

Review

## Dysphagia and Oral Health in Older People

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### Abstract

Dysphagia is a term that is used for the difficulty in moving liquid/food from mouth to the stomach. Dysphagia is very common in elders, which makes them susceptible to malnutrition, infection, institutionalization, and death. Consequently, it is categorized as a geriatric syndrome. Therefore, multidisciplinary teams need to work together to determine the correct etiology and implement an appropriate care plan. Oral care is crucial in managing dysphagia and dental hygienists and dentists serve as the key members. In some regions, the roles of dental professionals are not fully understood. Hence, the aim of this article is to review oral problems that are prevalent in older people and their relationship to dysphagia as well as the roles of dental professionals in dysphagia diagnosis and management.



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## Keywords

Swallowing disorder; dysphagia; elderly; geriatric; oral health

## 1. Introduction

Swallowing is a well-coordinated and complicated process that consists of four phases, the primary purpose of which is the transfer of food from the mouth to the pharynx. In the oral preparatory phase, a voluntary step, food or liquids are placed in the mouth, and a bolus is formed and held between the tongue and the palate before being transferred to the pharynx. There are some differences between liquids and solids in this phase. Solid foods should be chewed while liquids do not need chewing. The Glossopalatal Junction (GPJ) plays an important role by preventing the bolus from falling into the pharynx before the oropharyngeal swallowing reflex (OSR) is triggered. In the oral propulsive phase, the bolus is transferred through the mouth to the pharynx by tongue. The bolus is transferred through the pharynx by the propulsive forces of the tongue. Further, the bolus enters the pharynx (3<sup>rd</sup> phase) and is pushed by the pharyngeal stripping wave. In this phase, the pharyngeal contraction facilitates pharyngeal clearance. This phase is an automatic, involuntary phase that begins with the crosses of the bolus through the pillars of fauces by propulsive tongue trust. The configuration of oral cavity and pharynx which is defined as opening and closing events in Glossopalatal junction, velopharyngeal junction, laryngeal vestibule, and upper esophageal sphincter is essential for the safety of swallowing as these events arranged the oropharyngeal structure from a respiratory to a digestive pathway. After passing through the upper esophageal sphincter, the passage to the stomach continues via the esophagus (4<sup>th</sup> phase) by peristalsis [1].

Dysphagia is a term for swallowing disorders and defined as difficulty in moving the food (liquids or solids) from the mouth to the stomach [1]. Dysphagia has many complications including death [1-4]. Older people and in particular, very old, frail people are most at risk of dysphagia [1, 3, 4]. Studies reported 13% of the population with 65 or more years of age, 47% of frail elders who are hospitalized for acute illnesses, and 40–60% of elders from nursing homes had dysphagia. The prevalence increases if the old age co-morbid with neurological or neurodegenerative disorders such as Parkinson's disease (60%), Alzheimer's (80%), or stroke (30–78%). Dysphagia has many life-threatening complications such as malnutrition, dehydration, increased length of hospitalization, increased risk of mental health disorders such as anxiety and decreased quality of life (1). In view of the high prevalence of dysphagia in this population, its multiple etiology, associated co-morbidities and complications resulting in functional decline and a poor prognosis, dysphagia is considered to be a geriatric syndrome [4-6]. The management of dysphagia requires a multidisciplinary approach for diagnosis and management [4]. The constituent members of the multidisciplinary team often vary between the health team, within and between countries and regional areas [1]. For example, in some health care systems, dentists or dental hygienists are not routinely employed in the acute or rehabilitation setting to assist in the diagnosis and management of dysphagia [2].

Therefore, this article aims to highlight the relationship between dysphagia and some prevalent oral problems in frail older people and the roles a dentist or a dental hygienist can play in this

domain to improve their care delivery to prevent malnutrition and pneumonia.

## **2. Dry Mouth and Dysphagia**

Dry mouth is a prevalent oral symptom. The two dry mouth problems should be differentiated from each other: xerostomia, which is defined as a subjective feeling of dry mouth, and hyposalivation, an objective finding, which is a decrease in salivary production. These two problems are associated with each other. However, they may be present separately in a patient. For example, xerostomia may be present in a patient with a normal saliva flow rate [7].

Saliva is a key factor in protecting oral tissues, moisturizing the mucosa, remineralizing the tooth surface, bolus formation and retaining removable prosthesis [7-10]. With age, saliva production decreases, but not to a rate that will cause difficulty in swallowing unless a disease process or medication intervenes. Lack of saliva, without appropriate mouth care, will result in tooth loss and difficulty in the retention of the dental prosthesis. Reduction in teeth and ill-fitting dental prosthesis makes chewing inefficient and is followed by inadequate bolus formation [8, 11].

