

ORIGINAL ARTICLE

Association Between Sarcopenia Parameters and Quality of Life Among Older Adults in Gerik Perak Malaysia

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ABSTRACT

Introduction: Little is known how sarcopenia parameters may influence rural older adults' quality of life (QOL). **Objective:** This study aimed to determine the association of sarcopenia parameters with the QOL of older adults. **Methods:** This cross-sectional study recruited 114 participants aged 60 years and above (Mean age = 67.50±5.38 years) from a selected rural community in Gerik Perak, Malaysia. Measures of sarcopenia parameters included the SARC-F questionnaire, calf-circumference (CC), muscle strength (handgrip and lower limb), muscle mass (MM), and physical performances (balance and gait speed). The EQ5D5L health questionnaire measured QOL, which consisted of five domains (mobility, self-care, usual activities, pain/discomfort and anxiety/depression). Analysis of data was performed using multiple linear regression (with age- and gender-adjusted). **Results:** SARC-F, lower limb strength, MM and balance were significantly associated with mobility, usual activity, pain/discomfort and anxiety and depression domains of QOL (All p<0.01). Handgrip was associated with mobility and usual care (Both p<0.01). Gait speed was significantly associated with usual care and anxiety/depression (Both p<0.05). None of the sarcopenia parameters was associated with the self-care domain. **Conclusion:** The majority of the sarcopenia parameters were associated with the domains of QOL, but none could predict the self-care domain. Further study is warranted to find what factors may influence self-care among older adults as this is an essential aspect of independent living. *Malaysian Journal of Medicine and Health Sciences* (2022) 18(8):23-31. doi:10.47836/mjmhs18.8.4

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INTRODUCTION

Sarcopenia, characterized by age-related loss in skeletal muscle mass, muscular strength, and physical performance, is part of the components of frailty in older adults (1). Sarcopenia may result in functional decline, falls, fractures, poor endurance, physical inactivity, slow gait speed, reduced morbidity, and difficulties with instrumental and basic daily activities (2-4). Other sarcopenia-related health issues include cardiovascular and respiratory diseases, breast cancer, type II diabetes mellitus, glycaemic and metabolic regulation changes, decreased basal metabolism, osteoporosis, osteopenia, obesity, and bone fragility (5). Studies have also shown that sarcopenia affects the socioeconomic status of

individuals and countries as it increases frailty and hospitalization costs (6) and, in turn, jeopardizes independence and negatively impact the QOL (7, 8).

The European Working Group on Sarcopenia in Older People (EWGSOP) (9) and the Asian Working Group on Sarcopenia (AWGS) (10) have promoted that QOL should be one of the primary outcomes for future sarcopenia intervention research. Because older adults are typically frail due to a decline in their functional capacities, QOL should be a pressing concern (8). The latest algorithm for screening (1, 11) suggested that sarcopenia can be detected based on a few criteria, including the SARC-F questionnaire, calf circumference, muscle strength, muscle mass and physical performances. However, since sarcopenia is determined based on a few modifiable parameters, it is unknown which factors influence QOL. Identifying specific factors may guide healthcare providers to design targeted interventions that may combat sarcopenia and enhance QOL.

An earlier study conducted among urban and sub-urban older adults revealed a prevalence of 23% of sarcopenia based on the SARC-F questionnaire that measures perceived sarcopenia (7). It is unknown whether those residing in the rural setting might have a similar problem, as it is well established that health services and facilities for the rural setting might be limited compared to the urban and semi-urban settings. Furthermore, sarcopenia might be considered a socioeconomic issue (6, 12), consistent with a previous study that found urban older women are more prone to sarcopenia than rural older women (13).

There is a need to establish how sarcopenia parameters may influence the QOL of rural older adults, specifically in Malaysia. Thus, this study intended to determine whether sarcopenia parameters were associated with QOL of older adults in a selected rural setting, namely Gerik, Perak, Malaysia. The finding of this study may provide some evidence to support the need to provide health resources and public awareness for the prevention of sarcopenia among older adults in rural settings.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional study recruited older adults aged 60 and over from a selected community setting in Gerik, Perak, Malaysia, between August 2019 and January 2020. Gerik is one of the largest districts of rural Perak, Malaysia. The Department of Statistics Malaysia reported that in 2021, Perak was the leading state with the highest prevalence of older adults; 16.3 % aged 60 and above, and 11.4% aged 65 and above (14). Gerik has only one government hospital that provides services to the local population.

