Childhood Obesity: Role of Population-based Preventive Approaches

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Abstract

Background and objectives: The number of obese children worldwide is rising very rapidly in the past 4 decades so that childhood obesity is now considered as one of the serious public health challenges. The objective of this study is to provide an overview of the literature focused on the burden of childhood obesity and the ways to overcome it.

Materials and methods: Peer-reviewed studies published between 1991 and 2018 were considered for the review. Studies meeting eligibility criteria were published in English, targeted children aged 3–18 years. Seventy-six studies were considered for inclusion. Eighteen studies were excluded due to poor methodological quality. Sixty-four studies were included in the review. Data were extracted independently.

Results: This review identified the evidence-based intervention of childhood obesity prevention. The results indicate six key issues of emphasis in the literature: population-based preventive approach as the best option; preschool and primary school population as the major target group; behavioral changes are crucial; development of the structures to support policies and interventions at the level of government to prevent childhood obesity; population-wide policies and interventions and community-based interventions to combat childhood obesity prevention. Multisectoral collaboration and strong community participations are essential in building evidence-based well-constructed programs, policies and strategies for the prevention of childhood obesity.

Conclusion: Childhood obesity is associated with significant reduction in quality of life as well as related to bullying and social isolation. World Health Organization (WHO) recommended a population-based approach for childhood obesity prevention. The key components include structures to support policies and interventions, population-wide policies and initiatives and community-based interventions. Population-based preventive approach is one of the cost-effective ways and very much crucial to control the rising tide of childhood obesity.

Keywords: Body mass index, Childhood obesity, Community participation, Population-based prevention, Public–private partnership.

Introduction

Childhood obesity and its associated comorbidities is now one of the major public health issues worldwide. The contributing factors behind the high rise of childhood obesity include behavioral and social causes such as consuming unhealthy diet, less physical activities and insufficient sleeping patterns. Overweight families have the highest risk of overweight and obese children.1

Appropriate preventive measures can reduce the comorbidities associated with childhood obesity. Prevention can be given at primary level through effective health promotion programs, at secondary level by screening and behavioral changes or even at the tertiary level. For achieving the goal of childhood prevention the first targeted group should be aimed at the children of preschool settings.2

Population-based preventive approach is crucial to control the rising tide of childhood obesity and which is very cost-effective.2 The interventions for childhood obesity include lower consumption of sugar, fat and high calorie snacks, high intake of fruits and vegetables and involving in regular physical activities such as playing, physical exercise, sports, etc. Public–private partnership (PPP) along with strong community participation is essential to reverse this trend.

Background

Childhood obesity is now one of the serious public health issues worldwide. According to a WHO report on 2018, the obesity among the children and adolescent has risen more than tenfolds around 124 million (2016 estimate) in the last 4 decades. In addition, an estimated 216 million were classified as overweight and if current trends continue, more children and adolescents will be obese by 2022.3

From the last half of the 20th century, many of the developed and developing countries are being habituated of consuming more dairy products, meat, vegetables, sugary foods and the alcoholic beverages. They are also living sedentary lifestyles which are associated with greater number of overweight or obesity. Rates of cancer started increasing after these dietary changes.3 The reasons behind a person’s lifestyle can be the working conditions, unsafe life, home life, stress, unemployment and poor social environment.
Assessment of Obesity
Body mass index (BMI) is the single best indicator for assessing the childhood obesity.\(^4\)–\(^6\) International Obesity Task Force (IOTF) defined the cutoff points of BMI in childhood obesity as 30 kg/m\(^2\).\(^7\)
Child’s BMI differs with age to age. If child’s BMI is above the cutoff points for the given age and sex then it can be defined as obese.\(^2\)\(^,\)\(^8\)

Contributing Factors to Childhood Obesity
The key factors behind the childhood obesity have been showed in Table 1.

