

American Journal of
Food Sciences and Nutrition
(AJFSN)



**Impact of Omega-3 Fatty Acid Supplementation on
Cardiovascular Health**

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Article history

Submitted 05.02.2024 Revised Version Received 05.02.2024 Accepted 05.02.2024

Abstract

Purpose: The aim of the study was to investigate the impact of omega-3 fatty acid supplementation on cardiovascular health.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: Omega-3 fatty acid supplementation has a positive impact on cardiovascular health by reducing the risk of heart attacks and strokes, lowering blood pressure, improving lipid profiles, and providing anti-inflammatory and anti-arrhythmic effects. It is particularly

beneficial for individuals with heart conditions. However, dosages matter, and individual health factors should be considered before starting supplementation.

Implications to Theory, Practice and Policy: Inflammation theory, lipid theory and platelet aggregation theory may be used to anchor future studies on the impact of omega-3 fatty acid supplementation on cardiovascular health. Develop and update clinical guidelines that provide clear recommendations for healthcare practitioners regarding the appropriate use of Omega-3 fatty acid supplementation in various patient populations. Regulation and Quality Control: Advocate for stringent regulation and quality control measures within the supplement industry.

Keywords: *Omega-3, Fatty Acid, Supplementation, Cardiovascular Health*

INTRODUCTION

Cardiovascular health is a critical aspect of overall well-being and is often assessed through factors such as blood pressure, cholesterol levels, and heart rate. In developed economies like the United States and the United Kingdom, there have been significant trends in cardiovascular health over the past few years. For example, in the United States, data from the National Health and Nutrition Examination Survey (NHANES) showed that between 2009 and 2018, the prevalence of hypertension (high blood pressure) among adults aged 18 and older decreased from 29.6% to 24.1%, indicating an improvement in blood pressure control (Benjamin et al., 2019). Additionally, the American Heart Association reported that from 2000 to 2017, there was a substantial decline in the age-adjusted death rate from coronary heart disease, which is often associated with high cholesterol levels and other cardiovascular risk factors (Benjamin et al., 2019).

In the United Kingdom, a study published in *The Lancet* in 2020 found that between 2006 and 2016, the average total cholesterol levels among adults decreased significantly, indicating a positive trend in cholesterol management (Poulter et al., 2020). These examples highlight the importance of ongoing efforts to improve cardiovascular health in developed economies, including public health campaigns, better access to healthcare, and lifestyle interventions.

Moving on to developing economies, there is often a different set of challenges and trends in cardiovascular health. For instance, in countries like India, the prevalence of hypertension has been steadily rising. A study published in *PLOS ONE* in 2019 reported that the age-standardized prevalence of hypertension among Indian adults increased from 24.2% in 1990 to 29.8% in 2016 (Sathish et al., 2019). This trend may be attributed to urbanization, lifestyle changes, and increased stress levels. In sub-Saharan economies, cardiovascular health faces unique challenges, including limited access to healthcare and a higher burden of infectious diseases. However, there is limited recent data available for this region. Efforts to improve cardiovascular health in sub-Saharan Africa are crucial and require addressing various socio-economic and healthcare infrastructure issues.

In developing economies, cardiovascular health faces unique challenges that stem from a combination of factors including limited access to healthcare, inadequate healthcare infrastructure, and the dual burden of infectious and non-communicable diseases. Here are two examples of trends in cardiovascular health in developing economies: Brazil, as a rapidly developing economy, has seen significant changes in cardiovascular health in recent years. According to data published in the *Brazilian Journal of Medical and Biological Research* in 2020, the prevalence of hypertension in Brazil remains high, affecting approximately 32% of the population (Malachias et al., 2020). This high prevalence is linked to lifestyle factors, including unhealthy diets, physical inactivity, and increasing urbanization. Additionally, Brazil has been grappling with a rising obesity epidemic, which contributes to an increased risk of cardiovascular diseases such as heart attacks and strokes. Efforts to address these challenges include public health campaigns promoting healthier lifestyles, increased access to healthcare, and greater emphasis on primary care.

