Received: 1 April 2024 | Revised: 2 July 2024 | Accepted: 15 July 2024

DOI: 10.1002/jgf2.722

Journal of General and Family Medicine Open Access WILEY

ORIGINAL ARTICLE

Age and sex differences in sarcopenic dysphagia: A secondary data analysis

Hidetaka Wakabayashi MD, PhD[1] | Shingo Kakehi PT, MS[1] | Ayano Nagano RN, PhD[2] | Masako Kishima DDS, PhD[3,4] | Masataka Itoda DDS, PhD[4] | Shinta Nishioka RD, PhD[5] | Ryo Momosaki MD, PhD[6]

[1]Department of Rehabilitation Medicine, Tokyo Women's Medical University Hospital, Tokyo, Japan

[2]Department of Nursing, Nishinomiya Kyoritsu Neurosurgical Hospital, Nishinomiya, Japan

[3]Department of Dentistry, Wakakusa-Tatsuma Rehabilitation Hospital, Osaka, Japan

[4]Department of Oral Rehabilitation, Osaka Dental University Hospital, Osaka, Japan

[5]Department of Clinical Nutrition and Food Service, Nagasaki Rehabilitation Hospital, Nagasaki, Japan

[6]Department of Rehabilitation Medicine, Mie University Graduate School of Medicine, Tsu, Japan

Correspondence
Hidetaka Wakabayashi, Department of Rehabilitation Medicine, Tokyo Women's Medical University Hospital, 8-1, Kawada-cho, Shinjuku-ku, Tokyo, Japan.
Email: noventurenoglory@gmail.com

Funding information
Japan Society for the Promotion of Science, Grant/Award Number: 19H03979

Abstract

Background: Age and sex differences in sarcopenic dysphagia are unknown. The purpose is to characterize age and sex differences in sarcopenic dysphagia.

Methods: A cross-sectional and retrospective cohort study using information from the Japanese database on sarcopenic dysphagia was performed. We investigated age and sex differences between sarcopenic dysphagia and other forms of dysphagia. We investigated whether differences in prognosis for swallowing function, as assessed by the Food Intake Level Scale, and activities of daily living (ADL), as assessed by the Barthel Index were influenced by age and sex in patients with sarcopenic dysphagia.

Results: The study included 460 patients, including 229 men and 231 women, with a mean age of 81 ± 10 years. Fifty-eight percent of the patients had sarcopenic dysphagia. Age was independently associated with sarcopenic dysphagia (odds ratio (OR): 1.056, 95% confidence interval (CI): 1.035, 1.078), although sarcopenic dysphagia could also be seen in those younger than 65 years. Sex was not independently associated with sarcopenic dysphagia. The age cut-off for the diagnosis of sarcopenic dysphagia was 82 years in all patients (sensitivity, 0.660; specificity, 0.644), 80 years in men (sensitivity, 0.619; specificity, 0.631), and 83 years in women (sensitivity, 0.723; specificity, 0.577). Sarcopenic dysphagia showed no significant differences in the improvement of swallowing function and ADL based on age and sex.

Conclusions: Sarcopenic dysphagia was most common in older adults in their 80s or older. The possibility of sarcopenic dysphagia should be considered when dysphagia is present in people 80 years of age or older.

KEYWORDS
aged, deglutition disorders, diagnosis, gender, sarcopenia

1 | INTRODUCTION

Dysphagia becomes more common with age and is also more common in men. A meta-analysis of dysphagia in older adults found that 46% had dysphagia and that dysphagia was associated with pneumonia, malnutrition, sarcopenia, and death.[1] A systematic review and meta-analysis of dysphagia found that the prevalence of dysphagia was higher in older adults, 32.6% in adults, and 48.1% in older adults.[2] Older adults living in the community who were suspected of having dysphagia with an EAT-10 score of 3 or higher were 19.5% of those aged 65–74, 26.6% of those aged 75–84, and 45.0% of those aged 85 and older, with older adults being more likely to have dysphagia.[3] In addition to age-related loss of swallowing function (presbyphagia),[4] older adults are more likely than younger adults to have dysphagia due to stroke, dementia, sarcopenia, medication side effects, and other causes. In terms of sex, dysphagia was more common in men: 46.5% of women and 54.7% of men.[2] Speech-language pathology consultations for dysphagia were more common among older adults and men.[5] Thus, the influence of age and sex is important in dysphagia rehabilitation and general and family medicine.

