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Omega-3 Fatty Acids as a Treatment for Eating Disorders: A Systematic Review of the Literature

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Abstract

Background: Eating Disorders (ED) are widespread, disabling and often chronic psychiatric conditions. Currently, there is a need for further pharmacological treatment strategies. The objective of this report is to assess the effectiveness of omega-3 fatty acids in treating patients with eating disorders.

Method: Following the guidelines stipulated by the Cochrane Handbook for Systematic Reviews of Interventions, we conducted a comprehensive literature search in the MEDLINE, EMBASE, and PsycINFO databases. Articles that assessed the administration of omega-3 fatty acids in patients with ED and measured changes in eating disorder or comorbid illness symptoms were obtained.

Results: We identified 71 potentially relevant articles. However, only 3 studies were included for analysis. There were notable differences in dosage and type of omega-3 fatty acid used. Two of the three studies reported significant improvement in mood and general functioning.

Conclusion: Omega-3 fatty acids may be viable agents that are well tolerated, with minimal or no side effects, for patients with eating disorders. This report highlights significant knowledge gaps in omega-3 fatty acid treatment for eating disorders and suggests that there is a need for further research on this topic.

Keywords: Eating disorder; Treatment; Omega-3 fatty acid; Nutritional supplements

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Introduction

Dietary fats, specifically essential fatty acids, have recently received significant attention as a potential treatment for various mental illnesses, including major depression, bipolar disorder, and dementia [12]. Omega-3 (n-3) and omega-6 (n-6) fatty acids are two particular classes of polyunsaturated fatty acids that are essential components of neuronal phospholipid membranes. A high ratio of n-6 to n-3 fatty acids can promote neuro inflammation and is linked to negative alterations in brain functions [12]. Given that fatty acids cannot be synthesized de novo, there is a possibility that the lack of consumption of fatty acids can significantly influence the composition of phospholipid membranes and lead to psychopathology.

A growing body of literature has investigated the use of n-3 fatty acids in treating patients with major depressive disorder [10]. Reported that patients with depression have abnormal n-3 fatty acid metabolism and that these alterations

were not reversed in traditional antidepressant therapy. These authors suggest that depression might persist despite the successful use of antidepressants. In addition, [8] divided a group of 60 outpatients with depression into 3 subgroups: fluoxetine only, n-3 fatty acid only or a combination of both treatments. They found similar improvement in general symptoms of the monotherapy groups compared with baseline and significantly greater improvement in general symptoms in the combined therapy group. Third, [11] conducted a placebo-controlled study of participants with major depressive disorder already undergoing antidepressant therapy and found better outcomes in the treatment group administered a modified n-3 fatty acid. Finally, a recent systematic review has highlighted several epidemiological studies that suggest an inverse association between n-3 fatty acid intake and depressive symptoms [4].

Despite the evidence above, the treatment potential of n-3 fatty acids has not received similar investigative attention in the ED literature. Several studies have shown that the fatty acid profiles of patients with Anorexia Nervosa (AN) indicate deficiencies of essential fatty acids [7, 9]. These studies also indicate that fatty acid composition in plasma phospholipids changes during the course of AN. However, a more recent investigation by [14] has shown that proportions of eicosapentaenoic acid and docosahexaenoic acid (two particular types of n-3 fatty acids) among patients with short-duration ED did not differ from controls, suggesting that it is individuals with long-standing illness that may be at greater risk for depleted n-3 fatty acids. Given the emerging evidence for the utility of n-3 fatty acid treatment among individuals diagnosed with depression and the growing evidence base suggesting that individuals with ED may be at risk for depleted fatty acid profile, the current study aims to systematically review the literature investigating n-3 fatty acid supplementation as a form of intervention for patients with ED.

Methods

Following the principles of the Cochrane Handbook for Systematic Reviews [6] and the Users' Guides to the Medical Literature [5], we systematically reviewed the literature to identify studies evaluating the use of n-3 fatty acids as a primary or adjunctive treatment for patients diagnosed with ED.

Assessment of Study Eligibility

The criteria for inclusion in the study were articles that (1) implemented any study design and were published between January 1980 and December 2013; (2) were published in the English language; (3) recruited human participants of any age; (4) utilized n-3 fatty acids as a primary or adjunctive intervention within the ED treatment approach, and (5) reported outcomes such as eating disorder symptoms, body weight, or co-morbid symptoms.

Search Strategy

Two independent reviewers (AUTHOR INITIALS) screened the following three databases to locate relevant articles: MEDLINE, EMBASE, and PsycINFO. The key words and Medical Subject Headings used consisted of "eating disorders", "anorexia nervosa", "bulimia nervosa", "eating disorder not otherwise specified", "treatment outcome", "adjunctive treatment", "dietary supplements", "weight related or weight disorders", "omega-3 fatty acids", "eicosapentaenoic acid", "docosahexaenoic acid", and "fish oils". The references of these articles were also reviewed for studies not found in the database searches.

