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RESEARCH ARTICLE

Evaluation of Sex and Age Factors Contributing to the Diagnosis of Oral Frailty in Community-Dwelling Older Adults

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Background: With increasing interest in health in old age, aspects of oral aging are being considered. The Korean Academy of Geriatric Dentistry recently proposed the diagnostic criteria for oral frailty in older adults in Korea. This study aimed to conduct a cross-sectional survey of factors related to oral frailty among community-dwelling older adults and identify differences in oral frailty status according to age and sex.

Methods: Among 217 older adults aged ≥60 years who visited a senior center in Wonju, 206 completed all tests for oral frailty. Among them, data from those with a Korean Version of the Modified Barthel Index score ≥90 were used in the final analysis. After evaluating oral frailty diagnostic factors such as chewing ability, occlusal force, tongue pressure, oral dryness, oral cleanliness, and swallowing function, oral hypofunction was determined according to the oral frailty diagnostic criteria. Subsequently, the evaluation results were compared based on sex and age.

Results: Significant differences in chewing ability, maximum occlusal pressure, and maximum tongue pressure were observed between sexes. However, these differences did not affect oral frailty diagnosis. All diagnostic factors of oral frailty, except for the risk of oral dryness and swallowing dysfunction, showed significant differences with age. However, no significant difference was observed in the prevalence of oral frailty. Additionally, this study found no relationship between sex and oral frailty factors using the oral frailty diagnostic criteria. However, it also found that age plays a significant role as an oral frailty diagnostic indicator, in addition to oral dryness and swallowing function.

Conclusion: Sex and age did not affect oral frailty diagnosis. However, patients' chewing ability, occlusal force, and tongue pressure were affected by sex and age. Therefore, sex and age should be considered when diagnosing and intervening in oral frailty in the future.

Key Words: Aged, Dental care for aged, Oral frailty, Oral health

Introduction

1. Background

As interest in health increases and living standards improve, the human lifespan is increasing compared to the past, and the proportion of the older population is increasing worldwide[1]. South Korea is also reported to have a population aged 65 years or older (17.5% in 2022) and is expected to become a super-aging society by 2025 when this proportion reaches 20.3%[2]. As the proportion of the older population increases, interest in the physical changes due to aging also increases, and the concept of frailty has been proposed. Frailty refers to the inability to respond appropriately to external stress owing to a decrease in the physiological reserve to maintain homeostasis due to a decline in overall physical function, resulting in an increase in morbidity from various diseases and an increase in disability, dependence, falls, long-term care, and mortality.

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This increases the risk of negative health outcomes[3]. Thus, the prevention of frailty in older adults is important for a healthy life.

Because the oral cavity is the starting point for food intake and digestion, inadequate nutritional intake due to a decline in oral function not only affects the occurrence and progression rate of aging but also affects systemic health, causing oral changes in the older population. Thus, observations and interventions for oral changes are becoming increasingly important[4,5]. Recently, research has been conducted to define oral frailty by introducing the concept of frailty into the oral health field and to understand oral frailty as a risk factor for overall frailty.

To evaluate oral frailty, aspects such as deterioration of oral health status, chewing, swallowing, saliva disorders, deterioration of oral motor skills, and oral pain are considered[3]. As Korea has already become a super-aging society, the decline in oral function in old age is being considered. In Japan, where related research is being actively conducted, various standards have been proposed to evaluate oral function[6-8]. The Korean Academy of Geriatric Dentistry (KAGD) recently suggested new criteria for oral frailty diagnosis in Korean older adults[9], referring to the standards set by the Japanese Society of Gerodontology (JSG) for oral frailty evaluation[8]. These include poor oral hygiene, oral dryness, reduced occlusal force, decreased tongue-lip motor function, decreased tongue pressure, decreased masticatory function, and swallowing function deterioration. Based on a prospective cohort study by Tanaka et al.[6,7], the KAGD criteria are also considered the most standardized oral frailty evaluation criteria, presenting evaluation criteria that consider the characteristics of Korean older adults.

