



Probable Sarcopenia is Related to Depressive Symptom Severity in Korean Elderly Women

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ABSTRACT

Sarcopenia is commonly defined as a decrease in muscle mass accompanied by low muscle strength, and is known to increase the risk of frailty, falls and disability. According to the European guidelines for sarcopenia revised in 2018, if sarcopenia is clinically suspected, the muscle strength should be checked to determine whether it is probable sarcopenia before diagnosing sarcopenia. Recent studies have shown that depression is associated with sarcopenia. To explore further, this study investigated the association of probable sarcopenia with depressive symptom severity. This Cross-sectional study was conducted using data from the Korean National Health and Nutrition Examination Survey (2014, 2016). In the KNHNE survey, 2062 participants aged 65+ who completed both the PHQ-test and the grip strength test were selected. PHQ-9 was categorized into 4 groups according to the score, and low grip strength was defined as less than 26 kg for men and 18 kg for women according to AWGS criteria. Age, BMI, waist circumference, smoking status, comorbidities and diets were assessed as covariates. When adjusted all the covariates, Age ([OR]=1.175; [CI]=1.123-1.229), history of stroke ([OR]=2.467; [CI]=1.094-5.564), carbohydrate intake ([OR]=1.004; [CI]=1.000-1.009) was significantly associated with probable sarcopenia in male group. Whereas, in female group, age ([OR]=1.130; [CI]=1.090-1.171), lipid intake ([OR]=0.962; [CI]=0.929-0.997) was significantly associated with probable sarcopenia. Moreover, as the PHQ-9 score increased, the odds ratio for probable sarcopenia increased in female group (mild ([OR]1.477; [CI]1.007-2.167), moderate ([OR]2.421; [CI]1.292-4.537), moderately severe ~ severe ([OR]3.095; [CI]1.441-6.646)). The risk of probable sarcopenia increases with the depressive symptom severity in Korean elderly women.

KEYWORDS: sarcopenia, depression, depressive symptom, elderly women

INTRODUCTION

Sarcopenia is a progressive and generalized skeletal muscle disorder that can cause multiple problems by muscle mass reduction and muscular functional degradation¹. In the elderly, Sarcopenia raises the risk of frailty, falls, disability and can cause difficulties in basic ADL. There is also a study that mortality risk increases in the elderly when sarcopenia is present². Previous studies have shown that sarcopenia is associated with depression in the elderly. Hui Wang et al. reported that there is a significant relationship between sarcopenia and depressive symptom in elderly people living in welfare facilities in China³. Inhwon Lee et al. also found that sarcopenia was associated with depression in elderly women living in welfare facilities in Korea⁴. According to the European guidelines for sarcopenia revised in 2018, if sarcopenia is clinically suspected, the muscle strength should be checked through grip strength or chair stand test to determine whether it is probable sarcopenia before diagnosing sarcopenia¹. Grip strength is a simple and inexpensive test

as the primary indicator of probable sarcopenia and can be used as a powerful predictor of poor outcome patients. In this study, we investigated whether probable sarcopenia was associated with depressive symptom severity in the elderly.

MATERIALS AND METHODS

Subjects

This study is a cross-sectional study using data from the Korean National Health and Nutrition Examination Survey (KNHNE) conducted in 2014 and 2016. The subjects were 2,062 adults aged 65+ who completed the PHQ-9 questionnaire and the grip strength measurement among the 15,700 subjects who participated in the KNHNE Survey. The KNHNE Survey included age, sex, BMI, waist circumference, smoking history, comorbidity, and nutrition. And the smoker was defined who smoked more than 100 cigarettes during their lifetime.

