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SYSTEMATIC REVIEW

Omega-3 Supplementation for Adolescents and Young adults to Combat Symptoms of Anxiety and Depression

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Abstract

Anxiety and depression are prevalent mental health disorders among adolescents and young adults, with significant global implications. While pharmacotherapy and psychotherapy remain as standard treatments, interest in nutrition-based interventions, particularly omega-3 fatty acid supplementation, is growing due to their potential neuroprotective and anti-inflammatory properties.This systematic review evaluates the relationship between omega-3 fatty acid supplementation and its impact on symptoms of anxiety and depression in adolescents and young adults. A systematic search of four databases (Cochrane Library, PubMed, Web of Science, and Embase) identified randomized controlled trials, meta-analyses, and cohort studies published within the last eight years. Inclusion criteria targeted youth aged 7–30, with primary diagnoses of anxiety and/or depression, focusing on omega-3 supplementation alone or combined with traditional therapies. Data extraction adhered to PRISMA guidelines, assessing outcomes related to mood, anxiety, and cognitive performance. From 521 screened studies, 19 trials involving 1,854 participants met the inclusion criteria. Findings indicated modest improvements in depression severity, particularly when omega-3 supplementation was combined with antidepressant therapy. Anxiety outcomes were inconsistent, with dietary modifications showing more promise than standalone supplementation. Dosages exceeding 2g/day of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) appeared more effective over durations of 10–12 weeks. However, heterogeneity in study designs and dosages limited definitive conclusions.Omega-3 supplementation demonstrates potential as a complementary treatment for depression, particularly when integrated with conventional therapies. Evidence supporting its efficacy for anxiety is less robust. Future research should address optimal dosages, long-term outcomes, and the mechanisms underlying omega-3's therapeutic effects. While omega-3 has been reviewed to be safe and well-tolerated, omega-3 fatty acids are best utilized as part of a holistic treatment strategy.

Key words: omega-3 fatty acids, Depression, Anxiety, adolecents, young adults, Fish oil, supplementation

1 | INTRODUCTION

Anxiety and depression are leading causes of disability and illness in adolescents and young adults. Globally, one in five suffer from anxiety and depression contributing to 13% of total global disease (World Health Organization, 2024). In addition, diagnosis of depression has increased from 2017-2021 by 55.5 % after the COVID-19 pandemic (Adams et al., 2022). According to the Department of Health and Human Services (2024), depression is the second leading cause of mortality among ages between 10-34. Failure to combat mental health disorders in early adolescence hinders growth and development into young adulthood as well as limits (WHO, 2024).

The WHO emphasizes adolescence as a critical phase of significant physical, mental, emotional, social, and environmental changes that elevate the risk of mental health conditions (WHO, 2024).

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Exposure to stressful events during this period can increase vulnerability to comorbidities (Department of Health and Human Services, 2024). Anxiety and depression may disrupt cognitive function, decrease mood, stimulate social withdrawal, and can eventually lead to physical health issues (Department of Health and Human Services, 2024). Alarmingly, 41% of young adults do not access mental health services when compared to adults (Adams et al., 2022). Stigma surrounding Major Depressive Disorder (MDD) continues to remain untreated and underreported (Bhatia et al., 2007). While awareness of mental health is rising, effective diagnostic treatment options are crucial for youth populations.

Pharmacotherapy is one of the main forms of treatment including medications such as Selective Serotonin Reuptake Inhibitors (SSRIs) and Monoamine Oxidase Inhibitors (MAOIs). Although antidepressants have been shown to be ineffective alone, psychotherapy, exercise, social support, and nutrition strategies are essential for improving outcomes (Parish et al., 2023). Integration of multiple therapies may address the complex nature of mental health disorders, providing a more multi-faceted approach to recovery.

Nutrition therapy among mental health disorders has been recognized to show positive benefits initiating therapeutic signals to the brain and body to prevent further decline (Muscaritoli et al., 2021). Current literature has investigated the potential effects of omega-3 polyunsaturated fats including eicosapentaenoic acid (EPA) and docosahexaenoic Acid (DHa) on symptoms of anxiety and depression (Su et al., 2018). Omega-3 fatty acids aid in cell signaling and may change structures of cell membranes similar to antidepressants (Su et al., 2018). In addition, omega-3 fatty acids may stimulate neurotransmission of serotonin and dopamine which are essential in regulating chemical processes such as mood, digestion, metabolism, feelings, and sleep (Wani et al., 2015). Most young individuals do not obtain enough omega-3 fatty acids within their diet to obtain their benefits. Foods high in omega-3 fatty acids include fatty fish, nuts, seeds, avocados, and berries (Dempsey et al., 2023). Optimal levels of omega-3 fatty acids within young individuals can decrease inflammatory markers and improve cognitive function (DiNicolantonio et al., 2020). Ensuring adequate intake of omega-3 fatty acids with a balanced diet can be essential to support overall health and prevent development of comorbidities.

