STAWIŃSKA-DUDEK, Julia, JÓZEFOWICZ, Wiktoria, BRZOZA, Martyna, MACHAJ, Damian and STAWIŃSKA, Kornelia. Does a vegetarian diet have an impact on oral health? A literature review. Journal of Education, Health and Sport. 2025;79:58284. eISSN 2391-8306.
https://doi.org/10.12775/JEHS.2025.79.58284
https://apcz.umk.pl/JEHS/article/view/58284

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu). © The Authors 2025;
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The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 27.01.2025. Revised: 02.03.2025. Accepted: 02.03.2025. Published: 06.03.2025.

Does a vegetarian diet have an impact on oral health? A literature review

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Abstract:

Introduction and Purpose:

Vegetarianism is a diet with high intake of plants and exclusion of meat and poultry. Vegetarian diets are divided into vegan (no animal products), lactovegetarian (no animal meat, but includes milk and eggs), pescovegetarian (eating fish) and semivegetarian (occasional meat consumption) The effect of plant-based diet on oral health is still uncertain and research results are mixed. This review summarizes effects of vegetarian diet on periodontal health, dental erosion, oral microbiome and caries prevalence.

The state of knowledge:

According to the studies, periodontal health is improved in vegetarians, who show better periodontal indicators than omnivores. Vegetarians have a higher frequency of developing NCCL. Tooth erosion is more common in vegetarians because of their high intake of acidic foods, which can cause enamel abrasion and sensitivity. However, some results suggest that there is no significant relationship between diet and erosion. Results on the effects of a

vegetarian diet on the oral microbiome and the incidence of caries are mixed. Some studies show no diet-related differences, while others note favorable microbial profiles in vegetarians and a higher prevalence of Candida species compared to omnivores. Some studies show slightly lower DMFT scores in vegetarians, but these differences are often not statistically significant.

Conclusions:

The relationship between a vegetarian diet and oral health is complex and modified by many confounding variables, such as gender, age, dietary composition, lifestyle or oral hygiene habits. Due to the ambiguous results, more research needs to be conducted on the effects of a vegetarian diet on oral health, especially as it relates to the oral microbiome and the prevalence of caries.

Keywords: caries; dental erosion; oral health; vegetarian diet.

Materials and Methodology: The review is based on the thorough analysis of the materials selected from “PubMed” and “Google Scholar” scientific databases using the following key words: caries; dental erosion; oral health; vegetarian diet. These key words were chosen based on their relevance to the matter of an article.

Introduction:

Vegetarianism is a diet with high intake of plants and exclusion of meat and poultry (1). Vegetarian diets are divided into vegan (no animal products), lactovegetarian (no animal meat, but includes milk and eggs), pescovegetarian (eating fish) and semivegetarian (occasional meat consumption) (2). People become vegetarians because of ethical, social or environmental issues (3,4). The number of vegetarians is increasing worldwide (5,6), in part because of their health benefits, and also their positive impact on the environment (7). Vegetarian diet have a positive impact on body mass index (BMI), levels of cholesterol and glucose and also diseases such as cancer or cardiovascular problems (8–12). Some studies connect oral health with nutrition (5). For example caries and periodontitis with sugar intake and erosion with acidic food consumption (5). The effect of a plant-based diet on oral health is still uncertain and research results are mixed, with some studies showing positive associations (13,14) and others showing negative associations (15,16). This review summarizes effects of vegetarian diet on periodontal health, dental erosion, oral microbiome and caries prevalence.

The state of knowledge:

Periodontal Health

The lifestyle of vegetarians, and their high attention to health, may influence the relationship between vegetarian diet and periodontal health. Evidence shows a correlation between vegetarian diet and periodontal health, but the data are not sufficient to confirm a direct beneficial effect (17,18).

For example Staufenbiel et al. (2013) (19) found that people on plant-based diet had significantly lower periodontal screening index ($p=0.012$), probing pocket depths ($p=0.039$), bleeding on probing ($p=0.001$), a improved hygiene index ($p=0.001$) and less mobile teeth ($p=0.013$). Additionally, Atarbashi-Moghadam et al. (2020) (18) studied a group of raw vegans where a significant reduction in calculus index and debris index was observed, which may have been caused by better oral hygiene. Moreover, Inchingolo et al. (2024) (5) found that vegetarians have a better periodontal health than non-vegetarians, but have more erosions and tooth demineralization. What is more, Menzel et al. (2020) noticed that people on a vegetarian diet had reduced levels of C-reactive protein (CRP) compared to omnivores, which may result in improved periodontal health (6). However, some studies do not substantiate this relationship (20,21). On the other hand, in a study by Linkosalo et al. (1985) (22), no significant difference was observed between calculus and plaque formation in two groups of vegetarians and omnivores with similar oral hygiene status.

It ought to be highlighted that some studies have noted the effect of a vegetarian diet on the emergence of non-carious cervical lesions (NCCL). Vegetarians showed a tendency to have a higher frequency of developing NCCL (3,23). The appearance of NCCL when following a vegetarian diet may be due to the fact that erosions are more common, which can result in NCCL (23).

The effect of a vegetarian diet on periodontal health is modified by a number of factors such as gender, age, dietary composition, lifestyle or oral hygiene habits (3). Oral hygiene habits have a major impact on dental and periodontal health (3). A study by Staufenbiel et al. (2015) (24) showed significantly better oral hygiene habits among vegetarians, although vegetarians were less likely to use fluoride-containing toothpaste. Similarly, Mazur et al. (2020) found that people on plant-based diet had good overall oral health and presented good self-care and self-prevention (17). Furthermore, it has been suggested that a healthy diet results in a lower risk of

obesity, cardiovascular disease, type 2 diabetes and gestational diabetes, most of which are associated with some periodontal diseases (25–28).

