Effects of Omega-3 Fatty Acid Supplementation on Markers of Metabolic Syndrome

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Introduction

Introduction: End-Stage Renal Disease (ESRD) patients have accelerated risk profiles when compared to aged-matched controls. New unconventional treatment methods are needed to decrease the risk for premature atherosclerosis. **Objective**: The purpose of this study was to investigate the effects of orally administered over-the-counter (OTC) omega-3 fatty acid supplements (n-3) on markers of Metabolic Syndrome. **Design**: The study was conducted using a triple-blind, permuted-block, randomized and placebo controlled experimental design. **Setting**: Central Texas Nephrology Associates related dialysis clinics recruited patients (N=87) with markers for Metabolic Syndrome based on physician diagnosis. **Intervention**: Patients were followed prospectively for 8-months after being randomly placed into an n-3 or control group (n-6) and monitored for changes in Metabolic Syndrome markers of total cholesterol, VLDL, LDL, LDL particle size, LDL particle concentration, HDL, large HDL and triglycerides. **Results**: A significant time effect (HDL cholesterol [p=.012] and LDL cholesterol [p=.001]) occurred for two lipid variables. Additionally, the n-3 group had significantly improved levels of LDL cholesterol (p=.0001) and LDL particle concentration (p=.0001) when compared to the control (n-6) group. **Conclusions**: The use of an OTC n-3 supplement help to reduce lipids associated with Metabolic Syndrome in ESRD patients. By lowering lipid levels which are strong predictors of cardiovascular disease (LDL cholesterol, LDL particle concentration) with supplementation helped to reduce the risk for premature atherosclerosis in this patient population when compared to placebo. The use of n-3 for eight months in this study appeared to decrease risk for cardiovascular disease and lower markers for Metabolic Syndrome.

Introduction

Chronic hemodialysis patients have higher rates of cardiovascular disease and accelerated risk profiles due primarily to elevated lipid and triglyceride levels, and prothrombotic and inflammatory conditions associated with Metabolic Syndrome. Therefore the purpose of this study was to monitor the effects of an OTC fish oil supplement on lipid levels in ESRD patients.

Experimental Design

Participants

- ESRD patients (N=87) 18 years of age and older were recruited for the study
- Participants were informed as to the experimental procedures and signed informed consent statements in adherence with the human subjects guidelines with Baylor University

Study Protocol

- The study was conducted using a triple-blind, permuted-block randomized and placebo controlled experimental design.
- Subjects were randomly assigned to:
  - Fish oil group (n=44) [treatment]
  - Corn oil group (n=43) [placebo]

Methods

Patients in the experimental group consumed two 1-gram softgel capsules of fish oil concentrate with each meal or six capsules (6 grams) per 24 hours. The control group consumed two 1-gram softgel capsules of corn oil with each meal or six capsules (6 grams) per 24 hours, following the same protocol as the n-3 fatty acid group. Outcome variables were measured at baseline and eight months. Additionally, all patients consumed vitamin supplements which contained 15 mg of B_6, 12 mg of B_{12}, and 2.5 mg of Folic Acid.

Fish Oil and Placebo Composition

Fish oil and placebo were quality assured and quality controlled by *Royal Numico Research B.V.* (Greenville, SC). Fish oil soft-gels were packaged in a 1-gram capsule which contained 160 milligrams of EPA and 100 milligrams of docosahexaenoic acid (DHA) and 0.9 IU of d-alpha tocopherol as an antioxidant. The placebo soft-gels were packaged in a 1-g capsule which contained Canola oil (94% unsaturated fat, 6% saturated fat).

Statistical Analysis

Primary outcomes variables of interest included HDL, large HDL, LDL, LDL concentration, LDL particle size, VLDL, triglyceride, and total cholesterol. Analysis of Variance (ANOVA) was used to measure pretest differences in the variables of interest. ANOVA for repeated measures was used to measure changes in the primary outcome variables using a 2 (fish oil or corn oil) x 2 (time [repeated measures]) design. Differences in simple main effects were analyzed for significance if a significant interaction was not found between diet and time. The Statistical Package for the Social Sciences software for Windows (version 13.0, SPSS Inc, Chicago, IL) was used to perform the statistical analysis of the data. Statistical significance was set a-priori at .05.

Results

ANOVA revealed no statistically significant difference between the treatment and control groups at baseline regarding age, gender, tobacco history, diabetic status, months on dialysis, ethnicity, medication usage and lipid variables with the exception of LDL concentration. LDL concentration was significantly lower in the control group at baseline (p=.002). There was significant supplement/time interaction in LDL levels (p=.0001) and LDL concentration (p=.0001) with LDL and LDL concentration lower in the n-3 group. Repeated measures ANOVA revealed significant time trends in HDL (p=.012) and LDL (p=.001). All other variables were not statistically significant

Conclusions

Dietary intake of fish oil whether by n-3 rich foods or supplementation has been associated with decreased risk for heart disease. Most studies using a dietary supplement have included the use of pharmaceutical grade n-3 as the means for controlling lipid levels. The present study included the use of an OTC n-3 supplement in an effort to study the effects of lipid control with n-3 in a more affordable and readily available supplement. Significant changes in lipid values occurred in HDL, LDL and LDL concentration. HDL levels decreased in the control group and increased in the n-3 group with no significant differences at baseline between groups. LDL levels increased in both groups with significant differences at eight months within groups with the greatest amount of change occurring in the placebo group. It should be noted LDL concentration was significantly lower in the control group at baseline but decreased in the n-3 group and increased in the control group causing no significant difference in posttest levels. Potential reasons for these findings may be found in a dose-response relationship and advancement of disease progression in our sample population. Although the present study contributes novel findings concerning the effect of n-3 supplementation on lipid levels, some limitations existed; primarily the method of demonstrating compliance and quality control.

Funding

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Tables/Figures

Figure 1: Changes in LDL levels in the treatment and control groups.

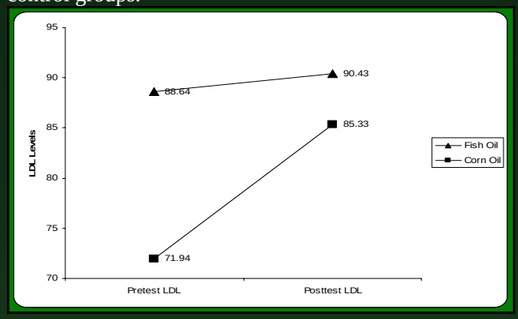

Figure 2: Changes in LDL concentration levels in the treatment and control groups.

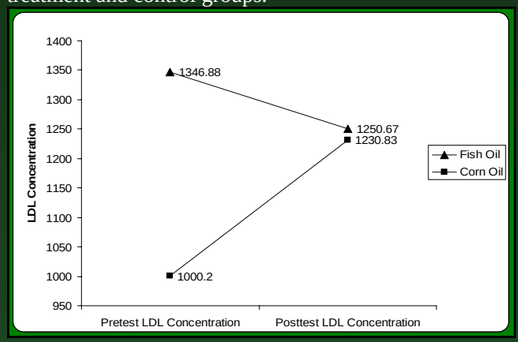

Figure 3: Changes in HDL levels in the treatment and control groups.