



Global Dietary Patterns and Their Impact on Oral Health: Insights for Dentistry

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Abstract

Diet plays a crucial role in shaping our overall health and well-being, encapsulated in the adage “you are what you eat.” This article examines various dietary patterns and their impacts on our lives, focusing on twelve globally recognized diets. Among these, the ketogenic, vegan, and Mediterranean diets emerge as the most popular. The ketogenic diet emphasizes high fat, moderate protein, and very low carbohydrate intake, primarily for weight loss and metabolic health. The vegan diet excludes all animal products, promoting plant-based foods for ethical, environmental, and health benefits. The Mediterranean diet, rich in fruits, vegetables, whole grains, and healthy fats, is renowned for its cardiovascular benefits. Additionally, the Indian diet, with its diverse culinary practices, is analyzed for its specific impact on oral health. Understanding these dietary patterns provides valuable insights into how food choices influence physical health and highlights the importance of balanced nutrition in maintaining overall well-being, particularly in the context of oral health.

Keywords: Dental Caries; Ketogenic; Mediterranean; Vegan

Introduction

Nutrition is the process of taking in food and converting energy for utilization. Nutrition can be broadly divided into Macronutrients and Micronutrients. Around 80% of the Indian population follows a vegetarian or lacto-vegetarian diet. It mainly focuses on high intake of plant foods like vegetables, fruits, and lentils as well as low consumption of meat. According to studies, the prevalence of dental caries in India is about 54% among adults and that of 3-18 years is 57% [1,2].

The Indian diet can significantly impact oral health both positively and negatively depending on the type of food consumed and oral hygiene practices followed. Positive Impacts:

- Spices commonly found in Indian cuisine such as Turmeric and Clove have antibacterial and anti-inflammatory properties that can help in maintaining oral health by reducing the growth of harmful bacteria. It is well known that Turmeric has both antimicrobial and anti-inflammatory properties and Clove is known for its analgesic properties [3].

Foods rich in fiber like green vegetables, grains, beans and lentils gently scrape off the plaque buildup from the tooth surface which helps in keeping them clean. Fiber needs a longer time to chew which leads to stimulation of salivary glands to produce more saliva in the mouth. Saliva helps in washing off the food particles from the mouth and keeping it clean. Dairy products such as Milk, Cottage cheese and Yogurt are rich sources of calcium which promotes bone health.

The increasing consumption of processed and fast foods, containing high levels of sugars and refined carbohydrates can promote increased inflammatory mediators which can cause periodontal inflammation (Periodontitis) and gingival inflammation (Gingivitis). Spicy foods cause irritation to oral mucosa leading to oral ulcers. Consumption of sweets and sugary beverages in the form of tea, coffee is common in India [4-7]. High sugar intake alters the composition of oral microbiome favoring growth of bacteria such as *Streptococcus Mutans* and *Lactobacillus* species. These bacteria metabolize sugar into lactic acid which in turn causes demineralization of enamel structure. About 30% of the adult Indian populations consume tobacco. Tobacco comes in various forms: smokeless tobacco, snuff and chewing tobacco. This causes gum disease, tooth decay, and oral cancer. Tobacco contains carcinogens which can alter the structure of oral epithelium leading to cancers. Other impacts such as immune suppression, vasoconstriction, hyperkeratosis, and dysplasia can also occur [8].

Review

Diet plays a crucial role in shaping our overall health and well-being, encapsulated in the adage “you are what you

eat.” This article examines various dietary patterns and their impacts on our lives, focusing on twelve globally recognized diets. Among these, the ketogenic, vegan, and Mediterranean diets emerge as the most popular.

The ketogenic diet emphasizes high fat, moderate protein, and very low carbohydrate intake, primarily for weight loss and metabolic health. The vegan diet excludes all animal products, promoting plant-based foods for ethical, environmental, and health benefits [9].

The Mediterranean diet, rich in fruits, vegetables, whole grains, and healthy fats, is renowned for its cardiovascular benefits. Additionally, the Indian diet, with its diverse culinary practices, is analyzed for its specific impact on oral health. Indian foods such as herbal spices (turmeric, clove, cardamom, cinnamon) offer anti-inflammatory and antimicrobial properties. Beverages like green tea, herbal tea, and ginger tea provide antioxidant benefits and fluoride content. Dairy products, including milk, yogurt, buttermilk, and cottage cheese, contribute calcium, phosphorus, casein, and probiotics, all beneficial for oral health [10].

