



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals

ISSN 2349-7203





Human Journals

**Review Article**

April 2022 Vol.:24, Issue:1

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## Childhood Obesity – A Raising Concern in Paediatrics

 <p>IJPPR INTERNATIONAL JOURNAL OF PHARMACY &amp; PHARMACEUTICAL RESEARCH An official Publication of Human Journals</p> 	
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<b>Submitted:</b>	25 March 2022
<b>Accepted:</b>	31 March 2022
<b>Published:</b>	30 April 2022

<p><b>Keywords:</b> childhood obesity, Body Mass Index, sedentary lifestyle, physical activities, psychological impact.</p>
<p><b>ABSTRACT</b></p> <p>Childhood obesity transpires when a child is significantly over the ideal weight. It is a complex health issue that increases the child's risk for serious and chronic medical problems. The majority of overweight and obese children live in developing countries compared to developed countries. One of the best plans of action to reduce the risk of childhood obesity is to improve eating habits and engage children in more physical and outdoor activities. Parents should enforce children to a healthier lifestyle to prevent the physical and psychological impacts of obesity on children.</p>



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## INTRODUCTION

Obesity affects both children and adults and it is considered as a severe public health issue. Individuals who are overweight or obese have larger bodyweight than the optimal weight and height<sup>1</sup>. Obesity is rising concern around the world and factors such as environmental, lifestyle, genetics and cultural contexts plays a major role<sup>2</sup>. Over the past 30 years, childhood obesity is found to be more prevalent among children in well-developed and developing nations, as well as in public health<sup>3</sup>. It is also well understood that the changes in the dietary habits of children have a long-term influence, such as increased consumption of ultra-processed foods<sup>4</sup>. High-calorie intake accumulates as fat in the body for later use (basal metabolism, thermal effect of meals, physical activity, and growth). Excess calorie deposition can only be avoided by ingesting only the necessary number of calories while engaging in physical exercise<sup>5</sup>. According to the World Health Organization (WHO), children and young people aged 5 to 17 years old should engage in 60 minutes of physical activity per day<sup>4</sup>. Over the last two centuries, obesity has become one of the major threats to life expectancy in children and adults<sup>6</sup>.

Obesity risks are reduced with a well-balanced diet and daily physical activities. Healthy eating habits and a healthy lifestyle should be encouraged by parents<sup>4</sup>. Childhood obesity has a substantial influence on both physical and mental health. Obese children are more likely to suffer from psychological illnesses such as depression and other mental disorders<sup>2</sup>.

The Kids-‘Go For Your Life’(K-GFYL) intervention is being used in a variety of contexts for children, including preschool, primary school, early childhood programs, family daycare, and long-term care. Increased consumption of fruits, vegetables, and water; decreased consumption of high-fat, high-salt, and high-sugar foods, as well as sweet drinks; increased physical activity; reduced sedentary behavior to decrease the burden of childhood obesity<sup>7</sup>.

Children are typically seen as the target demographic for weight management approaches because weight loss in an adult is much more difficult than that of children and there are more viable therapies for children when compared to adults<sup>8</sup>.

## EPIDEMIOLOGY

Obesity in childhood is a known risk factor for adult obesity and other health problems<sup>9</sup>. Worldwide obesity has nearly tripled since 1975. Most of the world’s population lives in countries where overweight and obesity kill more people than underweight<sup>10</sup>.

## International Scenario

Obesity in children has become more common in recent years all around the world. 200 million schoolchildren are overweight or obese, according to the International Association for the Study of Obesity (IASO) and the International Obesity Task Force (IOTF). Due to multiple limitations, such as a dearth of nationally representative schoolchildren surveys and a scarcity of serial data through time, it is difficult to compare childhood obesity prevalence rates between countries. According to Ranjani et al, the percentage of obese children in the United States (6-11 years old) was 7% in 1980 and had risen to 20% by 2008. According to the IOTF; the prevalence of overweight/obesity in both genders in the United States is 40%. According to a study, childhood obesity may be leveling off in certain developed countries, but significant rises remain in developing countries. However, these patterns aren't well-documented<sup>9</sup>.

Overweight or obese children and adolescents account for almost one-third of all children and adolescents in the United States. Overweight or obesity is more common as children get older: 22.8 percent of preschoolers (ages 2 to 5 years), 34.2 percent of school-aged children (ages 6-11 years), and 34.5 percent of adolescents (ages 12 to 19 years) are overweight or obese. Obesity affects between 1% and 8.4% of preschool children (ages 2 to 5 years), 17.7% of school-aged children (ages 6 to 11 years), and 20.5 percent of teenagers (ages 12 to 19 years).