The Korean oral frailty criteria presented by the KAGD were proposed through expert consensus, considering various previous studies. However, no study has reported whether the proposed oral frailty diagnostic factors and standards are appropriate for diagnosing oral frailty in older Koreans. However, because the oral function of older adults can be affected by age, sex, and the presence of disease, it is necessary to determine whether there are differences depending on sex or age before generalizing the criteria for determining oral frailty[10,11].

2. Objectives

This study aimed to conduct a cross-sectional survey of factors related to oral frailty diagnosis among community-dwelling older adults and identify differences in oral frailty according to sex and age.

Materials and Methods

1. Participants

This study was conducted in Wonju, Gangwon State, where a large number of older adults live. Before starting the study, the research team visited senior centers to obtain permission. A total of 217 older adults who visited these

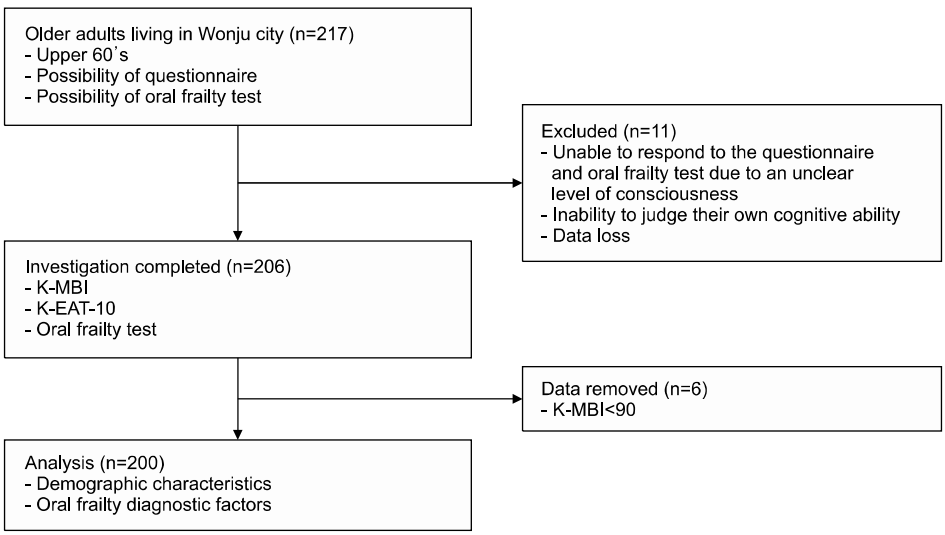

Fig. 1. Flowchart for this study. The oral frailty test evaluated factors such as chewing ability, occlusal pressure, number of remaining teeth, tongue pressure, oral dryness, and oral cleanliness. K-MBI: Korean Version of the Modified Barthel Index, K-EAT-10: Korean version of the Eating Assessment Tool-10.

senior centers consented to participate in this study. Overall, 206 older adults completed all tests to determine oral frailty, and data from those with a Korean Version of Modified Barthel Index (K-MBI) score of 90 or higher were used in the final analysis (Fig. 1). The reason for considering the K-MBI[12] in selecting the final analysis subjects was to minimize differences in oral hygiene management depending on the participants' behavioral limitations. This study was approved by the Institutional Review Board of Yonsei University (IRB No. 1041849-202212-SB-239-02).

2. Data collection

The sociodemographic information of the study participants was collected using questionnaires, and height and weight were measured directly by the researcher. Oral frailty diagnostic factors such as chewing ability, occlusal pressure, number of remaining teeth, tongue pressure, oral dryness, oral cleanliness, and swallowing function were investigated by three trained researchers. The researchers were trained to confirm an inter-rater reliability of 0.995 ($p < 0.001$). Investigations of oral frailty were performed according to the Korean diagnostic criteria for oral frailty, which were recently published by the KAGD[9], except for the Modified Water Swallowing Test (MWST). Instead of the MWST, the response results to the "swallowing liquids takes extra effort" item on the Korean version of the Eating Assessment Tool-10 (K-EAT-10) was used to determine subjective swallowing difficulty. The K-EAT-10 is a self-administered questionnaire measured on a 5-point scale ranging from 0 (no problem) to 4 (severe problem). Those who scored ≥1 point were judged to have decreased swallowing function[13].

