

REVIEW ARTICLE

# Childhood Obesity: Updates on Current Treatments

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**KEYWORDS**

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**ABSTRACT**

Rates of obesity among adults and children in the United States have been on the rise for decades and continue to increase based on recent studies. This is due to a combination of individual, environmental, and socioeconomic factors. Most recent studies indicate that 19.7%, or approximately 14.7 million children and adolescents, are affected by obesity. Addressing and preventing obesity in this population requires a comprehensive approach that includes counseling on healthy diet and exercise, behavioral interventions, possible pharmacotherapy, and, in some cases, surgical referral. A team-based approach is recommended, involving physicians, exercise physiologists, physical therapists, dietitians, diet assistants, psychologists, and social workers. While therapeutic lifestyle changes are the primary focus of treatment, providers must also consider socioeconomic factors, mental health, treatment of comorbidities, and familial factors in their treatment plans. Primary care providers should be familiar with all treatment options, including pharmacotherapy and when to refer for bariatric surgical consultation. This article aims to summarize the risks and consequences of childhood obesity, outline the approach the osteopathic family physician can take to treat the pediatric patient with obesity, and provide updates on the latest guidance and recommendations available.

## INTRODUCTION

Obesity arises from a complex combination of factors, including various individual, environmental, and socioeconomic influences.<sup>1</sup> The prevalence of obesity among adults and children has been on the rise for decades<sup>2</sup> and continues to rise, according to the latest studies.<sup>3</sup> Between 2017 and March 2020, the rate of obesity among children and adolescents in the United States was 19.7%, indicating that approximately 14.7 million youths aged 2 to 19 years were affected by obesity.<sup>3</sup> This is a stark increase from the 16.9% of children with obesity in 2009 to 2010.<sup>4</sup> As osteopathic family physicians are particularly well suited to provide comprehensive care through a holistic treatment approach for all patients, this article aims to summarize the risks and consequences of childhood obesity, outline the approach the osteopathic family physician can take to treat the pediatric patient with obesity, and provide updates on the latest guidance and recommendations available.

## DEFINITION

Obesity is characterized by an excessive accumulation of body fat, typically assessed in adults through body mass index (BMI), calculated by dividing body weight in kilograms by the square of height in meters. Obesity is characterized by a BMI equal to or greater than 30.0 kg/m<sup>2</sup>, while severe obesity is indicated by a BMI equal to or greater than 40.0 kg/m<sup>2</sup>.<sup>5</sup> BMI serves as a widely recognized screening tool for obesity in children over 6 years old and is endorsed with Grade B evidence by the US Preventive Services Task Force (USPSTF).<sup>6,7</sup> For children, BMI is adjusted based on percentiles for age and sex: normal weight (5th to 84.9th percentile), overweight (85th to 94.9th percentile), obesity (≥95th percentile to 120% of 95th percentile), class 2 obesity (>120% of 95th percentile), and class 3 obesity (>140% of 95th percentile).<sup>8</sup> Although BMI has limitations, it remains the simplest method for identifying obesity.<sup>9</sup> Notably, there is no universally accepted definition of obesity in children under 24 months<sup>10</sup>; however, those at risk can be identified using World Health Organization (WHO) weight-for-length charts.<sup>11</sup>

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## COMORBIDITIES/COMPLICATIONS

Many adults with obesity have other serious chronic diseases. Examples include 58% of US adults with obesity have high blood pressure, a risk factor for heart disease, and about 23% of adults with obesity have diabetes.<sup>3</sup>

Similar patterns can be seen in children as numerous potential consequences have been identified, including cardiovascular disease, type 2 diabetes mellitus, asthma, obstructive sleep apnea, musculoskeletal disorders, nonalcoholic fatty liver disease, attention deficit/hyperactivity disorder, conduct disorder, depression, learning disability, developmental delay, and lower executive function.<sup>12-20</sup> Moreover, childhood obesity has been linked to a higher risk of cancer, particularly multiple myeloma, colorectal, uterine corpus, gallbladder, kidney, and pancreatic cancers in young adults who were obese as children.<sup>21,22</sup> Children with obesity also face elevated risks of discrimination and bullying.<sup>23</sup> Additionally, these health challenges often persist into adulthood, as adolescents with obesity are five times more likely to have obesity as adults, with approximately 80% maintaining their weight status into adulthood.<sup>24</sup>

