International Journal of Food Science and Nutrition
ISSN: 2455-4898; Impact Factor: RJIF 5.14
Received: 22-11-2019; Accepted: 23-12-2019
www.foodsciencejournal.com
Volume 5; Issue 1; January 2020; Page No. 110-112

Role of omega 3 fatty acids in improving human health

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Abstract
Various studies reveal the health benefits of omega 3 fatty acids as nutritional supplement against life threatening disease like cardiovascular disease, skin disease and many inflammatory diseases. They have been linked to healthy aging throughout life. Fish-derived omega-3 fatty acids EPA and DHA have been associated with fetal development, very mild Alzheimer's disease. Studies have shown that EPA and DHA are important for proper retinal, neuronal development and immune function. Patients with Alzheimer's disease have been shown to be deficient in DHA, and supplementing them with EPA +DHA not only reverses this deficiency, but may also improve cognitive functioning in those patients. However, because our bodies do not efficiently produce some omega-3 fatty acids, it is necessary to obtain adequate amounts. EPA and DHA may be a safe and inexpensive link to a healthier life.

Keywords: heart, nutrition, cardiovascular, nutrition, food, diet

Introduction
Omega-3 [(n-3)] long-chain PUFA, including EPA and DHA, are dietary fats with a number of benefits for the human health [1]. Omega-3 polyunsaturated fatty acids (PUFAs) include α-linolenic acid (ALA; 18:3 ω-3), stearidonic acid (SDA; 18:4 ω-3), eicosapentaenoic acid (EPA; 20:5 ω-3), docosapentaenoic acid (DPA; 22:5 ω-3), and docosahexaenoic acid (DHA; 22:6 ω-3). Omega-3 fatty acids are polyunsaturated, containing more than one double bond. They are called omega-3 because their first double bond is placed at the third carbon atom when counting from the methyl end of the fatty acid.
They are found in many parts of the body like cell membranes [2] and play a role in anti-inflammatory processes and in the viscosity of cell membranes [3, 4]. EPA and DHA are vital for adequate fetal development and healthy aging [5]. DHA is found in abundance in the brain and retina [6].

Neurological
Depression
Those patients who may have depression because of insufficient omega-3 fatty acids can respond well to the diet containing high levels of omega-3 fatty acids and can show positive signs regarding treatment of depression. But this result is shown only when the depression is due to insufficient omega-3 fatty acids in diet [7].

Omega-3 fatty acids and Alzheimer's disease
A Study found that a diet characterized by higher intakes of foods high in omega-3 fatty acids (salad dressing, nuts, fish, tomatoes, poultry, cruciferous vegetables, fruits, dark and green leafy vegetables), and a lower intake of foods low in omega-3 fatty acids (high-fat dairy products, red meat, organ meat, butter) was strongly associated with a lower Alzheimer's disease risk [8].
An aged mouse with Alzheimer's disease was given a DHA rich diet, this resulted in significant reduction of overall plaque burden by 40.3% when compared with placebo. The image analysis of brain sections of hippocampus and parietal cortex showed largest reductions (40–50%) they are also believed to be the regions involved with Alzheimer's disease [9].

Omega-3 fatty acids and fetal development
EPA and DHA supplementation during pregnancy has been associated with multiple benefits for the infant. During pregnancy, the placenta transfers nutrients, including DHA, from the mother to the fetus [10].
The amount of omega-3 fatty acid in the fetus is correlated with the amount ingested by the mother, so it is essential that the mother has adequate nutrition [11].
Several studies confirmed the benefit of omega-3 supplementation during pregnancy in terms of proper development of the brain and retina. Of the 2 most important long-chain omega-3 fatty acids, EPA and DHA, DHA is the more important for proper cell membrane function and is vital to the development of the fetal brain and retina [12].
A study provided a cognitive assessment of children 2.5 y after maternal EPA+DHA supplementation during pregnancy from 20 week of gestation until delivery (n = 33) compared with children in a placebo group (n = 39). Children in the EPA + DHA–supplemented group attained significantly higher scores for eye and hand coordination [mean score, 114 (SD 10.2] than those in the placebo group

[mean score, 108 (SD 11.3)] (P = 0.021, adjusted P = 0.008) [13].

A study by Judge *et al*. found that children whose mothers had taken DHA supplementation during pregnancy (n = 29) had significantly better problem-solving skills at 9 month of age (P = 0.017) than those whose mothers had not taken DHA supplementation during pregnancy (n = 15) [14].

Omega-3 fatty acids and cardiovascular disease

Chronic inflammation is thought to be the cause of many chronic diseases, including cardiovascular disease. EPA and DHA are thought to have antiinflammatory effects and a role in oxidative stress [15].

