BENEFICIAL EFFECTS OF OMEGA-3 FATTY ACIDS ON GINGIVAL AND PERIODONTAL INFLAMMATION

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Abstract: *Periodontal disease is the multifactorial disease that leads to the destruction of the tooth-supporting structures. Periodontitis is a disease that affects approximately half of the general population. It is initiated by bacterial biofilm formation in a susceptible host and is characterised by destruction of the periodontium. There are three major kinds of omega fatty acids; omega-3, omega-6 and omega-9 fatty acids. Among the three mentioned, omega-3 fatty acids are a vital component of the diet as they can minimize inflammation and keep the body healthy. The effects of omega-3 fatty acid intake on gingival and periodontal inflammation have been studied by researchers in recent years. Fatty fish is an excellent dietary source of omega-3. The recommended omega-3 intake can also be met by eating plant-based foods, including omega-3-rich vegetables, nuts, and seeds. There are three main types of omega-3 fatty acid, which are called alpha-linolenic (ALA), docosahexaenoic acid (DHA), and Eicosapentaenoic acid (EPA). Plant sources, such as nuts and seeds, are rich in acid (ALA), while fish, seaweed, and algae can provide DHA and EPA fatty acids. The purpose of this review is to list the best sources of omega-3 fatty acids and the possible therapeutic effect on gingival and periodontal health.*

Keywords: ***Periodontal disease, omega-3, fatty acids, inflammation, fish.***

1. INTRODUCTION

Periodontal disease is an infectious disease characterized by inflammation and subsequent destruction of the supporting structures of the teeth. The prevalence and severity of attachment loss and bone loss increases with age. Inspite of the different perspectives given to the etiology of periodontal disease, microbial plaque is still accepted to be the primary etiologic agent. The microbial composition of dental plaque consists of higher levels of *Porphyromonas gingivalis, Treponema denticola, Bacteroides forsythus* [1].

Gingivitis is a prerequisite for the development of periodontal disease [2]. In 1965 Löe and co-workers demonstrated the influence of dental plaque as an etiological factor for gingival inflammation [3]. A study showed pronounced reduction in

gingival and periodontal inflammation, even though oral hygiene was not performed clearly suggesting intense impact of diet on gingival and periodontal inflammation [4]. A patient with gingivitis can revert to a state of health, but a periodontitis patient remains a periodontitis patient for life, even following successful therapy, and requires life-long supportive care to prevent recurrence of disease.

Omega-3 polyunsaturated fatty acids have a potential anti-inflammatory effect. The beneficial effects of the same on some diseases like rheumatoid arthritis, systemic lupus erythematosus, chronic periodontitis, and the inflammatory bowel disease have been proved [5-11].

ALA, DHA, and EPA

There are three main types of omega-3 fatty acid, which are called ALA, DHA, and EPA. Fish, seaweed, and algae (marine sources) include Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA), and that from plant sources include alpha-linolenic acid (ALA). Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the two members of the omega-3 fatty acid family having anti-inflammatory and immunomodulatory characteristics [12]. Studies have indicated the effect of omega-3 polyunsaturated fatty acids on the reduction of inflammatory biomarkers, cytokines, eicosanoids, and CRPs [13-16].

Reduction in carbohydrate intake, taking additional intake of Omega-3 fatty acids can benefit the periodontal tissues [17-23]. Reduction in the intake of carbohydrates as far as possible to a level <130 g/d which can be considered as a low-carb diet can really prove beneficial to keep the periodontal tissues healthy [24]. The association of carbohydrate consumption and gingivitis has been investigated in some earlier studies [17]. The excessive intake of carbohydrates seems to promote dysbiosis and chronic inflammatory diseases [18, 25].

Modern lifestyle, consisting mainly of refined carbohydrates and a high Omega-6 to Omega-3 fatty acid ratio promotes inflammatory processes. High glycemic index carbohydrates seem to directly promote inflammatory processes via NFkB activation and oxidative stress [26, 27]. It was found a significant higher bleeding on probing in individuals on a high sugar diet compared to individuals on a low sugar diet [28]. Some studies have recommended a diet rich in about 1.5 g/d of EPA/DHA to control inflammatory processes [29].

Sources of omega-3 fatty acid

Common dietary sources of omega-3 fatty acid is cod liver oil, fish oil, and marine animals with a high amount of fat, such as, seabass, oysters, mackerel, salmon, sardines, shrimps, tout. Flaxseed oil and nuts, especially walnuts, are also rich in omega-3 fatty acids [30].

The following types of fish are some of the best sources of these fatty acids (serving size is 28 gms):

1. Mackerel

A serving of mackerel contains:

- 0.59 g of DHA
- 0.43 g of EPA

2. Salmon

One serving of salmon contains:

- 1.24 g of DHA
- 0.59 g of EPA

3. Seabass

One serving of seabass contains:

- 0.47 g of DHA
- 0.18 g of EPA

4. Oysters

One serving of oysters contains:

- 0.14 g of ALA
- 0.23 g of DHA
- 0.30 g of EPA

5. Sardines

One serving of canned sardines contains:

- 0.74 g of DHA
- 0.45 g of EPA

6. Shrimp

One serving of shrimp contains:

- 0.12 g of DHA
- 0.12 g of EPA

7. Trout

One serving of trout contains:

- 0.44 g of DHA
- 0.40 g of EPA

Other sources of omega-3 fatty acid [31]

1. **Chia seeds**

Chia seeds are an excellent plant-based source of ALA omega-3 fatty acids. Chia seeds contain 5.055 g of ALA per 1-oz serving.

2. **Hemp seeds**

Hemp seeds contain 2.605 g of ALA in every 3 tablespoons (tbsp).

3. **Flaxseeds**

Flaxseeds contain 6.703 g of ALA per tbsp.

4. **Walnuts**

Walnuts contain 3.346 g of ALA per cup.

5. **Kidney beans**

Kidney beans contain 0.10 g of ALA per half-cup.

6. Soybean oil

Soybean oil contains 0.923 g of ALA per tbsp.

CONCLUSION

A diet rich in Omega-3 fatty acids and low in carbohydrates may significantly reduce periodontal and gingival inflammation in humans. Daily intake of Omega-3 fatty acids (such as fish oil capsules, a portion of sea fish, two spoons of flaxseed oil etc.), a restriction in the amount of trans-fatty acids as far as possible (such as fried meals, crisps, donuts, croissants etc.) and a reduction in Omega-6 fatty acids as far as possible (such as safflower oil, grape seed oil, sunflower oil, margarine, sesame oil, corn oil etc.). Fatty fish is an excellent dietary source of omega-3. People can also meet the recommended omega-3 intake by eating plant-based foods, including omega-3-rich vegetables, nuts, and seeds.

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