Sarcopenia is more common in older adults, with few sex differences; however, age and sex differences in sarcopenic dysphagia are unknown. The prevalence of sarcopenia increased with age after 75 years in both sexes.[6] The prevalence of sarcopenia was 2.6%, 5.3%, 23.3%, 43.9%, and 75.0% in men and 11.5%, 11.8%, 27.1%, 35.6%, and 54.3% in women in the age groups 65 to 69, 70 to 74, 75 to 79, 80 to 84, and 85 to 89 years, respectively.[6] A systematic review and meta-analysis of the general population worldwide found no sex difference in the prevalence of sarcopenia at 10% in both men and women.[7] A systematic review and meta-analysis of older adults by setting showed that the prevalence of sarcopenia in community-dwelling older adults was 11% in men and 9% in women.[8] In contrast, the prevalence of sarcopenia in nursing home residents was 51% in men and 31% in women, with a significantly higher prevalence in men.[8] The prevalence of sarcopenia in hospitalized patients was almost the same, 23% in men and 24% in women.[8] In a systematic review and meta-analysis of older adults in China, the prevalence of sarcopenia was almost similar in men (14%) and women (15%).[9] Sarcopenic dysphagia is defined as difficulty swallowing due to sarcopenia of the whole-body skeletal and swallowing muscles.[10,11] Because sarcopenic dysphagia is recognized with whole-body sarcopenia, it may resemble the age and sex characteristics of whole-body sarcopenia. In addition, rehabilitation nutrition strategies may differ between the sexes. However, age and sex differences in sarcopenic dysphagia are unknown.

The purpose of this study is to characterize age and sex differences in sarcopenic dysphagia.

2 | METHODS

2.1 | The Japanese database on sarcopenic dysphagia

This was a cross-sectional and retrospective cohort study that utilized information from the Japanese database on sarcopenic dysphagia, the details of which were previously reported.[12] In summary, the Rehabilitation Nutrition Database Committee of the Japanese Association of Rehabilitation Nutrition and the Japanese Working Group on Sarcopenic Dysphagia constructed the database. The database included dysphagic patients aged 20 years and older with a Food Intake Level Scale (FILS)[13] score of ≤8. FILS scores ranged from 1 to 10, with levels 1–3 indicating various degrees of nonoral intake, levels 4–6 indicating various degrees of oral food intake and alternative nutrition, levels 7–8 indicating various degrees of oral food intake alone, and level 9 indicating no dietary restriction but with medical consideration, while level 10 indicated normal intake of oral food. Dysphagia was diagnosed through medical interviews, physical examinations, observation of eating, and screening tests of swallowing function conducted by healthcare professionals involved in dysphagia rehabilitation. The database includes those with sarcopenic dysphagia and other forms of dysphagia. The database included various settings such as acute care hospitals, rehabilitation hospitals, and others. Baseline and follow-up information were documented. The primary outcome was the FILS score at follow-up. Follow-up data for hospitalized patients were obtained upon discharge. In the case of patients at home and those who had been hospitalized for over 3 months since the baseline assessment, follow-up data were recorded after a 3-month interval. The observation period was between August 2019 and March 2021. The inclusion criterion for the study was registration in the database, while the exclusion criterion involved the absence of records indicating sarcopenia.

2.2 | Sample size calculation of the database

We assumed a moderate effect size (effect size $w = 0.3$) for the association of factors such as sex and hoarseness with sarcopenic dysphagia. If we wanted to obtain statistically significant results for these associations with a chi-square test, we would need data from approximately 220 individuals. A total sample size of 440 persons was used for the sample size calculation, with 220 persons in acute care and convalescent hospitals.

2.3 | Ethical consideration

The study received approval from the ethics committee of the Yokohama City University Medical Center, and all participants were given the right to refuse participation in the study (opt-out option).

2.4 | Diagnosis of sarcopenic dysphagia

Sarcopenic dysphagia is defined as the loss of swallowing muscle mass and function associated with generalized loss of skeletal muscle mass and function.[14,15] Sarcopenic dysphagia was identified utilizing a reliable and validated diagnostic algorithm for the condition.[14,15] This diagnostic algorithm categorizes patients into three groups: probable, possible, or no sarcopenic dysphagia. To diagnose sarcopenic dysphagia, the presence of whole-body sarcopenia, as determined by the Asian Working Group for Sarcopenia (AWGS) 2019 criteria,[16] the presence of dysphagia, and the absence of other causative diseases of dysphagia, excluding sarcopenia, were essential criteria. The absence of other causative diseases of dysphagia means that there is no disease that explains the characteristics and severity of the patient's dysphagia. For example, suppose a patient who had an old stroke but no evidence of dysphagia is admitted to the hospital with aspiration pneumonia and develops dysphagia after admission. In this case, the cause of the dysphagia is considered to be the sarcopenia dysphagia, not the old cerebral infarction. Thus, many patients are diagnosed with sarcopenia dysphagia even if they have a disease other than sarcopenia, such as cerebral infarction, which can cause dysphagia. We believe that the database accurately applied the algorithm for the diagnosis of sarcopenic dysphagia because all database registrants are members of the Japanese Association of Rehabilitation Nutrition or the Japanese Working Group on Sarcopenic Dysphagia and are clinically involved in the management of sarcopenic dysphagia. Patients exhibiting low swallowing muscle strength, as assessed by tongue pressure measurements, were classified as having probable sarcopenic dysphagia, while individuals with normal swallowing muscle strength or those in whom measuring swallowing muscle strength was not feasible were diagnosed with possible sarcopenic dysphagia. In this study, patients were divided into two groups according to whether or not they had sarcopenic dysphagia (both probable sarcopenic dysphagia and possible sarcopenic dysphagia).

