



Nutrition for Geriatric Complete Denture Wearing Patients

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Abstract

Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul. Health is wealth and to strive this perfect health every mankind is running throughout all ages. Optimum nutrition furnishes substrates required for expression of genetic heritage. Thus, nutrition might play a vital role in influencing the occurrence and severity of degenerative diseases in elderly. Ageing itself may be associated with several nutritional problems, or indirectly due to interactions from medications. This review article highlights the changes in diet associated with ageing and importance of nutrition among elderly wearing complete dentures.

Keywords: Ageing; Nutrition; Vitamin; Complete Denture; Diet; Nutritional Analysis

Introduction

Diet and nutrition plays an important role in maintaining health and comfort of oral and dental tissues. This further enhances the possibility of successful execution and output of prosthodontic therapy in the elderly. Restoring lost masticatory function in partial or completely edentulous elders is a tough challenge for a prosthodontist. However, multiple factors which decide the healthy nutritional status of an elderly individual include age-related systemic diseases, socioeconomic status and dietary habits. A dental professional must be aware of these factors and their detrimental outcomes while providing a dental health care to an individual by providing counteractive dietary guidance. Dental problems vary with the patient and his or her dental status; hence treatment planning must meet the patient's specific needs. Associations between oral/dental health and nutritional status among elderly those wearing complete dentures is discussed in this article.

Nutritional objectives [1]

The basic objectives while conditioning edentulous patients are:

1. To establish a proper balanced diet for an elderly in accordance with his/her physical, social, psychological and economic background.

2. To establish temporary supportive diet pertaining to specific goals such as caries control, post-operative healing, soft tissue conditioning, etc.
3. To assess and establish factors among denture age group people that may either benefit or complicate the nutritional therapy.

Age-related changes affecting nutritional status [2-20]

Several age-related changes (physiological, psychosocial, functional and pharmacological) might alter the nutritional status of an individual. These factors are discussed below.

Physiological factors

- In elderly, lean body mass declines that further reduces calory needs causing prone for fall. Deficiency of vitamin D sets up metabolic bone disease in the elderly.
- Reduction in gastric acidity causes malabsorption of food-bound vitamin B12.
- Decreased or modified immune responses can be developed due to deficiency of zinc and vitamin B6.
- Often, dehydration is provoked in elderly due to declines in kidney function as well in total body water metabolism, thus causing a major issue during prosthetic phase.

- Deficiencies of vitamin B1, B2, niacin, B6, B12, Folate, pantothenic acid, vitamin C and vitamin E are associated with neurological and behavioural impairment in the older population.

Psychosocial factors

- A host of life-situational factors increase nutritional risk in elders.
- Elderly people living alone in family, those who are physically handicapped and dependent on other family members for their care, and those who are affected with chronic disease and living on restrictive diets, etc. develop nutritional deficiencies.

Functional factors

- Disabilities affecting daily basis function of an individual may affect his/her nutritional status. Diseases like arthritis, stroke, and vision or hearing impairment affect elderly causing nutritional deficit indirectly.

Pharmacological factors

- Nowadays elderly are dependent on several medication on a daily basis that can affect nutritional problems.
- These medications often cause problems such as nausea, anorexia, vomiting, gastrointestinal disturbances, xerostomia, and loss of taste. Altogether this results in nutritional deficiencies, loss of weight and finally malnutrition.

Factors influencing diet and nutritional status [2-9]

Xerostomia (dry mouth)

- Chewing and swallowing is disturbed due to dryness of mouth. Individual affected with xerostomia finds it difficult in chewing and swallowing. This is further influencing the selection of food resulting poor nutritional status.
- Medications used for hyposalivation may have deleterious influence on denture foundation areas [2].

Sense of taste and smell

- Ageing not only declines taste but smell also, thus altering the food choice. This further decreases diet quality in some elderly. Other factors like health disorders, medications, oral hygiene, denture use and smoking also contributes for this decreased function of taste and smell.
- Aging causes diminished sense of smell more rapidly over the sense of taste [2].
- Diminished appeal of some foods for e.g. cruciferous vegetables due to its bitterness causing limitation in its consumption and health benefits.

Oral infectious conditions

- Ageing leads to susceptibility to periodontal disease that may cause nutritional deficiencies indirectly.

Dentate status

- Poor oral and dental health leads to impaired masticatory function which further causes inadequate food choice altering nutrition intake by an individual [4].
- Retained natural dentition and well fitted prosthesis have been proved to be associated with higher and more varied nutritional intake and greater dietary quality [5].