Understanding these dietary patterns provides valuable insights into how food choices influence physical health and highlights the importance of balanced nutrition in maintaining overall well-being, particularly in the context of oral health.

Types of Nutrients has been explained in Figure 1.

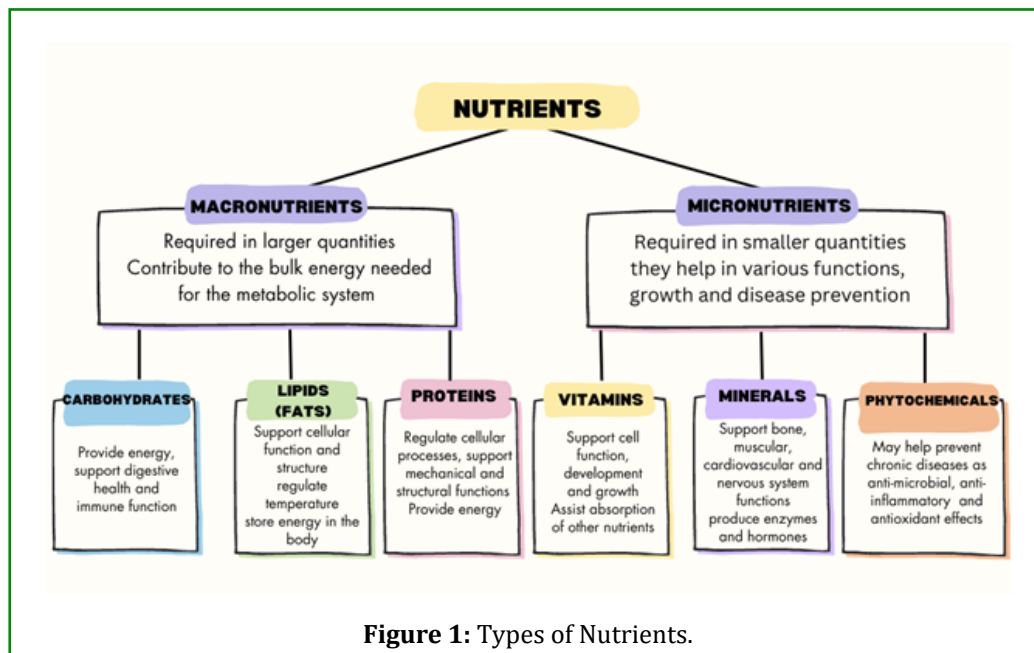


Figure 1: Types of Nutrients.

Types of Diet Followed Globally

Ketogenic Diet: Ketogenic diet is popular in countries such as the US and Canada. It means a low-carbohydrate diet. The ketogenic diet is a high-fat, low carbohydrate diet and moderate amount of protein, where the primary source of energy is fat instead of carbohydrate.

Positive Effects: Ketogenic diets can have potential anti-inflammatory effects, which might benefit gum health and reduce the risk of periodontal disease. Reduced Sugar Intake decreases the risk of dental caries. A low-carbohydrate, low-sugar diet can lower calculus formation, caries, and gingivitis by more than 50% without changing normal oral hygiene habits. Less sugar can also mean less plaque formation because bacteria utilize plaque as the medium to adhere to the tooth surface [11].

Negative Effects: One of the most common side effects of the ketogenic diet is “keto breath,” also known as “Halitosis” a distinct, often unpleasant odor due to the production of ketones from burning of fats, particularly acetone. Over 50% of the U.S. population experiences Halitosis. It is the major cause of sweet or fruity oral odor. It can also cause dry mouth or altered oral micro biome.

The ketogenic diet may alter the production of saliva, which can impact oral health. Saliva is essential for neutralizing acids, remineralising teeth and washing away food particles [12].

The restrictive nature of diet can lead to nutritional deficiencies which are for oral health, such as vitamins A (helps in the development and maintenance of oral mucosa), vitamin C (important for collagen synthesis and gingival health), and vitamin D (helps in mineralization of teeth and bone) all of which are important for maintaining healthy teeth and gums.