2.5 | Study design

A cross-sectional study was conducted to investigate potential differences in age and sex between sarcopenic dysphagia and other forms of dysphagia. Subsequently, a retrospective cohort study was carried out exclusively on patients with sarcopenic dysphagia to determine whether variations in prognosis for dysphagia and activities of daily living (ADL) were influenced by age and sex. ADL was assessed using the Barthel Index.[17] Dementia was assessed for presence or absence. The settings were categorized into three groups: acute care hospitals, which provide advanced and specialized care for patients with urgent and critical conditions, rehabilitation hospitals with convalescent rehabilitation ward, and others.

2.6 | Statistical analyses

Statistical analyses were performed using the IBM Statistical Package for the Social Sciences (SPSS), ver. 29 (IBM Corporation; Armonk, NY, USA). Parametric data were expressed as mean ± standard deviation (SD), and nonparametric data were expressed as median and interquartile range (IQR). Chi-squared test, Mann–Whitney *U* test, and *t*-test were used to analyze differences. Kolmogrov–Sminov and Shapiro–Wilk tests were used to analyze normality. We calculated the area under the receiver operating characteristic curve (ROC-AUC) to assess the predictive value of age. The ROC curves were constructed by plotting sensitivity against 1-specificity, and the optimal cut-off point was determined as the point closest to the upper left corner of the graph, indicating high sensitivity and low (1-specificity). Logistic regression analysis, ordered logistic regression analysis, and multiple linear regression analysis were performed to examine the relationship between age, sex, and sarcopenic dysphagia. In a retrospective cohort study, the objective variables were FILS and Barthel Index at follow-up, and age, sex, settings, dementia, FILS, and Barthel Index at baseline were included as dependent variables, because dementia, FILS, and Barthel Index at baseline were important confounding factors. VIF values greater than 10 were considered indicative of multicollinearity. A p value < 0.05 was considered statistically significant.

3 | RESULTS

The Japanese sarcopenic dysphagia database initially contained 467 registered patients. Seven of these patients (2%) were excluded due to missing data on the presence or absence of sarcopenia. The study included the remaining 460 patients (98%), including 229 men and 231 women, with a mean age of 81 ± 10 years. Of the 460 patients, 285 (58%) patients were diagnosed with sarcopenic dysphagia. Major diseases of the patients at baseline were cerebral infarction ($n = 78$, 17%), fracture of neck of femur ($n = 48$, 10%), pertrochanteric fracture ($n = 33$, 7%), intracerebral hemorrhage ($n = 27$, 6%), pneumonia ($n = 26$, 6%), and heart failure ($n = 24$, 5%).

Table 1 shows the baseline and follow-up demographic data of all patients between men and women. Sarcopenic dysphagia was more common in women than in men (69% vs. 55%, $p = 0.002$). However, women were older than men (83 vs. 78 years, $p < 0.001$). Calf circumference, handgrip strength, and tongue pressure were greater in men compared to women. No data were missing for FILS and Barthel Index.

Table 2 shows the baseline and follow-up demographic data of all patients between sarcopenic dysphagia and non-sarcopenic dysphagia. The sarcopenic dysphagia group was older (83 ± 9 vs. 77 ± 11 years, $p < 0.001$) and had thinner calf circumference, weaker grip strength, lower BMI, and more undernutrition and dementia.

TABLE 1 The baseline and follow-up demographic data of all patients between men and women.

	Total, $N=460$	Men, $N=229$	Women, $N=231$	p-Value
Age, years, mean ± SD	81 ± 10	78 ± 11	83 ± 10	<0.001[a]
Causative disease of dysphagia, *n* (%)				
Sarcopenic dysphagia	285 (58%)	126 (55%)	159 (69%)	0.002[b]
Other causative diseases	175 (42%)	103 (45%)	72 (31%)	
Dwelling				
Acute care hospitals	202 (44%)	110 (48%)	92 (40%)	0.102[b]
Rehabilitation hospitals	205 (45%)	89 (39%)	116 (50%)	
Others	53 (12%)	30 (13%)	23 (10%)	
Initial FILS, median (IQR)	7 (3, 8)	7 (2, 7)	7 (6, 8)	<0.001[c]
Initial Barthel Index, median (IQR)	25 (5, 50)	30 (10, 50)	20 (5, 50)	0.402[c]
Calf circumference (cm), mean ± SD	28.2 ± 4.0	29.1 ± 4.2	27.3 ± 3.6	<0.001[a]
Handgrip strength (kg), mean ± SD	13.0 ± 9.2	17.0 ± 10.3	9.1 ± 5.8	<0.001[a]
Tongue pressure (kPa), mean ± SD	16.6 ± 10.5	18.8 ± 10.4	14.4 ± 10.2	0.018[a]
Body mass index (kg/m^2), mean ± SD	20.2 ± 3.8	20.5 ± 3.7	19.8 ± 3.8	0.082[a]
GLIM Malnutrition, *n* (%)	300 (65%)	143 (62%)	157 (68%)	0.324[b]
Dementia, *n* (%)				
Follow-up FILS, median (IQR)	8 (7, 8)	8 (7, 8)	8 (7, 8)	0.424[c]
Follow-up Barthel Index, median (IQR)	50 (20, 80)	55 (25, 85)	50 (18.75, 75)	0.234[c]

Abbreviations: FILS, Food Intake Level Scale; GLIM, Global Leadership Initiative on Malnutrition; IQR, interquartile range; SD, standard deviation.