Effects of dentures on taste and swallowing

- A maxillary complete denture can influence taste and swallowing ability of prosthesis wearer.
- The hard palate contains taste buds; hence upper denture covering hard palate shows reduced taste sensitivity. This contributes in poorly coordinated swallowing by such dentures leading to death from choking often.

Effects of dentures on chewing ability

- Aged people tend to use more number of masticatory strokes and chew longer so that food is prepared for swallowing.
- Masticatory efficiency is decreased in complete denture wearing patients to about 80% compared to the patients with intact natural dentition.

Denture's effect on food choices, diet quality and general health

- The existing status of dentition and masticatory function affect variedly on intake of nutrition [6].
- Elderly compensate the decreased masticatory efficiency by selecting either processed or cooked foods. These people are used to chew it for longer time before making it palatable for swallowing.
- Some people may eliminate entire food groups from their diets due to reduced masticatory ability [7]. Dentate people tend to eat more fruits and vegetables than complete denture wearers.
- Replacing poorly fit dentures with new prosthesis may not improve dietary intake drastically [6].
- Also, replacing conventional ones with implant-supported dentures has not proved a significant improvement in food selection or nutrient intake [7].

Nutrient needs of the elderly [8-14]

Several researches agree that many of the degenerative changes observed in the oral cavity may be due to lack of essential nutrients.

Energy

- Ageing causes decline in basal metabolism and physical activity thus reducing energy requirements necessary for body.
- In elderly men, the average energy consumption is 1800 Kcal whereas in women it is about 1300 Kcal.

- Energy deficit leads to dull and dry hair, enlarged parotid gland, muscle wasting, pallor, pale tongue and conjunctiva and spoon-shaped nails.

Calories

- Ageing causes decreased calorie requirements due to reduced energy expenditures and a decline in basal metabolic rate [10].
- In elderly men, the mean RDA is 1600 Kcal, whereas in elderly women it is 2400 Kcal.

Protein

- Ageing leads to increased demand of protein requirement [13].
- Protein depletion in elderly seen as a decrease of the skeletal muscle mass. Deficiency of proteins causes edema and hence proteins are a must for denture wearers [12].
- RDA is 0.8 g/kg body weight per day (for persons above 51 years old)
- Dairy products, poultry. Meats, fish, nuts, grains, legumes and vegetables are the best sources of proteins.

Carbohydrates

- On daily basis, elderly consume more of carbohydrates because of their low cost compared to sources of protein. Carbohydrates containing sources can be stored without refrigeration and more preferred because of their ease of preparation.
- Approximately, intake of 50 to 60% of total calories belongs from carbohydrates.
- Grains, cereals, vegetables, fruits and dairy products are the good sources of carbohydrates.

Fiber

- Fibre is an important component of complex carbohydrates. Fibre-rich diet promotes bowel function and helps in reducing serum cholesterol. It also, prevents diverticular disease.
- Out of two forms, bran fibre is frequently added to dry cereals and breads. The other form i.e. vegetable fibre is more effective and less expensive [14].
- Often, edentulous elderly provoke gastrointestinal disturbances due to less consumption of fibre-rich foods. Decreased masticatory efficiency could be a reason for reduced selection of foods rich in fibre that are hard to chew [15].
- Joshipura, *et al.* [16] reported that even 1 gm of difference in dietary fibre intake between the dentate and completely edentate individuals can raise 2% risk for myocardial infarction.

Water

- Excessive water loss due to damaged kidney provokes negative water balance among elderly [17].
- Insufficient water intake in elderly causes dehydration, hypotension, and elevated body temperature, dryness of mucosa, decreased urine output and mental confusion.
- Minimum fluid intake should be 30 ml/kg body weight per day among elderly.

Vitamin A

- RDA is 800-1000 µgm.
- Animal foods such as liver and milk and milk products are rich sources of retinal/active Vitamin A.
- Deep green and yellow fruits and vegetables (apricots, carrots, and spinach) are good sources of beta-carotene/pro-vitamin A.
- Vitamin A deficiency results in Bitot's spots, xerosis of cornea, conjunctiva, oral mucosa and skin, follicular hyperkeratosis decreased salivary flow and decreased taste acuity.
- If the deficiency persists, it leads to hyperplasia of the gums or generalized gingivitis [11].

Vitamin B complex

Thiamine

- Thiamine deficiency has been reported among the poor, institutionalized and alcoholic elderly people. Thiamine deficiency, most commonly, develops beriberi.
- For elderly, the RDA of 0.5 per 1000 calories or 1 mg daily is advised.
- Pork or chicken-based meats, peas, whole grains, fortified grains, cereals and yeast are the best sources of thiamine.

