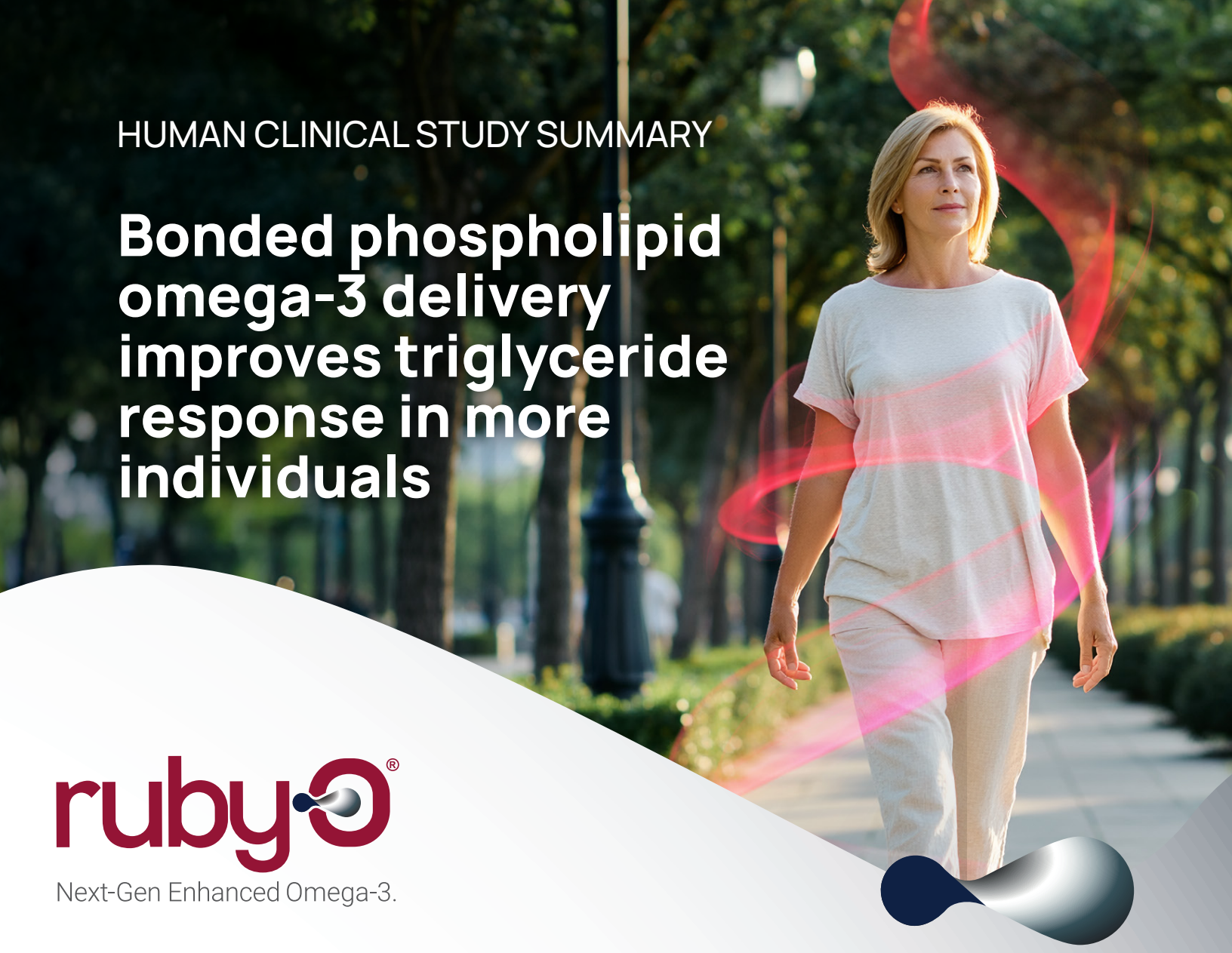
HUMAN CLINICAL STUDY SUMMARY

Bonded phospholipid omega-3 delivery improves triglyceride response in more individuals



ruby-O®

Next-Gen Enhanced Omega-3.

Human clinical evidence from a randomized, double-blind study evaluating Ruby-O®, a patented bonded phospholipid omega-3 platform, demonstrating stronger triglyceride responder outcomes and superior omega-3 incorporation efficiency at a lower EPA+DHA dose.

Focusing on delivery efficiency and clinical response rather than omega-3 dose alone.

