorp, Armonk, NY, USA); study parameters were tested for normality. Continuous variables of demographic, anthropometric muscle and lifestyle parameters were documented as mean and standard deviation. An independent t-test was used to compare the difference between sarcopenia and non sarcopenic groups and categorical variables were compared by column proportions. Pearson correlation was performed to assess association between body mass index BMI and ASMI. Binary logistic regression models were used to determine factors associated with sarcopenia. A p-value of <0.05 was considered statically significant.

RESULT

Socio-demographic characteristics

A total of 120 perimenopausal women aged 40-55 years participated in the study. Based on assessment criteria of AWGS, 53 participants were identified as sarcopenic, the remaining 67 participants did not meet the criteria for sarcopenia. Sarcopenic participants showed lower muscle mass, strength and physical performance compared to non-sarcopenic participants ($p < 0.05$). Therefore, the prevalence of sarcopenia among perimenopausal women in the study is 44.2%. The mean age of participants was 47.6 ± 3.73 years (Figure 3). The mean body weight was 64.39 ± 12.73 kg and the mean height was 155.77 ± 8.18 cm .The mean Body mass index (BMI) was 26.37 ± 4.16 kg/m^2 (Figure 1)(Table 1).

The assessment of muscle mass, muscle strength and physical performance was carried among all 120 perimenopausal women who were included in the study (Table 2, 5). 4).

Muscle mass was assessed using BCA Appendicular Skeletal Muscle Mass Index (ASMI) indicated a mean value of 5.96 ± 1.14 kg/m^2 (Figure 2)(Table 2). Muscle strength was assessed using handgrip(Figure 4) and quadriceps strength(Figure 5). The mean handgrip strength was 11.02 ± 2.73 kg and the mean quadriceps strength was 7.15 ± 2.14 kg (Table 2). The physical performance was assessed using Timed Up and Go (TUG) test, Chair sit to stand test and 6 meter gait speed. The mean TUG time was 10.98± 1.95 seconds, a mean Chair sit to stand 10.8 ± 2.72 repetitions, and a mean 6 meter gait speed was 0.58 ± 0.12 m/s(Figure 6,7) (Table 2). Participants identified as sarcopenic demonstrated comparatively low muscle mass, reduced muscle strength and poor physical performance than non sarcopenic (Table 5).

The relationship between Body Mass Index (BMI) and muscle mass was analysed using Pearson correlation analysis among 120 participants (Table 3). The result showed a significant positive correlation between BMI and ASMI ($r = 0.354$, $p < 0.001$) indicating the higher BMI and higher muscle mass values in study. This correlation was statistically significant at the 0.001 level (2-tailed), indicating an association between Body Mass Index and muscle mass among perimenopausal women. **Tables**

Table 1: Demographic Data

Characteristic	Mean, Standard deviation(S.D)
Age (years)	47.6 ± 3.73 years
Weight (kg)	64.39 ± 12.73 kg
Height (cm)	155.77 ± 8.18 cm
BMI (kg/m^2)	26.37 ± 4.16 kg/m^2

Table 2: Outcome Measures

Characteristic	Mean, Standard deviation
ASMI (kg/m^2)	5.96 ± 1.14 kg/m^2
Handgrip strength (kg)	11.02 ± 2.73 kg
Quadriceps strength(kg)	7.15 ± 2.14 kg
SARC-F score	12.11 ± 2.63
Timed Up and Go test (sec)	10.98 ± 1.95 sec
Chair sit-to-stand test (reps)	10.8 ± 2.72 reps
6-Meter gait speed (m/sec)	0.58 ± 0.12 m/s

Table 3: Correlation of Sarcopenia and BMI

Variables		ASMI	BMI
ASMI	Pearson Correlation	1	0.354***
	Sig. (2- tailed)		<.001
	N	120	120
BMI	Pearson Correlation	0.354***	1
	Sig. (2- tailed)	<0.001	
	N	120	120

Note:*p<0.001**

Table 4: Age Categorisation

Age	Frequency	Percent	Cumulative Percent
40 – 45 years	38	31.7	31.7
46 – 51 years	63	52.5	84.2
52 – 56 years	18	15.0	99.2
57 – 62 years	1	0.8	100.0
Total	120	100.0	

Table 5: Percentage of Women with Muscle Strength, and Physical Performance

Percentile	Handgrip strength (kg)	Quadriceps strength (kg)	TUG (sec)	CHAIR sit-to-stand (reps)	6-meter gait speed (m/sec)
25	9.0	6.0	9.94	9.0	.5000
50	11.0	7.0	11.005	10.50	.5600
75	13.75	9.0	11.990	12.0	.6375

Table 6: Correlation with Sarcopenia and handgrip strength

		handgrip strength	ASMI
handgrip strength	Pearson Correlation	1	0.76
	Sig. (2- tailed)		0.412
	N	120	120
ASMI	Pearson Correlation	0.76	1
	Sig. (2- tailed)	0.412	
	N	120	120

