Obesity and overweight in children below 5 years of age: environmental, behavioural and social factors and their active use in prevention and management

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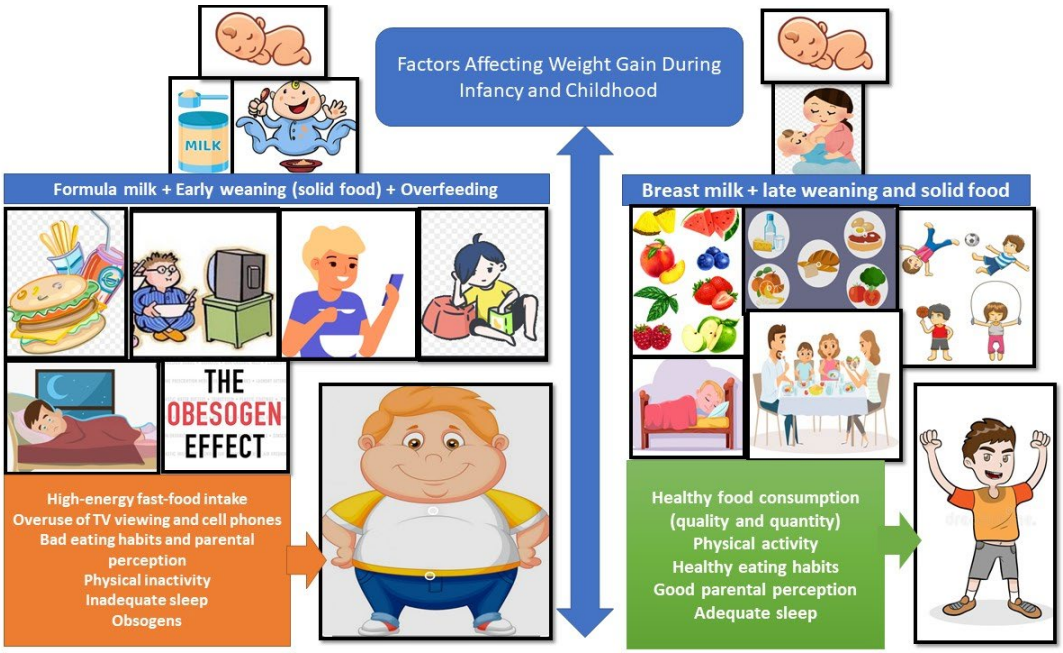


Abstract

Introduction: Early childhood is a critical time for obesity prevention. Children are developing taste preferences, learning to walk and play. They eagerly mimick both the healthy and unhealthy behavior of their parents, siblings and caregivers. Obesity during early childhood is a major health concern of the developed world and is steadily affecting many low- and middle-income countries, particularly in urban settings. Unfortunately, overweight, and obese children often stay obese into adulthood and more likely to develop many non-communicable diseases at a younger age. Important environmental and socioeconomic factors play a significant role in the initiation and progression of early childhood obesity. In this minireview, we try to shed light on the published data exploring various relevant issues, including possible etiologic factors in this target population at risk (children below 5 years) that may enable the initiation of early and effective policy and tactics for the prevention and management of this problem, particularly in high-risk communities.

Methods: We examined the English language literature (Pubmed, Google scholar, and Cochrane library) on the environmental and socioeconomic factors that appeared to be important in the pathogenesis of early obesity in children for the past 20 years. Inclusion criteria were obesity and overweight in young children below 5 years of age.

Results: Education, income, and urbanization, food environments and increased energy intake through consumption of fatty foods and a high sugar diet as well as parental effects through conveying their behaviors, attitudes, and feeding styles to their children appear to be among the most important factors that contribute to the initiation and progression of obesity in young children. Overfeeding preterms and small for gestational age infants, using artificial milk formula, and early addition of solid foods play a considerable share in inducing early obesity. In addition, lack of health education to parents and children, poor health care, and scarcity of access to physical activity are important risk factors in poor populations.

