



A Narrative Review of Childhood and Adolescent Obesity: Global Trends, Determinants, and Interventions

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Abstract

Childhood and adolescent obesity have emerged as one of the most pressing public health challenges of the 21st century, affecting both high-income and low- and middle-income countries. With increasing urbanisation, dietary transitions, and sedentary lifestyles, the prevalence of obesity among young people continues to rise globally, with significant implications for lifelong health. This narrative review critically examines global trends, key determinants, and evidence-based interventions for childhood and adolescent obesity. A comprehensive literature search was conducted using databases including PubMed, Cochrane Library, Google Scholar, and Semantic Scholar, covering studies published between 2006 and 2026. Keywords and Boolean operators related to obesity, adolescents, risk factors, and interventions were applied. Relevant peer-reviewed articles, policy documents, and global health reports were included, with emphasis on English-language publications. Additional sources were identified through citation tracking and expert consultation. Findings reveal that obesity in children and adolescents is driven by a complex interplay of factors, including unhealthy dietary patterns, physical inactivity, genetic predisposition, socioeconomic influences, and environmental exposures. Emerging contributors such as digital media use and obesogenic urban environments further compound the risk. Effective interventions require a multi-level approach, encompassing individual behaviour change, family engagement, school-based programmes, community participation, and supportive public health policies. The review underscores the urgent need for coordinated, context-specific

strategies that prioritise prevention, early identification, and sustainable management. Strengthening health systems, promoting health education, and fostering multisectoral collaboration are critical to reversing current trends and safeguarding the health and future productivity of the younger population.

Keywords:

Childhood and Adolescent Obesity, Global trends, Determinants, Interventions.

Introduction

Childhood and adolescent obesity is defined as excessive body fat accumulation that presents health risks in children and adolescents, typically assessed using body mass index (BMI) percentiles adjusted for age and sex, as outlined by the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) growth charts (Cheung et al., 2016; Kékê et al., 2015). Specifically, obesity is classified as a BMI at or above the 95th percentile for children and adolescents aged 2–19 years, with variations in cutoffs for global populations (Cheung et al., 2016; Shields & Tremblay, 2010). This condition has emerged as a pressing global public health challenge, with approximately 340 million children and adolescents aged 5–19 years classified as overweight or obese in 2016, a figure that has nearly doubled since 1980 (Nittari et al., 2020). The economic burden is substantial, with global healthcare costs related to obesity projected to exceed \$1 trillion annually by 2030, driven by direct medical expenses and productivity losses (Ge et al., 2025).

The long-term health consequences of childhood and adolescent obesity are profound, increasing the risk of non-communicable diseases such as type 2 diabetes, hypertension, cardiovascular diseases, certain cancers in adulthood, and a host of sexual and reproductive health-related challenges (Reinehr, 2018). Moreover, obesity in youth is associated with psychosocial challenges, including stigma, low self-esteem, and depression, which further exacerbate health disparities. The persistence of obesity into adulthood underscores the urgency of early intervention, as childhood obesity tracks strongly with lifelong health trajectories, amplifying morbidity and mortality risks (Putri et al., 2025). Addressing this epidemic is crucial not only for individual well-being but also for alleviating strain on healthcare systems and promoting equitable health outcomes worldwide.

This narrative review aims to synthesize the current evidence on childhood and adolescent obesity, informing research, policy, and practice. Specifically, it seeks to summarize global trends in the prevalence and distribution of childhood and adolescent obesity, highlighting regional and socioeconomic variations; explore the multifaceted determinants of obesity, encompassing biological, behavioral, and environmental factors; and evaluate evidence-based interventions, ranging from individual-level strategies to population-wide policies, while identifying gaps and opportunities for future research. By providing a comprehensive overview, this review aims to guide stakeholders in developing effective, scalable solutions to mitigate this global health challenge.