[a]*t*-test.

[b]Chi-square test.

[c]Mann–Whitney *U* test.

Table 3 shows the results of logistic regression analysis of sarcopenic dysphagia adjusted for settings. Age was independently associated with sarcopenic dysphagia (odds ratio (OR): 1.056, 95% confidence interval (CI): 1.035, 1.078). In contrast, sex was not independently associated with sarcopenic dysphagia (OR: 1.422, 95% CI: 0.946, 2.136).

Figure 1 shows the ROC curve and AUC as measures of the predictive value of age for sarcopenic dysphagia. The AUC for sarcopenic dysphagia was 0.675 (95% CI: 0.624–0.726) in all patients, 0.666 (95% CI: 0.596–0.736) in men, and 0.650 (95% CI: 0.569–0.730) in women. The age cut-off for the diagnosis of sarcopenic dysphagia was 82 years in all patients (sensitivity, 0.660; specificity, 0.644), 80 years in men (sensitivity, 0.619; specificity, 0.631), and 83 years in women (sensitivity, 0.723; specificity, 0.577).

Table 4 shows the demographic data of patients with sarcopenic dysphagia between men and women. Women were older than men (85 vs. 81 years, $p<0.001$). Calf circumference and handgrip strength were greater in men compared to women. Tongue pressure showed no significant difference between men and women. Initial FILS was significantly lower in men compared to women. Follow-up FILS and initial and follow-up Barthel Index did not show significant differences between men and women.

Ordered logistic regression analysis of follow-up FILS was performed, adjusted for age, sex, settings, dementia, and initial FILS. Age ($B=-0.018$, 95% CI: −0.042, 0.006, p-value: 0.147) and sex ($B=0.024$, 95% CI: −0.443, 0.491, p-value: 0.919) were not independently associated with follow-up FILS.

Multiple linear regression analysis of the follow-up Barthel Index was performed, adjusted for age, sex, settings, dementia, and baseline Barthel Index. Age ($B=-0.239$, 95% CI: −0.533, 0.055, p-value: 0.111) and sex ($B=-1.202$, 95% CI: −6.893, 4.488, p-value: 0.678) were not independently associated with the follow-up Barthel Index. All VIF values in the multivariable analysis ranged between 1.0 and 3.3. Therefore, our multivariable analysis did not exhibit any issues with multicollinearity.

TABLE 2 The baseline and follow-up demographic data of all patients between sarcopenic dysphagia and non-sarcopenic dysphagia.

	Total, $N=460$	Sarcopenic dysphagia, $N=285$	Non-sarcopenic dysphagia, $N=175$	*p*-Value
Age, years, mean ± SD	81 ± 10	83 ± 9	77 ± 11	<0.001[a]
Dwelling				
Acute care hospitals	202 (44%)	124 (44%)	78 (45%)	0.974[b]
Rehabilitation hospitals	205 (45%)	129 (45%)	76 (43%)	
Others	53 (12%)	32 (11%)	21 (12%)	
Initial FILS, median (IQR)	7 (3, 8)	7 (5, 8)	7 (1, 7)	0.002[c]
Initial Barthel Index, median (IQR)	25 (5, 50)	25 (5, 50)	25 (10, 50)	0.985[c]
Calf circumference (cm), mean ± SD	28.2 ± 4.0	27.2 ± 3.8	29.8 ± 3.9	<0.001[a]
Handgrip strength (kg), mean ± SD	13.0 ± 9.2	10.9 ± 7.1	16.5 ± 11.0	<0.001[a]
Tongue pressure (kPa), mean ± SD	16.6 ± 10.5	15.3 ± 10.9	18.8 ± 9.6	0.073[a]
Body mass index (kg/m^2), mean ± SD	20.2 ± 3.8	19.6 ± 3.6	21.0 ± 4.0	<0.001[a]
GLIM Malnutrition, *n* (%)	300 (65%)	208 (73%)	92 (53%)	<0.001[b]
Dementia, *n* (%)	139 (30%)	98 (34%)	41 (23%)	0.038[b]
Follow-up FILS, median (IQR)	8 (7, 8)	8 (7, 8)	8 (7, 8)	0.452[c]
Follow-up Barthel Index, median (IQR)	50 (20, 80)	55 (20, 80)	50 (20, 85)	0.183[c]

Abbreviations: FILS, Food Intake Level Scale; GLIM, Global Leadership Initiative on Malnutrition; IQR, interquartile range; SD, standard deviation.