Conclusions: Many important social and environmental factors can actively contribute to the production and progression of early childhood obesity. These factors differ considerably among different populations. Understanding these factors is essential for appropriate and early prevention as well as management of early childhood obesity, especially in high risk communities.

INTRODUCTION

Childhood obesity is one of the most serious public health challenges of the 21st century. Obesity in children is a major health concern of the developed world and is steadily affecting many low- and middle-income countries, particularly in urban settings. . Globally, in 2016 the number of overweight children under the age of five, was estimated to be over 41 million. (1) In the US, in 2017-2018, for children and adolescents aged 2-19 years, the prevalence of obesity was 19.3% and affected about 14.4 million.. Obesity prevalence was 13.4% among 2- to 5-year-olds, 20.3% among 6- to 11-year-olds, and 21.2% among 12- to 19-year-olds. and it is considered a top public health concern due to the high level of morbidity and mortality. (2,3) In the USA, between 2018 and 2020, among a cohort of 432,302 children and adolescents (aged 2–19 years), the rate of body mass index (BMI) increase approximately doubled during the COVID 19 pandemic compared to a prepandemic period. Persons with prepandemic overweight or obesity and younger school-aged children experienced the largest increases. (4) Almost half of all overweight children under 5 live in Asia and a quarter lived in Africa. (5)

Understanding the environmental, behavioral and social factors that can predispose to and/or intensify the risk of developing obesity, and those which decrease the risk of developing obesity, are crucial for developing national and international plans to prevent, decrease and manage obesity in the target populations. These factors appear to be multiple and interrelating. (6-8)

In this minireview, we examined the English literature (Pubmed, Google scholar, and Cochrane library) on the environmental and socioeconomic factors that appeared to be important in the pathogenesis of early obesity in children for the past 20 years. Some of these important environmental and socioeconomic factors are reviewed and analysed in the target population at risk (children below 5 years). In addition, some national strategies using these factors to tailor effective policies and tactics for prevention and management of obesity are reviewed. (9,10)

METHODS

We examined the English language literature (Pubmed, Google scholar, and Cochrane library) on the environmental and socioeconomic factors that appeared to be important in the pathogenesis of early obesity in children for the past 20 years. Inclusion criteria were obesity and overweight in young children below 5 years of age.

RESULTS

Definition of obesity

For children and teens, body mass index (BMI) is used to screen for potential weight and health-related issues. If children have a high BMI for their age and sex, a health care provider may perform further assessments to determine if excess fat is a problem. Obesity is defined as BMI > 2SD for age and sex above 2 years and weight for length (WFL) > 2SD for those below 2 years of age. BMI is calculated using the formula “weight in

kg/(Height in meters squared). (11-14) Different cut off points for diagnosing childhood obesity are adopted by WHO (14), U.S. Centres for Disease Control (15) and the Prevention and International Obesity Task Force, as shown in Figure 1. (16)

Figure 1. Cut off points for diagnosing childhood obesity

Organization	Definition of Childhood Obesity
World Health Organization (14)	*WHO Child Growth Standards (birth to age 5)* (12) • Obese: Body mass index (BMI) > 3 standard deviations above the WHO growth standard median • Overweight: BMI > 2 standard deviations above the WHO growth standard median • Underweight: BMI < 2 standard deviations below the WHO growth standard median
U.S. Centres for Disease Control and Prevention (15)	*CDC Growth Charts* (13) In children ages 2 to 19, BMI is assessed by age- and sex-specific percentiles: • Obese: BMI > 95th percentile • Overweight: BMI > 85th and < 95th percentile • Normal weight: BMI > 5th and < 85th percentile • Underweight: BMI < 5th percentile
International Obesity Task Force (16)	• Provides international BMI cut points by age and sex for overweight and obesity for children age 2 to 18 (14) • The cut points correspond to an adult BMI of 25 (overweight) or 30 (obesity)

Source: (16)

Methods of assessing obesity in young children in the population and its practicability

Field methods that can be used in the evaluation of childhood obesity in populations should be rapid, non-invasive, safe and relatively low-cost. They include the following:

1. BMI is used to screen for potential weight and health-related issues. However, researchers have demonstrated that measuring BMI fails in detecting a large number of obese individuals. In fact, for a given BMI there can be a wide variation in the percentage of fat, ranging from low to high. In 2 distinct cohorts, BMI was proved to be a better indicator of adiposity in early infancy than WFL. The use of the WFL Z score and weight for height Z score appear to be more accurate (17,18)

2. Waist Circumference (WC): Measurement of WC is a good parameter for the measurement of intra-abdominal adipose mass and total adipose mass index, which is correlated with the BMI and is independent of height. Various studies have shown the "superiority" of the WC over the BMI. Obese children with a waist circumference at or above the 90th percentile are at higher risk for dyslipidemia and insulin resistance than obese children with a normal waist circumference. (19,20)

3. **Skinfold thickness:** Measuring skinfold thickness is another easy method of detecting fatness. Skinfolds are particularly useful in monitoring changes in fatness in children because of their small body size, and the majority of fat is subcutaneous even in obese children. However, two studies revealed that it is not an accurate method to assess body fatness and that BMI is a better method.(21,22) The statistical relationships between skinfolds and percent or total body fat in children and adults are often not as strong as that of BMI (23,24)
4. **Evaluation of the body composition via bioimpedance (BIA)**: This involves passing an electric current, of low intensity (800 µA) and of fixed frequency (50 kHz), through the individual's body. A systematic review suggests that BIA is a practical method to estimate % body fat in children and adolescents. However, validity and measurement error are not satisfactory. (26,27)
5. **Evaluation of the body composition using near-infra-red interactance (NIR):** Some studies have obtained good results using the NIR method. However, other studies have not reached satisfactory conclusions, usually finding anunder-estimation of fat content. (28-30)) In conclusion, the choice of method for measuring fatness depends upon the research objectives for which the method will be used, the cost, the acceptance by participants, the ease of handling and measurement accuracy. (29)

The prevalence and trend of obesity in preschool children

In the USA, in 2016, obesity prevalence among children and adolescents was 13.9% among 2- to 5-year-olds, 18.4% among 6- to 11-year-olds, and 20.6% among 12- to 19-year-olds. Childhood obesity is also more common among certain populations. Hispanics (25.8%) and non-Hispanic blacks (22.0%) had higher obesity prevalence than non-Hispanic whites (14.1%). Non-Hispanic Asians (11.0%) had lower obesity prevalence than non-Hispanic blacks and Hispanics. (27) Obesity prevalence among children aged 2 to 5 years showed a quadratic trend (P = .04), decreasing from 10.1% in 2007-2008 to 8.4% in 2011-2012 and then increasing to 13.9% in 2015-2016. (31) . In 2017-2018, the obesity prevalence was 13.4% among 2- to 5-year-olds, 20.3% among 6- to 11-year-olds, and 21.2% among 12- to 19-year-olds. (2,3) The degree of obesity (severity) increased markedly during the COVID19 pandemic. (4)

In 2017–18, 1 in 4 (25%) of Australian children and adolescents aged 2–17 were overweight or obese, and 1 in 12 (8.2%) were obese. 25% of children between 2 and 5 years were overweight and 9 % were obese. For Indigenous boys, the prevalence of overweight and obesity increased between ages 2–4 (21%), 5–9 (33%) and 10–14 (45%). Boys aged 2–4 were less likely to be overweight or obese than girls in this age group (21% of boys and 37% of girls). (32) In 2012–13, 30% of indigenous children and adolescents aged 2–14 were overweight or obese, compared with 25% of their non-Indigenous counterparts. 10% of indigenous children and adolescents aged 2–14 were obese, compared with 7% of their non-indigenous counterparts. (33) In China, the standardized prevalence of obesity and overweight in children and adolescents was 19.4% in 2013 and 15.8% in 2018. (34) In India, the pooled data after 2010 estimated a combined prevalence of 19.3 per cent of childhood overweight and obesity which was a significant increase from the earlier prevalence of 16.3 per cent reported in 2001-2005. (35)