A study of 89 patients showed that EPA+DHA treated patients had a significant reduction in circulating markers of inflammation, C-reactive protein [16].

EPA+DHA have been associated with a reduced risk of recurrent coronary artery events and sudden cardiac death after an acute myocardial infarction and a reduction in heart failure events. Japanese population has a high relative intake of fish compared with other nations, and, thus, these data suggest that supplementation has cardiovascular benefits in those who already have sufficient baseline EPA+DHA levels [17].

Omega-3 fatty acids have been found to play a role in atherosclerosis and peripheral arterial disease (PAD). The chance of experiencing a cardiovascular event is lessened as supplementation of EPA and DHA improve plaque stability, decrease endothelial activation, and improve vascular permeability [18].

It was found that EPA supplementation is associated with significantly higher amounts of EPA in the carotid plaque than placebo (P < 0.0001), which may lead to decreased plaque inflammation and increased stability [19].

PAD, a manifestation of atherosclerosis, is characterized by buildup of plaque in the arteries of the leg and can eventually lead to complete blockage of the arteries. EPA+DHA supplementation has been shown to improve endothelial function in patients with PAD by decreasing plasma levels of soluble thrombomodulin from a median value of 33.0 mg/L to 17.0 mg/L (P = 0.04) and improve brachial artery flow–mediated dilation from 6.7% to 10.0% (P = 0.02) [20].

Eye health

From observational studies, there is strong evidence to support that supplementation of individuals with omega-3 formulations could lead to disease regression in some types of retinopathies, including age-related macular degeneration and macular dystrophies and also some severe forms of dry eyes. Therefore, using the right dosage regime and with the appropriate supervision, omega-3 supplementation could be a potential therapeutic for different types of oculopathies.[21]

Chiu *et al*. (2009) claim in their study that weekly consumption of two or three portions of fatty fish can be beneficial for ARMD patients. The claim is based on an 8-year study of 3000 patients who were given n-3 omega supplements and monitored for the possible development of macular degeneration. Findings determined ARMD 25% less likely among participants consuming a diet rich in omega 3 fatty acids, EPA and DHA. The authors concluded that the combined consumption of a diet rich in omega 3 with low glycemic index carbohydrates such as whole bread Products rather than processed may diminish the risk of progression of the disease to the advanced state [22].

Seddon *et al*. (2001). In the case study with 349 individuals at the age of 55–80 years, a higher intake of vegetable, monounsaturated and polyunsaturated fats and linoleic acid (n-6 omega PUFA) in 8 years was claimed to be associated with a greater risk for advanced ARMD while diets high in n-3 omega PUFAs and fish were inversely associated with risk for ARMD when intake of LA was low [23].

Skin health

Numerous studies have revealed that clinical imbalances of specific essential fatty acids are associated with a variety of skin problems. Hence dry, itchy, scaly skin is a hallmark sign of fatty acid deficiency [24].

Omega-6 fatty acids are believed to persuade more proinflammatory mediators and have been related with the development of inflammatory acne [25].

Joint health

A meta-analysis support the hypothesis that omega 3 PUFA supplementation improves pain outcomes after three months, particularly with respect to patient assessed pain, duration of morning stiffness, number of painful and/or tender joints, and NSAID consumption. 11 of the 16 studies aL 34 months used a dose of EPA/ DHA above 2.7 g ro-3 PUFAs per day. Significant improvements were noted in patient assessed pain and morning stiffness among studies providing high dose but not low-dose rrl-3 PUFA supplementation [26].

A randomized double blind clinical trial was performed on 60 patients (49 females, 11 males) over a 12 week period where packages containing supplements of omega-3 were distributed. Patients consumed 2 omegas - 3 capsules daily which contained 1.8 and 2.1 grams of EPA and DHA, respectively. Afterwards, patients were evaluated every four weeks for three months. Omega - 3 reduced the ESR in patients and had positive effects. The results of this study show that early use of omega – 3 supplements along with DMARDS treatment in patients with newly diagnosed RA can be effective in reducing symptoms [27].

Conclusion

From the above summarised studies, it can be concluded that supplementation of omega 3 fatty acids in various diseases like cardiovascular disease which includes peripheral arterial disease, skin disease like acne, inflammatory diseases like arthritis can be done. It is shown to have importance in the fetal life for proper developmental processes inside the womb, then it required in the growing years of childhood where it contributes to eye health, brain development, and growth of skeletal system. Further it is required throughout life for the maintenance of skin for protection it against harmful UV rays, prevention of cardiovascular diseases. Since omega 3 is supposed to be taken from outside and is not synthesized by the body, the supplementation in the form of tablets or consumption of omega 3 rich food substances is necessary on a daily basis.

Recommendation

This reviews focuses on few aspects of health. A variety of more and less explored areas of health can be focussed upon in the future.

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