Oral frailty, including reduced chewing ability, decreased occlusal pressure, fewer remaining teeth, weaker tongue pressure, and oral dryness, was assessed using the Korean diagnostic criteria for oral frailty. The findings are reported as "chewing ability impairment risk," "occlusal pressure deficit risk," "risk of retaining fewer teeth," "tongue pressure insufficiency risk" and "risk of oral dryness" in the results section (risk: 1 and normal: 2).

Chewing ability was assessed using color-changing chewing gum (masticatory performance-evaluating gum, XYLITOL; Lotte, Tokyo, Japan). After asking the participants to chew gum for 1 minute, the researcher compared it with the color chart and judged it based on five levels, with levels 1 and 2 judged as hypofunction[9,14]. Maximum occlusal force was measured using a pressure-sensitive film (Dental Prescale II; GC Co., Ltd., Tokyo, Japan) with a maximum intercuspal position for 3 seconds, and the criterion for determining hypofunction was less than 500 N[15]. The number of remaining teeth was examined using a tongue depressor and penlight, and occlusal ability was determined to be reduced when there were less than 20 teeth[8,9]. Maximum tongue pressure was measured for 7 seconds using a JMS tongue pressure-measuring instrument (TPM-02; JMS Co., Ltd., Tokyo, Japan) according to the manufacturer's guidelines[16]. The average of three repeated measurements was used for analysis, and the criterion for determining a decrease in tongue pressure was less than 30 kPa[8,9]. Oral dryness was measured using an oral moisture-checking device (Mucus; Life Co. Ltd., Saitama, Japan) according to the manufacturer's guidelines[17], and the average of three measurements was used for analysis.

Oral dryness was classified into three levels (risk: ≤27.9, caution: 28.0～29.5, normal: ≥29.6). If the test result was 27.9 or less, it was judged to be at risk of oral dryness[9]. According to the oral cleanliness standards of the Oral Health Assessment Tool[18], oral hygiene status was classified into three levels (0, clean condition; 1, presence of partial dental plaque or tartar; and 2, overall dental plaque, tartar, or severe bad breath). If a score of 2 was observed, it was judged as oral hypofunction (poor oral hygiene)[8,9]. As mentioned previously, participants' swallowing function was considered impaired if they scored a 1 or higher on the "swallowing liquids takes extra effort" item in the K-EAT-10. Additionally, assessment tools that obtained high validity and reliability in previous studies were selected for this study[8,9,13-18].

If functional decline was observed in two or more of the six diagnostic factors, the status was classified as oral frailty. If observed in one factor, the status was classified as pre-oral frailty. If not observed in any of the factors, the status was classified as robust (healthy).

3. Statistical analysis

Frequency analysis was performed to determine the

general characteristics of older adults. An independent t-test was performed to compare oral frailty diagnostic factors according to sex and age. The rate of oral frailty and its factors according to age or sex were calculated using a chi-square test (χ^2 test). Additionally, correlations between oral frailty diagnostic factors, sex, and age were analyzed using Spearman's correlation coefficients. IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis, and the significance level was set at 5%.

Table 1. General Characteristics of the Participants

	Number	%
Sex		
Male	56	28.0
Female	144	72.8
Age (y)		
＜75	70	35.0
≥75	130	65.0
BMI (kg/m^2)		
Underweight (＜18.5)	5	2.5
Normal weight (18.5≤BMI＜23)	54	27.0
Pre-obesity (23≤BMI＜25)	48	24.0
Obesity (≥25)	93	46.5
Total	200	100.0

BMI: body mass index.

