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Childhood obesity: Rising cases of obesity in post COVID era

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Abstract

The most significant public health issue faced by the 21st century is prevalence of Childhood obesity. Since the onset of the COVID-19 pandemic and the shift towards a new normal, children have been facing the challenge of dealing with overweight and childhood obesity. Disruptions to their regular routines have resulted in more screen time and a tendency to opt for unhealthy snacks instead of nutritious meals. This has led to a significant rise in obesity among children & in turn has increased the incidence of endocrine diseases like diabetes mellitus, disorders of thyroid gland and precocious puberty. In order to achieve lasting improvements in a child's eating habits and overall lifestyle, it is necessary to employ a multifaceted approach that addresses their mental wellness as well as the prevention and treatment of any associated complications. This review article addresses different multidimensional approach with Homoeopathic remedies for bringing in control of increasing cases of childhood obesity in post COVID 19 era.

Keywords: Childhood obesity, Post COVID-19, Homoeopathy

Introduction

Childhood obesity is defined as the abnormal or excessive accumulation of body fat. In the 21st century obesity is an important paediatric public health problem associated with risk of complications in childhood and increased morbidity and mortality throughout adult life. This problem is widespread globally and is increasingly affecting low- and middle-income countries, especially in urban areas. When children are overweight or obese, they are more likely to remain so into adulthood and are at an increased risk for developing non-communicable diseases at a younger age ^[1]. Even more concerning is that since the onset of the COVID-19 pandemic and the subsequent "new normal" way of life, children are experiencing an even greater predominance of overweight and obesity. This problem is rapidly increasing not only in developed countries but also in economically developing nations. The long-haul COVID-19 era of "new normal" living, characterized by stay-at-home orders, remote schooling, and physical distancing measures, has necessitated significant lifestyle changes that can be detrimental to children's health. The pandemic resulted in the loss of important aspects of school life, including peer interactions and mandatory physical activity, which are crucial for physical and mental wellness of the child ^[2]. Prior to pandemic in 2019, obesity rates across the globe were within normal and manageable levels. However, as a result of the lockdowns, home isolation, and other pandemic-related measures, there has been an uptick in cases of obesity. The shift to remote learning increased the cases of childhood obesity significantly by the end of 2021 ^[3]. The World Health Organization announced COVID-19 a pandemic globally on 11th March 2020 & the subsequent measures taken to prevent the spread of the virus have dramatically affected people's daily lives across the globe. The Education ministry postponed the reopening of schools and strongly discouraged students from participating in outdoor activities until limited school reopening was allowed. During this time, students who remained at home for online classes experienced significant weight gain due to increased screen time and a tendency to snack on unhealthy foods instead of consuming nutritious meals. The surge in childhood obesity has contributed to higher rates of endocrine diseases such as diabetes, disease of thyroid gland and precocious puberty ^[4].

Prevalence of Childhood Obesity in the Pre- and Post-COVID Eras

According to estimates from 2016, there were > 41 million overweight children under the age of five globally ^[1].

Currently, the global incidence of childhood obesity is 337 million, with 213 million classified as overweight and 124 million classified as having mild, moderate and severe obesity. In the United States, before the COVID-19 pandemic in 2017-2018, obesity affected 19.3% of children aged 2 to 19 years, equivalent to about 14.4 million children and adolescents. A study of 432,302 children aged 2 to 19 years found that the rate of body mass index (BMI) increase nearly doubled during the COVID-19 pandemic compared to the pre-pandemic period [5]. The prevalence of obesity among adolescents aged 12-18 years in 2020 (long-haul COVID 19 era) increased to 12.1% in comparison to 2019 (pre-COVID-19) which was 11.1% [6]. In India, childhood obesity is expected to reach 250 million by 2030. It is estimated that the percentage distribution of obesity in males and females by 2050, will be 60% and 50% [7].

Latest: % Infants overweight	2.4	
	Girls	Boys
2016: % children age 5-9 with obesity	3.7	2.6
2016: % children age 10-19 with obesity	1.8	1.1
2010: % adolescents with insufficient physical activity	69.6	71.6
Projections for 2030		
	Percentage	Number
Predicted 2030: Children aged 5-9 with obesity	10.8	12,692,004
Predicted 2030: Children aged 10-19 with obesity	6.2	14,789,136
Predicted 2030: number of children aged 5-19 with Obesity	27,481,141	

Following table displays facts from the Atlas of Childhood Obesity specifically pertaining to India [7]

Findings from 2019-2021 survey revealed increase of weight among children under the age of five in India. However, when considering the projected numbers, India may nurture approximately 27.48 million children with obesity between the ages of 5 to 19 by 2030, placing it second only to China [7].

