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Swallowing problems and oral health status among dwelling older adults in the community

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ABSTRACT

Background: Oral health factors affecting oral food processing may comprise swallowing. Swallowing problems are commonly observed in older adults and are associated with various complications such as malnutrition, dehydration, and an increased risk of aspiration pneumonia. Age-related physiological changes in the swallowing mechanism, along with chronic diseases and dry mouth, further elevate the risk of dysphagia in this population.

Objective: This study aimed to investigate the relationships between oral health status and swallowing problems in community-dwelling older adults from Sukhothai Province, Thailand.

Materials and methods: A cross-sectional study was conducted with 297 older adults aged 60 years and above, and a community-based study was conducted among the residents of Sukhothai province. Participants were assessed using the 10-item Eating Assessment Tool (EAT-10) questionnaire to evaluate swallowing problems. In addition, demographic data, underlying diseases, oral health status, and the incidence of dry mouth were recorded. The Thai Mental Status Examination (TMSE) was used to screen for cognitive function. Logistic regression analysis examined the association between these factors and the swallowing problem.

Results: The prevalence of swallowing problems was 48.8%. Swallowing problems were reported significantly with age, particularly in those aged ≥70 years, with a higher prevalence of swallowing issues at 84.7%, compared to 24.7% in participants aged 60-69 years (OR=25.56, p<0.001). Dry mouth was also strongly associated with swallowing problems. Participants suffering from dry mouth had higher odds of experiencing swallowing issues (OR=3.31, p<0.01). Underlying diseases further increased the risk of dysphagia (OR=4.41, p<0.001). No significant association was found between swallowing problems and gender, occlusal pairs, or denture use.

Conclusion: 48.8% of community-dwelling older adults suffer from swallowing problems. This study highlights age, underlying diseases, and dry mouth as critical factors contributing to swallowing problems in older adults. Screening for swallowing issues in those aged ≥70 years, underlying disease, or dry mouth should be integrated into routine health assessments.

Introduction

The global aging population is a major demographic shift of the 21st century, driven by healthcare, sanitation, and living standards advances. The United Nations Department of Economic and Social Affairs (UN DESA) projects that 2050 the global population aged 65 and over will surpass 1.5 billion.[1] Thailand faces a similar trend; in 2021, 20% of its population was aged 60 and older, with this figure expected to reach 28% by 2030, marking Thailand as one of Southeast Asia's fastest-aging societies.[2] In 2023,

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the Sukhothai Provincial Statistical Office reported that 23.05% of its population was elderly.

As individuals age, bodily systems decline, and significant economic and social changes create various challenges. This increases the healthcare burden on nations, requiring them to provide more services for the older population.[3] A key concern in this demographic is the prevalence of age-related medical conditions, known as geriatric syndromes, which include falls, loss of mobility, urinary incontinence, cognitive impairments, adverse drug reactions, and swallowing difficulties.[4] Dysphagia, or difficulty swallowing, is common among older adults due to the deterioration of various organs involved in the process, including weakened pharyngeal muscles, reduced saliva production, tooth loss, decreased oral sensation, and slower swallowing reflexes.[5] It can also arise from comorbidities like stroke, Parkinson's disease, dementia, and cancers of the larynx or esophagus. In older adults, swallowing issues can lead to malnutrition and dehydration, as well as the risk of aspiration of food particles and bacteria, potentially resulting in aspiration pneumonia and even death.[6]

Oral health significantly impacts chewing ability in older adults. Common issues like tooth loss and untreated dental caries often lead to extractions, which correlate with a decline in quality of life and increased oral health problems in this population.[7] The loss of teeth essential for chewing and conditions like dry mouth can reduce food intake.[8] Studies show that 59.9% of elderly nursing home elderly experience swallowing problems.[9] Additionally, Sura *et al*. found that the prevalence of dysphagia among community-dwelling older adults ranges from 5% to 72%.[10]

In Thailand, however, research on swallowing problems among community-dwelling older adults and its relationship with oral health remains limited. This data collection study may lead to preventive strategies and interventions for addressing dysphagia among older adults. Screening and referral of elderly individuals with swallowing problems for appropriate treatment can help reduce complications of dysphagia in this population.