Results

1. Distribution of participants according to general characteristics

Among the 200 older adults who participated in the study, 72.8% were female and 65.0% were 75 years or older, constituting the majority of the participants. Body mass index (kg/m^2) values were calculated based on the height and weight measurements of the participants. These values were categorized into four levels (underweight, normal weight, pre-obesity, and obese), and 46.5% of older adults were found to be obese (Table 1).

Table 2. Differences in Oral Frailty Diagnostic Factors Between the Male and Female Participants

Oral frailty diagnostic factors	Male (n=56)	Female (n=144)	Total (n=200)	p-value
Chewing ability	4.13±1.15	3.67±1.27	3.80±1.25	0.022
Chewing ability impairment risk (Risk: gum color levels 1 or 2)	1.89±0.32	1.80±0.40	1.83±0.38	0.081
Maximum occlusal pressure	454.09±337.79	303.04±262.99	348.00±294.62	0.001
Occlusal pressure deficit risk (Risk: ＜500 N)	1.33±0.47	1.23±0.42	1.26±0.44	0.134
Number of remaining teeth	17.65±10.91	18.46±10.56	18.32±10.62	0.694
Risk of retaining fewer teeth (Risk: ＜20)	1.56±0.50	1.59±0.49	1.59±0.49	0.741
Maximum tongue pressure	26.80±8.59	23.03±9.28	24.11±9.30	0.005
Tongue pressure insufficiency risk (Risk: ＜30 kPa)	1.36±0.49	1.25±0.44	1.26±0.44	0.097
Oral dryness	27.06±1.86	27.06±2.42	27.07±2.26	0.954
Risk of oral dryness (Risk: ≤27.9)	1.44±0.57	1.50±0.67	1.49±0.64	0.597
Oral cleanliness	1.00±0.51	0.84±0.66	0.89±0.62	0.068
Swallowing function	0.11±0.41	0.12±0.45	0.12±0.44	0.875
Risk of swallowing dysfunction (Risk: ≥1)	1.93±0.26	1.92±0.27	1.93±0.26	0.905

Values are presented as mean±standard deviation.
All p-values were calculated using an independent t-test.
The participant's chewing ability impairment risk, occlusal pressure deficit risk, risk of retaining fewer teeth, tongue pressure insufficiency risk, risk of oral dryness, and risk of swallowing dysfunction were coded as 1 when they were at risk and 2 when they were normal. Therefore, groups with smaller values were interpreted as being in a more dangerous state.

2. Differences in oral frailty diagnostic factors according to sex

Table 2 presents the differences in the oral frailty diagnostic factors between male and female participants. The results showed significant differences in chewing ability, maximum occlusal pressure, and maximum tongue pressure between sexes. However, when using the normal or risk criteria for oral frailty diagnosis, there were no sex differences in "chewing ability impairment risk," "occlusal pressure deficit risk," and "tongue pressure insufficiency risk" (Table 2). Additionally, the prevalence of oral frailty was not significantly different between male and female participants (Fig. 2, p=0.378).

3. Differences in oral frailty diagnostic factors according to age

Table 3 presents the differences in factors influencing the diagnosis of oral frailty based on age. All diagnostic factors for oral frailty demonstrated significant differences, except for the risk of oral dryness and dysphagia (Table 3). Additionally, there was no significant difference in the prevalence of oral frailty according to age (Fig. 3, p=0.221).

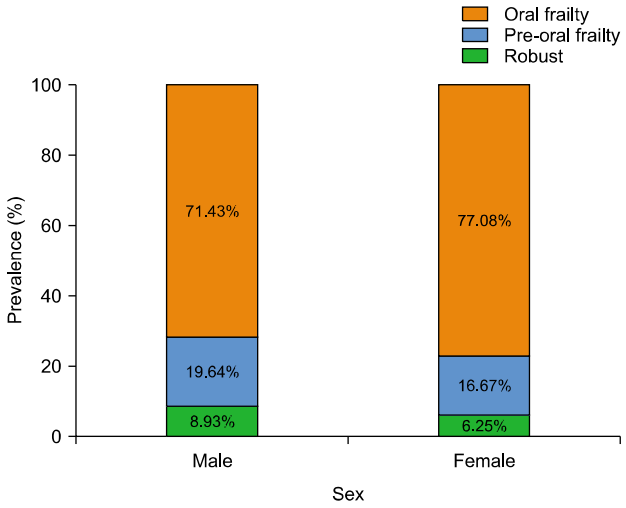

Fig. 2. Prevalence of oral frailty according to sex. Oral frailty prevalence (%) was calculated using chi-square test results.