Incidence & Pathophysiology

Childhood obesity incidence may be examined through Urie Bronfenbrenner's Social-Ecological Model (SEM). The COVID-19 pandemic caused crisis both in economic and social level, resulting in a chain reaction of stressors on children and families. The COVID-19 Obesogenic environment (depicted in Figure 1) increased the prevalence of childhood obesity. In the level of microsystem, the COVID-19 pandemic introduced stressors in children and families due to devastating life events. Parents experienced stress due to loss of job, COVID-19-related death of family member, home isolation, and remote work, which hindered their ability to adapt efficiently. To curb COVID-19 transmission rates, many countries, including India, closed schools, disrupting physical classrooms. This physical disruption had a detrimental impact on the socio-physical, and mental wellness of children from disadvantaged groups, such as low- and middle-income families [2].

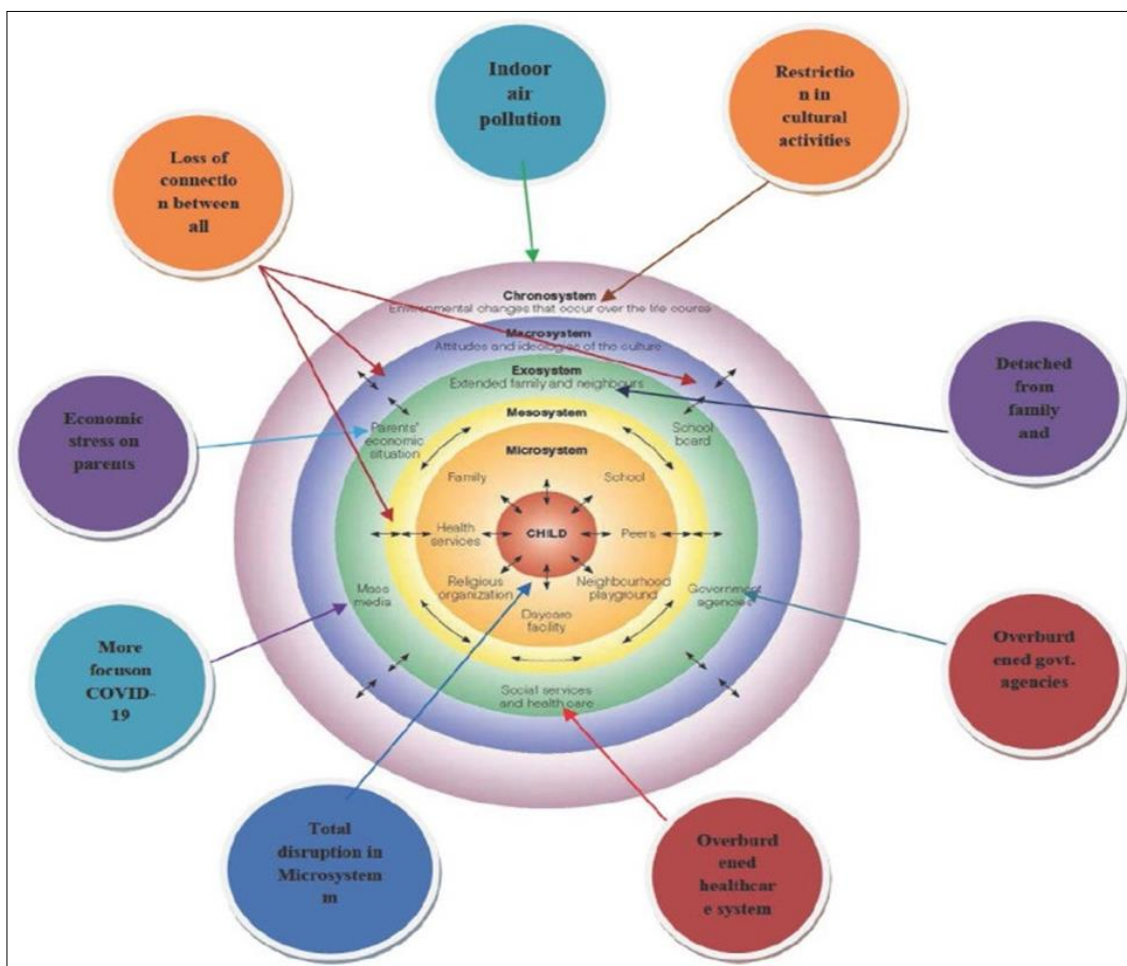


Fig 1: Social-Ecological Model of Obesogenic environment in post COVID-19 period [2]

