



Veganism and Oral Health—An Overview through the Perspective

Visha Shailesh Pandya¹ Luca Fiorillo^{2,3,4,5} Sneha Kalpe² Vini Mehta² Aida Meto^{2,3}
Agostino Di Certo⁶ Diana Russo⁵ Francesca Gorassini^{4,7} Maura Mancini⁴ Alessandra Mancini⁸
Cesare D'Amico^{3,4}

¹ Department of Public Health Dentistry, Vaidik Dental College & Research Centre, Dadra and Nagar Haveli and Daman and Diu, India

² Department of Public Health Dentistry, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

³ Department of Dentistry, Faculty of Dental Sciences, University of Aledent, Tirana, Albania

⁴ Department of Biomedical and Dental Sciences, Morphological and Functional Images, University of Messina, Messina, Italy

⁵ Multidisciplinary Department of Medical-Surgical and Odontostomatological Specialties, University of Campania "Luigi Vanvitelli," Naples, Italy

Address for correspondence Vini Mehta, BDS, MDS, Department of Public Health Dentistry, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune 411018, Maharashtra, India (e-mail: vini.mehta@statsense.in).

⁶ Azienda ospedaliera villa sofia-Cervello, Palermo, Italy

⁷ FiDent, Centro Medico Odontoiatrico, Reggio di Calabria, Italy

⁸ Department of Ophthalmology, University Magna Graecia of Catanzaro, Catanzaro, Italy

Eur J Gen Dent 2023;12:67–71.

Abstract

When meat and dairy products are no longer consumed, the practice of veganism, which forgoes the use of animal products, substantially impacts diet. The prevention and treatment of diseases like rheumatoid arthritis, diabetes, neurodegeneration, hypertension, and vascular diseases are usually aided by vegan diets. Vegan diets are associated with improved cardiovascular health and better nutrition quality than omnivorous diets. Vegans and vegetarians have a lower risk of periodontal disease but may be more prone to tooth erosion and dental caries due to deficiencies in vitamin B12 and lower saliva pH. A vegetarian or vegan diet may increase the risk of developing tooth erosion, but an omnivorous diet may increase the risk of periodontal disease and dental caries. Further clinical research must be performed to produce more statistically significant results and to support future studies that contrast omnivore, vegetarian, and vegan diets and their effects on dental health status.

Keywords

- ▶ veganism
- ▶ oral health
- ▶ dental diseases
- ▶ general health
- ▶ vegetarianism

Introduction

Diet, dental hygiene practices, and oral health are intricately linked in many ways. People have become more attracted to veganism in recent years. The adoption of a vegan lifestyle, which abstains from the consumption of animal products, has a profound influence on dietary choices as it excludes the intake of meat and dairy products.¹ In a survey of consumers in the United Kingdom conducted by Statista Global Consumer Survey in 2021, approximately 3% of participants claimed to be vegans. Additionally, a poll from 2021 found

that 41% of respondents in India were identified as vegan, vegetarian, or pescatarian.² Studies have discussed the effect of veganism on general health, but very few studies have discussed the effect on oral health.^{3,4} Thus, this editorial focused on the impact of a vegan diet on general and oral health.

Impact of Veganism on General Health

Vegan diets can frequently help prevent and treat conditions like rheumatoid arthritis, diabetes, neurodegeneration,

DOI <https://doi.org/10.1055/s-0043-1771381>.
ISSN 2320-4753.

© 2023. The Author(s).