Diet
High calorie intake is associated with overweight and obesity.\(^9\)
By consuming diet with low fat, sugar and salt with more fruits and vegetables the risk of obesity can be reduced.\(^10\)

Physical Activity
Nowadays, sedentary lifestyle is playing a key role in the high prevalence of obesity all around the world. A number of studies have shown that lack of sufficient physical activity is associated with childhood obesity.\(^1\)

Insufficient Sleeping Pattern
Inadequate sleeping causes hormonal and metabolic changes which include increase in the level of evening concentration of steroids, ghrelin and reduction in the level of leptin that in turn produces more hunger and appetite.\(^11\)

Parental Overweight
A number of studies showed family history as a strong factor for the childhood obesity.\(^12\)

Consequences of Childhood Obesity
Obese children are more likely to experience negative consequences such as altered metabolic functions, renal disease, orthopedic disorders, liver and gallbladder dysfunction, physical, lower self-esteem, psychological due to higher likelihood of being bullied and cardiovascular problem and cancer.\(^13\)–\(^17\)

Materials and Methods

Literature search: The relevant articles which were published in-between year 1991 and year 2018 have been considered for the literature review. Data were extracted independently.

Table 1: Contributing factors for childhood obesity\(^13\)–\(^21\)

<table>
<thead>
<tr>
<th>Behavioral and social factors</th>
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<tbody>
<tr>
<td>Diet</td>
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<tr>
<td>Low intake of fruits and vegetables</td>
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<tr>
<td>High-energy-density diets</td>
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<tr>
<td>High intake of sweetened drinks</td>
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<tr>
<td>Physical activity</td>
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<tr>
<td>Lack of physical activity</td>
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<tr>
<td>Short sleep duration</td>
</tr>
<tr>
<td>Demographic</td>
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<tr>
<td>Parental overweight</td>
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<td>Ethnicity</td>
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Inclusion Criteria
- Language: English
- Publication type: Research and review articles published in peer reviewed journals.
- Study design: Observational
- Study population: Targeted children aged 3–18 years.

Exclusion Criteria
- Language: Language other than English.

One hundred-one studies were considered for inclusion. 43 were excluded and 64 studies were included in the review. Data’s were extracted independently.

Ways to Prevent Childhood Obesity
The prevention of childhood obesity can be done at three levels,\(^18\)–\(^20\)
- Primordial prevention: It can be started from early childhood by keeping a normal BMI throughout childhood. The intervention includes health promotion.
- Primary prevention: It aims at risk groups to prevent overweight children from becoming obese. Its interventions are the health education and specific protection.

Population-based Approaches for Childhood Obesity Prevention
WHO has recommended a population-based approach for childhood obesity prevention\(^21\) (Flowchart 1).

This integrated approach for population-based childhood obesity prevention has been categorized into three components:

Flowchart 1: Schematic model on population-based approaches to childhood obesity prevention\(^21\)
Component 1: Structures to Support Policies and Interventions

This component is dealing the structures to support policies and interventions at the level of government to prevent childhood obesity. The key issues are leadership, “Health-in-all” policies, dedicated funding for health promotion, non-communicable disease (NCD) monitoring systems, workforce capacity, networks and partnerships and standards and guidelines.

It is a requirement for the high-level political leaders to provide the necessary strategic leadership for the prevention of childhood obesity. The effective application of the “health-in-all” policies in the areas such as health promotion, food security, food fiscal policies, transport and urban planning policies, safe environments, taxation and social policies related to health inequalities. Dedicated funding for health promotion is a need for the prevention of childhood obesity. This can be achieved by developing health promotion agencies, necessary budget and resources allocation and by multisectoral coordination.

Continuous NCD monitoring by giving prioritizing population dietary survey, food composition and food security can reduce the behavioral risk factor among children. The 10 key issues that have been addressed by WHO to reduce the behavioral risk factors in school environment includes alcohol use, dietary behaviors, drug use, hygiene, mental health, physical activity, protective factors, sexual behaviors, tobacco use and violence and unintentional injury.

Governments required strengthening the workforce capacity by providing sufficient training to the staffs for the sustainable supply of necessary skills. For achieving the goal multisectoral an effective coordination and collaboration are needed among the government at the local, state and national level and also between the government, nongovernmental organizations (NGOs) and the private sectors. PPP can play a major role to prevent the childhood obesity.