Note: p=0.412 (Not significant)

Table 7: Correlation with Sarcopenia and Physical Performance

Variables		ASMI	Tug test
ASMI	Pearson Correlation	1	0.028
	Sig. (2- tailed)		0.757
	N	120	120
Tug test	Pearson Correlation	0.028	1
	Sig. (2- tailed)	0.757	
	N	120	120

Note: p=0.757

Variables		ASMI	Six meter gait speed
ASMI	Pearson Correlation	1	0.082
	Sig. (2- tailed)		0.374
	N	120	120
Six meter gait speed	Pearson Correlation	0.082	1
	Sig. (2- tailed)	0.374	
	N	120	120

Note: p=0.374

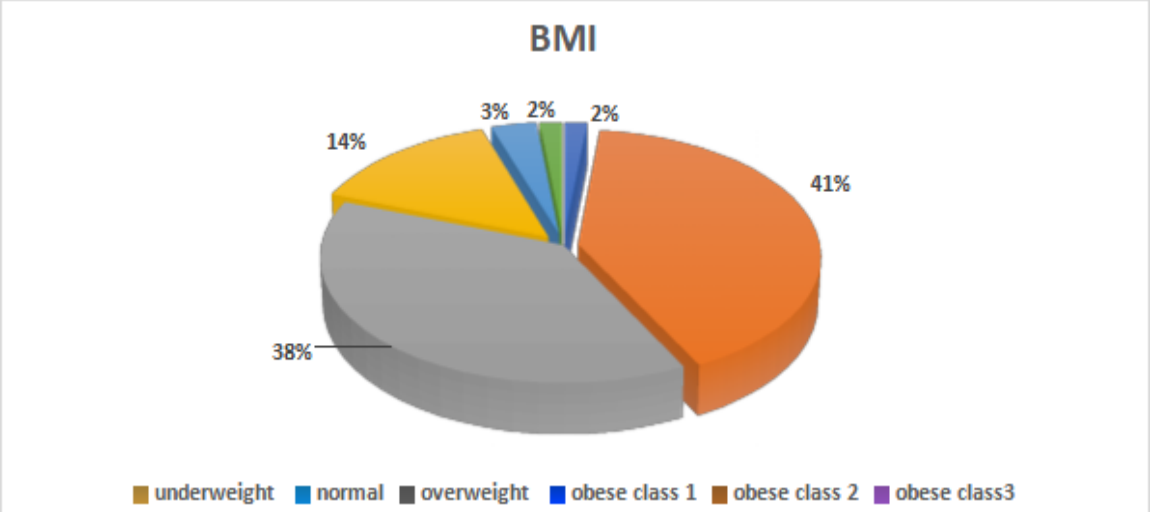

Figure 1: Body Mass Index (BMI) Distribution

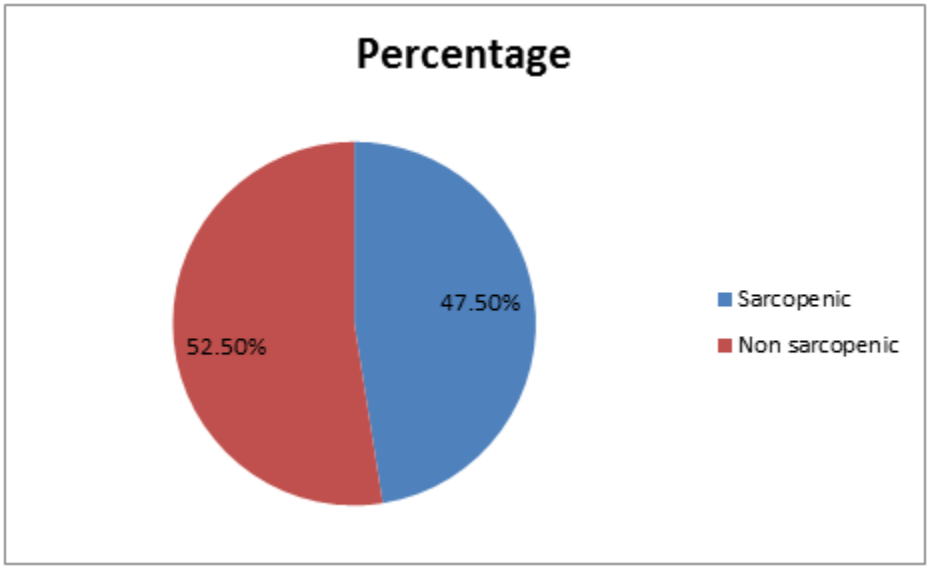

Figure 2: Distribution of Sarcopenic and Non sarcopenic participants

1- 45.83 % - Sarcopinic

2 -54.17 % - Non sarcopenic

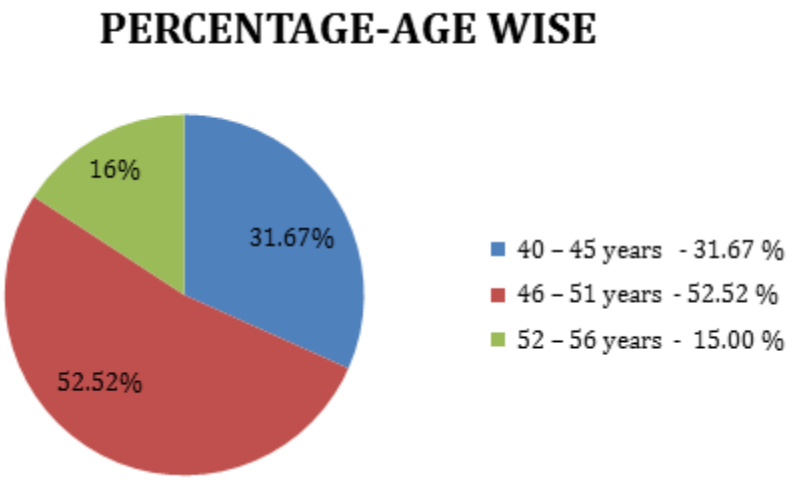

Figure 3: Age Distribution of Participants

Figure 5: Quadriceps strength

Figure 4: Handgrip strength

Figure 6: Gait speed

DISCUSSION

The present study shows that the prevalence of sarcopenia among perimenopausal women as early as 40-55 years was 44.2 indicating muscle loss may begin earlier than traditionally expected. Hormonal changes during perimenopause, particularly the decline in estrogen, contribute to reduction in muscle mass, muscle strength and physical performance. The mean ASMI (5.69 ± 1.14 kg/m^2)(Table 2) indicated that several participants were close to or below the cut-off value of the AWGS 2019 criteria. This shows that there is a considerable proportion of women in the perimenopausal stage to experience reduced muscle mass, muscle strength and physical performance.

Compared to previous studies, the prevalence observed in this study is higher. A large cross-sectional study by Kim Tae Nyun et al. reported that prevalence of 6.4% among middle aged women [15], while a systematic review by Ghasem Shafiee et al reported global prevalence among community-dwelling adults range from 5% to 13% [16]. This evokes that skeletal muscle decline tends to increase progressively with further menopausal stages. This indicates that sarcopenia becomes more common with increasing age and hormonal changes associated with menopause. The higher prevalence in this study may be attributed to difference in population traits, lifestyle and diagnostic criteria used.

Hormonal changes during the menopausal transition further contribute to muscle decrease. By Alfonso J. Cruz-Jentoft reports that decreasing estrogen level during menopause may impair muscle protein synthesis and accelerate muscle loss, therefore increasing the risk of sarcopenia [4].