Table 3. Differences in Oral Frailty Diagnostic Factors According to Participants' Age

Oral frailty diagnostic factor	<75 (n=70)	≥75 (n=130)	Total (n=200)	p-value
Chewing ability	4.27±0.96	3.55±1.32	3.80±1.25	<0.001
Chewing ability impairment risk (Risk: gum color levels 1 or 2)	1.93±0.26	1.77±0.42	1.83±0.38	0.001
Maximum occlusal pressure	432.86±313.93	302.80±274.28	348.00±294.62	0.003
Occlusal pressure deficit risk (Risk: <500 N)	1.37±0.49	1.20±0.40	1.26±0.44	0.013
Number of remaining teeth	22.87±7.48	15.86±11.25	18.32±10.62	<0.001
Risk of retaining fewer teeth (Risk: <20)	1.79±0.41	1.48±0.50	1.59±0.49	<0.001
Maximum tongue pressure	29.14±7.59	21.41±9.03	24.11±9.30	<0.001
Tongue pressure insufficiency risk (Risk: <30 kPa)	1.49±0.50	1.18±0.38	1.26±0.44	<0.001
Oral dryness	27.54±1.79	26.81±2.45	27.07±2.26	0.017
Risk of oral dryness (Risk: ≤27.9)	1.54±0.61	1.45±0.66	1.49±0.64	0.351
Oral cleanliness	0.76±0.60	0.95±0.62	0.89±0.62	0.032
Swallowing function	0.09±0.44	0.13±0.44	0.12±0.44	0.490
Risk of swallowing dysfunction (Risk: ≥1)	1.96±0.20	1.91±0.29	1.93±0.26	0.163

Values are presented as mean±standard deviation.
The p-values were calculated using an independent t-test.
The participant's chewing ability impairment risk, occlusal pressure deficit risk, risk of retaining fewer teeth, tongue pressure insufficiency risk, risk of oral dryness, and risk of swallowing dysfunction were coded as 1 when they were at risk and 2 when they were normal. Therefore, groups with smaller values were interpreted as being in a more dangerous state.

Table 4. Correlations of Oral Frailty Diagnostic Factors with Sex and Age

Oral frailty diagnostic factor	r			
	Sex	p-value	Age	p-value
Chewing ability	−0.162	0.022	−0.277	<0.001
Chewing ability impairment risk	−0.111	0.116	−0.200	0.005
Maximum occlusal pressure	−0.244	0.001	−0.211	0.003
Occlusal pressure deficit risk	−0.113	0.162	−0.186	0.008
Number of remaining teeth	0.028	0.694	−0.316	<0.001
Risk of retaining fewer teeth	0.024	0.741	−0.292	<0.001
Maximum tongue pressure	−0.199	0.005	−0.398	<0.001
Tongue pressure insufficiency risk	0.124	0.079	0.326	<0.001
Oral dryness	−0.004	0.956	−0.155	0.029
Risk of oral dryness	0.038	0.596	−0.066	0.351
Oral cleanliness	−0.116	0.102	0.152	0.032
Swallowing function	0.011	0.875	0.049	0.490
Risk of swallowing dysfunction	−0.008	0.905	−0.090	0.207
Oral frailty	−0.063	0.378	−0.087	0.221

r is the Pearson correlation coefficient.

