Relationship Between Lifestyle Factors and Physical Fitness Among Elderly Korean Women with Sarcopenia: A Cohort Study

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Research Article

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Abstract

Background

Approximately 20% of the population aged 65 years has sarcopenia, a major disease caused by aging. Previous studies have analyzed the prevalence and status of sarcopenia, as well as the frequencies and interaction effects among associated variables. This study aimed to identify the complex interactions between daily life-related factors, diagnostic factors, and physical strength factors as they relate to sarcopenia.

Methods

The study included 512 female participants aged 60–100 years from Incheon, Republic of Korea, who were recruited from 12 institutions. Participants engaged with the study for > 3 months. Additionally, questionnaires based on demographic traits, body composition, and fitness indicators were administered. The statistical significance threshold was established as $p < 0.05$.

Results

Hierarchical regression analysis of the characteristic factors affecting sarcopenia showed that individual characteristics affected sarcopenia (Model 1: R^2, 0.391; $p < 0.001$; Model 2: R^2, 0.427; $p < 0.001$). Hierarchical regression analysis of diagnostic and fitness factors affecting sarcopenia also showed an effect on sarcopenia (Model 1: R^2, 0.318; $p < 0.001$; Model 2:R^2, 0.419; $p < 0.001$; Model 3: R^2, 0.664; $p < 0.001$).

Conclusions

This study contributes to the general sarcopenia knowledge base. Additionally, by contributing to sarcopenia prevention and the prediction of associated chronic diseases, our findings may ultimately improve the quality of life in this demographic. It also contributes to the construction of a community health care system, thereby improving the quality of life of individuals aged 65 and above.

1. Background

On a global scale, the population of individuals aged 65 years and older is steadily rising and is forecasted to reach approximately 1.5 billion by 2050, constituting roughly 16% of the total population [1]. Aging brings about numerous changes within the human body, one of the most prominent being a decline in muscle mass. Standard muscle mass in healthy adults makes up approximately 42% of the total body mass; however, this figure decreases to approximately 27% with aging [2].

Decreased muscle mass is accompanied by a functional decline in muscle strength [3] and causes morphological changes in the body composition such as changes in skeletal muscle, fat, and bone tissue [4]. This loss increases the risks of fracture, physical disability, chronic disease, and death [5]. In 2010, the concept of sarcopenia was introduced, and in 2016, this condition was recognized as an independent disease by the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) code [6].

Sarcopenia is diagnosed based on low muscle mass (LMM) and strength (LMS) [7]. The European Working Group on Sarcopenia in Older People (EWGSOP) recommends using the SARC-F questionnaire (five-measuring instrument, strength, walking assistance, standing up from a chair, climbing stairs, falling) [8], or Ishii measuring instrument (including age, grip strength, and calf circumference) [9].

The prevalence of sarcopenia in women aged 65 years and older in community healthcare settings has been reported to be as high as 29% and falls in the range of 11–50% for adults over 80 years of age [10]. In a study of women aged 65 and older in Korea, the prevalence of sarcopenia was 22.1% [11]. Korea is one of the fastest-aging countries worldwide, and the demand for medical care and welfare for individuals aged 65 or older is constantly increasing.

In Korea, new research related to sarcopenia should be presented. An evaluation of domestic research trends showed that most previous studies — such as those by Jang [12] and Park [13] — only analyzed the prevalence and status of sarcopenia along with the frequency and interaction effect with each variable. Therefore, this study aimed to identify the complex interactions between the subjects' daily life-related factors, diagnostic factors for sarcopenia, and physical strength factors and to identify the factors that have a major influence on sarcopenia among the variables to provide data to prevent sarcopenia in individuals aged 65 or older.

