Nutrition Interventions for Pediatric Lipid Disorders

Compiled by: S. Skylar Griggs, MS, RD, LDN
Clinical Nutrition Specialist II
Department of Cardiology
Boston Children’s Hospital
Fifth Annual Let’s Go 5-2-1-0 Conference
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Agenda

• Attendees will become familiar with current universal screening guidelines for pediatric hyperlipidemia.

• Attendees will be up to date on current research regarding optimal lifestyle interventions for pediatric hyperlipidemia and hypertension.

• Attendees will be able to confidently deliver appropriate nutrition education goals specific to pediatric lipid abnormality and hypertension.
• 20.2% of youths have ≥ 1 abnormal lipid value. ¹
• 11.0% of youth have high or borderline blood pressure. ¹
• 32% of children are overweight or obese; 17% are obese. ²
  • Obese children are 3 times as likely to have abnormal lipids
• Only 27% of US high school students meet the American Heart Association exercise recommendations of 60 minutes per day. ²
High cholesterol and blood pressure contributes to cardiovascular disease across the lifespan

Autopsy studies show atherosclerosis can begin during childhood and adolescence

• **PDAY**: Cholesterol, BMI, and blood pressure levels correlate with the presence of atherosclerosis.¹

• **Bogalusa**: Increasing risk factor levels are associated with greater fibrous plaque area.²
“Usual” course of atherosclerosis

5th decade

6th decade

7th-8th decade

“Accelerated” course

1st decade

2nd decade

3rd-4th decade
Carotid IMT is related to cardiovascular risk factors

• Higher carotid IMT is related to cardiovascular risk factors measured from childhood through middle age.¹

• Significant current predictors of IMT were age and LDL cholesterol.¹
### Pediatric lipid cut-points

#### TABLE 9-1 Acceptable, Borderline-High, and High Plasma Lipid, Lipoprotein, and Apolipoprotein Concentrations for Children and Adolescents

<table>
<thead>
<tr>
<th>Category</th>
<th>Low, mg/dL&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Acceptable, mg/dL</th>
<th>Borderline-High, mg/dL</th>
<th>High, mg/dL&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>—</td>
<td>&lt;170</td>
<td>170–199</td>
<td>≥200</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>—</td>
<td>&lt;110</td>
<td>110–129</td>
<td>≥130</td>
</tr>
<tr>
<td>Non-HDL cholesterol</td>
<td>—</td>
<td>&lt;120</td>
<td>120–144</td>
<td>≥145</td>
</tr>
<tr>
<td>Apolipoprotein B</td>
<td>—</td>
<td>&lt;90</td>
<td>90–109</td>
<td>≥110</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>—</td>
<td>&lt;75</td>
<td>75–99</td>
<td>≥100</td>
</tr>
<tr>
<td>0–9 y</td>
<td>—</td>
<td>&lt;75</td>
<td>75–99</td>
<td>≥100</td>
</tr>
<tr>
<td>10–19 y</td>
<td>—</td>
<td>&lt;90</td>
<td>90–129</td>
<td>≥130</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>&lt;40</td>
<td>&gt;45</td>
<td>40–45</td>
<td>—</td>
</tr>
<tr>
<td>Apolipoprotein A-1</td>
<td>&lt;115</td>
<td>&gt;120</td>
<td>115–120</td>
<td>—</td>
</tr>
</tbody>
</table>
The Lipid Profile

Total = LDL + HDL + VLDL*

Chol Lousy Healthy TG/5

160 = 95 + 55 + 10

*Triglycerides/divided by 5 = VLDL

TC/HDL ratio <4.0
Hypertriglyceridermia

- Affects 5-15% of general pediatric population
  - Up to 32% of *obese* patients

- Primary risk: PANCREATITIS
  - Substantially higher risk when TGs >1000 mg/dL
  - Risk not always directly dose related
  - TGs certainly indicate disordered lipid metabolism & likely insulin resistance
Low HDL

- Normal/higher HDL strongly correlated with lower rates of heart disease
  - Causes efflux of cholesterol from cells = limits plaque growth

- Low HDL:
  - Can be familial
    - 75% of variability is genetically determined
  - Often onsets during puberty, particularly in males
  - Elevated weight and low physical activity levels are important determinants
  - Can be caused or exaggerated by smoke exposure
It’s not just about weight...

Among US adolescents 12-19 y.o.

