Hypercholesterolemia Among Children
When Is It High, and When Is It Really High?

Stephen Cook, MD, MPH

The rate of childhood obesity has at least tripled over the past 3 decades and has raised significant concerns about the cardiovascular health of America’s youth.1 Some fear that as a result of the obesity epidemic, a wave of debilitating chronic conditions will afflict America’s youth. We do not yet know when, or even if, the wave of cardiovascular risk factors, such as hypercholesterolemia and type 2 diabetes, will crash into the health of our country’s young adults. Perhaps the real question is the impact of childhood obesity, and the accompanying risk factors, on the health of Americans in their 30s and 40s.

Article p 1108

The American Academy of Pediatrics Committee on Nutrition released new guidelines on the screening and treatment of high cholesterol in children and adolescents.2 The guidelines were an update from 1998 and were intended to define both a broad population approach and a targeted individual approach. The popular media focused on the message that statins could now be prescribed to obese children as young as 8 years of age, and they missed the message about population-based prevention through lifestyle changes in nutrition and physical activity. The concern for families and providers would be that any obese youth with elevated cholesterol would now need to start a medication that their grandparents also use.

The public health and epidemiology community has recently provided data on the trends of a number of cardiovascular risk factors in youth. There needs to be more clarity in regard to the current health status of America’s children. There are significant differences in the rates of teens with an abnormal risk factor, such as impaired fasting glucose >100 mg/dL, and a clear clinical condition, such as type 2 diabetes mellitus. Previous data showed that the US prevalence of type 2 diabetes in the early 1990s was only 0.4% of US adolescents, and impaired fasting glucose (110 to 125 mg/dL) affected only 1.7%. When the American Diabetes Association changed the criteria for elevated fasting glucose from >110 mg/dL to 100 mg/dL, it was found that impaired fasting glucose affected 7% of adolescents in 1999–2000.3 This has not been an isolated finding. A study of a large cohort of mostly overweight eighth graders from across the United States showed that 40% had a fasting glucose >100 mg/dL.5 The SEARCH for Diabetes in Youth study confirmed that type 2 diabetes, once virtually unknown in the young, is likely to represent one third to one half of all new cases of diabetes among US adolescents.6 Although specialty clinics first showed a dramatic rise in referrals for type 2 diabetes,7 more recent national data still show type 2 diabetes to be a rare condition (≈0.5%).8 These findings highlight the prevalence of the precursors for serious disease in today’s adolescents, but full-fledged disease is still a rare event in teens.9

This difference is apparent in the article by Ford et al in the present issue of Circulation.10 They reported the rate of elevated cholesterol and high cholesterol requiring pharmacotherapy among US adolescents. Key features of this study are that it is both nationally representative and current (ie, reported during the current obesity epidemic) and is not from a single pediatric lipid specialty clinic. Their first finding was that only 0.8% of US teens had a low-density lipoprotein (LDL) cholesterol level above the threshold for pharmacotherapy to be considered. This group included youth with an LDL cholesterol level >190 mg/dL, those with LDL >160 mg/dL with risk factors (obesity, hypertension, smoking, or family history of premature cardiovascular disease), and those with diabetes mellitus and LDL ≥130 mg/dL. They also found that less than half of those meeting criteria for pharmacotherapy had an LDL >190 mg/dL, a rate consistent with a familial form of hypercholesterolemia. The second point of this article was that elevated cholesterol, defined by cutoffs from the Lipid Research Clinics Prevalence Study and the National Cholesterol Education Program, was found to affect only 9% to 10% of US teens. This difference, 10% compared with <1%, is similar to the rates of impaired fasting glucose compared with actual levels of type 2 diabetes. These findings should enlighten the pediatric health community to the fact that, despite all the attention given to the recent cholesterol screening guidelines from the American Academy of Pediatrics, they will encounter few children or teens in need of medication to treat severe hyperlipidemia in their primary care practices.

We need to consider the trends of cardiovascular risk factors on a population level. On a population level, some risk factors in children have been stable during the pediatric obesity epidemic, and some seem to be decreasing.11 US data show that mean levels of total, LDL, and high-density lipoprotein cholesterol have remained unchanged from the early 1990s to 2000. During this time, body mass index, waist circumference, and blood pressure have increased. The rate of smoking and second-hand smoke exposure is decreasing.12,13

© 2009 American Heart Association, Inc.