Vitamin B6 deficiency (pyridoxine)

- Approximately, 50 to 90% of the elderly are affected by vitamin B6 deficiency. This is an important cause of the increased prevalence of the carpal-tunnel syndrome in the elderly.
- The RDA is 1.2-1.4 mg.
- Vitamin B6 deficiency results in nasolabial seborrhoea and glossitis.

Vitamin B12 (riboflavin)

- Kidney, heart, milk, eggs, liver and green leafy vegetables are rich sources of vitamin B12.
- In elderly, the RDA of vitamin B12 is 3 µgm.
- Vitamin B12 deficiency leads to nasolabial seborrhoea, fissuring/redness of eyelid corners and mouth. It also causes magenta colored tongue and genital dermatosis [11].

Vitamin C

- The RDA is about 60 microgram.
- Citrus fruits, tomatoes, potatoes and leafy vegetables are the best sources of vitamin C.
- Vitamin C deficiency leads to spongy and bleeding gums, petechie, delayed healing and painful joints [13].

Vitamin D

- Most of the elderly develop vitamin D deficiency due to lack of sun exposure and an inability to synthesize vitamin D in skin and convert it in kidney.
- Fish liver oils is the rich source of vitamin D.
- The RDA is 5 microgram.
- Vitamin D deficiency develops bow-legs and beading of ribs.

Vitamin E

- As total plasma vitamin E levels increases with the advancement of age, its deficiency does not create a problem.
- The RDA is 8-10 mg alpha-TE.

Minerals

Deficiencies of minerals (magnesium, fluoride, folic acid, zinc and calcium) have been reported in the geriatric people with varied dentition [18].

Folic acid

- Folate deficiency has been developed among economically deprived urban blacks and institutionalized elderly. These groups have found to be at the most risk in developing foliate deficiency.
- RDA is 500 microgram.
- Leafy green vegetables, oranges, liver, legumes and yeast are one of the best sources of folic acid.
- Folic acid deficiency leads to magaloblastic anemia, ulcers in oral cavity, glossodynia, glossitis and stomatitis.

Calcium

- RDA is 800mg/day.
- Due to lack of HCL acid in the stomach, elderly develop a decline in calcium absorption. Hence, elderly should be cautious in acidulating the calcium before its digestion.
- Common finding among elderly is lactose intolerance due to lactase deficiency. Therefore, milk must be advised to be consumed in the modified form [19].
- Milk and its products, dried beans, peas, canned Salmon, leafy green vegetables and tofus are the best sources of calcium.

- Denture wearing elderly often shows rapid and excessive residual ridge resorption that can be a result of negative calcium balance. This further may contribute in developing osteoporosis [13].

Iron

- The prevalence of iron deficiency is rare among the healthy elderly. Blood loss can be suspected in elderly affected with anemia.
- RDA for iron is 10 mg. Meat, fish, poultry, whole grains, leafy green vegetables, dried beans and peas are good sources of iron.
- Deficiency of iron may lead to burning tongue, dry mouth, anemia's and angular cheilosis [11].

Zinc

- Age-related decrease (mostly after an age of 65 years) in intestinal absorption declines the utilization of zinc.
- RDA is 15 mg.
- Animal products, whole grains and dried beans are the good sources of zinc.
- Zinc deficiency leads to decrease in taste acuity, mental lethargy and slow wound healing.

Modified food pyramid diagram

To meet the nutritional needs for people aged 70 years and above, following food pyramid has been designed [9].

Triphasic nutritional analysis**Phase 1**

In this phase, all patients are screened to obtain certain important information from their medico-social history and to check clinical signs of nutritional deficiency. They are, also screened to obtain selected anthropometrical measurements and to assess the adequacy of dietary intake.

Qualitative dietary assessment

Qualitative dietary assessment evaluates about an individual's present and past dietary habits. It also determines about the recent changes in his/her diet. Vogt, *et al.*²⁰ has suggested a questionnaire that identifies nutritional problems among older people. This questionnaire can be implemented in inpatient as well in outpatient settings also. Depending on the total score, the potential nutritional status can be detected wherein; the nutritional evaluation should progress to Phase II further. If Phase I generates adequate details from an elderly, then the further nutritional assessment can be terminated and appropriate dietary counselling instituted.

Phase II

According to the questionnaire, if the score detected identifies a potential nutritional problem, then additional information can be accumulated. Furthermore, a semiquantitative dietary analysis adjunct with routine blood chemistry should be carried out.

