

Oropharyngeal Dysphagia in a Community-Based Elderly Cohort: the Korean Longitudinal Study on Health and Aging

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Received: 5 June 2013
Accepted: 20 August 2013

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The funding for this study was provided by a grant from the Korean Health Technology R & D Project, Ministry for Health, Welfare, & Family Affairs, Republic of Korea (Grant No. A092077) and the National Research Foundation of Korea (NRF) grant funded by the Korea Government (MEST) (No. 2012-0000999) and a grant from Korea Healthcare Technology R&D Project, Ministry for Health, Welfare and Family Affairs, Republic of Korea (No. A070001).

This study was conducted to investigate the prevalence of dysphagia and evaluated the association of dysphagia and activities of daily living in a geriatric population residing in an independent-living facility in Korea. Korean men and women 65-yr and older living in a single, typical South Korean city ($n = 415$) were enrolled in the Korean Longitudinal Study on Health and Aging study. Dysphagia was assessed using the Standardized Swallowing Assessment. Data were collected on activities of daily living (ADL), instrumental ADL (IADL), and medical history and laboratory. The overall prevalence of dysphagia in the random sample was 33.7% (95% CI, 29.1-38.4), including 39.5% in men and 28.4% in women. The identified risk factors for dysphagia were men (OR, 3.6, $P = 0.023$), history of stroke (OR, 2.7, $P = 0.042$) and presence of major depressive disorder (OR, 3.0, $P = 0.022$). Dysphagia was associated with impairment in IADL domains of preparing meals and taking medicine ($P = 0.013$ and $P = 0.007$, respectively). This is the first published report of the prevalence of dysphagia in older community-dwelling Koreans. Dysphagia is a common problem among elderly people that limits some IADL domains.

Key Words: Deglutition Disorders; Elderly; Activities of Daily Living; Community-Based Cohort

INTRODUCTION

Oropharyngeal dysphagia is a common clinical condition among elderly people, although sufferers are sometimes unaware of their condition (1). The prevalence of dysphagia is high in older patients with neurodegenerative diseases (up to 80%) or stroke (40%) and is related to age, frailty (44%), and common comorbidities in older people such as muscular, endocrine, and psychiatric diseases (2). Previous studies have reported serious swallowing and cough reflex disorders in frail elderly patients (3). Many older patients present with impaired lip closure and inability to form bolus (4), apraxia and decreased control, and bolus propulsion (5-8). Delays in transfer of the bolus through the oropharynx, laryngeal closure, and opening of the upper esophageal sphincter have been reported with aging (9, 10).

Swallow function screening is designed to detect clinical indicators of potential risk for deglutition and aspiration (11). To take a proactive approach toward difficulty in swallowing in elderly people, it is needed to use a screening test in clinical practice since formal swallowing evaluation such as videofluorography is neither possible nor warranted in all healthy elders (12). There are some clinical findings associated with a risk of aspira-

tion such as abnormal voluntary cough (11) or a wet or hoarse voice (13). The Standardized Swallowing Assessment (SSA) including water-swallowing test has been used for screening of dysphagia in the patients with neurologic deficit (11). It may be used to evaluate the prevalence and characteristics of dysphagia among older people, yet few studies to date have used the SSA to evaluate the prevalence of dysphagia in geriatric communities, particularly in Korea.

The present study estimated the age- and sex-standardized prevalence of dysphagia in older Korean people aged 65 yr or older and investigated demographic, socioeconomic, nutritional, medical, psychiatric risk factors for dysphagia. In addition, we evaluated the impact of dysphagia on activities of daily living (ADL).

MATERIALS AND METHODS

Study population

This study was a part of the Korean Longitudinal Study on Health and Aging (KLoSHA), a population-based, prospective cohort study on health, aging, and common geriatric diseases in elderly Koreans (14). The baseline study was conducted from Septem-

ber 2005 to August 2006, and the follow-up registrations took place after approximately 5 yr from May 2010 to March 2012.