Circulation is available at http://circ.ahajournals.org
DOI: 10.1161/CIRCULATIONAHA.108.837666
The rate of high school seniors who smoke has also decreased by nearly 30% from 1980 to 2006.\textsuperscript{14} It seems that public health efforts may be paying off in terms of the reduction of some cardiovascular risk factors.

Certain environmental and population efforts are likely linked to these improvements. The amount of saturated fat in the US food supply remained fairly stable up until 2000 but has increased since then.\textsuperscript{14} Although some national data have shown a decrease in the percentage of calories from fat in the US diet, the absolute amount of fat also increased in parallel with an increase in total calories.\textsuperscript{15} Novel efforts have now begun to decrease trans fat availability and intake to help reduce the risk for cardiovascular disease. In addition to efforts to improve the diet of the US population, efforts to reduce smoke exposure need continued vigilance. There has been somewhat of a leveling off in the decline of tobacco use among adolescents of late.\textsuperscript{13}

The low prevalence of serious conditions such as familial hypercholesterolemia and type 2 diabetes mellitus in youth provides some reassurance about the immediate or imminent cardiovascular health of US teens, but the high prevalence of the precursors of cardiovascular disease in this group puts in doubt the health of these same individuals in their third, fourth, or fifth decades of life. Longitudinal studies of adults who were obese with cardiovascular risk factors 20 to 30 years ago suggest a growing likelihood of premature cardiovascular sequelae that may be starting in today’s children in this obesity epidemic.\textsuperscript{16,17} US mortality data among adults has shown a concerning trend in recent years. Coronary heart disease mortality, which had been dropping steadily over 20 years, has leveled off for women aged 35 to 45 years and has increased among men aged 35 to 45 years.\textsuperscript{18} This finding raises questions and concerns that, although tobacco use has decreased, a slight rise among young adults may be a signal whereby the rise in childhood obesity, as well as the accompanying risk factors, may begin to have an impact on the health of America’s adults.

The roles of the primary and specialty pediatricians are clearly changing but should be directed toward community, family, and behavioral approaches to improve the current and future health status of America. The protective effect of exercise and fitness has a role in determining the course of this disease process. In October 2008, the Department of Health and Human Services released the Physical Activity Guidelines for all Americans as a national policy for this country. The American Academy of Pediatrics lipid guidelines state that changes in diet and other lifestyle factors are key for the population approach. Behavioral counseling for diet and exercise is also the first-line treatment for the targeted, individual approach. Behavioral techniques for discussing nutrition and exercise changes with families are both feasible and accepted by families.\textsuperscript{19}

Behavioral and lifestyle treatment modalities are currently moving toward more strong support by the medical community. The Healthcare Effectiveness Data and Information Set measures for 2009 will now include body mass index tracking and counseling for diet and physical activity at all annual visits for children aged ≥2 years.\textsuperscript{20} Pediatricians do not need enroll in continuing medical education events on the use of statins and angiotensin-converting enzyme inhibitors in their adolescent patients. They would be better served to seek training in behavioral approaches to motivate families to adopt healthy dietary patterns and prescribe exercise as a medicine to be taken daily. A reversal of this trend is not likely to come solely from behavioral approaches in the clinical setting.

The urgent issues we need to address are the importance of implementing preventive strategies versus continued observation of these abnormal risk factors. These are questions to be addressed and supported by the continued tracking of health status and risk factors on both regional and national levels. The issue of prevention also needs to be supported on local and global levels. It would be ideal if this article by Ford et al received the attention of the general pediatric audience that the cholesterol guidelines received. The pediatric clinical community is in a unique position to meet with the entire family to discuss and apply prevention guidelines. Pediatric providers can advocate for continued and increased efforts to reduce the effects of tobacco smoke on youth. They can push for community efforts to support active outdoor play and to preserve and expand activity time during the school day, either as recess or physical education. They can call for improved dietary standards in childcare facilities and schools, advocate limitations on vending options in schools, and endorse limits on advertising to children. Pediatricians can also be a strong voice for the health of today’s children and the future of America.

**Sources of Funding**

Dr Cook is supported by National Institutes of Health Career Development grant K23 HL08694-01A1.

**Disclosures**

Dr Cook has received a speaker’s honorarium from the American Dairy Council.

**References**


Key Words: Editorials ■ diagnosis ■ epidemiology ■ hypercholesterolemia ■ obesity ■ pediatrics
Hypercholesterolemia Among Children: When Is It High, and When Is It Really High?
Stephen Cook

Circulation. 2009;119:1075-1077
doi: 10.1161/CIRCULATIONAHA.108.837666
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 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/119/8/1075

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/