Global Trends in Childhood and Adolescent Obesity

Childhood and adolescent obesity, defined as a BMI above the 95th percentile for age and sex (CDC) or >2 SD above the WHO growth reference median, is a growing global health concern (Leung et al., 2024). In 2022, approximately 390 million children and adolescents aged 5–19 years were overweight, with 160 million classified as obese, reflecting a fourfold increase in obesity prevalence from 2% in 1990 to 8% in 2022 (Communitymedicine4all, 2024). The WHO reports that 35 million children under 5 were overweight in 2024, with nearly half residing in Asia and a 12.1% increase in Africa since 2000; high-income countries, such as those in the Americas (29% prevalence in 2016), exhibit the highest rates, while low- and middle-income countries (LMICs), particularly in the Western Pacific (up to 68.1% projected by 2030), show rapidly rising trends (WHO, 2025). Disparities by age, sex, and socioeconomic status (SES) are notable. Obesity prevalence increases with age, with adolescents (12–19 years) showing higher rates (e.g., 22.2% in the U.S.) than younger children (12.7% for 2–5 years). Boys often have higher obesity rates (9.3% globally) than girls (6.9%) (NHS, England, 2024). SES patterns vary: in high-income countries, lower SES correlates with higher obesity, while in LMICs, higher SES groups are more affected.

Over the past two decades, childhood and adolescent obesity have risen dramatically. The NCD Risk Factor Collaboration (NCD-RisC) reports an eightfold increase in obesity among 5–19-year-olds from 1975 to 2016, with a sharp acceleration between 1990 and 2022 (Phelps et al., 2024). In high-income countries like the U.S., the UK, and France, obesity rates have shown signs of plateauing since the early 2000s (e.g., the U.S. from 30% in 2009 to 32% in 2019), likely due to public health interventions like sugar taxes and nutrition campaigns; conversely, LMICs, particularly in South Asia, Southeast Asia, and the Western Pacific, have seen accelerated growth, with prevalence in some regions doubling since 2000 (World Obesity, 2025). For instance, in Malaysia, obesity among boys aged 5–19 rose from 0.5% in 1975 to 15% in 2016. This shift reflects the nutrition transition in developing nations, driven by urbanization and dietary changes.

Global surveillance of childhood obesity faces significant limitations (Pulungan et al., 2024); inconsistent definitions across regions—e.g., BMI cutoffs varying by WHO vs. local standards (e.g., China's BMI >27.5)—hinder comparability. Underreporting is prevalent in LMICs due to limited health infrastructure and data collection, particularly in rural and indigenous populations. Emerging metrics, such as body composition (e.g., fat mass) and visceral fat measured via waist circumference, offer greater precision in assessing health risks but are underutilized due to cost and technical barriers. These metrics could refine obesity assessment by accounting for ethnic variations in fat distribution, but standardized protocols are lacking. Addressing these gaps requires global collaboration to harmonize definitions and enhance surveillance in underserved regions.

Determinants of Childhood and Adolescent Obesity

Childhood and adolescent obesity is a complex global health challenge driven by an intricate interplay of biological, genetic, behavioral, environmental, social, and psychosocial determinants (Singh et al., 2008). Understanding these factors is critical for designing effective prevention and intervention strategies to address this growing epidemic.

Biological and Genetic Factors

Genetic predispositions significantly influence childhood and adolescent obesity. Genome-wide association studies (GWAS) have identified key genetic variants, such as those in the FTO gene, which are robustly associated with higher body mass index (BMI) in both children and adults; a GWAS involving over 13,000 children with obesity and 15,500 controls pinpointed multiple loci linked to childhood obesity, underscoring genetic heritability(Li, 2016). Epigenetic mechanisms, such as DNA methylation, further modulate obesity risk. For instance, epigenome-wide association studies have identified differentially methylated CpG loci associated with severe obesity, with meta-analyses of over 4,000 children linking DNA methylation to BMI from birth to adolescence(Chu et al., 2017). Polycystic ovarian syndrome (PCOS) in adolescents is also associated with obesity, potentially due to hormonal imbalances that exacerbate weight gain, though its interaction with environmental factors requires further study(Chen-Patterson et al., 2024).

