



Understanding the Epidemic of Obesity in Indian Children: Review article

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ABSTRACT:

Introduction: Childhood obesity has become a significant public health concern in India, with its prevalence rising at an alarming rate in recent years. Consumption of processed food, lack of physical activity and exposure to technology are few of risk factors for steep rise in childhood obesity.

Objectives: To provide a comprehensive analysis of the epidemiology, determinants and consequences of obesity among Indian children.

Methods: Following the PRISMA guidelines, a systematic search was conducted across multiple databases including PubMed, Scopus, and Web of Science. Studies included in this review were those that examined the prevalence, determinants, and consequences of childhood obesity in India, published from 2018 to 2023.

Results: The prevalence of childhood obesity in India has shown a marked increase over the past two decades. Key determinants identified include socio-cultural influences, dietary patterns, physical activity levels, and socioeconomic disparities. The review highlights significant regional variations and emphasizes the role of urbanization and modernization in dietary and lifestyle changes. Consequences of childhood obesity identified include increased risk of metabolic syndrome, type 2 diabetes, cardiovascular diseases, and psychosocial issues.

Conclusions: The findings underscore the urgent need for targeted interventions and preventive strategies to address the growing epidemic of childhood obesity in India. Comprehensive, multi-sectoral approaches involving community-based programs, and education are essential to mitigate the long-term health impacts on future generations.

1. Introduction

Childhood obesity has become a pressing public health issue worldwide, and India is no exception. Once considered a problem of affluent nations, obesity among Indian children has escalated dramatically in recent decades, presenting significant challenges to individual health, healthcare systems, and societal well-being ⁽¹⁾. Childhood obesity has reached epidemic proportions globally, with an increasing number of children and adolescents affected by excess adiposity. Beyond its

immediate consequences on physical health and well-being, childhood obesity predisposes individuals to a myriad of long-term health complications, including metabolic disorders, cardiovascular disease, respiratory dysfunction, and musculoskeletal impairments. ⁽²⁾

Epidemiology of Childhood Obesity in India

The prevalence of childhood obesity in India has reached alarming levels, with recent studies indicating a substantial increase in overweight and obesity among



children and adolescents. According to the Comprehensive National Nutrition Survey (CNNS) conducted in 2016-2018, approximately 9.3% of children aged 5-9 years and 11.8% of adolescents aged 10-19 years in India were overweight or obese (Ministry of Health and Family Welfare, 2019).⁽³⁾ These figures represent a significant rise from previous estimates and highlight the growing burden of obesity-related health issues among the younger population.

Several factors contribute to the increasing prevalence of childhood obesity in India. Rapid urbanization, sedentary lifestyles, changes in dietary habits, and socioeconomic transitions have led to shifts in the traditional patterns of diet and physical activity, predisposing children to weight gain and obesity. Moreover, cultural perceptions of body weight and beauty ideals, coupled with limited awareness of the health risks associated with obesity, further exacerbate the problem.^(4,5)

2. Objective

To provide a comprehensive analysis of the epidemiology, determinants and consequences of obesity among Indian children

3. Methods

Following the PRISMA guidelines, search was conducted in online databases including PubMed, Scopus, and Web of Science. Studies examined the prevalence, determinants, and consequences of childhood obesity in India, published from 2018 to 2023 were included.

4. Results

Determinants of Childhood Obesity in India:

A) Socio-Cultural Influences

Socio-cultural factors play a pivotal role in shaping dietary behaviours, physical activity patterns, and body image perceptions among Indian children. Traditional dietary patterns, characterized by high consumption of carbohydrates, fried foods, and sweets, have been gradually replaced by energy-dense, nutrient-poor diets rich in processed foods, sugar-sweetened beverages, and fast food. Moreover, cultural celebrations and festivals often revolve around feasting and indulgence, promoting the consumption of calorie-rich foods and beverages.⁽⁶⁾

Body weight and shape ideals vary across different regions and socio-economic strata in India, with thinness traditionally associated with poverty and malnutrition, while plumpness symbolizes prosperity and well-being. These cultural norms influence parental feeding practices, food choices, and physical activity behaviours, contributing to the development of childhood obesity.

