Section: Biochemistry

Original Research Article

A COMPARATIVE STUDY ON THE EFFECTS OF OMEGA-3 FATTY ACID SUPPLEMENTATION ON PLASMA TRIGLYCERIDE LEVELS IN DIABETIC VS. NON-DIABETIC INDIVIDUALS

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Abstract

Background: Omega-3 fatty acids are known to influence plasma triglyceride levels, but their differential impact on diabetic and non-diabetic individuals remains unclear. To compare the effects of Omega-3 fatty acid supplementation on plasma triglyceride levels in diabetic versus non-diabetic individuals. **Material & Methods:** This study enrolled 100 participants, divided equally between diabetic (n=50) and non-diabetic (n=50) groups. Participants received Omega-3 fatty acid supplements over a 12-week period. Plasma triglyceride levels were measured at baseline and after the supplementation period. Statistical analysis was conducted to compare the effects within and between groups. **Results:** Baseline triglyceride levels were higher in the diabetic group (2.5 ± 0.8 mmol/L) compared to the non-diabetic group (1.8 ± 0.6 mmol/L). Post-supplementation, the diabetic group exhibited a 24% reduction (0.6 mmol/L decrease, $p < 0.01$) in triglyceride levels, while the non-diabetic group showed a 17% reduction (0.3 mmol/L decrease, $p < 0.05$). The reduction was significantly greater in the diabetic group ($p < 0.05$). Subgroup analysis within the diabetic group indicated a more significant reduction in poorly controlled diabetics (HbA1c > 8%). No major adverse effects were reported; minor gastrointestinal discomfort was noted in 4% of participants. **Conclusion:** Omega-3 fatty acid supplementation significantly reduces plasma triglyceride levels, with a more pronounced effect observed in diabetic individuals, particularly those with poor glycemic control.

INTRODUCTION

The modulation of plasma triglyceride levels is a critical factor in the management of cardiovascular risk, particularly in individuals with metabolic disorders such as diabetes.[1] Elevated triglyceride levels are associated with an increased risk of cardiovascular diseases (CVD) and are a common feature in patients with type 2 diabetes mellitus (T2DM).[2] The management of lipid profiles in these patients is thus of paramount importance.

Omega-3 fatty acids, primarily found in fish oil, have been recognized for their potential in improving lipid metabolism.[3] These polyunsaturated fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are known to exert beneficial effects on plasma lipid profiles, including a reduction in triglyceride levels.[4] However, the extent to which these benefits are conferred in diabetic versus non-diabetic individuals remains inadequately explored.

Recent studies have suggested that the metabolic disturbances associated with diabetes might alter the body's response to Omega-3 fatty acids.[5] For instance, insulin resistance, a hallmark of T2DM, may influence lipid metabolism and modify the impact of dietary supplements like Omega-3 fatty acids6. Given the growing prevalence of diabetes globally and its associated risk of CVD, understanding the differential effects of these

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supplements in diabetic and non-diabetic populations is crucial.

This study aims to compare the effects of Omega-3 fatty acid supplementation on plasma triglyceride levels in diabetic and non-diabetic individuals. By elucidating these effects, we hope to contribute to a more tailored approach in managing dyslipidemia, particularly in diabetic patients who are at a heightened risk of cardiovascular complications.

MATERIALS AND METHODS

Study Design and Setting

This comparative study was conducted at the Government Medical College in Ongole, Andhra Pradesh, from March 2023 to July 2023. It aimed to evaluate the effects of Omega-3 fatty acid supplementation on plasma triglyceride levels in diabetic versus non-diabetic individuals.

Participants

A total of 100 volunteers were enrolled, equally divided between diabetic (n=50) and non-diabetic (n=50) participants. Diabetic participants were diagnosed with type 2 diabetes mellitus, confirmed by medical records. Non-diabetic participants had no history of diabetes or other metabolic disorders.

Inclusion Criteria

Age between 40 and 70 years.

For diabetics, a confirmed diagnosis of type 2 diabetes mellitus.

For non-diabetics, no history of diabetes or significant metabolic disorders.

Willingness to adhere to the supplementation regimen.

Exclusion Criteria

Hypersensitivity to fish oil supplements.

Current use of lipid-lowering medications.

