

HYPERLIPIDEMIA

Hyperlipidemia or hyperlipoproteinemia typically refers to any elevation of blood lipid levels (e.g., total cholesterol, triglycerides, or lipoproteins).¹

Although terms such as hypercholesterolemia are often used interchangeably with hyperlipidemia, there are subtle differences. Hypercholesterolemia refers to elevated blood cholesterol. Dyslipoproteinemia or dyslipidemia describes abnormal levels of blood lipoproteins (e.g., low levels of high-density lipoprotein [HDL cholesterol], elevated low-density or very-low-density lipoprotein [LDL or VLDL cholesterol]). Table 11 lists the range of acceptable, borderline, and high cholesterol levels for at-risk children and adolescents.

Significance

At least one-quarter of children and adolescents are estimated to have borderline or high cholesterol levels.² In adults, elevated blood-cholesterol levels are strongly associated with atherosclerosis (hardening of the arteries) and death from coronary heart disease (CHD).³ The process of atherosclerosis begins in childhood, with the appearance of fatty streaks in the arteries. Dietary interventions can lower total and LDL cholesterol levels and is considered the initial therapy for hyperlipidemia.¹

Prevention

The following dietary recommendations have been issued for the prevention of atherosclerosis in children 2 years of age and older:^{4,5}

- Children younger than 2 years of age should not have their fat or dietary cholesterol intake restricted because of the high energy required during this time of rapid growth and development.
- Children 1 year of age and older should eat a variety of foods to ensure adequate nutrition. At age 2, children gradually need to begin eating fewer high-fat foods, so that by age 5, they receive no more than 30 percent of their calories from fat.
- Children should be encouraged to maintain or increase their levels of regular physical activity.
- Older children and adolescents need to be counseled on the consequences of tobacco use and provided with strategies for avoiding it.

To promote lower cholesterol levels in all healthy children and adolescents ages 2 to 18, the following pattern of nutrient intake is recommended:⁵

- Saturated fat should be less than 10 percent of the total number of calories consumed.
- Over several days, total fat should average not more than 30 percent but not less than 20 percent of total calories.
- Dietary cholesterol should be no more than 300 mg per day.

Screening

Early identification and treatment of children and adolescents with elevated lipid levels may reduce their risk of developing premature CHD.

Table 11. Classification of Cholesterol Levels in High-Risk Children and Adolescents^a

	Total Cholesterol mg/dL	LDL Cholesterol mg/dL
Acceptable	< 170	< 110
Borderline	170–199	110–129
High	≥ 200	≥ 130

Source: National Cholesterol Education Program.¹

^ai.e., children and adolescents from families with hypercholesterolemia or premature cardiovascular disease.

A family history of premature cardiovascular disease and/or high blood cholesterol are the most significant risk indicators for screening lipid levels in children and adolescents. Health professionals need to identify children and adolescents at highest risk for developing accelerated atherosclerosis by screening cholesterol levels in those who meet any of the following criteria:⁵

- A parent or grandparent (≤ 55 years of age) who has been diagnosed with coronary atherosclerosis (on the basis of a coronary arteriography), including those who have undergone balloon angioplasty or coronary artery bypass surgery
- A parent or grandparent (≤ 55 years of age) with documented myocardial infarction, angina pectoris, peripheral vascular disease, cerebrovascular disease, or sudden cardiac death
- A parent with a high blood cholesterol level (≥ 240 mg/dL)

Children and adolescents whose family history cannot be reliably obtained—particularly those with

other risk factors—should also be screened to determine their need for medical and nutrition guidance.⁵

Other risk factors that contribute to early onset of CHD include the following:^{5,6}

- Family history of premature CHD, cerebrovascular disease, or occlusive peripheral vascular disease
- Cigarette smoking
- Elevated blood pressure
- Low HDL cholesterol concentrations (< 40 mg/dL)
- Severe obesity (BMI ≥ 95th percentile)
- Diabetes mellitus
- Physical inactivity

Medical Screening

- Evaluate for and treat secondary causes of hyperlipidemia (e.g., corticosteroids, anabolic steroids, certain oral contraceptives, anorexia nervosa, hypothyroidism, diabetes mellitus, pregnancy).^{7,8}
- Evaluate for familial lipid disorder and clinical signs of hyperlipidemia.^{7,8}
- Identify other risk factors.^{7,8}
- Screen all family members.^{7,8}

