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(REVIEW ARTICLE)

Evaluation of Nutritional Status in Completely Edentulous Patients Before and After Denture Rehabilitation: A Narrative Review

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Abstract

Complete tooth loss creates notable obstacles to the nutritional status and well-being for individuals with complete edentulism, particularly in older individuals. This narrative review examines the available evidence about nutrition following complete edentulism, certain nutritional variables following denture rehabilitation, indicators of nutritional adequacy, redundancy, etc. It is well established that, due to edentulism, individuals tend to eat less and like certain food options and categories, and deficiencies in nutrient intake are common. Conventionally and from a rehabilitation protocol standpoint - whether full or partial edentulous patients, fixed and rigid, and/or implant-supported prostheses present restorative masticatory function and better nutritional input. The authors also review dietary counseling. Dietary counseling is used in conjunction with removable prosthetic options where outcomes improve the ability to suitably intake nutrients and optimize the denture's intended directed. The long-term consideration of possible systemic health and oral health-related quality of life (OHRQoL) outcomes are discussed as well. The complexity with nutrition to health and the health to well-being demonstrated the multifaceted relationship between oral health and overall nutrition. The perspective indicates that an approach to care needs to be comprehensive and involve other members of the patient team's respective health disciplines with regard to managing the edentulous patient.

Keywords: Completely edentulism; Malnutrition; Rehabilitation; Biochemical nutritional markers; Masticatory ability; Anthropometry

1. Introduction

Complete edentulism, defined as the total loss of all-natural teeth, is a debilitating oral condition that usually occurs among older adults, though the prevalence among populations differs. The absence of natural dentition impacts facial aesthetics, articulation of speech, and chewing efficiency. Poor mechanical breakdown of food during chewing into smaller particles ends up with significant dietary modifications, whereby most individuals shift to softer and less nutritious foods. Changes in diet due to difficulties in chewing significantly contribute to the risk of malnutrition or inadequate intake of essential macro- and micronutrients. Poor oral health status, especially characterized by the loss of all teeth, was significantly associated with increased incidences of malnutrition and sarcopenia. Prosthodontic rehabilitation aims to restore the masticatory function and nutritional status of edentulous patients, along with OHRQoL, which is mainly achieved through complete dentures. However, the relative effectiveness of the various prosthetic options regarding improvement in various nutritional outcomes has remained a source of continuous debate and research. This narrative review critically analyzes the current nutritional status of completely edentulous patients before and after denture rehabilitation; the methods of nutritional assessment; common nutrient deficiencies in this population; and the comparative effects of conventional and implant-supported prostheses on nutritional health.

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Additionally, it outlines the physiological and psychological aspects of dietary alteration and indicates that better rehabilitation outcomes can be achieved with the addition of personalized dietary counselling.

2. Materials and methods

A narrative review, focusing to summarize the existing evidence on the nutritional status of completely edentulous patients before and after denture rehabilitation. Data was collected from biomedical databases like PubMed, Web of Science, and Google Scholar articles. Studies included are completely edentulous adults focused on denture rehabilitation or dietary counseling, and reported nutritional outcomes.

3. Result and Discussion

3.1. Nutritional Status in Edentulous Patients Before Rehabilitation

When a patient is completely edentulous, his or her capacity to maintain an appropriate, nutritionally adequate diet is significantly altered because this limitation is based on the progressive inability to chew foods, which in turn impacts food choice and nutritional intake [1,2]. Complete edentulism often results in far-reaching functional and physiological changes, which affect chewing efficiency, food choice, and nutritional intake. In fact, denture rehabilitation is often preceded by reports from edentulous patients of their inability to chew certain fibrous or hard foods adequately. This inability often leads to a grossly compromised diet devoid of adequate nutritional value. Loss of natural dentition not only impairs oral function but also has systemic effects through reduced dietary diversity and nutrient intake, thereby increasing the risk of malnutrition among older adults.

3.2. Dietary Changes and Restrictions

People without teeth often alter their eating habits to exclude foods that would require considerable time chewing, such as raw fruits, fibrous vegetables, nuts, and meats [2,3]. They usually choose softer and easier-to-chew choices, which are often more processed and lower in nutrients [4]. This limited food consumption leads to a reduced diversity of foods consumed and low nutrient intake [5].