## DEMOGRAPHICS AND RISK FACTORS

Childhood and adolescent obesity stem from a complex interplay of genetic, behavioral, and environmental factors. Healthcare providers should prioritize monitoring patients with predisposing factors for obesity, such as parental obesity, inadequate nutrition, reduced physical activity, sedentary lifestyles, insufficient sleep, high consumption of sugary drinks and fast food, bedroom television, low family income, and food insecurity.<sup>25,26</sup> It is crucial for clinicians to also consider risk factors in younger children, including maternal/gestational diabetes, gestational hypertension, maternal smoking, excessive gestational weight gain, and rapid infant growth.<sup>25,27</sup>

When reviewing the statistics on obesity prevalence by patient demographics, it should be noted that some groups are disproportionately affected more than others. Obesity prevalence among children and adolescents aged 2 to 19 years varied by age, race/ethnicity, and family income. Rates increased with age, ranging from 12.7% among those aged 2 to 5 years to 22.2% among those aged 12 to 19 years. Highest prevalence was observed among Hispanic (26.2%) and non-Hispanic black (24.8%) youths, followed by non-Hispanic white (16.6%) and non-Hispanic Asian (9.0%) youths. Obesity rates generally decreased with higher family income levels. Overall, obesity prevalence did not significantly differ between boys (20.9%) and girls (18.5%), except among specific age groups and racial/ethnic categories. Among US girls, obesity prevalence was highest among non-Hispanic Black girls (30.8%). Among US boys, obesity prevalence was highest among Hispanic boys (29.3%). Boys had higher obesity rates than girls among those aged 6 to 11 years and among non-Hispanic Asian youths and those from higher-income families. Conversely, among non-Hispanic black youths, obesity prevalence was lower in boys compared to girls.<sup>3</sup>

The American Academy of Pediatrics (AAP) guidelines published in 2023 acknowledge that obesity is a multifaceted chronic disease whose risk and treatment challenges are impacted by adverse childhood experiences (ACEs) and social determinants of health (SDoH). The guidelines also highlight the fact that obesity does not affect all demographics equally, requiring providers to be aware of the impact of factors like racism on management of childhood obesity.<sup>28</sup>

Patterns of obesity prevalence can vary based on sociodemographic characteristics, such as age, race/ethnicity, and family income. When looking at the effect income can have on childhood obesity, research has shown obesity prevalence increases as family income decreases with obesity noted in 11.5% of US children with family income more than 350% of the Federal Poverty Level (FPL), 21.2% with family income 130% to 350% of FPL, and 25.8% with family income 130% or less of FPL.<sup>3</sup>

## TREATMENT

The aim of treating children and adolescents with overweight or obesity is to establish healthy habits and lifestyle patterns that will ideally continue into adulthood, thereby preventing future health issues, enhancing quality of life, and boosting body image and self-esteem.<sup>29</sup> The treatment strategy should be patient-centered and holistic, encompassing nutrition, physical activity, behavioral changes, and, in certain cases, pharmacotherapy or bariatric surgery. For some patients, an interdisciplinary team-based approach might be most effective.<sup>30</sup> The USPSTF has found that a comprehensive, team-based method involving primary care clinicians, exercise physiologists, physical therapists, dietitians, diet assistants, psychologists, and social workers can be beneficial.<sup>6</sup>