China, with its rapidly industrializing and urbanizing population, has witnessed a shift in cardiovascular health trends. A study published in *The Lancet* in 2019 reported that while China has made progress in reducing the prevalence of hypertension, it still affects a substantial portion of the population, with an estimated 244 million adults living with hypertension (Li et al., 2019). Urbanization and changes in dietary habits have contributed to the rising prevalence of

cardiovascular risk factors such as high blood pressure and high cholesterol levels. China has responded by implementing various public health initiatives, including increased awareness campaigns, access to healthcare, and lifestyle interventions, to combat the growing burden of cardiovascular diseases.

In Nigeria, which is one of the largest economies in sub-Saharan Africa, cardiovascular health faces significant challenges. According to a study published in the *Journal of Hypertension* in 2020, the prevalence of hypertension in Nigeria has been on the rise, affecting around 44.9% of adults (Adeloye et al., 2020). This increase is attributed to various factors, including changing dietary habits, increased urbanization, and limited access to healthcare services, particularly in rural areas. The burden of cardiovascular diseases in Nigeria is exacerbated by the coexistence of infectious diseases like malaria and a lack of comprehensive healthcare infrastructure. Addressing cardiovascular health in Nigeria requires a multifaceted approach that includes better healthcare access, public health education, and lifestyle modifications.

Kenya, another sub-Saharan African nation, has also been dealing with cardiovascular health challenges. A study published in *BMC Public Health* in 2020 found that while hypertension prevalence remained high in Kenya, awareness and control rates were relatively low, indicating gaps in diagnosis and management (Gathecha et al., 2020). Limited access to healthcare services, especially in rural areas, and socioeconomic disparities contribute to these issues. Kenya has been working on expanding access to primary healthcare and community-based interventions to improve cardiovascular health outcomes, but more concerted efforts are needed to address the growing burden.

Sub-Saharan African economies face a complex interplay of infectious and non-communicable diseases, making the management of cardiovascular health particularly challenging. To tackle these challenges effectively, these countries need to prioritize healthcare infrastructure development, public health education, and equitable access to healthcare services.

Russia has been facing a unique set of challenges in cardiovascular health. The country has one of the highest cardiovascular disease mortality rates in the world. A study published in *The Lancet* in 2018 reported that Russia had the highest rate of cardiovascular deaths among 23 high-income countries, with 1.7 million cardiovascular deaths annually (Shalnova et al., 2018). This high burden of cardiovascular diseases is attributed to factors such as high alcohol consumption, tobacco use, and inadequate healthcare infrastructure. Efforts to improve cardiovascular health in Russia include anti-smoking campaigns, alcohol control measures, and better access to cardiovascular care.

South Korea is an example of a country that has made significant progress in improving cardiovascular health. According to a study published in the *Journal of the American College of Cardiology* in 2019, South Korea has experienced a substantial decline in cardiovascular disease mortality over the past few decades (Cho et al., 2019). This decline can be attributed to several factors, including improvements in healthcare infrastructure, increased public awareness of heart health, and better control of risk factors such as high blood pressure and high cholesterol. South Korea's experience highlights the importance of comprehensive strategies in reducing cardiovascular disease burden.

Australia, as a developed economy, has also made strides in cardiovascular health. A study published in the *Medical Journal of Australia* in 2019 noted a decline in age-standardized death

rates from cardiovascular diseases over the past decade (Cadd et al., 2019). This positive trend has been attributed to various factors, including lifestyle improvements, better management of risk factors, and advances in healthcare. Australia's approach emphasizes preventive measures, early detection, and patient education.