[a]*t*-test.

[b]Chi-square test.

[c]Mann–Whitney *U* test.

TABLE 3 Logistic regression analysis of sarcopenic dysphagia.

	B	SE	*p*-Value	Odds ratio	95% CI of odds ratio		VIF
Age	0.052	0.011	<0.001	1.053	1.031	1.075	1.117
Sex	0.337	0.208	0.105	1.401	0.932	2.108	1.086
Acute care hospitals	0.258	0.337	0.445	1.294	0.668	2.508	2.778
Rehabilitation hospitals	0.227	0.341	0.505	1.255	0.644	2.446	2.854
Dementia	0.171	0.117	0.144	1.186	0.943	1.491	1.105
Constant	−4.184	0.895	<0.001	0.015			

Note: Reference. Age. 1 year; Sex. Men; Acute care hospital. Yes; Rehabilitation hospitals. Yes; Dementia. Yes.

Abbreviations: B, beta; CI, confidence interval; SE, standard error.

4 | DISCUSSION

The study found the following age- and sex-specific characteristics of sarcopenic dysphagia. Sarcopenic dysphagia was most common in older adults in their 80s or older, although it could also be seen in those younger than 65 years. Sarcopenic dysphagia was more common in women; however, the difference was not statistically significant after adjusting for age. Sarcopenic dysphagia showed no significant differences in the improvement of swallowing function and ADL based on age and sex.

Sarcopenic dysphagia was most common in older adults in their 80s and older, although it could also be seen in those younger than 65 years. Consistent with the particularly high prevalence of whole-body sarcopenia in persons over 75 years of age,[6] the prevalence of sarcopenic dysphagia also appears to be higher in persons over 80 years of age. Although the prevalence of causative diseases of dysphagia, such as stroke, dementia, and medication side effects, also increases with age, the possibility of sarcopenic dysphagia should be suspected in older adults over 80 years of age when dysphagia is present. The diagnostic algorithm for sarcopenic dysphagia

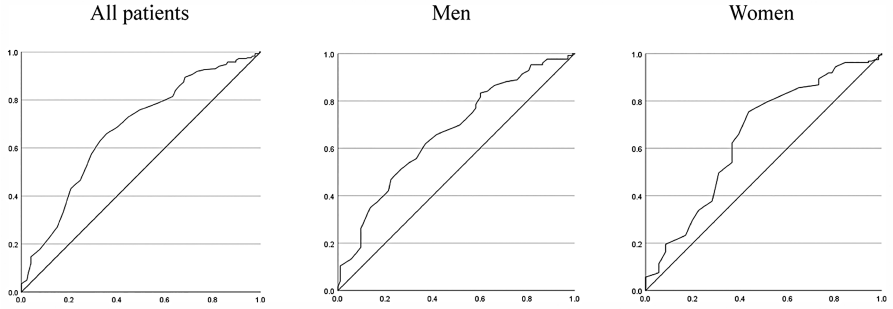

FIGURE 1 The ROC curve and AUC as measures of the predictive value of age for sarcopenic dysphagia. The AUC for sarcopenic dysphagia was 0.675 (95% CI: 0.624–0.726) in all patients, 0.666 (95% CI: 0.596–0.736) in men, and 0.650 (95% CI: 0.569–0.730) in women.

TABLE 4 The baseline and follow-up demographic data of patients with sarcopenic dysphagia between men and women.

	Total, *N* = 285	Men, *N* = 126	Women, *N* = 159	*p*-Value
Age, years, mean ± SD	83 ± 9	81 ± 10	85 ± 9	<0.001[a]
Dwelling				
Acute care hospitals	124 (44%)	64 (51%)	60 (38%)	0.071[b]
Rehabilitation hospitals	129 (45%)	46 (37%)	83 (52%)	
Others	32 (11%)	16 (13%)	16 (10%)	
Initial FILS, median (IQR)	7 (5, 8)	7 (2.5, 7)	7 (6, 8)	<0.001[c]
Initial Barthel Index, median (IQR)	25 (5, 50)	25 (5, 50)	30 (5, 50)	0.739[c]
Calf circumference (cm), mean ± SD	27.2 ± 3.8	28.1 ± 4.3	26.5 ± 3.3	<0.001[a]
Handgrip strength (kg), mean ± SD	10.9 ± 7.1	13.3 ± 8.4	9.0 ± 5.4	<0.001[a]
Tongue pressure (kPa), mean ± SD	15.3 ± 10.9	16.5 ± 11.2	14.6 ± 10.7	0.442[a]
Body mass index (kg/m^2), mean ± SD	19.6 ± 3.6	19.9 ± 3.6	19.4 ± 3.5	0.186[a]
GLIM Malnutrition, *n* (%)	208 (73%)	90 (71%)	118 (74%)	0.581[b]
Dementia, *n* (%)	98 (34%)	41 (33%)	57 (36%)	0.589[b]
Follow-up FILS, median (IQR)	8 (7, 8)	7 (7, 8)	8 (7, 8)	0.468[c]
Follow-up Barthel Index, median (IQR)	55 (20, 80)	55 (20, 80)	55 (20, 80)	0.794[c]

Abbreviations: FILS, Food Intake Level Scale; GLIM, Global Leadership Initiative on Malnutrition; IQR, interquartile range; SD, standard deviation.