This is an open access article published by Thieme under the terms of the Creative Commons Attribution License, permitting unrestricted use, distribution, and reproduction so long as the original work is properly cited. (<https://creativecommons.org/licenses/by/4.0/>)

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

hypertension, and vascular diseases.^{3,4} According to the World Health Organization, cardiovascular diseases are responsible for 43.6% of all fatalities globally.⁵ A study by Benatar and Stewart encouraged lifestyle changes, such as vegetarian, vegan, and plant-based diets, and positive outcomes in managing cardiovascular disease risk variables were seen.⁶ Cardiovascular risk factors in vegans were evaluated in a review of observational studies conducted in 2018, and it was found that vegetarian diets were linked to decreased calorie and saturated fat intake and consumption of more fiber and phytochemicals and better cardiovascular profiles in the majority of countries.^{1,7}

Evidence Suggesting the Effect of a Vegan Diet on General Health

Based on diet quality indices, Parker and Vadiveloo conducted a systematic review and compared the quality of vegetarian and nonvegetarian diets. This evaluation comprised 12 trials and found that vegetarians outperform omnivores regarding nutrition quality. The best outcomes were observed in vegetarians, who consumed the most fruits, green vegetables, whole grains, and vegetable protein sources while consuming the least saturated fat and sodium.⁸

Vegans may risk consuming insufficient amounts of methionine, whereas vegetarian diets offer adequate protein and amino acids.⁹ There is evidence that vegetarians, particularly vegans, have decreased serum levels of vitamin B12. They are causing osteoporosis, death in children, elevated homocysteine, anemia, and developmental delays.¹⁰ A systematic study published in 2019 showed that vegans had reduced bone mineral density and more excellent fracture rates than omnivores, confirmed by quantitative ultrasound.^{11,12} While a considerable body of research examines the effects of a vegetarian diet on overall health, there is a lack of specific information regarding its impact on oral health.

Impact of Veganism on Oral Health

The food, directly and indirectly, impacts the periodontium, which has a substantial impact on immunological response. The nonvegetarian diet causes bleeding on probing and periodontal inflammation compared with a vegan diet.¹³ The high fiber explains this in a vegan diet, which results in reduced food biofilm build-up. Vegetarians have lower periodontal scores, according to Chowdhury in 2022. This might be because vegetarians have better oxidative balance and lower plaque scores. So, a vegan diet is balanced, and this research also demonstrates how a balanced diet benefits the periodontium. Thus, a diet rich in fruits, nuts, and vegetables can aid in lowering inflammation and preventing the onset of periodontal disease. Hence, vegans and vegetarians are less likely than omnivores to experience periodontitis, gingivitis, and other inflammatory disorders of the mouth.¹⁴

Evidence Suggesting the Outcome of Consuming a Vegan Diet on Oral Health

Veganism and Increased Risk of Periodontitis

According to a meta-analysis conducted by Haghghatdoost et al, vegans also experience less inflammation.¹⁵ Vegans, particularly those who consume sufficient plant-based oils, have enough vitamin E and a higher concentration of carotenoids. On the contrary, a plant-based diet increases the risk of vitamin D insufficiency. A deficit in vitamin D causes hypo-calcification and hypoplasia of the enamel, demineralization of the jaw alveoli, and an increased risk of periodontitis. It also has a deleterious impact on calcium status. In addition, calcium from plant sources has a lower bioavailability, contributing to the high prevalence of calcium deficiency and osteoporosis in vegans.¹⁶

Veganism and Vitamin Deficiency

Some vegetarian diets necessitate significantly more chewing, so constant wear and tear may lead to poor oral health. Vegans typically consume less protein than omnivores. Moreover, protein intake impacts the acidity of saliva, which is why their saliva pH is lower. Angular cheilosis, cracked lips, ulcerative gingivitis, periodontal disorders, and sore tongue are all linked to vitamin B1, B3, B6, and B12 deficiency caused by a strict vegan diet. These vitamins and selenium levels intrinsically linked to a higher prevalence of dental caries.^{15,17} Thus, a lack of nutrients may cause oral health issues such as the escalation of recurring aphthous ulcers and the emergence of glossodynia.¹⁸ Too low B12 values can also lead to ulcers afferent to the oral cavity and glossitis, that is, an inflammation of the tongue, which leads to a change in its shape and color, generally leading it to swell and appear more red and sore, not to be confused with oral neoforations.¹⁹