The pandemic has had an impact on the mental wellness of children like mental fatigue, irritable, anxiety, and hyperphagia. 27% of guardians reported a decline in their children's mental health, and 14% reported a decline in their behavioural health. Prolonged lockdowns in many countries led to families stocking up on processed foods, which easily cooked, thereby increasing the risk of childhood obesity. In the Exo-system, lack of spacious environment in many homes or restrictions in parks limited children opportunities for exercise and activities. Exercise and physical activity are anti-obesogenic, releasing anti-stress hormones such as endorphins and enkephalin (opioid-like substances) in the brain. Due to lack of exercise during home isolation, stress levels were not neutralized. Micro-system hazards, such as indoor pollution, also increased the rate of obesity [2].

Diagnostic criteria for childhood obesity

BMI is commonly used to determine weight of child as per the age. The WHO's criteria for classifying childhood obesity are as follows: Underweight - BMI less than the 50th percentile; Healthy weight - BMI between the 50th and less than the 85th percentile; Overweight - BMI between the 85th and less than the 95th percentile; Obesity - BMI equal to or greater than the 95th percentile [1]. The Indian Academy of Pediatrics (IAP) has also provided criteria for the classification of childhood obesity. IAP 2015 charts were developed by backtracking adult BMI Indian cut-offs for overweight (23 kg/m²) and obesity (27 kg/m²). Extreme obesity is defined as a BMI > 120% of the 95th percentile or > 35 kg/m² [19].

Risk factors contributing for Childhood obesity [11]

1. School closures
2. Reduced physical activity
3. Increased sedentary life style: additional hours of television per day
4. Increased sleeping time
5. Increased screen time: playing video games and getting more access to social media leads to anxiety, depression and inattention
6. Parenting style and parent life style
7. Parenting feeding style
8. Watching TV while eating
9. The consumption of snack foods, including items such as chips, baked goods, and candy.

The study conducted in Italy by Pietrobelli *et al.* and Censi *et al.* showed a decrease in physical activity and an increase in screen time among children during COVID-19 lockdown, which was consistent with similar findings worldwide. Androutsos *et al.* in Greece and Ruiz-Roso *et al.* in Brazil reported a decrease in fast food consumption due to home isolation, while Philippe *et al.* in France reported an increase in dessert intake. In Palestine, 41.7% of adolescents reported weight gain due to increased consumption of fried foods, sweets, sugar-added drinks, and dairy products during the lockdown. Family's worse financial status was found to be

associated with more weight gain, primarily due to stress, staying at home, social distancing, frequent cooking, and parents' concern about the impact of COVID-19. Similar findings from China showed an increase in BMI in all groups of youth (high school, undergraduate, and graduate students). Additionally, in Poland, a reduction in vegetable, fruit, and legume intake was associated with an increase in BMI, leading to weight gain of nearly 30% [9].

Comorbidities in short- and long-term level [7]

Psychological

Obesity is associated with various psychological and emotional problems like mood disorders, somatoform disorders, and eating disorders such as binge eating, emotional eating, and loss of control over eating. These disorders can be triggered by a variety of factors such as stress, social pressure & body shaming. In addition, they may experience social isolation, negative self-esteem, and depression symptoms, such as anhedonia.

Body dissatisfaction is a common psychological consequence of obesity. Children and adolescents with obesity often have negative perceptions of their body and appearance, which can contribute to poor self-esteem and body image. This can lead to social isolation, decreased participation in physical activities, and even avoidance of social situations.

Obesity-related stigma and discrimination can also contribute to psychological distress. Obese children may face teasing, bullying, and discrimination from peers, which can lead to feelings of shame and low self-worth.