2. Methods

2.1 Participants

This study included individuals aged 60–100 years residing in Incheon, Republic of Korea. The participants consisted of 512 female participants utilizing 12 establishments catering to older adults such as welfare and protection centers. Prior to interacting in the study, all participants received a comprehensive explanation outlining the objectives, methodologies, and potential risks involved. They were explicitly informed of their right to withdraw from the study at any point without facing any negative consequences. Each participant within the study cohort provided their signature on an informed consent form. The study protocol was approved by the Ga-Chon University Institutional Bioethics Committee (approval no. 1044396-202301-HR-020-01) and adhered strictly to the principles outlined in the Declaration of Helsinki.

2.2 Measurement of physical fitness factors

The study was conducted between June and August 2023. Each participant completed a questionnaire regarding their demographic characteristics and physical fitness.

Fitness assessments were conducted in the same locations immediately following the questionnaire. They entailed the analysis of body composition (height, weight, body fat mass, appendicular skeletal muscle [ASM], body mass index [BMI]), blood pressure, and calf circumference (CC). Physical fitness tests were conducted in the following order: dominant hand grip (DHG), dominant plantar flexion (DPF), dominant dorsal flexion (DDF), short physical performance battery (SPPB), timed up-and-go (TUG), and 2-minute walk test. The diagnostic criteria for sarcopenia are shown in Fig. 1 [14].

Statistical Analysis

All findings are reported as means ± standard deviations. Statistical analyses were conducted using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Group differences were evaluated using one-way analysis of variance (ANOVA), followed by Tukey's post-hoc test. Sarcopenia factors and fitness tests were analyzed using two-way ANOVA, and post-hoc analysis was performed using Tukey's test. A hierarchical regression analysis was conducted to examine the association between sarcopenia and the variables. Subsequently, a model was developed, with sarcopenia serving as the dependent variable and each variable serving as an independent variable. Statistical significance was set at $p < 0.05$.

3. Results

Table 1 shows the demographic characteristics of the participants. One-way ANOVA analysis of the demographic characteristics revealed statistically significant differences in all variables according to sarcopenia status (age, height, weight, body fat mass, BMI, ASM, $p < 0.001$; disease, $p = 0.012$).

Table 1
The demographic characteristics of the participants

Variables		Total n (%)	Normal n (%)	Possible n (%)	Sarcopenia n (%)	Severe n (%)	F	*P*
Age (years)	60–69	101 (19.7)	77 (39.1)	19 (12.8)	3 (4.3)	2 (2)	76.058	**<0.001*****
	70–79	165 (32.2)	85 (43.1)	45 (30.4)	22 (31.8)	13 (13.3)		
	80–89	204 (39.9)	32 (16.2)	72 (48.6)	35 (50.8)	65 (66.3)		
	< 90	42 (8.2)	3 (1.5)	12 (8.1)	9(13.1)	18 (18.4)		
Height (cm)	~ 149.9	191 (37.3)	36 (18.3)	68 (45.9)	31 (44.9)	56 (57.1)	38.027	**<0.001*****
	150–159.9	287 (56.1)	134 (68.0)	76 (51.4)	37 (53.6)	40 (40.8)		
	< 160	34 (6.6)	27 (13.7)	4 (2.7)	1 (1.5)	2 (2.1)		
Weight (kg)	~ 44.9	50 (9.8)	8 (4.1)	0 (0)	10 (14.5)	32 (32.7)	109.464	**< 0.001*****
	45–49.9	66 (12.9)	20 (10.2)	2 (1.4)	18 (26.1)	26 (26.5)		
	50- 54.9	123 (24)	50 (25.4)	14 (9.5)	36 (52.2)	23 (23.5)		
	< 55	273 (53.3)	119 (60.3)	132 (89.1)	5 (7.2)	17 (17.3)		
Body fat mass (%)	~ 19.9	12 (2.3)	2 (1)	0 (0)	6 (8.7)	4 (4.1)	92.899	**< 0.001*****
	20–29.9	88 (17.2)	39 (19.8)	5 (3.4)	15 (21.7)	29 (29.6)		
	30–39.9	271 (52.9)	122 (61.9)	60 (40.5)	40 (58)	49 (50)		
	< 40	141 (27.6)	34 (17.3)	83 (56.1)	8 (11.6)	16 (16.3)		
BMI (kg/m2)	~ 18.5	33 (6.5)	16 (8.1)	0 (0)	6 (8.7)	11 (11.2)	93.037	**<0.001*****
	18.6–24.9	197 (38.5)	108 (54.9)	20 (13.5)	4 (5.8)	65 (66.3)		
	25–29.9	189 (36.9)	63 (31.9)	91 (61.5)	13 (18.8)	22 (22.5)		
	< 30	93 (18.1)	10 (5.1)	37 (25)	46 (66.7)	0 (0)		
ASM	~ 5.9	262 (51.1)	93 (47.2)	37 (25)	65 (94.2)	97 (98.9)	137.385	**< 0.001*****
	6–8.9	222 (48.9)	103 (52.2)	111 (75)	4 (5.8)	1 (1.1)		
	< 9	1	1 (0.6)	0 (0)	0 (0)	0 (0)		
Disease	Yes	301 (58.8)	103(52.2)	89 (60.1)	40 (58)	69 (97.9)	3.701	**0.012***
	No	211 (31.2)	94 (47.8)	59 (39.9)	29 (42)	29 (2.1)		
Total		512	197	148	69	98		

