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**Review Article**

# The effect and approach of dentures on the nutritional state of the elderly

**Haitham Mohammed Binhuraib[1]*, Somaya Saad Alwathnani[2], Asma Gadan Alanazi[3], Manal Yahya Alqaidy[4], Abdulaziz Abduallah Aljarallah[5], Nashwa Saud Alqurashi[6], Faisal Abdullah Alreshidi[7], Bayan Ahmad Aldakkan[8], Awadh Owaidh Alazmi[9], Asim Adnan Sulimani[10], Nowair Ali Alanazi[11]**

[1]Department of Prosthodontics, North Jeddah Specialist Dental Center, King Abdullah Medical Complex, Jeddah, Saudi Arabia
[2]Dental Department, Armed Forces Hospital Alkharj, Riyadh, Saudi Arabia
[3]West Riyadh Dental Center, First Health Cluster, Riyadh, Saudi Arabia
[4]Dental Department, Rabigh General Hospital, Jeddah, Saudi Arabia
[5]Department of Prosthodontics, Abha Specialized Dental Center, Abha, Saudi Arabia
[6]College of Dentistry, Umm Al-Qura University, Mecca, Saudi Arabia
[7]Department of Medical Servies, Ministry of Interior, Dammam, Saudi Arabia
[8]West Riyadh Dental Center, Dental Medical Complex in West of Riyadh, Riyadh, Saudi Arabia
[9]Dental Department, Qassim Health Cluster, Buraydah, Saudi Arabia
[10]Dental Department, King Fahad Armed Forced Hospital, Jeddah, Saudi Arabia
[11]Dental Department, Prince Sultan Military Medical City, Riyadh, Saudi Arabia

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***Correspondence:**
Dr. Haitham Mohammed Binhuraib,
E-mail: hhuraib@moh.gov.sa



## ABSTRACT

The absence of natural teeth presents considerable hurdles in consuming certain foods that demand efficient chewing, rendering elderly individuals vulnerable to malnutrition. Studies have reported malnutrition rates among this group ranging from 2% to 10%. Several factors contribute to this issue, including tooth loss itself, diminished masticatory function, and age-related alterations in taste sensitivity and saliva production. This review delves into the significant effect of dentures on the nutritional well-being of elderly individuals, shedding light on the challenges posed by edentulism, or complete tooth loss. The review underscores the crucial role of integrating dietary guidance into the prosthodontic treatment of edentulous patients. Personalized dietary counselling emerges as a vital strategy to rectify nutrient imbalances and enhance oral and overall health. Key recommendations encompass embracing a diverse array of foods while also moderating salt, fat, and sugar consumption. Furthermore, promoting the intake of hydrating fluids such as water, juice, and milk is essential. Continuous monitoring and support are emphasized as indispensable components for ensuring enduring dietary improvements among this vulnerable population. In conclusion, this review underscores the imperative of addressing the nutritional implications of dentures in the elderly and advocates for a comprehensive approach to safeguarding their dietary health.