Overall, addressing the psychological consequences of obesity is an important part of comprehensive treatment and management of the condition. Psychological interventions such as cognitive-behavioural therapy (CBT), family-based therapy, and mindfulness-based interventions is effective in improving psychological well-being and promoting healthy behaviours.

Physical health consequences

Obesity in children can also lead to a variety of physical health consequences. In infants and young children, being overweight or having high subcutaneous fat can lead to delayed motor milestones. In adolescence, slipped upper femoral epiphysis and pathologic genu varum like musculoskeletal problems can occur. Pulmonary complications like shortness of breath & obstructive sleep apnea can also be seen. Cardiovascular complications such as dyslipidemia and hypertension, as well as gastrointestinal complications like gallbladder disease and non-alcoholic fatty liver disease can also occur. In females, hyperandrogenemia & menstrual abnormalities like delayed menarche, oligomenorrhea, and amenorrhea are more common in obese girls, and hormonal patterns of polycystic ovarian syndrome may also be observed. Finally, obese children may also face socio-economic consequences such as rejection from peers, progressive withdrawal & victims of bullying.

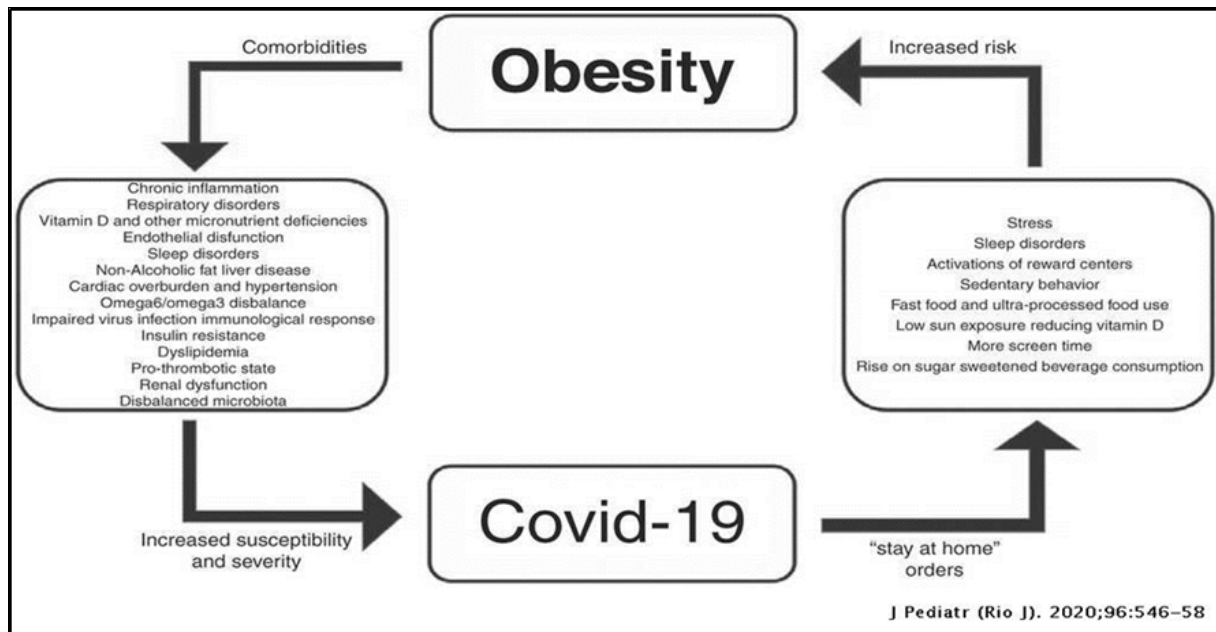


Fig 2: Long term effects (interrelationship between childhood obesity and COVID 19) ^[15]

Childhood obesity prevention Environment

In addition to the '5-2-1-0' rule, there are other evidence-based interventions that can be implemented in schools to prevent and manage childhood obesity. These include:

1. Providing healthy food options in school cafeterias and vending machines, and limiting access to unhealthy foods and sugary drinks.
2. Increasing the platform for physical activity during the school day, such as through phys-ed classes, providing intervals & active transportation to and from school.
3. Implementing classroom-based physical activity breaks and integrating movement into academic lessons.
4. Providing education and support for parents and families on healthy eating and physical activity habits at home.
5. Encouraging a positive body image and self-esteem in students, and promoting healthy attitudes towards food and physical activity.
6. Partnering with community organizations and health professionals to provide additional resources and support for obesity prevention and management.