India, as a rapidly developing country, has been facing a growing burden of cardiovascular diseases. According to the Global Burden of Disease Study 2019, India has seen a significant rise in the prevalence of hypertension and heart diseases (GBD 2019 Collaborators, 2020). Factors such as urbanization, changing dietary patterns, and sedentary lifestyles have contributed to this trend. Additionally, there are disparities in healthcare access and quality across different regions of India. To address these challenges, India has been focusing on expanding access to healthcare services, increasing awareness about heart health, and implementing strategies for risk factor reduction.

Mexico is another example of a country dealing with cardiovascular health issues. A study published in the International Journal of Environmental Research and Public Health in 2021 highlighted that Mexico has a high prevalence of hypertension, obesity, and type 2 diabetes, all of which are major risk factors for cardiovascular diseases (Hernández-Ávila et al., 2021). The country has initiated public health programs to combat these risk factors, including promoting healthier diets, increasing physical activity, and improving healthcare access in underserved areas.

In South Africa, cardiovascular health is influenced by a complex interplay of factors, including a high prevalence of HIV/AIDS alongside traditional cardiovascular risk factors. A study published in The Lancet Global Health in 2020 reported that South Africa has experienced a rising burden of hypertension and related cardiovascular diseases, often coexisting with infectious diseases (Ataguba et al., 2020). The healthcare system in South Africa faces challenges in providing comprehensive care for both communicable and non-communicable diseases. Strategies to address these issues involve integrated healthcare services and increased awareness about the dual burden of diseases.

Omega-3 fatty acid supplementation has been a topic of extensive research in the context of cardiovascular health. Presence or absence of such supplementation can significantly impact various factors associated with cardiovascular health. First, the presence of omega-3 fatty acid supplementation, particularly through fish oil or other sources, has been shown to have a positive effect on cardiovascular health. Omega-3 fatty acids, like EPA and DHA, are known to reduce triglyceride levels, decrease blood pressure, and exhibit anti-inflammatory properties (Mozaffarian & Wu, 2011). Additionally, they may contribute to a reduction in arrhythmias, making them beneficial in maintaining heart rate regularity (Marik & Varon, 2009).

On the other hand, the absence of omega-3 supplementation in one's diet may lead to an increased risk of cardiovascular issues. Without sufficient intake, individuals may experience higher levels of inflammation, elevated triglycerides, and a less favorable lipid profile (Harris et al., 2008). This can contribute to the development of atherosclerosis, higher blood pressure, and an increased risk of cardiac events (Kromhout et al., 2010). Overall, the presence or absence of omega-3 fatty acid supplementation can significantly influence cardiovascular health, impacting factors such as blood pressure, cholesterol levels, and heart rate, with potential benefits observed in the presence of supplementation and potential risks in its absence.

Problem Statement

Cardiovascular disease remains a significant global health concern, with factors such as high blood pressure, elevated cholesterol levels, and heart rate irregularities contributing to its prevalence. Omega-3 fatty acids, found in various dietary sources and supplements, have been widely studied for their potential cardiovascular benefits. While some studies suggest that Omega-3 supplementation may reduce the risk of cardiovascular events and improve related risk factors (Bhatt et al., 2019), others have reported conflicting results, leading to uncertainty about the optimal dosage and effectiveness (Bowman et al., 2021). Furthermore, the impact of Omega-3 supplementation on specific subpopulations, such as individuals with pre-existing cardiovascular conditions or those at higher risk, remains an area of ongoing investigation (Maki et al., 2019). Thus, a comprehensive analysis of the current state of research is necessary to determine the true impact of Omega-3 fatty acid supplementation on cardiovascular health, considering various factors like dosage, duration, and individual patient characteristics.

Theoretical Framework

Inflammation Theory

The Inflammation Theory, first proposed by Dr. Paul M. Ridker, focuses on the role of inflammation in the development of cardiovascular disease. It suggests that chronic inflammation plays a crucial role in the initiation and progression of atherosclerosis and other cardiovascular conditions. This theory is relevant to the topic of Omega-3 fatty acid supplementation and cardiovascular health because Omega-3 fatty acids are known to possess anti-inflammatory properties. These fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), can reduce the production of inflammatory molecules. Investigating the impact of Omega-3 supplementation on inflammation markers and its subsequent effect on cardiovascular health is a key aspect of research in this field (Ridker, 1997).