B) Dietary Patterns

The transition from traditional diets to Westernized dietary patterns has had profound implications for childhood obesity in India. Urbanization, globalization, and increased disposable incomes have led to greater accessibility and affordability of processed foods, snacks, and sugary beverages, displacing nutrient-rich, home-cooked meals. Children are exposed to aggressive marketing tactics promoting unhealthy foods, often marketed as convenient, affordable, and desirable choices.⁽⁷⁾ Furthermore, the prevalence of food insecurity and malnutrition coexisting with obesity, known as the double burden of malnutrition, is increasingly observed in low- and middle-income countries. Limited access to nutritious foods, may lead to erratic eating patterns, overconsumption of energy-dense foods, and micronutrient deficiencies, contributing to the development of obesity and its associated comorbidities.⁽⁸⁾

C) Physical Activity Levels

Sedentary lifestyles and a decline in physical activity levels among Indian children have emerged as key contributors to the obesity epidemic. Urbanization, technological advancements, and changes in transportation patterns have led to a reduction in active modes of commuting and recreational activities, with children spending more time indoors engaged in sedentary behaviours such as watching television, playing video games, and using electronic devices. Moreover, safety concerns, lack of access to recreational facilities, and academic pressures limit opportunities for outdoor play and physical exercise, exacerbating the problem.⁽⁹⁾

Consequences of Childhood Obesity in India

Childhood obesity poses significant health risks and long-term consequences for affected individuals, with implications for physical, psychological, and social well-being. Obese children are at increased risk of developing



a range of comorbidities, including type 2 diabetes, hypertension, dyslipidaemia, fatty liver disease, and respiratory disorders. Moreover, childhood obesity tracks into adulthood, increasing the likelihood of obesity-related complications later in life, including cardiovascular disease, stroke, certain cancers, and premature mortality.⁽¹⁰⁾

Psychosocial consequences of childhood obesity, such as low self-esteem, body image dissatisfaction, social stigmatization, and peer victimization, further compound the burden of the disease. Obese children may experience discrimination and bullying in school settings, leading to psychological distress and impaired quality of life. Additionally, academic performance may be adversely affected by obesity-related health issues, absenteeism, and reduced cognitive function, perpetuating a cycle of disadvantage and poor health outcomes.⁽¹¹⁾

A) Metabolic Syndrome and Cardiovascular Health

Childhood obesity is strongly associated with the development of metabolic syndrome, a cluster of metabolic abnormalities that increase the risk of cardiovascular disease and type 2 diabetes. Insulin resistance, dyslipidaemia, hypertension, and central adiposity are hallmark features of metabolic syndrome, often manifesting in obese children and adolescents. These metabolic disturbances promote endothelial dysfunction, inflammation, and oxidative stress, contributing to the pathogenesis of atherosclerosis and cardiovascular complications later in life.⁽¹²⁾

Obese children are more likely to exhibit early signs of subclinical atherosclerosis, including arterial stiffness, endothelial dysfunction, and increased carotid intima-media thickness. Moreover, elevated levels of circulating inflammatory markers such as C-reactive protein (CRP), interleukin-6 (IL-6), and tumour necrosis factor-alpha (TNF-alpha) further exacerbate vascular inflammation and endothelial dysfunction in obese individuals. These pro-inflammatory and pro-thrombotic states predispose obese children to an increased risk of myocardial infarction, stroke, and other cardiovascular events in adulthood.^(13,14)

B) Respiratory Function and Pulmonary Health

Childhood obesity exerts detrimental effects on respiratory function and pulmonary health, leading to a range of respiratory complications such as asthma,

obstructive sleep apnea (OSA), and exercise intolerance. Excess adiposity contributes to the mechanical compression of the thoracic cavity and diaphragmatic excursion, leading to decreased lung volumes, impaired respiratory mechanics, and reduced lung compliance. Obese children often exhibit restrictive pulmonary patterns characterized by reduced forced vital capacity (FVC) and forced expiratory volume in one second (FEV1), predisposing them to respiratory symptoms and exercise intolerance.⁽¹⁵⁾

Obstructive sleep apnea is highly prevalent among obese children, with obesity being a significant risk factor for its development. Excessive adipose tissue deposition in the upper airway leads to airway obstruction during sleep, resulting in recurrent episodes of apnea and hypopnea. Untreated OSA can have profound consequences on neurocognitive function, cardiovascular health, and quality of life in affected children, emphasizing the importance of early diagnosis and intervention.⁽¹⁶⁾

C) Hepatic Steatosis and Liver Health

Non-alcoholic fatty liver disease (NAFLD) is the most common liver disorder in obese children, characterized by hepatic steatosis, inflammation, and fibrosis. Excessive accumulation of triglycerides in hepatocytes leads to lipid droplet formation and hepatocellular injury, predisposing obese children to the development of NAFLD. Insulin resistance, dyslipidaemia, and systemic inflammation contribute to the pathogenesis of NAFLD, exacerbating liver damage and promoting disease progression.⁽¹⁷⁾