The KLoSHA's baseline cohort comprised two samples of persons living in Seongnam City on August 1, 2005: a simple random sample ($n = 1,118$) from a pool of 61,730 persons aged 65 yr or older and a volunteer sample ($n = 3,166$) including all residents aged 85 yr or older. They were invited to participate in the study by both letter and telephone. Of the 1,118 randomly sampled individuals, 695 agreed to participate in the baseline KLoSHA study. Of the 3,166 residents aged 85 yr or older, 270 volunteered to participate in the study. We registered those who were dead at follow-up period and among the remaining 827 participants who were still alive, 106 participants did not respond to the invitation to participate and 197 participants refused the invitation. SSA was performed on 415 of the 497 samples who participated the follow-up registrations and we estimated prevalence of dysphagia and identified its risk factors from this sample ($n = 415$). At each participant's first visit, we evaluated their demographics and general health status via standardized self-questionnaires and interviews by three nurses specializing in dementia. Within 2 weeks of their first visit, participants had a second visit at which four neuropsychiatric specialists conducted comprehensive neuropsychological tests. Additionally, we conducted laboratory tests to evaluate participants' general physical health and determine whether common geriatric disorders were present (14).

All assessments were performed at our hospital, located in Seongnam. All participants were fully informed regarding the study protocol, and they provided written informed consent themselves or through their legal guardians.

Assessment of swallowing function

The Standardized Swallowing Assessment (SSA) was used to evaluate swallowing function (11, 15). The screening consisted of 3 sections. The first section ensured that the participant was physically able to participate in the screening and included level of alertness/responsiveness and the ability of the participant to be positioned upright with some degree of head control. The second section evaluated voluntary cough, salivary management, the ability to lick the top and bottom lip, respiratory function, and vocal quality. If the patient showed abnormalities in any of these criteria, the screening was considered "failed." If all items on sections 1 and 2 were passed, section 3 involved 3 trials of water from a teaspoon (5 mL). If no abnormality was noted, then a half glass of water (about 120 mL) was presented. If no dysfunction was noted, then an appropriate meal was ordered and the patient was supervised during the meal.

Abnormality was defined as coughing, choking, or breathlessness while swallowing, or a wet/gurgly voice after swallowing. An overall judgment of swallowing safety was made by a trained occupational therapist. Inter- and intra observer reli-

ability levels for the SSA vary among studies (16, 17). Perry et al. (18) used a summary judgment based on clinical indicators found in the patient's medical record as to the presence or absence of dysphagia. This judgment was used as the "gold standard" for identification of dysphagia and was what established concurrent validity for this screening. Evaluators who completed an education and training program achieved very good agreement ($\kappa = 0.88$, exact agreement 94%) (11). SSA is more specific for dysphagia in general than for aspiration specifically (18).

Activities of daily living assessment

We measured ADL using the Korean ADL (K-ADL) scale for basic activities and the Korean Instrumental ADL (K-IADL) scale for instrumental activities. The K-ADL and K-IADL were created and validated using 408 basic activities and 242 instrumental activities for older Koreans (19). The activities were categorized into seven basic ADL domains (dressing, washing face and hands, bathing, eating, performing transfers, toileting, and continence) and 10 IADL domains (grooming, doing housework, preparing meals, doing laundry, taking a short trip, using transportation, shopping, managing money, using a telephone, and taking medicine) (19). The participants answered both questionnaires with the aid of three nurses familiar with each parameter of the K-ADL, and K-IADL.

Statistical analyses

The prevalence of dysphagia was calculated and stratified by gender (men and women) and age (65-69, 70-74, 75 yr or older) and we derived 95% confidence intervals (CIs) for each prevalence estimate using the exact method based on a binomial distribution. Estimates of prevalence were adjusted with respect to age and gender for the population aged ≥ 65 yr, in order to estimate the overall prevalence rates. Standardized prevalence rates for Korean elderly were also estimated using the direct standardization method, according to which prevalence rates are adjusted by age, or age and gender to fit that of the total Korean population based on the 2011 national census. The means and standard deviations of continuous variables and the frequencies of categorical variables are used to report descriptive statistics.

Additionally, the demographic variables of age (65-75 vs ≥ 75), gender, and years of education (0-6 vs ≥ 7) were used in a risk analysis model of dysphagia. The following variables were analyzed in the risk analysis: past medical history of cerebral or coronary artery disease (as determined by self-reported questionnaire), living status (living without vs living with spouse), income (the minimum cost of living [USD 1,081/month for a family of four] or less vs more than the minimum cost of living), common geriatric disorders such as major depression, neuropsychiatric disorders (including major or minor depression, alcohol or substance dependence, schizophrenia, panic disorder,

