

Impact of vegetarian, vegan, and omnivorous dietary patterns on oral and periodontal health: A narrative review

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Abstract

Nutrition plays a fundamental role in maintaining general health, particularly the integrity of oral tissues. Given the increasing adoption of plant-based dietary patterns, this narrative review aimed to evaluate and compare the effects of vegetarian, vegan, and omnivorous diets on oral, dental, and periodontal health. A structured literature search was conducted in PubMed, Scopus, Google Scholar, Elmnet, and Civilica to identify studies published up to March 2024. Human studies involving children or adults that evaluated the association between vegetarian, vegan, or omnivorous dietary patterns and oral health outcomes, published in English or Persian, were included. The included studies were narratively reviewed and qualitatively synthesized. Of the retrieved studies, 10 met the inclusion criteria. The findings indicated that vegetarian diets may influence oral microbiome composition and salivary characteristics, while potentially increasing the risk of dental erosion. Although some studies have reported a higher prevalence of dental caries and periodontal diseases among individuals following omnivorous diets, these associations should be interpreted with caution due to the heterogeneity and inconsistency of the available evidence. Furthermore, potential nutritional limitations of vegetarian diets, including inadequate intake of calcium and vitamin D, should be considered as they may affect oral tissue health. Overall, dietary patterns appear to have an important impact on oral and dental health. Ensuring adequate and balanced nutrient intake, regardless of dietary pattern, and increasing awareness of the oral health implications of different diets may contribute to the maintenance of oral and periodontal health.

Keywords: Vegetarian Diet, Vegan Diet, Oral Health, Periodontal Diseases, Dental Caries, Tooth Erosion

Introduction

The relationship between oral hygiene habits, dietary behaviors, and oral health status is complex and multifactorial. Multiple interrelated factors contribute to oral disease development and progression (1).

Despite this, many individuals remain unaware of the impact of dietary habits and nutritional status on oral health maintenance. Therefore, dental professionals and oral health practitioners play a crucial role in performing nutritional screening to identify dietary risk factors associated with dental caries and periodontal diseases. Collaboration between nutrition specialists and oral healthcare providers is essential for identifying, educating, and managing nutrition-related oral health problems. Such interdisciplinary approaches can significantly improve oral healthcare outcomes (2).

Vegetarianism refers to dietary patterns that emphasize the consumption of plant-based foods while limiting or excluding animal-derived foods to varying degrees. Depending on the type of vegetarian diet, individuals may exclude only meat and poultry or may also avoid other animal products such as fish, eggs, and dairy products. Various motivations influence the adoption of vegetarian diets, including health, ethical, environmental, and social considerations (3). Based on the inclusion of specific animal products, vegetarian diets are categorized into veganism (exclusive consumption of plant-based foods), lacto-vegetarianism (plant-based foods and dairy products), lacto-ovo vegetarianism (plant-based foods, dairy products, and eggs), and pesco-vegetarianism (plant-based foods, dairy products, eggs, and fish) (4-6). Individuals may adopt these dietary patterns for various reasons, including health awareness, environmental concerns, socioeconomic influences, ethical considerations, and spiritual or religious beliefs (7-9). A subset of vegetarian diets is veganism, which excludes all animal-derived foods, including meat, dairy products, eggs, and other animal-based ingredients. Vegan diets primarily

rely on plant-based foods such as fruits, vegetables, legumes, grains, nuts, and seeds (10).

Vegetarianism in Contemporary

Society globally, the prevalence of vegetarian dietary patterns is increasing. Except for India, where approximately one-third of the population follows vegetarian diets, vegetarians remain a minority in most countries. According to the American Dietetic Association, appropriately planned vegetarian diets are nutritionally adequate and safe across all life stages, including childhood, adolescence, pregnancy, and lactation. Additionally, plant-based diets have been associated with several health benefits, including improved cardiometabolic profiles and a reduced risk of some chronic diseases (11-14).

Currently, scientific evidence regarding the potential impact of vegetarian diets on oral health (OH) remains inconsistent (15). Considering individual variability, dietary patterns may directly and indirectly influence immune responses, oral microbiota, and oral metabolomic profiles (16). However, studies focusing on general dietary habits and oral diseases remain limited. Therefore, this narrative review aims to evaluate the association between vegetarian, vegan, and omnivorous dietary patterns and their potential effects on oral health outcomes.