Studies showed that xerostomia has the potential to increase the risk of dysphagia by changing taste, mastication of food, and bolus formation. Also, hyposalivation increases the risk for several oral diseases such as dental caries, candidiasis, bad breath, burning/sore mouth, taste disturbances, difficulties in chewing and swallowing [7].

Many older people have multiple long term conditions, which will result in significant polypharmacy. These medications with a significant anticholinergic effect (Tricyclic antidepressants, opiates) may induce xerostomia and hyposalivation, therefore increasing susceptibility to oral health issues, mainly dysphagia [7].

## **3. Tooth Loss and Dysphagia**

Tooth loss has many etiological factors, including dental caries [12], periodontal diseases and gingivitis [13], and trauma. Dysphagia has the potential to increase the risk of dental caries in the patients compared to the healthy population due to increase contact time between sugars and teeth when dysphagia is present [14]. Additionally, periodontal disease and gingivitis are more prevalent in patients with dysphagia [14].

If the number of teeth is below a critical number, chewing becomes less efficient, and the bolus is less well formed. This may result in an early or fragmented presentation of the bolus to the pharynx leading to an unsafe swallow [8, 15]. Also, tooth loss and the presence of dentures will influence occlusal force and lead to a decrease in the eating of hard/firm fruit and vegetables [16]. Therefore, tooth loss and mastication insufficiencies cause limitations in diet and food choices and thus indirectly increase the risk of mortality [17].

Although studies support that dentures can reduce the complications of tooth loss [18, 19], it also promotes some problems such as the high risk of candida, denture stomatitis [20, 21] and pneumonia [22, 23], especially if the dental plates are not kept clean, which should be considered.

## **4. Dental Caries and Dysphagia**

The relationship between dysphagia and dental caries is complex. Dental caries and tooth decay are the most prevalent chronic diseases in frail older people [24, 25]. Dental caries is a

multifactorial disease, affecting both the crown (coronal caries) and root (root caries). Caries is the result of the interaction of acid-producing bacteria and fermentable carbohydrate with the teeth, especially if the saliva flow is low [12].

## **5. Periodontal Diseases and Dysphagia**

Periodontal disease is a disorder of periodontium, a tissue that surrounds and supports teeth and its mildest form is gingivitis. Bacterial biofilm (dental plaque), which accumulates on teeth, can cause gingivitis. Gingivitis does not affect the surrounding tissues; however, as the disease progresses, periodontitis will appear that can cause loss of connective tissue and bone support [26]. Severe periodontitis can also cause tooth loss, occasional pain and masticatory problems [26].

## **6. Dysphagia, Poor Oral Health, Malnutrition, and Aspiration Pneumonia**

Poor oral health, dysphagia, and malnutrition are related to each other and each has the potential to be a cause and the result of each other [3, 13]. These three factors are also critical risk factors for aspiration pneumonia [27].

The relationship between the oral microbiome and the lungs is considered to be the same, with microorganisms moving from the mouth to the lungs and then being removed by mucus and the mucociliary waves. Ordinarily, this does not lead to any problem. However, in the presence of significant morbidity (frailty, cancer, diabetes, stroke), immunity is suppressed and a chronic inflammatory state persists. This then increases the likelihood of pneumonia, often termed as “aspiration pneumonia.” The literature suggests that the most prevalent organisms are *Streptococci*, *Haemophilus* species and *Chlamydia* species [28, 29]. These gram-negative species colonize different parts of the oral cavity such as gingiva (especially in periodontitis), teeth (dental plaque and cavitated lesions), oral mucosal surfaces, saliva, denture surfaces and tongue (especially the dorsum of the tongue) [28, 30-32]. They can be released from different surfaces of the oral cavity into salivary secretions and thus, aspirating these gram-negative species with saliva and or food into the lower respiratory tract will increase the risk of pneumonia [30, 31].

Aspiration may be seen following video-fluoroscopy or fiberoptic endoscopic evaluation of swallowing (FEES), but not all people aspirating develop pneumonia [4, 33, 34]. The diagnosis of aspiration pneumonia is often misdiagnosed with community-acquired pneumonia.

Swallowing problems, as well as poor oral hygiene, may lead to respiratory infections such as aspiration pneumonia by aspirating gram-negative living microorganisms in the oral cavity [33]. Therefore, improving oral care is essential to reduce the risk of pneumonia [34].

According to the above information, dysphagia and dental problems can both result in a vicious cycle and should be considered in a multidisciplinary dysphagia team.

## **7. Roles of Dentists, Dental Hygienists and Dental Nurses in Dysphagia Multidisciplinary Teams**

Given the relationship between dysphagia and oral health (Table 1), it is believed that dentists, dental hygienists, and dental nurses play an essential role in dysphagia diagnosis and management. They work together as a team, while dentists are responsible for dental treatments, dental hygienists provide oral care and play an important role in long term management of dental care at home [35]. In this view, some diagnostic tools are made for dental professionals to facilitate the

identification of dysphagia. One of these tools is the Dentist Swallowing Assessment Test (Den SAT). Den SAT is a simplified accurate assessment tool used by dentists to identify elders with dysphagia. Therefore, dentists are key members in identifying signs and symptoms of deglutition problems and referring patients to speech therapists or swallowing therapist for further assessment and treatment [36].