- 56% of kids with any CVD risk factor are normal weight
- 54% of kids with high/borderline high LDL are normal weight
- 35% of kids with low HDL-C are normal weight

\(^1\)
Screening children to identify lipid disorders and reduce future heart disease
Pediatric Lipid Screening

Doctors: Test all kids for cholesterol by age 11

Dr. Elaine Urbina, left, examines Joselyn Benninghoff, 10, at Children's Hospital in Cincinnati. Benninghoff is taking medication to control her cholesterol. In new guidelines released Friday, doctors are recommending that every child be tested for high cholesterol by around age 10 to prevent heart disease later in life. (AP)
Pediatric screening and treatment recommendations

• Universal lipid screening for ALL children between 9-11 y.o. and again between 17-21 y.o.

• Treatment begins with lifestyle modification

• Statins are indicated for children who are not responsive to lifestyle therapy starting at age 8-10 years
  • 3 lifestyle visits with dietitian generally recommended
Lots of Controversy

**ONLINE FIRST**

**Universal Screening and Drug Treatment of Dyslipidemia in Children and Adolescents**

Bruce M. Psaty, MD, PhD
Frederick P. Rivara, MD, MPH

the use of statins and their indications have expanded. By 2005, an estimated 30 million Americans were taking statins, and in 2009, both simvastatin and atorvastatin were

**Is Universal Pediatric Lipid Screening Justified?**

Matthew W. Gillman, MD, SM
Stephen R. Daniels, MD, PhD

Fourth, relying on family history to drive the screening process, advocated by the American Academy of Pediatrics in 2008 and a previous NHLBI-sponsored panel in 1992, will miss many

**NHLBI Integrated Guidelines on Cardiovascular Disease Risk Reduction:**

Can We Clarify the Controversy about Cholesterol Screening and Treatment in Childhood?

Moderator: Sarah D. de Ferranti¹,²,³*
Experts: Stephen R. Daniels,⁴,⁵ Matthew Gillman,⁶ Louis Vernacchio,⁷,⁸ Jorge Plutzky,⁹,¹⁰ and Annette L. Baker¹¹
When to consider statins

- Consider statins at ≥ 10 years IF despite 6 months of lifestyle counseling
  - LDL ≥ 190 mg/dL
  - LDL ≥ 160 mg/dL and
    - family history of early coronary disease OR two or more moderate risk factors, OR one high-level risk factor
  - LDL ≥ 130 mg/dL and
    - 2 high level Risk factors OR 1 high level and 2 moderate level Risk factors
Hypertension and CVD

- Clinical practice guidelines recommend universal screening of BP during childhood.¹

- 11.0% of youths have high or borderline BP.
  - High BP = systolic or diastolic BP at the 95th percentile or higher
  - Borderline high BP = systolic or diastolic BP at the 90th percentile or higher or 120/80mmHg or higher (but <95th percentile).²
Hypertension and CVD

• BP tracks from childhood into adulthood.
  • Among adults in the United States, elevated BP are associated with cardiovascular events, including mortality.  

• Early identification of elevated BP may improve long-term health outcomes.

Brian K. Kit, MD, MPH; Elena Kuklina, MD; Margaret D. Carroll, MSPH; Yechiam Ostchega, PhD, RN; David S. Freedman, PhD; Cynthia L. Ogden, PhD

Table 2. Prevalence of Adverse BP in Children and Adolescents Aged 8 to 17 Years, 2011-2012a

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Participants, No.</th>
<th>High BP</th>
<th>Borderline High BP</th>
<th>Either High or Borderline High BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1665</td>
<td>1.6 (1.0-2.4)</td>
<td>9.4 (7.2-11.9)</td>
<td>11.0 (8.8-13.4)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boysb</td>
<td>842</td>
<td>1.8 (0.6-4.1)</td>
<td>13.7 (9.5-18.8)</td>
<td>15.4 (11.0-20.9)</td>
</tr>
<tr>
<td>Girls</td>
<td>823</td>
<td>1.4 (0.8-2.1)</td>
<td>5.4 (3.0-9.0)</td>
<td>6.8 (4.0-10.6)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-12</td>
<td>904</td>
<td>1.9 (1.1-3.0)</td>
<td>4.7 (2.7-7.4)</td>
<td>6.5 (4.5-9.1)</td>
</tr>
<tr>
<td>13-17</td>
<td>761</td>
<td>1.3 (0.5-2.8)</td>
<td>13.7 (10.3-17.7)</td>
<td>15.0 (11.2-19.4)</td>
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<tr>
<td>Race/Hispanic originb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>388</td>
<td>1.1 (0.5-1.9)</td>
<td>8.3 (5.5-12.0)</td>
<td>9.4 (6.7-12.7)</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>483</td>
<td>1.9 (0.6-4.3)</td>
<td>13.5 (10.5-17.0)</td>
<td>15.3 (12.5-18.6)</td>
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<tr>
<td>Hispanic</td>
<td>502</td>
<td>2.4 (0.7-5.6)</td>
<td>9.1 (4.3-16.4)</td>
<td>11.5 (6.3-18.7)</td>
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<tr>
<td>Non-Hispanic Asian</td>
<td>203</td>
<td>1.7 (0.5-4.2)</td>
<td>6.9 (3.3-12.4)</td>
<td>8.5 (3.8-16.0)</td>
</tr>
<tr>
<td>BMI category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>1002</td>
<td>1.6 (0.9-2.7)</td>
<td>6.8 (4.3-10.0)</td>
<td>8.4 (5.9-11.5)</td>
</tr>
<tr>
<td>Overweight</td>
<td>267</td>
<td>1.9 (0.3-5.9)</td>
<td>10.9 (6.6-16.6)</td>
<td>12.8 (8.6-18.1)</td>
</tr>
<tr>
<td>Obese</td>
<td>347</td>
<td>1.3 (0.3-3.6)</td>
<td>16.7 (10.8-24.1)</td>
<td>18.0 (12.0-25.4)</td>
</tr>
</tbody>
</table>
Nutrition for Pediatric Hypercholesterolemia
Lifestyle and Lipids