Dental Erosion

Erosion is a chemical process affecting the hard tissues of the tooth, without the involvement of bacteria (29) and it is caused as a result of acid exposure (30). The aetiology and pathogenesis of erosion is connected to chemical, biological and behavioural factors (31), that can either prevent or control the progression of tooth erosion (32). People on plant-based diet are eating more fruits and vegetables than non-vegetarians (33,34). What is more fruits consumed in large quantities by vegetarians have a high erosion potential (35–37). Consequently, high acid content of a vegetarian diet, results in a lower pH in the oral cavity (38).

A number of studies suggest the influence of a plant-based diet on the aetiology of white spots, dental erosion, abrasion and erosive tooth wear (19,24,34,39). For instance, Smits et al. (2020) observed that vegetarians have twice the risk of erosion (2). It is worth to notice that enamel erosion can lead to sensitivity, pain and even tooth loss (40). Therefore dentists and the general public should therefore be more aware of this issue (3,17).

On the other hand, the Mazur et al. (2020) study (17) showed contradictory results and found no association between dental caries, recession, erosive tooth wear, abrasion sensitivity, periodontitis and lifestyle habits of vegetarians ($p < 0.05$), excluding the consumption of fresh fruit during the day. Similarly, in the study by Herman et al. (2011) (34), there was no direct association between the vegetarian diet and the incidence of dental erosion and also abrasion. Erosive changes were observed in 39.1 per cent of vegetarians and 23.9 per cent of controls, and this was not statistically significant. Neither the vegetarian diet nor the length of vegetarian diet was a risk factor for erosive or abrasive cavities. The authors emphasise that the aetiology of non-carious cavities is complex and that the destruction of tooth tissue is not necessarily caused exclusively by chemical or mechanical factors. The formation of these cavities can be strongly influenced by the occlusal conditions, the influence of the soft tissues around the tooth, the level of mineralisation of the hard tooth tissues or the properties of the saliva (41–45). Additionally, vegetarians appear to be more susceptible to erosion and abrasion due to the fact that they consume more acidic foods and an abnormal horizontal brushing pattern is more common. The authors found that erosive changes occurred more frequently on labial surfaces

(34) in contrast to the study by Linkosalo and Markanen (1985) where mainly affected were occlusive surfaces (46).

Oral Microbiome and Candida Presence

Research on the effects of a vegetarian diet on the oral microbiota have mixed results (5). Several studies question the effect of diet on the composition of the oral microbiome (47–49).

The results of a study by Inchingolo et al (2024) showed no significant differences between vegetarians and omnivores in terms of oral microbial composition. The authors suggested that oral hygiene may determine oral microbial composition to a more significant extent than diet (5). Similarly, Eberhard et al. (50) found no association between oral microbiota and clinical parameters and confirmed that diet did not change the composition of the oral microbiota.

On the other hand, Khocht et al. (2021) reported that vegetarians have increased levels of *Actinobacteria*, and *Proteobacteria* which connect to healthy gingiva (51). Moreover *Veillonella rogosae* and *Mogibacterium timidum*, characteristic for periodontitis, were found more frequently in omnivores (51).

In addition, Patil et al. (2017) noted a higher prevalence of *Candida* in vegetarians (68.5%) than in omnivores (40.7%) (52). Diet had a significant effect on the diversity of *Candida* species, as evidenced by the presence of *Candida krusei* only in the vegetarian group and mainly *Candida glabrata* and *Candida tropicalis* in the non-vegetarian group (52). *Candida albicans* was more frequently isolated in people on a plant-based diet (52).

Caries Prevalence and DMFT Index

The Decayed, Missing and Filled Teeth (DMFT) index is used worldwide as the most important index to assess oral and dental health (53), and it is the most significant index used in epidemiological studies of community health (54). This index measures the number of teeth with caries, the number of teeth treated and the number of teeth missed due to caries (55).
Smits et al. (2020) (3) noted that DMFT score was slightly lower for people on plant-based diet than in omnivores. The difference between those two grups became statistically insignificant when the adult populations were tested separately. Mixed evidence found on other measures of tooth decay or tooth count for the impact of vegetarian and non-vegetarian diets. Chopra et al. (56) found that children on a vegetarian diet, compared to those who consumed a varied diet,

had higher DMFT index. On the other hand, some studies have found no significant relationship between dietary habits and the incidence of tooth decay (57).

Conclusions

The relationship between a vegetarian diet and oral health is complex and modified by many confounding variables, such as gender, age, dietary composition, lifestyle or oral hygiene habits (3). A vegetarian diet is associated with a healthier lifestyle, as indicated by a lower BMI, lower smoking rates and greater physical activity in vegetarians (58). These factors are associated with better oral health (59,60).

A vegetarian diet has both its strengths and limitations. In terms of positive impact, due to its anti-inflammatory properties, vegetarian diet can be beneficial to periodontal health. At the same time, a high intake of acidic foods, which are the main components of this diet, can cause an increased risk of tooth erosion. Dentists need to be aware of this problem to be able to competently help the patient. The effect of a vegetarian diet on the oral microbiome and the incidence of caries is inconclusive. Due to the ambiguous results, more research needs to be conducted on the effects of a vegetarian diet on oral health, especially as it relates to the oral microbiome and the prevalence of caries.

Disclosure:

Author Contributions:

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Receiving funding: Not applicable - no specific funding.

All authors have read and agreed to the published version of the manuscript.

Funding Statement: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable in this article as no new data were created or analyzed in this article.

Acknowledgements: None.

Conflicts of Interest Statement: The authors declare no conflict of interest.

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