Severe comorbid conditions (e.g., advanced heart disease, renal failure).

Pregnancy or lactation.

Alcohol or substance abuse.

Intervention

Participants received 1 gram per day of Omega-3 fatty acid supplements, containing EPA and DHA, for 12 weeks.

Data Collection

Data collection included demographic information and medical history at baseline, with plasma triglyceride levels measured at baseline and after the supplementation period. Blood samples were collected and processed using standardized biochemical methods.

Statistical Analysis

The primary outcome was the change in plasma triglyceride levels. Independent t-tests compared the diabetic and non-diabetic groups, with subgroup analyses in the diabetic group for glycemic control. A p-value < 0.05 was considered significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee, Government Medical College, Ongole,Andhra Pradesh. All participants provided informed consent after being briefed about the study's purpose, procedures, potential risks, and benefits. Participants were assured of confidentiality and the right to withdraw from the study at any time without any consequences to their medical care.

RESULTS

Participant Demographics

The study enrolled 100 individuals, divided equally into diabetic (n=50) and non-diabetic (n=50) groups (Table 1). The diabetic group comprised 26 males and 24 females with an average age of 58 years. The non-diabetic group consisted of 25 males and 25 females with an average age of 55 years.

Baseline Plasma Triglyceride Levels

Baseline plasma triglyceride levels were higher in the diabetic group (2.5 ± 0.8 mmol/L) compared to the non-diabetic group (1.8 ± 0.6 mmol/L), as shown in Table 2.

Effects of Omega-3 Fatty Acid Supplementation

After 12 weeks of Omega-3 fatty acid supplementation, both groups exhibited a reduction in plasma triglyceride levels. The diabetic group showed a mean decrease of 0.6 mmol/L (24% reduction, $p < 0.01$), while the non-diabetic group experienced a mean decrease of 0.3 mmol/L (17% reduction, $p < 0.05$) (Table 3).

Comparative Analysis

Comparative analysis revealed a significantly greater reduction in triglyceride levels in the diabetic group compared to the non-diabetic group ($p < 0.05$), indicating a more pronounced response to supplementation in diabetic individuals (Table 4).

Subgroup Analysis within Diabetic Group

Subgroup analysis within the diabetic group indicated that individuals with poorly controlled diabetes (HbA1c $>$ 8%) experienced a more significant reduction in triglyceride levels (0.8 mmol/L) compared to those with well-controlled diabetes (HbA1c $\leq$ 8%) (0.4 mmol/L), with both subgroups showing statistically significant changes ($p < 0.05$) (Table 5).

Adverse Effects

The supplementation was well-tolerated in both groups. Minor gastrointestinal discomfort was reported by 4% of participants in each group (Table 6).

Table 1: Participant Demographics

Group	Number of Participants	Male	Female	Average Age (years)
Diabetic	50	26	24	58
Non-Diabetic	50	25	25	55

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Table No. 2: Baseline Plasma Triglyceride Levels

Group	Baseline Triglyceride Levels (mmol/L)
Diabetic	2.5 ± 0.8
Non-Diabetic	1.8 ± 0.6

Table No 3: Changes in Plasma Triglyceride Levels After Supplementation

Group	Mean Decrease in Triglyceride Levels (mmol/L)	Percentage Reduction	P-value
Diabetic	0.6	24%	< 0.01
Non-Diabetic	0.3	17%	< 0.05

Table No. 4: Comparative Analysis of Triglyceride Level Reduction

Comparison	P-value
Diabetic vs. Non-Diabetic Group	< 0.05

Table No. 5: Subgroup Analysis in Diabetic Group

HbA1c Level	Mean Decrease in Triglyceride Levels (mmol/L)	P-value
> 8%	0.8	< 0.05
≤ 8%	0.4	< 0.05

Table No. 6: Adverse Effects

Adverse Effect	Diabetic Group (%)	Non-Diabetic Group (%)
Gastrointestinal Discomfort	4	4