Possible, possible sarcopenia; severe sarcopenia; BMI, body mass index; ASM, appendicular skeletal muscl

Table 2 shows the results of the two-way ANOVA analysis of the factors of sarcopenia and the fitness test. All sarcopenia factors showed statistically significant differences; in particular, ASM (age, $p = 0.012$; sarcopenia, $p < 0.001$; age × sarcopenia, $p = 0.017$), SPPB (age, $p < 0.001$; sarcopenia, $p < 0.001$; age × sarcopenia, $p = 0.003$), and TUG (age, $p < 0.001$; sarcopenia, $p < 0.001$; age × sarcopenia, $p = 0.016$) showed statistically significant differences in the analysis of sarcopenia by age group. In addition, all factors related to the fitness test showed statistically significant differences. In particular, both DDF (age, $p = 0.018$; sarcopenia, $p < 0.001$; age × sarcopenia, $p = 0.005$) and the 2-minute walk test (age, $p < 0.001$; sarcopenia, $p = 0.002$; age × sarcopenia, $p = 0.044$) showed statistically significant differences in the analysis of sarcopenia by age group.

Table 2
The results of life style factors affecting sarcopenia

	Variable		60s	70s	80s	90s		F	*p*
A	ASM	Normal	6.37 ± 0.08	5.99 ± 0.08	5.83 ± 0.12	7.19 ± 0.41	A:	3.687	**0.012+**
		Possible	7.04 ± 0.16	6.53 ± 0.10	6.41 ± 0.08	6.26 ± 0.20	S:	62.439	**< 0.001###**
		Sarcopenia	5.16 ± 0.49	5.34 ± 0.15	4.93 ± 4.68	4.42 ± 0.29	A×S:	2.272	**0.017***
		Severe	5.12 ± 0.49	5.15 ± 0.19	4.87 ± 0.09	4.55 ± 0.17			
	CC	Normal	34.66 ± 0.28	34.03 ± 0.27	32.93 ± 0.43	34.00 ± 1.41	A:	1.148	0.329
		Possible	35.52 ± 0.56	34.13 ± 0.37	34.43 ± 0.30	34.50 ± 0.70	S:	35.216	**< 0.001###**
		Sarcopenia	31.50 ± 1.41	32.05 ± 0.52	30.91 ± 0.44	28.50 ± 1.01	A×S:	1.828	0.061
		Severe	28.50 ± 1.73	30.36 ± 0.62	30.27 ± 0.31	30.81 ± 0.58			
	SPPB	Normal	11.83 ± 0.21	11.53 ± 0.20	11.29 ± 0.36	11.00 ± 1.85	A:	7.927	**< 0.001+++**