[a]*t*-test.

[b]Chi-square test.

[c]Mann–Whitney *U* test.

assumes an age of 65 and older.[14] However, whole-body sarcopenia can occur even in people who are not old due to low activity, malnutrition, and disease. Sarcopenic dysphagia can also occur with whole-body sarcopenia, but not necessarily in older adults. Therefore, the criterion of age 65 years or older seems unnecessary for the diagnosis of sarcopenic dysphagia.

Sarcopenic dysphagia was more common in women; however, the difference was not statistically significant after adjusting for age. Due to women having a longer life expectancy than men, and considering that many participants in this study were older adults, sarcopenic dysphagia was more prevalent in women before adjusting for age. Nevertheless, after age adjustment, no significant differences were found. Tongue pressure did not significantly differ between men and women in older individuals.[18–20] Tongue pressure is a component of the diagnostic algorithm for sarcopenic dysphagia.[14] Therefore, there may be few apparent sex differences in sarcopenic dysphagia, similar to whole-body sarcopenia. Because dysphagia was generally more common in men than in women,[2] dysphagia resulting from causes other than sarcopenia, such as stroke, dementia, and medication side effects, may be more prevalent in men.

Sarcopenic dysphagia showed no significant differences in the improvement of swallowing function and ADL based on age and sex. Sarcopenic dysphagia has a worse prognosis for swallowing function and ADL, along with a higher mortality rate than dysphagia due to other causes.[21–23] Regardless of age and sex, swallowing function and ADL may improve with appropriate treatment in sarcopenic dysphagia. Rehabilitation nutrition, which combines nutritional care management and rehabilitation, can effectively address whole-body sarcopenia and sarcopenic dysphagia.[24–26] Therefore, a combination of aggressive nutrition therapy to improve sarcopenia[27,28] and rehabilitation, such as resistance training of the whole-body muscle[29,30] and the swallowing muscle[31] should be implemented in patients with sarcopenic dysphagia.

Sarcopenia and malnutrition were common in both the sarcopenic dysphagia group and the non-sarcopenic dysphagia group. The sarcopenic dysphagia group had smaller calf circumference, weaker handgrip strength, lower BMI, and more malnutrition. However, the mean calf circumference and handgrip strength in the non-sarcopenic dysphagia group were lower compared with the cutoff values of the AWGS 2019 criteria for sarcopenia diagnosis. In addition, the prevalence of malnutrition diagnosed by the GLIM criteria was 53% in the non-sarcopenic dysphagia group. However, these values were more severe in the sarcopenic dysphagia group. Therefore, both sarcopenia and malnutrition should be diagnosed in patients with dysphagia, regardless of whether they have sarcopenic dysphagia or not. The triad of rehabilitation, nutrition, and oral management has been evaluated in the 2024 review of reimbursement for medical and nursing care.[32,33] This is an effort to improve the daily functioning of hospitalized and older patients without compromising their quality of life. While oral and swallowing interventions are important, they must be coordinated with rehabilitation and appropriate nutritional management. The results of this study suggest that all patients with dysphagia should not only be rehabilitated, but also diagnosed for sarcopenia and malnutrition and addressed in the triad of rehabilitation, nutrition, and oral management.[32,33]

This study has several limitations. First, because it focused solely on patients with dysphagia, the overall prevalence of dysphagia in the population studied is unknown. Second, the majority of patients in this study were older than 65 years. Third, the odds ratio was calculated based on logistic regression analysis in a cross-sectional study; however, causality could not be established and the risk ratio for each variable for sarcopenic dysphagia is not known. Fourth, the timing of follow-up varies between acute care and rehabilitation hospitals. Fifth, this study may have a sampling bias of the patients enrolled in the database, and the impact of the patient background on the results on gender differences in sarcopenia dysphagia. Future research is required to ascertain the prevalence of dysphagia in individuals younger than 65 years.

5 | CONCLUSIONS

Sarcopenic dysphagia was most common in older adults in their 80s or older, although it could also be seen in those younger than 65 years. Sarcopenic dysphagia was more common in women; however, the difference was not statistically significant after adjusting for age. Sarcopenic dysphagia showed no significant differences in the improvement of swallowing function and ADL based on age and sex. The possibility of sarcopenic dysphagia should be considered when dysphagia is present in people 80 years of age or older.

ACKNOWLEDGMENTS

This work was supported by JSPS KAKENHI (19H03979).

CONFLICT OF INTEREST STATEMENT

The authors have stated explicitly that there are no conflicts of interest in connection with this article. Hidetaka Wakabayashi is an Editorial Board member of *Journal of General and Family Medicine* and a co-author of this article. To minimize bias, they were excluded from all editorial decision-making related to the acceptance of this article for publication.

