Journal of Clinical Lipidology (2008) 2, 156–161

Journal of Clinical Lipidology

Societal aspects in the dietary management of childhood hyperlipidemia

Rosemary L. Walzem, RD, PhD, FACN,* Peter Murano, PhD

Department of Nutrition and Food Science, 122 Kleberg Center, 2253 Texas A&M University, College Station, TX 77843-2253, USA (Drs. Walzem and Murano), Poultry Science Department, 101 Kleberg Center, 2472 Texas A&M University, College Station, TX 22843-2472, USA (Dr. Walzem), and Institute for Obesity Research and Program Evaluation, 1500 Research Parkway, 2254 Texas A&M University, College Station, TX 77843-2254, USA (Dr. Murano)

KEYWORDS:
Blood lipids;
Child;
Interventions;
Nutrition;
Obesity

Abstract. Pediatric hyperlipidemias increasingly require dietary management of overweight and obesity for resolution. Dietary management of inappropriate weight gain may be outside of normal pediatric expertise. This review used scientific statements of expert professional groups, federal program documentation, and selected original articles or opinions to survey dietary techniques and highlight continuing controversies and therapeutic successes. At present, complex societal and environmental factors underlie the current epidemic in pediatric overweight, precluding definitive statements of best practices. Thus, although first-generation professional group recommendations are available, clinicians should expect recommendations to change. However, lack of standardized practices to assess the degree and quality of overweight (central versus peripheral adiposity) limit objective determination of therapeutic need and timely referral to nutrition professionals. Dietary management of insulin-resistant, overweight/obese children with dyslipidemias (metabolic syndrome) requires appropriate laboratory diagnostics to ensure that total fat and energy restrictions do not provoke or exacerbate hypertriglyceridemia or liver fat accumulation. Integrated treatment approaches that combine nutrition education, behavioral modification, and individualized diet instruction are showing success. Diet instructions that include practical translation of nutrition principles to daily eating habits are able to bring about substantial dietary change. The role of the school as a significant component of a child's lifestyle is described, as well as consideration of federally mandated feeding programs as a factor in designing effective dietary management strategies for those likely to be at high risk for overweight and dyslipidemias. The need for coordination among families, and health and school professionals to achieve success is emphasized.

Increasingly, dietary management of pediatric hyperlipidemia falls into one of two broad categories: hypercholesterolemia and obesity-associated dyslipidemias. Childhood hypercholesterolemia predicts adult hypercholesterolemia and increased atherosclerotic cardiovascular disease (ASCVD) risk.[1] Similarly, left untreated, childhood overweight, obesity, and metabolic syndrome predict adult overweight and obesity and metabolic syndrome.[2,3] Diet is a well-documented environmental variable in the causation of hyperlipidemia and obesity, and diet modification is the cornerstone of interventions to reduce ASCVD risk and body mass index (BMI).[4,5] The 1992 National Cholesterol Education Program focused on blood plasma total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C)–lowering,[5] and provided general diet guidelines for two levels of total

* Corresponding author.
E-mail address: rwalzem@poultry.tamu.edu
Submitted February 17, 2008. Accepted for publication April 6, 2008.

1933-2874/$ -see front matter
doi:10.1016/j.jacl.2008.04.003

fat: saturated fat and cholesterol reduction, the so-called "Step 1" and "Step 2" diets. The report recommended a team approach for effective intervention and provided some general guidelines for implementation. A Scientific Statement issued by the American Heart Association in 2005 expanded upon dietary advice in an effort to address defects in diet quality that prior recommendations encouraged.[5] The focus has also changed from TC to non–high-density lipoprotein cholesterol (non–HDL-C) because the issue is to lower all atherogenic lipoproteins, including very low–density lipoproteins and intermediate-density lipoproteins as well as LDL.