Omega-3 fatty acids are among the most extensively studied and widely used nutritional ingredients for cardiovascular health. Their role in supporting healthy triglyceride levels is well established. However, real-world clinical outcomes remain variable, even when comparable doses of EPA and DHA are consumed.
This variability suggests that omega-3 efficacy is influenced not only by dose, but by how these lipids are structured, delivered, and biologically incorporated at the cellular level.

naturmega®

Smart lipids. Trusted science. Global impact.

This white paper presents human clinical evidence evaluating Ruby-O® Balance, a bonded phospholipid omega-3 (BPL-O3)™ platform developed by Naturmega.® In a randomized, double-blind, controlled clinical study conducted in non-medicated adults with elevated triglycerides, Ruby-O® Balance demonstrated:

- A **higher proportion** of **individuals** responding with **triglyceride**
- **34% greater omega-3** incorporation per milligram of **EPA+DHA,** despite a **lower daily dose.**
- A **favorable safety** and **tolerability** profile.
- Greater attainment of clinically relevant **triglyceride thresholds.**
- Favorable trends across additional **cardiometabolic markers.**

These findings support a shift in omega-3 formulation strategy, from increasing dose toward optimizing delivery efficiency and biological utilization.

1. Cardiovascular Health and Hypertriglyceridemia

According to the World Health Organization (WHO), hypertriglyceridemia affects approximately 25–30% of the adult population worldwide and is a well-recognized risk factor for cardiovascular disease, metabolic syndrome, and pancreatitis[1–4].

Lifestyle interventions and pharmacological approaches remain central to triglyceride management. Omega-3 fatty acids are widely recommended as a nutritional strategy due to their established role in supporting triglyceride reduction and overall cardiovascular health[2,3].

Despite broad adoption, omega-3 supplementation does not consistently produce uniform responses across individuals. This variability has traditionally been addressed by increasing EPA and DHA intake. However, growing clinical and epidemiological evidence suggests that dose alone does not fully explain differences in cardiovascular outcomes, highlighting the importance of delivery, bioavailability, and biological utilization[3–5].

2. Beyond Dose:
The Importance of Omega-3 Structure

Omega-3 fatty acids are delivered in different molecular forms, each influencing digestion, absorption, and tissue incorporation.

2.1 Conventional Omega-3 (Triglyceride Form)

Most fish oil supplements deliver EPA and DHA in triglyceride form. These require enzymatic hydrolysis by pancreatic lipase prior to absorption. Their bioavailability may depend on dietary fat intake, and their incorporation into cell membranes can be variable.

2.2 Bonded Phospholipid Omega-3

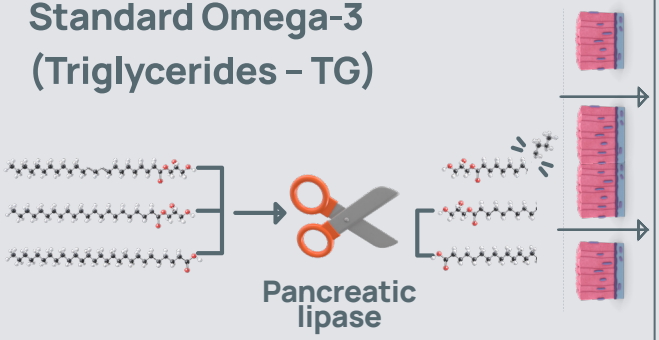
When EPA and DHA are delivered bound to phospholipids, they more closely resemble the lipid structures naturally present in human cell membranes. This configuration enables:

- More direct absorption.
- More efficient incorporation into the phospholipid bilayer.
- Improved biological utilization at the cellular level.

This structural difference provides a strong biological rationale for improved omega-3 efficiency without increasing dose.

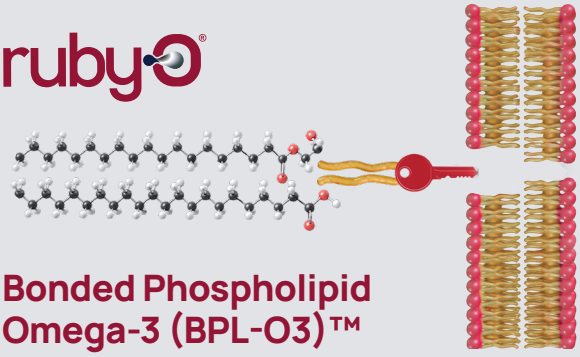
Not all Omega-3s are the same:
The structural advantage of phospholipids.

