

# ***Current Status and Potential Recommendations of Childhood Obesity in China***

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**Abstract:** Childhood obesity has become a thorny issue that has aroused mounting concern worldwide. Especially in China, the prevalence of overweight and obesity among Chinese children has risen rapidly in recent decades, which face serious challenges. Despite lacking the research focused on the economic burden of childhood obesity in China, it can be inferred that childhood obesity and possible health risks in adulthood will impose tremendous economic burden. In China, there were many effective interventions that can help address childhood obesity, including suitable preventions, drugs and surgeries. Besides, the government also provided support for the increasing childhood obesity problem by introducing related policies. However, there's still room for improvement about the childhood obesity in China. This article aims to clarify the current situation of childhood obesity in China and further provide some reference suggestions from the perspectives of the government, pharmaceutical companies and children. In order to reduce the disease burden of childhood obesity to some extent, this article aims to put forward suggestions that are suitable for Chinese children and adolescents according to the actual situations of China.

**Keywords:** Childhood obesity, Disease burden, Suggestions, China

## **1. Introduction**

Overweight and obesity have become a global “epidemic” which is also an intractable problem in both developed and developing countries. The World Health Organization has previously warned that childhood obesity has become one of the riskiest public health challenges. Moreover, based on a few national surveys, the prevalence of overweight and obesity among Chinese children has risen rapidly in recent decades. According to the report from 2020, more than a half of adults in China are overweight or obese, and the overweight rate of adult is around 34.3% and the obesity rate is 16.4%. Meanwhile, 1/5 (19%) children and teenagers aged 6-17 years and 1/10(10.4%) children under 6 years old are overweight or obese [1].

In the past, Chinese people mainly ate a plant-based diet based on coarse grains and vegetables, but now it has gradually changed to a more Western-style diet, and more and more animal source foods, fine grains and deeply processed high-sugar and high-fat foods are eaten. Physical activity levels are declining, and inactivity and sedentary behavior are becoming more common. In addition, genetic susceptibility [2], sleep conditions, psychosocial stress, exposure to obesogenic chemicals,

and early exposure to adverse factors are also factors that influence obesity. Moreover, lack of sleep is a great factor in the nation's obesity prevalence. According to the 2011 research, more than 55% of Chinese adolescents and children aged 3 to 17 lack sleep, 5.5% of young people lack sleep [3].

Obesity is not only a chronic, recurrent and progressive medical problem, but also a difficult social problem to deal with. From a biological point of view, obesity can be summarized as the result of excessive accumulation of calories due to special individual factors such as diet, physical activity, and genetic predisposition. However, individual-level factors are largely driven by environmental factors (e.g., urbanization, urban planning, food systems, and the environment) and systemic dynamics (e.g., economic development, social norms, and policies that contribute to rising obesity rates) such as economic, social, and political factors [4].

The lifestyle of Chinese people has changed dramatically with the rapid development of society and economy in the past few decades. It is well-known that the main factors that influence overweight and obesity are diet and exercise. However, in China, the higher the socioeconomic status of the group, the more likely to be obese, which contrasts with the developed countries, the higher proportion of low-income groups obesity phenomenon. The researchers point out that socioeconomic inequality profoundly influences changes in weight and nutritional intake between East and West, while the country seems to face an epidemic of obesity among teenagers (whereas children in poor rural areas in the West are an exception) [5]. Furthermore, in terms of environmental drivers, urban expansion has created new ways of working and living for Chinese people, with heavy physical work in the countryside being replaced by low-intensity physical activity in machinery and service industries. Urban planning and the built of buildings, roads, parks, transportation infrastructure also contribute to obesity risk by affecting People's Daily life. Moreover, with economic development, people tend to have more incomes which allow them to afford cars, household appliances, labor-saving machines, electronic devices, etc. However, this also leads to sedentary lifestyles. In addition, cheap, tasty but unhealthy foods such as McDonalds with low nutrition and high calories are increasingly available to the public [6]. Consequently, those factors contribute to people becoming obese, and hence cause people to have unpleasant health conditions.

