
PERIODONTAL STATUS IN INDIVIDUALS WITH MEDITERRANEAN DIET (LITERATURE REVIEW)

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ABSTRACT

Introduction: The condition of the periodontal tissues can usually be checked by conducting a periodontal screening or examination of the periodontal tissues. From this examination, the health status of the periodontal tissue will be obtained, which can facilitate findings related to periodontal disease. Diet has been reported to be significantly associated with periodontal health. A diet that is known to have a beneficial effect on treating inflammation in the oral cavity is the Mediterranean diet. **Aim:** This literature review discusses the conclusive results of periodontal status in patients or individuals with a Mediterranean diet obtained from several studies. **Review:** The clinical parameters measured on examination of the periodontal tissue to obtain periodontal health status were plaque and calculus scores, bleeding on probing (BOP), probing pocket depth (PPD), gingival recession (GR), and clinical attachment level or clinical attachment loss (CAL). Nutritional factors are known to act as sources of interference and modulation. A diet that lacks micronutrients (vitamins and minerals) can exacerbate the inflammatory response of the periodontal tissues. The Mediterranean diet is known to be low in saturated fat and rich in polyphenols, oleocanthal, lycopene, minerals, fiber, vitamins, and omega-3 fatty acids. This diet can provide antioxidant and anti-inflammatory effects that can affect the periodontal tissue. Although not very numerous, there are studies examining periodontal tissue and periodontal disease in individuals with a Mediterranean diet. These studies require the health status of the periodontal tissues. **Conclusion:** Periodontal health status in individuals with a Mediterranean diet based on several studies shows quite good results, where there is a decrease in scores on bleeding on probing (BOP), pocket depth (PD), clinical attachment loss (CAL), and low plaque index.

INTRODUCTION

Periodontium is a tissue that surrounds the teeth and serves as a support for the teeth, preventing the teeth from becoming detached from the socket. Periodontal tissue is composed of four main components: gingiva,

cementum, periodontal ligament, and alveolar bone. Periodontal disease can be caused by inflammation and damage to periodontal tissue structures caused by plaque bacteria accumulation.¹ Periodontal disease is a prevalent dental and oral health condition frequently encountered. According to the

2010 study published by the World Health Organization (WHO), the occurrence of periodontal disease among individuals aged 35–44 years exhibits a range of 40–75%. In Indonesia, the prevalence of periodontal disease, specifically periodontitis, was reported to be 74.1% based on data from the Riset Kesehatan Dasar (RISKESDAS) in 2018.²

Periodontal disease can be categorized into two main stages based on the severity of damage to the periodontal tissues: gingivitis and periodontitis. In cases of infection or inflammation in the periodontal tissues, the initial infection typically begins at the gingival margin. Subsequently, it progresses in a downward direction towards the root of the tooth, leading to the detachment of the gum attachment. This process results in the formation of a periodontal pocket, which can potentially lead to deterioration of the alveolar bone that surrounds the teeth.³

The condition of periodontal tissues is commonly assessed through periodontal screening or examination. This process helps determine the health status of the periodontal tissues, aiding in the detection of periodontal disease and evaluating treatment outcomes.⁴ The periodontal examination includes various components, such as measuring periodontal pocket depth (PPD), assessing gingival recession (GR), identifying bleeding on probing (BOP), evaluating plaque and calculus scores, as well as clinical attachment loss (CAL). This examination is performed on

each tooth, and the highest recorded score or value is documented for reference.^{5,6}

Periodontal disease is a chronic condition influenced by the immune response to the presence of pathogenic bacteria on the tooth surface. Nutrition plays a crucial role in modulating the immune system. The composition of dietary intake or eating patterns has a significant impact on various health outcomes and represents a modifiable risk factor for periodontal disease. Furthermore, there is a reported significant association between dietary patterns and periodontitis. Healthier eating patterns or improved diet quality have been shown to exert a protective effect on periodontal health.⁸

The Mediterranean diet is one of the dietary patterns known for its beneficial effects on decreasing oral inflammation. International guidelines such as those of the American Heart Association (AHA) and the European Atherosclerosis Society (EAS) cite the Mediterranean diet as an example of a healthy plant-based diet.⁵ This dietary approach originated from the Mediterranean region's European population's eating patterns. The diet emphasizes the consumption of fruits, vegetables, legumes, and cereals as primary sources of nutrition. Olive oil is the primary source of fat, while moderate red wine consumption and limited red meat consumption are observed.

This diet may have a positive effect on the prevention and management of periodontal

diseases because it increases antioxidant activity and displays anti-inflammatory properties in the body.^{7,9,10} Literature provides further insights into various findings related to periodontal health status among individuals adhering to the Mediterranean dietary pattern. This literature review will summarize the evidence from previous literature on the Mediterranean diet.