Study Participants

The participants for this study were recruited via flyers, word of mouth and community leaders. The inclusion criteria for participation were 1) aged 60 years old and above, 2) both males and females, 3) able to understand and read Malay or English, 4) able to understand verbal instructions, 5) no acute illness such as stroke and Parkinson disease (<6 months) and 6) able to walk with or without aids. The exclusion criteria were; 1) having increased blood pressure (systolic >180) at the time of assessment by the researcher, 2) self-reported that have been diagnosed by a medical doctor for clinical conditions such as heart problem, gastrointestinal tract disease, and musculoskeletal injury such as a bone fracture or sprain (< 6 months), and 3) having recent surgery (< 6 months). The study procedure was explained to the participants before signing the consent form if they agreed to participate in the study. The study procedure involving human subjects was reviewed and approved by the UiTM Research Ethics Committee (REC/494/19).

Sociodemographic and Clinical Characteristics

The sociodemographic data that were collected include age (years), gender, marital status (single/ married/ divorced/widowed), ethnicity (Malay/Chinese/Indian/others), level of education (illiterates/primary school/high school/college/university), occupation, level of income (T20= \geq RM13,149; M40=RM4,850-10,959; B40= \leq RM4,850), living arrangement (alone/with spouse/family/nursing homes/institution/hospitalized), type of house (single/double storey/apartment/condominium), type of toilets (sitting/squatting), smoking (Yes/No), alcohol usage (Yes/No) and fall history (Yes/No).

Data for medical history included current medical diagnosis, other comorbidities and history of surgery. Blood pressure was taken before the physical assessment for precautionary measures. Other medical histories such as Vision (Yes/No), pacemaker (Yes/No), polypharmacy (Yes/No), hearing aids (Yes/No) and dentures (Yes/No) were also documented. The height was measured using a stadiometer to the nearest 1 cm. The body composition analyzer was used to measure the body weight (kg) and percentage of fat (%). The body weight (kg) divided by the square of height (m^2) was computed to present the body mass index (BMI) (kg/m^2).

Sarcopenia Parameters

The sarcopenia parameters used in this study were based on the guidelines by the AWGS (1), which is, first, to use the SARC-F questionnaire to determine the level of perceived sarcopenia for case findings. This is followed by measuring the handgrip strength and muscle mass to confirm the presence of sarcopenia. Physical performance measures (gait speed and balance performance) were used to determine the severity of the sarcopenia. For this study, we did not classify the participants according to sarcopenia status as this study aimed to determine which sarcopenia parameters that may associate with QOL.

Perceived Sarcopenia status (SARC-F Questionnaire)

The perceived sarcopenia status was measured using the SARC-F questionnaire, a 5-item self-reported screening procedure for sarcopenia risk. The Malay version of the SARC-F questionnaire translated by the *Institut Terjemahan Buku Malaysia* and the original English version were used according to participants' understanding. Responses from the participants depend on their perception of limitations in five items: strength, walking ability, rising from a chair, stair climbing, and experiences with falls (15). Each item is scored either Yes (1) or No (0). A score of ≥ 4 indicates possible sarcopenia.

Muscle strength

The handgrip strength was measured using a hand-held dynamometer (JAMAR, Hatfield, PA, USA). The

participants were positioned seated in an armchair with the hand to be tested supported by the armchair. The researcher ensured that the elbow was in a 90-degree flexion angle and that the forearm was neutral. After a demonstration by the researcher, the participants were asked to squeeze the dynamometer as hard as possible and hold it for about two seconds. The measurement was repeated three times alternately with the other sides to allow rest in between tests. The maximum score from the six trials was recorded as the final score in kilograms (kg).

The five-time sit to stand (5STS) test was used as a functional performance measure of lower limb strength (16). The participants began sitting with their back against the upright backrest of the chair, with both arms crossed over the chest; they stood up and sat down five times as quickly and safely as they could while being timed. The researcher demonstrated the appropriate technique for the performance of the test. Once the researcher said "go", the participants started the test and stopped when the buttocks reached the seat after the fifth stand (16). The score was recorded in seconds as the time to complete the test that represented the strength of the lower limb.

Muscle mass

A bioelectrical impedance analysis (BIA) was used to measure muscle mass by measuring the Appendicular Skeletal Muscle Mass (ASM) and converting it to ASM/height². The BIA does not measure muscle mass directly; instead, it uses whole-body electrical conductivity to estimate muscle mass. To diagnose sarcopenia, the cut-off points for ASM/height² are less than 7.0 kg/m² and 6.0 kg/m² in men and women, respectively (11).