Study Selection and Data Collection

Both reviewers (BP, MK) assessed each potential article for inclusion and eligibility. In the case of a disagreement, a third reviewer (JC) assessed the article for eligibility. If any additional information about potential studies was needed, the corresponding author of the publication was contacted. Both reviewers independently extracted any relevant data using a pre-piloted data extraction form and further validated the extracted data through an iterative discussion. The data collected included demographic data, type of ED, type of n-3 fatty acid provided and dosage, and any outcome data.

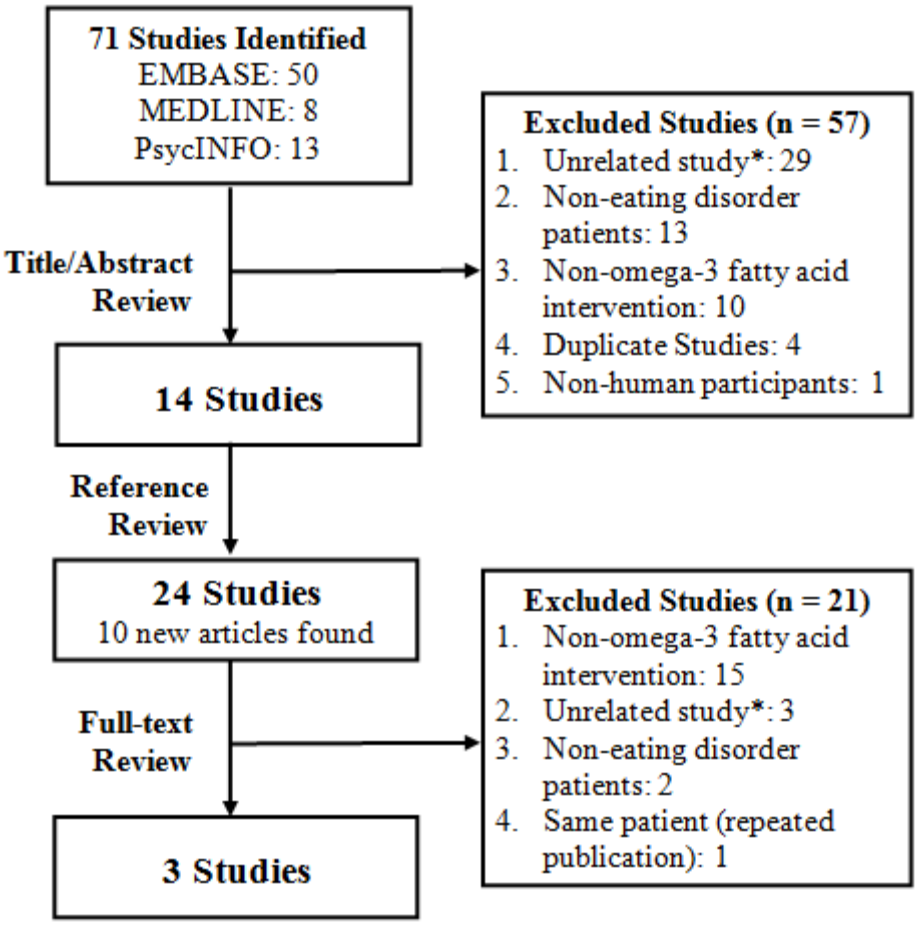
Results

The initial search yielded 71 studies for title and abstract review. Of these, 14 studies were retrieved for full-paper review. Ten new articles were found upon screening of references, which led to a total of 24 studies for full review.

Excluded Studies

After full-paper review, 21 of the 24 potential studies were excluded for the following reasons: focusing on non-ED populations, focusing on non-n-3 fatty acid interventions, being duplicate studies, or including non-human participants (Figure 1).

Figure 1: Flow diagram displaying search results, inclusion, and exclusion from MEDLINE, EMBASE, and PsycINFO



*Unrelated studies are those that do not focus on either the ED population or administer n-3 fatty acids as an intervention.

Included Studies

The three studies included in our final review were published between the years 2004 – 2007 [2, 3, 13]. The study sample sizes ranged from 1-26 participants. The total number of participants across all three studies was 34. The mean age of participants was 21.6 years (Table 1). The participants from all three included studies were diagnosed with AN. Seventeen (50%) of the participants were diagnosed with the restrictive subtype, and 17 (50%) with the binge eating/purging subtype (Table 1). The included studies used a combination of Ecosapentaenoic Acid (EPA) (66.7%), docosahexaenoic acid (DHA) (66.7%) and/or arachidonic acid (AA) (33.3%) as the source of essential n-3 fatty acids. Dosages were only reported by two of the included studies.