Prenatal and early-life influences are critical. Higher maternal BMI and excessive gestational weight gain are strong predictors of childhood obesity, with a study of over 160,000 mother-child pairs showing a significant association(Zhang et al., 2026). Gestational diabetes increases offspring obesity risk by altering fetal metabolism. Breastfeeding, particularly exclusive breastfeeding for at least six months, may reduce obesity risk, potentially due to lower protein intake compared to formula feeding(Koletzko et al., 2019). These findings highlight the interplay between genetic predispositions and early environmental exposures in shaping obesity risk.

Behavioral and Lifestyle Factors

Behavioral and lifestyle factors are central to the obesity epidemic. Dietary patterns, particularly high consumption of ultra-processed foods and sugar-sweetened beverages, are strongly linked to weight gain. A systematic review of 30 studies found that sugar-sweetened beverage intake significantly increases the risk of overweight and obesity in children and adolescents(Malik et al., 2006). Diets rich in fruits, vegetables, and whole grains, conversely, are protective, promoting satiety and better nutrient profiles. Physical activity levels and sedentary behaviors significantly influence obesity risk. Longitudinal studies show that physical activity declines with age, contributing to weight gain, with global data indicating that 80% of adolescents fail to meet recommended activity levels(Telford et al., 2025). Sedentary behaviors, such as excessive screen time and gaming, exacerbate this trend, with children spending over 3 hours daily on screens being at higher risk. Sleep duration and quality are emerging risk factors, with short sleep (<10 hours per night) associated with a 40% increased risk of obesity, likely due to disruptions in appetite-regulating hormones(Liu et al., 2022). These behavioral factors underscore the need for interventions targeting diet, activity, and sleep.

Environmental and Social Determinants

The obesogenic environment, characterized by easy access to high-calorie, low-nutrient foods, pervasive food marketing, and limited opportunities for physical activity, plays a pivotal role in obesity. Urban design, such as a lack of safe parks or walkable areas, and school food policies offering unhealthy options, contribute to this environment(Zou, 2024). Food marketing

targeting children, particularly for ultra-processed foods, further drives unhealthy consumption patterns.

Socioeconomic factors create disparities in obesity prevalence. In high-income countries, lower socioeconomic status (SES) is associated with higher obesity rates due to limited access to healthy foods and safe recreational spaces. In contrast, in low- and middle-income countries, higher SES groups often face increased obesity risk due to the adoption of Westernized diets and lifestyles (Popkin & Ng, 2022). Cultural and family influences also shape behaviors. In some cultures, larger body sizes are viewed as signs of health or prosperity, leading to overfeeding, while parental obesity strongly predicts childhood obesity due to shared genetic and environmental factors (on the Evaluation, 2021).

Psychosocial and Mental Health Factors

Psychosocial factors are intricately linked to childhood and adolescent obesity. Obesity is associated with psychological comorbidities, including depression, anxiety, and low self-esteem, which can exacerbate weight gain (Soroceanu et al., n.d.). Bullying and social isolation are prevalent among obese youth, with studies showing that overweight children are more likely to experience peer victimization, impacting their emotional and physical health (Bacchini et al., 2015). The relationship between obesity and mental health is bidirectional: psychological distress can lead to emotional eating, while obesity can worsen mental health disorders, potentially contributing to eating disorders like binge-eating disorder (Stephoe & Frank, 2023). Stigma surrounding obesity further complicates health outcomes. Stigmatizing language from healthcare providers or peers can reduce motivation for weight loss and lead to avoidance of medical care, perpetuating a cycle of weight gain (Westbury et al., 2023).

Multifaceted Complications of Childhood and Adolescent Obesity: Medical, Sexual/Reproductive, and Social Perspectives

Childhood and adolescent obesity is a complex, multisystem disorder with far-reaching consequences that extend beyond excess adiposity to encompass medical, sexual and reproductive health, and psychosocial well-being. Its early onset predisposes affected individuals to a lifetime trajectory of morbidity, reinforcing the need for a multidimensional understanding of its complications.