A primary responsibility of the clinician is to educate patients and their families, encouraging them to adopt healthy lifestyles.<sup>14</sup> Although there is no single diet recommended for all children, certain general guidelines can help reduce obesity. Consumption of sugar-sweetened beverages, processed foods, fast food, candies, snacks, cakes, animal products, whole milk, and refined grains is linked to higher obesity rates.<sup>31</sup> Clinicians should inform patients and their parents about these associations to provide general dietary guidance. Conversely, diets low in sugar and fat but high in fruits, vegetables, whole grains, fish, nuts, legumes, and yogurt are less likely to be associated with obesity.<sup>31</sup>

## Behavioral Approach

Behavioral interventions have proven effective in improving weight management for children and adolescents. To be effective, behavioral interventions should combine education on physical activity and nutrition, promote

healthy behaviors through goal-directed change, and be delivered frequently over an extended period.<sup>6,32</sup>

Effective behavioral interventions must also be personalized and specific. Healthcare providers should use their initial assessment of the patient’s dietary and physical activity history to identify gaps relative to recommended behaviors. They should also identify any barriers that have previously prevented the patient from achieving a healthy weight and assess the readiness of the patient and their family to commit to change.<sup>33</sup> This information can be effectively gathered through motivational interviewing, a communication style in which the provider asks questions to understand and strengthen the patient’s commitment to change.<sup>34</sup>

Providers should use a family-centered and nonstigmatizing approach that acknowledges obesity’s biologic, social, and structural drivers. Motivational interviewing should be utilized when appropriate during the evaluation process. A referral to intensive health behavior and lifestyle treatment should be offered by providers to patients aged 6 years or older and may be considered in those aged 2 to 5 years. Research has found that greater contact hours lead to more effective treatments, being most beneficial when including at least 26 hours of multicomponent treatment over 3 to 12 months.<sup>6</sup>

In many cases, intensive treatment may not be available. If this is the case, providers should increase the intensity of weight-management support through collaboration with resources in the community to support nutrition, food insecurity, physical activity, and other SDoH. Some examples include food provision programs, local parks, and other recreation programs.<sup>28</sup>

Physical activity recommendations for children are based on the amount of time and level of intensity (see Table 1).<sup>35</sup> Encouraged activities should be age-appropriate, varied, and enjoyable for the child.<sup>36</sup> Priority should be given to activities that develop fundamental movement skills (such as running, kicking, throwing, catching, jumping, and balancing), as children who master these skills are more likely to remain physically active as they grow older.<sup>37</sup> Additionally, healthcare providers should focus on reducing sedentary time by limiting nonacademic screen time and replacing it with physical activity whenever possible.<sup>33</sup>

For children who are not meeting the recommended levels of physical activity, families should be provided with examples of age-appropriate activities that match the child’s skill level and intensity requirements. The duration and frequency of these activities should be gradually increased in small increments until the recommended amount is reached.<sup>35</sup>

TABLE 1: Physical activity recommendations for children<sup>35</sup>

Age	Activity Amount	Activity Intensity*
3 to 5 years old	>180 minutes/day	Any intensity; some moderate to vigorous
5 to 17 years old	>60 minutes/day	Moderate to vigorous intensity; activity type should include bone/muscle strengthening 3 days/week

\*Activity intensity is rated as light, moderate, or vigorous. Light is defined by MET (metabolic equivalent of task) <3 (e.g., walking, playing catch). Moderate is defined by MET 3 to 6 (e.g., jogging, yardwork). Vigorous is defined by MET >6 (e.g., running, ice skating, jumping rope).

Dietary recommendations for children and adolescents, including calorie intake and diet composition, vary by age and gender. The Dietary Reference Intake Calculator for Healthcare Professionals can help estimate calorie and nutrient needs. It is also important to specifically address the intake of sugar-sweetened beverages (such as soda, fruit drinks, and sports drinks), which are high in calories and added sugars.<sup>38</sup> If it is determined that the dietary calorie intake is excessive, the focus should be on specific behaviors that increase calorie intake (e.g., avoiding soda) rather than setting strict calorie limits (e.g., consuming less than 2000 calories per day).