In this systematic review, the primary objective is to evaluate the relationship between omega-3 fatty acid intake and symptoms of anxiety and depression in adolescents and young adults. Deficiency in dietary omega-3 fatty acids may increase an adolescent's risk for mental disorders as well as stunt growth and development in a critical period. With increased resources for health professionals, it is vital treatments become well-rounded to meet the individual needs of diverse populations. Dietary approaches, alongside pharmacological treatments and psychotherapy are increasingly recommended by physicians for managing mental health, recognizing the importance of nutrition in overall well-being. Omega-3 fatty acids are a key nutrient needed for proper brain health; therefore, they may show significant benefits in individuals experiencing poor mood and function (Dempsey et al., 2023). In this analysis, we hypothesize supplementation of omega-3 fatty acids in younger populations will aid in their mental health and reduce episodes of depression and anxiety.

2 | METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was incorporated to extensively collect documents and conduct an analysis on research outcomes (Page et al., 2021). This systematic review has been registered with PROSPERO, an international registry for systematic reviews linked to research in health care. PROSPERO registration number is CRD42024566601.

Search Strategy

Four electronic databases were utilized (Cochrane Library, PubMed, Web of Science and Embase). Medical Subject Headings (MeSH) word terms were set to filter current literature pertaining to the topic of research. "Omega 3" and "Mental Health" or "Depression" or "Anxiety" "Adolescents" are some

examples of MeSH terms created to provide relevant material. The results of this search were limited to randomized clinical controlled trials, meta-analysis, crossover studies, and/or cohort trials. A full search strategy, utilizing Boolean operators, was then used to further navigate through articles and can be located on Table 1.

Table 1. Search Terms for Data Extraction

Search No.	Search Strategy	No. of References
1	(Adolescents OR Students OR Young Adults OR College Students OR University Students) AND (Omega-3 OR Polyunsaturated fats OR Fish Oil OR EPA OR DHA) AND (Mental Health OR Depression OR Anxiety OR Mood OR Cognitive Function)	692
2	(Student OR Young Adult OR College Student OR University Student) AND (Omega-3 OR Polyunsaturated fats OR Fish Oil OR EPA OR DHA) AND (Mental Health OR Depression OR Anxiety OR Mood OR Cognitive Function)	421

Eligibility Criteria

Scientific literature containing randomized clinical trials, meta-analysis, cohort, and crossover designs were included within this review. Research analyzing the relationship between omega-3 fatty acid supplementation through pills or diet was also extracted focusing on adolescent and young adult populations between the ages of 7-30. Studies must have been published within the past 8 years and be published in English. Subjects involved in studies must be related to mental health, depression, and anxiety. All subjects must be human and contain no other severe comorbidities. Exclusion criteria were also set to remove duplicate articles, animal studies, and review articles. Table 2 provides a list of set criteria to collect articles for analysis.

Table 2. Eligibility Criteria for Review

Criteria	Inclusion	Exclusion
Age	7-30 yrs old	<7, or >30yrs old
Gender	Female/Male	n/a
Setting / Country	United States, Other countries	n/a
Health Status / Problem / Condition	Depression, Stress, Anxiety, BPD, Mental health disorders	Schizophrenia, Psychosis, PTSD, Cancer, other chronic health conditions
Intervention / Exposure	Omega-3 fatty acid supplementation, high EPA/DHA diet, fish oil supplementation	Vitamin D co-supplementation, antibiotics, probiotics, cardiovascular medications
Outcome	Improvement on mental health, mood, symptoms of anxiety/depression	Behavioral issues, weight, ADHD
Study Design Preferences	Clinical trial, RCT, Cohort studies, Meta Analysis, Crossover	Systematic review, case reports
Size of Study Groups:	At least 10 in each study group	<20 total between control/outcome groups
Language	English	Any other language
Publication Year Range	Studies within the past 8 years	Studies published longer than 8 years.
OTHER	Human subjects	Rats, mice, other animal subjects

Data Extraction and Quality Assessment

Following the PRISMA framework, the primary author extracted data, which was organized by study design, participants, study criteria, duration, outcomes, and results. Additional characteristics such as statistical analysis, exposures, supplement type, demographics, and confounding variables were also implemented in the charting process to assess quality

of studies (Page et al., 2021). The Evidence Analysis Library (EAL, 2024) quality criteria checklist was used to develop a thorough review of possible bias, reliability of methods outcome measurement, statistical significance, possible confounders, and overall quality. This system of quality assessment provides consistency, prevents bias, and ensures validity is being represented across all articles.

3 | RESULTS

Out of 521 records screened, 475 records were initially screened, with 475 evaluated by the primary author. After applying inclusion criteria, 451 studies were excluded leaving 19 clinical trials that met the criteria for analysis. A total of 1,854 participants were included, with a mean age of 16 and intervention durations ranging from 6-24 weeks.