Veganism and Erosion

Also, in vegans, increased consumption of fruits and vegetables, which lowers salivary pH and causes erosive tooth surface loss, may hasten tooth surface loss.¹⁷ The results of the meta-analysis conducted by Smits et al in 2020 suggested that vegans may be at a twice higher risk of tooth erosion as they consume more fruits and vegetables than other diets.^{20,21} Dietary guidance is crucial to maintaining good oral health over the long run because vegan individuals are more susceptible to demineralization and acid erosion. Compared with people who follow a nonvegetarian diet, people who only consume plant-based foods tend to eat more fruit and vegetables, introducing more acidic foods that lower the pH of the saliva. Additionally, this is linked to the emergence of caries.¹⁸ In addition, vegetarians and vegans may be more prone to developing tooth caries by consuming these acidic meals, causing the oral cavity's pH to decrease.

Veganism and Dental Caries

Research conducted in Italy discovered no evidence of a connection between dietary habits, xerostomia, and halitosis in the vegan diet group compared with the omnivore group.²²

However, a vegan diet may predispose patients to demineralization and white spot lesions. Consuming a vegan diet was also linked to a higher risk of dental caries and a more significant number of decayed, missing, and filled teeth, possibly because these diets are deficient in vitamin B12.^{23–25}

Fi-Index Tool

This manuscript has been checked with the Fi-index tool and obtained a score of 0 for the first author only on 17/03/2023, according to SCOPUS.^{26,27} The fi-index tool aims to ensure the quality of the reference list and limit any auto-citations.

Discussion

There have been some hypothesized processes that could account for the associations between a vegetarian diet and positive oral health results. Those who adopt a vegetarian diet typically consume more fruits and vegetables than those who do not. Consumption of these acidic foods may lower the pH level in the oral cavity.²³

Various proposed mechanisms could explain the relationships between a vegetarian diet and successful outcomes in dental health. Vegetarians often consume more fruits and vegetables than nonvegetarians do. Certain acidic meals may cause the pH of the oral cavity to decrease after consumption.¹⁹ There are numerous other food groups besides the meat food group where the vegetarian diet differs from the nonvegetarian diet, including sweets, whole grains, and legumes.^{1,8}

Moreover, individuals may choose a vegetarian diet for a variety of reasons. As dental disorders take time to develop, it is possible that adopting a vegetarian diet from a young age will have a different impact than adopting a vegetarian diet for only a few months or years.²⁸ The vegetarian diet is also linked to a healthier lifestyle; for example, vegetarians may

smoke less, be physically more active, and have lower body mass indexes than nonvegetarians, all of which are linked to better oral health.^{19,29}

Thus, adopting veganism helps reduce dental diseases like dental caries and periodontitis. However, it may cause vitamin deficiencies causing angular cheilosis or ulcerative gingivitis. It may also cause an increased risk of tooth erosion and developing dental caries (► Fig. 1).

The impact of veganism on general and oral health has gained attention in recent years. Vegan diets have numerous health benefits, including preventing and treating rheumatoid arthritis, diabetes, neurodegeneration, hypertension, and vascular diseases. Studies have shown positive outcomes in managing cardiovascular disease risk factors with vegetarian, vegan, and plant-based diets. Vegetarian diets have also been linked to better cardiovascular profiles, decreased calorie and saturated fat intake, and increased consumption of fiber and phytochemicals. The quality of vegetarian diets is superior to nonvegetarian diets in terms of nutrition. Vegetarians consume more fruits, green vegetables, whole grains, and vegetable protein while consuming less saturated fat and sodium. However, vegans may risk consuming insufficient amounts of methionine and vitamin B12, leading to potential health issues such as osteoporosis, elevated homocysteine levels, anemia, and developmental delays. Vegans have been found to have reduced bone mineral density and higher fracture rates compared with omnivores.³⁰

Regarding oral health, a vegan diet has shown positive effects on periodontium. Vegetarian diets, including vegan diets, have been associated with lower periodontal scores, reduced bleeding on probing, and decreased periodontal inflammation compared with nonvegetarian diets. The high fiber content in a vegan diet helps reduce food biofilm build-up, leading to better periodontal health. The balanced nature of a vegan diet, rich in fruits, nuts, and vegetables, can help lower inflammation and prevent the onset of

