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Effect of fatty and lean fish intake on lipoprotein subclasses in subjects with coronary heart disease: A controlled trial

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BACKGROUND: Fish oil intake reduces serum triglycerides; however, little is known about the effects of dietary fish intake on lipoprotein subclasses.

OBJECTIVE: We aimed at assessing the effect of fatty and lean fish intake on the lipoprotein subclasses in an intervention study.

METHODS: The intervention study included 33 patients with coronary heart disease, who were aged 61.0 ± 5.8 (mean ± SD) years. The subjects were randomly assigned to a fatty fish (n = 11), lean fish (n = 12), or control (n = 10) diet for 8 weeks. Fish diets included at least 4 fish meals per week. Subjects in the control group consumed lean beef, pork, and chicken. Lipoprotein subclasses and their lipid components were determined by nuclear magnetic resonance spectroscopy.

RESULTS: Concentrations of n-3 fatty acids and docosahexaenoic acid increased in the fatty fish group. The concentrations of cholesterol, cholesterol esters, and total lipids in very large high-density lipoproteins (HDLs) increased in the fatty fish group (overall difference $P = .005$, $P = .002$, and $P = .007$, respectively; false discovery rate $P = .04$, $P = .04$, and $P = .05$, respectively). The mean size of HDL particles increased in the fatty fish group (9.8 ± 0.3 nm at baseline and 9.9 ± 0.4 nm at end of study; overall difference $P = .004$, false discovery rate $P = .04$). The fish diets did not affect very-low-density lipoprotein or low-density lipoprotein size.

CONCLUSION: Fatty fish intake at least 4 times per week increases HDL particle size which might have beneficial effect in patients with coronary heart disease.

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Fatty fish contains long-chain n-3 fatty acids, namely eicosapentaenoic and docosahexaenoic acids (EPA and DHA), which in several studies were shown to reduce serum triglycerides.[1,2] The effect of fish oils on total, low-density

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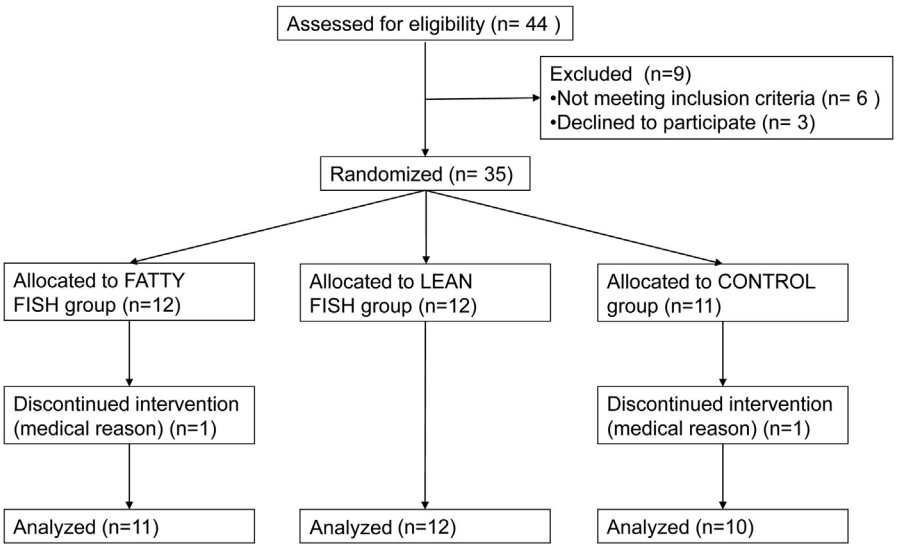

Figure 1 The subject flow.

lipoprotein (LDL), or high-density lipoprotein (HDL) cholesterol has been minor.[2] However, traditional lipid panels with total lipoprotein concentrations are inadequate to evaluate changes in multiple characteristics of the lipoproteins, such as those of HDL.[3,4] With the use of nuclear magnetic resonance (NMR) spectroscopy, lipoprotein particles of different sizes and a variety of lipid constituents in unfractionated serum and plasma can be analyzed.[5–7] Knowledge on the association between lipoprotein particles and cardiovascular disease (CVD) risk has deepened with the use of the new measures; for example, in some studies large HDL particles have been associated with lower CVD risk, whereas small HDL particles have been associated with higher CVD risk.[8,9] However, a recent study suggested that the average HDL diameter does not significantly differ between young patients with myocardial infarction and controls.[10]

Only few dietary interventions have reported results on lipoprotein subclass profiles.[11,12] Some studies that assessed the effect of use of fish oil or DHA oil supplements have been published.[13–16] Only 1 study has previously assessed the effect of fish within the context of low saturated-fat diet on lipoprotein particles.[11] We have

Table 1 Characteristics of the subjects at baseline of the intervention

	Fatty fish (n = 11)	Lean fish (n = 12)	Control (n = 10)	*P* value*
Age, years, mean ± SD	62.1 ± 6.3	60.7 ± 5.1	60.2 ± 6.4	.58
Sex, female/male, n/n	3/8	2/10	1/9	.75
Body mass index (calculated as kg/m^2), mean ± SD	26.8 ± 3.1	27.8 ± 2.1	27.0 ± 2.8	.63
Systolic blood pressure, mm Hg, mean ± SD	124 ± 16	126 ± 11	129 ± 14	.69
Diastolic blood pressure, mm Hg, mean ± SD	81 ± 8	84 ± 9	82 ± 9	.70
Current smoking, n	1	1	2	.71
Use of medications, n				
Use of statin†				.34
Atorvastatin	4	7	3	
Simvastatin	5	5	4	
Rosuvastatin	2	0	3	
Aspirin	10	11	8	.66
ACE inhibitor	3	6	6	.30
Calcium antagonist	3	4	2	.78
Oral anticoagulant	4	4	5	.71
Nitrate	2	4	3	.70

ACE, angiotensin-converting enzyme.
*Determined by analysis of variance or χ^2 test.
†The doses of statins were 10–40 mg/d for atorvastatin and simvastatin and 10–20 mg/d for rosuvastatin.