Methods

This narrative review was conducted using a targeted literature search of PubMed, Scopus, Google Scholar, Elmnet, and Civilica databases to identify relevant studies published up to March 2024. The search strategy included keywords related to “vegetarian diet,” “vegan diet,” “omnivorous diet,” “oral health,” “dental caries,” “periodontal disease,” and “Tooth Erosion.” Studies investigating the effects, associations, or clinical outcomes of vegetarian, vegan, and omnivorous dietary patterns on oral and periodontal health indicators in human populations, including both children and adults, were included. Only full-text articles published in English or Persian were considered eligible. Data

from qualified studies were extracted and qualitatively analyzed to identify key findings related to clinical outcomes, oral microbiome alterations, and oral health indicators. No quantitative synthesis or meta-analysis was performed, and findings were reported descriptively.

Results

A targeted literature search identified 105 records from the selected databases. After removing duplicates and screening titles and abstracts for relevance to the association between vegetarian, vegan, and omnivorous dietary patterns and oral health (OH), 10 studies met the inclusion criteria and were included in the qualitative synthesis.

Effects of Vegetarian and Omnivorous Diets on Periodontal Health

The impact of dietary patterns on periodontal health and periodontitis has been widely acknowledged. Epidemiological studies have linked periodontal disease (PD) to obesity, insulin resistance, type 2 diabetes, and cardiovascular diseases (17-19). A common underlying feature of these conditions is low-grade systemic inflammation (20). Periodontal disease itself may induce systemic inflammatory responses and endotoxemia, suggesting a potential role of oral microbiota in cardiometabolic pathophysiology (21).

Dietary nutrients may influence periodontal tissue destruction through modification of supragingival plaque biofilm composition, regulation of pro-inflammatory cytokine secretion, and alterations in salivary volume and composition (22).

Although studies directly assessing the relationship between vegetarian diets and periodontal status remain limited, available evidence suggests that vegetarians may present better periodontal parameters compared to omnivores (23). However, the number of high-

quality longitudinal studies remains insufficient to draw definitive conclusions.

Impact of Dietary Patterns on Salivary Microbiota

The influence of diet on gut microbiota has been extensively documented, demonstrating that long-term dietary habits significantly affect microbial diversity and composition (24, 25). In contrast, studies examining salivary microbiota are fewer, and consistent evidence supporting a dominant role of diet in shaping oral microbial communities is lacking.

Beyond specific dietary patterns, variations in dietary habits across populations may also influence oral microbiome composition. A cross-ethnic study comparing salivary microbiota in 52 South Koreans and 88 Japanese individuals demonstrated lower microbial diversity among Koreans (26). Differences in community structure and composition were observed despite close cultural, geographical, and genetic proximity. Variations in dietary habits—such as the higher consumption of spicy, salty, and fermented foods in Korea—were proposed as contributing factors (27).

These findings suggest that diet may act as a modifying factor in oral microbiota composition rather than a primary determinant.

Dental Outcomes Associated with Vegetarian and Omnivorous Diets

Dental erosion is a chemical process not mediated by bacteria that affects hard dental tissues (28). Fruit consumption—commonly high in vegetarian and vegan diets—is considered one of the most significant extrinsic risk factors for dental erosion (29, 30). Evidence indicates that vegetarians may be more susceptible to erosive tooth wear (31).

Dietary Patterns and Oral Health Outcomes in Pediatric Populations

Nutritional variables may also influence the risk of non-carious cervical lesions (NCCLs).

Kumar et al. reported a higher prevalence of NCCLs among vegetarian children compared with those following a mixed diet; however, these findings should be interpreted cautiously, as the study population consisted of children attending special needs schools in India and may not be representative of the general pediatric population. Increased consumption of acidic plant-based foods may contribute to erosive processes that could predispose individuals to such lesions (32).

With regard to dental caries, findings remain inconsistent. Some studies reported higher decayed, missing, and filled teeth (DMFT) scores among children with mixed diets, whereas others found slightly higher caries prevalence among vegetarian children; however, these differences were often not statistically significant (33, 34). Variability in sample size, sugar consumption patterns, oral hygiene behaviors, and overall diet quality may explain these discrepancies.