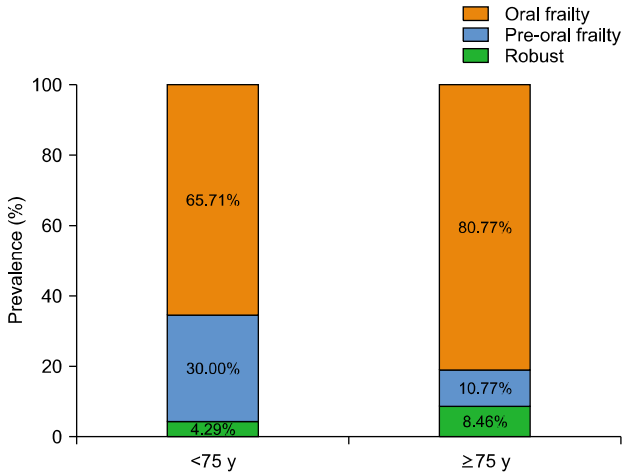

Fig. 3. Prevalence of oral frailty according to age. Oral frailty prevalence (%) was calculated using chi-square test results

4. Relationship of oral frailty diagnostic factors with sex and age

There was a relationship between sex and oral frailty diagnostic factors such as chewing ability, maximum occlusal pressure, and maximum tongue pressure (Table 4). Nevertheless, there was no relationship between sex and oral frailty diagnostic factors, such as chewing ability impairment risk, occlusal pressure deficit risk, and tongue pressure insufficiency risk, when using normal or risk criteria for oral frailty diagnosis.

There was a relationship between age and diagnostic factors for oral frailty, except for swallowing function (Table 4).

Discussion

1. Interpretation

As the proportion of the older population increases due to aging, efforts are needed to understand the frailty process and systemic changes that may occur in older adults to ensure their quality of life[19]. In 2022, the KAGD presented oral frailty criteria for Korean older adults[9]. This standard is based on the JSG[8] and Tanaka et al.'s standardized oral frailty standard, which has been established through a multiyear cohort study[6,7]. While there is a proposal to establish guidelines for diagnosing and providing interventions for oral frailty through the aforementioned standards and literature review, there is a lack of verification as to whether the factors and standards for determining oral frailty are appropriate for Korean older adults. In particular, the definition of "older adults" broadens as more people live longer; therefore, it is important to investigate whether oral hypofunction varies with sex and age[20].

2. Key results and comparison

This study included 217 older adults living in Wonju,

Gangwon State, who visited a senior center during the study period. In this study, to evaluate the influence of age and sex on oral frailty in a healthy community-dwelling elderly population, subjects were recruited by dividing those aged 60～74 years into the early old age group and those aged 75 years or older into the late old age[21,22]. As oral hygiene behavior can be influenced by the ability to perform activities of daily living, the final analysis included 200 older adults who had a K-MBI score of 90 points or higher and did not require help from others in daily life.

Our analysis of the differences in oral frailty diagnostic factors according to sex among the study participants confirmed that men had better chewing ability, maximum occlusal pressure, and maximum tongue pressure than women (Table 2). Additionally, our evaluation of the relationship between oral frailty and sex confirmed that chewing ability, maximum occlusal pressure, and maximum tongue pressure were negatively correlated with the female sex (Table 4). This result can be interpreted as reflecting the tendency for women to have weaker masticatory muscles than men[23]. Previous research[24,25] has suggested that oral frailty is more likely to occur in women than in men; this is also inferred to be affected by differences in muscle strength between the sexes. However, in this study, sex differences could not be confirmed in the chewing ability impairment risk, occlusal pressure deficit risk, or tongue pressure insufficiency risk based on the risk classification criteria for determining oral frailty. In addition, the proportion of older adults diagnosed with oral frailty was 71.4% in men and 77.1% in women, with no sex differences (Fig. 2). Considering these results, although differences in chewing ability, occlusal force, and tongue pressure may occur due to differences in the physiological characteristics of men and women, severe characteristics were not considered in the evaluation of oral frailty in older adults. However, it is essential to note that assessing oral frailty in older adults as “normal” or “at risk” without considering these physiological characteristics may not be accurate.