		Possible	9.78 ± 0.42	9.47 ± 0.28	7.31 ± 0.26	8.25 ± 0.92	S:	23.961	**< 0.001###**
		Sarcopenia	10.67 ± 1.07	9.77 ± 0.39	8.67 ± 0.38	6.50 ± 1.31	A×S:	2.808	**0.003****
		Severe	8.50 ± 1.31	6.62 ± 0.51	6.44 ± 0.28	5.50 ± 0.58			
	TUG	Normal	7.44 ± 0.55	7.52 ± 0.52	9.11 ± 0.92	12.13 ± 4.82	A:	6.012	**0.001+++**
		Possible	10.87 ± 1.11	10.13 ± 0.72	12.53 ± 0.68	16.62 ± 2.40	S:	8.400	**< 0.001###**
		Sarcopenia	8.25 ± 2.78	9.46 ± 1.03	10.54 ± 0.98	14.80 ± 3.41	A×S:	2.288	**0.016***
		Severe	9.90 ± 3.41	15.48 ± 1.37	15.95 ± 0.71	15.50 ± 1.54			
B	DHG	Normal	24.81 ± 0.45	22.71 ± 0.43	20.72 ± 0.76	20.39 ± 3.94	A:	1.671	0.173
		Possible	19.63 ± 0.90	10.0597.93±	16.69 ± 0.55	14.18 ± 1.97	S:	16.829	**< 0.001###**
		Sarcopenia	17.93 ± 2.27	19.47 ± 0.84	18.70 ± 0.80	16.64 ± 2.79	A×S:	1.084	0.373
		Severe	10.85 ± 2.79	14.47 ± 1.09	14.53 ± 0.59	13.27 ± 1.25			
	DPF	Normal	17.89 ± 0.44	15.82 ± 0.42	13.77 ± 0.75	15.10 ± 3.89	A:	4.092	**0.007++**
		Possible	16.18 ± 0.89	12.78 ± 0.58	10.68 ± 0.53	10.06 ± 1.94	S:	10.986	**< 0.001###**
		Sarcopenia	16.70 ± 2.24	13.71 ± 0.83	12.35 ± 0.79	11.56 ± 2.75	A×S:	1.268	0.252
		Severe	7.60 ± 2.75	9.20 ± 1.08	10.05 ± 0.58	7.87 ± 1.23			
	DDF	Normal	15.27 ± 0.38	13.64 ± 0.36	11.04 ± 0.64	14.20 ± 3.34	A:	3.408	**0.018+**
		Possible	13.27 ± 0.76	9.62 ± 0.49	7.89 ± 0.46	5.99 ± 1.67	S:	15.413	**< 0.001###**
		Sarcopenia	12.00 ± 1.92	10.25 ± 0.71	9.37 ± 0.68	7.54 ± 2.36	A×S:	2.664	**0.005****
		Severe	4.40 ± 2.36	6.31 ± 0.93	7.88 ± 0.50	5.66 ± 1.06			
	2 min	Normal	97.70 ± 2.85	98.25 ± 2.71	83.66 ± 4.81	46.00 ± 24.99	A:	9.132	**< 0.001###**
		Possible	81.47 ± 5.73	68.73 ± 3.73	47.31 ± 3.47	30.00 ± 12.49	S:	4.904	**0.002++**
		Sarcopenia	79.0014.43	75.50 ± 5.33	68.63 ± 5.10	28.00 ± 17.67	A×S:	1.947	**0.044***
		Severe	55.50 ± 17.67	51.84 ± 6.93	48.53 ± 3.73	29.60 ± 7.90			