Diet intervention can reduce TC and LDL-C concentrations in children

In the intervening 17 years, two key longitudinal studies have reported on the responses of hypercholesterolemic and normolipemic children to dietary interventions aimed at reducing cholesterol in atherogenic lipoproteins.[5] The Dietary Interventions Study in Children (DISC) was the largest (n = 663) and the longest dietary intervention study in free-living children with elevated LDL-C. Started in 1987, DISC recruited normotensive, prepubertal 8- to 10-year-olds with TC concentrations between the 80th and 98th percentiles for age and gender and followed them to ~17 years of age. Dietary recommendations in DISC were similar to those of the Step 2 diet and delivered as part of an intensive group and individual intervention for the first 3 years of the study. Less-intensive follow-up and intervention were continued for an additional 4 years. In that study, dietary interventions aimed to reduce total dietary energy intake (DEI) as fat to 28% of kilocalories, with ≤8% DEI from saturated fat and up to 9% DEI from polyunsaturated fat. The goal for cholesterol intake was to consume <75 mg cholesterol per 1000 kcal. Dietary interventions were designed using a "stoplight" food classification approach with foods classified as "go" or "whoa," depending upon their fat and cholesterol content. Diet instructions were delivered in a series of interventions linked to behavioral skill–training focusing on the child. DISC was the first study to rely on the child to provide his or her own 24-hour dietary intake data and, recognizing that the children would ultimately control their own food choices, train for that competency in adolescence and adulthood. The Special Turku Coronary Risk Factor Intervention Project (STRIP) applied similar dietary goals and intervention strategies prospectively in normocholesterolemic children prior to their first birthday following recruitment from well-baby clinics in Finland.[6] Now carried through 14 years of age, the STRIP study also showed long-term efficacy in TC and LDL-C–lowering when individualized diet plans were implemented in conjunction with parent education and progressively more instruction to the child.

Empowering children to select healthful foods in appropriate amounts early in life is key to establishing healthy long-term dietary intakes

In both DISC and STRIP, interventions reduced total and saturated fat intake, TC, and LDL-C, despite increasing numbers of meal selections away from home by maturing children, albeit differences decreased as intervention frequency decreased. In both studies, saturated fat intake was lowest during the first intervention year, but averaged ~10% DEI longitudinally, as opposed to ~13% DEI in the usual care groups. Longitudinal total fat intake averaged ~30% DEI in the intervention group and ~32% DEI in the usual care group. Importantly, in both DISC and STRIP, growth and pubertal development remained similar and within normal healthy limits between the intervention and usual-care children, despite effective serum cholesterol–lowering among intervention subjects in both trials. These outcomes ease fears about the possible effects of saturated fat and cholesterol restriction on growth and maturation in young growing children. Final mortality data are not yet available for DISC or STRIP, leaving open the question of actual ASCVD reduction, but it is notable that the interventions did not adversely affect BMI and serum triacylglycerol and HDL-C, despite the higher relative and absolute carbohydrate intakes recommended in both studies. Perhaps key was that both studies recommended increased carbohydrate intake in the form of complex carbohydrates (whole grains, vegetables, and fruit) with a total carbohydrate intake consistent with maintenance of a healthy bodyweight.[7] Interestingly, in STRIP, the frequency of overweight was less in girls assigned to the intervention group, despite the omission of primary energy restrictions and similar dropout rates among overweight and normal-weight children.[8]

Analysis of changes in food-intake patterns was conducted in DISC and showed that snack foods, desserts, and pizza contributed approximately one third of total DEI in both intervention and control groups at year 3 of the study.[9] This relatively high contribution of what many consider "junk" foods has been observed repeatedly in many populations,[10,11] with overweight being associated with increased total energy intakes rather than a skewing of DEI toward any particular food type. In boys, intakes of desserts, snacks, and pizza were directly associated with both LDL-C and BMI, whereas consumption of breads and grains was negatively associated with BMI. In girls, dairy consumption was negatively associated with BMI. No significant association between food groups and LDL-C were observed among girls.[9] Although lower intakes of DEI from fat were associated with higher intakes of iron, folate, vitamins A and C, they were also associated with lower intakes in calcium, zinc, magnesium, phosphorous, vitamins E and B-12, thiamin, niacin, and riboflavin. Inadequate intakes of several of these mineral nutrients are of concern relative to development of hypertension.[12]