Q. N.	Question	Score
1	I have an illness or condition that made me change the kind and/or amount of food I eat.	2
2	I eat fewer than two meals per day.	3
3	I eat few fruits, vegetables, or milk products.	2
4	I have three or more glasses of beer, liquor, or wine per day.	2
5	I have tooth or mouth problems that make it hard for me to eat.	2
6	I don't always have enough money to buy the food I need.	4
7	I eat alone most of the time.	1
8	I take three or more different prescribed or over-the-counter drugs a day.	1
9	Without wanting to, I have lost or gained 10 pounds in the last 6 months.	2
10	I am not always able to shop, cook and/or feed myself.	2

Table 1: Questionnaire for assessing the nutritional health of elderly adults [20].
[0-2 Good nutritional health, 3-5 Moderate nutritional risk, 6 or more High nutritional risk]

Semiquantitative dietary analysis

At this semiquantitative dietary analysis level, dietary intake is assessed using more quantitative means like food composition tables or computer-assisted nutrient analysis programs. Even the services of a registered dietician should be hired at this level to quantify the average caloric and nutrient intakes of an elderly individual.

Biochemical assessment

More definitive nutritional status can be gained by executing common automated blood tests. But often, most of the indices are influenced by an age-related decline in renal function and body water. This decline is further enhanced by the effects of medication and chronic debilitating diseases. For younger ones, these indices fall within standard ranges.

Phase III

More complex nutritional problems in elderly can be reserved for this phase, which can be assessed under the guidance and direction of the concerned physician. The final analysis can be made after biochemical assays of blood, urine and tissues. Adjunct to this metabolic and endocrinal functional tests can be accomplished.

Foods recommended for the elderly

The five food groups that may provide a fair health status in elderly are discussed as follows:

- Vegetables and fruits- four servings are recommended, that further can be subdivided into:
 - Vitamin C- two servings especially from good sources such as citrus fruits, green salads, raw cabbage, etc.
 - Provitamin A- one serving from good source such as deep green and yellow vegetables or fruits.
 - Potatoes and other vegetables and fruits- one serving only.
- Flour products- four servings of enriched breads, cereals, etc.

- Milk-based products- two servings of milk and milk-based products (e.g. cheese).
- Protein-rich products- two servings of non-vegetarian products such as meats, fish, poultry, and eggs can be recommended. Even dried beans, peas and nuts are the best sources.
- Miscellaneous foods- These include fats, oils and sugars. For essential fatty acids, the only serving of 2-4 table-spoons of polyunsaturated fats is advised.

Diet plan for elderly wearing new denture

Usual sequence of biting, chewing and swallowing of food for a normal dentate individual becomes little uneasy for an elderly wearing a new set of complete denture. An easier way for them is to learn this sequence of eating food in the reverse order. Therefore, for the initial days after delivering denture, liquid diet should be recommended for those elderly. Again for the next few days a soft diet plan is prescribed that can be followed by a regular diet plan by the end of the week [12].

1st day after denture insertion

The following diet plan can be recommended:

Fruit juices, gruels cooked in water/milk, milk, eggs, meats and meat soups, etc. should be advised, whereas a glass of milk must be prescribed at least once a day.

2nd and 3rd day after denture insertion

Fruit juices, cooked vegetables, cooked cereals, softened breads, rice, milk, cottage cheese, chopped beef, ground liver, scrambled eggs, tender chicken/fish, etc. should be advised. A butter/margarine and a glass of milk at least once a day should be made regular part of diet.

4th and consecutive days after denture insertion

After the sore spots have healed, little firm foods can be advised. Firmer foods can be cut into small pieces before initiating chewing and swallowing. The diet plan must contain butter/margarine and a glass of milk at least once a day.

Nutrition counselling and dietary guidance for the elderly

Fabrication of complete denture involves a series of clinical and laboratory procedures, hence history of dietary habits can be taken as a part of denture treatment. Dietary or nutritional analysis and counselling can be considered as an important step not only during the entire denture therapy but post-denture insertion also. In case of any severe nutritional deficiency or disease seen in elderly can be referred to his/her physician for more detailed diagnostic procedures and treatment. Dietary pattern indicating excessive consumption of cariogenic foods can be altered by the dentist. Evidence of imbalanced diets may lead to difficulty or minimal suggestive clinical signs indicative of poor dietary habits.

Conclusion

Complete denture failures, many a times, results due to the nutritional deficiencies of the patient. Consequently, good health and nutrition of elderly are necessary for the successful denture wearing.

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