Standard Omega-3 (Triglycerides – TG)



Standard omega-3s are primarily delivered in triglyceride (TG) form. They require hydrolysis by pancreatic lipase to release free fatty acids, a process that can reduce the efficiency of their incorporation into cellular membranes. Their absorption is also highly dependent on dietary fat intake.

ruby-O®



Bonded Phospholipid Omega-3 (BPL-O3)™

With Ruby-O, EPA and DHA are esterified to a phospholipid backbone, enabling direct absorption and more efficient incorporation into the phospholipid bilayer of cell membranes. This mechanism does not rely on dietary fat intake, allowing for improved biological utilization.

3. Ruby-O® Balance:
Designing Omega-3 Delivery at the Cellular Level

Ruby-O® Balance is built on Naturmega's patented BPL-O3™ (Bonded Phospholipid Omega-3) molecular architecture.
Rather than relying on higher EPA and DHA content, Ruby-O® Balance is designed to align omega-3 delivery with the body's natural lipid pathways. This delivery-driven approach aims to improve consistency of response across individuals by optimizing how omega-3s are absorbed, transported, and incorporated into tissues.

4. Beyond Dose: The Importance of Omega-3 Structure

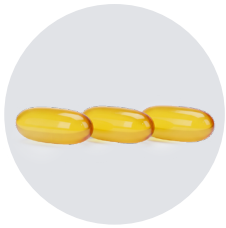
4.1 Study Overview

Randomized, double-blind, controlled clinical study

Duration: 12 weeks

Population: 44 non-mediated adults with mild to moderate hypertriglyceridemia

Intervention group: Ruby-O® Balance (825 mg/day EPA+DHA) hypertriglyceridemia



Control group: Conventional triglyceride-based fish oil (903 mg/day EPA+DHA) ceridemia

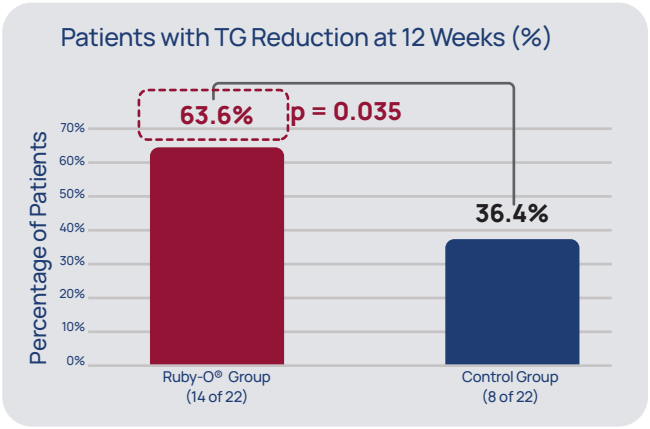
The study was designed to isolate the impact of omega-3 delivery architecture rather than omega-3 dose.

Baseline characteristics were comparable between groups.
No statistically significant differences were observed at baseline for age, sex distribution, body mass index (BMI), fasting triglyceride levels, or Omega-3 Index values (all $p > 0.05$), confirming successful randomization and a robust foundation for comparison of intervention effects (see Appendix A).

5. Clinical Outcomes

5.1 Triglyceride Response: Looking Beyond Averages

Triglyceride response to omega-3 supplementation varies widely between individuals. Because of this variability, average group changes alone do not always reflect how many people meaningfully benefit from an intervention.



In this study, evaluating outcomes at the individual level revealed clear and clinically meaningful differences between groups. A significantly higher proportion of participants receiving Ruby-O® Balance experienced triglyceride reduction compared with the control group.

Specifically, 63.6% of participants (14 out of 22) in the Ruby-O® Balance group showed triglyceride reduction after 12 weeks, compared with 36.4% (8 out of 22) in the control group.