Characteristics of Clinical Trials

Of the 19 clinical trials reviewed, 13 focused on adolescents diagnosed with DD or MDD (Fristad et al., 2016; Li et al., 2024; Gabbay et al., 2018; Osuna et al., 2023; Arnold et al., 2017; Paduchova et al., 2021; Oracova et al., 2022; Katrencova et al., 2020; Zhang et al., 2019; Trebatika et al., 2020; Llavaska et al., 2024; McNamara et al., 2022; Stadterman et al., 2016), while the remaining six trials examined young adults under the age of 37. Three studies recruited participants through academic institutions (Ginty et al., 2015; Stadterman et al., 2019; Trebatika et al., 2020). The other three trials conducted analysis on young adults under the age of 37 with diagnosis of depression (Herselman et al., 2022; Reigada et al., 2021; Francis et al., 2019) Omega-3 fatty acids were predominantly tested in combination with antidepressant therapy. Only one study from Stadterman and colleagues (2019) tested omega-3 as a standalone treatment. The daily dosages of Omega-3 PUFAs ranged from 500-2400mg per day based on recommendations for adolescents and young adults. Overall, studies were conducted across multiple countries including the U.S., Sweden, Europe, India, China, Iran, Australia, and Canada. Female participants generally outnumbered male participants within studies. Table 3 provides a summary of characteristics among each article included in this review.

Psychological Tests

To assess the severity of depression, a variety of instruments were used including the Child's Depression Index (CDI), The Child's Depression Rating Scale Revised (CDRS-R), the Beck Depression Inventory (BDI), Montgomery–Åsberg Depression Rating Scale (MADRS), and the Inventory of Depressive Symptomology (IDS). According to the American Psychological Association (2023), the tests measure cognitive, behavioral, and affective signs of depression, providing a comprehensive understanding of mood, thoughts, and feelings associated with depression symptoms. Each instrument has been validated for reliable, clinical use through evidenced based studies and aid in determining symptoms of depression, anxiety, and track progression of treatment (American Psychological Association, 2023).

Primary Outcome – Symptoms of Depression

The primary outcome measured was the severity of depression, which was evaluated in 17 studies that tested treatments of omega-3 supplementation either alone or in combination with antidepressants or psychotherapy. Fristad and associates (2016) revealed omega-3 monotherapy and combined treatments had marginal differences in reducing depression severity (p=0.079, d = 0.39) suggesting a small but possibly clinically meaningful effect. Furthermore, Arnold and colleagues (2017) found minimal improvements in CDRS-R scores (p= 0.048) while combined treatment also had a modest effect (p= 0.050) over time. The study found a negative correlation between dosage (2g/day) and depression severity (r = -0.34, p < .001). Similarly, studies from Paduchova et al., (2021), Trebatika et al., (2020), and Osuna et al., (2023) reported non-significant improvements in depression severity when omega-3 supplementation was compared to placebo, suggesting limited efficacy in monotherapy (p < 0.05). On the other hand, Li and associates (2023) presented a significant reduction in MADRS scores (β = −5.54, p = .00027) suggesting omega-3 supplementation may be effective when combined with other therapeutic approaches. Overall, the evidence indicates omega-3 fatty acids may have modest effects on reducing depression severity, especially when