and insomnia), renal dysfunction (estimated GFR < 60 mL/min/1.73 m² vs ≥ 60 mL/min/1.73 m²), diabetes mellitus (use of antidiabetic medication or a serum fasting glucose > 110 mg/dL), hypertension (systolic blood pressure > 135 mmHg, diastolic blood pressure > 85 mmHg, or the use of antihypertensive medications), dyslipidemia (total cholesterol level ≥ 240 mg/dL, triglyceride level ≥ 150 mg/dL, HDL cholesterol level < 40 mg/dL in men and < 50 mg/dL in women, or the use of a lipid-lowering agent), metabolic syndrome, defined as having three or more of the following five criteria: BMI (mass [kg]/height [m]²) > 25 kg/m² or waist circumference > 90 cm in men and 80 cm in women, hypertriglyceridemia, low HDL cholesterol, hypertension, and diabetes mellitus), or thyroid illness (defined as hypothyroidism or hyperthyroidism on a current thyroid function test).

Dysphagia prevalence according to these variables was assessed using chi-square tests. Multivariate analyses were performed on variables with *P* value < 0.1 using a binary logistic regression analysis. Logistic regression analysis was used to calculate the odds ratios (OR) of various risk factors of dysphagia. We compared K-ADL and K-IADL in participants with and without dysphagia using t-tests and Mann-Whitney U test. Two-sided *P* values < 0.05 were deemed to be statistically significant. All analyses were performed using the Statistical Package for the Social Sciences version 17.0 (SPSS, Inc., Chicago, IL, USA).

Ethics statement

This study was approved by the institutional review board of Seoul National University Hospital (IRB No. E-1201-035-394). Each participant or their legal guardian provided informed consent before their participation in the study.

RESULTS

Characteristics of the study population

Of the 415 randomly sampled participants, 195 (46.9%) were

men. Their median age was 74 yr (range, 65-95 yr). The mean age was 77.3 ± 8.7 for men and 75.7 ± 8.4 yr for women, and 151 (36.5%) participants were ≥ 80 yr of age.

Prevalence of dysphagia

Table 1 shows the prevalence rate of dysphagia according to symptoms. The overall prevalence of dysphagia was 33.7% (95% CI, 29.1-38.4%). Of all the participants, 0.5% (95% CI, 0.1-1.7%) had poor voluntary cough, 2.2% (95% CI, 1.0-4.1%) had reduced or absent lip closure, 1.7% (95% CI, 0.7-3.5%) had reduced or absent tongue movement, and 20.5% (95% CI, 16.7-24.7%) had poor voice quality. The prevalence of impaired ability to drink water was 18.1% (95% CI, 14.5-22.1%). The prevalence of dysphagia was 39.5% (95% CI, 32.6-46.7%) in the 195 men and 28.4% in the 220 women (95% CI, 22.6-34.9%). The estimated age- and gender-standardized prevalence rate of dysphagia in Koreans aged 65 yr or older was 23.6%.

Dysphagia risk factors

The univariate analysis revealed five variables associated with dysphagia that had a *P* value < 0.1: gender, history of stroke, diabetes mellitus, metabolic syndrome, and presence of a major depressive disorder. In subsequent multivariate analyses, gender (OR, 3.6, *P* = 0.023) history of stroke (OR, 2.7, *P* = 0.042) and presence of a major depressive disorder remained significant (OR, 3.0, *P* = 0.022) after adjusting for age (Table 2).

Impact of Dysphasia on ADL, and IADL

Table 3 summarizes the impact of dysphagia on ADL, and IADL. Among the IADL activities, the ability to prepare meals was limited in participants with dysphagia compared with those without (1.6 ± 0.5 vs 1.2 ± 0.4, respectively; *P* = 0.013), and taking medication was impaired in the participants with dysphagia compared with those without (1.4 ± 0.7 vs 1.2 ± 0.8; *P* = 0.007). However, no difference in the ADL domains was found between participants with and without dysphagia.