Overweight and obesity in children can give rise to all sorts of unintended consequences. Physiologically, often due to obesity and mobility inconvenience, fear of heat, excessive sweating, easy fatigue, severe cases can involve the respiratory system, circulatory system, endocrine system, causing hypoxemia, congestive heart failure, coronary heart disease, fatty liver, cholelithiasis, diabetes, hypertension, arthritis, and other complications [7]. Psychologically, obesity also has a significant impact on children's psychological development. They often lack self-confidence due to discrimination, bad partnership, poor self-feeling and other psychological pressure and issues, which is very unfavorable for children who are at the age of unstable psychological development. Moreover, obesity also has adverse effects on children's intelligence, immune function, and reproductive system.

## **2. Diagnosis and treatment process**

Obesity treatment aims to enable obese children to achieve and maintain a healthy weight, which can improve overall health and reduce the risk of future developing obesity-related complications. Prevention is the first step and a key step in the treatment of obesity.

Obesity can be prevented from 3 aspects. First prevent overnutrition during pregnancy, then pay attention to diet conditioning and behavior correction such as slow down the children's eating, don't be greedy and partial to food, Restrict snacks. And increase physical activity [8].

Then the second part is to diagnose, here are 4 ways [9], weight-for-height which is the most useful way for children, and body mass index BMI, skinfold thickness, total adiposity measurement. When a definite diagnosis has been made, today, there are three methods can be used, including general ways, surgical ways and medicines [10]. For general ways, dietary changes which is about cutting

calories, restricting certain foods, meal replacements and so on. Then Exercise and activity, this is an important part of staying healthy even for general people. Like playing football, badminton and running. Besides, these the obese children need to change their behaviors, they need counseling. And they need to receive support from friends and relatives close to them and get comprehension where others suffer from the same trouble with them.

If the it doesn't achieve good results after general ways, they need Surgical treatments or take medicines. For surgical, according to different principle, it can be treated by limit intake, reduce absorption or both. Here are some different Operation methods , Laparoscopic vertical banded gastroplasty , Laparoscopic adjustable gastric banding , Laparoscopic sleeve gastrectomy and Laparoscopic biliopancreatic diversion with duodenal switch [11].For medicines, When it comes to drugs,Orlistat has been proved to significantly reduce the weight of obese children. And here are some Commonly used medications approved by the FDA. For example, Bupropion-naltrexone, Liraglutide, Phentermine-topiramate, Semaglutide [12]. Therefore, it is inseparable from the topic of traditional Chinese medicine. Traditional Chinese physicians usually use Fuling, Atractylodes, oriental water plantain and so on [13].

What's more, there are stills some other special treatments Hydrogels, Vagal nerve blockade and Gastric aspirate. And for serious cases, now we use the MTD system especially for those with more complications. It's a model including multidisciplinary expert joint outpatient service, multidisciplinary consultation and discussion, multidisciplinary follow-up and education, and holding multidisciplinary related seminars [14].

### 3. Government intervention

In order to effectively strengthen the prevention and the control of obesity among children and adolescents and promote the healthy growth of children and adolescents. The National Health and Wellness Committee and the Ministry of Education and other six departments have formulated *the Implementation Plan for the Prevention and Control of Obesity in Children and Adolescents*.

It aims divides into two parts: national goal and regional goal. The national goal is based on the average annual growth rate of overweight and obesity rate from 2002 to 2017, to make the average annual growth rate of overweight and obesity rate of children and adolescents aged 0-18 years from 2020 to 2030 decreased by 70%. The target of this project is to classify Chinese provinces (autonomous regions and municipalities) into three epidemic levels: high, medium and low based on the current situation of overweight rates among teenagers. The average annual growth rate of overweight and obesity among adolescents in high-prevalence areas is projected to decrease by 80% from baseline, while that of children and adolescents in middle-epidemic areas will be reduced by 70%, and that in low-epidemic areas is predicted to decrease by 60%.