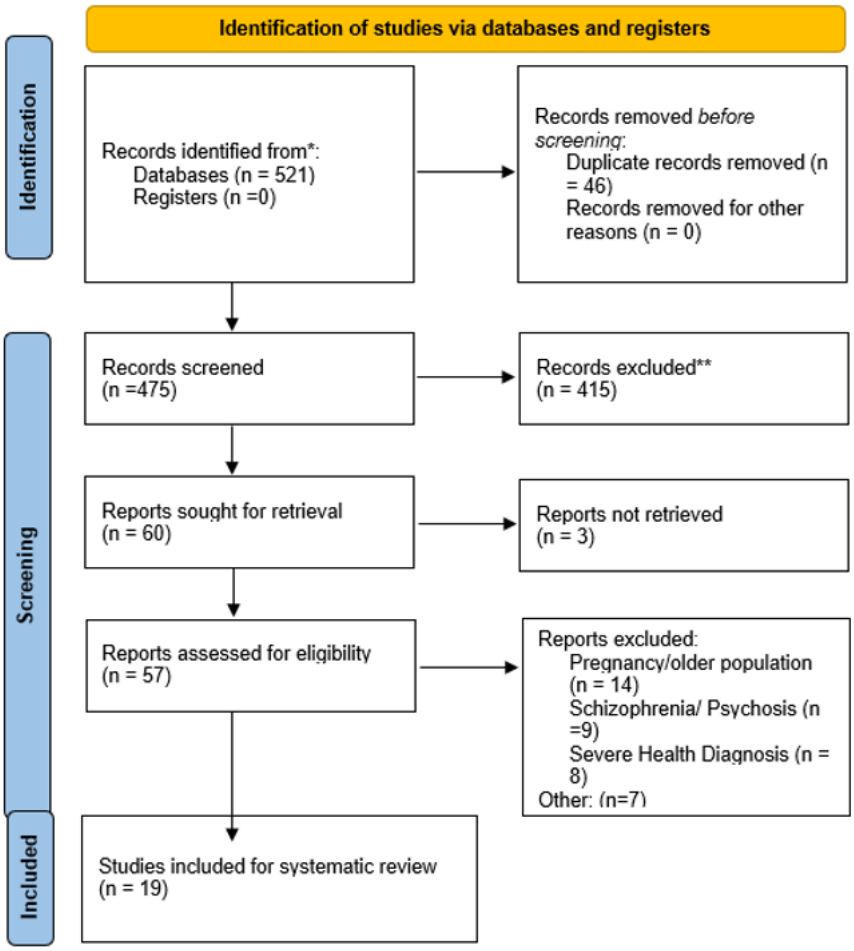

Fig. 1: PRISMA Flowchart of Systematic Review Screening Process

combined with other therapies such as antidepressants and psychotherapy.

In addition, recent research over the past eight years has examined the stress factors that impact young students diagnosed with depression, with a focus of omega-3 fatty acid supplementation. Six key studies conducted across various colleges and universities shed light on this relationship (Gabbay et al., 2018; Ginty et al., 2015; Herselman et al., 2020; Reigada et al., 2021; Staderman et al., 2019; Trebatika et al., 2020). According to Ginty and co-researchers (2015), a significant difference (p= 0.04) among intervention and control groups were observed after supplementation with 67% of individuals receiving supplementation no longer obtaining a BDI score greater than or equal to ten. A significant reduction (p= 0.032) in symptomology was shown in undergraduate students diagnosed with clinical depression with a significant main effect for time rather than group without treatment (Ginty et al., 2015). According to Stadterman and colleagues (2019), severity of depression scores decreased over the ten weeks of intervention, as measured by the CDRSR (p = 0.02), but not the BDI (p = 0.08). Posttreatment analyses of depression severity resulted in non-significant differences for both CDRSR (p= 0.69) and BDI (p= 0.65) indicating no benefits to omega-3 FA therapy (Stadterman et al., 2019). In another study by Trebatika and co-researchers (2020), after six and twelve weeks, intervention groups reported a correlation (r= 0.254) between CDI scores and omega-3 fatty acids; however, the omega-6/omega-3 ratio in the intervention group with DD and MADD subgroups were not significant (p= 0.181). Furthermore, Gabbay and colleagues (2019) concluded incremental dosages of 0.6g/d of omega-3 fatty acids resulted in significant differences among depression severity between intervention and placebo groups as

both were comparable in improvement assessed by the CDRS-R (O3FA: t = −6.47, $p < .001$; placebo: t = −8.10, $p < .001$) and BDI (O3FA: $t = -4.38$, $p < .001$; placebo: $t = -3.52$, $p = .002$). Furthermore, Gabbay and co-researchers (2019) reported supplemental omega-3 fatty acids were not to superior to placebo on clinical features of irritability, anhedonia, or suicidality (O3FA: $t = -4.65$, $p < .001$; placebo: $t = -4.22$, $P < .001$); anhedonia (O3FA: $t = -3.89$, $p = .001$; placebo: $t = -6.09$, $p < .001$). Overall, the studies collectively displayed a heterogenous mixture of results lacking substantial evidence to determine a clinical benefit to reduce the symptoms of depression.

Symptoms of Anxiety

Four clinical trials assessed the relationship between omega-3 supplementation and symptoms of anxiety which are often linked with depression. A study by Herselman and co-researchers (2022) showed a significant reduction in anxiety scores until the 3^{rd} visit (-2.828 ± 0.77; $p = .0031$) when supplemented with fish oil/walnuts; however, no differences were found between the intervention and placebo groups in later visits ($p > 0.05$). Similarly, Reigada et al. (2021) did not find any significant differences between groups in state of anxiety levels ($p > 0.05$). On the contrary, a study from Francis and associates (2019) reported the dietary change group (omega-3 rich foods like fish, seeds, nuts and vegetable oils) showed a significant reduction in anxiety symptoms ($p = 0.0325$, Cohen's d = 0.54) by day 21 of the trial, suggesting dietary modifications may be more effective than omega-3 supplementation alone in reducing anxiety in depressed individuals. Overall, the results indicate that omega-3 supplementation for reducing anxiety was inconsistent with only Francis et al. (2019) showing a significant effect. Longer-term dietary modifications were viewed to be more beneficial than omega-3 supplementation alone.