Values are means ± SD + p < .05, ++p < .01, +++p < .001 by ages; #p < .05, ##p < .01, ###p < .001 by sarcopenia; *p < .05, **p < .01, ***p < .001 by ages × sarcopenia; Possible, possible sarcopenia; severe sarcopenia; A, the factor of sarcopenia; B, the factor of fitness test; ASM, Appendicular skeletal muscle; CC, Calf circumference; DHG, Dominant Hand grip; DPF, Dominant plantar flexion; DDF, Dominant dorsal flexion; SPPB, Short Physical Performance Battery; TUG,Timed up and go; 2 min, 2 minute Walking test

Table 3 shows the results of the hierarchical regression analysis of the characteristic factors affecting sarcopenia. In Model 1 (basic characteristics), statistically significant results were found for age (*B*, 0.054; *t*, 6.271; $p < 0.001$), resistive area (*B*, -0.042; *t*, -2.214; $p = 0.028$), and physical activity type (*B*, 0.072; *t*, 2.500; $p = 0.013$). In Model 2 (Model 1 + additional characteristics), statistically significant results were found for age (*B*, 0.045; *t*, 4.973; $p < 0.001$), resistive area (*B*, -0.044; *t*, -2.338; $p = 0.020$), type of physical activity (*B*, 0.063; *t*, 2.159; $p = 0.032$), income (*B*, -0.110; *t*, -2.517; $p = 0.013$), and drinking frequency (*B*, 0.095; *t*, 2.724; $p = 0.007$). The Durbin-Watson value of the model in Table 3 was 1.956, which was close to 2, and all values were below VIF 5.

Table 3
The results of characteristics factors affecting sarcopenia

	independent variable	**Model 1**				**Model 2**			
		B	*β*	*t*	*p*	*B*	*β*	*t*	*p*
A	(Constant)	**-3.222**		**-3.951**	**<0.001*****	**-2.902**		**-2.739**	**0.007****
	Age	**0.054**	**0.420**	**6.271**	**<0.001*****	**0.045**	**0.346**	**4.973**	**<0.001*****
	Residential area	**-0.042**	**-0.142**	**-2.214**	**0.028***	**-0.044**	**-0.149**	**-2.338**	**0.020***
	Religion	0.043	0.053	1.035	0.302	0.054	0.066	1.276	0.203
	Education level	-0.083	-0.082	-1.415	0.158	-0.030	-0.030	-0.480	0.631
	Regular physical activity	0.154	0.044	0.844	0.400	0.056	0.016	0.300	0.764
	Type of physical activity	**0.072**	**0.138**	**2.500**	**0.013***	**0.063**	**0.120**	**2.159**	**0.032***
	Family					0.013	0.014	0.275	0.783
	House					0.012	0.008	0.168	0.867
	Education level of Family					0.006	0.006	0.114	0.910
	Income					**-0.110**	**-0.156**	**-2.517**	**0.013***
	Drinking frequency					**0.095**	**0.143**	**2.724**	**0.007****
	Smoking frequency					0.124	0.021	0.410	0.682
	F (p)	*25.504 (***< 0.001******)*				*14.415 (***< 0.001******)*			
	R^2	*0.391*				*0.427*			
	$_{adj}R^2$	*0.376*				*0.398*			

Significant difference, *p < .05, **p < .01, ***p < .001; tested byHierarchial regression analysis. A(dependent variable); Model 1, basic characteristics; Model 2, Model 1 + additional characteristics