Medical complications

The medical burden of obesity in children and adolescents is substantial and increasingly mirrors adult non-communicable disease patterns. Obese youth are at heightened risk of insulin resistance, type 2 diabetes mellitus, dyslipidaemia, and hypertension; key components of metabolic syndrome (Steinberger et al., 2009). Recent global data indicate a rising incidence of paediatric type 2 diabetes closely linked to obesity prevalence (Xu et al., 2025). Cardiovascular alterations, including early atherosclerosis and left ventricular hypertrophy, may begin in adolescence, increasing long-term cardiovascular risk (Juhola, 2017).

Respiratory complications such as obstructive sleep apnoea and reduced pulmonary function are common, while non-alcoholic fatty liver disease (NAFLD) has emerged as the leading cause of chronic liver disease in children (Yu et al., 2025). Orthopaedic problems, including slipped

capital femoral epiphysis and Blount disease, further impair mobility and quality of life. Importantly, obesity-related inflammation and endocrine dysregulation contribute to immune dysfunction and may predispose to certain malignancies later in life (Shaikh et al., 2024). These complications underscore that childhood obesity is not a benign condition but a precursor to early-onset chronic disease.

Sexual and reproductive health complications

Obesity significantly disrupts sexual and reproductive health, particularly during the critical developmental window of adolescence. In females, obesity is strongly associated with menstrual irregularities, anovulation, and polycystic ovarian syndrome (PCOS), mediated by hyperinsulinaemia and androgen excess (Ibáñez et al., 2017). These disturbances may impair fertility and increase the risk of subfertility in later life. Additionally, obese adolescent girls are more likely to experience early menarche, which is linked to adverse reproductive and metabolic outcomes (Cheng et al., 2022).

In males, obesity is associated with hypogonadism, reduced testosterone levels, and impaired spermatogenesis, potentially affecting future reproductive capacity (Guerra-Carvalho et al., 2022). Beyond physiological effects, obesity influences sexual behaviours and vulnerability. Evidence suggests that obese adolescents may engage in earlier or riskier sexual activity, possibly due to psychosocial pressures, low self-esteem, or peer dynamics (Combs, 2016). Furthermore, obesity complicates pregnancy outcomes in adolescents, increasing the risk of gestational diabetes, hypertensive disorders, caesarean delivery, and adverse neonatal outcomes (Yogev & Visser, 2009). These reproductive health challenges highlight the intergenerational implications of adolescent obesity, where maternal obesity may predispose offspring to similar metabolic risks.

Psychosocial and social complications

The social and psychological consequences of obesity are profound and often immediate. Obese children and adolescents frequently experience stigma, discrimination, and bullying, which can lead to social isolation and poor academic performance (Haqq et al., 2021). Weight stigma has been identified as a critical determinant of mental health, contributing to depression, anxiety, and low self-esteem. The relationship between obesity and mental health is bidirectional. Psychological distress may promote maladaptive coping behaviours such as emotional eating and sedentary lifestyles, further exacerbating weight gain (Chen et al., 2023). Additionally, body image dissatisfaction is prevalent among adolescents with obesity and may increase the risk of disordered eating patterns, including binge-eating disorder.

Social determinants, including socioeconomic status, cultural norms, and family dynamics, further shape the lived experience of obesity. In some settings, larger body size may be culturally valued, while in others, it attracts stigma, creating conflicting pressures for adolescents. Limited access to healthy foods, safe recreational spaces, and supportive healthcare services disproportionately affects disadvantaged populations, reinforcing health inequities (Mamun & Alam, 2025). Importantly, obesity-related stigma may extend into healthcare settings, leading to delayed care-seeking and reduced adherence to interventions. This highlights the need for adolescent-friendly, non-judgmental care models that integrate medical, psychological, and social support systems.