The prevalence of obesity varies by race, ethnicity, and socioeconomic class. Obesity is more common among African Americans, American Indians, and Mexican Americans as children than among non-Hispanic whites. Obesity is more common in low-income countries as well. Obesity prevalence in children is strongly influenced by hereditary factors. Obese in one parent increases the chance of obesity in the child by two to three times, and it can grow to fifteen times if both parents are obese<sup>11</sup>.

The United Nations Children's Fund (UNICEF), the World Health Organization (WHO), and the World Bank all have obesity estimates for children under the age of five. The Institute for Health Metrics and Evaluation (IHME) recently released estimates of childhood obesity in children aged 2 to 4 years at the country level. The NCD Risk Factor Collaboration provides obesity estimates for children aged 5 to 19. Obesity in children aged 2–4 years has increased moderately worldwide, with discrepancies in low and middle-income countries. Obesity in children aged 5 to 19 years was rare in 1975, but it was much more common in 2016<sup>12</sup>.

## Indian Scenario

With its widely different geographical, socioeconomic, and cultural norms, there is a paucity of nationally representative data on obesity in children in India.

However, due to a lack of well-conducted nationwide studies and a lack of standardization in the definition of childhood overweight and obesity, the scope of the problem among Indian children is unknown. Developing countries, such as India, face a unique "double burden" problem, with obesity among children and adolescents on one end of the spectrum and malnutrition and underweight on the other<sup>9</sup>.

Data from the Indian Journal of Endocrinology and Metabolism states that Obesity affects between 5.74 and 8.82 percent of Indian schoolchildren. B. Between the ages of 13 and 18 in metropolitan South India, 21.4 percent of men and 18.5 percent of females are overweight or obese. According to the International Obesity Task Force (IOTF), around 10% of children aged 5 to 17 years old (approximately 155 million) were overweight in 2000, with two to three percent (30 to 45 million) obese<sup>13</sup>.

## ETIOLOGY

Obesity is caused by an imbalance in energy intake and expenditure, with a rise in positive energy balance being linked to lifestyle and dietary consumption preferences.

- ✓ Genetics- Around 5% of occurrences of childhood obesity may be attributed to a hereditary cause.
- ✓ Dietary variables may have a role in the rise in obesity rates.
- ✓ In recent years, obesity has been related to increased fast food intake.
- ✓ Sugary beverages may contribute to obesity in very minor amounts in elevating BMI.
- ✓ Chips, baked goods, and candy are examples of snack foods and this may play a role in childhood obesity.
- ✓ Sedentary lifestyle in the children such as a decrease in outdoor activities and spending more time watching television, Electronic media<sup>14</sup>.

## PREDISPOSING RISK FACTORS

Childhood obesity is influenced by behavioral, environmental, psychological, and biological variables. Low calcium intake and vitamin D insufficiency may contribute to obesity in children<sup>15</sup>.

## THE IMPACT OF BEHAVIOURAL FACTORS

### Environment factors

When compared to those who walked or cycled to school, children who are driven to school have a higher chance of engaging in physical exercise<sup>16</sup>. Obesity is more likely in children who are stressed at home, have parental misunderstandings, or live far away from their parents<sup>17</sup>.

### Genetic factors

This heritable obesity could be caused by hormonal abnormalities that cause changes in energy intake and expenditure, resulting in obesity<sup>18</sup>. The most prevalent gene deficiency associated with a severe, early form of obesity in children is a mutation in the melanocortin 4 receptor gene (MC4R)<sup>19</sup>.

### Vitamins and nutritional components

Vitamins are also added to a variety of diets and infant formulas. The prevalence of childhood obesity may be linked to increased vitamin intake. Because B vitamins can improve fat synthesis, increasing B vitamin (B1, B2, and niacin) consumption was substantially linked to the prevalence of obesity and diabetes.

### Proteins

Childhood obesity is linked to excessive protein consumption throughout infancy. Higher protein consumption throughout the supplemental feeding phase (ages 6 to 18 months) was linked to a higher BMI at 4 to 7 years and a higher risk of obesity later on.

### Fat

Obesity can be caused by an excess of dietary fat (mostly triglycerides) in foods or cuisines. With high caloric density, cholesterol content, and saturated fatty acid level, dairy fat is often regarded as a contributor of dairy products to the development of obesity<sup>20</sup>.