Table 1. Prevalence of dysphagia in elderly Koreans according to symptoms

Parameters	Swallowing difficulty*						Dysphagia*
	Voluntary cough	Lip closure	Tongue movement	Breathing pattern	Voice quality	Impaired safety	
Age (yr) [†]							
65-69 (n = 116)	0.0 (0.0-3.1)	0.9 (0.0-4.7)	0.9 (0.0-4.7)	2.6 (0.5-7.4)	14.7 (8.8-22.4)	14.7 (8.8-22.4)	25.9 (18.2-34.8)
70-74 (n = 100)	0.0 (0.0-2.5)	1.4 (0.2-4.8)	2.1 (0.4-5.9)	7.5 (3.8-13.0)	26.5 (19.6-34.4)	23.8 (17.2-31.5)	43.4 (33.5-53.8)
≥ 75 (n = 199)	1.3 (0.2-4.7)	4.0 (1.5-8.4)	2.0 (0.4-5.7)	2.0 (0.4-5.7)	19.1 (13.2-26.2)	15.1 (9.8-21.8)	33.3 (26.8-40.4)
Gender [†]							
Men (n = 195)	0.5 (0.0-2.8)	3.6 (1.5-7.3)	3.6 (1.5-7.3)	6.2 (3.2-10.5)	24.1 (18.3-30.7)	22.6 (16.9-29.1)	39.5 (32.6-46.7)
Women (n = 220)	0.5 (0.0-2.5)	0.9 (0.1-3.3)	0.0 (0.0-1.7)	2.3 (0.7-5.2)	17.3 (12.5-22.9)	14.1 (9.8-19.4)	28.4 (22.6-34.9)
All, crude [‡]	0.5 (0.1-1.7)	2.2 (1.0-4.1)	1.7 (0.7-3.5)	4.1 (2.4-6.5)	20.5 (16.7-24.7)	18.1 (14.5-22.1)	33.7 (29.1-38.4)
Age-standardized [‡]	0.4	2.1	1.6	4.0	19.9	17.7	33.9
Sex-standardized [‡]	0.5	2.1	1.6	4.0	20.3	17.8	33.3
Age- and gender-standardized [‡]	0.3	1.7	1.5	4.3	20.2	18.6	23.6

*Swallowing difficulty and dysphagia was evaluated using the Standardized Swallowing Assessment (SSA). [†]Cases per 100 people in a given stratum; % (95% CI). [‡]Standardized with regard to the 2011 Korean population.

Table 2. Multivariate analysis for the risk factors on dysphagia after adjusting for age

Variables	No. of patients (%)	P value	Exp (B)	95% CI for Exp (B)	
				Lower	Upper
Male (vs female)	195 (46.9)	0.023	3.624	0.541	3.248
History of stroke	24 (5.8)	0.042	2.741	1.109	7.632
Diabetes mellitus*	63 (15.2)	0.071	1.625	0.892	3.251
Metabolic syndrome [†]	209 (50.4)	0.093	1.551	0.793	2.277
Major depressive disorder [‡]	21 (5.1)	0.022	3.045	1.149	7.962

For definitions of diabetes mellitus* and metabolic syndrome[†], see the text. [‡]Major depressive disorder was diagnosed according to the DSM-IV criteria.

DISCUSSION

The present study is the first published report of the prevalence of dysphagia and aspiration risk among older Koreans. Several previous studies have demonstrated age-related physiological changes in swallowing, including delayed upper esophageal sensory discrimination, decreased lingual strength, and delayed upper esophageal sphincter relaxation during swallowing (21-23). To our knowledge, the present study is one of the few to estimate the prevalence of dysphagia using an swallowing screening assessment administered by a trained specialist to older Koreans living independently.

The overall prevalence of dysphagia in our random sample was 33.7%. Clave et al. (24) and Serra-Prat et al. (25) reported that the “real” prevalence of dysphagia among elderly people living independently was 23.0%, and impaired ability to swallow was 11.4%. A 1991 Swedish study found the prevalence of dysphasia to be 35% in participants aged 50-79 yr (26). Okamoto et al. (27) reported that the prevalence of swallowing problems was 15.1% among a health elderly Japanese population.

Previous studies found that impaired safety of aspiration is mainly caused by delayed closure of the laryngeal vestibule and that residue is mainly related to weak tongue bolus propulsion forces and slow hyoid motion in frail elderly patients (28). However, relationships between dysphagia and pneumonia in community dwelling elderly are poorly understood (28). Several types of bedside assessment of swallowing have been used to evaluate patients with neurological impairments and other conditions. The videofluorographic swallowing study is frequently referred to as the ‘gold standard’ for identifying dysphagia (15, 29), as it provides anatomical and functional information; however, swallowing is assessed under ideal conditions that are different from those in clinical settings (30). Thus, the assessment of swallowing remains an important screening tool for dysphagia and aspiration risk. We found a relatively high association of poor voice quality and impaired ability to drink water in participants with dysphagia. The association with other clinical features such as voluntary cough, lip closure, and breathing pattern was not as strong. These clinical findings could serve as key items in a screening assessment of healthy older people.

