

## Review Article

# Nutrition and orthodontics

### ABSTRACT

Orthodontic patients avoid many types of food, particularly fruits, raw vegetables, and other hard and tough foods, as they cannot chew these properly because of pressure sensitivity of the teeth in the initial 3–5 days period after routine. As a result, such individuals consume significantly less proteins and other key nutrients, fiber, calcium, nonhem iron, and some vitamins. This article presents an overview of the relationship between diet and orthodontic treatment. The nutritional guidelines to obtain good oral and general health in orthodontic patients are discussed.

**Keywords:** Nutrition, oral health, orthodontics

### INTRODUCTION

In recent years, people have become more aware and concerned about maintaining good health and having a healthy lifestyle. A good diet plays an important role in maintaining good health.<sup>[1,2]</sup> Even the governments of different countries have been working to formalize national nutrition monitoring system, and there are new labeling laws for foods regarding fat and salt content.<sup>[3]</sup> With so much focus on healthier foods and more nutritional food choices, dietary counseling and nutritional education relevant to oral health have become an important component of dental education. In fact, 1987 guidelines for accreditation of dental schools by the American Dental Association require that “the graduate must be competent to provide dietary counseling and nutritional education relevant to oral health.” Study of diet and nutrition is also a mandatory part of curriculum in Indian dental schools.<sup>[4]</sup>

With nutritional issues in the spotlight, it seems a good time to evaluate how orthodontic treatment affects a patient’s diet. Orthodontic treatment creates physical, physiologic, and emotional stresses that increase the nutrient mobilization and utilization, thus raising the nutritional requirements of the person. This along with the fact that the nutritional needs of adolescents (the age of a typical orthodontic patient) are already stressed by growth and development

as well as the emotional stress of puberty, maintenance of a well-balanced diet is of great importance. Fixed orthodontic treatment (braces in common language) typically lasts for around 1½ to 3 years and, during this duration, certain dietary restrictions and modifications are advised. Typically, the orthodontist often advises their patients to eat soft food during treatment to avoid pressure sensitivity, but very few give clear-cut instructions or provide diet charts. In absence of these, patients generally switch over to convenient easy-to-eat food, without any special attention to the nutrient values of the consumed food. The literature suggests that orthodontic patients’ nutritional status can affect the reaction of the tissues to orthodontic forces. Nutritional considerations are most critical during growth and development and environmental challenges. The literature suggests that the nutritional status of the orthodontic patients can affect the biologic response of the periodontal ligaments and the bone to orthodontic bands and brackets. Ascorbic acid deficiency slows down orthodontic tooth

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movement by decreasing the body's ability to heal [Tables 1 and 2]. Less than adequate levels of ascorbic acid hinder the breakdown and reformation of collagen, which is necessary for tooth movement. About 17%–72% of orthodontic patients have less than optimal levels of ascorbic acid. Retention may also be affected by ascorbic acid levels as shown by a study in which Guinea pigs with deficiency of ascorbic acid experienced more rapid relapse of malocclusion after treatment than nondeficient ones. The involvement of certain nutrients in orthodontics has been looked at in the past, but the diet as a whole has not been evaluated.<sup>[5,6,7]</sup>

### LAW OF THE MINIMUM (FORMULATED BY JUSTUS VON LIEBIG, 1843)

Among the nutrients essential for growth, the one which is furnished in minimum amount (relative to the need for growth at normal rate) will thereby determine the rate of growth, the organism growing only to extent that it can increase in size. The Law of Minimum is applicable to proteins but not to minerals since the body may grow to adult size although poor in calcium and other minerals. Children with poor bone structure may still grow to the average or normal size. Furthermore, the orthodontic patient is in a special need of dietary counseling in view of the additional plaque-retentive areas provided by the orthodontic appliances. Furthermore, the patient undergoing orthognathic surgeries presents special nutritional considerations. In addition, nutritional imbalances and deficiencies may be involved in the etiology of craniofacial anomalies. This article presents an overview of the relationship between diet and orthodontic treatment and the nutritional strategies which can be employed to obtain good oral and general health in orthodontic patients.<sup>[6]</sup>

### EFFECT OF NUTRITIONAL STATUS ON TOOTH MOVEMENT AND TISSUE RESPONSE TO APPLIANCES

Orthodontic treatment relies on the biologic response of the periodontal ligaments and the alveolar bone to the applied force system.

The orthodontic patient is usually selectively treated during the adolescent growth spurt, which provides an additional challenge to his/her nutritional status. During growth or healing, some nutrients that are otherwise nonessential become essential for optimal growth.