Calf Circumference

Calf circumference was measured using a standard non-elastic cloth tape on the lower leg's non-dominant side on the calf region's biggest bulk. The smaller the score, which was recorded in centimetres, indicates the more risk of sarcopenia. The AWGS suggested cut-off points of < 34 cm and < 33 cm for males and females, respectively, for risk of sarcopenia (1).

Gait speed

The physical performance was assessed by measuring gait speed across a four-meter distance that was marked on the floor. The participants were instructed to walk a 4-meter distance at their usual pace from a still-standing position just behind a marked line as the starting point of the 4-meter measure. The score for the test was recorded based on the duration (second) to complete the movement the moment the participants' first foot crossed the starting line until the one foot crossed the finishing line. The participants were allowed to use their walking aids if they used it regularly (17). The cut-off point for gait speed was similar in both genders, that is ≤ 0.8 m/s (11).

Balance

The time up and go test (TUG) was also used to measure balance performance to indicate additional physical performance as one of the parameters indicating sarcopenia. The participants began sitting on a sturdy armchair with a back, and a distance of 3-meter away from the front edge of the chair was marked on the floor. A coloured cone was placed at the end of the 3-meter pathway to indicate the turning point for the participants to turn back to the chair. The researcher instructed the participants to sit comfortably with their back against the chair and their arms resting on the armrests. Before the test, the participants were allowed one practice trial in which they were reminded to walk at their usual pace (18). After a few minutes of rest, the researcher instructed the participants to start the test once the word "go" was given, in which the participants should stand up, walk at their usual speed, comfortably, turn back at the cone and return to the chair and sit down again, while the researcher recorded the time. The longer the time to complete the task, the poorer is the physical performance and thus may indicate risk of sarcopenia and fall.

Quality of life (QOL)

The EQ-5D-5L health questionnaire was adopted to measure the QOL of the participants (19). The instrument consists of five dimensions (mobility, self-care, usual activity, pain, anxiety/depression), with each dimension has five levels of responses: no problems, slight problems, moderate problems, severe problems, and extreme problems. The participants were asked to indicate their health state by ticking (or placing a cross) in the box against the most appropriate statement in each of the five dimensions (20). This decision results in a one-digit number expressing the level selected for that dimension.

Data Analysis

Data were processed and analyzed using the IBM SPSS version 22. Descriptive statistics were used to describe the characteristics of the patients based on frequency, percentage, mean and standard deviation. The multivariate linear regression analysis was used to estimate the association by reporting the beta coefficient and p-value between sarcopenia parameters and each domain of QOL. In addition, the variance inflation index (VIF) (to check for the presence of multicollinearity) and the Durbin Watson (values 0 – 4; to indicate the usefulness of the variables in making predictions) were also checked. A $p < 0.05$ was set as the level of significance for all statistical measures.

RESULT

The characteristics of the participants (N=114, mean age = 67.50 ± 5.38 years) of this study are shown in Table I. The majority of the participants were female, married, Malays, had high school education, were not employed,

had B40 level of income, lived with a family, stayed in a single-storey house, and having seated toilets. Table II presents the health characteristics, sarcopenia measures and the QOL scores according to the five domains.

The results of the multivariate linear regression analysis (with gender- and age-adjusted) are displayed in Table III. The examination of the values for VIF for all variables showed none exceeded ten, indicating an absence of multicollinearity. In addition, the values of the Durbin-Watson were between 0 - 4, indicating the multiple determination R² are useful in predicting the domains of QOL.

Table I. Characteristics of participants (N=114)

Characteristics	Frequency (%)
Age, Mean ± SD = 67.50±5.38 years	
Gender	
Male	51 (44.7)
Female	63 (55.3)
Marital Status	
Married	88 (77.2)
Single/Divorced/Widowed	26 (22.8)
Ethnicity	
Malay	77 (67.5)
Chinese	24 (21.1)
Indian	13 (11.4)
Level of Education	
Illiterates/Primary School	13 (11.4)
High School	56 (49.1)
Tertiary	45 (39.5)
Occupation	
Unemployed	64 (38.6)
Working	50 (61.4)
Level of Income	
M40 (Rm4,850-10,959)	14 (12.3)
B40 (<RM 4,850)	100 (87.7)
Living Arrangement	
Alone	2 (1.8)
With spouse	27 (23.7)
With family	85 (74.6)
Type of House	
Single-storey	89 (78.1)
Double-storey	25 (21.9)
Types of Toilet	
Seated	105 (92.1)
Squatting	9 (7.9)
Smokers	16 (14.0)
Alcohol intake (YES)	10 (8.8)