For the key tasks, it can start from family, school and society. First, family members, especially parents, need to improve family responsibilities and play their full roles in family environment as competent caregivers, including helping children fall into relatively scientific eating behaviors, cultivating children's habit of physical activity in their regular life, doing a good job in monitoring the weight and growth of children and adolescents, strengthening community support such as distributing publicity materials and organizing popular science lectures. Second, schools should take on responsibilities to maintain the healthy weight of children and adolescents, including running the nutrition and health class well, improving school food supply which need to formulate and revise the feeding guidelines for kindergartens, primary and secondary schools and training of catering practitioners in schools as well as feeding units, and ensure physical activity time at school. Third, medical and health institutions have the responsibility and ability to optimize weight management services. To be specific, they also need to improve weight management during pregnancy and the weight management of kids and strengthen the intervention of obese children. Forth, the government

should strengthen the construction of supportive environment, pay attention to the popularization of knowledge and skills of obesity prevention, improve the management of food marketing, and improve sports facilities for children and teenagers.

Another policy which related to children's obesity, is called Regulations on School Food Safety and Nutrition Health Management, formulated in 2019. It emphasizes the implementation of prevention first, whole-process monitoring, territorial management, and school implementation of centralized catering in schools, and establishes a working mechanism of division of responsibility for education, food safety supervision and management, and health departments. Schools should draw on the standards formulated by the "Dietary Nutrition Guide for Students" issued by the health authorities, and guide teenagers to develop scientific and nutritious eating habits according to the nutritional and health needs of students of different ages.

#### **4. Economic evaluation of interventions on childhood obesity**

In terms of childhood obesity, numerous studies on the effectiveness and economic evaluation of interventions have been published abroad, including dietary intervention, exercise intervention, and psychological intervention. By contrast, in China, only a few studies have explored the cost-effectiveness of interventions to prevent childhood obesity, which used different economic evaluation methods.

On the basis of CNKI research and PubMed research conducted in 2023, economic evaluations of three presentive interventions could be identified in the published literature since 2013 in China. Three studies evaluate obesity prevention programs for children, two of them were based on a multi-center randomized controlled clinical trial conducted in six different cities between 2009 and 2010[15]. In this study, three common preventive interventions were selected, including nutrition education, physical activity intervention and comprehensive intervention. The study published in 2013 applied cost-effectiveness methodology, characterized by the use of body mass index (BMI) as a health outcome [16]. This study found that comprehensive intervention was significantly more cost-effective than physical activity intervention and nutrition education. The cost effectiveness ratio for four cities in China was \$113.0, \$62.1, \$346.5 and \$30.7 per BMI, respectively. Another study compares costs per quality-adjusted life year (QALY) and costs per benefit among different interventions [17]. This study was employed from a societal perspective to the health utilization and outcome that are attributable to the nutrition education, physical activity and comprehensive intervention. Comprehensive intervention and nutrition education were more cost-effective relative to the physical activity intervention. To be specific, the incremental cost-effectiveness ratio (ICER) was \$1478.6 and \$661.8 for comprehensive intervention and nutrition education respectively. Comprehensive intervention was cost-effective at a willingness-to-pay threshold of China.

Different from the studies mentioned, further one study differs in a variety of aspects such as perspective, intervention target, target population, costs and health gain measures included [18]. The data of this study came from the Chinese Primary School Children Physical Activity and Dietary Behavior Changes Intervention (CHIRPY DRAGON) study conducted in 2019 [19, 20]. It reported detailed cost-effectiveness results from two perspectives, including a public sector and a societal perspective. The intervention set is the diet and physical activity while the matched control is usual practice. Although the costs and outcome involved in two perspectives are different, two perspectives come to consistent conclusion that prevention program could produce a cost-effective effect against childhood obesity than usual practice. From the public sector perspective, compared with usual practice, the cost of the preventive intervention is US \$2,502 / QALY, which is highly cost-effective under the US threshold. In addition, the ICER was \$20,796 per QALY from societal perspective, which is also cost-effective using same threshold.

Although realizing the existence of many limitations, those known studies demonstrate that taking preventive action, especially comprehensive intervention, is a beneficial investment that is both cost-effective and cost saving for childhood obesity in China.

## 5. Risk factors of childhood obesity in China

Childhood obesity doesn't happen by accident. The reasons leading to childhood obesity are manifold besides genetic and biological factors, including socioenvironmental factors. Therefore, management of overweight and obesity in advance by altering behavior and physical activity among children and their parents are exclusively critical.

