

Nutrition and Psychosocial Factors were Associated with Possible Sarcopenia According to AWGS 2019

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Research article

Keywords: Possible sarcopenia, nutrition, psychosocial factors

Posted Date: April 27th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-22960/v1>

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Abstract

Background This study aimed to provide basic data for preventing and managing sarcopenia by identifying the relationship between sarcopenia, malnutrition, and psychosocial factors among the elderly in the community.

Methods The study included 1,019 subjects aged 60 and over. "Possible sarcopenia (PS)" was defined by low handgrip strength with or without reduced physical performance. Nutrition was evaluated according to the mini nutritional assessment (MNA), and the psychosocial factors examined were self-efficacy, social isolation, fear of falling, and social capital (trust and participation). A logistic regression analysis was also performed on the relationship between risk of malnutrition, psychosocial factors, and PS.

Results MNA was significantly associated with social participation ($\text{exp}(B) = 1.747$, $p < 0.001$), fear of falling ($\text{exp}(B) = 2.905$, $p < 0.001$), and self-efficacy (high/low, $\text{exp}(B) = 0.654$, $p = 0.011$). In model 3, which included both MNA and psychosocial factors, PS was significantly associated with MNA ($\text{exp}(B) = 2.529$, $p < 0.001$) and fear of falling ($\text{exp}(B) = 1.544$, $p = 0.045$). Compared with the low self-efficacy group, the high group ($\text{exp}(B) = 0.589$, $p = 0.009$) was significant.

Conclusion The factors related to PS include risk of malnutrition, fear of falls, and self-efficacy, and social participation was associated with increased risk of malnutrition. In addition to the health program, it will be necessary to improve self-efficacy so that individuals feel they can do activities of daily living themselves and to reduce their fear of falling through muscle strength and balance exercises. Finally, it is also necessary to increase regular participation in community social activities.

Background

In Korea in the year 2000, the population aged 65 years and older exceeded 7%, and the society is increasingly aging. As of 2020, 15.7% of the total population is 65 years or older, and it is expected that 20.3% of the total population will be 65 years old or older by 2025.[1] The pace of aging has risen faster in rural areas, and most rural areas already consist of a primarily elderly population.

For the elderly, sarcopenia is accepted as an important factor that affects physiological function as well as health-related quality of life. That is, decreases in muscle strength or in body function due to a decrease in muscle mass are closely related to the mortality rate and health-related quality of life of the elderly. [2, 3] For this reason, the World Health Organization named sarcopenia a disease in 2016[4, 5], making it an important intervention target not only for medical personnel but also for health care.

Recently, in Europe and Asia, the criteria for the diagnosis of sarcopenia were published. [6, 7] In particular, in the Asian guidelines, "possible sarcopenia (PS)" was defined for the prevention and management of Sarcopenia in the community, and lifestyle improvements in diet and exercise were recommended. [7]

On the other hand, malnutrition [8, 9] is a major risk factor for sarcopenia, and intervention for malnutrition is most important for the prevention and management of sarcopenia. In addition to factors related to nutritional deficiency, psychosocial factors are also important. A recent review study [9] showed that self-efficacy, social isolation, fear of falls, resilience, depression, and social networks directly affect sarcopenia, and they indirectly affect sarcopenia through lifestyle.

Psychosocial factors are known to play a role in nutritional deficiency, as studies have shown that people who eat alone [10] or have limited social networks [11] are more likely to be depressed and have malnutrition. For this reason, the Mini Nutritional Assessment (MNA) tool, which includes psychosocial factors, was developed to evaluate nutritional deficiencies in the elderly. [12, 13]

To date, most studies have been conducted on whether nutritional and psychosocial factors are individually related to sarcopenia, but both factors have rarely been considered simultaneously. This study aims to provide basic data for preventing and managing sarcopenia by identifying the relationship between sarcopenia, malnutrition, and psychosocial factors among the elderly in the community.