Secondary Outcomes

Mood, memory, and cognitive performance have shown minimal associations with omega-3 supplementation in populations diagnosed with depression. Studies, including Francis and associates (2019) found no significant differences between intervention and placebo groups among mood and memory performance as measured by the Profile of Mood States (POMS-A) subscales ($p > 0.05$). However, the POMS-Anger ratings ($F(1,75) = 3.691$, $p = .059$) among day 21 revealed a significant decline among trends in the diet group than the control group. In relation to cognitive performance, Bauer and colleagues (2014) discovered DHA-rich Omega-3 supplementation led to functional activation in the brain during cognitive tasks (Stroop and Spatial Working Memory), though no significant improvements in behavioral performance were observed ($p > 0.05$). Similarly, Arnold et al. (2017) noted minimal improvements to mood in with 1.6g supplementation of EPA and DHA. While some cognitive changes were observed in clinical trials, the cognitive changes were minimal and did not translate into clear benefits in terms of behavioral performance or clinical mood improvements. Many researchers have advocated for further investigation of omega-3 fatty acids among children and adolescents to analyze protective benefits for brain health and prevent cognitive decline.

Quality Assessment and Risk of Bias

The quality of the studies included within this systematic review varied with more than half receiving a positive quality rating and deemed to have a summary of low risk of bias across all domains. Six studies were rated as neutral using the Evidence Analysis Library (EAL) guidelines. Zero studies included had a negative summary rating. Potential sources of bias for these studies included issues related to subject selection, potential funding, loss of follow-up, selective reporting, and blinding of participants. The factors were carefully considered during the quality assessment process and have been accounted for when interpreting the findings. See Figure 2 for the results of the quality assessment.

Table 3. Characteristics of Studies Part A

Author	Duration (weeks)	Design	Sample Size	Population	Intervention	Comparator	Outcome
Amminger et al. (2023)	12	RCT	223	15–25-year-olds with MDD	840 mg of EPA; 560 mg of DHA	Placebo	IDS
Arnold et al. (2017)	12	RCT	73	7–14-year-olds with diagnosis of MD, MDD, NOS, or DD	2g of omega-3/day, or with PEP	Placebo	CDRS-R
Bauer et al. (2015)	10	Double-Blind Crossover	11	Young adults ages 20-30	400 mg of DHA rich fish oil	365 mg of EPA rich fish oil	Stroop and Spatial Working Memory tasks
Francis et al. (2019)	10	RCT	78	Individuals aged 17-30 with high-moderate depression/anxiety scores	Diet high in omega-3FA	Habitual diet	DASS-21
Fristad et al. (2016)	12	Pilot RCT	60	7–12-year-olds with MDD, dysthymic disorder, or depressive disorder, NOS clinically diagnosed.	500mg Ω3 each twice daily	Placebo	CDRS-R
Gabbay et al. (2018)	10	RCT	48	Adolescents ages 12-19 with primary diagnosis of MDD	3.6 g/d, combined EPA [2.4 g] + DHA [1.2 g	Placebo	CDRS-R
Ginty et al. (2015)	3	RCT	23	18–21-year-old undergraduate students with depression	1.4 g of EPA and DHA fatty acids daily for 21 days	Corn oil	BDI
Herselman et al (2020)	16	RCT	60	Undergraduate students between the ages of 18-30	60g Walnuts	Placebo	DASS-21, POMS
Ilavska et al. (2024)	12	RCT	58	10–18-year-olds with DD or MADD	2400 mg of total omega-3 FA (1000 mg of eicosapentaenoic acid (EPA) and 750 mg of docosahexaenoic acid (DHA)	Sunflower oil (omega-6 emulsion)	CDI
Katrencova et al. (2020)	12	RCT	80	Adolescents ages 7-18 yrs old with DD or MADD	2400 mg of total omega-3 FA; 1000 mg EPA and 750 mg DHA	Placebo: Omega-6 Sunflower oil	CDI

Characteristics of Studies Part B

Li et al. (2024)	12	RCT	71	Adolescents ages 13-24 diagnosed with clinical depression	2700mg of Omega-3 Fish Oil capsules	Placebo	MADRS
McNamara et al. (2022)	12	RCT	42	Adolescents ages 9-21 with Major Depressive Disorder	2,250 mg n-3 PUFAs (EPA+DPA+DHA)	Placebo	CDRS-R, CGI-S
Oracova et al. (2022)	12	RCT	58	Adolescents ages 11-18 with MADD or DD and anxiety	2400mg of Omega-3 PUFAs	Placebo: Omega-6 Sunflower Oil	CDI
Osuna et al. (2023)	6	Case-Control Study	95	Adolescents ages 13-18 years old	2.496 g n-3/day	Placebo: Palm, olive, soy, canola, and coco butter oils	CDRS-R, CES-D & BAI
Paduchova et al. (2021)	12	RCT	58	Adolescents ages 13-18 with DD, MADD, or both diagnosis	2400 mg of total omega-3 FA	Healthy controls	CDI
Regiada et al. (2021)	22	Pilot RCT	51	Young adults in college at least 18 years old with symptoms of anxiety and/or depression	2000 mg of omega-3 fish oil (1125 mg EPA and 875 mg DHA)	Placebo	BDI, STAI, PSS-10
Stadterman et al. (2016)	10	RCT	48	12–19-year-olds with MDD	3.6g Omega-3	Placebo	CDRS-R, BDI
Trebatika et al. (2020)	12	RCT	60	7–18-year-olds with DD or MADD diagnosis	2g Omega-3: 1.4 g [EPA], 0.2 g [DHA]	Placebo Sunflower Oil	CDI
Zhang et al. (2019)	---	Meta Analysis	153	Children/Adolescents 6-18 yrs old with Depression	400 mg/day to 2289 mg/day	Placebo	CDRS-R

