Chapter (9)
Non-Pharmacologic Treatment of Low HDL-C
I. LIFESTYLE INTERVENTIONS ARE AN INTEGRAL PART OF ANY MANAGEMENT PLAN
The National Cholesterol Education Program NCEP, and many other international organizations, emphasizes lifestyle modification for anyone with lipid levels outside target range. The NCEP guidelines include lifestyle modifications (e.g., exercise, moderate alcohol use, smoking cessation, and monounsaturated fat in the diet) as first-line therapy for low HDL-C.

II. DIET THERAPY
Current recommendations for the management of dyslipidemia in patients with T2 DM include behavioral interventions. Of interest is the increasing evidence of the benefit of low carbohydrate diet programs in achieving weight loss and improving lipid and lipoprotein levels.

A. Effect of diet on HDL
- A low carbohydrate diet has an overall favorable effect on lipoprotein subfractions.
- When studying the effects of diet and exercise in men and postmenopausal women with low levels of HDL cholesterol and high levels of LDL cholesterol, it was shown that diet control failed to lower LDL-C levels in patients who did not engage in aerobic exercise.
- Reduced fat intake produces small but significant increases in fasting plasma TG concentration, decreases HDL-C levels and lowers ApoA1 and HDL-C.
- The serum LDL/HDL-C ratio is influenced more favorably by exchanging saturated with unsaturated fat than by reducing saturated fat in the diet of women.
- Total fat, saturated fat, and cholesterol intakes increase HDL-C in men, but not in women.
- A low-fat diet is generally recommended to patients with coronary heart disease. Low-fat diet decreases both LDL-C and HDL-C. As a result of low-fat diet, low HDL-C individuals slightly decrease their HDL-C, but substantially decrease their LDL-C resulting in a significant improvement in the LDL-C/HDL-C ratio. However, subjects with normal HDL-C levels decreased both their LDL-C and HDL-C resulting in an unchanged LDL-C/HDL-C ratio.

B. Effect of Special Diet Regimens on HDL-C
- Patients and physicians are interested in using popular diets as individualized eating strategies for disease prevention. Atkins (carbohydrate restriction), Zone (macronutrient balance), Weight Watchers (calorie restriction), or Ornish (fat restriction) diet groups. Each diet significantly reduces the LDL/HDL by approximately 10%.
C. Effect of Special Food Items

- Numerous studies showed that **almond** lowers LDL-C while preserving HDL-C. Yet, few studies showed that almond significantly lowered HDL cholesterol without affecting the LDL/HDL because of its significant decrease in LDL cholesterol (29%).
- **Soy protein** is associated with significant increases in serum HDL cholesterol. Improvements in HDL-C are only observed after 12 weeks.
- **Hydrogenated fats** (like margarines) increase plasma cholesterol levels while depressing HDL-C levels.
- **MUFA-enriched diet** (monounsaturated fatty acids like olive oil) significantly increases HDL.
- **Consumption of green tea** is associated with lower serum total cholesterol, however, it does not affect serum HDL-C and TG.
- **Fermented milk** (like Rayeb Milk) significantly increases HDL-C.
- **The plant analogue of cholesterol, phytosterols**, are prepared from some plants. Free phytosterol, when heated & then cooled in fat are available for use labeled as margarine or oil enriched with phytosterol. Consumption of phytosterol-enriched food significantly reduces plasma cholesterol and LDL-C without affecting HDL-C.

III. EXERCISE

*Physical activity, besides facilitating weight reduction and assisting in maintaining weight loss in the long term, may increase serum levels of HDL-C.*

- **Moderate and high-intensity training** increase HDL levels significantly in hypercholesterolemic men, and moderate-intensity aerobic exercise significantly increased HDL levels in healthy women.
- **Only men with high TG/low HDL-C** show a significant increase in HDL-C levels in response to exercise. Endurance exercise training may be particularly helpful in men with low HDL-C, elevated TGs, and abdominal obesity.
- **Exercising before a fat meal** may have a beneficial effect on the triglyceride response and HDL metabolism.

**Recommendations for Exercise**

- Regular physical activity should be an integral part of risk reduction of the high-risk patient.
- Under advice of a physician, a high-risk patient who is overweight /obese should start walking 30 minutes for 3 days per week.
• Ideally, exercise should build up to 45 minutes of more intense walking at least 5 days a week.
• Patients also should be encouraged to modify daily activities, (e.g., walking instead of driving and climbing stairs instead of using the elevator).
• The American Heart Association-suggested activities include brisk walking, hiking, stair-climbing, aerobic exercise, resistance training, jogging, running, bicycling, rowing, swimming, and sports such as tennis, racquetball, soccer, and basketball. These are especially beneficial when performed regularly.

IV. OBESITY

• Body fatness indices including BMI and WHR (waist/hip ratio) are negatively associated with concentrations of HDL-C.
• In men with high TG/low HDL-C, exercise-induced change in abdominal subcutaneous adipose tissue is the only significant correlate of the increase in plasma HDL-C.

V. ALCOHOL

• Recommendations to include alcohol consumption in a lifestyle program are controversial, given the risks of over consumption and abuse.
• The alcohol mediated increase in the plasma HDL-C concentration could be a metabolic marker of an increased flux of postprandial TRL (triglycerides rich lipoproteins), rather than a protective factor against CVD.
• Furthermore, no strong data from prospective, randomized, clinical trials have associated reductions in atherosclerotic events with alcohol consumption.

VI. SMOKING

• Smoking cessation reduces risk for CVD events; the decline in risk begins within a few months of quitting smoking. Randomized, primary-prevention clinical trials of smoking cessation have revealed substantial reduction in subsequent cardiovascular events in quitters.
• There is an association of decreased HDL-C even with passive smoking.
• The magnitude of the potential improvement for HDL-C with cessation of smoke exposure is as great as that observed for almost any other intervention.
Recommendations Concerning Smoking

- Effective tobacco dependence treatments are available and every patient who uses tobacco should be offered at least one of these treatments.
- **Patients willing to try to quit** smoking should be provided treatments.
- **Patients unwilling to try to quit** smoking should be provided a brief intervention designed to increase their motivation to quit. Moreover, these patients should be objectively and reliably informed of the dangers of persistent smoking.

SUMMARY

- Carbohydrate restriction is more important than fat restriction when considering HDL-C raising.
- The serum LDL/HDL-C ratio is influenced more favorably by exchanging saturated with unsaturated fat than by reducing saturated fat in the diet.
- Abdominal adiposity and dietary fat consumption affect HDL subclasses differently depending on subject sex and menopausal status.
- Male subjects with low HDL-C respond to a low-fat diet better than individuals with normal HDL-C.
- The Atkins, Ornish, Weight Watchers, and Zone diets decrease LDL/HDL; while the DASH diet decreases HDL level.
- Consumption of the phytosterol-enriched food reduces plasma cholesterol and LDL-C without affecting HDL-C.
- Moderate and high-intensity training increase HDL.
- Exercising before a fat meal may have a beneficial effect on HDL metabolism.
- Body fatness indices are negatively associated with concentrations of HDL-C.
- The alcohol mediated increase in the plasma HDL-C concentration could be a metabolic marker of an increased flux of postprandial TRL, rather than a protective factor against CVD.
- The magnitude of improvement for HDL-C with cessation of smoking is as great as that observed for almost any other intervention.