



Nonalcoholic Fatty Liver Disease (NAFLD) in Children and Adolescents



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Liver Disease Is Common in Children

When considering common childhood diseases, liver disease probably doesn't come to mind. Therefore, you may be surprised to learn that liver disease in children and adolescents is a common and growing problem.

In fact, nonalcoholic fatty liver disease (NAFLD) is the most common chronic liver disease in children, and it is the most common cause underlying elevated transaminases in asymptomatic children and adolescents cared for by the liver specialists (hepatologists) at Nationwide Children's Hospital.

What Is NAFLD?

Patients with NAFLD present with a morphological pattern of liver injury similar to alcoholic liver disease but without history of ethanol exposure (Figure 1).

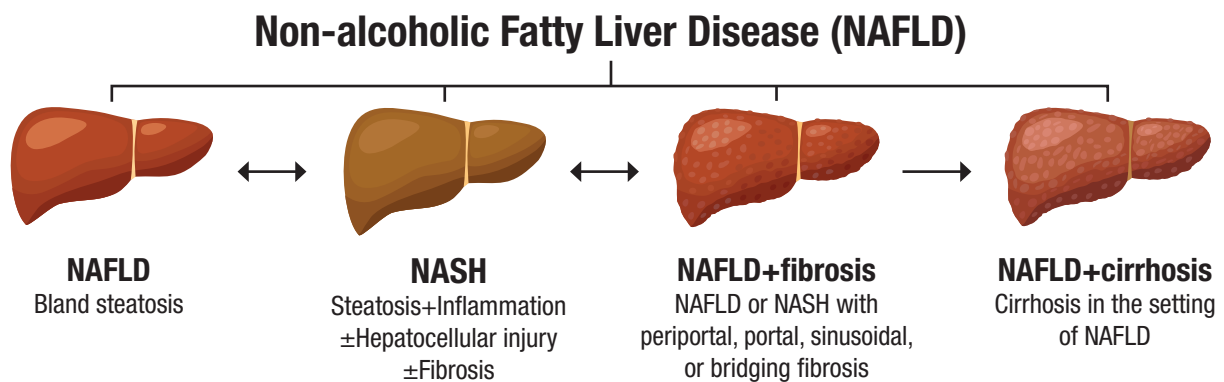


Figure 1. NAFLD is an umbrella term covering a spectrum of disease phenotypes.

What Causes NAFLD?

Obesity is the biggest risk factor for NAFLD in children and adolescents. In the United States and worldwide, the rate of obesity in children is increasing. NAFLD is directly related to obesity, which is why the incidence and prevalence of NAFLD are also increasing. The two diseases are modified by some of the same factors as well.

Why Is It Important to Diagnose NAFLD Early?

If left untreated, NAFLD, and especially NASH, is a major cause of long-term morbidity and may lead to liver fibrosis (Figure 2). If steatosis and inflammation persist, NASH with fibrosis can progress – although these late stages and complications are rarely seen in adolescents – to cirrhosis, portal hypertension, hepatocellular carcinoma, end-stage liver disease and need for liver transplant. NAFLD is now the second most common indication for liver transplantation in U.S. adults.

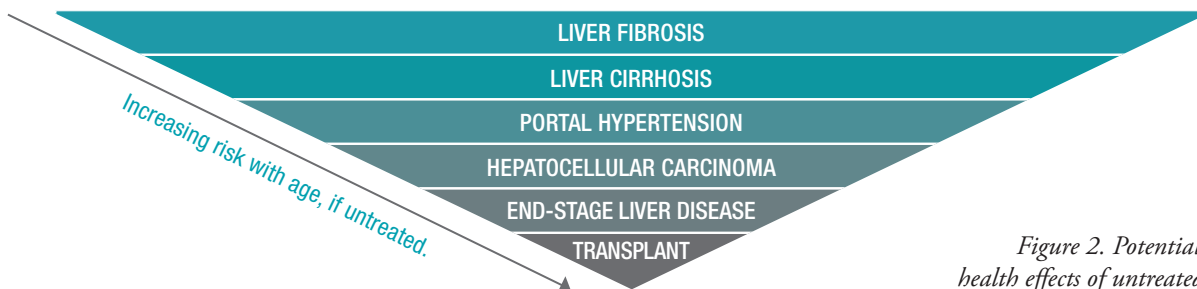


Figure 2. Potential long-term health effects of untreated NAFLD.

Screening Recommendations

NAFLD diagnosis starts with awareness of the problem and screening. When you see a child who is overweight in the clinic, consider the child's age and clinical features to decide if screening is appropriate.