The provider should establish weight targets as a way to monitor improvement in weight over time. This goal can be shared with patients and their families, but providers should be mindful not to prioritize weight change over behavior change. The target for children and adolescents will vary based on a number of factors, such as age and BMI percentile.<sup>6,32</sup>

Adherence to a behavioral intervention is considered crucial for its success.<sup>25</sup> Follow-up visits should be scheduled based on the patient’s readiness to change and the type of counseling provided. Typically, visits are scheduled monthly during the initial stages of weight management but may be more frequent, such as weekly, for more intensive interventions. Weight targets should be reassessed every 3 to 6 months. If there is no progress toward the weight target within 6 to 12 months, the patient should be evaluated for alternative treatment options or referred to a weight management specialist. If weight loss exceeds recommended rates, the patient should be screened for an eating disorder and referred for appropriate care.<sup>6,32</sup>

### Pharmacotherapy

When lifestyle modifications and behavioral interventions are insufficient to manage obesity, medications can be considered as an additional therapy (see Table 2). Until recently, only three medications were approved for weight loss in adolescents: phentermine for children over 16 years old, and orlistat and liraglutide for children aged 12

and older.<sup>39-41</sup> However, in 2022, once-weekly semaglutide and combination phentermine/topiramate were approved in adolescents as well.<sup>42,43</sup>

Phentermine is a sympathomimetic amine first approved in 1959. It is a DEA Schedule IV stimulant agent approved for short-term use (12 weeks). Some patients may lose about 5% of their body weight. Phentermine causes an increase in release of norepinephrine from the hypothalamus resulting in hunger suppression and a slight increase in energy expenditure. It is approved for patients >16 years of age.<sup>39</sup> Phentermine should not be used with overactive thyroid or uncontrolled high blood pressure or seizure disorder. It is contraindicated in patients with history of cardiovascular disease, glaucoma, agitated states, drug abuse, or within 14 days of monoamine oxidase inhibitor use.

Combination of phentermine and topiramate is also approved as a DEA Schedule IV drug. Some patients may lose an average of 5% to 10% of their body weight. It is approved for patients ≥12 years of age.<sup>44</sup> The mechanism of weight loss with topiramate is unclear. Topiramate has an inhibitory action on glutamate neurotransmission. Glutamate stimulation of the lateral hypothalamus increases food intake. Also, topiramate has been associated with decreased levels of neuropeptide Y, a potent appetite-stimulating neurohormone. Phentermine/topiramate combination should be discontinued with acute myopia and secondary angle glaucoma and should not be used with glaucoma or hyperthyroidism. Topiramate can cause birth defects so phentermine/topiramate should not be started until a pregnancy test is negative. Thereafter, the FDA recommends women use effective contraception and have monthly pregnancy tests during treatment with phentermine/topiramate.

Orlistat is a gastrointestinal lipase inhibitor that impairs

digestion of dietary fat. Lower doses are approved over the counter. Some patients may lose about 5% of their body weight. It is approved in patients ≥12 years of age.<sup>40</sup> Potential side effects include oily discharge with flatus from the rectum, especially after fatty foods, and it may promote gallstones and kidney stones. There is also potential for malabsorption of fat-soluble vitamins (A, D, E, K). As such, patients should take a multivitamin daily. It is contraindicated in chronic malabsorption syndrome and cholestasis.

Semaglutide is a weekly injectable GLP-1 receptor agonist. At lower doses (1 mg per week), semaglutide is indicated to lower blood sugar among patients with type 2 diabetes mellitus, while it is approved for treatment of obesity at doses up to 2.4 mg. Some patients may lose up to 15% of their body weight with the higher dose. Semaglutide results in increased insulin secretion inhibition of glucagon release and gluconeogenesis. There is also delayed gastric emptying and reduced appetite. Semaglutide is approved in patients ≥12 years of age with an initial BMI in the ≥95th percentile for age and sex.<sup>42</sup>

Similar to semaglutide, liraglutide is a GLP-1 agonist also approved for obesity in patients ≥12 years of age with an initial BMI in the ≥95th percentile for age and sex.<sup>41</sup> The difference, in this case, is the medication is injected daily as opposed to weekly. Potential side effects are similar to semaglutide.