- **STRIP**: Dietary counseling is effective in improving serum lipids
  - Decreasing saturated fat intake decreased serum LDL-C levels from infancy until 19 years of age.

- **DISC**: Fat modified diet improved moderately elevated plasma low-density lipoprotein cholesterol (LDL-C) levels.

- **Mietus-Snyder et al**: Improvement in HDL-C through liberalizing of the use of monounsaturated fat.
Role of a dietitian

- Assess individualized nutrition needs
- Help patients to establish realistic goals
- Equip patients with techniques to stay on track
- Provide ongoing encouragement and support
Lifestyle Recommendations for all Preventive Cardiology patients

• Balance Plate Method

• Increase Fruits and Veggies

• Choose Whole Grains

• Avoid SSB
A Visit to Preventive Cardiology

• First visit
  • Heart healthy lifestyle class (one time)
  • Vital signs/Labs
  • Consultation with a clinician
  • Consultation with a Registered Dietitian (food record)

• Follow-up visits
  • Vital signs/Labs
  • Consultation with a clinician
  • Consultation with a Registered Dietitian (food record)
Welcome to Preventive Cardiology

Annette Baker MSN, CPNP
Skylar Griggs MS, RD, LDN
Heather Harker RN, BA, BS
Heart Healthy Fats
Monos and Polys

- Nuts and Natural Nut butters
  - Peanuts
  - Almonds
  - Walnuts
  - Pecans
  - Pistachios
  - Cashews
  - Hazelnuts
  - Macadamias
  - Sunflower Seeds
  - Avocados

- Oils
  - Olive
  - Canola
  - Vegetable
  - Peanut
  - Flaxseeds/Oil

- Fatty Fish 2x/week
  - Salmon, Tuna, Sardines, Bluefish, Herring, Trout

Salt and Blood Pressure

- Excess salt (sodium) puts pressure on the heart & blood vessels
- Processed foods contribute up to 75% of our salt intake
  - Canned soups
  - Deli lunch meats
  - Frozen meals
  - Snack foods (chips, crackers)
  - Some breads and rolls, cereals, cheeses, sauces
  - Sodas

Limit Saturated and Trans Fats

- Red Meats (Beef, Lamb, Veal, Steak)
- Poultry Skin
- Deep Fried Foods
- Full fat dairy
- Butter, Shelf stable nut butters
- Margarine, Shortening
- Pastries, Doughnuts, Pie Crusts
- Processed Cookies, Crackers

Nutrition Label 101

#1 Serving Size:
Facts are based on the serving size

Saturated/Trans fats:
Fat that raises LDL

Total Fat – Sat, Trans = Heart Healthy fats

Sodium: Raises LDL cholesterol
Dietary Fiber: Decreases LDL cholesterol
Lifestyle recommendations for all Preventive Cardiology patients

• Choose Low or No Calorie Beverages

• Eat Breakfast Daily

• Weight Stabilization (if applicable)

• Eliminate Smoke Exposure (if applicable)

• Exercise 60 minutes per day on most days
HIGH LDL-C

• Lower Saturated Fats
  • 7-10% of total calorie needs

• Eliminate Trans Fats
  • “partially hydrogenated oils”

• Increase Fiber Intake
  • fruits, veggies, whole grains, beans/legumes
HIGH LDL-C

• **Plant Sterols/Stanols**
  • Reserved for children with who do not achieve LDL-C cholesterol goals with conventional dietary treatment alone.