Considering that previous studies have shown a rapid decline in oral function in adults over 75 years of age, this study established an age criterion of 75 years[23,26], recognizing it as a threshold that may influence oral frailty. Our analysis showed that there was no significant difference in the diagnosis of oral frailty by age; however, oral frailty occurred in 65.7% of adults under 75 years of age and 80.8% of those over 75 years of age (Fig. 3). According to the Korean standard for diagnosing oral frailty, a diagnosis is made when two or more of six diagnostic factors are met. Therefore, it is likely that the age-dependent differences in the risk of decline in oral function for most oral frailty diagnostic factors are reflected in these findings.

Among the oral frailty diagnostic factors, there was no significant age-related difference in the risk of oral dryness, swallowing function, or risk of swallowing dysfunction (Table 3, 4). In the case of oral dryness, there was a difference depending on age; however, as none of the age groups reached the normal criterion of 29.6[9], no difference according to age could be confirmed in the risk of oral dryness. As dry mouth is more likely to occur with age and can be affected by various factors such as systemic diseases, it is necessary to comprehensively consider systemic conditions, such as the age of the older person being tested and the medications taken, when determining oral frailty[27,28]. In the evaluation related to swallowing disorders (swallowing function and risk of swallowing dysfunction), the scores for swallowing function were 0.09 and 0.13 points for the under 75 years and over 75 years groups, respectively, indicating a low subjective level of perceived swallowing disorder among participants.

One thing to consider regarding the results of this study is that swallowing function was evaluated using the K-EAT-10, as opposed to the MWST suggested by the KAGD for evaluating swallowing function[9]. In this study, among the 10 items of the K-EAT-10, a score of more than 1 point for the response to the item “more effort is needed when swallowing liquids,” indicated that the risk of swallowing dysfunction was decreased. The K-EAT-10, originally designed as a 10-item questionnaire rated on a 4-point scale, judges this factor as abnormal when the total score is 3 points or more (range: 0 to 40). Therefore, using a threshold of 1 point or more for one question to assess the risk of swallowing may not be a stringent standard, and it was confirmed that the prevalence of oral frailty did not change significantly by applying this standard (data not shown).

Recently, in Japan, the “oral frailty five-item checklist,”

an evaluation index to identify oral frailty through a survey of older adults in the community, was announced[6]. In this previous study, difficulty in swallowing was proposed to be evaluated based on yes or no responses by asking "Have you choked on your tea or soup recently." In our study, the selected questions were similar to those of the MWST. Thus, there is potential to use this checklist as an alternative to the MWST. In addition, considering that the MWST requires separate preparations, such as a syringe and water, and may cause discomfort during evaluation, particularly in participants with actual swallowing disorders, there is a need for test methods or questions that can replace the MWST in the diagnosis of oral frailty.

In this study, it was confirmed that for all oral frailty diagnostic factors, except the risk of oral dryness, swallowing function, and risk of swallowing dysfunction, more cases were at risk of oral function decline in the 75-year-old or older age group (Table 3). In particular, the results of this study showed that the tongue pressure of older adults over 75 years of age was 21.4 kPa, which was similar to the normal standard (29.1 kPa) for people under 75 years of age, whereas their tongue pressure tended to decrease significantly with age. As aging leads to a decline in muscles throughout the body, declines in muscle mass and function affect the tongue, masticatory muscles, and pharyngeal muscles, ultimately affecting one's swallowing function[29,30]. In the present study, the decline in tongue pressure in adults aged ≥75 years was attributed to this effect. Notably, the manufacturer of the tongue pressure-measuring device suggests different standards for measuring tongue muscle decline depending on age (60～69 years: 30 kPa; 70 years or older: 20 kPa). Thus, a tongue pressure of 20 kPa for individuals over 70 years of age does not indicate that they lack sufficient force to swallow food; rather, it represents the minimum required standard for tongue pressure. However, according to the standards presented by the KAGD, the standard for decreasing tongue pressure is 30 kPa, regardless of age[9]. Given that a decline in tongue strength is anticipated due to reduced muscle mass during the aging process, it is necessary to explore standards that consider age when measuring tongue strength in older adults and the minimum tongue pressure target required for maintaining appropriate nutritional intake and health[31].