REVIEW

Periodontal disease

The onset of periodontal disease may be preceded by a series of inflammatory conditions impacting the teeth's supporting tissues. Inflammation of periodontal tissues is an immune response to the accumulation of bacterial biofilm in the periodontium.⁷ The key risk factor for the initiation of periodontal disease is the accumulation of dysbiotic microflora that provides a favorable environment for pathogenic bacteria, including *Porphyromonas gingivalis*, *Prevotella intermedia*, *Aggregatibacter actinomycetemcomitans*, and *Fusobacterium nucleatum*. The aforementioned pathogenic bacteria have the capability to generate compounds that trigger a confined inflammatory reaction inside the gingival tissues. This is achieved by the release of interleukins, prostaglandins, and other cytokines, which in turn stimulate osteoclasts. This process leads to the degradation of periodontal ligaments and the surrounding bone structure, leading to the enlargement of

the gingival pocket, the absorption of alveolar bone, the development of periodontal pockets, tooth mobility, and in certain instances, tooth loss. The significance of nutrition in the prevention of several chronic diseases, such as periodontal disease, has been widely acknowledged.¹² The influence of nutrition on periodontal health has been widely recognized, with numerous studies demonstrating the importance of both macronutrients (carbohydrates, fats, and proteins) and micronutrients (vitamins and minerals) in promoting overall health and regulating pro-inflammatory and anti-inflammatory mechanisms that affect immune responses.^{11,13} The relationship between nutrition and oral health is closely intertwined, as the occurrence of periodontitis is influenced by immune system functioning. Consequently, various nutritional components have been recognized as potential causes of disruption and adjustment.

The consumption of diets that are deficient in fruits, vegetables, and crucial micronutrients, like vitamins and minerals, can potentially worsen the inflammatory response in periodontal tissues. The Mediterranean diet has been recognized for its advantageous impact on mitigating mouth inflammation. The dietary strategy in question is distinguished by its beneficial effects on oral health, mostly attributed to its anti-inflammatory capabilities and the abundance of essential nutrients it contains.

Mediterranean Diet

The Mediterranean diet was first introduced in 1960 by Ancel Keys, who provided a scientific account of it through his renowned research known as "The Seven Countries Study." The current investigation explored the dietary habits of individuals living in the Mediterranean area. The Mediterranean diet refers to the dietary patterns commonly observed in Mediterranean countries. These patterns are characterized by a significant consumption of olive oil, olives, fruits, vegetables, cereals (mainly whole grains), legumes, a moderate to high intake of fish, a moderate intake of eggs, poultry, and dairy products, and a low intake of sugary foods, meats, and meat products. Within the confines of this dietary regimen, the permissibility of wine drinking is contingent upon its moderation, unless such indulgence conflicts with prevailing religious or societal conventions.^{12,14}

A nutritional pyramid has been established taking into account the findings of international scientific consensus and the expertise of the Mediterranean Diet Foundation Expert Group. This pyramid incorporates portion sizes and the availability of locally sourced foods in the Mediterranean region (refer to Figure 1). The nutritional pyramid shown above has been customized to suit the unique circumstances and indigenous customs prevalent in the Mediterranean region. The dietary regimen exhibits a reduced quantity of saturated fat and an

abundance of polyphenols, oleocanthal, lycopene, minerals, dietary fiber, vitamins, and omega-3 fatty acids.

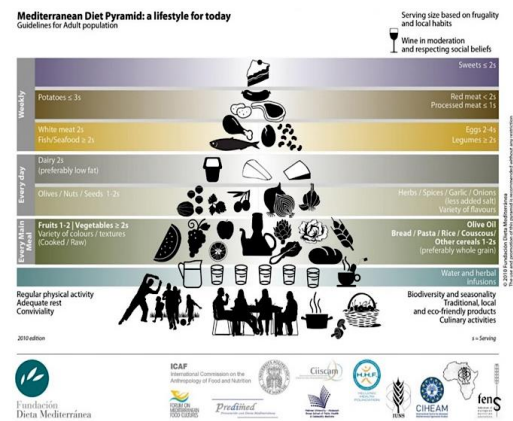


Figure 1. Mediterranean diet pyramid¹⁰

Olive oil constitutes a pivotal element of the Mediterranean diet.⁸ The consumption of olive oil at a high level is a prominent feature of this particular dietary pattern. Olive oil functions as the principal dietary fat source in the Mediterranean diet and is frequently employed in culinary preparations and as a condiment for salads. The predominant fat found in olive oil is Monounsaturated Fatty Acid (MUFA), a type of unsaturated fat.¹⁰ Moreover, olive oil is rich in polyphenols and oleocanths, compounds known for their potent anti-inflammatory activity. While the exact mechanisms are not fully understood, olive oil plays a significant role in enhancing the host's immune response against infections.⁸ In addition to the high consumption of olive oil, the Mediterranean diet is also abundant in fruits and vegetables. Fruits and vegetables containing polyphenols and lycopene act as antioxidants, reducing

oxidative stress. Furthermore, moderate consumption of red wine has been associated with benefits such as enhancing antioxidant and anti-inflammatory processes.^{10,15} Several studies have indicated that the antioxidant and anti-inflammatory effects present in the Mediterranean diet, as well as other healthy diets, can offer favorable outcomes for the prevention and treatment of periodontal tissue conditions.^{7, 12}

Impact of Mediterranean Diet on Periodontal Status

Despite being somewhat limited in scope, there has been research conducted to investigate the impact of the Mediterranean diet on periodontal tissues and periodontal disease in individuals. These studies commonly involve the evaluation of periodontal health status, which encompasses parameters such as bleeding upon probing (BOP), pocket depth (PPD), gingival recession (GR), and clinical attachment loss (CAL) measured at six sites or sides of each tooth. Additionally, plaque and calculus scores are assessed, and in some cases, the presence or absence of tooth loss is recorded within the sample.