**Keywords:** Dentures, Edentulism, Nutritional status, Malnutrition, Masticatory function, Dietary guidance

## INTRODUCTION

Around the world, millions of individuals face edentulism, and the prevalence of edentulism increases with age. Elderly individuals who have lost all their teeth often avoid certain types of foods, especially raw vegetables, because they have difficulty chewing them with traditional complete dentures.[1] The dental health of older adults, in combination with various other factors, can impact their nutritional health. Studies conducted by Sheiham and colleagues have shown that individuals who have fewer than 20 teeth or use traditional full dentures tend to consume a less nutritious diet compared to those who have a greater number of teeth.[2] Malnutrition is a common issue among the elderly, with a reported prevalence ranging from 2% to 10%.[3] Malnutrition is defined as a state where an imbalance of energy, protein, and other nutrients has measurable adverse effects on body structure, function, and clinical outcomes.[4] In addition to dental status, several factors in the oral health sphere impact nutrition. As people age, their muscular strength decreases, leading to longer chewing times. There is also a reduction in saliva production with age, especially for unstimulated saliva, and changes in saliva composition.[5] These factors affect the ability to form a cohesive and slippery food bolus for effective swallowing. Assessing the potential for malnutrition can be approached from various perspectives, one of which involves taking into account the quality of life-related to oral health (OHRQoL).[6] Studies have shown that OHRQoL is related to malnutrition, with a lower quality of life indicating a higher risk of malnutrition.[7] Edentulousness increases with age, and studies using food questionnaires showed that tooth loss leads to modifications of diet as subjects choose food that is easier to chew.[2,8-10] Such food questionnaires are usually used to assess food consumption. Protein, calcium, phosphorus, and haemoglobin in the blood play a crucial role in maintaining optimal health. However, when individuals become edentulous, their levels of these essential nutrients in the blood tend to decrease due to limited food choices and reduced overall intake of these nutrients.[11-14] The rehabilitation of edentulous patients with conventional complete dentures is expected to have a positive impact on the health status and quality of life of elderly individuals.

## METHODOLOGY

This study is based on a comprehensive literature search conducted on November 6, 2023, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the effect and approach of dentures on the nutritional state of the elderly. There were no restrictions on date, language, participant age, or type of publication.

## DISCUSSION

Oral health plays a pivotal role in shaping an individual's nutritional status, encompassing factors such as taste sensitivity, dry mouth, periodontal disease, and the overall condition of their teeth and gingiva.[15] Research has shown that up to 20% of older individuals have reported that oral problems have hindered them from eating the foods they would like to enjoy.[16] Extensive documentation exists regarding how dentures affect the eating habits and overall nutritional health of older.[7] Research conducted at Tufts University revealed that individuals who wear dentures generally have a reduced intake of essential nutrients compared to older adults, who retain a greater number of their natural teeth. Many of these nutrients are typically present in foods that are challenging to chew, such as tough meats, specific vegetables, and fruits.[16] Earlier studies have likewise shown that individuals who have less than 20 teeth or those who wear full dentures tend to consume lower levels of nutrients compared to those who have more than 20 teeth.[2] Generally, adults have a total of 32 teeth, but a considerable number of people worldwide have lost all of their teeth. In many countries, especially among individuals aged over 75, the average number of remaining natural teeth falls below 20.[17] The majority of studies have demonstrated a connection between tooth loss, the use of dentures, and reduced dietary intake, which in turn raises the risk of malnutrition.[7,18]

However, it is important to highlight that a systematic review and meta-analysis concentrating on individuals aged over 60 years did not uncover significant associations between dental status and malnutrition, in contrast to certain earlier findings.[19] Another study revealed that individuals who had well-fitting dentures felt that their diets were comparable to those with 18 or more natural teeth. This suggests that effective dental treatment has the potential to enhance dietary choices.[20] These findings, however, do not consistently align, as most research has primarily focused on complete dentures. The influence of partial dentures, where only some teeth are missing, remains relatively understudied and not well understood.

### *Impact of oral health on nutrition in denture wearers*

The impact of oral health on nutrition for denture wearers is a significant concern. The condition of one's mouth and teeth can have adverse effects on their ability to maintain proper nutrition. Studies have shown that among older individuals, one in five reported that their oral health issues prevented them from eating the foods they would prefer. Additionally, 15% of them took longer to finish their meals, and their enjoyment of food was limited due to oral problems. Furthermore, 5% of these individuals avoided certain foods because they had difficulties with chewing.[21,22] While the increase in health risks associated

with tooth loss may seem relatively small, it has the potential for significant implications because a substantial portion of the population is affected. Risk factors for malnutrition in denture wearers include issues like loose dentures, sore spots under dentures, severe resorption of the jawbone, difficulty in chewing, reduced food intake, inability to prepare food independently, unexpected weight gain or weight loss, substance abuse (alcohol or drugs), and undergoing chemotherapy or radiation therapy.[21-23] The consequences of using complete dentures can also impact both oral and denture-supporting tissues. These effects can be either direct or indirect (Table 1).[24]