Methods

Participants

This cross-sectional study was derived from another study investigating the determinants of walking movements of rural residents. This study was conducted by extracting only the data of elderly people over 60 years of age to study sarcopenia.

The survey was initially conducted in two areas in Gyeongsangnam-do that are designated for research purposes. The number of study subjects was determined to be 1,450, calculated with a confidence level of 95% and a sample error of $\pm 2.1\%$ p in a population size of

5,700. Subjects were assigned households with an even number based on the street address of the area, and after confirming in the administrative data the number of residents over the age of 19 who were said to be alive, approximately 1,600 people were assigned. The survey consisted of a face-to-face questionnaire administered by six researchers who had received training and practice training twice on how to collect data and how to administer face-to-face questionnaire surveys. Data were collected for about two months beginning in June 2018. The subjects of the study were those who could precisely answer the questions after listening to the questionnaire, and those who agreed to participate in the study were included. Among the 1,600 people assigned, 1,500 were surveyed, excluding those who were not alive at the time of the investigation or who refused to participate. Of the 1,500, only 1,019 subjects aged 60 years or older were selected as study subjects.

This study was conducted with the approval of the Institutional Review Board of Gyeongsang National University (GIRB-A18-Y-0027).

Materials

The exposure variables in this study were nutritional deficiency and sociopsychological factors, and the outcome variable was sarcopenia. Demographic characteristics (gender, age, living alone) and socio-economic characteristics (education level, occupation, monthly income) were investigated as correction variables. Occupation was divided into agriculture and others, and the average monthly household income values were divided into the following categories: less than 1 million won, 1 000 to 2 000 dollars, 2000 to 3000 dollars, 3000 to 4000 dollars, and over 4000 dollars.

1) Possible Sarcopenia

The revised Asian guidelines suggested possible sarcopenia concept for community preventive services. "Possible sarcopenia (PS)" was defined by low muscle strength (handgrip strength, M: <28 kg, F: <18 kg) with or without reduced physical performance (5-time chair stand test: ≥ 12 sec). The measurement was conducted using the Smedley-type dynamometer (TKK 5401; Takei Scientific Instruments Co., Tokyo, Japan) to alternately evaluate each hand twice, and the grip strength used for analysis was the largest of the four measured values.

2) Nutrition

The Mini Nutritional Assessment (MNA), which evaluates the nutritional status of the elderly, was downloaded from the www.mna-elderly.com website and adapted to a Korean version [16]. The tool consists of 18 questions (4 questions from the new system, 6 questions from the overall physical and mental assessment, 6 questions from the dietary assessment, and 2 questions from the self-awareness assessment about health and nutrition), and a total score of 30 is calculated. After calculating the overall score, 23.5 points or more was categorized as good nutrition, 17.0 to 23.5 points as nutritional risk, and 17 points or less as nutritional deficiency. In this study, we categorized subjects with 23.5 points or more as well-nourished and those with 23.5 points or less as at risk of malnutrition.

3) Psychosocial factors

The psychosocial factors examined were self-efficacy, social isolation, fear of falling, and social capital (trust and participation), among those suggested by Tieland et al. [9]

Self-efficacy addressed confidence in performing exercise and proper diet even under the following conditions: takes a long time at one time; needs to be repeated several times until finished; or feeling worried, depressed, anxious, tired, or busy. In order to increase the response rate of questionnaires, the respondents were asked to respond on a scale of 1–7, where 7 is 'very confident', 4 is 'so, so', and 1 is 'not confident'. As a result, if there was high confidence across all situations, the mean score would be 7 points. The mean score was reclassified into a high self-efficacy group (more than 6 points), a medium self-efficacy group (4–5 points), and a low self-efficacy group (less than 3 points).

Social isolation or no social isolation was assigned according to the subject having or not having at least two neighbors (friends) or family members (relatives) with whom they could talk intimately. Fear of falling was assigned according to a 'Yes' or 'No' response to the following question: Have you ever hesitated to go out because you're afraid of falling?