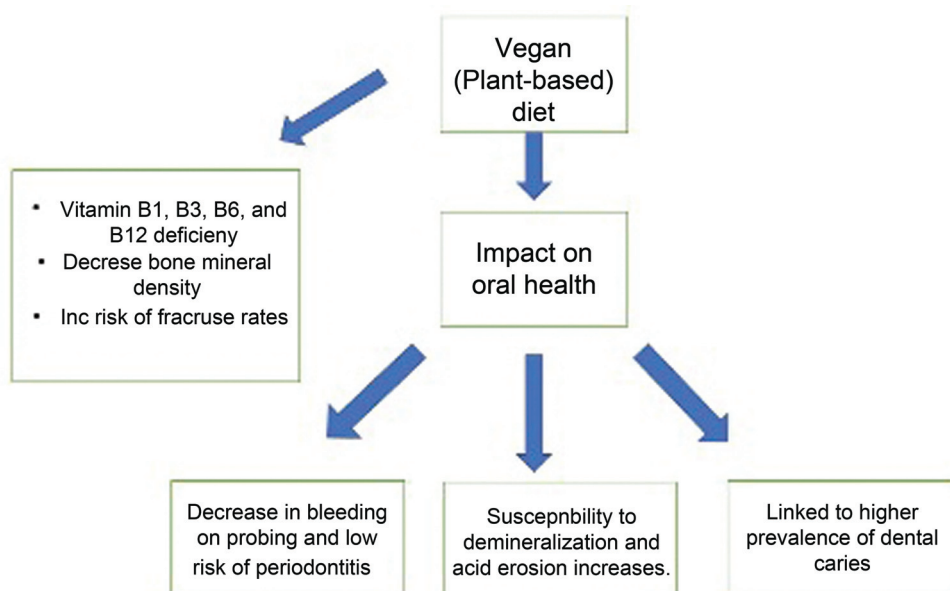


Fig. 1 Schematic diagram representing the impact of veganism on oral health.

periodontal disease.^{15,31} However, there are also potential concerns regarding the oral health of veganism. Vegans may be at an increased risk of vitamin deficiencies, particularly vitamin B12, which can contribute to oral health issues such as angular cheilosis, cracked lips, ulcerative gingivitis, periodontal disorders, and sore tongue.²² Lower protein intake in vegans can affect the acidity of saliva, resulting in lower saliva pH. This acidic environment can contribute to tooth erosion. The increased consumption of fruits and vegetables in a vegan diet, while beneficial in many aspects, can also lower salivary pH and further contribute to erosive tooth surface loss.^{21,32}

Moreover, vegan diets have been associated with a higher risk of dental caries and a more significant number of decayed, missing, and filled teeth, potentially due to deficiencies in vitamin B12. Vegan diets may also require more chewing, leading to wear and tear on teeth. Vegans must be mindful of their nutrient intake and maintain proper oral hygiene practices to mitigate these risks.²¹

Recommendations

As veganism continues to grow in popularity, dentists need to receive additional training to address the specific needs of vegan patients effectively. Dentists can play a crucial role in the holistic care of patients by recognizing potential systemic connections between oral issues and other symptoms. Further clinical investigations are needed to generate more robust evidence and support comparative studies on the impact of omnivorous, vegetarian, and vegan diets on oral health. Future research should also consider additional factors such as socioeconomic status, education, and access to dental care, which can influence oral health outcomes. Dentists require additional training to properly serve the demands of this patient population as veganism becomes a more prevalent lifestyle choice. If we think there might be a systemic connection between patients' oral issues and other symptoms, we can play a critical part in their holistic care as dental professionals. Future clinical investigations must be conducted to generate more statistically meaningful results and support future studies that compare omnivorous, vegetarian, and vegan diets and their impact on oral health status. Future research should also include more characteristics that might affect the outcomes, such as socioeconomic level, education, and other factors that have impacted access to dental care and affected oral habits.

Conclusions

The prevention and treatment of diseases like rheumatoid arthritis, diabetes, neurodegeneration, hypertension, and vascular diseases are usually aided by vegan diets.