A standardized, evidence-based, updated national guidelines on healthy lifestyles are an essential tool for the obesity prevention which should be focused on the children, adolescents, elderly communities and also the minority groups.

Component 2: Population-wide Policies and Initiatives

It involves creation of a supportive environment for healthy lifestyles and diets by necessary policy changes especially in the areas of agriculture, food security, food retail and food marketing. It has been recommended that policies to encourage breastfeeding are required to be including as a part of obesity prevention strategies.

One of the cost-effective public health approaches to bring down the prevalence of childhood obesity may be the limiting or banning certain types of foods and advertising on mass medias.

A standardized nutrition labeling on foods sold is one of the effective ways to encourage more healthy diets among the people. It is essentials to display the nutrition information on the product packaging, including the nutrition components of carbohydrates, proteins, calories and fat so that the consumers will get the options to make a healthier food choice.

Front-of-pack traffic-light nutrition labeling has been broadly recommended as an efficient tool to increase understanding the nutritional composition of food and improving awareness among the consumers. The nutrient contents are colour-coded (green, amber and red) indicating the relative levels (low, medium or high) of nutrient contents of food.

Food price has a major role on the consumers’ selection of food. Some other recommended ways to practicing healthy food are:

• Monetary incentives for purchasing healthy food
• Discount facilities for purchasing low-fat snacks from vending machines
• Tax reduction of healthy foods
• Tax increases on unhealthy foods.

Fruits and Vegetables

Higher intake of fruits and vegetables are associated with the reduction of energy density and promote satiety. Practicing more fruits and vegetables intake in everyday meal is another effective way of prevention of the burden of this childhood obesity.

![Front-of-pack traffic-light nutrition labeling](image1.png)
Availability and accessibility of the fresh fruits and vegetables within their test preference is an important key issue. Multimedia including social media and school can play a major role by delivering message regarding benefits of fruits and vegetable consumptions. Active provision of fruits and vegetables in schools can encourage the children to consume those and also will help to drive their taste from fast foods to healthy food.42

A number of food policies exist. Examples of some evidence based cost-effective policies are:

• Policy regarding trans-fatty acids restriction 43,44
• Policy regarding healthy food delivery in government institutions such as hospitals, community healthcare centers, rehabilitation centers, etc. 45,46

Physical activities: WHO recommended for at least 60 minutes moderate-to-vigorous-intensity physical activity every day such as play, sports, transportation, recreation, planned exercise, etc., for the children. 47

All government can use WHO guidance to develop their national physical activity policies and programs. Government are required to ensure safe environment for traveling to and from schools, adequate sports, playground and leisure’s facilities for the children.23

To increase awareness and change attitude toward healthy eating and physical exercise social marketing campaign through mass media is another cost effective way to prevent childhood obesity which can run parallel to the community-based programs.48

Component 3: Community-based Interventions
Community-based interventions are delivered through the community people by addressing their needs. Involving the community leaders in the planning and implementation process is the key way to success.49 The recommended best practice principles for the community-based obesity prevention have been given below:50

• Community participation: The interventions should be designed by focusing on the demographic, geographic, cultural and religious aspect of the targeted community including their strength and weakness. Strong community participation is required for the effective implementation.50
• Designing and planning the program: Before designing the program the problem of the target community should be clearly specified. To get more effectiveness, the program should be consistent and linked with the national, state and local planning, the problem should be time-relevant with the accessibility of the resources.50
• Effective implementation: The interventions are required to be evidence based with new opportunities and can be adaptable. Effective collaboration with the partner agencies with systemic monitoring and documentation are a mandatory part.
• Sustainability and adaptability: Key components to achieve the sustainability of the interventions include strengthening the local capacity, an integrated intervention approach to the implementation process and sharing knowledge and achievement among the different community groups.51
• Leadership and transparency: Transparency is very much crucial during decision making and planning. To avoid the conflicts there should have a clear-cut guideline to run the program.50
• Evaluation: To maintain the sustainability and efficacy of a programme effective evaluation process is mandatory which should be documented and ensures the confidentiality.