Abbreviations: EPA eicosapentaenoic acid; DHA docosahexaenoic acid; PUFA Polyunsaturated Fatty Acids; O-3 Omega-3; DD Depressive Disorder; MDD Major Depressive Disorder; MADD Mixed Anxiety and Depressive Disorder; CDI Child's Depression Index; CDRS-R Children's Depression Rating Scale Revised; HDRS Hamilton Rating Scale for Depression; BDI Beck Depression Inventory; BAI Beck Anxiety Inventory; CES-D center for Epidemiological Studies Depression Scale; IDS Inventory of Depressive Symptomatology; MADRS Montgomery-Asberg Depression Rating Scale; Depression, Anxiety, and Stress Scale DASS-21 scale; POMS-A Profile of Mood States; FO Fish Oil

4 | DISCUSSION

While current literature on omega-3 supplementation in youth and adolescent populations are limited, this systematic review evaluated new evidence on therapeutic interventions that may address the rising prevalence of anxiety and depression. According to the National Healthcare and Disparities Report (2022), diagnoses of anxiety and depression have increased by 27% since 2020, especially among individuals aged 13 to 25, a group already experiencing compromised mental, emotional, physical, and developmental health in the wake of the COVID pandemic. Notably, individuals diagnosed with MDD and anxiety have been shown to have lower levels of omega-3 polyunsaturated fatty acids (PUFAs), specifically eicosapentaenoic acid EPA and docosahexaenoic acid (DHA), compared to healthy individuals (Pottala et al., 2012). Omega-3 fatty acids are vital for brain development particularly during periods of growth.

Given these concerns, omega-3 supplementation has been considered in various clinical trials examining the potential to alleviate depression and anxiety symptoms. Multiple clinical assessment tools were used to measure depressive symptomology and test the efficacy of omega-3 fatty acids. Despite the heterogeneity in study design, populations, and methodologies, current findings suggest omega-3 supplementation may support brain health by enhancing