Despite the limited pharmacologic options for treating obesity in children, clinicians play a crucial role in managing the impact of medications on a patient's weight. When treating other conditions in pediatric patients with overweight and obesity, it is important to avoid obesogenic medications when possible. The Endocrine Society's 2016 guidelines provide recommendations for pharmacologic treatments to minimize further weight gain due to medication side effects.<sup>45</sup>

TABLE 2: Medications approved for weight loss in pediatric patients<sup>29</sup>

Medication	Minimum Age for Use	Mechanism of Action	Potential Side Effects
Phentermine	>16 years of age	Sympathomimetic amine; increases norepinephrine release from the hypothalamus; suppresses hunger and increases resting energy expenditure	Dry mouth, headache, elevated blood pressure or heart rate, tremor, insomnia
Phentermine/topiramate	≥12 years of age	Phentermine	Phentermine
Orlistat	≥12 years of age	Topiramate has an inhibitory action on glutamate neurotransmission and has been associated with decreased levels of neuropeptide Y	Paresthesia, dizziness, dysgeusia, insomnia, constipation, dry mouth
Liraglutide	≥12 years of age	Inhibits gastric and pancreatic lipases, reducing absorption of fat	Oily discharge with flatus from the rectum; increased risk of gallstones and kidney stones; may cause malabsorption of fat-soluble vitamins (A, D, E, K)
Semaglutide	≥12 years of age	GLP-1 receptor agonist (weekly)	Nausea, hypoglycemia, diarrhea, constipation, vomiting, headache, decreased appetite, dyspepsia, fatigue, dizziness, abdominal pain, increased lipase, and renal insufficiency



## Bariatric Surgery

Although bariatric surgery is not studied as extensively in adolescents as it is in adults, children with obesity and comorbid conditions who have not responded to comprehensive behavioral interventions might be candidates for surgical or device therapy. The AAP suggests considering bariatric surgery for patients with Class 2 obesity (BMI  $\geq 35$  kg/m<sup>2</sup>, or 120% of the 95th percentile for age and sex, whichever is lower) with significant comorbid conditions, and for patients with Class 3 obesity (BMI  $\geq 40$  kg/m<sup>2</sup>, or 140% of the 95th percentile for age and sex, whichever is lower).<sup>46</sup> Adolescent patients pursuing bariatric surgery face various challenges, including lack of insurance approval,<sup>47</sup> limited provider knowledge,<sup>48</sup> and insufficient access to tertiary care facilities equipped for pediatric bariatric surgery.<sup>49</sup> In 2022, the American Society for Metabolic and Bariatric Surgery (ASMBS) published updated guidelines with further evidence supporting the benefits of bariatric surgery in this population.<sup>50</sup>

## CONCLUSION

Although bariatric surgery is not studied as extensively in adolescents as it is in adults, children with obesity and comorbid conditions who have not responded to comprehensive behavioral interventions might be candidates for surgical or device therapy. The AAP suggests considering bariatric surgery for patients with Class 2 obesity (BMI  $\geq 35$  kg/m<sup>2</sup>, or 120% of the 95th percentile for age and sex, whichever is lower) with significant comorbid conditions, and for patients with Class 3 obesity (BMI  $\geq 40$  kg/m<sup>2</sup>, or 140% of the 95th percentile for age and sex, whichever is lower).<sup>46</sup> Adolescent patients pursuing bariatric surgery face various challenges, including lack of insurance approval,<sup>47</sup> limited provider knowledge,<sup>48</sup> and insufficient access to tertiary care facilities equipped for pediatric bariatric surgery.<sup>49</sup> In 2022, the American Society for Metabolic and Bariatric Surgery (ASMBS) published updated guidelines with further evidence supporting the benefits of bariatric surgery in this population.<sup>50</sup>

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