## COMPLICATIONS

Obesity in children is linked to co-morbidities that impact nearly every body system, including the endocrine, gastrointestinal, pulmonary, cardiovascular, and musculoskeletal systems.

### Cardiovascular system

- Obese children are also more likely to have additional cardiometabolic risk factors, such as high blood pressure, low HDL cholesterol, and high triglyceride levels.

### Endocrinology system

- Obesity and age both enhance the prevalence of pediatric type 2 diabetes mellitus.

### Respiratory system

Alveolar hypoventilation and significant oxygen desaturation are common in children with severe obesity. Obesity in children has also been linked to the development of asthma<sup>21</sup>.

### Gastrointestinal

- Obesity may cause Cirrhosis; NASH (Non-alcoholic steatohepatitis) can range from simple steatosis to cirrhosis and progressive steatohepatitis. The most common cause of liver disease in children is nonalcoholic fatty liver disease<sup>21, 22</sup>.

### Musculoskeletal system

- Arthralgias in the lower extremities, impaired movement, Tibial bending, slipped capital femoral epiphysis (SCFE)<sup>22</sup>.
- Obesity in children increases the risk of musculoskeletal disorders such as decreased mobility, increased fracture risk, and lower extremity joint discomfort.

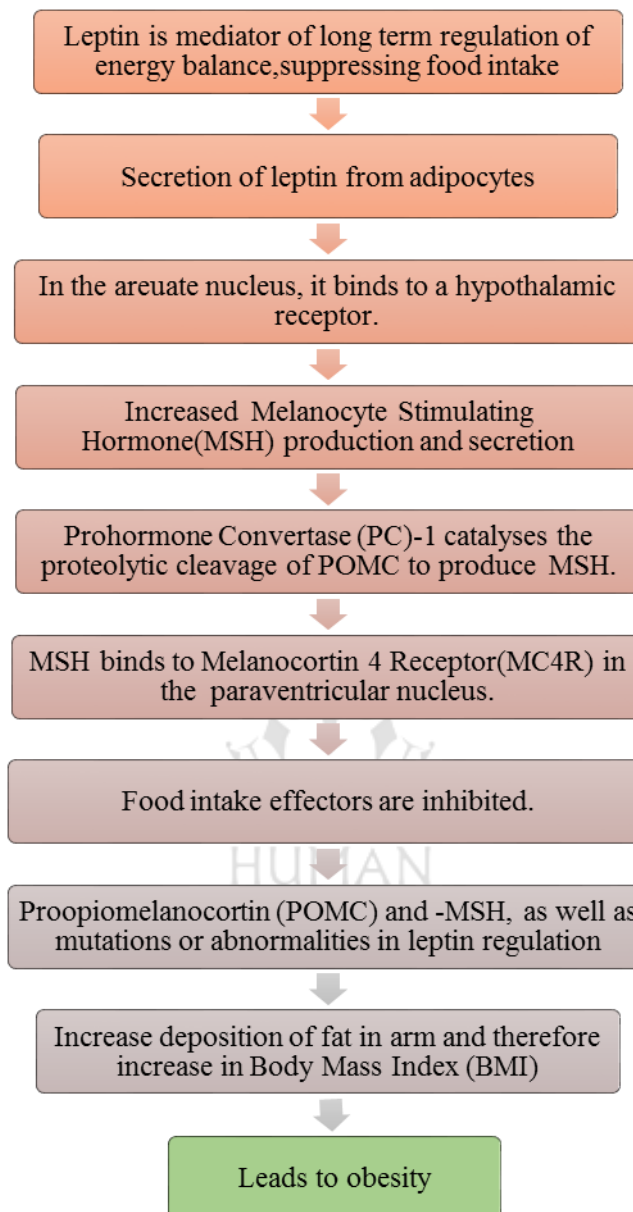
### Neurological factors

Obesity in childhood is linked to an increased incidence of idiopathic intracranial hypertension (pseudotumor cerebri). Headache, vomiting, retro-ocular eye pain, and vision loss are some of the clinical signs<sup>21</sup>.

Kids who are obese have lower self-esteem than children who are not obese<sup>14</sup>.

## PATHOPHYSIOLOGY

### BASED ON THE REGULATION OF LEPTIN<sup>23</sup>



## CLINICAL MANIFESTATION

- Fatigue and shortness of breath
- Increased Sweating.
- Apnea (sleep deprivation)
- Joint discomfort

- Dislocation of Hips
- Knocked knees and flat feet
- Irritation and rashes on the skin
- Hips, abdomen, and backstretch marks (though these can occur in non-obese children as well)
- Constipation
- Gastroesophageal reflux disease (GERD)
- Girls experience early puberty, while boys experience delayed puberty<sup>24</sup>.