Several findings have been drawn from research examining the periodontal status of people who adhere to the Mediterranean diet. A study conducted at the University of Freiburg in Germany examined a cohort of patients who underwent a dietary transition from a Western diet characterized by a high

intake of processed carbohydrates and pro-inflammatory saturated fats to a Mediterranean diet that was low in processed carbohydrates but abundant in omega-3 fatty acids, vitamin C, vitamin D, and fiber. The findings of the study indicated a reduction in scores pertaining to gingival inflammation (GI) and pocket depth (PPD) in relation to the periodontal condition of the individuals involved. Nevertheless, the score for plaque index exhibited no significant alterations.¹³

The present study highlights the potential beneficial impact of the Mediterranean diet on periodontal health, as seen by decreased inflammation and improved periodontal markers observed in persons who adhere to this dietary regimen.

Research conducted by Bartha et al. (2021) and Adolph et al. (2022) has also shown similar findings in terms of periodontal status to the study conducted at the University of Freiburg in Germany. In the study by Bartha et al.¹⁶, a significant decrease in scores was observed in patients following the Mediterranean diet for 6 weeks. The decrease in scores was noted in the clinical parameters of bleeding upon probing (BOP) and gingival inflammation index (GI). However, pocket depth (PD) increased, and plaque values remained constant or showed no change. A reduction in scores for clinical parameters such as pocket depth (PD) and gingival inflammation (GI) was also found in the study by Woelber et al. Similar outcomes were reported in the research conducted by Kondo

et al. on subjects following the Mediterranean diet for 8 weeks. The results of this study demonstrated effective improvements in pocket depth (PD), clinical attachment loss (CAL), and bleeding upon probing (BOP).¹⁶

These studies collectively highlight a consistent trend of positive effects on periodontal parameters, particularly reductions in inflammation and improvements in pocket depth, clinical attachment loss, and bleeding upon probing, among individuals adopting the Mediterranean diet.

In contrast, in another study conducted by Radić et al. (2022)¹⁷ it was found that patients or individuals following a Mediterranean diet with a significant consumption of olive oil had more teeth and experienced a reduction in pocket depth (PD) and clinical attachment loss (CAL), along with lower plaque values. Furthermore, a recent study examining the relationship between specific dietary patterns and the prevalence of periodontal disease in a population-based Northern cohort also indicated that subjects adhering to the Mediterranean diet had significantly lower plaque indices, a greater number of teeth, and a lower severity of periodontal disease compared to those not following the Mediterranean diet. These findings were also replicated in a study by Altun et al. (2021).⁵ The results of their research demonstrated that patients with the Mediterranean diet had a significantly lower likelihood of experiencing periodontitis, and based on their periodontal

status, patients with the Mediterranean diet exhibited lower clinical parameters such as bleeding upon probing (BOP) and plaque index.

Based on these various studies, it can be concluded that, on average, individuals following the Mediterranean diet tend to experience improvements in their periodontal status, including decreased scores in clinical parameters like bleeding upon probing (BOP), pocket depth (PD), and gingival inflammation (GI), as well as having a greater number of teeth. The clinical parameter that often varies is the plaque score, or plaque index. In some studies, the plaque index remains stable (no change), while others show a reduction in plaque index. According to the research conducted by Radić et al.,¹⁷ regular consumption of nuts in the Mediterranean diet can be linked to lower dental plaque.

Furthermore, a reduced risk of gingival inflammation has also been reported in patients with low carbohydrate consumption. Elevated levels of sugar or processed carbohydrates can promote microbiota dysbiosis, which can induce an inflammatory response and lead to glucose dysregulation. This, in turn, can result in deeper periodontal pockets within the periodontal ligament cells, promoting apoptosis, and inhibiting cell proliferation. As a result, diets low in carbohydrates, high in fats, and semi-vegetarian diets like the Mediterranean diet are known to have clinically relevant positive effects on periodontitis clinical parameters.

This includes a reduction in pocket depth (PD) and clinical attachment loss (CAL).¹⁶

Although further scientific support is needed, the relationship between periodontal disease and dietary patterns has shown a clear direction. Balanced diets rich in nutrients and vitamins have the potential to act as protective factors against periodontal disease and may demonstrate the potential to prevent its occurrence.

CONCLUSION

The periodontal status of individuals following a Mediterranean diet, as indicated by several studies, generally demonstrates favorable outcomes. On average, there is a reduction in scores for bleeding on probing (BOP), periodontal pocket depth (PD), clinical attachment loss (CAL), and a low plaque index.

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