Nutrition Screening

- Interview the child or adolescent and parents to assess food purchasing and preparation habits as well as eating patterns. Provide nutrition counseling.^{8,9}
- Ask the child or adolescent to complete a 3-day food record to supplement the dietary interview. (If the child is younger than 10, the parent should complete the food record.)^{8,9}

Monitoring

Children and adolescents with hyperlipidemia need to have their blood cholesterol, eating behaviors, and other risk factors monitored regularly. Those with borderline cholesterol levels should be rechecked within 1 year, but those with high LDL or high total cholesterol values should be seen 1 to 2 months after initial nutrition counseling to reevaluate their status. Three-day food records can be collected at least twice a year to help assess progress. If blood lipid levels have not improved or dietary goals have not been achieved, more intensive counseling may be required. With familial lipid disorders, blood lipid levels may not improve appreciably, even with excellent adherence to a regimen. This may be an appropriate time for referral to a lipid center and/or consideration of drug therapy.

Counseling

Following are the major components of nutrition counseling for children and adolescents with hyperlipidemia.

- Seek support from the child's or adolescent's family.
- Explain and encourage adherence to the National Cholesterol Education Program Step-One Dietary Guidelines¹ (see Table 12). The guidelines emphasize eating fruits and vegetables, whole grain products, legumes, lower-fat dairy products, lean red meat, poultry, and fish.
- Ensure the nutritional adequacy of the child's or adolescent's diet.
- Teach skills for appropriately selecting and preparing food.



- Help the child or adolescent and the family plan ahead for special occasions and provide flexibility in food choices.
- Encourage the reduction of other CHD risk factors.
- Encourage regular physical activity and sound approaches to weight management. If the child or adolescent is overweight, encourage daily physical activity.

Following are age-appropriate strategies for preventing or treating hyperlipidemia.

Infancy and Early Childhood

When infants are introduced to cow's milk at about 1 year, whole milk should be given because of their need for higher levels of fat. Children older than 2 years can be given reduced-fat (2 percent), low-fat (1 percent), or fat-free (skim) milk.

Serving three healthy meals plus three snacks each day is the best way to satisfy the young child's appetite.

**Table 12. National Cholesterol Education Program Step-One Dietary Guidelines—
Servings per Day for Different Age Groups**

Food Group	Age of Child or Adolescent (years)						
	2–3	4–6	7–10	11–14 Males	11–14 Females	15–18 Males	15–18 Females
Meat, poultry, fish (oz)	2	5	6	6	6	6	6
Eggs (per week)	3	3	3	3	3	3	3
Dairy products (serving)	3	3	4	4	4	4	4
Fruits (serving)	2	3	3	3	3	5	3
Vegetables (serving)	3	3	3	4	3	4	3
Breads and cereals (serving)	5	6	7	9	8	12	8
Fats and oils (serving)	4	5	5	7	5	10	5
Sweets and modified desserts (serving)	1	2	2	4	3	4	3

Source: National Cholesterol Education Program¹

- Dairy products serving = 1 cup milk or yogurt, 1 oz cheese, 1/2 cup frozen dairy dessert
- Fruits serving = 1 medium piece, 1/2 cup juice
- Vegetables serving = 1/2 cup raw or cooked, 1 cup salad
- Breads and cereals serving = 1 slice bread, 1/2 hamburger or hot dog bun, 1 cup cereal, 1 tortilla, 1/2 cup rice or pasta, 1 muffin, 1 4-inch pancake
- Fats and oils serving = 1 teaspoon oil or margarine, 1 tablespoon salad dressing
- Sweets serving = 6 oz fruit-flavored beverage, 3/4 oz hard candy, 2 cookies, 1 slice cake, 1 1/2 tablespoons jam/jelly

Middle Childhood

The dietary recommendations of the National Cholesterol Education Program and the American Academy of Pediatrics are more than adequate to support growth in middle childhood, as long as meals are not skipped and snacks are available.^{1,5} It is important to determine that foods are not being eliminated because of the child's refusal to try a lower-fat item. For example, a child may drink less

milk because of refusing to try reduced-fat (2 percent), low-fat (2 percent), or fat-free (skim) milk. Gradually introducing lower-fat milk (e.g., mixing equal portions of higher-fat milk and lower-fat milk for a week) or using it first in milkshakes (made with lower-fat milk and lower-fat ice cream) may encourage acceptance.