Additionally, higher protein intake relative to sugar consumption has been suggested to result in

lower oral acidity, potentially influencing caries risk (33, 34).

Other Oral Findings

Compared to omnivores, vegetarians have demonstrated greater sensitivity to metallic tastes and reduced sensitivity to sweet and bitter tastes (35).

Some studies have suggested a possible association between plant-based diets and oral epithelial atrophy, although a definitive causal relationship has not been established (36).

Adherence to vegetarian dietary patterns is often associated with healthier lifestyle behaviors, which may indirectly contribute to improved oral health outcomes (36).

The general characteristics and principal findings of the included studies are summarized in Table1.

Table 1. Summary of key characteristics and main findings of included studies in the present narrative review

Author / Year	Study Design	Population / Sample	Diet Type	Oral Health Indicators	Main Findings	Reference
Staufenbiel, 2013	Cross-sectional	Adults	Vegetarian	Periodontal status	Vegetarians had better periodontal health	(23)
Pedraño, 2018	Cross-sectional	Adults	Vegetarian	Dental erosion	Increased susceptibility to dental erosion in vegetarians	(31)
Kumar, 2015	Cross-sectional	Children	Vegetarian	Non-caries cervical lesions (NCCLs)	Higher risk of NCCLs among vegetarian children	(32)
Chopra, 2015	Cross-sectional	Children	Omnivorous	DMFT	Association between sugar consumption and DMFT	(33)
Somannavar, 2012	Cross-sectional	Adults	Vegetarian / Omnivorous	DMFT, Oxidative stress	Vegetarians had lower oral acidity and lower DMFT scores	(34)
Jalil Mozhdehi, 2021	Cross-sectional	Adults	Vegetarian / Omnivorous	Taste perception	Vegetarians showed higher sensitivity to metallic taste, lower sensitivity to sweet and bitter	(35)
Craig, 2010	Review	Adults	Vegetarian	Dental erosion and caries	Fruit-rich vegetarian diets linked to increased dental erosion	(30)
Inchingolo, 2024	Systematic Review	Adults	Vegetarian	Oral health	Adherence to vegetarian diet associated with healthier lifestyle and better oral health	(36)

Takeshita et al., 2014	Cross-sectional	Adults (52 South Koreans, 88 Japanese)	Different dietary habits	Salivary microbiota composition	Lower salivary microbial diversity was observed among Koreans; dietary habits were suggested as one of several factors contributing to differences in oral microbiota composition.	(26)
De Filippis et al., 2014	Cross-sectional	Adults	Omnivorous / Ovo-lacto-vegetarian / Vegan	Salivary microbiota and salivary metabolome	Similar salivary microbiota profiles were observed across dietary groups, although differences in the salivary metabolome suggested that dietary patterns may influence oral microbial ecology.	(27)

Discussion

Comparison with Previous Systematic Reviews

While the systematic review by Azzola et al. (1) focused on the influence of vegetarian, vegan, and omnivorous diets on oral health in adult populations, the present narrative review also discusses evidence from pediatric populations and summarizes findings on specific oral health outcomes, including periodontal health, dental erosion, non-caries cervical lesions (NCCLs), and salivary microbiota. These aspects have received comparatively less attention in previous reviews.

This inclusion of pediatric populations is particularly important, as dietary habits established during childhood can influence oral health trajectories into adulthood. For instance, Kumar et al. reported a higher prevalence of NCCLs among vegetarian children attending special needs schools in India; however, these findings may not be generalizable to the broader pediatric population because oral hygiene practices, socioeconomic status, and underlying health conditions may have influenced the observed outcomes. In contrast, DMFT scores did not differ consistently between vegetarian and omnivorous children across the available studies (32-34). By contrast, adult vegetarians may experience improved periodontal health but increased susceptibility to dental erosion (23, 31). These age-specific insights complement the

findings of the 2023 systematic review, highlighting that the impact of dietary patterns on oral health is both population- and outcome-specific.

Furthermore, careful nutritional planning is essential during childhood, as inadequately planned vegetarian diets may increase the risk of insufficient intake of vitamin B12, iron, and zinc, which are important for normal growth and oral tissue development (37).

Biological Mechanisms Linking Diet and Oral Health

The findings of this narrative review suggest that dietary patterns may influence oral health through multiple biological and behavioral pathways, particularly affecting periodontal status, salivary microbiota composition, and dental outcomes (23, 26, 27).