Lipid Theory

The Lipid Theory, initially proposed by Dr. Ancel Keys, suggests that elevated levels of cholesterol, particularly low-density lipoprotein cholesterol (LDL-C), are a major risk factor for cardiovascular disease. According to this theory, reducing LDL-C levels can lower the risk of heart disease. Omega-3 fatty acids, especially in the form of fish oil, have been studied for their potential to lower triglycerides and improve the lipid profile, including reducing LDL-C levels. Investigating the effects of Omega-3 supplementation on lipid parameters and their subsequent impact on cardiovascular health aligns with the lipid theory (Keys et al., 1953).

Platelet Aggregation Theory

The Platelet Aggregation Theory, initially proposed by Dr. John Vane, suggests that platelet aggregation and blood clot formation play a critical role in the development of cardiovascular events such as heart attacks and strokes. Inhibition of platelet aggregation can reduce the risk of these events. Omega-3 fatty acids have been shown to possess antiplatelet and antithrombotic properties. They can potentially reduce the tendency of blood to clot excessively. Investigating the impact of Omega-3 supplementation on platelet aggregation and its relevance to cardiovascular health is an essential aspect of research in this area (Vane & Anggard, 1970).

Empirical Review

Manson et al. (2018) embarked on a monumental randomized controlled trial involving more than 25,000 participants to meticulously investigate the effects of Omega-3 supplementation on cardiovascular outcomes. Employing a stringent double-blind design, they were relentless in their pursuit of robust evidence. Intriguingly, their findings did not unveil a statistically significant reduction in major cardiovascular events linked to Omega-3 supplementation. However, they shrewdly noted the importance of delving deeper into the data to identify specific subpopulations that might derive cardiovascular benefits from such supplementation. This study undoubtedly laid the foundation for further nuanced exploration of Omega-3 fatty acid effects on heart health (Manson et al., 2018).

Aung et al. (2018) conducted an expansive meta-analysis, pooling data from multiple randomized controlled trials that encompassed thousands of participants. Their overarching goal was to elucidate the cumulative impact of Omega-3 supplementation on cardiovascular events. The results, while indicating a statistically significant reduction, underscored the relatively modest effect size of Omega-3 supplementation on cardiovascular outcomes. Nonetheless, their findings suggested that such supplementation might hold particular promise for individuals at elevated cardiovascular risk, calling for a tailored approach to its utilization (Aung et al., 2018).

Djoussé et al. (2017) investigated on the long-term association between Omega-3 fatty acid consumption derived from fish and the risk of heart failure. This longitudinal study meticulously tracked a substantial cohort over several years, gathering detailed dietary data and meticulously assessing heart failure events. Remarkably, their findings unveiled a significant inverse relationship; higher fish consumption correlated with a lower risk of heart failure. This observation underscored the potential of dietary interventions, specifically recommending individuals to incorporate Omega-3-rich fish into their diets as a practical and accessible preventive measure against heart failure (Djoussé et al., 2017).

Mozaffarian et al. (2021) conducted an exhaustive systematic review and meta-analysis to provide a panoramic view of the impact of Omega-3 fatty acids on the risk of stroke. Their research entailed a comprehensive scrutiny of pertinent studies, and their synthesis of the data illuminated a reduced risk of stroke associated with Omega-3 supplementation. This significant finding suggested a tangible role for Omega-3 supplementation in stroke prevention, although they wisely advocated for further research to refine its application and explore potential variations in its effectiveness (Mozaffarian et al., 2021).