Because of the inefficient chewing and loss of masticatory function, completely edentulous patients usually adopt significant dietary changes and restrictions before denture rehabilitation. Hard and fibrous foods, including raw fruits and vegetables, meats, and nuts, are usually avoided and replaced by soft, easily chewable foods like mashed foods, rice, and puddings. This adaptation leads to lower intake of the main nutrients, such as protein, fiber, vitamins A, C, and D, and iron, zinc, and calcium, and thus impairs nutritional status [6]. Many patients compensate for this with high-energy, refined foods, which are easy to eat and are of a poor nutritional nature; such foods increase the risk of malnutrition and metabolic disorders. Furthermore, there may be a loss of pleasure in meals, a decrease in appetite, and embarrassment at mealtimes that could further restrict food intake. These dietary restrictions were noted to be related to age, socio-economic status, length of time edentulous, and systemic factors such as xerostomia. Nutritional status in edentulous individuals is unequivocally reported to deteriorate before rehabilitation and improve after denture provision, coupled with dietary counselling [3,7].

3.3. Macronutrient and Micronutrient Deficiencies

The limited diet due to edentulousness frequently results in macronutrient and micronutrient deficiency in edentulous patients. Studies have suggested that edentulous patients often consume fewer calories, proteins, and dietary fiber. Particularly, protein deficiency has been associated with lower serum levels of albumin, indicating a poorer protein status [8]. In addition to macronutrients, micronutrients such as vitamins A, C, B1, B6, B12, D and calcium and other minerals are frequently low [8-10]. For example, edentulous adults who live independently have been shown to have lower serum levels of ascorbic acid and retinol compared to dentate adults [10].

Completely edentulous patients are usually exposed, before prosthetic rehabilitation, to deficiencies of both macronutrients and micronutrients due to impaired mastication, changed food selection, and reduced dietary variety. The inability to chew protein-rich and fibrous foods because of the loss of teeth results in an insufficient intake of protein. This generally decreases muscle mass, strength, and immune function. Application of soft foods instead of well-balanced diets leads to unbalanced intake of macronutrients and enhanced risk for metabolic disorders [11,12]. Avoiding hard fruits, vegetables, and meats mainly involves deficiencies of important micronutrients, including vitamins A, C, D, B12, and folate, and iron, zinc, and calcium, implicated in oral mucosa integrity, bone health, and systemic immunity. Investigations found that edentulous individuals consumed significantly fewer vegetables and fruits

compared with dentate persons and had lower serum levels of vitamin C and carotenoids [13]. Such evidence has confirmed poorer nutritional habits in edentulous individuals. Moreover, poor mastication contributes to reduced consumption of dairy products in older adults, which in turn aggravates their deficiencies of calcium and vitamin D and can contribute to osteoporosis development and resorption of the alveolar bone [14].

3.4. Increased Risk of Malnutrition

The risk of malnutrition is heightened for edentulous individuals as a result of limited dietary variety and nutrient deficiencies [15,16]. This risk may be more significant in older adults who are already predisposed to malnutrition due to age-related metabolic changes, chronic co-morbidities, and socioeconomic factors [8,15]. Malnutrition in edentulous patients not only exerts a detrimental effect on oral health but also creates a vicious circle of negative impacts on immunity, frailty, and the quality of life in general.

3.5. Evaluation Methods of Nutritional Status

An accurate measurement of nutritional status has important implications for the identification of risk patients and the follow-up of rehabilitation outcomes. Several methods are used for this purpose.

3.6. Anthropometric Measurements

Anthropometric measures, including Body Mass Index (BMI), and body composition measurements, are frequently employed. Low BMI values may suggest undernutrition, while post-rehabilitation increases can indicate nutritional improvement [17,18]. These indices reflect changes in overall body composition and are indicative of fat and lean mass changes associated with dietary adjustments following tooth loss. Edentulous individuals often present with lower values of BMI and reduced muscles and fat stores, which may indicate undernutrition or sarcopenia associated with impaired masticatory efficiency and limited dietary variety [17,18].

Denture rehabilitation, especially with implant-supported prostheses, has been associated with improvement in chewing function and food intake that results in stabilization or an increase in BMI and body composition parameters, reflecting improved energy and protein balance. However, BMI in itself may not give a full representation of nutritional recovery, as it is not able to differentiate lean mass from fat mass. Therefore, the addition of BIA or DEXA can give a more accurate measure of changes in skeletal muscle mass and fat distribution after rehabilitation. Recent literature suggests that anthropometric measures should be combined with dietary assessment and biochemical markers for an overall nutritional outcome in edentulous subjects [19,20].