Deficiency in vitamins can significantly impact oral health. Vitamin A deficiency is associated with xerostomia, which is characterized by reduced saliva production, leading to dry mouth and potential oral health complications. Vitamin C deficiency can result in scurvy, a condition marked by bleeding gums, loose teeth, and impaired wound healing in the oral cavity. Vitamin D deficiency contributes to enamel hypoplasia, where the enamel on teeth does not develop fully, leaving them vulnerable to decay and structural issues. Maintaining adequate levels of these vitamins through a balanced diet or supplementation is crucial for promoting optimal oral health [13].

Examples of ketogenic foods and their impact on oral and dental health

Meat and poultry are valuable sources of iron and vitamin B12, essential for promoting the production of red blood cells

that support healthy blood circulation, including within the oral tissues. Dairy products such as cheese play a crucial role in oral health by strengthening tooth enamel through their high calcium content. They also help neutralize acids in the mouth, thereby reducing the risk of tooth decay and erosion. Avocados, rich in vitamin E, contribute anti-inflammatory properties that can aid in reducing gum inflammation and supporting overall oral health when incorporated into a balanced diet. These foods highlight the importance of dietary choices in maintaining oral health and preventing oral diseases

Vegan

Vegan diet is basically a plant based diet (Vegetables, Fruits, Nuts and Grains). People following vegan diets avoid intake of Dairy products, Eggs and food that comes from animals. Around the world, Veganism is quite popular among citizens of the United Kingdom (6%) [14]. It can have various effects on oral health, both positive and negative.

Positive Effects: High Intake of Fruits and Vegetables which are rich in vitamins, calcium and antioxidants can help in collagen synthesis which is required for maintaining integrity of gingival tissues, remineralisation of teeth and reducing inflammation. High Fiber Intake: A diet rich in fiber can help clean teeth and gums, reducing plaque buildup and promoting good oral hygiene. Reduced Saturated Fats: A vegan diet is generally low in saturated fats, which can be beneficial for overall health, including reducing inflammation that could affect gum health [15].

Negative Effects: High phytate content: whole grains, legumes, nuts are rich in phytic content. Phytates have a tendency to bind with minerals like calcium and magnesium which causes their deficiencies and compromise the mineralization of teeth. Certain nutrients such as vitamin B12 (found in meat), Iron, vitamin D and Calcium are deficient in people following vegan diets. Deficiencies of these nutrients can cause glossitis (inflammation of oral mucosa), hypomineralization of enamel, and increased susceptibility to oral infections. [14,16] Vegans heavily rely on carbohydrates which act as a substrate for bacteria causing greater risk of caries.

Examples of Vegan Foods and their Benefits on Oral Health

Leafy green vegetables like kale and spinach are essential for maintaining the integrity of gingival tissues due to their high vitamin C content, which supports collagen production necessary for gum health. Fruits such as oranges, apples, and pears provide a wealth of antioxidants and vitamins, which help combat oxidative stress and promote overall oral health. Legumes such as beans, chickpeas, lentils, and kidney beans are rich in protein, zinc, and other nutrients that support

tissue repair and maintenance, crucial for the health of gums and other oral tissues. Incorporating these foods into a balanced diet contributes significantly to maintaining optimal oral health and preventing oral diseases.

Mediterranean Diet

The Mediterranean diet is traditionally followed by people living in countries bordering the Mediterranean Sea. It mainly focuses on fruits, vegetables, grains, sea food, moderate amounts of dairy products and lean meat once in a while. They avoid heavily processed foods and refined sugars.

Positive Effects: Olive oil (contains polyphenols) is one of the main ingredients of the Mediterranean diet. Being rich in antioxidants reduces risk of periodontal diseases additionally its anti-inflammatory properties are beneficial too. Sea food is a rich source of omega -3 fatty acids that exhibit anti-inflammatory properties and helps in reducing periodontal inflammation. Legumes such as Beans and Lentils contain Iron, fiber and Magnesium [17]. People following this diet also consume wine in moderation which has cleansing benefits on oral health [18].