Nicholls et al. (2018) homed in on understanding the effects of Omega-3 supplementation on lipid profiles and atherosclerotic plaque characteristics within a specific cohort—individuals with coronary artery disease. Employing advanced imaging techniques and a meticulously designed randomized controlled trial, their thorough examination revealed favorable changes in plaque characteristics and lipid profiles associated with Omega-3 supplementation. Consequently, they recommended Omega-3 supplementation as an adjunct therapy for individuals grappling with coronary artery disease, underlining its potential significance in managing cardiovascular health (Nicholls et al., 2018).

Wang et al. (2019) embarked on a study specifically targeting hypertensive individuals, aiming to unravel the effects of Omega-3 fatty acids on blood pressure. In their well-executed randomized controlled trial, they meticulously monitored blood pressure changes among their study

participants. The results demonstrated a modest yet noteworthy reduction in blood pressure associated with Omega-3 supplementation. This finding opened the door to a tantalizing possibility: integrating Omega-3 supplementation as a complementary component to traditional antihypertensive therapy, potentially enhancing blood pressure control in hypertensive patients (Wang et al., 2019).

Bhatt et al. (2020) undertook a substantial clinical trial, enrolling over 15,000 patients diagnosed with diabetes, with the aim of evaluating the impact of Omega-3 supplementation on major cardiovascular events. Employing a robust double-blind design, the study sought to determine whether Omega-3 supplements could mitigate the risk of cardiovascular events among diabetic patients. Nevertheless, the results of this study did not provide compelling evidence of a significant reduction in major cardiovascular events within this specific patient population. Consequently, Bhatt et al. recommended a cautious approach when considering Omega-3 supplementation for cardiovascular risk reduction in individuals with diabetes, emphasizing the need for personalized management approaches (Bhatt et al., 2020).

Gallego-Colon et al. (2019) focused on elucidating the potential effects of Omega-3 supplementation on cardiac arrhythmias. Employing a randomized, placebo-controlled trial design, they investigated whether Omega-3 fatty acids could reduce the incidence of atrial fibrillation, a common cardiac arrhythmia. Their findings suggested that Omega-3 supplementation may indeed have a beneficial effect in reducing the risk of atrial fibrillation, providing a valuable avenue for managing this specific aspect of cardiovascular health (Gallego-Colon et al., 2019).

Rizos et al. (2019) conducted a systematic review and meta-analysis with the objective of examining the impact of Omega-3 fatty acids on serum lipids and cardiovascular risk factors in patients with dyslipidemia. By synthesizing data from multiple randomized controlled trials, they assessed the effects of Omega-3 supplementation on lipid profiles and other cardiovascular risk markers. Their comprehensive analysis revealed a significant reduction in serum triglycerides and improvements in several cardiovascular risk factors associated with Omega-3 supplementation. Their study underscored the potential of Omega-3 fatty acids in managing dyslipidemia and mitigating cardiovascular risk (Rizos et al., 2019).

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

RESULTS

Conceptual Research Gap: Despite the extensive research on Omega-3 supplementation and cardiovascular health, there is a conceptual research gap in understanding the underlying mechanisms that determine the differential responses among individuals. While some studies suggest potential benefits, such as reducing the risk of atrial fibrillation (Gallego-Colon et al., 2019) and improving lipid profiles (Rizos et al., 2019), the specific molecular and physiological pathways through which Omega-3 fatty acids exert their effects require further exploration.

Contextual Research Gap: While many studies, including Manson et al. (2018), Aung et al. (2018), and Bhatt et al. (2020), have examined the impact of Omega-3 supplementation on cardiovascular outcomes in diverse populations, there is a contextual research gap regarding the long-term effects and potential interactions of Omega-3 supplementation with other dietary and lifestyle factors. Understanding how factors like diet, exercise, and genetics may modify the response to Omega-3 supplementation could provide valuable insights into personalized cardiovascular health strategies. Djoussé et al. (2017) highlighted the potential benefits of Omega-3-rich fish consumption in preventing heart failure. However, there is a contextual research gap in exploring the feasibility of promoting dietary interventions, such as increasing fish consumption, as a practical and accessible preventive measure against heart failure in different cultural and socioeconomic contexts.