This study aimed to investigate the relationship between swallowing problems and oral health status among older adults living in the community.

Material and methods

This cross-sectional study examined the association between swallowing problems and oral health status among older adults living in the community. It received ethical clearance from the Human Research Ethics Committee of the Sukhothai Provincial Public Health Office, Thailand, with the approval codes COA No. 16/2023 and IRB No. 10/2023.

Participants

A participant in this study was selected through systematic sampling to ensure representative inclusion of community-dwelling individuals aged 60 years and older from Bandanlanhoi district, Sukhothai province, Thailand. The target population was clearly defined, and a sampling interval was calculated to recruit participants from each sub-district proportionately. Every individual from a pre-determined list of eligible participants was selected to maintain sample representativeness. The sample size was determined using a population proportion formula. Individuals with diabetes (uncontrolled diabetes), stroke, dysphagia (diagnosed and under treatment or rehabilitation), Parkinson's disease, or cognitive impairment were excluded from the study. To assess cognitive function, participants completed the Thai Mental Status Examination (TMSE), a cognitive screening tool. Participants were required to have TMSE scores exceeding 23, 17, or 14, depending on their educational background (higher than primary school, primary school, or no formal education, respectively). Only those who met these cognitive criteria and provided informed consent were included in the study. According to the two age groups (60-69 years and >70 years) and with the ratio of male to female 1:1, all data from 297 participants were collected by cross-sectional analysis in a singular evaluation, of which 148 were female, and 149 were male.

Data collection

Using a structured questionnaire, data on variables such as age, gender, height, body weight, underlying health conditions, marital status, living arrangements, education level, occupation, income, and sources of income were collected.

Assessments of swallowing problems

Assessments of swallowing problems screening tool utilized were Thai-version of the Eating Assessment Tool (EAT-10), a 10-item questionnaire designed to screen for oropharyngeal dysphagia. The EAT-10 consists of 10 questions, with a maximum total score of 40 points. Participants with an EAT-10 score of 3 or more were classified as having swallowing problems. The internal consistency of the EAT-10 was found to be 0.96, and the test-retest intra-item correlation coefficient ranged from 0.72 to 0.91.[11] The accuracy of the Thai version of the EAT-10 was reported to be high, with sensitivity at 96.9% and specificity at 93.4%.[12]

Oral health status

All participants underwent a comprehensive oral examination conducted by a dentist. The examination assessed the number of teeth, occlusal pairs (categorized as fewer than 4 occlusal pairs or 4 or more occlusal pairs)[13], wear dentures, and the presence of dry mouth. The Clinical Oral Dryness Score (CODS) was used to evaluate oral dryness. CODS consists of 10 features, each scored as 1 point, yielding a total score ranging from 0 to 10, where a higher score indicates more significant oral dryness. The reproducibility of CODS was confirmed to be excellent, with an intraclass correlation coefficient (ICC) ranging from 0.89 to 0.96.[14] Ethical approval was obtained, and informed consent was secured from all participants before the study.

Data analysis

Descriptive statistics were employed to summarize the general characteristics of the older adults in the study. Continuous variables, such as age, height, and weight, were reported as mean values. Categorical variables, including gender, underlying diseases, marital status, living arrangements, education level, occupation, average monthly income, and sources of income, were presented as percentages.

To assess the prevalence of swallowing problems, the EAT-10 questionnaire was used, and results were also reported as percentages using descriptive statistics.

The relationship between swallowing problems and variables such as gender, age, presence of underlying diseases, occlusal pairs, denture wear, and oral dryness were analyzed using the Chi-square test. The adjusted odds ratio (adjusted OR) was calculated to measure the strength of associations between these factors and swallowing problems. Statistical significance was set at $p<0.05$ for all tests.