**Table 1** Characteristics of original articles that are related to oral health and oropharyngeal dysphagia (OD).

Article reference	Study design	Type of participants	Sample size	Age of participants	Results	Conclusion
Brochier et al. [8]	Cross-sectional study	Individuals living in long-term care institutions	155	60 or more years of age	60.9% of participants had OD. The participants who presented no occlusal pair or xerostomia had the highest prevalence of OD.	Impaired oral health is associated with an increased risk of OD.
Poisson et al. [13]	Epidemiological study	Hospitalized elderlies in the acute care unit	159	Mean age: 85.28 (SD:5.68)	21.8% of patients had dysphagia. According to multivariate analysis oral candidiasis was independently associated with dysphagia.	Dysphagia was related to candidiasis, salivary hypofunction, oral self-care dependency, oral self-feeding dependency
Ortega et al. [14]	Observational-transversal study	Elderly patients with a history of dysphagia caused by aging and neurological disorders and elderlies without dysphagia	65	70 or more years of age	Edentulism and caries were very prevalent in OD patients compared to patients without OD. Dentate elderlies with OD had complications such as poor oral health, periodontitis,	OD elderlies showed a high prevalence of poor oral hygiene and periodontal diseases and caries. A systematic assessment of oral health is recommended for elderlies

					caries and gingivitis.	with OD.
Furuta et al. [15]	Longitudinal study	Elderlies who receiving home care	259	Mean age: 85.0 SD: ±7.7	Participants who had 9 or fewer teeth and swallowing dysfunction had a higher risk of mortality compared to those with 10 teeth or more and normal swallowing.	Severe tooth loss and swallowing dysfunction with the potential to increase the risk of mortality. Attention should be given to these two conditions in dependent elderlies.
Wakabayashi et al. [18]	Cross-sectional study	Elderlies needing long term care	354	65 or more years of age	Occlusal support had a direct effect on dysphagia. Dysphagia and malnutrition were associated directly with each other. Activities of daily living were affected deleteriously by dysphagia and malnutrition.	Occlusal support is associated directly with dysphagia and indirectly with malnutrition and activities of daily living.
Takeuchi et al. [19]	Prospective cohort study	Elderlies in nursing homes	156	More than 70 years old	The risk of incident pneumonia was not clear between the subjects who wore dentures and were at risk of aspiration and those who were	Denture wearing has the potential to moderate the risk of incident pneumonia which was associated with aspiration risk.

Linuma et al. [22]	Prospective observational study	Community living very elderly	524	85 or more years of age	<p>not at risk of aspiration. The risk of incident pneumonia was much higher in the subjects who did not wear dentures and at risk of aspiration versus who was not at the risk of dysphagia.</p> <p>Swallowing difficulties and denture wearing during sleep were independently associated with a higher risk of incident pneumonia</p>	<p>The wearers of dentures during sleep have poor denture hygiene practices, fewer dental office visits, denture and tongue plaque, and oral candidiasis. Oral hygiene programs for pneumonia prevention should be considered in this population.</p>
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## 8. Oral Hygiene

Along with the early diagnosis, appropriate interventions should be considered in a multidisciplinary manner. Minimal Massive Intervention (MMI) is a cost-effective, evidence-based program which is based on three interventional domains: 1- compensatory interventions such as fluid and food texture adaptation to improve the safety of swallowing; 2- nutritional supplementation to avoid malnutrition; 3- oral health to decrease the load of respiratory pathogens from oral cavity. Speech therapists, dietitians, dentists/dental nurses/dental hygienists as well as doctors, are the critical health providers in this kind of intervention [27].

## 9. Conclusion

Dysphagia is a geriatric syndrome and needs a multidisciplinary point of view for its diagnosis and management to reduce its health-threatening complications. Oral health is related to dysphagia and should be considered to reduce the risk of aspiration pneumonia. According to the importance of oral health in preventing complications of dysphagia, dental professionals such as dentists, dental nurses, and dental hygienists can play an important role in both, diagnosis and management.

## Author Contributions

Sima Farpour: Contributions to the design of the article. Analysis, interpretation of data for the article. Drafting the article. Final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

David Smithard: Contributions to the conception and design of the article. Interpretation of data for the article. Revising the article critically. Final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Hamid Reza Farpour: Contributions to the design of the article. Interpretation of data for the article. Revising the article. Final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## Competing Interests

The authors have declared that no competing interests exist.

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