Table 4 shows the results of the hierarchical regression analysis of the sarcopenia diagnostic and fitness factors. The analysis of Model 1 (basic characteristics) revealed statistically significant results for age (*B*, 0.066; *t*, 11.374; $p < 0.001$), regular physical activity (*B*, 0.191; *t*, 2.047; $p = 0.041$), and hyperlipidemia (*B*, -0.366; *t*, -3.830; $p < 0.001$). In contrast, that of Model 2 (Model 1 + body composition) revealed statistically significant results for age (*B*, 0.045; *t*, 6.846; $p < 0.001$), diabetes (*B*, 0.237; *t*, 2.413; $p = 0.016$), hyperlipidemia (*B*, -0.267; *t*, -2.943; $p = 0.003$), appendicular skeletal muscle (*B*, -0.1364; *t*, -3.913; $p < 0.001$), calf circumference (*B*, -0.047; *t*, -2.055; $p = 0.041$), and percent body fat (*B*, 0.020; *t*, 2.240; $p = 0.026$). The analysis of Model 3 (Model 2 + fitness factors) revealed statistically significant results for appendicular skeletal muscle (*B*, -0.312; *t*, -4.243; $p < 0.001$), DHG (*B*, -0.057; *t*, -6.924; $p < 0.001$), DPF (*B*, 0.026; *t*, 2.256; $p = 0.025$), dominant single leg stance test (*B*, -0.007; *t*, 2256; $p = 0.007$), 2 minute walk test (*B*, -0.004; *t*, -2.516; $p = 0.012$), CC (*B*, -0.184; *t*, -8.444; $p < 0.001$), and SPPB (*B*, 0.095; *t*, 2.724; $p = 0.007$). The Durbin-Watson value of the model in Table 3 was 1.747, which was close to 2, and all values were below VIF 5.

Table 4
Results of hierarchial regression analysis of sarcopenia diagnostic factors

	independent variable	Model 1				Model 2				Model 3			
		B	*β*	*t*	*p*	*B*	*β*	*t*	*p*	*B*	*β*	*t*	*p*
A	(Constant)	-4.213		-9.53	< 0.001***	0.384		0.498	0.619	6.877		8.865	< 0.001***
	Age	0.066	0.495	11.374	< 0.001***	0.045	0.337	6.846	< 0.001***	-0.003	-0.019	-0.388	0.698
	RPA	0.191	0.088	2.047	0.041*	0.169	0.079	1.951	0.052	0.042	0.020	0.623	0.534
	Diabete	0.203	0.084	1.940	0.053	0.237	0.098	2.413	0.016*	0.049	0.020	0.632	0.528
	Hyperlipidemia	-0.366	-0.166	-3.830	< 0.001***	-0.267	-0.121	-2.943	0.003**	-0.131	-0.060	-1.815	0.070
	ASM					-0.364	-0.32	-3.913	< 0.001***	-0.312	-0.274	-4.243	< 0.001***
	CC					-0.047	-0.127	-2.055	0.041*	-0.004	-0.012	-0.236	0.814
	Percent Body Fat					0.020	0.136	2.240	0.026*	-0.008	-0.056	-1.154	0.249
	DHG									-0.057	-0.28	-6.924	< 0.001***
	DPF									0.026	0.116	2.256	0.025*
	DDF									-0.022	-0.093	-1.686	0.093
	DSLT									-0.007	-0.118	-2.711	0.007**
	Chair sit and reach									-0.003	-0.030	-0.827	0.409
	2 minute Walking test									-0.004	-0.108	-2.516	0.012*
	Timed up and go									-0.024	-0.117	-1.862	0.063
	Gait speed									0.012	0.023	0.388	0.698
	SPPB									-0.184	-0.427	-8.444	< 0.001***
	F (p)	*44.115 (< 0.001***)*				*38.706 (< 0.001***)*				*45.291 (< 0.001***)*			
	R^2	*0.318*				*0.419*				*0.664*			
	$_{adj}R^2$	*0.311*				*0.409*				*0.650*			

Significant difference, **p* < .05, ***p* < .01, ****p* < .001; tested by Hierarchial regression analysis. A(dependent variable), Sarcopenia; Model 1, basic characteristics; Model 2, Model 1 + body composition; Model 3, Model 2 + fitness factors; RPA, Regular physical activity; ASM, Appendicular skeletal muscle; CC, Calf circumference; DHG, Dominant hand grip; DPF, Dominant plantar flexion; DDF, Dominant dorsal flexion; DSLT, Dominant Single leg stance test; SPPB, Short Physical Performance Battery

4. Discussion

According to the results of this study, differences in sociodemographic factors, regular physical activity, and the type of physical activity were associated with sarcopenia.