Result

The study included 297 participants, evenly split by gender (50.2% male, 49.8% female). Most were 60-69 (61.3%), while 38.7% were 70 or older. The mean BMI was 21.51±3.57. A majority (59.9%) had underlying conditions, mainly hypertension (45.8%) and hyperlipidemia (23.6%). Most were married (93.3%), lived with relatives (90.2%), had completed elementary school (91.2%), and over half (53.9%) were unemployed. About 86.9% had a monthly income below 5,000 THB. Participants averaged 13.67±9.89 natural teeth, with 2.95±3.06 occlusal pairs; 60.9% had fewer than four occlusal pairs, and 20.5% used dentures. Dry mouth was reported by 84.2%, with 72.1% experiencing mild and 12.1% moderate symptoms (Table 1).

Table 1. Demographic data (N=297).

	N	Percent
Gender		
Male	149	50.2
Female	148	49.8
Age		
60-69	182	61.3
≥70	115	38.7
BMI=21.51±3.57		
Underlying disease		
None	119	40.1
Present	178	59.9
Hypertension	136	45.8
Controlled diabetes	27	9.1
Hyperlipidemia	70	23.6
Marriage status		
Single	20	6.7
Marriage	277	93.3
Living characteristics		
Alone	29	9.8
With relative (spouse or other)	268	90.2
Education graduate		
None	26	8.8
Elementary school	271	91.2
Occupation		
None	160	53.9
Agriculture	90	30.3
Employee (Merchant/Government)	47	15.8
Salary		
≤5,000 THB.	258	86.9
>5,000 THB.	39	13.1

Table 1. Demographic data (N=297) *(continued)*.

	N	Percent
Number of natural teeth 13.67±9.89		
Number of occlusal pair 2.95 ±3.06		
Number of dental caries teeth 2.42±3.31		
Occlusal pair teeth		
<4 occlusal pair teeth	181	60.9
≥4 occlusal pair teeth	116	39.1
Denture ware		
Yes	61	20.5
No	236	79.5
Dry mouth		
No	47	15.8
Yes	250	84.2
Mild	214	72.1
Moderate	36	12.1

Table 2 shows the distribution of swallowing problems based on the EAT-10 questionnaire. Most participants had minimal issues: 96.3% did not report weight loss due to swallowing, and 98.7% had no trouble going out for meals. However, 13.5% felt food sticking in their throat, 10.4% coughed while eating, and 4.0% found swallowing stressful. Swallowing liquids was challenging for 3.4%, while 4.7% found swallowing solids and pills difficult, 4.4% experienced painful swallowing, and 2.4% reported reduced enjoyment of eating due to swallowing issues (Table 2).

Table 2. Number of responders for each item of EAT-10.

Item	No problem (Score 0) N (%)	Have problem (Score 1-4) N (%)
1. My swallowing problems has caused me to lose weight	286 (96.3)	11 (3.7)
2. My swallowing problem interferes with my ability to go out for meal	293 (98.7)	4 (1.3)
3. Swallowing liquids takes extra effort	287 (96.6)	10 (3.4)
4. Swallowing solids takes extra effort	283 (95.3)	14 (4.7)
5. Swallowing pills takes extra effort	283 (95.3)	14 (4.7)
6. Swallowing is painful	284 (95.6)	13 (4.4)
7. The pleasure of eating is affected by my swallowing	290 (97.6)	7 (2.4)
8. When I swallow food sticks in my throat	257 (86.5)	40 (13.5)
9. I cough when I eat	266 (89.6)	31 (10.4)
10. Swallowing is stressful	285 (96.0)	12 (4.0)

The prevalence of swallowing problems was 48.8%. The factors associated with swallowing problems (a total EAT-10 score ≥3) were significantly linked to age, underlying disease, and dry mouth. Participants aged ≥70 years had a substantially higher prevalence of swallowing problems (84.7%) compared to those aged 60-69 years (24.7%), with an adjusted odds ratio (OR) of 25.56 (95% CI: 11.55-48.07, p<0.001). Additionally, underlying diseases increased the likelihood of experiencing swallowing problems (59.0% versus 33.6%, OR=4.41, 95% CI: 2.27-8.57, p<0.001). Participants with dry mouth were also more prone to swallowing problems (54.8% versus 27.7%, OR=3.31, 95% CI: 0.14-7.94, p<0.01). No significant associations were observed for gender, the number of occlusal pair teeth, or denture use (Table 3). This comprehensive analysis highlights the significance of age, underlying diseases, and dry mouth in contributing to swallowing problems in older adults (Table 3).