Dietary habits of children are a key determinant in childhood obesity development. A case-control study found that the major risk factors of obesity in youngsters aged 8–13 in Jinzhou were overeating habits and preference for high-fat foods as well as high maternal body mass index [21]. Another study of teenagers aged 6–12 in Beijing demonstrated that the major risk factors were frequent snacks (odds ratio = 2.65), fast eating (odds ratio = 2.51) as well as unbalanced eating habits (odds ratio = 1.84) [21]. Moreover, a prospective study published in 2011 showed an interesting situation that skipping breakfast was significantly associated with elevated BMI among Hong Kong children [22]. Children's physical activity and sedentary behavior also play important roles in the development of obesity in China. It is obvious that lacking physical activity could profoundly contribute to weight gain. In China, a majority of researches indicated that building new exercise facilities and improving physical activities have the potential to help reduce the incidence of childhood obesity [23]. Increased sedentary behaviors has been identified as a special risk factor for obesity. Most of studies showed that spending too much time on sedentary lifestyle, especially sedentary behavior involves staring at screens, was strongly related to childhood obesity in China [24].

Environmental factors and family situation may play an important role in the increasing development of childhood obesity. In particular, family, school, community environment can play a crucial role regarding this. There are many factors involved in family environment, including grandparental child care, parental migration and poor complementary feeding. A previous study demonstrated that parental and caregiver feeding practices was related to the child's weight [25]. Besides, poor complementary feeding may affect the development of childhood obesity, thereby intensifying the burden of family [26]. Parents' behavior before and after gestation period are also key influencing factors of childhood obesity. A large survey conducted in nine cities in China identified several family factors that may result in childhood obesity, including cesarean section, gestational diabetes, mother's low educational level and family members overweight [27].

## 6. Conclusion and recommendation

Although the current research and government policy focus on the childhood obesity in China, there are also many problems among this field. Furthermore, in order to satisfy the future needs of the childhood obesity, it is urgent to offer some suggestions from different perspectives.

First limitation is about the threshold value designed by mentioned economic evaluation studies. The UK and US threshold values were used in the study published in 2021. This article recommends using Chinese threshold that was defined as one time to three times GDP, about 85,698 Yuan (\$11,954) and 257,094 Yuan (\$35,864). A further limitation was the time horizon of the intervention. The time horizon of known studies was limited to 12 months and they ignored the sustainability of the intervention. It is important to prolong the time horizon to explore and predict the long-term effectiveness of interventions. Although all school-based obesity preventions appear cost-effective, treating obesity may be more cost-effective to some extent. Therefore, there is an urgent need for more studies to explore the cost-effective of drugs or surgeries involved in childhood obesity.



Viewed from the angle of the government, more projects focused on childhood obesity in China should be promoted by the government. We would recommend a whole project, “steal” obesity object. The project has four steps: 1. Survey the family conditions according to the inheritance and life behavior scoring system to evaluate; 2. Diagnose students’ real conditions; 3. According to their scores, we can provide personalized students daily diet and mainly restrict the high-risk group of students, with planned of different frequencies and types of exercises; 4. For mental health education, to ensure students regard obesity with a positive attitude, as it can decrease the chance for overweight or obese students to experience unfair treatment and be discriminated against by others. Moreover, it can also reduce their anxieties about their future health conditions.

Viewed from the angle of medical companies, more specific drugs on childhood obesity need to be developed by medical companies in China. Medical corporations should conduct more clinical trials and health economic evaluation of drugs for childhood obesity.

Viewed from the angle of patients, we can speculate that the level of health knowledge pervasion among parents and children needs to be improved. Follow the advice below may generate desirable effects. Firstly, parents should help children develop hobbies and encourage them to participate in interest-oriented class to keep unhealthy lifestyles away. What’s more, parents can also organize parent-child activities regularly and set up incentives for kid’s healthy behavior.

To sum up, the increasingly serious problem of obesity among children in China needs to attract the attention of the whole society. The government should widely advocate and create a supportive environment conducive to obesity prevention and intervene throughout the society. The government, the medical companies and patients must make their effort to alter the situation of childhood obesity in China.

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