Table II Characteristics of health, sarcopenia and quality of life participants (N=114)

Characteristics	Frequency (%)	Mean ± SD
Height (cm)		157.08 ± 5.46
Weight (kg)		70.35 ± 13.06
Body Mass Index (kg/m ²)		28.29 ± 4.15
Fat Percentage (%)		31.81 ± 5.37
Self-reported Comorbidity	92 (80.7)	
Hypertension	31 (27.2)	
Diabetes mellitus	98 (86.0)	
Cholesterol	75 (65.8)	
Knee pain		
Polypharmacy (>3 medications)	94 (82.5)	
Abnormal Vision	72 (63.2)	
Had history of fall	29 (25.4)	
Sarcopenia Parameters		
SARC-F Score		2.99 ± 1.65
Muscle mass (ASM/height ²)		15.92 ± 3.86
Calf Circumference (cm)		34.33 ± 4.23
Handgrip strength (kg)		19.03 ± 6.79
Lower limb strength (sec)		9.03 ± 0.97
Balance (sec)		16.43 ± 4.43
Gait Speed (m/s)		0.82 ± 0.091
Quality of Life		
Mobility		1.72 ± 0.793
Self-care		1.01 ± 0.094
Usual activity		1.50 ± 0.682
Pain/Discomfort		1.88 ± 0.754
Anxiety/Depression		1.16 ± 0.366

Table III. Factors associated with quality of life (adjusting for age and gender)

	Domains of quality of life											
	Mobility		Self-care		Usual activity		Pain/Discomfort		Anxiety/Depression			
	β	p value	β	p value	β	p value	β	p value	β	p value		
SARC-F score	0.649	<0.01**	-0.139	0.285	0.571	<0.01**	0.716	<0.01**	0.583	<0.01**		
Calf circumference	0.081	0.369	-0.017	0.887	-0.050	0.625	0.076	0.482	0.089	0.442		
Handgrip strength	-0.429	<0.01**	0.067	0.702	-0.452	<0.01**	-0.148	0.351	-0.191	0.261		
Lower limb strength	0.613	<0.01**	-0.053	0.675	0.690	<0.01**	0.649	<0.01**	0.738	<0.01**		
Muscle mass	-0.403	<0.01**	0.031	0.815	-0.318	<0.01**	-0.391	<0.01**	-0.442	<0.01**		
Balance	0.601	<0.01**	-0.193	0.125	0.583	<0.01**	0.645	<0.01**	0.668	<0.01**		
Gait speed	-0.017	0.812	0.000	1.000	0.168	0.030*	-0.017	0.835	0.183	0.038*		

B = beta coefficient; significant p value <0.01** and <0.05*

DISCUSSION

The assessment of QOL is essential in understanding older individuals' health status and well-being despite having an ageing impairment. Thus, it is crucial to explore whether the modifiable sarcopenia parameters are associated with QOL. Due to the small sample size, gender comparison was not performed. However, it is important to note that many studies have established differences in physical characteristics between genders (21, 22). These include differences in hormonal factors, architectural characteristics of muscle, muscle fibre type, muscle biomechanical characteristics, and neural activity during muscle contractions (23, 24). In addition, studies have also shown that sarcopenia is more prevalent in females than males (7, 25). However, a recent study found no significant difference in QOL between genders. Regarding that, to control for gender as the potential confounding factor, the regression analysis was performed by adjusting for gender (26).

In this current study, the SARC-F score was associated with all domains of QOL except for self-care. This is expected as some components of the SARC-F may represent the domains QOL using the EQ5D5L measures as it was developed to obtain information about falls, mobility and strength (11). The current finding also supports a previous study; however, in the previous study, QOL was measured using the CASP-12 scale consisting of several domains such as control, autonomy, self-realization and pressure (27).

Measuring CC is a simple method suitable for community or primary care settings; however, none of the domains of QOL was associated with CC. In contrast to a previous study among older adults with chronic obstructive pulmonary disease, reduced CC was associated with worse QOL (28). CC has also been shown to link with disability among the western population, in which the smaller the CC, the higher the impairment (29). Another study reported that CC could predict emerging care-need in older Taiwanese compared to BMI (30). In addition, a higher prevalence of sarcopenia was found among active older women detected using SMI compared to CC, and CC was not associated with physical performances, which were measured using the 5STS test for lower limb strength, TUG test for balance and mobility as well as the short physical performance battery for functional performance of the lower extremities (31). The previous finding may not be applicable in the current setting, which could be due to the differences in the anthropometric and body compositions between Asians and Westerns (1). More studies are needed to explore the applicability of CC in determining impairment among Asian people, specifically the Malaysians, which are comprised of various ethnicities.