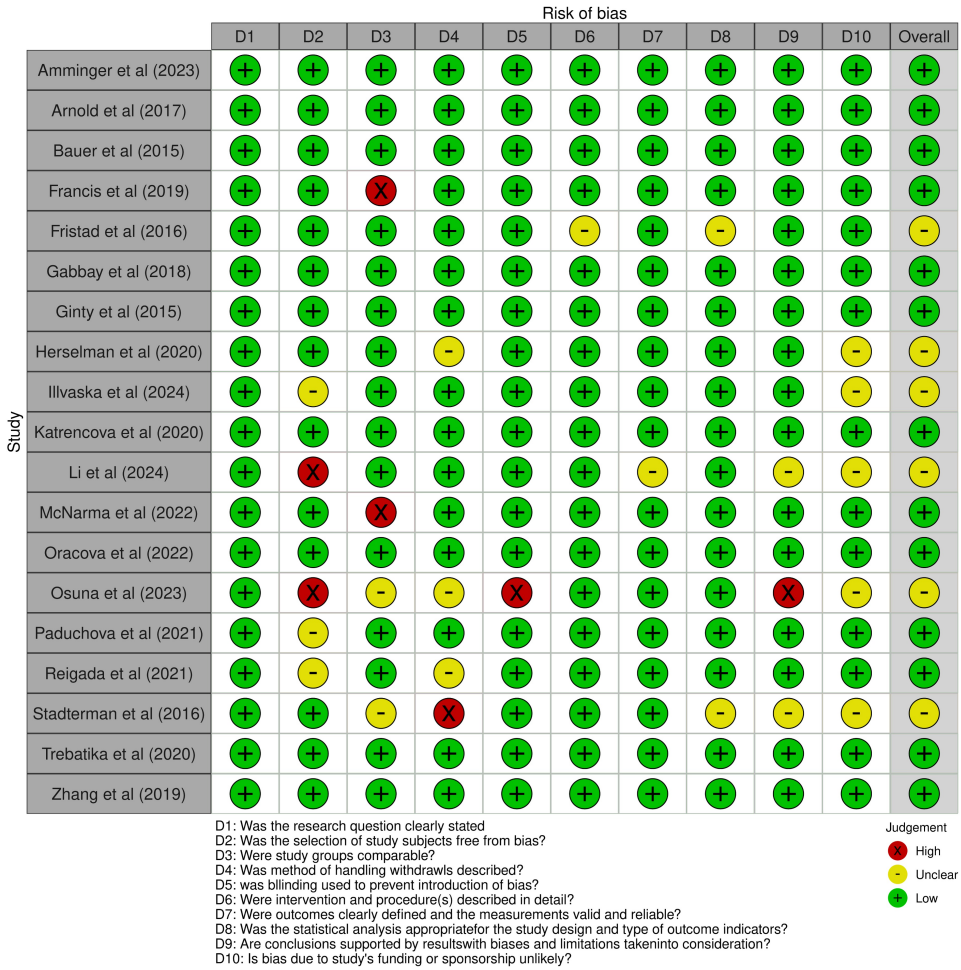

Fig. 2: Quality Assessment and Risk of Bias of Selected Studies

neurotransmitter function, reducing inflammation, and promoting Brain Derived Neurotrophic Factor (BDNF) activity (Thakur et al., 2023). Research has shown psychological stress, due to anxiety and depression, increases the levels of inflammatory cytokines such as Interleukin-1 Beta (IL-1β) and Tumor Necrosis Factor Alpha (TNFα), which negatively affect the central nervous system (Logan, 2004). Omega-3 supplementation has shown to interact with inflammatory processes, potentially mitigating their harmful effects on brain function. Research from Kiecolt-Glaser and associates (2012) evaluated the possible role omega-3 fatty acids by revealing significant interactions between omega-3 supplementation and serum Interleukin-6 decreasing from 10-12% in low and high dosage groups compared to placebo. In more severe diagnoses such as bipolar disorder (BPD), Eslahi and team (2023) found depression scores along with cytokine serum concentrations such as TNF-a, IL-6, and hs-CRP all decreased significantly and revealed positive correlations ($p < 0.001$). Omega-3 fatty acids are associated to have anti-inflammatory properties that may explain the mechanistic benefits to dietary supplementation.

Results from conclusive studies revealed a positive relationship between increased dietary omega-3 fatty acids and severity of anxiety and/or depression over longer periods of time. Clinical trials by Li and team (2024), Ginty and associates (2015), and Stadterman and colleagues (2016) showed significant improvements in depression scores with omega-3 supplementation ranging from 2.5 to 3g/day over a period of 10-12 weeks. However, moderate dosages of omega-3 (less than 2g/day) administered for ten weeks or fewer had little to no impact on depression, suggesting insufficient evidence for lower dosages. In addition, other clinical evidence has revealed EPA

may be more effective than DHA in treating depression; however, the potential mechanisms remain unclear (Peng et al., 2020). Although not all findings were statistically significant between intervention and placebo groups, most participants who received supplementation of omega-3 fatty lowered symptoms of anxiety and/or depression to some degree from baseline.

Furthermore, no adverse side effects were found with this omega-3 fatty acid supplementation among studies and overall reached a consensus to safe measures for young adult and youth populations (Li et al., 2024). Generally, younger populations been known to have higher omega-6 to omega-3 ratios due to increased consumption of processed foods, refined vegetable oils, and refined grains. Therefore, diet modifications that raise PUFA's can be an innovative strategy to prevent mental health disorders and improve remission rates of depression (Zielinska et al., 2022). In addition, implementation of dietary omega-3 fatty acids has shown enhanced therapeutic effects from antidepressants, which is primary treatment for depression. The investigation by Mehdi and colleagues (2023) explored the efficacy of combining antidepressant medication with omega-3 supplements and found this combined treatment led to a greater decline in Hamilton Depression Rating Scale (HDRS) scores compared to either treatment alone. Their results suggest a combined approach may offer superior therapeutic benefits for individuals with depression (Mehdi et al., 2023). Meanwhile, the National Center for Complementary and Integrative Health (2024) highlights the potential modest benefits of omega-3 fatty acids as an adjunctive therapy to medications. However, the Academy of Nutrition and Dietetics (2024) advocates obtaining omega-3 fatty acids through diet to optimize the benefits of brain health, emphasizing food sources over supplements. Despite these findings, research remains inconclusive regarding the use of omega-3s as a standalone treatment in reducing depressive symptoms. Ultimately, the optimal dosage of omega-3s for this population has yet to be established, creating a significant gap in the research needed to support the clinical prescription of this treatment for anxiety and depression.