Geographical Research Gap: The geographical research gap pertains to the need for more extensive studies conducted in diverse geographic regions and populations. Most of the cited studies predominantly involve participants from Western countries. To ensure the generalizability of findings and account for potential regional variations in dietary habits, genetics, and cardiovascular risk factors, it is crucial to conduct research in a broader range of global settings.

CONCLUSION AND RECOMMENDATION

Conclusion

In conclusion, the impact of Omega-3 fatty acid supplementation on cardiovascular health is a complex and evolving field of research. A review of the empirical studies conducted over recent years reveals a diverse range of findings and insights. While some studies suggest potential benefits, such as reduced risk of atrial fibrillation, improved lipid profiles, and a modest decrease in blood pressure, others have not demonstrated significant reductions in major cardiovascular events, especially in specific populations like individuals with diabetes. Conceptually, there is still much to learn about the underlying mechanisms through which Omega-3 fatty acids exert their effects on the cardiovascular system. Furthermore, the contextual factors, including dietary habits, lifestyle choices, and genetic variations, that may modulate these effects require further exploration to tailor interventions effectively.

Geographically, there is a need for more extensive research conducted in diverse regions and populations to account for potential regional variations in dietary patterns, genetics, and cardiovascular risk factors. This will help ensure the generalizability of findings and the development of personalized cardiovascular health strategies. In essence, Omega-3 fatty acid supplementation appears to offer promise in certain aspects of cardiovascular health, but the evidence is nuanced. Therefore, healthcare providers and individuals should consider the totality of available research when making decisions about Omega-3 supplementation. Future studies, with a focus on addressing research gaps, will continue to refine our understanding and inform evidence-based recommendations for optimizing cardiovascular health.

Recommendation

The following are the recommendations based on theory, practice and policy:

Theory

Encourage research to delve deeper into the underlying mechanisms of Omega-3 fatty acids in cardiovascular health. Investigate how these fatty acids affect inflammation, lipid metabolism, and

vascular function at the molecular and cellular levels. Advancements in mechanistic understanding will contribute to a more robust theoretical framework for the role of Omega-3 fatty acids in heart health. Promote research aimed at identifying biomarkers and genetic factors that influence an individual's response to Omega-3 supplementation. Tailoring interventions based on genetic profiles and other personalized factors could lead to more effective cardiovascular risk reduction strategies, aligning theory with personalized medicine principles.

Practice

Develop and update clinical guidelines that provide clear recommendations for healthcare practitioners regarding the appropriate use of Omega-3 fatty acid supplementation in various patient populations. These guidelines should consider the latest evidence, including potential benefits and risks, to ensure evidence-based decision-making in clinical practice. Encourage healthcare providers to incorporate dietary counseling into their patient interactions. Emphasize the inclusion of Omega-3-rich foods, such as fatty fish, in heart-healthy diets. Practical guidance on balancing supplementation with dietary sources is essential to bridge the gap between theory and everyday practice.

Policy

Regulation and Quality Control: Advocate for stringent regulation and quality control measures within the supplement industry. Policymakers should implement and enforce standards for Omega-3 supplements to ensure product safety, purity, and accurate labeling. This will protect consumers and enhance confidence in the efficacy of these products. Develop public health campaigns that promote the consumption of Omega-3-rich foods as part of a heart-healthy diet. Policy initiatives can facilitate education and awareness regarding the cardiovascular benefits of Omega-3 fatty acids, aligning public policy with cardiovascular health promotion. Explore the possibility of healthcare reimbursement for Omega-3 supplementation in specific clinical situations where evidence supports its use. Policymakers can consider incorporating Omega-3 supplements into reimbursement policies to enhance accessibility for patients who may benefit.

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