Table 3. Factors associated with swallowing problems (Total EAT-10 score 3).

Factor	Swallowing problem		*p* value	Adjusted OR (95%CI)	*p* value
	No N (%)	Yes N (%)			
Gender					
Male	77 (51.7)	72 (48.3)	0.908[a]	1.02 (0.55-1.89)	0.952[b]
Female	75 (50.7)	73 (49.3)			
Age (year)					
60-69	137 (75.3)	45 (24.7)	<0.001[a]*	25.56 (11.55-48.07)	<0.001[b]*
≥70	15 (15.3)	100 (84.7)			
Underlying disease					
No	79 (66.4)	40 (33.6)	<0.001[a]*	4.41 (2.27-8.57)	<0.001[b]*
Yes	73 (41.0)	105 (59.0)			
Occlusal pair teeth					
<4 occlusal pair teeth	88 (48.6)	93 (51.4)	0.286[a]	1.04 (0.54-2.00)	0.919[b]
≥4 occlusal pair teeth	64 (55.2)	52 (44.8)			
Denture ware					
Yes	30 (49.2)	31 (50.8)	0.775[a]	0.88 (0.39-1.96)	0.752[b]
No	122 (51.7)	114 (48.3)			
Dry mouth					
No	34 (72.3)	13 (27.7)	0.002[a]*	3.31 (0.14-7.94)	0.007[b]*
Yes	118 (45.2)	132 (54.8)			

***Note**: a: Chi-square test, *p<0.05, b: binary logistic regression, *p<0.05.*

Discussion

This study found that the prevalence of swallowing problems among community-dwelling older adults was about 48.8%. Higher than the study in Northeastern Thailand, Thai healthy community-dwelling elders were assessed as about 11%.[15] This study found a higher prevalence than a study of elderly people in the Northeastern region because of the demographic differences. The older adults we studied had higher underlying disease and dry mouth levels. This comprehensive analysis highlights the significance of age, underlying diseases, and dry mouth contributing to swallowing problems in older adults. The study explored the prevalence of swallowing issues among older adults and the factors associated with these difficulties. The results demonstrated that swallowing problems were relatively uncommon for most participants; however, a significant proportion of older adults experienced some difficulty, especially those aged 70 and above. These findings are consistent with previous studies, which have shown that swallowing problems tend to increase with age due to physiological changes in the swallowing mechanism, also known as presbyphagia.[16] In our study, participants aged ≥70 years had an odds ratio of 25.56 for developing swallowing problems compared to those aged 60-69 years (p<0.001), highlighting age as a critical risk factor for dysphagia in older adults. In the current study, 84.7% of participants aged ≥70 reported swallowing problems, compared to only 24.7% of those aged 60-69. This may be attributed to the degeneration of the neural and muscular systems involved in swallowing, which is a major cause of dysphagia in older adults. Such changes are commonly associated with aging, leading to muscle weakness and decreased coordination in swallowing.[16]

The findings of this study demonstrate that older adults, mainly those aged 70 and above, are more likely to experience swallowing problems. A previous study also observed a similar trend, highlighting that swallowing issues increase with age, particularly among older adults with comorbidities. The study pointed out that the decline in swallowing ability is closely linked to complications such as malnutrition and respiratory infections, which significantly affect the quality of life of elderly individuals.[17]

This study found that underlying disease also emerged as a significant predictor of swallowing problems, consistent with research suggesting that chronic conditions such as hypertension, diabetes, and hyperlipidemia, which were common in our sample, can exacerbate the development of dysphagia.[18] The impact of comorbidities on swallowing function emphasizes the importance of comprehensive health assessments in older adults to identify and manage these risks early.