**Table 1: The consequences of using complete dentures.**

| Consequence | Type |
|---|---|
| **Denture stomatitis** | Direct |
| **Denture irritation** | Direct |
| **Hyperplasia** | Direct |
| **Traumatic ulcers** | Direct |
| **Flabby ridges** | Direct |
| **Residual ridge resorption** | Direct |
| **Mucosal ulcerations** | Direct |
| **Altered taste perception** | Direct |
| **Burning mouth syndrome** | Direct |
| **Gagging** | Direct |
| **Reduced ability to chew** | Indirect |
| **Decline in functional capacity** | Indirect |
| **General health decline** | Indirect |
| **Inadequate diet** | Indirect |
| **Weakened tissue tolerance** | Indirect |
| **Difficulty adapting to dentures** | Indirect |

***Factors that affect diet and nutritional status***

The impact of dentures on the nutritional status of individuals can vary widely among people.[24] Oral impairments can significantly affect diet and nutrition due to changes in the ability to taste, bite, chew, and swallow foods. Dentures, in particular, can negatively impact chewing performance. Elderly individuals tend to use more chewing strokes and take longer to prepare food for swallowing. Recent studies have shown that masticatory efficiency in complete denture wearers can be approximately 80% lower than in those with intact natural dentition. Moreover, individuals with conventional complete dentures require between 1.5 and 3.6 times more chewing strokes to achieve an equivalent reduction in particle size compared to those wearing mandibular implant-retained over-dentures.[25] Taste sensitivity may also be diminished, and it can be challenging to locate food in the mouth when the palate is covered, as is the case with full upper dentures. These issues are further exacerbated by complete denture wearers. Compared to individuals with natural teeth or partial dentures, those with complete dentures often report lower subjective estimates of taste, texture acceptability of test foods, and ease of chewing. The sensory qualities of food can significantly impact an individual's enjoyment of eating and lead to reduced calorie intake.[24] The comfort of wearing dentures is closely tied to the lubricating ability of saliva in the mouth. Xerostomia, or dry mouth, can also affect complete denture retention and is associated with difficulties in chewing and swallowing. This, in turn, can have adverse effects on food selection and contribute to poor nutritional status. Problems related to lubricating, masticating, tasting, and swallowing food play a significant role in the complex physiological and psychological manifestations of aging.[22]

Studies have shown that even after replacing lost natural teeth with dentures, masticatory efficiency may remain reduced. This reduced masticatory ability can lead to changes in dietary choices, potentially resulting in an impaired nutritional status. Some individuals compensate for their reduced chewing ability by opting for processed or cooked foods over fresh ones, or they may eliminate certain food groups from their diets. Even when masticatory function is restored with conventional dentures, research suggests that people adapt to tooth loss by altering their dietary intake.[26-29] These dietary changes can have health implications. For instance, people with full dentures may consume fewer calories and lower levels of specific nutrients compared to those with partial dentures or natural dentition. Additionally, individuals with full dentures may consume lower levels of essential vitamins and minerals, such as vitamins A and C. Edentulous individuals often avoid certain foods, especially raw vegetables and other hard and tough foods, as they find it challenging to chew them with conventional dentures. Consequently, they tend to consume significantly fewer proteins and other essential nutrients, as well as less fiber, calcium, non-heme iron, and some vitamins compared to those with natural teeth.[24] Moreover, the difficulty of chewing hard and coarse foods, which are major sources of vitamins, minerals, proteins, and fiber, can lead to a shift in food selection patterns. Various studies have indicated that dietary factors play a role in the development and prevention of significant diseases, including cancer, coronary heart disease, and cataracts.[30] The relationship between dental status and certain nutrients, such as vitamin C, appears to be important for overall health. Lower levels of plasma ascorbate and plasma retinol, which can occur in edentulous individuals, may have adverse effects on skin and eye health. Reduced vitamin C intake can also be associated with conditions like cataracts [2]. Additionally, research suggests that edentulous individuals, particularly men, have a higher prevalence of type II diabetes and may consume diets that are less balanced and lower in fiber compared to those with natural teeth. A decrease in fiber consumption can increase the risk of colorectal adenoma, and diets lacking in vegetables, carotene, and fiber are associated with a higher risk of cancer and heart disease.[24] Furthermore, edentulous individuals may be at an increased risk of gastrointestinal and cardiovascular disorders. Some studies have found unfavorable risk