In Europe, the combined prevalence of childhood overweight/obesity ranges from more than 40% in southern Europe to less than 10% in northern Europe. Overall, the prevalence of overweight was higher in girls (21.1%) than boys (18.6%). There was a higher prevalence of obesity in population groups with lower education and income levels. (36)

Childhood overweight and obesity are also increasing in less developed countries and those with transitional economies. In many cases, this increase in overweight is occurring in societies where levels of under-nutrition remain high. Overweight particularly affects children in affluent families and urban families and is usually much less in rural areas. (37,38)

Socioeconomic factors and their contribution to the problem of obesity in young children

Education, income, and urbanization

The prevalence of obesity in the USA decreases with increasing level of education of the household head among children and adolescents aged 2-19 years. (39) Obesity prevalence was 18.9% among children and adolescents aged 2-19 years in the lowest income group, 19.9% among those in the middle-income group, and 10.9% among those in the highest income group. It was also lower in the highest income group among non-Hispanic Asian and Hispanic boys and non-Hispanic white, non-Hispanic Asian, and Hispanic girls. Obesity prevalence did not differ by income among non-Hispanic black girls. (39)

Current research suggests that the disparities in childhood obesity associated with race/ethnicity are strongly driven by disparities in socioeconomic status (SES). Low SES children are almost twice more likely to experience obesity than high SES children. (40,41)

Differences in obesity prevalence have also been reported by the degree of urbanization. (42-43) In a cohort study on USA children obesity was inversely associated with urbanization. (44)

In Australia between 2014–15, one-third (33%) of boys in the lowest socioeconomic group were overweight or obese, compared with 22% of those in the highest socioeconomic group. More than one-third (38%) of girls in the lowest socioeconomic group were overweight or obese, compared with 24% of those in the highest socioeconomic group. (45) For girls living in remote areas, the prevalence of overweight and obesity was 1.5 times as high as for those living in major cities (36% compared with 24%). (46) However, there was no statistically significant difference in the prevalence of overweight and obesity between boys living in remote areas (35%) and those living in major cities (27%). (45) In China also, childhood obesity and overweight prevalence was higher in urban areas. (47)

Diet-related causal factors

Food environments

Research has demonstrated that children's eating patterns are strongly influenced by characteristics of both the physical and social environment. The effect of physical environment is exemplified by children's tendency to qualitatively eat foods that are available and easily reachable, and quantitatively by their tendency to eat greater quantities when larger portions are offered. Mealtime structure comprises social and physical attributes, for example families eating together, TV-viewing during meals, and the source of foods (e.g., home, restaurants, schools). Moreover, higher intake of fats is linked to eating out or TV watching while eating. (48,49)

Social environment and parental effects on eating patterns

Parents play an explicit role in directing their children's eating patterns through their actions, attitudes, and eating styles. Researchers noted that children learn by modelling parents' and peers' preferences, intake and willingness to try new foods. It appears that families who eat together consume more healthy foods. It has been shown that authoritarian limitation of "junk-food" by parents is associated with a substantial increase in craving for unhealthy food and increased weight gain. (50-53)

Overfeeding of premature and small for gestational age babies

Very low birth weight children who demonstrate rapid and excessive weight gain during infancy have greater chances of adult obesity and metabolic syndrome components, including hypertension and dysglycemia. Rapid infantile weight gain increases the risk of childhood obesity in early term or late preterm infants as compared to those with normal term births. (54-57)

Early introduction of solid food and using artificial milk formulas

Early nutrition in infancy may affect later child health outcomes including overweight as a result of 'programming'. Systematic reviews suggest that breastfeeding is associated with a moderate reduction in the risk of later overweight and obesity. Higher protein content of artificial formula compared to the lower protein content of breastmilk appears to accelerate growth rate and increased fat mass during infancy. (57) The protection breastfeeding confers against childhood overweight and obesity may be due to its resulting in lower fat storage and inhibition of undue early adipocyte development. The introduction of milk other than breast milk before 6 months compared to at 6 months or later was a risk factor for being overweight or obese at 20 years of age. (58) Some evidence suggests that very early introduction of solid food (at or before 4 months), rather than at 4-6 months or >6 months, may increase the risk of childhood overweight. (59-60)