• **Low-fat Dairy**
  • Between 12-24 months, reduced fat milk (2% or lower) can be used.
  • >24 months, fat free or 1% milk is recommended, as it optimizes the nutrient benefit without adding additional saturated fat.
What does 12-15 grams of saturated fat look like?
HIGH LDL-C

- **Lean Proteins**
  - Replacement for high saturated fat proteins

- **Cooking Methods**
  - Reduce deep or pan frying
  - Discourage the use of heavy sauces
HIGH TG

• **Limit Added Sugars**
  • SSB, white carbohydrates, desserts

• **Choose Whole Grains**
  • Whole wheat, oat, brown rice

• **Omega 3 rich fish 2x/week**
  • High dose Omega 3 supplements (EPA + DHA) decreased TG values by 24% in those 10-19 y.o.1

• **Alcohol (if applicable)**
  • Limit Binge Drinking

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LOW HDL-C

- **Increase Exercise**
  - 300 minutes/week of vigorous activity.

- **Eliminate Trans Fats**
  - “partially hydrogenated oils”

- **Increase Heart Healthy Fat Sources**
  - Oils, avocados, fatty fish, nuts, seeds

- **Eliminate Smoke Exposure** (if applicable)
Lifestyle and BP

- Limited data on the effect of dietary changes upon BP in children.
  - Generally accepted based upon adult trials that DASH diet has a beneficial effects in children and adolescents with HTN

- Increased salt intake is associated with higher BPs

- Greater reduction of systolic BP (SBP) in adolescents patients assigned to the DASH diet versus routine
DASH diet

**DASH Style Diet:**
- Limit Sodium to 2,000 mg or less
- Include fruits, vegetables, whole grains, low-fat dairy products, fish, poultry, dried beans, nuts and seeds
- Consume less red meats, processed foods
- Minimize added sugar from sweets, candies, cookies and sugar-sweetened beverages
Processed foods contribute up to 75% of salt intake

- Instant Noodles/Ramen
- Canned foods (soups, veggies, beans)
- Some Deli lunch meats, cured meats
- Pizza, Cheeses, Meats
- Pasta sauces, marinades, dressings
- Frozen meals
- Snack foods (chips, crackers, cookies)
- Some breads, bagels, rolls, cereals
- Sodas
Lifestyle and BP

• Stress reduction
  • Meditation, yoga

• Weight Management

• Physical Activity
  • 300 minutes/week
Role of Physical Activity

• Over half of high school students do not get 60 min/day

• 44% of high school students don’t get PE during an average week
  • MA does not have a recess requirement for elementary school
  • 43% of schools do not administer fitness tests in any grade

• Discuss benefits with family of Regular activity
  • Encourage a family based approach
  • Capitalize on opportunities at any time of the day
Identify potential lifestyle barriers

- If lifestyle continues to be sub-optimal after multiple visits consider barriers to success:
  - Food safe house (exposure to undesirable foods)
  - Parent/child conflict (sneaking food)
  - Financial stressors (food security, safe space to exercise)
  - Mental health issues
  - Undetected medical issues
Working with children vs. adults

- Approach needs to change with developmental stage

- Goal is long term behavior change

- Decreasing anxiety, patient and parental

- Social pressures; promoting healthy relationship with food

- Working with the ENTIRE family, support system

- Working with school, youth center, rec center, residential center

- Access and time for physical activity
Helpful Smart Tech

• Food records, Calorie Counters
  • MyFitness Pal
• Restaurant Nutrition
  • HealthyOut
• Cooking/Shopping
  • ShopWell
  • Fooducate
• Meal Prep
  • Whole Foods Market Recipes
• Food Safety
  • Is My Food Safe?
• Sleep/Relaxation
  • Sleep Cycle
  • Simply Being Meditation
• Physical Activity
  • NIKE Training Club
Weight loss is not the primary focus

• Weight loss is not the primary goal in nutrition counseling for lipid disorders
• Weight loss may accompany improvements in lipid values as a consequence of recommended lifestyle modifications.
• We choose not to focus on weight first but rather counsel on other sustainable lifestyle changes that will improve overall cardiovascular health.
• Weight = sensitive issue for many
Takeaways

• Lipid disorders are common and may not be related to weight.
• Dietitians play a key role as a member of the care team.
• Dietary interventions help to improve values and counseling is specific to the lipid abnormality.
  • e.g. low glycemic diet (TG) vs low saturated fat (LDL) vs increasing healthy fats (HDL)
• Counseling children with high cholesterol and high blood pressure is a family affair.
With Thanks to…

• Sarah de Ferranti MD, MPH and the Preventive Cardiology team
• Center for Nutrition at BCH
• Eva Greenthal and the Let’s Go! Planning team