factors for cardiovascular disease in middle-aged individuals with dentures, including higher consumption of sweet snacks, increased obesity, and lower serum HDL-cholesterol concentrations.

## NUTRITION GUIDELINES

The incorporation of dietary guidance into comprehensive prosthodontic treatment is essential for edentulous patients, as it can significantly impact their nutrition and overall well-being. A significant majority, approximately 70% to 80%, of edentulous patients have expressed satisfaction with complete denture treatment and acknowledged its benefits.[24] According to Geertman et al masticatory muscles respond to the stimuli they receive during chewing. Over-dentures, in particular, can enhance sensory feedback and facilitate better muscle coordination, ultimately improving the ability to chew food effectively. The clinical evidence presented in this study indicates that the capacity to chew tougher foods largely relies on the retention provided by implants in the lower jaw.[31] Furthermore, Davis, Stern, and Merickse have emphasized the suitability of over-dentures for elderly patients who have lost their functional capacity or have struggled to adapt to conventional complete dentures in the lower jaw. Replacing conventional complete dentures with osseointegrated implants has been shown to lead to a significant enhancement in masticatory function.[32]

In the pursuit of enhanced diet quality, it is imperative to provide individualized dietary counseling to patients undergoing prosthodontic treatment. The primary objective of dietary counseling for these patients is to rectify imbalances in nutrient intake that may negatively impact both their overall health and oral health. This involves a comprehensive approach that encompasses gathering a nutrition history, assessing the patient's dietary habits, educating the patient about essential dietary components for oral health, motivating the patient to make dietary improvements, and providing ongoing support to help the patient implement dietary changes.[24] For denture-wearing patients who tend to favor soft, sugary, and fatty foods like doughnuts, cakes, pastries, and cookies, it is crucial to guide on the importance of incorporating fruits, vegetables, whole grains, and cereals into their regular diet. Complex carbohydrates, a vital component of these foods, contain dietary fiber, which serves various functions, such as promoting regular bowel function, mitigating glycemic responses, potentially reducing serum cholesterol levels, and aiding in the prevention of diverticular disease. Additionally, it is important to address the use of vitamin and mineral supplements. Patients should be made aware that relying solely on supplements without a balanced diet can create a false sense of security. Older adults, in particular, may choose supplements that do not cover the nutrients they are most likely to be deficient in. The nutritional goals for denture-wearing patients should emphasize the consumption of a diverse range of foods, including protein sources, dairy products, fruits, vegetables, whole grains, and cereals. Simultaneously, it is essential to advise patients to limit their intake of salt, fat, and sugar. Encouraging the consumption of water, juice, and milk can also contribute to better overall nutrition.[29,33] Furthermore, to enhance compliance with dietary recommendations, it is crucial to provide follow-up and ongoing support. Regular discussions about dietary progress during future appointments can help patients stay on track with their nutritional goals. This holistic approach to nutrition care should be an integral and sustained component of the overall prosthodontic treatment plan.

## CONCLUSION

Denture wearers may face potential challenges related to their nutritional intake. Dentists should be mindful of these nutritional risk factors and offer guidance to help patients transition to balanced diets more smoothly. Providing comprehensive healthcare to denture wearers necessitates effective communication and the coordination of services. Given the intricate nature of this task, it is advisable for dentists to collaborate with dieticians to ensure both good nutritional health and effective care for these individuals.

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