Social capital assessed social participation in a meeting at least once a month (Yes / No) and trust by neighborhood people (Yes / No).

Statistical analysis

The frequency and average were presented for general characteristics, nutritional deficiencies, and psychosocial factors, and the χ^2 and t-test were performed for general characteristics, nutritional deficiency, and psychosocial factors, according to whether or not PS was present.

First, a logistic regression analysis was performed for the relationship between risk of malnutrition and psychosocial factors, with demographic and socio-economic characteristics included as correction variables. Next, a logistic regression analysis was also performed for the relationship between risk of malnutrition, psychosocial factors, and PS. Demographic characteristics and socio-economic characteristics were also included as correction variables. In model 1, correction variables and risk of malnutrition were included; in model 2, correction variables and psychosocial factors were included; and finally in model 3, all variables were included.

All analyses were performed using SPSS 25.0, and statistical significance was defined as 0.05 or less.

Results

1. General characteristics and distribution of PS

The general characteristics of the study subjects are shown in Table 1. There were 426 men (41.8%) and 593 women (58.2%), and the mean age was 72.1 ± 7.6 years. Of the study population, 29.8% lived alone, 65.9% had an education level below elementary school level, and 85.9% had a monthly income of less than 2 million won.

Table 1
General characteristics

		N	%
Sex	Male	426	41.8
	Female	593	58.2
Age	60 years	421	41.3
	70 years	402	39.5
	80 years	196	19.2
	Mean \pm sd	72.1 \pm 7.6	
Living alone	Yes	304	29.8
	No	715	70.2
Education level	\leq 6 grade	672	65.9
	\geq 7 grade	347	34.1
Income	< 2 million KW	875	85.9
	\geq 2 million KW	144	14.1
Occupation	Farmer	466	45.7
	Other	553	54.3
MNA	> 23.5	507	49.8
	\leq 23.5	511	50.1
Social participation	Yes	572	56.1
	No	447	43.9
Trust	Yes	843	82.7
	No	176	17.3
Social isolation	Non-isolated	804	78.9
	Isolated	214	21.0
Fear of falling	No	872	85.6
	Yes	146	14.3
Self efficacy	High	483	47.4
	Medium	172	16.9
	Low	364	35.7

More than 50.1% were at risk of malnutrition in their nutritional status. Results of the psychosocial factor assessment were as follows: 56.1% engaged in social participation, 82.7% experienced social trust, social isolation was present for 21.0%, 14.3% had fear of falling, and 47.4% had high self-efficacy.

Table 2 shows the results of a prevalence of PS, in addition to a simple analysis of muscular dystrophy and psychosocial factors. PS applied to 24.6% of the study population and was significantly associated with the MNA, social participation, social isolation, fear of falls, and self-efficacy ($p < 0.001$).

Table 2
Possible sarcopenia, nutrition and psychosocial factors

		Possible Sarcopenia		robust		P value
		N	%	N	%	
MNA	> 23.5	56	11.0	451	89.0	< 0.001
	≤ 23.5	195	38.2	316	61.8	
Social participation	Yes	89	15.6	483	84.4	< 0.001
	No	162	36.2	285	63.8	
Trust	Yes	207	24.6	636	75.4	0.901
	No	44	25.0	132	75.0	
Social isolation	Non-isolated	181	22.5	623	77.5	0.002
	Isolated	70	32.7	144	67.3	
Fear of falling	No	183	21.0	689	79.0	< 0.001
	Yes	68	46.6	78	53.4	
Self efficacy	High	68	14.1	415	85.9	< 0.001
	Medium	43	25.0	129	75.0	
	Low	140	38.5	224	61.5	
Total		251	24.6	768	75.4	

Table 3
Nutrition-related factors: multiple logistic regression results

	Exp(B)	95% CI of exp(B)		p value
		Lower	Upper	
Social participation	1.747	1.294	2.358	< 0.001
Trust	1.275	0.864	1.883	0.221
Social isolation	1.257	0.858	1.841	0.241
Fear of falling	2.905	1.828	4.616	< 0.001
Self efficacy				0.036
Self efficacy (high/low)	0.654	0.471	0.908	0.011
Self efficacy (medium/low)	0.851	0.563	1.284	0.441
Adjusted for sex, age, living alone, education level, income, and occupation				