Other challenges accompanying the adolescent period are increased emotional stress, a higher level of physical activity, and the unbalanced diet that typifies this age group. Ascorbic

**Table 1: An orthodontic appliance friendly balanced diet**

Food group	Main nutrients
Cereals, grain products, rice and wheat flour, maize, rice flakes, and Maida	Energy, protein, invisible fats, Vitamins B and B2, folic acid, iron, and fiber
Pulses - Legumes, Bengal gram, black gram, greengram, redgram, Rajmah, soyabean	Energy, protein, invisible fats, Vitamins B and B2, folic acid, calcium, iron, and fiber
Milk and meat products	Protein, fat, Vitamin B2, calcium
Meat and chicken-liver, fish, eggs	Protein, fat, and Vitamin B2
Fruits - Apple, guava, tomato ripe, papaya, orange, sweet lime, watermelon	Fiber, Vitamin C, carotenoids
Vegetables (green leafy)	Invisible fat, carotenoids, Vitamin B2, folic acid, iron, calcium fiber
Other vegetables - Carrot, brinjal, Lady's finger, capsicum, beans, onion, cauliflower	Carotenoids, folic acid, calcium fiber
Fat and sugar-butter, ghee, groundnut, coconut oil	Energy, fats, and essential fatty acids
Sugar and jiggery	Energy

**Table 2: Indian diet chart**

Food group	Quantity	Sources
Cereals	300 g	Wheat, rice, millets
Pulses	60 g (veg), 30 g (nonveg)	Sprouts/fermented
Meat	30 g	Egg/chicken/fish
Vegetables	300 g	Peas, carrot, pumpkin, beans, green leafy vegetables
Fruits	100 g	Orange, apple, papaya, mango, etc.
Milk and milk products	300 g	Cheese, curd, etc.
Sugar	20 g	Confectionary
Fats	20 g	Oil/butter/ghee

acid is a classic example of a nutrient that may influence the biologic response to the orthodontic forces, and several studies have documented its effect on orthodontics. The rationale for the effect of ascorbic acid is based on the fact that a lack of it interferes with the collagen synthesis by preventing hydroxylation of proline to hydroxyproline, thus affecting both the periodontal ligament and the formation of osteoid.<sup>[8]</sup>

If involved in the biologic response to the tooth movement, ascorbic acid may also influence retention.

Nutritional status may also play a role in the gingival response to the orthodontic bands and brackets, especially in regards to increased exposure to retained debris, and tissue tolerance needs to be maximized.

### NUTRITION AND SKELETAL MATURATION

Prolonged nutritive failure in growing children shows a retarding influence on each of the 28 bone centers in the hand and the wrist, which are used as indicators of skeletal maturation.

The fastest growing centers generally show the greatest relative response to dietary correction, whereas the slowest growing centers do not demonstrate a preferential utilization of nutrients.

### DIETARY COUNSELING FOR PLAQUE CONTROL AND GENERAL HEALTH IN ORTHODONTIC PATIENTS

The orthodontic patient is subject to a number of challenges that will require a certain host response, which is partially dependent on nutritional status. These challenges increased irritation to the periodontium, the physical and emotional stresses, the increased requirements to the adolescent growth, and the often poor quality of the diet during this period.<sup>[6]</sup> These stresses include the requirement for tissue response to orthodontic forces in periodontal ligaments and bone.

The increased irritation to the periodontium, the physical and emotional stresses, the increased requirements to the adolescent growth, and the often poor quality of the diet during this period.<sup>[9,10]</sup>

In addition, the use of alcohol or drugs may further increase nutritional requirements. For example, oral contraceptive steroids increase the need for pyridoxine, foliates, and ascorbic acid.<sup>[10,11]</sup>

The use of phenytoin by orthodontic patients with epilepsy represents another example of drug-induced vitamin requirement. An anticonvulsant-induced osteomalacia with increased osteocytes and osteoclastic resorption was shown to exist in epileptic orthodontic patients and was reversed with Vitamin D therapy.

The increased amount of unmineralized new bone may result in a tendency for increased indirect bone resorption in the patients.

Incremental increase in height and weight as compared with standards is one of the best measures of satisfied nutritional needs, although they are not diagnostic for borderline nutritional states. Thus, the orthodontist, who usually uses these data for growth prediction, can estimate past nutritional status. In addition, the presence of such orthodontic appliances as bands and brackets should alert the orthodontist to the cariogenicity and poor gingival health due to diet.

Perhaps, the best method for patient education is dietary history. Proper instructions on how to keep a dietary history for several days can provide the basis of a brief educational session with the orthodontist or an auxiliary. In

addition, a general evaluation of the patient's diet in regard to its balance of nutrients and food groups can be made.

Scientifically, food is divided into five major groups; each group provides some, but not all the nutrients we need. Each food group is as important as another, and one cannot replace the other. For good health, we need them all. Here, we discuss about the groups of food that make up a good diet. We also discussed here that how much we need to eat from each group and the quantity of food we should eat. Well balanced diet is:

- Vegetables
- Fruit
- Milk, yogurt, and cheese
- Meat, poultry, fish, dry beans, eggs, nuts, oilseeds, and sweets
- Bread, cereal, rice, and pasta.