NAFLD encompasses a spectrum of liver pathology, ranging from simple hepatic steatosis to non-alcoholic steatohepatitis (NASH), fibrosis, and cirrhosis. While hepatic steatosis is reversible with lifestyle modifications, NASH carries a higher risk of progression to advanced liver disease and hepatocellular carcinoma in adulthood. Early detection and intervention are essential for preventing the long-term complications of NAFLD and mitigating the burden of liver-related morbidity and mortality in obese individuals.⁽¹⁸⁾

D) Musculoskeletal System and Orthopedic Complications

Obesity exerts mechanical stress on the musculoskeletal system, leading to a range of orthopedic complications



such as musculoskeletal pain, joint dysfunction, and impaired mobility. Excess body weight places increased strain on weight-bearing joints such as the knees, hips, and spine, predisposing obese children to musculoskeletal disorders such as osteoarthritis and slipped capital femoral epiphysis (SCFE). Moreover, altered biomechanics and gait patterns associated with obesity may further exacerbate joint degeneration and functional impairment. Childhood obesity is also associated with an increased risk of fractures, particularly in the lower extremities, due to reduced bone mineral density and compromised bone strength. Obesity-related alterations in bone metabolism, hormonal regulation, and inflammatory cytokine production contribute to impaired bone accrual and skeletal development in affected children. Consequently, obese children may experience delayed skeletal maturation, growth abnormalities, and an increased susceptibility to fractures and orthopedic injuries. ^(19,20)

E) Psychological and Social Impact

In addition to its physiological consequences, childhood obesity has profound psychological and social implications, affecting self-esteem, body image, and quality of life. Obese children are more likely to experience stigma, discrimination, and bullying due to their weight, leading to psychological distress, social isolation, and impaired psychosocial functioning. Body dissatisfaction and negative self-perceptions associated with obesity may contribute to the development of depression, anxiety, and eating disorders in affected children ⁽²¹⁾

Moreover, obesity-related health issues such as asthma, sleep apnea, and mobility limitations can further exacerbate psychological distress and impair academic performance, peer relationships, and overall well-being. The psychosocial burden of childhood obesity underscores the importance of comprehensive, multidisciplinary approaches to obesity management, addressing both physical and mental health needs of affected children and their families. ⁽²²⁾

Interventions and Strategies for Prevention

Addressing the epidemic of childhood obesity in India requires multifaceted interventions targeting individual, family, community, and policy levels. Prevention efforts should focus on promoting healthy eating habits,

increasing physical activity levels, and creating supportive environments conducive to healthy lifestyles. School-based interventions, incorporating nutrition education, physical activity promotion, and environmental modifications, can play a crucial role in shaping children's behaviours and attitudes towards health. ⁽²³⁾

Community-based programs, involving collaboration between schools, healthcare providers, local authorities, and non-governmental organizations, can facilitate the implementation of sustainable interventions aimed at preventing childhood obesity. These initiatives may include community gardens, active transportation infrastructure, recreational facilities, and nutrition education workshops tailored to the needs of specific populations. Moreover, media literacy campaigns and regulatory measures targeting food marketing practices can help mitigate the influence of unhealthy food advertising on children's dietary choices. ⁽²⁴⁾

Policy interventions, such as taxation on sugar-sweetened beverages, restrictions on junk food advertising, and school food regulations, are essential for creating environments that support healthy eating and active living. Government initiatives aimed at improving access to nutritious foods, promoting breastfeeding, and strengthening health systems for early detection and management of childhood obesity are also critical components of a comprehensive public health approach. ⁽²⁵⁾

5. Discussion

Childhood obesity is a complex and multifaceted public health issue in India, driven by a confluence of socio-cultural, environmental, and economic factors. The escalating prevalence of obesity among Indian children poses significant challenges to individual health, healthcare systems, and society as a whole. Addressing this epidemic requires concerted efforts from multiple stakeholders, including policymakers, healthcare providers, educators, parents, and the community. By understanding the determinants and consequences of childhood obesity and implementing evidence-based interventions and strategies for prevention, we can work towards creating healthier environments and empowering future generations to lead active, fulfilling lives. Investing in the health and well-being of Indian



children today is crucial for building a healthier and more prosperous nation tomorrow.

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