Another diagnostic factor of oral frailty that should be considered with respect to age is the number of remaining teeth. The KAGD recommends using the number of remaining teeth as an indicator of functional decline in occlusal force, especially when it is challenging to measure occlusal force using specialized equipment, with the suggestion that the number of remaining teeth should be less than 20[9]. Previous studies have established that the number of remaining teeth has a significant impact on the chewing ability, nutritional intake, and quality of life of older adults[32,33]. Notably, our study showed that the number of remaining teeth in older adults aged ≥75 years was 15.9, which was significantly different from the 22.8 teeth in older adults aged <75 years. It was also evident that there were age-related differences in the standards for evaluating the risk of retaining fewer teeth (Table 3, 4). The number of remaining teeth is influenced by various factors, including age, residential area, toothbrushing habits, and systemic diseases. Age, in particular, emerges as an important factor that affects the number of remaining teeth and may increase the prevalence of oral frailty. This finding suggests that an oral care plan that can preserve the natural teeth of older adults for a long time is required.

3. Suggestion

The results of this study showed that sex did not have a significant impact on determining oral frailty; however, age was confirmed to affect the judgment of oral frailty in all evaluation factors, except for dry mouth and swallowing difficulties in older adults. Therefore, in the currently proposed criteria for determining oral frailty, there is a need to scrutinize the risk level criteria by incorporating age-related considerations, especially concerning chewing ability, occlusal pressure, and tongue pressure, which reflect the physiological characteristics of the older population. These findings provide valuable insights for establishing oral rehabilitation goals in healthy older adults of similar age groups or those experiencing advanced systemic senescence in the future by confirming the level of oral frailty factors according to age in healthy older adults.

Dental hygienist intervention methods for improving oral function in older adults have not yet been clearly

established; therefore, there are many differences among researchers. Consequently, there is a need to reassess the scope of work in oral functional rehabilitation for dental hygienists by examining collaborations with other professions domestically. Additionally, considering intervention methods for oral frailty implemented in other countries and adapting to changes in the domestic industry, such as the emergence of senior-friendly foods, is essential. Proposing intervention methods tailored to the characteristics of Koreans and older adults is crucial. Moreover, the lack of clear establishment of the concepts of oral frailty and hypofunction in Korea may lead to confusion in diagnosis and intervention planning. Therefore, institutional support is needed to clearly define oral frailty in Korea and integrate it into clinical practice.

4. Limitations

This study had some limitations. First, this study was conducted with healthy older adults with no difficulties in daily living (K-MBI ≥90). In addition, this study did not provide detailed information on the general health status of the participants or their medications. Although the participants' medical histories were investigated during the course of this study, the potential impact of drugs affecting the salivary glands or causing systemic diseases was not considered. It is also important to note that various factors can affect oral dryness, potentially affecting the determination of oral frailty. Therefore, further studies are needed to confirm this aspect. However, for the purpose of this study, which was to evaluate the clinical usability of the oral frailty criteria, minimizing factors other than sex and age that could affect the results was an important consideration; therefore, healthy older individuals were included in this study.

5. Conclusion

This study aimed to assess sex and age factors contributing to the diagnosis of oral frailty in community-dwelling older adults. In the present study, sex did not play a significant role in oral frailty diagnosis. However, significant variations were observed across age groups in factors reflecting physiological changes in older adults, such as occlusal pressure, chewing ability, and tongue pressure. Therefore, sex and age should be considered when diagnosing and intervening in oral frailty in the future. These findings have important clinical implications in the diagnosis and treatment of oral frailty.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

Approved by the Institutional Review Board at Yonsei University (IRB No. 1041849-202212-SB-239-02).

Author contributions

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Data availability

The authors may provide raw data upon reasonable request.

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