Diet and Primordial Prevention of Cardiovascular Disease in Children and Adolescents

Stephen R. Daniels, MD, PhD

It is now clear that the process of atherosclerosis begins in childhood. A series of pathology studies, starting with autopsy examination of young soldiers killed in combat in the Korean War and the war in Vietnam to more recent studies such as the Pathobiologic Determinants of Atherosclerosis in Youth (PDAY) study and the Bogalusa study, have demonstrated that fatty streaks in the aorta and coronary arteries develop early in life and that even the more advanced and more concerning fibrous plaques are present in a proportion of adolescents and young adults. The PDAY and Bogalusa studies also have demonstrated that the traditional risk factors such as high body mass index, high blood pressure, and dyslipidemia are strongly associated with the presence and extent of arterial lesions. The Bogalusa cohort also has demonstrated that the presence of multiple risk factors is associated with an even higher risk for atherosclerotic lesions.

It is also well known that atherosclerotic cardiovascular disease is the most common cause of death in developed countries. Not uncommonly, the first clinical episode related to atherosclerosis is sudden cardiac death. Taken together, these data argue very strongly for the prevention of atherosclerosis and for prevention efforts to begin early in life. This might best be labeled primordial prevention because it is aimed at the prevention of development of risk factors in the first place. However, pediatric prevention of cardiovascular disease also includes primary prevention that focuses on control of cardiovascular disease risk factors once they are present to prevent overt clinical disease in adulthood.

Dietary intervention is a key component of primordial prevention of dyslipidemia. Reduced intake of saturated fat and cholesterol in the diet has been shown in numerous studies to be associated with lower total and low-density lipoprotein cholesterol. Overall control of calories and restriction of added sugar also are important in the prevention of hypertriglyceridemia. However, implementing diet changes in infants, children, and adolescents has not been without controversy. The central nervous system develops rapidly during the first 2 years of life. This includes the process of myelination, which is thought to depend to some extent on the intake of fats in the diet. There also has been concern that a diet lower in saturated fat might interfere with normal growth and development. This concern was based on case reports of infants and children who developed failure to thrive as a result of the misguided overrestriction of calories from fat by parents. There also has been concern that a diet lower in saturated fat and cholesterol might interfere with normal sexual maturation. This concern is based in part on the concept that cholesterol is an important building block of sex steroid hormones. This tension between a desire to prevent dyslipidemia and atherosclerosis and a concern that some dietary interventions might be disadvantageous has been heightened by a dearth of scientific evidence. Thus, the optimum diet for infants, children, and adolescents that would be useful in the prevention of atherosclerosis and also free of unwanted side effects has remained obscure.

Fortunately, the special Turku Coronary Risk Factor Intervention Project (STRIP) has been able to provide important information on diet throughout childhood and its role in the primordial prevention of atherosclerosis. The STRIP study is a prospective randomized controlled clinical trial of diet carried out in Turku, Finland. In this study, infants were recruited from well-baby clinics from 1990 to 1997. At 7 months of age, infants were randomly assigned either to receive counseling aimed at controlling environmental factors related to cardiovascular disease risk or to a control group. The intervention families had intensive diet counseling; the control families were seen by the same team and received standard advice but without intensive dietary counseling. Dietary counseling for the intervention was supervised by a dietitian, and the aim was to keep the total intake of fat at 30% to 35% of daily energy, the ratio of saturated fat to monounsaturated plus polyunsaturated fatty acid at 1:2, and the cholesterol intake at <200 mg/d. Breastfeeding was encouraged for the first year of life in both groups. When infants in the intervention group reached 1 year of age, skim milk was recommended. Parents in the intervention group were counseled to include increased fruits, vegetables, and whole grain products in the diet. Food records were used as an important part of the dietary counseling. During the early years of the study, diet counseling was directed at the parents. As the study subjects reached 7 years of age and older, progressively more dietary counseling was directed at the child. The control group received the standard health education that would be routinely given at Finnish well-baby and well-child visits. At 12 months of age, cow milk with 1.9% fat was recommended for daily use. Thus, the control group recommendations paralleled the kind of diet information that
has been most frequently provided to parents in the United States.

In this issue of Circulation, Niinikoski et al12 present the most up-to-date findings from the Special Turku Coronary Risk Factor Intervention Project (STRIP). This report focuses on results from the study in 14 years of age. Thus, we now have data across many dimensions in which concerns have been raised about diet, lipids, and lipoproteins in infancy, childhood, and adolescence. In this report, the STRIP investigators demonstrate that ongoing dietary intervention has resulted in significantly lower total and low-density lipoprotein cholesterol at 14 years of age. High-density lipoprotein cholesterol remained similar between the 2 groups. As important as those results is the fact that no significant differences existed between the dietary intervention and the control groups in growth, body mass index, pubertal development, or age at menarche for girls. This means that the STRIP dietary intervention is both safe and effective when applied from 7 months to 14 years of age. The results of this study are consistent with those of the Dietary Risk Factor Intervention Project (STRIP). This report focuses in infancy, childhood, and adolescence in the United States.13

The results of the STRIP study have important clinical and public health implications. Evidence is mounting that we should be implementing a diet similar to the one used by the STRIP investigators in infants, children, and adolescents in the United States. This includes supporting breastfeeding and introducing low-fat dairy products at 1 year of age. However, it also is important that ongoing, appropriate counseling on diet be provided to parents during primary pediatric care. This will help to minimize any misguided attempts of some parents to use a very-low-fat, low-calorie diet, which can result in failure to thrive. Recently, Ford et al14 reported that approximately half of the decline in deaths resulting from coronary artery disease in the United States from 1980 to 2000 was attributable to a reduction in major risk factors for cardiovascular disease. It is possible that more widespread adoption of a STRIP-type diet in childhood could lead to a further reduction in low-density lipoprotein cholesterol and ultimately death resulting from coronary artery disease.

Disclosures

None.

References


Key Words: Editorials ■ atherosclerosis ■ diet ■ fatty acids ■ pediatrics ■ prevention
Diet and Primordial Prevention of Cardiovascular Disease in Children and Adolescents
Stephen R. Daniels

Circulation. 2007;116:973-974
doi: 10.1161/CIRCULATIONAHA.107.723817
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2007 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/116/9/973

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/