Table 3. Differences in health-related quality of life, activities of daily living, and instrumental activities of daily living according to the presence of dysphagia

Activities	Without dysphagia		Dysphagia		P value
	Mean	SD	Mean	SD	
Korean version of activities of daily living (K-ADL)*					
Dressing	1.1	0.3	1.1	0.3	0.833
Washing face and hands	1	0.2	1.0	0.3	0.968
Bathing	1.1	0.4	1.1	0.3	0.323
Eating	1	0.2	1.0	0.1	0.350
Performing transfers	1	0.2	1.0	0.3	0.996
Toileting	1.1	0.3	1.1	0.3	0.887
Continence	1.1	5.1	0.9	5	0.761
K-ADL summary	7.4	1.6	7.3	1.6	0.780
Korean version of instrumental ADL (K-IADL)*					
Grooming	1.1	0.3	1.1	0.3	0.527
Doing housework	1.6	1	1.4	0.9	0.123
Preparing meals	1.2	0.4	1.6	0.5	0.013
Doing laundry	1.8	1.2	1.8	1.2	0.770
Taking a short trip	1.5	0.5	1.5	0.5	0.912
Using transportation	1.8	1.2	1.7	1.3	0.761
Shopping	1.5	0.5	1.6	0.5	0.706
Managing money	1.2	0.4	1.1	0.3	0.070
Using a telephone	1.3	0.7	1.3	0.5	0.519
Taking medication	1.2	0.8	1.4	0.7	0.007
K-IADL summary	13.9	5.3	13.7	4.1	0.525

*High scores indicate limited activity of daily living and instrumental activity of daily living. SD, standard deviation.

Impaired swallowing in older people is caused by neurogenic and myogenic factors. Delayed swallowing found in healthy older people (31-33) is caused by neurological diseases and the neurodegenerative process related to aging (33). Furthermore, drugs that affect consciousness or swallowing may contribute to a delayed swallowing response (4, 34). Our study showed that male gender, history of stroke and major depressive disorders were independent risk factors for dysphagia.

The prevalence of dysphagia is higher in men than in women. The condition could explain the higher prevalence of dysphagia in men, who exhibit a greater age-related decline in absolute strength in all muscle groups including the tongue muscle (35), which may be a major cause of impaired bolus propulsion (4) compared with women (35). In this study, the univariate analysis revealed knee extensor strength was not significantly associated with dysphagia. In addition, tongue muscle strength was not evaluated in the present study. Several studies have identified that gender representation was equal in young but not in elderly populations with dysphagia (36). There are structural and physiological differences between male and female brains (36). Overall, our findings suggest that gender differences should be considered when evaluating the prevalence of dysphagia in older adults.

The impact of dysphagia on the health of older people is higher than that of other chronic conditions (37). The physiological outcomes of dysphagia include aspiration, hypovolemia, failure to thrive, and upper-airway obstruction (38). The prevalence of dysphagia is associated with advanced age, a low Barthel score,

slow walking speed, and poor functional capacity (25). In the present study, dysphagia was associated with impairment in the IADL activities of preparing meals and taking medication. Previous studies have demonstrated that dysphagia decreased the quality of life in older people. We found no difference in quality of life between participants with and without dysphagia; however, those with dysphagia were limited in some IADL domains. Chen et al. (39) reported that significant impairment in quality of life was common in the community-based geriatric population; however, general health measures did not appear to be sensitive to swallowing-related quality of life. Careful screening and provision of treatment for dysphagia in older people could improve IADL. The presence of major depressive disorder was three times more frequent in our participants with dysphagia than in those without. Previous investigations of the social and psychological impact of dysphagia on older patients showed that 45% people found eating to be pleasant, 41% felt anxiety or panic during mealtimes, and 36% avoid eating with others because of dysphagia (2).

The present study has some limitations. First, the sample size was not large enough to estimate the standardized age-gender prevalence. Second, we used a cross-sectional design; thus, no conclusions can be drawn regarding causality. The strength of the present study is that all the participants were assessed by expert physicians using standardized and structured instruments.

The present study is the first to report the prevalence of dysphagia in community-dwelling older Koreans. Dysphagia is a common problem that limits some IADL domains in older people.

ACKNOWLEDGMENTS

The authors thank the Medical Research Collaborating Center at Seoul National University Bundang Hospital for statistical analyses.

DISCLOSURE

The authors have no conflicts of interest to disclose.

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