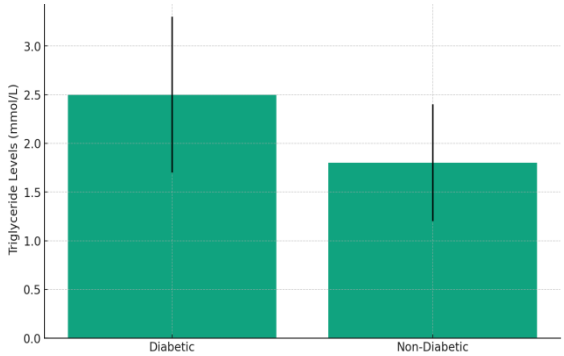

Figure No:1 Baseline Plasma Triglyceride Levels

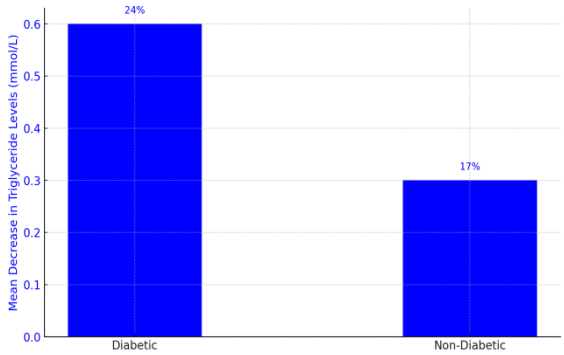

Figure No: 2 Changes in Plasma Triglyceride Levels After Supplementation

DISCUSSION

This study's findings provide valuable insights into the differential impacts of Omega-3 fatty acid supplementation on plasma triglyceride levels in diabetic and non-diabetic individuals. The significant reduction in triglyceride levels observed in both groups aligns with existing literature, highlighting the lipid-modulating effects of Omega-3 fatty acids.[7,8,9] However, the more pronounced effect in the diabetic group, especially those with poor glycemic control, suggests a potentially greater therapeutic benefit in this population.

The baseline difference in triglyceride levels between the two groups underscores the known association between diabetes and dyslipidemia. The greater reduction in the diabetic group could be attributed to a higher baseline level, offering more room for improvement. This phenomenon has been observed in other studies, where patients with higher initial triglyceride levels tend to show more significant reductions upon Omega-3 fatty acid supplementation.[10,11]

Furthermore, the subgroup analysis within the diabetic cohort reveals an interesting pattern: individuals with poorly controlled diabetes (indicated by higher HbA1c levels) exhibited a more substantial decrease in triglyceride levels. This finding could imply that Omega-3 fatty acids play a more active role in lipid metabolism in the context of disturbed glucose homeostasis. It aligns with the existing literature that Omega-3 fatty acids might improve lipid profiles by altering the very metabolic pathways disrupted in diabetes.[12,13,14]

However, while these findings are promising, they should be interpreted with caution. The study's duration of 12 weeks may not be sufficient to assess long-term effects and sustainability of triglyceride reduction. Furthermore, the study did not control for dietary and lifestyle variables, which could have influenced the outcomes. Future studies should consider a longer duration, a larger sample size, and control for these variables to validate and expand upon these findings.

The minor gastrointestinal discomfort reported by a small percentage of participants is consistent with the known safety profile of Omega-3 fatty acid supplements. This suggests that such supplementation is a safe and effective strategy to manage triglyceride levels, particularly in diabetic individuals.

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Clinical Implications

The clinical implications of this study are multifaceted, particularly in the management of dyslipidemia in diabetic patients. The significant reduction in triglyceride levels after Omega-3 fatty acid supplementation suggests a potential for these supplements to be an effective adjunct in lipid management, especially for those with diabetes. This is notably relevant for diabetic patients with poorly controlled glycemia, as they exhibited a more substantial response to supplementation15. Consequently, Omega-3 fatty acids could play a critical role not only in improving lipid profiles but also in potentially reducing the associated cardiovascular risks. This insight paves the way for clinicians to consider Omega-3 supplements as a targeted intervention, especially in diabetic patients who struggle to achieve optimal lipid control through conventional treatments.

CONCLUSION

Our study reinforces the support for utilizing Omega-3 fatty acid supplements in the management of dyslipidemia, particularly in diabetic patients.These findings could have significant implications for the dietary management of lipid abnormalities in diabetic individuals, potentially reducing cardiovascular risk and improving overall metabolic health. However, further research is necessary to fully understand the mechanisms involved and to optimize therapeutic strategies for different patient populations.

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