Sarcopenia has become a major global social problem, having left a significant impact on healthcare and social security systems around the world [3]. The main causes of this conclusion include aging, sociodemographic factors, and lifestyle [15].

Gao et al. [16] have reported that education, especially at a high level, influences the prevention of sarcopenia, arguing that governmental educational support is needed for individuals aged 65 years and older with low levels of education. However, in this study, no association was found between the education level of the participants and that of their families and the prevalence of sarcopenia, which is considered to be the result of the establishment of a universal public education system and a lifelong learning system in Korea (senior university, government facility education). Other sociodemographic factors associated with sarcopenia include residential areas, disease, income, and alcohol consumption. These findings correspond with that of a previous study [17], which found that social activities and incomes of individuals aged 65 and older vary based on the residential area and housing type, and that the lesser the physical activities they engage in, the higher the frequency of alcohol consumption.

Previous studies have indicated that physical activity in individuals aged 65 and older is essential for preventing chronic diseases and sarcopenia [10]. Physical activity is also related to the presence or absence of social life; it determines the income of individuals aged 65 and older and also influences the time spent at home. These results can affect the participants' mental health, causing depression [18] and ultimately lead to overall body weakness.

By analyzing the participants through a two-way ANOVA, we confirmed the differences in physical fitness variables according to age and sarcopenia level. In a study conducted on older women by Da Rocha et al., a decline in physical function and physical activity increased body mass index, weight, and the risk of sarcopenia [19]. The results of this study's hierarchical regression analysis also confirmed the relationship between body composition, fitness factors, and sarcopenia. In particular, in the case of ASM hierarchical regression analysis showed significant differences between fitness factors in Model 2 (added body composition factors) and Model 3 (added fitness factors), confirming the relationship between sarcopenia and fitness factors.

However, excessive fat in body composition can cause muscular obesity, and if a participant is obese, this acts as a factor that complicates the diagnosis of sarcopenia [20]. Therefore, certain factors limit the diagnosis of sarcopenia, and follow-up studies using skin autofluorescence and various measurement tools for accurate diagnosis should be conducted in the future.

Finally, as suggested by international clinical practice guidelines, diet and physical activity have been shown as essential for the management of sarcopenia [15]. Regarding nutrition, individuals aged 65 and older need direct monitoring and dietary surveys to ensure proper intake of protein and vitamin D as well as energy balance [21].

This study had one limitation: the absence of a dietary survey. The inclusion of a dietary survey would have clarified the association between obesity and sarcopenia. Therefore, further investigations are warranted to explore the correlation between diet, lifestyle, and sarcopenia in patients.

5. Conclusions

This study enriches the understanding of sarcopenia by exploring its associations with sociodemographic factors, lifestyle choices, and physical activity. The insights gained from this study have the potential to enhance quality of life, mitigate the risk of sarcopenia, and anticipate related chronic conditions. Nonetheless, additional post-mortem investigations are warranted to validate these findings across diverse population segments and elucidate the interplay between sarcopenia, obesity, and dietary habits in Korea. Such endeavors hold promise for preventing sarcopenia and fostering the development of a robust community healthcare infrastructure, thereby enhancing the well-being of older adults.

Abbreviations

International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)

low muscle mass (LMM)

low muscle strength (LMS)

European Working Group on Sarcopenia in Older People (EWGSOP)

appendicular skeletal muscle (ASM)

body mass index (BMI)

calf circumference (CC)

dominant hand grip (DHG)

dominant plantar flexion (DPF)

dominant dorsal flexion (DDF)short physical performance battery (SPPB) timed up-and-go (TUG)

analysis of variance (ANOVA)

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Ga-Chon University Institutional Bioethics Committee (approval no. 1044396-202301-HR-020-01) and adhered strictly to the principles outlined in the Declaration of Helsinki. All participants provided informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have no conflict of interest to declare.