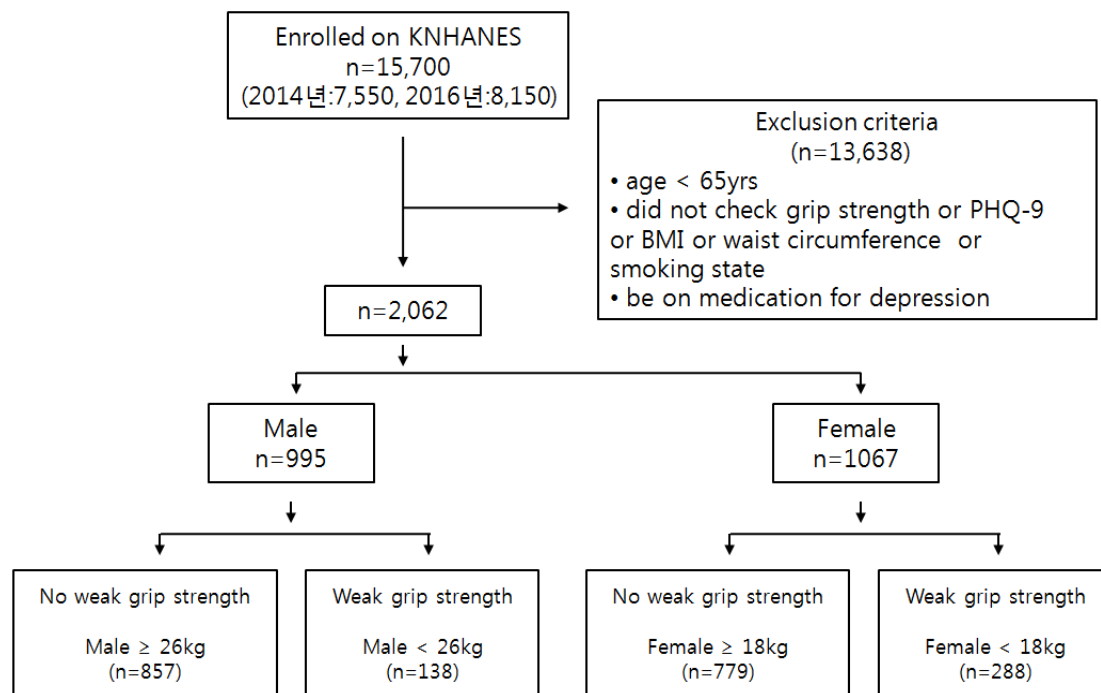
Exclusion Criteria

In this study, the subjects who were younger than 65 years or



who did not measure grip strength, BMI, waist circumference, or who did not respond to the smoking history questionnaire

or PHQ test were excluded. In addition, those who received medication for depression were excluded.



Probable Sarcopenia

According to the 2018 EWGS guideline, probable sarcopenia should be assessed before diagnosing sarcopenia. The muscle strength is checked by grip strength or chair stand test. Among them, the grip strength was used in this study. The subjects were measured a grip strength using a digital grip strength dynamometer (TK K 5401, Japan). The grip strength of both hands was measured three times each, and the maximum value of the major hand was used as the hand grip strength. We defined probable sarcopenia as less than 26 kg for males and less than 18 kg for females according to the cut-off value of low hand grip strength of AWGS⁵.

Depressive Symptom Severity

Depressive symptom severity was assessed using the Korean version of PHQ-9 (Patient Health Questionnaire-9). The PHQ-9 test is used as a tool to screen the presence and severity of depression by conducting a questionnaire of 9 questions. In this study, Depressive symptom severity was classified according to the PHQ-9 score (0-4: none-minimal, 5-9: mild, 10-14: moderate, 15-27: moderately severe to severe)⁶.

Statistical Analysis

Statistical analysis was performed using SPSS software version 20.0 (SPSS Inc., IL, USA). This study is a complex sample design utilizing data from the National Health and Nutrition Survey in 2014 and 2016. The study was conducted by grouped according to gender. Continuous variables were expressed as mean ± standard error, and nominal variables as percent. T-test and Chi-square test were used to describe

the variables characteristics. To investigate whether probable sarcopenia is associated with depressive symptom severity, we used logistic regression models. Age, BMI, waist circumference, smoking status, comorbidities, and diets were adjusted in the logistic regression models. The p-value <.05 was considered significant.

DISCUSSION

In this study, the risk of probable sarcopenia increased with increasing depressive symptom severity in elderly women. There are several factors that explain these results, including physical inactivity and immune dysregulation.