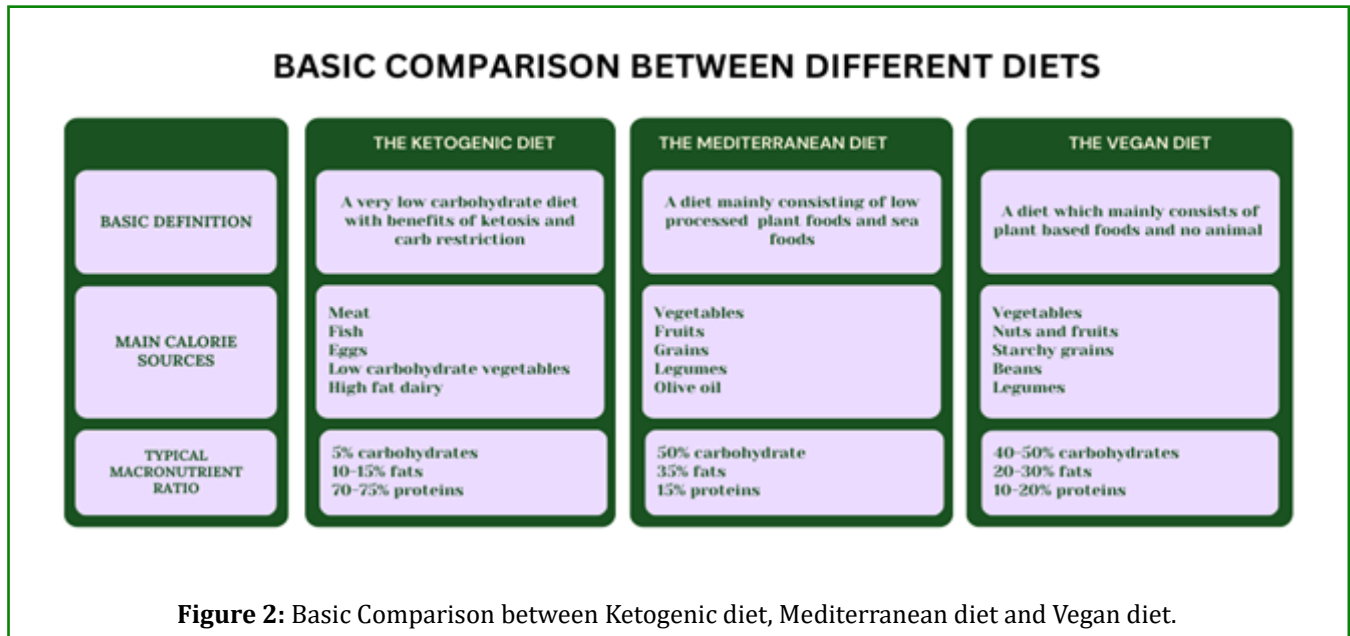
Negative Effects: Frequent consumption of citrus fruits such as tomatoes and oranges can lead to severe erosion of the enamel structure of the tooth. Sticky nature of dry fruits such as dates and apricots can cause increased risk of tooth decay. Limited dairy consumption can potentially compromise the

strength of teeth. Consumption of wine in excess amounts can cause staining because of its pigmentation or dental erosion because of its highly acidic nature [19,20].

Example Mediterranean Foods Beneficial for Oral Health

Leafy greens such as spinach, kale, and Swiss chard are rich sources of calcium and folic acid, crucial for maintaining strong teeth and gums. Fruits like apples, pears, and berries are high in fiber and vitamins, which support overall oral health and digestion. Vegetables such as broccoli, carrots, and bell peppers provide essential vitamins and minerals that promote gum health and contribute to a balanced diet. Nuts and seeds like almonds, walnuts, and sesame seeds are excellent sources of calcium and healthy fats, benefiting tooth enamel and overall oral health. Dairy products such as cheese and yogurt supply calcium and phosphorus, essential for maintaining strong teeth and bones. Fish varieties like salmon, sardines, and mackerel are rich in omega-3 fatty acids, which have anti-inflammatory properties beneficial for gum health and overall oral well-being. Incorporating these nutrient-rich foods into daily meals supports optimal oral health and helps prevent dental problems.

A basic Comparison has been shown in Figure 2.



Conclusion

In conclusion, to avoid the above-mentioned problems it is necessary to follow certain measures to prevent oral diseases. It is important to emphasize on a balanced diet with

limited sugar and processed food consumption and including vegetables, fruits and whole grains. Consuming acidic foods like tomatoes and citrus fruits in moderation and rinse the mouth with water afterward to neutralize acids or limiting the consumption of alcohol and acidic beverages.

It is necessary to Maintain oral hygiene like regular brushing, flossing and regular dental checkups goes a long way in maintaining the longevity of teeth and overall oral health. Regular visits to the dentist can help monitor and address any oral health issues early. Public health initiatives and education about the impacts of diet and lifestyle on oral health can help reduce the prevalence of diet related oral health issues.

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