This study provides important insight into sarcopenia among perimenopausal women, a population that has received limited attention in existing research. Most literature focused on older adults or postmenopausal women whereas this study evaluates women in perimenopausal stage (40-55 years). Another strength of this study is multiple assessments of sarcopenia components involving muscle mass (ASMI), muscle strength (handgrip and quadriceps strength) and physical performance (Timed Up and Go test, Chair sit to stand test and 6 meter gait speed). The reference of AWGS 2019 criteria, provides specific cut-off values for Asian population and improves the relevance of findings for the regional population. Additionally, the study investigated the association between BMI and muscle mass, which made further understanding of potential factors influencing sarcopenia in perimenopausal women.

The finding of this study highlights the importance of early identification and prevention of muscle loss. Assessments such as Handgrip strength, quadriceps strength, and gait speed. Physical performance test can identify women who are at risk. Early interventions such as Strength training, Resistance training, Regular physical activity and adequate protein intake can help to maintain muscle mass and strength during the menopause transition period. In addition, monitoring BMI with muscle health can also help to detect individuals who are at higher risk of developing sarcopenia. Thus, implementing early preventive strategies may reduce the risk of fall, reduced functional mobility and poor quality of life among perimenopausal women.

The limitations of the study are that the sample size was limited due to time constraints during data collection. Though 120 were included, a larger sample size provides more appropriate results and improves the findings. The participants who were recruited from women attending outpatient clinics and some participants were presented with musculoskeletal conditions involving shoulder, knee and ankle. These may influence their physical performance and muscle strength assessment. Although sarcopenia was assessed using AWGS 2019 criteria, factors like dietary protein intake, physical activity level were not considered which may influence muscle mass and strength. Longitudinal studies like retrospective study, cohort studies could be better for understanding the progression of muscle loss during the menopausal transition.

CONCLUSION

Therefore sarcopenia is prevalent among perimenopausal women with age criteria 40-55 years, indicating early onset of loss of muscle mass. Early screening and tailored physiotherapy interventions are essential to prevent risk of fall and improve quality of life.

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