In this study, handgrip strength was associated with mobility and usual activity domains of QOL. The association between handgrip strength and QOL is in accordance with other studies (32, 33). In addition, the literature suggests that poor QOL is also influenced by low muscle strength and low muscle mass (3). Consistently, another study revealed that handgrip strength was correlated positively and significantly with all of the SF-36 dimensions except for vitality and mental health (5). Specific illness states, such as type 2 diabetes and cerebrovascular disease, have been linked to poorer health-related QOL and reduced muscular strength (34). Thus, it was suggested that maintaining muscle strength may combat sarcopenia as it is crucial for optimal functioning (5). Previous researchers suggested that muscle quality is compromised with ageing even though the reduction of muscle strength is more quickly compared to the rate of decline in muscle mass (35); thus, intervention such as resistance training should be incorporated in geriatric rehabilitation.

Lower limb strength, which was measured by the 5STS, indicates the functional strength of the lower limb, was associated with all domains of QOL except for self-care. This finding is similar to a previous study that found a significant association between lower limb muscle strength and functional independence among 150 older adults but differs in gender (36). A similar finding has also been shown among older adults with diabetes mellitus (37). In the older population, independence in daily functions is essential for successful ageing that may be influenced by functional capacity and how they perceive QOL (5). Those with excellent muscle strength may have greater capacity and less physiological pain and are more likely to take on more societal responsibilities in life, resulting in enhanced physical, social, and emotional function (38). It has also been suggested that reduced eyesight, cardiovascular illness, and cognitive impairment may link with lower limb muscle strength (39). Because the lower limbs support the body and motions like walking, their weakening reduces stability and mobility, leading to falls, a loss of functional independence, and a shift to a dependent lifestyle (40).

Muscle mass was significantly associated with all domains of QOL consistent with a previous study (3), except for self-care. Though ageing muscle mass in both males and females may decline concurrently, the current analysis was performed by adjusting for gender and age effects. Thus, it should be interpreted and concluded with previous evidence. Although senior males have more muscle mass than females, their muscular degeneration is more rapid, and older women have more fat mass (41). In addition, a study has shown that in men, low skeletal muscle mass was associated with low serum myostatin levels, whereas there was no significant association in women (42). Such findings may be linked to muscle fibre atrophy, caused by growth hormone production, a drop in motor neurons, sex steroid levels, and physical activity (43).

As measured by the TUG test, balance performance was also significantly associated with all domains of QOL except for self-care. Consistently, a previous study has shown that difficulty maintaining balance and walking are linked to low QOL in nursing homes for frail living individuals (44). This finding should also be interpreted carefully, as the previous study found that differences between females and males in their balance performance could be due to anthropometric differences (45).

In this study, gait speed was significantly associated with usual activity and anxiety/depression. This finding supported a previous longitudinal study which took place over 16 years that baseline depression levels were univariately associated with incident gait speed impairment in women; however, it was not found similar in men (46). A previous study has established that older individuals with atrial fibrillation had a slow

gait, linked to poor mood and cognition (47). Another study highlighted that lower walking speed is linked to age, education, and, more importantly, controllable variables like impairment in everyday activities (48).

The outcomes of this study may provide some evidence to support the need for urgent public health interventions. Given the strong association between sarcopenia parameters with specific domains of QOL, strategies for improving I may be targeted by tackling each of the sarcopenia parameters. Intervention such as resistance training and protein supplement for improving muscle strength and muscle mass should be incorporated in geriatric QOL rehabilitation. In addition, promoting the importance of lifelong participation in physical and social activities may have a major role in combating sarcopenia. Sarcopenia assessment should be incorporated in all levels of geriatric care regardless of the setting, as early detection can direct sarcopenic individuals to a practical multidisciplinary approach in the prevention and rehabilitation.

CONCLUSION

This study provides evidence that several sarcopenia parameters may influence the QOL of older adults residing in a selected rural setting in Malaysia. However, findings should be interpreted with caution as the sample size of the study population was small, and the analysis did not assess genders and sarcopenia status independently. In addition, the Malay version of the SARC-F questionnaire has not been validated yet among the Malaysian population. Further cross-sectional study with a bigger sample size should be done comparing urban and rural areas to differentiate the relationship between sarcopenia parameters, QOL domains and based on severity of sarcopenia status. Gender differences should be considered when implementing health programs and appropriate interventions to improve QOL.

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