- A vegan diet helps in reducing bleeding on probing and periodontal inflammation.
- Vitamin B1, B3, B6, and B12 deficiencies from a strict vegan diet have been related to angular cheilosis, cracked lips, ulcerative gingivitis, periodontal problems, and sore tongue.

- Due to their tendency to eat more fruits and vegetables, vegans may have a twofold increased risk of tooth erosion.
- Consuming a vegan diet was connected to an increased risk of developing dental caries.

Data Statement

Data are available on request to the corresponding author.

Authors' Contributions

V.S.P. and S.K. helped in conceptualization. A.M. contributed to methodology. A.Ma. and D.R. helped in formal analysis. ADC contributed to investigation. MM provided resources. A.M. and G.F. helped in data curation. V.M. was involved in writing—original draft preparation. V.S.P. and S.K. was involved in writing—review and editing V.M. and C.D.A. helped in supervision. L.F. was involved in project administration. All authors have read and agreed to the published version of the manuscript.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Hargreaves SM, Raposo A, Saraiva A, Zandonadi RP. Vegetarian diet: an overview through the perspective of quality of life domains. *Int J Environ Res Public Health* 2021;18(08):4067
- 2 Kim H. Increase in veganism: Is veganism growing in 2022? How fast is it growing? Sentient Media. Published May 13, 2022. <https://sentientmedia.org/increase-in-veganism/>
- 3 Parva NR, Tadeballi S, Singh P, et al. Prevalence of vitamin D deficiency and associated risk factors in the US population (2011–2012). *Cureus* 2018;10(06):e2741. Doi: 10.7759/cureus.2741
- 4 Uwitonze AM, Murererehe J, Ineza MC, et al. Effects of vitamin D status on oral health. *J Steroid Biochem Mol Biol* 2018;175:190–194
- 5 World Health Organization. World Health Statistics 2020: Monitoring Health for the SDGs, Sustainable Development Goals. World Health Organization Geneva, Switzerland, 2020
- 6 Crimmarco A, Springfield S, Petlura C, et al. A randomized crossover trial on the effect of plant-based compared with animal-based meat on trimethylamine-N-oxide and cardiovascular disease risk factors in generally healthy adults: Study With Appetizing Plant-food-Meat Eating Alternative Trial (SWAP-MEAT). *Am J Clin Nutr* 2020;112(05):1188–1199
- 7 Benatar JR, Stewart RAH. Cardiometabolic risk factors in vegans; a meta-analysis of observational studies. *PLoS One* 2018;13(12):e0209086. Doi: 10.1371/journal.pone.0209086
- 8 Parker HW, Vadiveloo MK. Diet quality of vegetarian diets compared with nonvegetarian diets: a systematic review. *Nutr Rev* 2019;77(03):144–160
- 9 Mariotti F, Gardner CD. Dietary protein and amino acids in vegetarian diets—a review. *Nutrients* 2019;11(11):2661. Doi: 10.3390/nu11112661
- 10 Naik S, Mahalle N, Bhide V. Identification of vitamin B12 deficiency in vegetarian Indians. *Br J Nutr* 2018;119(06):629–635
- 11 Iguacel I, Miguel-Berges ML, Gómez-Bruton A, Moreno LA, Julián C. Veganism, vegetarianism, bone mineral density, and fracture risk: a systematic review and meta-analysis. *Nutr Rev* 2019;77(01):1–18
- 12 Menzel J, Abraham K, Stangl GI, et al. Vegan diet and bone health—results from the cross-sectional RBVD study. *Nutrients* 2021;13(02):685. Doi: 10.3390/nu13020685