By implementing these interventions, schools can play a critical role in promoting healthy lifestyles and preventing childhood obesity.

Treatment of childhood obesity

Yes, a multidisciplinary approach is recommended for the treatment of childhood obesity. This approach should involve healthcare professionals from various disciplines such as paediatrics, nutrition, psychology, physical activity, and social work. The primary objectives of this approach are to promote healthy eating habit and lifestyle, maintain their mental wellbeing, and prevent and treat any associated complications.

Diet: Balanced diet is recommended for the treatment of childhood obesity. The diet should meet the child's nutritional needs while promoting weight loss or maintenance. Dietary counselling and education can be provided by a registered dietitian to make healthier food

choices and learn how to prepare and plan meals that meet their needs ^[20].

- a) **Low fat diets (LFDs):** Low calorie diets having less fat. Low fat diets have calorie of 800 Kcal/day. This had the capability to induce rapid weight loss but weight is regained quickly once the diet is ceased. It is recommended when the child has to lose weight rapidly for medical complications.
- b) **Low calorie diet (LCDs):** Energy restricted diets in range 800 to 1500 Kcal/day and contains balanced protein, fat and carbohydrate with less fat. It is not advised for < 6 years of age
- c) **High dietary fibre diets:** fibre supplements with diet of 1200 to 1600 Kcal/day.
- d) **Very low-calorie diets:** Diet consisting of 600- 800 Kcal or less per day. To achieve rapid weight loss, protein intake of 0.8 to 1.5 g/Kg of ideal body weight. Should not be continued for more than 4 weeks.

Sources of diet and regimen

It is important to note that a restrictive approach to dieting, such as completely avoiding certain foods, may not be sustainable or healthy in the long term. Instead, it is recommended to focus on incorporating more whole, nutrient-dense foods and reducing or moderating the consumption of highly processed or high-calorie foods. In terms of practical dietary recommendations, here are some suggestions:

- Encourage the consumption of whole foods such as fruits, vegetables, whole grains, lean protein sources, and healthy fats (e.g. nuts, seeds, avocado).
- Limit the consumption of processed foods and drinks that are high in added sugars and unhealthy fats, such as sugary drinks, chips, cookies, and fried foods.
- Promote healthy snacking options, such as cut-up fruits and vegetables, hummus and whole-grain crackers, or low-fat yogurt.
- Encourage children to drink plenty of water and limit sugary drinks, including fruit juices.
- Encourage family meals and discourage eating in front of screens, which can lead to mindless eating and

overconsumption.

- Teach children about portion sizes and encourage them to eat slowly and mindfully, paying attention to hunger and fullness cues.
- It is important to take advice from a registered dietician, to develop a personalized and sustainable nutrition plan for a child with obesity.
- A diet chart for a 10-year old obese child whose weight is 55 kg is mentioned below [20]:

Food items	Raw (g)	Cooked quantity	Energy (Kcal)	Protein (g)
Rice	100	2 cups	375	7
Dal	25	10 tsp	95	5
Milk	300	1 ½ cups	200	9
Egg	80	2	160	12
Soya	25	10 tsp	110	11
Greens	50	5 tsp	-	1
Idili	-	1	50	1
Total			990	46

Ideal weight 30 kg protein 1.5 to 2.5 g/Kg = 30×1.5 = 45 g energy < 50% of RDA = 1000Kcal

Physical exercise

Exercise with effective diet is beneficial rather than diet or exercise alone. Exercise that increase the fitness are walking, cycling and swimming. 30 minutes walking, 15 minutes running, volley ball playing for 45 minutes per day & walking 3 miles/hr will expend 300 Kcal/hr and lead to loss of 3kg in 3 months [7].

Cognitive and family based behavioural therapy

Self-assessment (food and activity diary), effort-based reward, stimulus control & cognitive reframing and well-grounded soulution [7].