3.7. Biochemical Analysis

Blood-based biomarkers are valuable indicators for evaluating plasma concentrations of proteins (such as serum albumin), minerals (like ferritin), and vitamins (including B12, C, B6, and D) [10,21,22]. These biochemical markers provide objective data on specific nutrient deficiencies and the overall nutritional condition of an individual. Biochemical measurements are objective, sensitive markers of nutritional status that provide information about possible deficiencies in both macronutrient and micronutrient status that cannot be detected by either anthropometric or dietary assessment. Blood biomarkers are commonly measured and include plasma levels of proteins such as serum albumin and prealbumin, minerals including ferritin, calcium, and zinc, and vitamins such as B12, C, B6, D, and folate [13,23].

Of these, serum albumin and prealbumin are useful indicators of protein-energy nutrition, and low levels suggest either inadequate intake of protein or the presence of systemic inflammation. Ferritin levels indicate iron stores and pinpoint anemia due to a diet lacking in variety. Deficiencies of vitamins B12, B6, and C have also frequently been observed in edentulous populations, especially in older adults in whom intake of fruits, vegetables, and animal proteins is lower compared with that in younger adults [23,24].

Furthermore, edentulous subjects are often burdened with insufficient serum 25-hydroxyvitamin D levels, further contributing to the potential enhanced risk of bone resorption and impaired osseointegration of prosthodontic or implant therapy. Alterations in serum albumin, vitamin B12, and hemoglobin have also been monitored following dental rehabilitation using implant-supported prostheses and dietary counseling interventions, with reports of significant improvements [19].

3.8. Dietary Assessment Methods

Dietary assessment is frequently performed through various tools:

- Food Frequency Questionnaires (FFQs) help document usual dietary patterns and frequency of consumption.
- Food Diaries or Journals provide detailed insights into portion sizes and specific food choices when maintained over several days.
- 24-hour Dietary Recalls record food and beverage intake from the previous day to analyze nutrient consumption [25].
- These approaches are essential for identifying food restrictions and quantifying macro- and micronutrient intake.

3.9. Nutritional Screening Tools

Standardized nutritional screening instruments are widely used, especially in geriatric populations:

- Mini Nutritional Assessment (MNA) is an established tool for detecting malnutrition risk through evaluation of dietary intake, recent weight loss, mobility, and psychological or health-related factors [26].
- Community Elders Nutrition and Eating Risk Assessment (CENRA) is another validated method for evaluating dietary patterns and identifying nutritional risk.
- The mini-nutritional assessment (MNA) represents one of the most widely validated and clinically applied tools in geriatric nutrition research and practice. It evaluates anthropometric data, such as BMI and recent weight loss, dietary intake patterns, mobility, psychological stress, and underlying medical conditions, to assess the presence of malnutrition or risk thereof, either alone or in combination [18,27]. The MNA has been demonstrated to be sensitive in the diagnosis of nutritional risk among edentulous and denture-wearing individuals; post-rehabilitation improvement in MNA often correlates with an improved dietary intake and quality of life.
- Another specific and validated screening tool for community-dwelling older adults is the Community Elders Nutrition and Eating Risk Assessment (CENRA). The CENRA places much emphasis on the assessment of eating habits, appetite, and variety of food to ensure the detection of at-risk subjects with undernutrition because of inadequate access to food, poor dentition, or failure to chew properly [17]. The simplicity and ease of administration render it a useful instrument for a large-scale screening of edentulous patients before and after prosthodontic rehabilitation.
- Taken together, these tools enable the clinician to identify nutritional risk early, apply appropriate dietary interventions, and monitor changes in nutritional health subsequent to oral rehabilitation.

3.10. Oral Health–Related Quality of Life

Although not a direct nutritional measure, OHRQoL questionnaires yield valuable subjective information regarding the consequences of oral conditions for eating comfort and daily living. Improved OHRQoL following rehabilitation is strongly associated with increased dietary intake and general well-being [2,10].

3.10.1. Effects of Denture Rehabilitation

The primary goal of denture rehabilitation is the restoration of oral function and the minimization of adverse nutritional effects resulting from tooth loss. Very often, the success of this process depends on the type of prosthesis fabricated and the amount of extra support provided.