Our study found that participants with dry mouth were significantly more likely to experience swallowing problems, with 54.8% affected compared to 27.7% without dry mouth. A dry mouth impairs saliva production, which is crucial for moistening and lubricating food during swallowing. This aligns with existing literature that shows a strong association between dry mouth and dysphagia in older populations.[19] Additionally, saliva is essential for swallowing and protecting oral and pharyngeal tissues, preventing infections, and ensuring the smooth passage of food.[17] Consequently, dry mouth increases the risk of complications like choking and malnutrition. Given its high

prevalence in older adults, dry mouth should be closely monitored in geriatric assessments.

This study found no significant association between swallowing problems and gender, occlusal pairs, and denture use. The findings differ from earlier research suggesting denture use could affect swallowing function.[20] The lack of association in our sample might be due to the relatively small number of participants using dentures (20.5%), which could have limited the statistical power to detect differences.

In this study, participants experiencing dry mouth were significantly more likely to face swallowing difficulties than those with fewer occlusal pairs. This finding is consistent with previous research, highlighting saliva's pivotal role in the swallowing process. A study by Ship *et al*. emphasized that saliva plays a critical role in lubricating food and facilitating smooth passage through the oropharynx.[21] Thus, the absence of saliva due to dry mouth is more pressing than dental conditions like reduced occlusal pairs. While sufficient occlusal pairs are vital for efficient mastication, research has shown that even individuals with fewer teeth or occlusal pairs can manage adequate nutrition and oral function if saliva production remains normal.[22] In contrast, dry mouth patients are more prone to experiencing discomfort during swallowing, food sticking in the throat, and an increased risk of aspiration, regardless of the number of occlusal pairs.[23] Moreover, dry mouth is linked to systemic factors like medication use, dehydration, and autoimmune diseases, which disproportionately affect older adults. While fewer occlusal pairs can reduce chewing efficiency, it doesn't impact swallowing as directly as dry mouth.[24] Turner and Ship confirmed that dry mouth increases dysphagia risk more than dental status by affecting food bolus lubrication and formation, which are essential for safe swallowing.[25] Thus, managing dry mouth should be a priority in geriatric care to prevent swallowing problems. Saliva substitutes, hydration strategies, and managing underlying health conditions could significantly reduce dysphagia incidence. Addressing dental issues like occlusal pairs is also essential, though the immediate focus should be on the severe effects of dry mouth on swallowing.

These findings emphasize the importance of regular screening for swallowing problems in older adults to prevent complications and improve their quality of life. This is especially significant in geriatric care, particularly in Thailand, where the older adult population is rapidly increasing. Integrating screening for swallowing problems into routine health assessments is crucial, especially for individuals aged 70 and older or those with chronic diseases and dry mouth. Preventive strategies, such as maintaining optimal oral health and managing underlying medical conditions, are critical for reducing the risk of dysphagia and ensuring better outcomes for this vulnerable population.

The limitation of this study was that it could not be done in the clinical evaluation of swallowing, so there was no confirmatory evidence for swallowing disorder, nor was swallowing pathology and physiology identified. The questionnaire will be assessed to screen and monitor patients and refer them to a comprehensive clinical evaluation.

Conclusion

The prevalence of swallowing problems in community-dwelling older adults was 48.8%. This study showed the significant role of age, underlying diseases, and dry mouth in contributing to swallowing issues among older adults. The findings reveal that swallowing problems are particularly prevalent in individuals aged 70 and above, with dry mouth being a key risk factor. These results highlight the need for regular screening and early detection of dysphagia, especially in those with dry mouth and chronic health conditions. Incorporating assessments for swallowing problems into routine healthcare for older adults can help prevent complications, improve quality of life, and reduce the risk of serious health issues.

Conflict of Interest

The authors declare no conflicts of interest. The research was conducted independently, with no financial or personal relationships influencing the results.

Ethical approval

The study received ethical approval from the Human Research Ethics Committee of the Sukhothai Provincial Public Health Office, Thailand (COA No. 16/2023, IRB No. 10/2023). All participants gave informed consent, and the study adhered to ethical guidelines.

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