ETHICS STATEMENT

None.

ORCID

Hidetaka Wakabayashi https://orcid.org/0000-0002-0364-0818
Ryo Momosaki https://orcid.org/0000-0003-3274-3952

REFERENCES

1. Banda KJ, Chu H, Chen R, Kang XL, Jen HJ, Liu D, et al. Prevalence of oropharyngeal dysphagia and risk of pneumonia, malnutrition, and mortality in adults aged 60 years and older: a meta-analysis. Gerontology. 2022;68:841–53. https://doi.org/10.1159/000520326
2. Rajati F, Ahmadi N, Naghibzadeh ZA, Kazeminia M. The global prevalence of oropharyngeal dysphagia in different populations: a systematic review and meta-analysis. J Transl Med. 2022;20:175. https://doi.org/10.1186/s12967-022-03380-0
3. Igarashi K, Kikutani T, Tamura F. Survey of suspected dysphagia prevalence in home-dwelling older people using the 10-item eating assessment tool (eat-10). PLoS ONE. 2019;14:e0211040. https://doi.org/10.1371/journal.pone.0211040
4. Wakabayashi H. Presbyphagia and sarcopenic dysphagia: association between aging, sarcopenia, and deglutition disorders. J Frailty Aging. 2014;3:97–103. https://doi.org/10.14283/jfa.2014.8
5. Bolinger C, Dembowski J, Mory K. Pneumonia: does age or gender relate to the presence of an slp dysphagia consultation? Geriatrics (Basel). 2020;5:51. https://doi.org/10.3390/geriatrics5030051
6. Yamada M, Nishiguchi S, Fukutani N, Tanigawa T, Yukutake T, Kayama H, et al. Prevalence of sarcopenia in community-dwelling Japanese older adults. J Am Med Dir Assoc. 2013;14:911–5. https://doi.org/10.1016/j.jamda.2013.08.015
7. Shafiee G, Keshtkar A, Soltani A, Ahadi Z, Larijani B, Heshmat R. Prevalence of sarcopenia in the world: a systematic review and meta- analysis of general population studies. J Diabetes Metab Disord. 2017;16:21. https://doi.org/10.1186/s40200-017-0302-x
8. Papadopoulou SK, Tsintavis P, Potsaki P, Papandreou D. Differences in the prevalence of sarcopenia in community-dwelling, nursing home and hospitalized individuals. A systematic review and meta-analysis. J Nutr Health Aging. 2020;24:83–90. https://doi.org/10.1007/s12603-019-1267-x