The well-established association between periodontal disease and metabolic disorders such as obesity, insulin resistance, type 2 diabetes, and cardiovascular diseases highlights the systemic relevance of periodontal inflammation (17-19). Given that dietary habits strongly influence systemic inflammation and metabolic health, it is plausible that plant-based dietary patterns may indirectly contribute to improved periodontal parameters through anti-inflammatory and antioxidant mechanisms. Diets rich in fruits, vegetables, and whole grains provide polyphenols and antioxidant vitamins that may modulate inflammatory pathways, reduce

oxidative stress, and support periodontal tissue homeostasis. In addition, adequate vitamin C intake is essential for collagen synthesis, wound healing, and maintenance of gingival connective tissue, which may contribute to periodontal health (20, 21, 38).

However, the available evidence remains heterogeneous. While some studies suggest better periodontal outcomes among vegetarians, others indicate increased susceptibility to dental erosion due to higher consumption of acidic foods, particularly fruits (29-31). The inconsistency in caries-related findings further reflects the multifactorial nature of dental caries, which depends not only on dietary composition but also on frequency of sugar intake, oral hygiene practices, fluoride exposure, and salivary flow (33, 34).

Regarding oral microbiota, although dietary patterns may modulate microbial diversity and composition, current evidence does not support diet as the sole or dominant determinant. Cultural, genetic, and environmental factors likely interact with dietary habits to shape the oral microbial ecosystem (24-27).

Importantly, individuals adhering to vegetarian or vegan diets often demonstrate greater health consciousness and healthier lifestyle behaviors, including improved oral hygiene practices. This factor may partially confound the observed associations between diet and oral health (36).

Clinical Implications and Practical Recommendations

From a clinical perspective, dental practitioners should consider dietary patterns when assessing patients' risk profiles. Vegetarians and vegans may benefit from counseling regarding acidic food consumption and mineral intake (e.g., calcium, vitamin D, vitamin B12), while omnivorous individuals with high sugar intake may require intensified caries-prevention strategies.

In addition, our review highlights several practical implications for dental professionals.

Dietary patterns should be considered during oral health assessment, as they may influence the risk of periodontal disease, dental erosion, and nutritional deficiencies. Patients following vegetarian or vegan diets may benefit from individualized dietary counseling, advice on limiting the frequency of acidic food and beverage consumption, appropriate fluoride-based preventive strategies to reduce the risk of erosive tooth wear and dental caries, and assessment of oral hygiene practices. When clinical findings or dietary history suggest possible nutritional deficiencies, particularly of vitamin B12, calcium, vitamin D, iron, or zinc, referral for nutritional assessment or collaboration with a registered dietitian may be appropriate. These individualized preventive approaches may contribute to improved oral health outcomes across different age groups (1, 37).

Strengths and Limitations

This narrative review has several strengths, including the inclusion of both adult and pediatric populations and the evaluation of multiple oral health outcomes, such as periodontal health, dental erosion, NCCLs, and salivary microbiota. However, several limitations should be acknowledged. As a narrative review, it did not include a formal quality assessment of the included studies. In addition, heterogeneity in study design, population characteristics, dietary assessment methods, and oral health outcomes limits direct comparison of findings and precludes definitive conclusions.

Future Research Directions

Given the limited number of longitudinal and interventional studies, future research should focus on well-designed clinical trials and prospective cohort studies to clarify the direct and indirect effects of plant-based dietary patterns on oral health outcomes. Further investigations evaluating biological markers of inflammation,

oxidative stress, salivary composition, and oral microbiota are also warranted.

Conclusion

With the growing popularity of vegetarian and vegan dietary patterns, understanding their impact on oral health has become increasingly important. The evidence reviewed suggests that vegetarians may exhibit better periodontal conditions but may also experience higher susceptibility to dental erosion and enamel demineralization. Conversely, individuals following omnivorous diets may present a higher risk of periodontal disease and dental caries, potentially due to differences in dietary composition and oral microbiota profiles.

Although current evidence remains limited and heterogeneous, this narrative review provides a foundation for future clinical and research investigations. Greater awareness of diet-related oral health implications may enhance preventive strategies and personalized dental care.

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