3.10.2. Conventional Complete Dentures

Conventional dentures improve mastication and overall satisfaction compared with complete edentulism. However, they cannot fully recover natural chewing efficiency.

- Masticatory Function: New dentures improve both objective and subjective chewing performance, but improvements in masticatory function do not always lead to significant dietary changes [2].
- Nutrient Intake: It has been established that prosthodontic intervention with conventional dentures alone can have a minimal effect on the nutritional status of healthy elderly individuals. However, individuals wearing conventional dentures still tend to consume fewer nutrients and less balanced dietary patterns compared with dentate persons.

3.10.3. Implant-Supported Prostheses

The implant-supported overdentures and the fixed implant prostheses offer superior retention and stability compared to their conventional denture counterparts, which has resulted in marked improvements in masticatory efficiency [28].

3.11. Enhanced Chewing Ability:

Improved denture stability allows consumption of harder and more fibrous foods, including fruits, vegetables, and meats that were previously avoided [28,29].

- Nutritional Benefits: Several studies have reported that patients fitted with implant-supported prostheses exhibit notable improvements in dietary quality and nutritional biomarkers. These changes are particularly advantageous for older adults vulnerable to malnutrition [20,28].
- Quality of Life: Implant-retained overdentures consistently show superior results compared with conventional dentures in terms of chewing performance, satisfaction, and quality of life [30-32].
- Biochemical Improvements: Enhanced mastication associated with implant-supported prostheses can lead to better nutrient absorption and improved biochemical markers of nutrition [22].

3.12. Mechanisms of Nutritional Improvement

Rehabilitation of dentures improves nutrition in a multifaceted manner through interrelated physiological and psychosocial mechanisms.

- Restored Chewing Efficiency: Functional restoration allows better food breakdown and digestion, facilitating increased nutrient absorption [33]. An added benefit of Rehabilitating dentures is that patients will expand the variety of foods consumed, allowing for a greater quantity of nutrient-dense foods [17,28].
- Psychological and Social Factors: Enhanced comfort, appearance, and social confidence contribute to greater enjoyment of meals and improved appetite, further boosting dietary intake [34].

3.13. The Essential Role of Dietary Counselling

Although prosthodontic treatment has a substantial improvement in oral form and function, it may not independently indicate significant nutritional gains [35,36]. The literature appears to have proliferated on the matter of how individualized dietary counselling needs to be tied to prosthetic rehabilitation.

- Behavioral Adaptation: Adherence to individualized dietary recommendations enables patients to capitalize on improved chewing function, adjusting food preferences to optimize nutrition [37-39].
- Correction of Nutrient Deficiencies: Even after functional restoration, counseling assists in identifying and addressing specific nutritional gaps, fostering healthier eating patterns [37].
- Clinical Outcomes: Outcomes reflect studies of the combination of dietary counselling with prosthodontic rehabilitation; wherein nutritional biomarkers have improved from the home services. Providing management in collaboration with dental professionals and dietitians adds oversight and comprehensiveness that accounts for both oral and nutritional therapeutic needs [40].

3.14. Quality of Life and Long-Term Impacts

Rehabilitating with dentures has both short-term and long-term advantages that go beyond oral function.

- Sustained Nutritional Gains: Although short-term nutritional improvements are common, long-term maintenance often requires continued guidance and periodic monitoring.
- OHRQoL: Longitudinal studies have shown that complete dentures significantly impact OHRQoL, including eating, speech, appearance, and self-confidence. Prostheses supported by implants provide better outcomes in OHRQoL than conventional dentures long term [41,42]. Systemic Health: Enhanced nutrition through denture rehabilitation can positively affect systemic health, potentially reducing the risk of malnutrition-related conditions among elderly individuals [28].

4. Conclusion

Total tooth loss presents significant risks to both nutrition and health by limiting dietary variety while promoting nutrient deficiencies. While both conventional and implant-supported dentures are superior in chewing effectiveness to no teeth, implant-supported denture prostheses provide better function, dietary modifications, and nutritional health. The benefits of a prosthodontic rehabilitation protocol are maximized when diet education is customized for the individual and when coordination of diet and restoration assists the patient in returning to normal function while mitigating health and quality-of-life complications in a thorough and long-lasting manner. Further research into long-term effects and best practices will help continue to promote optimal nutrition support for patients receiving oral rehabilitation treatment options in the future.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed

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