9. Xin C, Sun X, Lu L, Shan L. Prevalence of sarcopenia in older Chinese adults: a systematic review and meta-analysis. BMJ Open. 2021;11:e041879. https://doi.org/10.1136/bmjopen-2020-041879
10. Wakabayashi H, Kishima M, Itoda M, Fujishima I, Kunieda K, Ohno T, et al. Diagnosis and treatment of sarcopenic dysphagia: a scoping review. Dysphagia. 2021;36:523–31. https://doi.org/10.1007/s00455-021-10266-8
11. Abu-Ghanem S, Graf A, Govind J. Diagnosis of sarcopenic dysphagia in the elderly: critical review and future perspectives. Dysphagia. 2022;37:1093–102. https://doi.org/10.1007/s00455-021-10371-8
12. Mizuno S, Wakabayashi H, Fujishima I, Kishima M, Itoda M, Yamakawa M, et al. Construction and quality evaluation of the Japanese sarcopenic dysphagia database. J Nutr Health Aging. 2021;25:926–32. https://doi.org/10.1007/s12603-021-1646-y
13. Kunieda K, Ohno T, Fujishima I, Hojo K, Morita T. Reliability and validity of a tool to measure the severity of dysphagia: the food intake level scale. J Pain Symptom Manage. 2013;46:201–6. https://doi.org/10.1016/j.jpainsymman.2012.07.020
14. Mori T, Fujishima I, Wakabayashi H, Oshima F, Itoda M, Kunieda K, et al. Development, reliability, and validity of a diagnostic algorithm for sarcopenic dysphagia. JCSM Clin Rep. 2017;2:1–10. https://doi.org/10.17987/jcsm-cr.v2i2.17
15. Fujishima I, Fujiu-Kurachi M, Arai H, Hyodo M, Kagaya H, Maeda K, et al. Sarcopenia and dysphagia: position paper by four professional organizations. Geriatr Gerontol Int. 2019;19:91–7. https://doi.org/10.1111/ggi.13591
16. Chen LK, Woo J, Assantachai P, Auyeung TW, Chou MY, Iijima K, et al. Asian working group for sarcopenia: 2019 consensus update on sarcopenia diagnosis and treatment. J Am Med Dir Assoc. 2020;21:300–307.e302. https://doi.org/10.1016/j.jamda.2019.12.012
17. Mahoney FI, Barthel DW. Functional evaluation: the Barthel index. Md State Med J. 1965;14:61–5.
18. Arakawa I, Igarashi K, Imamura Y, Müller F, Abou-Ayash S, Schimmel M. Variability in tongue pressure among elderly and young healthy cohorts: a systematic review and meta-analysis. J Oral Rehabil. 2021;48:430–48. https://doi.org/10.1111/joor.13076
19. Iwasaki M, Ohara Y, Motokawa K, Hayakawa M, Shirobe M, Edahiro A, et al. Population-based reference values for tongue pressure in Japanese older adults: a pooled analysis of over 5,000 participants. J Prosthodont Res. 2023;67:62–9. https://doi.org/10.2186/jpr.JPR_D_21_00272
20. Arakawa-Kaneko I, Watarai Y, Schimmel M, Abou-Ayash S. Relationship between tongue pressure and handgrip strength: a systematic review and meta-analysis. J Oral Rehabil. 2022;49:1087–105. https://doi.org/10.1111/joor.13362
21. Wakabayashi H, Takahashi R, Murakami T. The prevalence and prognosis of sarcopenic dysphagia in patients who require dysphagia rehabilitation. J Nutr Health Aging. 2019;23:84–8. https://doi.org/10.1007/s12603-018-1117-2
22. Nagai T, Wakabayashi H, Nishioka S, Momosaki R. Functional prognosis in patients with sarcopenic dysphagia: an observational cohort study from the Japanese sarcopenic dysphagia database. Geriatr Gerontol Int. 2022;22:839–45. https://doi.org/10.1111/ggi.14466
23. Campo-Rivera N, Ocampo-Chaparro JM, Carvajal-Ortiz R, Reyes-Ortiz CA. Sarcopenic dysphagia is associated with mortality in institutionalized older adults. J Am Med Dir Assoc. 2022;23:1720.e1711–17. https://doi.org/10.1016/j.jamda.2022.06.016
24. Nagano A, Nishioka S, Wakabayashi H. Rehabilitation nutrition for iatrogenic sarcopenia and sarcopenic dysphagia. J Nutr Health Aging. 2019;23:256–65. https://doi.org/10.1007/s12603-018-1150-1
25. Kakehi S, Wakabayashi H, Inuma H, Inose T, Shioya M, Aoyama Y, et al. Rehabilitation nutrition and exercise therapy for sarcopenia. World J Mens Health. 2022;40:1–10. https://doi.org/10.5534/wjmh.200190
26. Kakehi S, Isono E, Wakabayashi H, Shioya M, Ninomiya J, Aoyama Y, et al. Sarcopenic dysphagia and simplified rehabilitation nutrition care process: an update. Ann Rehabil Med. 2023;47:337–47. https://doi.org/10.5535/arm.23101
27. Nakahara S, Takasaki M, Abe S, Kakitani C, Nishioka S, Wakabayashi H, et al. Aggressive nutrition therapy in malnutrition and sarcopenia. Nutrition. 2021;84:111109. https://doi.org/10.1016/j.nut.2020.111109
28. Nishioka S, Nakahara S, Takasaki M, Shiohama N, Kokura Y, Suzuki T, et al. The concept of aggressive nutrition therapy and clinical indication: a position paper. Clin Nutr ESPEN. 2022;52:322–30. https://doi.org/10.1016/j.clnesp.2022.09.013
29. Yoshimura Y, Wakabayashi H, Nagano F, Bise T, Shimazu S, Shiraishi A. Chair-stand exercise improves post-stroke dysphagia. Geriatr Gerontol Int. 2020;20:885–91. https://doi.org/10.1111/ggi.13998
30. Yoshimura Y, Wakabayashi H, Nagano F, Bise T, Shimazu S, Shiraishi A, et al. Chair-stand exercise improves sarcopenia in rehabilitation patients after stroke. Nutrients. 2022;14:461. https://doi.org/10.3390/nu14030461
31. Gao M, Xu L, Wang X, Yang X, Wang Y, Wang H, et al. Efficacy and safety of oropharyngeal muscle strength training on poststroke oropharyngeal dysphagia: a systematic review and meta-analysis. BMJ Open. 2023;13:e072638. https://doi.org/10.1136/bmjopen-2023-072638
32. Wakabayashi H, Kakehi S, Kishima M, Itoda M, Nishioka S, Momosaki R. Impact of registered dietitian and dental hygienist involvement on functional outcomes in patients with dysphagia: triad of rehabilitation, nutrition, and oral management. Eur Geriatr Med. 2023;14:1301–6. https://doi.org/10.1007/s41999-023-00833-7
33. Wakabayashi H. Triad of rehabilitation, nutrition, and oral management for sarcopenic dysphagia in older people. Geriatr Gerontol Int. 2024;24(Suppl 1):397–9. https://doi.org/10.1111/ggi.14651

How to cite this article: Wakabayashi H, Kakehi S, Nagano A, Kishima M, Itoda M, Nishioka S, et al. Age and sex differences in sarcopenic dysphagia: A secondary data analysis. J Gen Fam Med. 2024;25:343–350. https://doi.org/10.1002/jgf2.722