

What is Pediatric Hypertriglyceridemia?

Triglycerides are a type of fat that circulates throughout the bloodstream. Hypertriglyceridemia means an increased blood level of triglycerides. When this occurs in a person under the age of 18 years old it is called pediatric hypertriglyceridemia. While triglycerides are useful in normal amounts, levels that are too high can cause health problems in the short term and long term. Pediatric hypertriglyceridemia rarely shows presentable symptoms and can only be identified by doing a lab screening, which is recommended for ages 10 and 18 years old when a history of high-risk conditions or a family history of related issues is present.

Pediatric hypertriglyceridemia usually occurs due to an unhealthy diet in persons predisposed to high triglycerides for reasons we do not yet fully understand. Often, people with a diet high in saturated or trans fats or high in carbohydrates for long periods of time can also become overweight or obese. So, while many with pediatric hypertriglyceridemia also have overweight or obesity, roughly 40% have normal weight. We know that pediatric hypertriglyceridemia is very common, affecting 20% or more of all kids 8 to 17 years old. In rare cases, the levels are extremely high, usually due to an identifiable genetic cause or other medical condition, or as a side effect of medication.

Criteria for Diagnosis of Hypertriglyceridemia:

Hypertriglyceridemia is diagnosed by a blood test done after no food or drink (except water) is consumed for several hours; this is called a fasting cholesterol or lipid panel. On a fasting cholesterol panel, normal triglyceride levels depend on age. Hypertriglyceridemia is defined in children 10 years and older as at or above 130 mg/dL. In children 9 years old or younger, hypertriglyceridemia is defined as at or above 100 mg/dL. Often, low levels of HDL (high-density lipoprotein cholesterol) are also present, defined as below 40 mg/dL. We begin to suspect a genetic cause if the triglyceride level is over 1,000 mg/dL.

What Does a Diagnosis of Pediatric Hypertriglyceridemia Mean for My Child?

Higher triglycerides in childhood are associated with heart disease in adulthood, like heart attack, stroke, and heart failure. However, high triglycerides do not commonly cause heart diseases in childhood. Modifying the triglyceride levels during childhood appears to improve early signs of heart disease like fatty build-up in the blood vessels. Therefore, identifying silent high triglycerides with fasting cholesterol panel may be helpful to prevent heart disease in the future.

Severely high triglycerides above 1,000 mg/dL are a different and complicated issue. When triglycerides are very high, the major concern is the occurrence of acute pancreatitis, which can happen at any time. The pancreas is an organ with many functions including the production of enzymes that break down food in our intestines. It is not known exactly how extremely high triglycerides cause pancreatitis. However, it is thought that there can be local release of enzymes, which should be used to break down protein and fat in food, causing damage to the pancreas. Pancreatitis can cause severe abdominal pain, nausea, vomiting, and a variety of other complications within hours to days. If untreated, pancreatitis can be life-threatening; and therefore, patients and families caring for them must be vigilant for this

possibility and connect with members of the Healthcare Team if pancreatitis is suspected. Preventing this complication is difficult so early attention and treatment are warranted.

Lifestyle Recommendations for Children with Pediatric Hypertriglyceridemia:

Guidelines recommend children with hypertriglyceridemia make dietary changes, preferably under the guidance of a registered dietitian. Key changes include the reduction of simple carbohydrates and sugars especially those in drinks with sugar (whether natural or added sugar) and from refined starches including breads, noodles, rice, and potatoes. Instead, substitutions can include:

- Sugar-free drinks
- Whole grain breads
- Whole wheat noodles
- Brown rice
- Quinoa

Lean proteins should be emphasized like fish, chicken, or turkey without the skin, nuts and nut butters, low-fat dairy like soft cheeses (mozzarella, ricotta, and cottage cheese are examples), Greek yogurts, and eggs. Equally important is maximizing the intake of high-fiber and non-starchy vegetables like carrots, cucumbers, cauliflower, broccoli, spinach, etc. Starchy vegetables like potatoes, corn, or peas are less helpful. Avoiding too much saturated and trans-fat is good for overall health but focusing on low carbohydrates is essential to lower triglycerides. A lower carbohydrate approach may be associated with a roughly 27% reduction in triglycerides on average in a few months, although results vary. Achieving five hours of sweat-producing activity weekly also helps. If obesity is present, working towards a healthy weight is helpful to continue lowering triglycerides, but the above dietary changes are helpful even without weight loss.

For those with severe hypertriglyceridemia due to genetic mutations, reducing carbohydrates and sugar could be slightly helpful, but these rare conditions are treated with a very low-fat diet, usually less than 20 grams of fat per day. This diet is very restrictive, and consultation with a registered dietitian who has expertise in lipid disorders is needed to avoid nutrition deficiencies. If your child has genetically driven severe hypertriglyceridemia, you should speak with your child's Healthcare Team about an appropriate dietary plan.