Risk of Bias and Quality Assessment

While the clinical trials, from this review, implemented systematic methods to assess depression symptoms and severity, there were several limitations. Inconsistent dietary interventions including the lack of adherence to supplementation protocols were potential factors that could have influenced the results. In addition, participant demographics had larger female populations which could limit the generalizability to findings to males. Furthermore, studies also reported moderate dropout rates which may have skewed results. Despite these limitations, validated measures were still used to measure symptoms of depression and recorded data presented some benefits from omega-3 supplementation especially in combination with other treatments.

Application to the Practitioner

While research supporting the use of omega-3 fatty acids for treatment of anxiety and depression remains limited, this review may aid practitioners in developing adjunctive treatments. Given the evidence of some positive effects with higher dosages over longer periods of time, treatment plans may integrate use of omega-3 with CBT and SSRIs. Individual needs and considerations must be tailored by clinicians as optimal guidelines are still under development. In addition, clinicians must be aware of dietary patterns that may incline younger populations to omega-3 deficiencies. Educating the necessity of a healthy omega-3 to omega-6 ratio for mental and physical health can help reduce the risk of mood disorders. Dietary counseling may also benefit patients to seek an increase in natural high omega-3 foods such as fatty fish, walnuts, and flaxseeds to complement omega-3 fatty acid therapy. As some clinical research supports the combined treatment of omega-3 fatty acids and antidepressant medications, clinicians may consider co-prescribing these treatment plans to optimize outcomes of relief. Omega-3 fatty acids have been cited by research to have anti-inflammatory benefits that aid in treating chronic or severe mood disorders (Grosso et al., 2014). Given the favorable safety profile in the studies reviewed, omega-3 supplementation can be recommended as a low-risk intervention providing more acceptable option that promotes less stigma or concern for adverse side effects. Incorporating a more holistic approach to mental health care can recognize the interplay between nutrition and mental well-being.

Nutrition based strategies can broaden mental health care and support lifestyles that contribute to overall mental health of patients.

Strengths

This systematic review provides a diverse range of studies with a total of 17 randomized clinical trials, allowing for a greater understanding of the potential benefits for omega-3 supplementation. This review carefully followed the PRISMA Guidelines and selected studies based on rigorous inclusion criteria ensuring research was relevant to the topic, well designed, conducted appropriately, and focused on specific adolescent and young adult populations with diagnosis of anxiety and/or depression. This criterion enhances the reliability of the findings and supports conclusions for the role of omega-3 fatty acids as a therapeutic treatment in mental health disorders. The safety profile reported within studies emphasizes omega-3 supplementation can be considered as an adjunctive treatment for anxiety and depression. In addition, the anti-inflammatory mechanisms of omega-3 were explored further among clinical trials to strengthen evidence that inflammation plays a key role in the pathophysiology of anxiety and depression. Therefore, this review provides scientific background of how omega-3 can reduce inflammatory cytokines produced with mental health disorders. Synergistic effects of omega-3 supplementation when combined with traditional treatments such as antidepressants and psychotherapy can be valuable for clinicians looking for multimodal approaches to treatment of symptoms from anxiety and depression.

Limitations

This systematic review contains several important limitations. Limited research has been conducted on youth populations with moderate to severe MDD, which restricts the generalizability of findings. In addition, the heterogeneity in study designs, populations, and treatments across clinical trials reflects the challenges of synthesizing results from diverse clinical approaches and outcomes. However, interest in this clinical dietary treatment has grown new and upcoming research into versatile treatments for mental health disorders. Modest sample sizes and dominating female participants limit the ability to draw broad conclusions for this population. Moreover, many male participants with untreated or undiagnosed depression may not have been adequately represented. In addition, loss of follow-up and poor adherence to omega-3 regimen in some trials resulted in gaps within research, further reducing the reliability of conclusions. Heterogeneity among treatment dosages across studies presents another limitation, as the optimal dosage for therapeutic benefit has yet to be determined from clinical research. Furthermore, it is crucial to address conflicting findings, especially those influenced by potential biases, to ensure a comprehensive, accurate recommendation. Considering these limitations, further in-depth research is needed to better understand the mechanisms behind omega-3's effects on depression and anxiety to define more consistent dosing guidelines for clinical practice.

5 | CONCLUSION

Overall, this systematic review highlights the potential role of omega-3 fatty acids in alleviating anxiety and depression in youth populations. Inadequate omega-3 intake, which is common among Western diets, may contribute to the rising prevalence of mental health disorders as omega-3s are essential for brain development and cognitive function. While omega-3 supplementation is deemed safe and may offer therapeutic benefits, further research is required to establish optimal dosages, investigate the mechanisms of action, and further explore how omega-3 fatty acids can enhance the effects of traditional antidepressants. In conclusion, our results provided limited evidence that omega-3 supplementation can provide therapeutic effects as a standalone treatment. While current literature supports utilizing omega-3 fatty acids as complementary therapy, more robust studies are needed to clarify the dosage and long-term efficacy of omega-3 fatty acids in treating mental health disorders.

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