Interventions to Address Childhood and Adolescent Obesity

Addressing childhood and adolescent obesity requires a comprehensive, life-course, and multisectoral approach that integrates individual, family, community, and policy-level strategies. Contemporary evidence emphasizes that no single intervention is sufficient; rather, multicomponent and sustained interventions yield the most meaningful outcomes (Ewart-Pierce et al., 2016).

Lifestyle modification remains the cornerstone of obesity prevention and management. Interventions focusing on dietary improvement, increased physical activity, and behavioral change have demonstrated consistent benefits, particularly when delivered in combination. Structured programs promoting reduced intake of ultra-processed foods and sugar-sweetened beverages, alongside increased consumption of fruits, vegetables, and whole grains, are associated with improvements in adiposity and cardiometabolic risk profiles (Wadden et al., 2012). Physical activity interventions, especially those incorporating school-based exercise programs and active play, improve energy balance and metabolic health. However, evidence suggests that isolated interventions may have modest effects on BMI, reinforcing the importance of integrating behavioral counselling and family engagement (Malakar et al., 2025). Behavioral strategies such as goal-setting, self-monitoring, and motivational interviewing further enhance adherence and long-term outcomes (Burke et al., 2024).

Family-based interventions are particularly effective in younger populations, recognizing the central role of parents in shaping dietary habits, physical activity, and health behaviours. Recent meta-analyses highlight that parent-focused behavioural interventions initiated early in life can significantly reduce obesity risk trajectories, especially when they address feeding practices, screen time, and sleep hygiene (Hunter et al., 2025). Parental modelling of healthy behaviours and supportive home environments are critical determinants of success. Interventions that include caregiver education, family counselling, and shared goal-setting tend to achieve better outcomes than child-only approaches, underscoring the importance of a household-level strategy.

Schools represent a strategic platform for large-scale intervention. Evidence from recent systematic reviews indicates that multicomponent school-based programmes combining nutrition education, physical activity promotion, and environmental modifications are more effective than single-component interventions (Hassan et al., 2024). Community-based interventions, including youth clubs, recreational programmes, and public awareness campaigns, complement school efforts by reinforcing healthy behaviours in broader social contexts. These interventions are particularly relevant in low- and middle-income countries, where rapid urbanisation and changing dietary patterns contribute to rising obesity prevalence. Healthcare settings play a critical role in early identification and management. Current guidelines recommend intensive, family-based behavioural interventions (≥ 26 contact hours) for children and adolescents with obesity, delivered by multidisciplinary teams including physicians, dietitians, and behavioural specialists (Force et al., 2024a). Pharmacotherapy is increasingly considered for adolescents with severe obesity or obesity-related comorbidities when lifestyle interventions are insufficient. Medications such as orlistat, liraglutide, and semaglutide have shown efficacy in reducing BMI and improving metabolic parameters, although their use requires careful monitoring (Patel et al., 2025). In selected cases of severe obesity with significant complications, metabolic or bariatric surgery may be indicated in

adolescents, demonstrating substantial and sustained weight loss and improvement in comorbidities. However, such interventions require stringent selection criteria and long-term follow-up.

Upstream, population-level strategies are essential for sustainable impact. Policies targeting the obesogenic environment, such as taxation of sugar-sweetened beverages, regulation of food marketing to children, front-of-pack labelling, and improved urban planning to encourage physical activity, have shown promising effects in reducing obesity risk (Ijoma et al., 2024). Equity-focused interventions are particularly important, as obesity disproportionately affects socioeconomically disadvantaged populations. Policies that improve access to affordable healthy foods and safe recreational spaces are critical for reducing disparities. Emerging evidence supports the role of digital health (eHealth and mHealth) interventions, including mobile applications, wearable devices, and social network-based platforms, in promoting healthy behaviours among adolescents. These tools offer scalable, engaging, and personalized approaches to behaviour change, although long-term effectiveness and adherence remain areas for further research (Ijoma et al., 2024).