During middle childhood, it is more difficult to monitor and control the food intake of a child with hyperlipidemia because of additional eating oppor-

tunities (e.g., at school, friends' houses, the movies, fast-food and other restaurants, and the neighborhood store). The health professional needs to weigh both the severity of the hyperlipidemia and the risk of developing CHD against the child's feelings of being deprived of favorite foods, and to build as much flexibility as possible into the child's diet.^{1,8}

Adolescence

The National Cholesterol Education Program's dietary recommendations for adolescents with hyperlipidemia are nutritionally adequate, even during the rapid growth and development associated with puberty.¹ The need for flexibility in the diet is even greater for the adolescent with hyperlipidemia, who is eating away from home more frequently and assuming greater responsibility for selecting and preparing foods. Because elevated lipid levels are not associated with any pain or visible signs, it is challenging for adolescents to resist favorite foods to prevent health consequences far in the future. Consistent support from the family and health professionals for the adolescent's food choices is important in order to continue and reinforce dietary change. Adolescents in foster homes or halfway houses may face additional obstacles in trying to maintain a healthy, low-fat diet.^{7,8,10}

Health professionals need to weigh the severity of the adolescent's hyperlipidemia against the relative risk that the adolescent may develop an eating disorder. Many adolescents with eating disorders initially justify their restrictive eating as an attempt to "eat healthy," denying they are trying to lose weight. In addition, secondary causes of hyperlipidemia include the metabolic changes seen in anorexia nervosa or the use of anabolic steroids for enhanced muscle mass. It may be useful to briefly

screen for eating disorders in adolescents with hyperlipidemia.

Referral

Referral to a specialized lipid center should be considered for children and adolescents with a significant family history of premature heart disease or familial lipid disorders. Comprehensive nutrition counseling for the family is needed to help the child or adolescent adhere to the diet. Children and adolescents with LDL cholesterol higher than 130 mg/dL should be referred to a dietitian, who can tailor the diet to meet individual needs.

References

1. National Institutes of Health, National Heart, Lung, and Blood Institute, National Cholesterol Education Program. 1991. *Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents*. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute, National Cholesterol Education Program.
2. Williams CL, Bollella M. 1995. Guidelines for screening, evaluating, and treating children with hypercholesterolemia. *Journal of Pediatric Health Care* 9(4):153-161.
3. Levine GN, Keaney JF Jr, Vita JA. 1995. Cholesterol reduction in cardiovascular disease. Clinical benefits and possible mechanisms. *New England Journal of Medicine* 332(8):512-521.
4. American Academy of Pediatrics, Committee on Nutrition. 1998. *Pediatric Nutrition Handbook* (4th ed.). Elk Grove Village, IL: American Academy of Pediatrics.
5. American Academy of Pediatrics, Committee on Nutrition. 1998. Cholesterol in childhood. *Pediatrics* 101(1 Pt. 1):141-147.

6. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *Journal of the American Medical Association* 285(19): 2486–2497.
7. American Medical Association, Department of Adolescent Health. 1995. *Guidelines for Adolescent Preventive Services (GAPS): Recommendations Monograph* (2nd ed.). Chicago, IL: American Medical Association.
8. Arden MR, Schebendach JE. Disease prevention among youth: Atherosclerosis and hyperlipidemia. 1996. In Rickert VI, ed., *Adolescent Nutrition: Assessment and Management* (pp. 89–106). New York, NY: Chapman and Hall.
9. Frank GC. 1988. Nutritional therapy for hyperlipidemia and obesity: Office treatment integrating the roles of the physician and the registered dietitian. *Journal of the American College of Cardiology* 12(4): 1098–1101.
10. Kottke TE, Brekke ML, Solberg LI. 1993. Making “time” for preventive services. *Mayo Clinic Proceedings* 68(8):785–791.