Table 4
Sarcopenia-related factors: multiple logistic regression results

Exp(B)	Model 1			Model 2			Model 3					
	95% CI of exp(B)		p value	Exp(B)	95% CI of exp(B)		p value	Exp(B)	95% CI of exp(B)		p value	
	Lower	Upper			Lower	Upper			Lower	Upper		
MNA	2.984	2.085	4.269	< 0.001				2.529	1.745	3.664	< 0.001	
Social participation					1.475	1.033	2.104	0.032	1.342	0.935	1.927	0.111
Trust					1.087	0.690	1.712	0.719	1.036	0.654	1.643	0.880
Social isolation					0.969	0.635	1.479	0.885	0.928	0.605	1.424	0.733
Fear of falling					1.802	1.183	2.743	0.006	1.544	1.009	2.363	0.045
Self efficacy								0.010				0.033
Self efficacy (high/low)					0.546	0.369	0.809	0.003	0.589	0.396	0.877	0.009
Self efficacy (medium/low)					0.753	0.476	1.194	0.228	0.789	0.494	1.259	0.319
Adjusted for sex, age, living alone, education level, income, and occupation												

2. Association between PS and nutrition, psychosocial factors

MNA was significantly associated with social participation ($\text{exp}(B) = 1.747$, $p < 0.001$), fear of falling ($\text{exp}(B) = 2.905$, $p < 0.001$), and self-efficacy (high/low, $\text{exp}(B) = 0.654$, $p = 0.011$) after correction by gender, age, living alone, education, income, and occupation. In Model 1, which included only nutritional status after correction by gender, age, living alone, education, income, and occupation, MNA were significantly associated with PS ($\text{exp}(B) = 2.984$, $p < 0.001$). In Model 2, social participation ($\text{exp}(B) = 1.475$, $p = 0.032$), fear of falls ($\text{exp}(B) = 1.802$, $p = 0.006$), and high self-efficacy compared to low ($\text{exp}(B) = 0.546$, $p = 0.003$) were significantly associated with PS. In model 3, which included both MNA and psychosocial factors, PS was significantly associated with MNA ($\text{exp}(B) = 2.529$, $p < 0.001$) and fear of falling ($\text{exp}(B) = 1.544$, $p = 0.045$). Compared with the low self-efficacy group, the high group ($\text{exp}(B) = 0.589$, $p = 0.009$) was significant.

Social participation influenced nutritional deficiency and was indirectly associated with PS, while fear of falls and self-efficacy were directly or indirectly associated with PS. MNA was most closely associated with PS.

Discussion

This study is the first under the new diagnostic criteria for PS [7] to examine the relationship between PS, as defined for community health programs, and nutritional and psychosocial factors. As a result of the study, nutrition was found to be associated with PS, and among the psychosocial factors, fear of falls was directly and self-efficacy was indirectly related to PS. The social participation aspect of social capital was directly associated with risk of malnutrition and indirectly associated with PS.

The prevalence of PS in this study was 24.6%. Another study that was also conducted in accordance with the latest EWGSOP2 guidelines found a 9.3% prevalence of PS among Koreans [15], a 6.5% prevalence among Chinese males, and a 3.3% prevalence among Chinese females. [16] These criteria were the prevalence of low muscle strength and reduction of muscle mass, and it is difficult to directly compare the prevalence with the criteria of this study. Considering that the subjects of this study were elderly people in rural areas, the prevalence was higher in rural areas than in urban areas.

A majority of the population (50.1%) was at risk of malnutrition, which is most relevant to PS, and among the demographic characteristics, age was associated with malnutrition. That is, considering the study that the aging process itself is related to anorexia and about 21% of the elderly have anorexia [18], the anorexia itself is also closely related to malnutrition [19]. Nutritional deficiency in the elderly is associated with adverse health outcomes such as sarcopenia and falls, but the risk of PS is higher in older adults with a risk of malnutrition than in older adults without a risk of malnutrition [20].