- 13 Santonocito S, Polizzi A, Palazzo G, Indelicato F, Isola G. Dietary factors affecting the prevalence and impact of periodontal disease. *Clin Cosmet Investig Dent* 2021;13:283–292
- 14 Chowdhury MR, Rajaram SS, Sen UK, Mahapatra AR, Nisha S. Comparative evaluation of periodontal health in vegetarians and nonvegetarians – a cross-sectional study. *Int J Nutr Pharmacol Neurol Dis* 2022;12:153–156
- 15 Haghghatdoost F, Bellissimo N, Totosy de Zepetnek JO, Rouhani MH. Association of vegetarian diet with inflammatory biomarkers: a systematic review and meta-analysis of observational studies. *Public Health Nutr* 2017;20(15):2713–2721
- 16 Akesson B, Ockerman PA. Selenium status in vegans and lactovegetarians. *Br J Nutr* 1985;53(02):199–205
- 17 Galchenko AV, Nazarova AM. Essential trace and ultra trace elements in nutrition of vegetarians and vegans. Part 2. iodine, selenium, chromium, molybdenum, cobalt. *Microelements Med* 2020;21:13–22
- 18 Booth J, Hurry J. The impact of a vegan diet on oral health. *BDJ Team* 2020;7:18–19
- 19 Cervino G, Fiorillo L, Laino L, et al. Oral health impact profile in celiac patients: analysis of recent findings in a literature review. *Gastroenterol Res Pract* 2018;2018:7848735. Doi: 10.1155/2018/7848735
- 20 Cicciù M, Herford AS, Cervino G, Troiano G, Lauritano F, Laino L. Tissue fluorescence imaging (VELscope) for quick non-invasive diagnosis in oral pathology. *J Craniofac Surg* 2017;28(02):e112–e115
- 21 Smits KPJ, Listl S, Jevdjevic M. Vegetarian diet and its possible influence on dental health: a systematic literature review. *Community Dent Oral Epidemiol* 2020;48(01):7–13
- 22 Zumbo G, Costacurta M, Zara F, et al. Diet implications and oral health status of women in central Italy. *Eur J Dent* 2022;16(03):557–563
- 23 Peoples' Friendship University of Russia. Department of medical elementology Moscow, Russian Federation., Galchenko AV. Impact Of Vegetarianism and Veganism On Oral Health. *Int J Dent Oral Sci* 2021;22:65–71
- 24 Pedrão AMN, Andrews Portes L, Padilha Gomes E, Figueira Teixeira FC, da Costa Pereira A, de Oliveira NC. Erosive tooth wear and dietary patterns: A clinical study. *Oral Health Prev Dent* 2018;16(02):145–151
- 25 Azzola LG, Fankhauser N, Srinivasan M. Influence of the vegan, vegetarian and omnivore diet on the oral health status in adults: a systematic review and meta-analysis. *Evid Based Dent* 2023;24(01):43–44
- 26 Fiorillo L. Fi-index: a new method to evaluate authors Hirsch-index reliability. *Publ Res Q* 2022;38:465–474
- 27 Fiorillo L, Cicciù M. The use of fi-index tool to assess per-manuscript self-citations. *Publ Res Q* 2022;38:684–692
- 28 Alcorta A, Porta A, Tárrega A, Alvarez MD, Vaquero MP. Foods for plant-based diets: challenges and innovations. *Foods* 2021;10(02):293. Doi: 10.3390/foods10020293
- 29 Rudloff S, Bühner C, Jochum F, et al. Vegetarian diets in childhood and adolescence: Position paper of the nutrition committee, German Society for Paediatric and Adolescent Medicine (DGKJ). *Mol Cell Pediatr* 2019;6(01):4
- 30 Chauhan B, Nayani N, Sankeshwari R. Effect of vegan diet on general health - a systematic review. *J Clin Diagn Res* 2021;15(06):E01–E5
- 31 Mahriani Y, Indriyanti R, Musnamirwan IA, Setiawan AS. A cross-sectional study on dietary assessment, oral hygiene behavior, and oral health status of adolescent girls. *Front Nutr* 2022;9:973241. Doi: 10.3389/fnut.2022.973241
- 32 Honório HM, Rios D, Júnior ESP, de Oliveira DSB, Fior FA, Buzalaf MAR. Effect of acidic challenge preceded by food consumption on enamel erosion. *Eur J Dent* 2010;4(04):412–417