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Authors' contributions

All authors were well-informed of the WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects - and confirmed that this study firmly fulfilled the declaration. None of the authors has financial or private relationships with commercial, academic, or political organizations or people that may have improperly influenced this research. Overall planning of the research, data acquisition, analysis and interpretation, and major drafting and revision of manuscript submission was done by J.-Y. S.; providing the anatomical and clinical opinion for conception, overall organization, and direct supervision of the research was undertaken by J.-Y. K.

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Figures

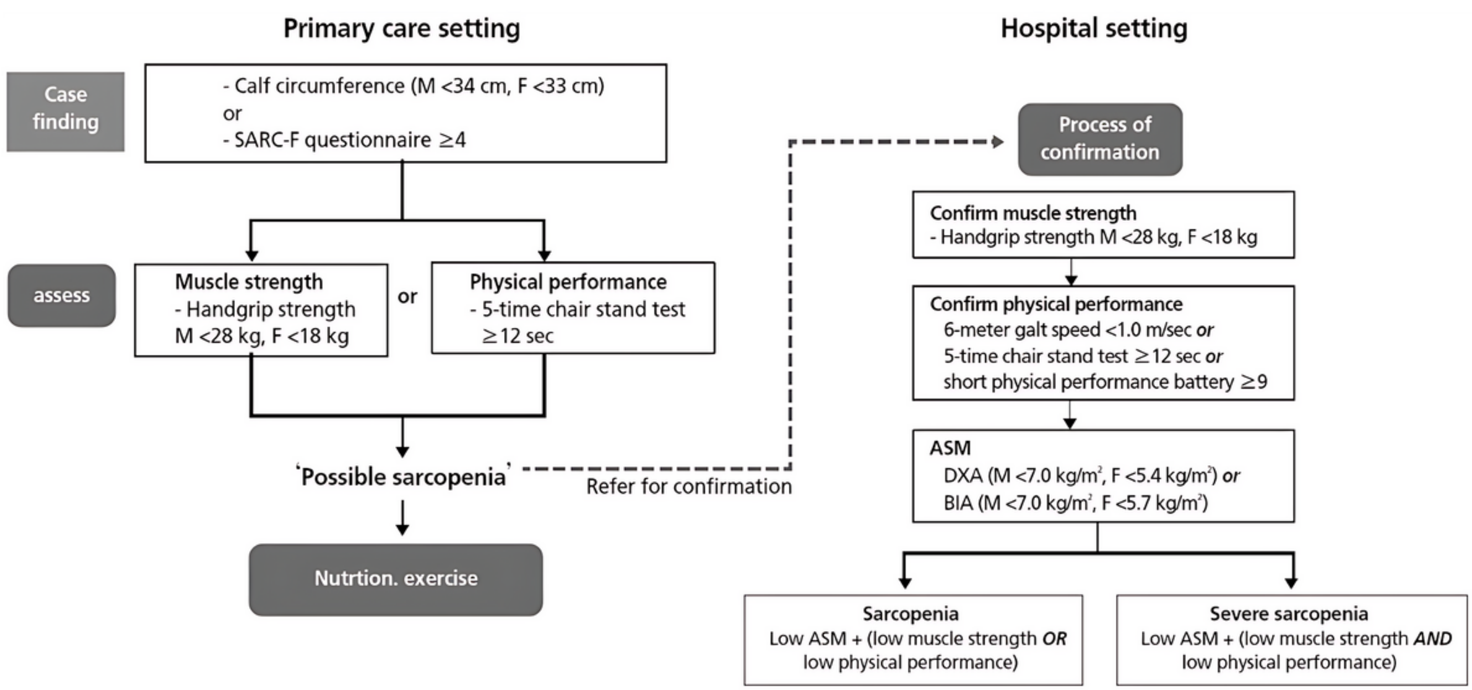

Figure 1

The diagnostic criteria for sarcopenia