Physical Inactivity

Typical features of depression include decreased interest, energy loss, and psychomotor retardation. In a previous study, a multi-national cross-sectional study of adults 55+ years showed a decrease in physical activity in the depression group ([OR]=0.973; [CI]=0.949-0.997)⁷. Also, in a cross-sectional study of adults 60+ years in Brazil, physical inactivity was higher in patients with depression ([OR]=1.281; [CI]=1.048-1.566)⁸. In addition to, in animal studies of rats, there was an increase in muscle apoptosis-related substance in the less active rats⁹. Based on this, it can analogize that physical activity decreases with increasing depressive symptom severity and muscle weakness increases accordingly.

Immune Dysregulation

Previous studies have also shown that immune dysregulation may be involved in the relationship between depression and muscle weakness. Yekta Dowlati et al. reported that pro-inflammatory cytokines such as IL-6 and TNF-α were

increased in the major depression group compared to the control group¹⁰. And Laura A. Schaap et al. reported that a decrease in muscle strength was associated with a high level of TNF- α ¹¹.

Strength

The strength of this study was a relatively large sample size and that analyzed by dividing male and female groups. Unlike previous studies, depressive symptom severity was grouped and analyzed using the PHQ-9 score. And we used the newly defined term ‘probable sarcopenia’.

Limitation

The limitations of this study were cross-sectional study, thus the causal relationship between depressive symptom and probable sarcopenia could not be confirmed. So it is necessary to investigate the causal relationship through future prospective studies. And this study showed a significant correlation between depressive symptom severity and probable sarcopenia in elderly women, but not in elderly men. Therefore, it is necessary to identify the factors that make a difference through further research.

RESULTS AND CONCLUSION

Of the 15,700 initial participants, 13,638 were excluded because they were under 65 years of age, did not perform any

tests or were on medication for depression. Consequently, 2,062 participants were available for analyses. There were 995 men (no weak grip strength: 857, weak grip strength: 138) and 1067 women (no weak grip strength: 779, weak grip strength: 288). In variable characteristics, the probable sarcopenia group was higher in age and stroke prevalence and lower in BMI, energy, carbohydrate and protein intake in both men and women than normal group (Table. 1). There was also a significant difference in the PHQ-9 score between the probable sarcopenia group and the normal group in the female group. When adjusted all the covariates, Age ([OR]=1.175; [CI]=1.123-1.229), history of stroke ([OR]=2.467; [CI]=1.094-5.564), carbohydrate intake ([OR]=1.004; [CI]=1.000-1.009) was significantly associated with probable sarcopenia in male group (Table. 2). Whereas, in female group, age ([OR]=1.130; [CI]=1.090-1.171), lipid intake ([OR]=0.962; [CI]=0.929-0.997) was significantly associated with probable sarcopenia (Table. 3). Moreover, as the PHQ-9 score increased, the odds ratio for probable sarcopenia increased in female group (mild ([OR]1.477; [CI]1.007-2.167), moderate ([OR]2.421; [CI]1.292-4.537), moderately severe ~ severe ([OR]3.095; [CI]1.441-6.646)). Therefore, the conclusion of this study is that the likelihood of sarcopenia increases with the severity of depressive symptoms in elderly Korean women.

Table 1. Characteristics of participants according to grip strength

Variables	Man			Woman		
	Normal	Probable sarcopenia	p-value	Normal	Probable sarcopenia	p-value
N	857	138		779	288	
Age (yrs)	71.5±0.18	75.4±0.36	.000	71.8±0.21	75.2±0.31	.000
BMI (kg/m ²)	23.8±0.11	23.0±0.30	.006	24.6±0.13	24.0±0.29	.013
Waist circumference (cm)	86.4±0.33	85.0±0.85	.068	84.3±0.42	83.6±0.72	.434
Smoker	671 (78.3%)	104 (75.4%)	.441	39 (5.0%)	20 (6.9%)	.219
Energy intake (Kcal)	1999.9±31.31	1707.3±48.55	.000	1500.1±23.76	1272.1±35.52	.000
Carbohydrate intake (g)	334.0±5.38	309.0±9.15	.034	270.1±4.57	237.0±6.82	.000
Protein intake (g)	65.2±1.25	52.2±1.89	.000	48.2±0.92	39.1±1.47	.000
Hypertension	424 (49.5%)	64 (46.4%)	.499	428 (54.9%)	158 (54.9%)	.981
DM	173 (20.2%)	25 (18.1%)	.572	147 (18.9%)	68 (23.6%)	.087
Stroke	36 (4.2%)	14 (10.1%)	.003	22 (2.8%)	18 (6.2%)	.009
Osteoarthritis	81 (9.5%)	14 (10.1%)	.797	282 (36.2%)	96 (33.3%)	.385
PHQ-9 score			.092			.000
0~4 (minimal)	754 (88.0%)	115 (83.3%)		596 (76.5%)	188 (65.3%)	
5~9 (mild)	77 (9.0%)	13 (9.4%)		121 (15.5%)	54 (18.8%)	
10~14 (moderate)	15 (1.8%)	5 (3.6%)		41 (5.3%)	27 (9.4%)	
15~27 (Moderately severe ~ severe)	11 (1.3%)	5 (3.6%)		21 (2.7%)	19 (6.6%)	