Table 1: Characteristics of Included Studies

Reference	Methods	Participants	Intervention	Outcomes	Key results and conclusions
Ayton, Azaz, Horrobin [16] Location: Europe (U.K.)	***Open case series*** All patients offered standard treatment, intervention Study end point: 3 months	7 adolescents with: AN restrictive subtype Age: 15.8 ± 3.0 years ICD-10 criteria for AN	1g/day Ethyl-EPA for 3 months	Change in body weight (kg) BDI-2 EDI-2 CGAS Morgan-Russell Scale	5/7 showed improvement in mood and a marked improvement on psychometric measures. Generally, there was a significant increase in mood after the first 6-8 weeks of treatment, and this was accompanied by improved general functioning. In those patients who stopped E-EPA treatment, there was deterioration in mood, and in weight and growth at about 2-3 months after the cessation of the treatment.
Barbarich et al.[17] Location: North America (U.S.)	***Open trial*** Random allocation to active or placebo group (both received fluoxetine) Study end point: 6 months	26 participants with AN a) restricting (10) b) restricting/ purging (6), c) binge eating/ purging (10) Age: 23.0 ± 6.3 years	Active group tryptophan, vitamins, 4 fish oil capsules (600 mg DHA & 180 mg AA) per day Placebo group starch, high oleic sunflower oil	Mean weight gain (kg) STAI-Y Y-BOCS	The use of nutritional supplements containing […] essential fatty acids did not increase the efficacy of fluoxetine in individuals with AN. When assessed at end point, mean weight gain, mean changes in anxiety or obsessive and compulsive symptoms were not significantly different between active and placebo groups.
Ross[18] Location: North America	***Literature review with a case report*** Study end point NR	A 27-year-old woman with AN binge eating/purging subtype	Supplement regimen with n-3 fatty acids containing EPA & DHA (dosage NR), valerian, and other micronutrients	Change in ideal body weight (kg) "Psychological testing" Specific scales NR	74% ideal body weight to 90% at time of discharge. The patient's depression scores at time of discharge showed only a minimal level of depression compared with a severe level at time of admission Her anxiety had decreased significantly […] and the patient learned mind-body skill for managing anxiety

Abbreviations*:* BDI, Beck-Depression Inventory; EDI, Eating Disorder Inventory; CGAS, Children's Global Assessment Scale; STAI, State-Trait Anxiety Inventory; Y-BOCS, Yale-Brown Obsessive Compulsive Scale; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; AA, arachidonic acid; NR, not reported.

Effectiveness of n-3 fatty acids to treat eating disorders

Barbarich et al. (2004) completed a randomized open trial among 26 participants with AN to assess whether n-3 fatty acids increased the efficacy of fluoxetine in reducing ED and comorbid symptoms. When assessed after six months, there were no significant differences between the active and the placebo group. However, the comparison was limited to those who completed the treatment protocol (n=9) and therefore, the authors could not statistically control for any potential confounding factors. Ross (2007) reported a case of a 27-year-old woman with AN who was being treated with a supplement regimen that was comprised of EPA, DHA, and other micronutrients (Table 1). Ross (2007) reported that the patient's depression and anxiety decreased significantly after treatment. The only study to solely focus on essential fatty acids was an open case series by [2]. Seven adolescents with AN were administered ethyl-EPA alongside the standard treatment at their clinic. After three months of treatment, the authors reported significant improvements in several areas. In patients who stopped ethyl-EPA treatment, there was deterioration in mood and weight within 2-3 months. The authors reported that this was consistent with the rate of depletion of EPA from red cell membranes.

Discussion

The present review has found that there is a lack of primary research testing the effectiveness of n-3 fatty acids as an intervention for patients with ED. Only case reports and small pilot studies exist. Two of the three included studies reported an improvement in ED symptoms as well as co-morbid conditions due to n-3 fatty acid treatment. It is interesting to note that both studies that used EPA as an intervention reported an improvement in outcomes for patients with ED. Conversely, the study that administered AA and DHA reported no improvement in outcomes.

The limitations of this review include the paucity of available studies in the area of n-3 fatty acids for the treatment of ED. Only three studies could be located, two of which are case studies and are intrinsically at a high risk for bias. Thus, our results are limited by the availability of high quality studies in patients with ED. Moreover, we have limited information about the potential influence of age and type of ED on the effectiveness of n-3 fatty acids to reduce ED and co-morbid symptoms. All of the included studies focused solely on AN, with no articles targeting patients with Bulimia Nervosa or Eating Disorder Not Otherwise Specified (EDNOS: now referred to as OSFED in DSM-5 [1]. This is particularly problematic given evidence suggesting that the prognosis of patients with ED is heavily dependent on the type of the ED diagnosed, the age of the patient and the age of onset of the ED.

From the present review, it should be noted that more promising outcomes were reported within the case series which focused on the adolescent population. N-3 fatty acids are responsible for almost 20% of the brain's dry weight and are intrinsically connected to the communication of neurons in the brain. It is possible that n-3 fatty acids play a significant role in brain development among adolescents and should be considered a plausible and important area for future research. Given the promising results illustrated from n-3 fatty acid trials among patients with other mental illnesses, there is merit in investigating the utilization of n-3 fatty acids in the treatment of ED, particularly in the adolescent population.

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