Pharmacological interventions

It is important to note that the use of medication for the treatment of childhood obesity should be done under strict medical supervision and in conjunction with a comprehensive lifestyle intervention program. The decision to use medication should only be made after careful consideration of the risks and benefits, and after other non-pharmacological interventions have been tried and proven ineffective. The use of medication alone is not a sustainable solution for childhood obesity, and the focus should always be on adopting a healthy lifestyle with a balanced diet and regular physical activity. Orlistat was the only drug of choice available for severe obesity but in 2020 US-FDA certified Liraglutide durg for more than 12 years old children [7].

Bariatric surgery: Bariatric surgery is generally not recommended for children and adolescents as it carries significant risks and potential complications, including malnutrition, bowel obstruction, and postoperative infections. Moreover, long-term effects of bariatric surgery on growth and development are not yet fully understood. Therefore, non-surgical approaches, including lifestyle modifications and pharmacological interventions, should be the primary focus for the management of childhood obesity. In some extreme cases, bariatric surgery may be considered only after careful evaluation and only if other interventions

have failed, and the potential benefits outweigh the risks.[7]

Homoeopathic management

A totality of symptoms was formed after reviewing all the articles being published during post COVID period from 2020 to 2022 [8-18] on increasing cases of childhood obesity, its risk factors, obesogenic environment and the comorbidities.

1. Stress and depression among the children due to isolation from peers
2. Stress accompanied by binge eating
3. Easy fatigability
4. Irritability
5. Anxiety
6. Overuse of computers
7. Watching TVs with binge eating and increase screen time
8. Weak eyesight
9. Increase in weight
10. Improper sleep
11. Fear of attending cancelled exams
12. Overeating aggravated by anxiety
13. Feelings of shame, embarrassment, and low self-worth

Reportorial rubrics for childhood obesity post COVID-19 in synthesis 8.1V repertory in radar 10.0.028 version [21]

1. Mind- Sadness-Children in.
2. Mind- Sadness- Canine hunger, with.
3. Mind- Prostration of mind- Eye strain from.
4. Mind- Company- Desire for- Alone agg, When.
5. Mind- Bulimia.
6. Mind- Fear- Failure of examination.
7. Mind- Taciturn- Mutism- Children in.
8. Mind- Anxiety- Future about.
9. Generals- Obesity- Children in.
10. Clinical- Obesity- Children in.
11. Vision- Dim- Straining eyes.

Homoeopathic therapeutics

Antimonium crudum

- Excessive irritability and fretfulness.
- Tendency to grow fat [23]
- Much concerned about his fate.
- Cross and contradictory; whatever is done fails to give satisfaction.

Calcarea carb

- Persons of scrofulous type.
- Children who grow fat, are large bellied, with large head, pale skin, chalky look, leucophlegmatic temperament, [23]
- Fat, fair, flabby, perspiring cold, damp and sour.
- Fears loss of reason, misfortune.
- Averse to work or exertion.

Lycopodium

- Melancholy, afraid to be alone.
- Loss of self-confidence.
- Constant fear of breaking down under stress.
- Excessive hunger.
- Desire for sweet things.
- Bulimia with much bloating [22]

- After eating, pressure in stomach with bitter taste in mouth.

Carcinosin ^[22]

- Fear of failure, of exam.
- Fear of not being able to accomplish their goals.
- Desires chocolate, coffee, sweets, sugar, fat, eggs, butter, cheese, cream, milk, bacon, smoked meat.
- Food that makes him worse.
- Cyclic vomiting in infant bulimia.

Saccharum album ^[22]

- Obesity with compulsive eating, especially sweets, cakes and pastries, potato chips.
- Bulimia with obesity.
- Insatiable appetite not ameliorated by eating.
- Restlessness aggravated after eating sweets.
- Alternating moods, gentleness alternating with aggression.
- Extremely aggressive, quarrelsome, violent malicious and defiant especially after eating chocolate or sweets.
- Fits of anger.

Conclusion

The selection of homoeopathic medicines should be based on totality of symptoms and susceptibility of the individual. The most effective way to address the rising cases of childhood obesity in the Post-COVID-19 era is through a multidisciplinary approach that includes proper diet and exercise, healthy eating habits, lifestyle changes, and mental health support. This approach should be tailored to the individual needs and circumstances of each child, and may involve a combination of medical, nutritional, psychological, and physical interventions. It is important to work closely with healthcare professionals to develop a comprehensive and personalized plan for managing childhood obesity.

Conflict of interest

Not available

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Not available

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