#### Cereals (carbohydrates)

This group should provide  $\frac{1}{4}$ <sup>th</sup> of our total energy requirements. The forms in which cereals are generally consumed in a typical Indian diet consist of chapattis, rice, and bread. They are generally an easy food groups for braces wearers because most grain products are very soft and easily chewed. In cases of discomfort, dunking/mashing chapattis in curries and dals ensure that you don't miss out on the two most vital components of a balanced diet – carbohydrates and proteins.

#### Milk and milk products

Dairy products should comprise about  $\frac{1}{4}$ <sup>th</sup> of the total dietary requirements. Strong bones and teeth rely on a diet that is rich in calcium. Dairy products provide us with calcium, Vitamin D, potassium, and even protein. Dairy products are an excellent choice for braces wearers because most dairy products are soft and require very little chewing. Milk, milk shakes, yogurt (curd), and cottage cheese are the commonly used milk products in Indian diets and their consumption by patients should be encouraged.

#### Vegetables

Vegetables again comprise about  $\frac{1}{4}$ <sup>th</sup> of the total dietary requirements. Vegetables provide us with vitamins and minerals that are essential for growing bodies. Most Indian diets consume vegetables in the cooked form, so they do not provide much of the problem for braces wearers. They can be mashed up further for increased comfort. Raw vegetables or salads can be grated or cut into bite-sized pieces.

#### Fruits

Fruit is an essential part of a healthy diet, but eating it with braces can be quite challenging. Hard fruits such as apple,

unripe pears, and peaches can be very difficult to bite into because of the brackets that are on the teeth. After a wire change, even the softest food can be a nightmare. For 3–4 days after an orthodontic appointment, choose citrus juicy fruits such as oranges and berries. Hard fruits can be cut bite-sized pieces so that they can be chewed with the back teeth. If nothing else works, fruit juice is always a healthy easy option. Frequently, it is uncomfortable to bite or chew something very cold with all that metal around the teeth. Having eatables at room temperature helps.

#### Nuts and seeds

Carefully selecting the choices from this vegetarian group will help keep the braces secure. Nuts and seeds are very hard and they are very small – two challenging aspects for braces wearers. During the duration of active orthodontic treatment, select nut spreads or coarsely grind your favorite nuts and seed.

#### Meat

Meat poses a problem for braces wearers because it is fibrous, making it hard to chew. Avoid eating meat right from the bone. Tofu or cottage cheese provides a safe alternative to meat as a source of protein. Select lean, tender cuts of meat and cut them into bite-sized pieces before you eat it.

### BRACES-FRIENDLY EATING TIPS

When you abide by the rules of what to eat and what not to eat when wearing braces, you are doing yourself a favor. Your orthodontist gives you dietary guidelines for a reason. When you are wearing braces, it is important to avoid certain foods that can damage the orthodontic appliances, brackets, and wires, which may cause delays in treatment. The key rule is: Nothing hard, sticky or chewy!

Here is a handy red, yellow, and green light list of do's and don'ts when it comes to snacking while wearing braces.

You can also check out our complete list of orthodontic dietary guidelines and more.

#### ABSOLUTELY NO FOOD GROUP

- Gum – Sugarless or otherwise
- Sticky foods – Toffees, candies, etc.
- Hard food – Nuts (unless grinded), popcorn, corn on the cob, pizza crusts, ice, and cookies.

#### Red light (never eat!)

Nuts, popcorn, chewing gum, hard pretzels, pizza crust, Gummy Bears, caramels, jelly beans, chocolate chips, ice cubes, chapatti, paratta, nan and boiled candy.

#### Yellow light (use caution, cut up, and chew with back teeth)

Nacho Chips, Bagels, Ribs, chicken wings, raw vegetables, hard fruit (i.e., apples, unless sliced thin or cut in small pieces), fruit with pits (i.e., peaches), corn on the cob, crusty bread, Granola Bars, and foods high in sugar (e.g., pop, candy): don't eat often and brush soon after.

#### Green light (go for it!)

Ice cream (no nuts), potato chips, steamed vegetables, pasta potatoes, French fries, soft pretzels, yogurt, pudding, jelly, soup, subsandwiches, cereal in milk, cheese, eggs, milkshakes, caramel bars, and peanut butter cups.

### CONCLUSION

To optimize patient's physiologic response to orthodontic treatment, it may be beneficial to provide dietary guidance to orthodontic patients in choosing soft food diets. This includes obtaining nutrition history, evaluating the diet, educating the patient about diet components important for oral health, motivating the patient to improve diet, and follow-up to support patient's effort to change food behaviors.

Patients with braces who prefer or switchover to convenience foods such as cakes, pastries, ice creams, and cookies, which are high in simple sugars and fats, should be advised regarding the value of fruits, vegetables, grains, and cereals in the irregular diet. Nutrition goals for the orthodontic patient should be to eat a variety of foods including protein sources, dairy food, fruits, vegetables, and cereals and to limit salt, fat, and sugar intake.

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