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Title: The effects of plant sterols and aerobic exercise on triglycerides and low-density lipoprotein cholesterol in sedentary normolipidaemic overweight Chinese males
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Summary

Diet and exercise underpin key lifestyle interventions for the prevention of cardiovascular diseases (CVD). They are often recommended in tandem and work in different yet complementary ways. This has resulted in calls for synergistic diet-exercise combinations, which may augment the benefits of existing strategies in the prevention of CVD. A plant sterol-aerobic exercise intervention has been shown to be effective in lowering triglycerides (TG) and low-density lipoprotein cholesterol (LDL-C), two independent risk factors of CVD, in hypercholesterolaemic obese Caucasian adults. However, more evidence is warranted to substantiate its beneficial effects, especially in the Chinese ethnicity, wherein notable heterogeneities in clinical severity and treatment responses of CVD have been observed as compared to Caucasians.

The primary aim of this study was to investigate the synergistic effects of a plant sterol-aerobic exercise combination on fasting TG, postprandial TG (ppTG) and fasting LDL-C in sedentary normolipidaemic overweight Chinese males. Fifteen Chinese males (mean ± SD: age 24.67 ± 3.41 years old, BMI 26.10 ± 1.52 kg/m²) underwent four 10-day interventions in a randomized order: (i) consumption of 2g/day of control margarine (Control), (ii) consumption of 2g/day plant sterols-fortified margarine (PS), (iii) consumption of 2g/day of control margarine with 30 minutes/day of walking (EX) and (iv) consumption of 2g/day of PS margarine with 30 minutes/day of walking. Fasting lipids were measured on Day 1 and Day 11 of each intervention, with an assessment of ppTG done on Day 11.
PS-EX consistently lowered mean fasting TG and ppTG AUC (area under the curve) with the largest absolute effect size by 0.31 mmol/L and 1.96 mmol/L.h respectively. A significant effect of trial on percentage Δ fasting TG levels (log-transformed) \( (F(3,36) = 4.752, \ p = .007, \ \text{partial } \eta^2 = .284) \) was observed. Pairwise comparisons revealed a significant difference between PS-EX and PS-only \( (M = 0.384, \ SE = 0.110, \ p = .028, \ 95\% \ CI 0.035 \text{ to } 0.727) \).

Mean incremental AUC in descending order were 4.60, 5.46, 6.56 and 6.46 mmol/L.h for PS-EX, EX-only, Control and PS-only respectively. One-way repeated-measures analysis of variance of the incremental area under the time curve showed that PS-EX lowered ppTG response significantly by 29.9\% \( (M = -0.365, \ SE = 0.102, \ p = .018, \ 95\% \ CI -0.678 \text{ to } -0.053) \), compared to the control. While no statistically significant effect was observed on the fasting LDL-C levels, the absolute effect sizes of the Control, PS-only, EX-only and PS-EX trial were -0.07, -0.31 mmol/L, -0.18 and -0.28 mmol/L respectively. Cohen’s \( d_z \) for PS-EX was consistently the largest across all three parameters (fasting LDL-C, fasting TG and ppTG), with the sum absolute effect size for PS-EX being more than the sum absolute effect sizes of PS-only and EX-only.

The results of the present study suggest that a plant sterol-aerobic exercise combination may confer synergistic clinical benefits on lipid levels in sedentary overweight normolipidaemic Chinese males. This highlights the potential of a plant sterol-aerobic exercise combination as a valuable strategy in the management of CVD risk in this population.