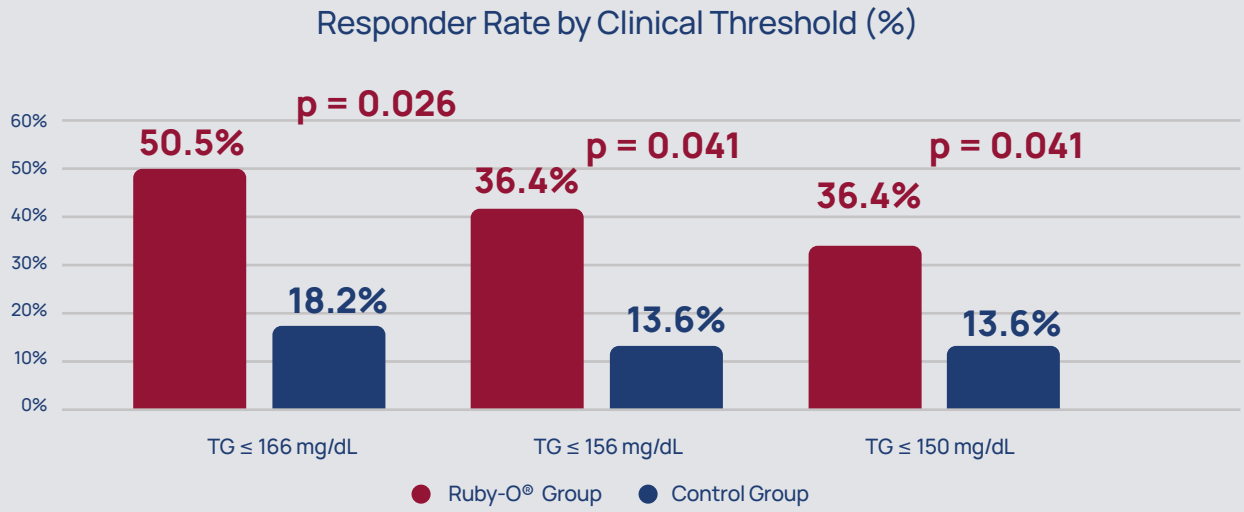
Beyond overall reduction, more participants in the bonded phospholipid omega-3 group achieved clinically relevant triglyceride thresholds associated with improved cardiovascular risk profiles, including:

- ≤166 mg/dL
- ≤156 mg/dL
- ≤150 mg/dL

These results demonstrate that Ruby-O® Balance helped omega-3 work for more individuals, not just a small subset of strong responders. By focusing on how many people respond and whether they reach meaningful clinical targets, this analysis provides a clearer picture of real-world benefit than average changes alone.

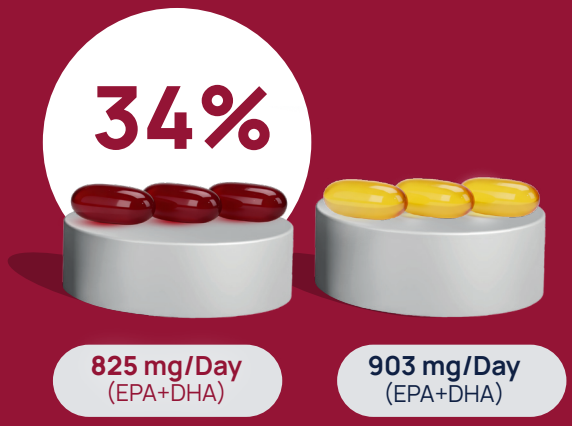
Achieving clinical goals: More patients in the Ruby-O® Group achieved healthy triglyceride levels.

Clinical threshold analysis: Percentage of participants who achieved TG levels below clinically relevant targets.



5.2 Omega-3 Incorporation Efficiency

Both formulations increased the Omega-3 Index over the 12-week period.



Improved Omega-3 Delivery Efficiency per Milligram of EPA+DHA:

34% greater biological incorporation versus conventional fish oil.

Omega-3 Index increase normalized to daily EPA+DHA intake

Ruby-O® Group (825 mg/day EPA+DHA): 0.0422% increase in Omega-3 Index per mg.

Control Group – Triglyceride Form (903 mg/day EPA+DHA): 0.0311% increase in Omega-3 Index per mg.

Bonded phospholipid omega-3 delivery achieved 34% greater biological incorporation per milligram of EPA+DHA compared with conventional triglyceride-based fish oil.

However, when adjusted for daily EPA+DHA intake, Ruby-O® Balance demonstrated **34% greater omega-3 incorporation per milligram** compared to conventional fish oil. This efficiency metric confirms that bonded phospholipid delivery enhances biological uptake and tissue incorporation.

5.3 Secondary Cardiometabolic Markers

Favorable trends were observed across several secondary cardiometabolic parameters, including:

- **Blood pressure**
- **Glycemic control indicators**
- **Waist-to-hip ratio**
- **Inflammatory markers**

While not all secondary outcomes reached statistical significance, these trends support the broader cardiometabolic relevance of efficient omega-3 delivery.

6. Safety and Tolerability

Ruby-O® Balance was well tolerated throughout the study:

- **No serious adverse events were reported.**
- **All adverse events were mild and transient.**
- **Adherence exceeded 95%.**

A mild increase in partial thromboplastin time (PTT) was observed, suggesting a potential antithrombotic signal that warrants further investigation.