Table 2. Association between depressive symptom severity and low grip strength in the men group by logistic regression

Variables	Unadjusted	Model I	Model II
PHQ Score			
Mild	1.281(0.617-2.662)	1.066(0.501-2.268)	0.992(0.468-2.102)
Moderate	1.569(0.565-4.357)	1.201(0.394-3.657)	1.297(0.463-3.632)
Moderately severe ~ severe	2.416(0.587-9.946)	2.785(0.801-9.683)	2.894(0.765-10.941)
Age (yrs)		1.196(1.145-1.250)	1.175(1.123-1.229)
BMI (kg/m ²)		0.948(0.823-1.091)	0.958(0.830-1.107)
Waist circumference (cm)		1.005(0.961-1.052)	1.009(0.964-1.056)
Smoking status		0.727(0.437-1.210)	0.784(0.461-1.333)
Hypertension			0.792(0.495-1.267)
DM			0.762(0.416-1.397)
Stroke			2.467(1.094-5.564)
Osteoarthritis			1.063(0.533-2.121)
Energy intake (Kcal)			0.999(0.998-1.000)
Carbohydrate intake (g)			1.004(1.000-1.009)
Protein intake (g)			0.998(0.983-1.012)
Lipid intake (g)			0.994(0.977-1.011)

Data are presented as odds ratio (95% confidential intervals). Model 1: adjusted for age, BMI, waist circumference, smoking status Model 2: Model 1 + adjusted for comorbidities, diet.

Table 3. Association between depressive symptom severity and low grip strength in the women group by logistic regression

Variables	Unadjusted	Model I	Model II
PHQ Score			
Mild	1.472(1.017-2.131)	1.427(0.987-2.063)	1.477(1.007-2.167)
Moderate	2.392(1.320-4.336)	2.438(1.318-4.508)	2.421(1.292-4.537)
Moderately severe ~ severe	3.742(1.793-7.812)	3.528(1.624-7.665)	3.095(1.441-6.646)
Age (yrs)		1.146(1.106-1.187)	1.130(1.090-1.171)
BMI (kg/m ²)		0.950(0.849-1.063)	0.953(0.844-1.075)
Waist circumference (cm)		1.005(0.970-1.043)	1.011(0.974-1.049)
Smoking status		1.485(0.813-2.713)	1.360(0.734-2.519)
Hypertension			0.806(0.570-1.142)
DM			1.126(0.719-1.765)
Stroke			1.366(0.660-2.829)
Osteoarthritis			0.874(0.618-1.236)
Energy intake (Kcal)			1.002(0.999-1.006)
Carbohydrate intake (g)			0.989(0.976-1.003)
Protein intake (g)			0.993(0.971-1.016)
Lipid intake (g)			0.962(0.929-0.997)

Data are presented as odds ratio (95% confidential intervals). Model 1: adjusted for age, BMI, waist circumference, smoking status Model 2: Model 1 + adjusted for comorbidities, diet.

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Citation: Young-Min Kim, "Probable Sarcopenia is Related to Depressive Symptom Severity in Korean Elderly Women", *American Research Journal of Medicine and Surgery*, Vol 4, no. 1, 2022, pp. 1-5.

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