The Expert Committee on NAFLD (ECON) and the North American Society of Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN)¹ currently recommend that:

- Screening should be considered between 9 to 11 years in age for children with:
 - Body mass index (BMI) \geq 95th percentile
 - BMI \geq 85th to 94th percentile with any of the following additional risk factors:
 - Central adiposity
 - Insulin resistance
 - Prediabetes or diabetes; \uparrow blood glucose or \uparrow hemoglobin A1c
 - Dyslipidemia
 - Sleep apnea
 - Family history of NAFLD/NASH
- Earlier screening may be considered in younger patients with other risk factors, such as severe obesity, family history of NAFLD/NASH, and/or hypopituitarism.
- Consider screening of siblings and parents of children with NAFLD if they have known risk factors of NAFLD.

How to Screen and When to Refer

Currently, the best test for screening is the alanine transaminase (ALT) test.²

- What levels should trigger suspicion of NAFLD and referral?
 - If ALT is persistently elevated (>3 months) at $\geq 2x$ the upper limit
 - ALT >80 U/L warrants increased clinical concern and timely evaluation

Other screening recommendations:

- Ultrasound is NOT recommended as a screening test due to poor sensitivity and specificity, which makes it unreliable to diagnose NAFLD. Nevertheless, it is still commonly used in clinical practice when working up a patient for NAFLD, mainly to help rule out other liver diseases or causes of transaminase elevation, but also because a homogeneously echogenic (bright) liver may support the diagnosis.
- CT is NOT recommended as a screening test due to exposure to radiation.
- Follow-up screening is recommended:
 - If risk factors remain unchanged, repeat ALT every two to three years.
 - If risk factors increase, consider repeating ALT sooner.

To assist in diagnosis and management, you might also consider:

- Sending a lipid panel for dyslipidemia or hypercholesterolemia
- Obtaining a hemoglobin A1c
- Assessing the thyroid function (TSH and free T4)
- Measuring a 25-OH vitamin D level (Vitamin D deficiency or insufficiency is common in obesity and may exacerbate NAFLD.)
- Testing for hepatitis B and C antibodies
- Asking about a history of sleep apnea (Recurrent hypoxia may contribute to more severe fatty liver disease.)
 - Does the patient snore, stop breathing at night, or have enlarged tonsils? Consider a sleep study (polysomnography) and/or a referral to ENT.

ALT	Upper limit	2x Upper limit
Girls	22 U/L	44 U/L
Boys	26 U/L	52 U/L
<p>Note: Your local laboratory or hospital will likely have different (higher) normal values for ALT. You should consult a pediatric gastroenterologist/ hepatologist with any questions or concerns about whether an ALT elevation, especially if persistent, is significant.</p>		

Potential Treatment Options

First-line treatment for all children with NAFLD is lifestyle modification to improve diet and increase physical activity.

A Healthy, Well-Balanced Diet

1. Maintain healthy, well-balanced diet.
2. Avoid sugar-sweetened beverages, such as soda, fruit juices and “sports drinks.”
3. Avoid fried or deep-fried foods and other foods high in saturated fat or trans fats.

Physical Activity Recommendations

- Obtain 45-60 minutes of vigorous aerobic exercise (intense enough to get out of breath and break a sweat!), three to four times per week.
- Tip – Kids need to find activities they can enjoy and will stick with. Encourage families to take time to let their child experiment with different sports, exercises and activities.

Please note: Exercise is very important, but exercise alone will not result in meaningful weight loss. It **MUST** be accompanied by a change in diet.

Sleep Hygiene Recommendations

Good sleep hygiene is particularly important for children. Encourage parents/caretakers to implement the following:

- Encourage at least eight hours of sleep per night – most children typically need nine to 10 hours.
- Limit screen time (any device including television) outside of school to less than two hours per day.
- Switch off all electronic devices at least 30 minutes before bed time.
- Do not allow a television in the child’s bedroom.
- Watch for snoring and sleep apnea (pauses in breathing) as the child is sleeping.

Referrals and Consultations

Online: [NationwideChildrens.org/Liver](https://www.nationwidechildrens.org/Liver)

Phone: (614) 722-6200 or (877) 722-6220 | Fax: (614) 722-4000

Physician Direct Connect Line for 24-hour urgent physician consultations:
(614) 355-0221 or (877) 355-0221.



References: (1) Vos MB, Abrams SH, Barlow SE, et al. NASPGHAN Clinical Practice Guideline for the Diagnosis and Treatment of Nonalcoholic Fatty Liver Disease in Children. *J Pediatr Gastroenterol Nutr.* 2017;64(2):319-334. doi:10.1097/MPG.0000000000001482. (2) Schwimmer JB, Dunn W, Norman GJ, et al. SAFETY Study: Alanine Aminotransferase Cutoff Values Are Set Too High for Reliable Detection of Pediatric Chronic Liver Disease. *Gastroenterology.* 2010;138(4):1357-1364.e2. doi:10.1053/j.gastro.2009.12.052