7. Interpretation of Findings

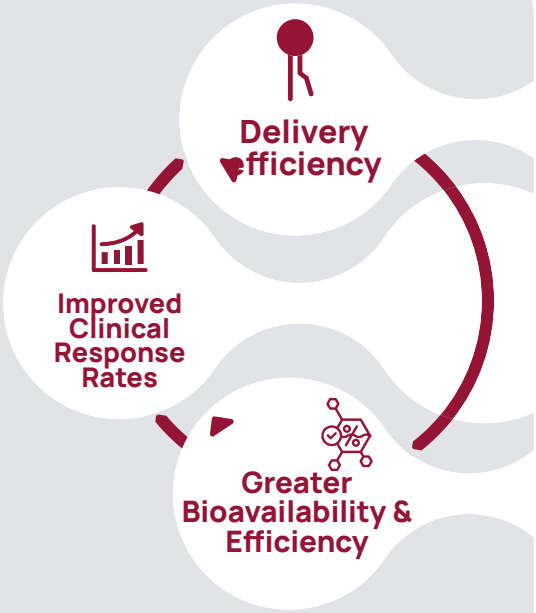
The results indicate that **omega-3 bioavailability and cellular incorporation are key drivers of clinical response.** Rather than increasing dose, optimizing lipid architecture may represent a more effective strategy for improving triglyceride outcomes, particularly in populations with metabolic risk factors.

Beyond the average, superior bioavailability drives clinical response.

Although the trial did not meet its primary endpoint in average TG reduction, it revealed a clinically meaningful benefit at the patient level.

The significantly higher responder rate and 34% greater dose efficiency support the hypothesis of improved absorption and cellular incorporation.

This effect is particularly important for achieving validated TG targets, such as the 166 mg/dL threshold, which is associated with a 45% increase in the risk of cardiovascular events.



8. Implications for Omega-3 Innovation

For brands operating in an increasingly crowded omega-3 category, differentiation based solely on EPA and DHA content is limited. The findings presented here support an alternative framework for innovation, one focused on:

- **Delivery efficiency**
- **Outcome-oriented formulation**
- **Alignment with human lipid biology**

This approach enables the development of premium omega-3 solutions with clinically relevant differentiation.

9. Advancing the Clinical Roadmap

This study represents an important milestone within Naturmega's broader clinical strategy for bonded phospholipid omega-3s. Ongoing and future research includes:

- **Larger study populations**
- **Longer intervention periods**
- **Expanded cardiometabolic endpoints**
- **Evaluation across additional formulation formats**

For brands seeking a ready-to-market **Omega-3 formulation** supported by clinical evidence, **Ruby-O® Balance** offers a validated platform **for commercial implementation.**

Conclusion

This clinical study demonstrates that bonded phospholipid omega-3 delivery can improve triglyceride response in more individuals, even at lower EPA+DHA doses.
By prioritizing delivery efficiency and cellular integration, Ruby-O® Balance reflects a scientifically grounded approach to advancing omega-3 efficacy and a broader capability in lipid innovation.

About Ruby-O®

Ruby-O® is a patented bonded phospholipid omega-3 (BPL-O3)™ molecular platform developed to enhance the biological utilization of EPA and DHA.

About Naturmega

Naturmega® is a lipid science company focused on the development of advanced, clinically backed omega-3 solutions through proprietary technologies and human clinical research.

Read the full clinical study here

Regulatory Notice
This document is intended for educational and informational purposes only. Statements have not been evaluated by regulatory authorities. Finished product claims remain the responsibility of the brand owner.

References

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Appendix A. Baseline Characteristics of the Study Population
Description
Baseline demographic and clinical characteristics were comparable between the bonded phospholipid omega-3 group (BPL-O3)™ and the control group receiving conventional triglyceride-based fish oil. No statistically significant differences were observed between groups for age, sex distribution, body mass index (BMI), fasting triglyceride levels, or Omega-3 Index at study entry (all $p > 0.05$).
These findings confirm successful randomization and establish a robust baseline for the comparison of intervention effects observed during the study period.

Table A1. Baseline Characteristics of Participants

Characteristic	Ruby-O® Group (BPL-O3)™	Control Group (TG)	p-value
Age, years (mean)	46.1	44.6	0.673
Female sex, %	36.4	27.3	0.747
Body Mass Index, kg/m² (mean)	30.2	29.3	0.425
Triglycerides, mg/dL (mean)	214.1	206.3	0.745
Omega-3 Index, % (mean)	5.60	5.69	0.778

Table Notes
- Values are presented as means or percentages, as indicated.
- p-values were calculated using appropriate statistical tests for continuous or categorical variables.
- No statistically significant differences were observed between groups at baseline ($p > 0.05$ for all comparisons).