Proper protein intake in the elderly is a key factor in maintaining skeletal muscle mass. Malnutrition can lead to a decrease in dietary protein intake and micronutrient intake, so above all, evaluation of nutritional status is important for the health care of the elderly. Recently, it has been determined that it may be necessary to consume 1.2 to 1.5 g / kg-bw of protein per day in order to slow or counteract sarcopenia in the elderly. [21, 22]

This study found that people who regularly participate in social activities have a lower nutritional risk than those who do not, which is the same result as from a previous study [23]. In other words, a subject that is in contact with a group of people is more likely to access community resources, which in turn can provide an opportunity for older people to have resources to address malnutrition. For this reason, MNA was developed specifically as a nutrition screening and assessment tool for elderly patients over 65 years of age. The MNA category was developed to consider social factors by asking questions about behavioral abilities, eating alone, and living alone, as well as changes in food intake, involuntary weight loss, number of meals consumed daily, and self-awareness of malnutrition [24].

There are a number of psychosocial factors that directly or indirectly affect physical performance, one of the aspects of PS in the elderly. Self-efficacy is typically associated with gait speed [25] and limitations in physical function [26]. Perhaps more important, self-efficacy is a factor that determines participation in lifestyle improvement activities such as exercise and nutrition improvement [27–29] and is known to mediate the relationship between lifestyle, especially physical activity, and functional limitations in the elderly. [28, 30, 31] Therefore, self-efficacy is a powerful psychosocial factor in improving physical function, and a cognitive approach is needed to increase it. [32, 33] Fear of falling is associated with increased sedentary action time and decreased physical activity [34], which negatively affect physical functioning in the elderly. [35]

Limitation of this study include the fact that it is a cross-sectional study, which is insufficient for explaining causality in the relationship between PS, malnutrition, and psychosocial factors. In other words, psychosocial factors may be reduced due to lack of muscle strength, and nutritional deficiency may be caused by this. Secondly, this study targeted only the rural elderly living in one area, and therefore the results cannot be appropriately applied to the general population. Despite these shortcomings, however, there have been few studies thus far to evaluate the relationship between psychosocial factors, nutrition, and PS, and this basic study provides the significance to inform the continued need for such studies.

Conclusions

The factors related to PS include risk of malnutrition, fear of falls, and self-efficacy, and social participation was associated with increased risk of malnutrition. In addition to the health program, it will be necessary to improve self-efficacy so that individuals feel they can do activities of daily living for themselves and to reduce their fear of falling through muscle strength and balance exercises. Finally, it is also necessary to increase regular participation in community social activities.

Abbreviations

AWGS
Asian Working Group for Sarcopenia
EWGSOP
European Working Group on Sarcopenia in Older People
MNA
Mini Nutritional Assessment
PS
Possible sarcopenia

Declarations

- **Ethics approval and consent to participate:** The study protocol was approved by the Ethics Committee of Gyeongsang National University (Approval No. GIRB-A18-Y-0027). Written informed consent was obtained from all participants
- **Consent for publication:** Not applicable.
- **Availability of data and materials:** The data of this study belong to the government. But, the datasets analyzed in the current study are available from the corresponding author on reasonable request.
- **Competing interests:** The authors declare that they have no competing interests.

- **Funding:** This work was supported ministry of agriculture, food, and rural affairs in Korea. (Korea ministry, This was only a research grant.)
- **Authors' contributions:** KSP and BK participated in the study design, performed the statistical analysis, and drafted the manuscript; MJK and SHS provided assistance in the statistical analysis; GYL, YMS, ARS performed measurements of variables; ARS and MJK provided assistance in the literature review and revised the manuscript; All authors read and approved the final manuscript.
- **Acknowledgements:** Not Applicable

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