Treatment Options for Children with Pediatric Hypertriglyceridemia:

After six months of the above changes, if levels are still high, medications can be considered with discussions about the benefits and limitations of medications. The first step is increasing omega-3 fatty acids through capsules containing these fats. If ineffective, a next step would be medicines such as fibrates or in, rarer situations, niacin. Medications like statins generally have very modest benefits for triglycerides. While there are no specific medications that are approved by the FDA to reduce triglycerides in children, experts often support the use of medications that can be used in adults with this condition. A detailed discussion of the risks and benefits of using medications to lower triglycerides should be discussed with the Healthcare Team.

Omega-3 fatty acids (“fish oils”): Omega-3 fatty acids are medications that are widely available over the counter, meaning without a prescription, or with a prescription from a member of your Healthcare Team. These include two specific omega-3 fatty acids, known as EPA and DHA, that specifically help to lower triglycerides. Given the variability of concentrations of EPA and DHA and lack of demonstrated benefit from fish oils available without a prescription, it is recommended that for the treatment of hypertriglyceridemia in children, prescription fish oils be used. Prescription omega-3 oils are often gel-like capsules that contain liquid omega-3 oil and can be given once or twice daily, depending on the prescribed dose. They should be given with a meal and should not be broken or crushed before swallowing. These medications are typically well tolerated but can lead to some upset stomach and fishy-smelling burps while rarer side effects include variable heart rates or increased risk of bleeding. Fish oil medications should not be used in patients with a seafood allergy, and a child’s Healthcare Team should be consulted if there is a concern for bleeding, such as dark stools or easy bruising.

Fibrates: Fibrates are a class of medication that reduces triglycerides by reducing the creation of triglycerides and the breakdown triglycerides in the body. Examples of these medications include fenofibrate or gemfibrozil. Fenofibrate is the most used medication in this class and can be given at variable doses, mostly once daily, with or without food, in a capsule or tablet formulation. These medications may cause a risk of muscle aches when used with statin medications. Monitor for these muscle aches when the cause is not known and discuss with the Healthcare Team if this occurs. Patients with a history of gallbladder issues or kidney disease may need to avoid these medications; however, for individuals without these conditions, they are typically well tolerated.

Statins: Although used less commonly for hypertriglyceridemia, statins are medications that lower cholesterol and have been widely across the world for many years. Examples of statins include simvastatin, rosuvastatin, atorvastatin, pitavastatin, and pravastatin. By preventing the storage and production of cholesterol in the liver, statins reduce the number of cholesterol particles in the blood that can lead to heart attacks and strokes. All statins are FDA approved for use in children, some as young as 8 years old, others at age 10 and older. Statins are pills that are taken by mouth, once daily, either with or without food. Statins can usually be taken with other medications. Some people can experience muscle aches with statins; however, they are usually well tolerated and are very rare in children. If this occurs, please talk to your Healthcare Team to decide if any new aches are related to the statin medications or related to activities like playing or exercising.

Niacin: Niacin, a medication used rarely in children, is a medication to lower triglycerides that works by preventing the production of triglycerides in the liver. Niacin comes in many different doses in a pill form that is often given once daily at bedtime with a low-fat snack. Most forms of niacin should not be crushed. A common side effect of niacin may be flushing of the skin which can occur shortly after a dose is given. If a child is an adolescent (e.g., over 16 years old), some clinicians may recommend giving aspirin before niacin to prevent the flushing; however, this should not be done without first speaking to the Healthcare Team as aspirin should not be used in young children. Niacin can also cause stomach and liver problems and should only be used with careful supervision by the Healthcare team.

For all of these medications, it is important to talk to your Healthcare Team prior to starting any new medications or supplements to ensure that they are safe to take with prescribed medications. Following the start of new medications, dose adjustments, or discontinuation of certain cholesterol-lowering medications, your Healthcare Team will request repeat laboratory tests to check the impact of the medication on cholesterol levels, which can serve as a marker for risk of heart disease. Additional



monitoring tests, such as liver tests, may be needed on a less frequent basis. As always, if you have any concerns with medications, please discuss them with members of your Healthcare Team.

Finding a Pediatric Cholesterol/ Lipid Specialist in Your Area:

The treatment of high cholesterol in children is a small but growing field in medicine. Some pediatric lipid specialists are pediatric cardiologists, some are pediatric endocrinologists, some are pediatricians, and some are adult lipidologists with an interest in caring for children with high cholesterol.

Your child's primary care provider is your key medical home base to find lipid or cholesterol specialists in your area. On the website for your health care system, review providers in pediatric cardiology and pediatric endocrinology and look for key interests like "lipid clinic", "cholesterol", or preventive cardiology", or search those terms under medical conditions the system treats.