## DIAGNOSIS

The usage of percentiles of weight to length ratio or Body Mass Index, depending on sex and age, is used to define overweight and obesity. The weight-length ratio is used to diagnose overweight and obesity in children up to the age of 24 months. It is based on BMI from the age of 2 to 5 years<sup>25</sup>. Exogenous obesity, often known as "simple or primary obesity," is the most common diagnosis in obese children<sup>26</sup>. Waist circumference measurement, physical examination, and lab tests are among the diagnostic techniques available. Cholesterol readings, fasting blood sugar and hemoglobin A1C, thyroid tests, and living function tests are some of the lab tests available<sup>27</sup>. If children under the age of ten have their Aspartate aminotransferase and Alanine aminotransferase levels tested<sup>28</sup>. Waist-to-hip ratio, skinfold thickness, bioelectric impedance analysis (BIA), underwater weighing (densitometry), computerized tomography (CT), and magnetic resonance imaging are some of the methods used to quantify obesity (MRI). BMI is the cheapest and most accurate way to quantify obesity; however, it simply measures raw fatness.

$$\text{Body mass index (BMI)} = \text{Weight (kg)} / \text{height (m}^2\text{)}^{21}.$$



**NUTRITIONAL STATUS BASED ON WHO criteria<sup>29</sup>**

**Table 1: NUTRITIONAL STATUS BASED ON WHO criteria<sup>29</sup>.**

S.NO	NUTRITIONAL STATUS	WHO CRITERIA
1.	Underweight	<18.5
2.	Normal	18.5-24.9
3.	Overweight	25-29.9
4.	Obese	≥ 30
5.	Obese type 1 (obese)	30-40
6.	Obese type 2 (morbidly obese)	40.1-50
7.	Obese type 3 (super obese)	>50

**NON PHARMACOLOGICAL MANAGEMENT**

- Having a healthy breakfast routine- Encourage children to have healthier breakfast rather than fast foods
- Binge eating and high-fat night meals should be avoided
- Increasing meal frequency and avoiding infrequent meal patterns
- Avoiding the influence of television while having food<sup>21</sup>.
- Breastfeeding is a method of nourishing a child-The risk of childhood obesity is said to be lowered if a baby is breastfed exclusively for six months. Obesity risk decreased by 4% in later life after this period of breastfeeding.
- Physical activity- Children from 5 to 17 years who engage in daily physical activity reap numerous health benefits.
- Supplementation with vitamin D - To avoid obesity, sun exposure is critical for vitamin D synthesis. Vitamin D is found in a small number of foods, including fish liver oils, fish, organ meats (which are high in vitamin D), egg yolks, and sun-dried mushrooms (which contain less vitamin D)<sup>30</sup>.

## PHARMACOLOGICAL MANAGEMENT

### ORLISTAT

The Food and Drug Administration (FDA) has approved Orlistat for the treatment of obesity in teenagers (age, 12 years). Because Orlistat prevents fat-soluble vitamins from being absorbed.

Dose: Take 60 mg three times a day. 120 mg three times a day with meals as a maintenance dose<sup>31</sup>.

Mechanism of Action: Orlistat acts by binding covalently to the serine residue of the active site of gastric and pancreatic lipases. When administered with fat-containing foods, it partially inhibits hydrolysis of triglycerides, thus reducing the subsequent absorption of monoglycerides and free fatty acids<sup>32</sup>.

Adverse drug reaction: Diarrhea, abdominal pain, flatulence, and greasy stools <sup>31</sup>.

Drug Interaction: Orlistat interferes with the absorption of many drugs such as Warfarin, Amiodarone, Cyclosporine, and Thyroxin as well as a fat-soluble vitamin (Vitamin A, D, E, and K) affecting their bioavailability and effectiveness <sup>33</sup>.

### CONCLUSION

Obesity is a chronic illness that can lead to physical and psychological difficulties, as well as early comorbidity and death if it begins in childhood. Obese children are at risk for a variety of chronic disorders, including cardiovascular and intestinal problems. Obesity risk is reduced by eating a well-balanced diet and engaging in daily aerobic exercise. The right food and nutritional components, as well as optimal food intake habits, are crucial in preventing childhood obesity.

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