Challenges and Future Directions in Addressing Childhood and Adolescent Obesity

Despite growing evidence on effective interventions, addressing childhood and adolescent obesity remains fraught with complex, multilevel challenges. One major barrier is the multifactorial nature of obesity, driven by biological, behavioural, environmental, and social determinants, which limits the effectiveness of single-component interventions. Even when evidence-based strategies exist, translating them into sustainable, real-world practice is difficult due to fragmented healthcare systems and limited integration across sectors (Pitsillidou et al., 2021).

At the individual and family level, poor adherence to lifestyle interventions remains a critical challenge. Factors such as low health literacy, parental reluctance, time constraints, and competing socioeconomic priorities reduce engagement with obesity prevention programmes. In many settings, unhealthy dietary patterns and sedentary behaviours are deeply entrenched, making behavioural change difficult to sustain. Additionally, stigma and weight bias may discourage adolescents from seeking care, further complicating management.

At the health system level, limited access to multidisciplinary care, including dietitians, behavioural therapists, and adolescent-friendly services, restricts the delivery of intensive, evidence-based interventions. Resource constraints are particularly pronounced in low- and middle-income countries, where competing health priorities and inadequate infrastructure hinder implementation. Furthermore, current clinical models often prioritize treatment over prevention, missing opportunities for early intervention.

At the policy and environmental level, the persistence of obesogenic environments remains a major obstacle. Widespread availability of energy-dense, nutrient-poor foods, aggressive marketing targeting children, and urban designs that discourage physical activity undermine intervention efforts. Policy implementation is frequently challenged by limited political commitment, industry resistance, and insufficient funding (Force et al., 2024b). School-based

interventions, although promising, also face barriers such as inadequate resources, competing academic priorities, and lack of trained personnel.

Looking forward, future directions must prioritize integrated, systems-based approaches. There is a need to shift from isolated interventions to comprehensive, multilevel strategies that align healthcare, education, community, and policy actions. Strengthening primary prevention, particularly during early childhood and adolescence, remains critical to altering long-term trajectories. Advances in precision public health and data-driven approaches offer opportunities to tailor interventions based on individual risk profiles, sociocultural contexts, and environmental exposures. Similarly, digital health innovations, including mobile health platforms and wearable technologies, can enhance engagement among adolescents and support sustained behaviour change.

Equity must be central to future efforts. Addressing social determinants of health, such as poverty, food insecurity, and access to safe recreational spaces, is essential to reducing disparities in obesity prevalence and outcomes. Policies that promote healthy food environments, regulate marketing to children, and create activity-friendly urban spaces are crucial for long-term impact. Finally, there is a growing need for adolescent-centred, stigma-free care models that integrate physical, mental, and reproductive health services. Embedding youth participation in programme design and implementation can improve acceptability and effectiveness.

Conclusion

Childhood and adolescent obesity has emerged as a critical global public health challenge, with rapidly rising prevalence across both high-income and low- and middle-income countries. As highlighted in this review, its aetiology is complex and multifactorial, involving an interplay of genetic, behavioural, environmental, and psychosocial determinants. The consequences are far-reaching, extending beyond immediate physical health risks to include long-term cardiometabolic diseases, reproductive health complications, and profound psychosocial impacts.

Importantly, obesity in early life tracks strongly into adulthood, reinforcing the urgency of early, sustained, and preventive interventions. Evidence consistently supports the effectiveness of multicomponent strategies that integrate lifestyle modification, family engagement, school- and community-based programmes, and supportive policy actions. However, persistent challenges, including obesogenic environments, health system limitations, socioeconomic inequities, and stigma, continue to hinder progress.

Moving forward, a paradigm shift is required toward integrated, life-course, and equity-driven approaches that prioritize prevention, strengthen adolescent-friendly healthcare systems, and address the broader social determinants of health. Harnessing innovations such as digital health and precision public health, alongside strong political commitment and multisectoral collaboration, will be essential. Ultimately, tackling childhood and adolescent obesity is not only a health imperative but also a societal investment, critical to securing healthier futures and sustainable development worldwide.

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