Key areas for the community-based childhood obesity prevention include:

Early Childcare Settings
For successful and effective community-based childhood prevention the first targeted groups should be the preschools and kindergartens which can lead to sustainable behavioral changes in early childhood environment.52

Children can be encouraged by delivering the following message by:

• Encouraging daily active playing
• Encouraging more water intake
• Encouraging more intake of fruits and vegetables
• Discouraging watching television and other screen-based activities for prolonged time-period.

Primary and Secondary School-based Intervention
Primary and secondary schools are the main targeted areas for community-based intervention of the childhood obesity prevention. The followings have been recommended as standard practice in primary and secondary school settings: 50,53

• The integrated curriculum should be included the components of the healthy lifestyle modification practices such as healthy eating, physical activity, etc.
• Regular practical physical activity sessions
Childhood Obesity: Role of Population-based Preventive Approaches

- A closely monitored quality school canteen
- Creating a supportive environment for the children so that they can continue their healthy practice throughout each day
- Capacity building by giving proper training to the teachers and staffs
- Encouraging parents’ contribution at home to maintain the sustainability.

**Other Community Activities**

Other cost-effective community-based areas such as primary health care centers, religious settings, sports and activity centers etc. have a great role for prevention of childhood obesity.49

**DISCUSSION AND CONCLUSION**

This review examined the literature to describe the childhood obesity with its bad consequences and its population-based preventive strategies. Worldwide more than 340 million children and adolescents aged 5–19 were overweight or obese in 2016 and if current trends continue it will be twice by 2025.1

The fundamental causes behind the higher incidence of childhood obesity are a shift in diet toward higher intake of foods which are rich in fat and sugar but low vitamins, minerals and other healthy micronutrients with trends toward less physical activity. Childhood obesity is associated with serious health complications such as premature onset of certain types of chronic diseases like heart disease, diabetes mellitus, etc.

A study on 1999 in China showed that increase the price of unhealthy food was related with decrease in their consumptions of those foods.54 Another study in USA found that a reduction of the price of healthy food was associated with increase their intake.55

In 2008, Australia took one initiative on healthy food service policy named as “A Better Choice”. The aim was to supply the healthier food and non-alcoholic beverage to the government-run facilities such as community health centers, clinics and hospitals. An evaluation on 2009 showed that 25% facilities had successfully implemented the full strategies whereas 78% facilities reported implementation of more than half of the strategies.56,47

A study in United State was conducted in a cafeteria setting which showed that increasing the variety of nutritional food was associated with the changing food habit behavior.56

In 2001 another study regarding the effectiveness of health education on the vending machine snacks consumption also showed similar result that decreasing the prices of low-fat foods were significantly associated with body weight reduction.61

Both studies that changing the price structure of food items was required to changing food habit behavior.

WHO recommends daily moderate-to-vigorous physical activities for the children.62 One review study on physical activity in 2009 showed that having recreational facilities such as parks and playgrounds in community settings were highly related to outdoor physical activities in youth and adults. Higher standard school design such as a big school campus, basketball hoops and convenient access to stairs were also associated with high level of physical activities in children.58,59

School settings should be higher quality and attractive because students are spending a big amount of time in their school environment. Policy-based school interventions have a major role for childhood obesity prevention.56

A school-based study on prevention of childhood obesity showed that nutrition and physical activity interventions were significantly associated with body weight reduction.51

The home environment is an important area for childhood obesity prevention. Parental support showed a major role in prevention and control of childhood obesity. One study showed that increasing parenteral support were associated with higher intake of healthy foods.52

WHO recommended to take necessary measures on marketing of food and nonalcoholic beverage to children and also provides guidelines for the successful implementations.53,64

Taxations on unhealthy food have been shown a very cost-effective measure to combat childhood obesity.28,33

**Obesity is preventable:** The key requirements are the supportive environments and communities which will encourage the general people for practicing healthier food diet and regular physical activity. Research community can better design and implement effective strategies for reduction of the childhood obesity.

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Childhood Obesity: Role of Population-based Preventive Approaches


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