Living a sedentary life with poor access to physical activity

Existing research indicates that physical inactivity is linked to the risk of obesity. Despite the disputes and confounders of estimating the effect of physical activity on BMI, the beneficial role of physical activity in delaying or preventing metabolic complications

such as type 2 diabetes, cardiovascular disease, and hypertension is widely recognized. (61-64)

Paucity of health education to parents and children and poor health care

People in America who live in the most poverty-dense counties are those most prone to obesity. Counties with poverty rates of >35% have obesity rates 145% greater than wealthy counties. Individuals who live in impoverished regions have poor access to fresh food and have limited access to full-service supermarkets or grocery stores. They often suffer from food insecurity. (65) Food insecurity is the disruption of food intake or eating patterns because of lack of money and other resources. In 2014, 17.4 million U.S. households were food insecure at some time during the year. (66)

Children from disadvantaged/poor families seem to be leading the trend in rising prevalence of overweight and obesity. Because they often live in communities that are recognized as unsafe, these children are prone to spend more time indoors. This is paired with watching more television, which displaces other forms of educational and active entertainment and, particularly where food advertising to children is allowed, increases their risk of being exposed to incorrect knowledge about healthy eating. (67,68)

Exposure to obesogens

Obesigens are functionally defined as chemicals that inappropriately alter lipid homeostasis and fat storage, change metabolic setpoints, or disrupt energy balance. The role of obsogens in the evolution of obesity was recently recognized by the Presidential Task Force on Childhood Obesity and the National Institutes of Health (NIH) Strategic Plan for Obesity Research. For example, chemical pesticides in food and water, particularly atrazine and DDE (dichlorodiphenyldichloroethylene —a DDT breakdown product), have been linked to increased BMI in children and insulin resistance. Many of these chemicals can increase the risk of developing obesity and should be investigated according to the characteristics of the area in question. (69-73)

Sleep deprivation

Accumulating evidence supports the role of reduced sleep as contributing to the current obesity epidemic in children and youth. Longitudinal studies have repeatedly demonstrated that short or restricted sleep duration is associated with increased weight gain and the development of obesity in humans. Insufficient sleep appears to increase weight gain mainly through increasing food intake. Voluntary sleep restriction has been shown to increase snacking, the number of meals eaten per day, and the preference for energy-dense foods. (74)

Relation between Maternal weight gain during pregnancy and childhood obesity

A surprisingly reliable relationship has been documentd between pregnancy weight gain and birth weight ($p < 0.0001$). Infants of women who gain more than 24 kg during

pregnancy were 148.9 g (CI 141.7–156.0) heavier at birth, compared to infants of women who gained 8–10 kg. Investigators observed that for every two pounds of excess weight in pre-pregnancy, women had a 4.5 percent heighter risk of their child becoming obese. A study also noticed that children with mothers who had excessive weight gain during pregnancy were 50 percent more likely to become obese at 4 years of age. (75,76)

Relation between infantile and early childhood obesity and and adulthood obesity

Many population-based observational studies have shown that rapid weight gain during infancy, including a catch-up growth phenomenon or adiposity rebound in early childhood, predisposes a person to the development of obesity, type 2 diabetes, and cardiovascular diseases later in life. It has been shown that rapid catch up in weight (a gain > 0.67 SD in weight for age or weight for length) during infancy and toddlerhood is significantly associated with subsequent obesity and cardiometabolic risk. (77,78)

Childhood levels of both BMI and triceps SF are associated with adult levels of BMI and adiposity. The magnitude of these longitudinal associations increases with childhood age, but the BMI levels of even the youngest children (ages 2-5 years) are moderately associated (r = 0.33-0.41) with adult adiposity. Overweight young children (2- to 5-year-old) were 4 times or more likely to become obese adults (65%) compared to normal-weight children (15%). Even after accounting for the triceps SF of children, BMI-for-age provids additional information on adult adiposity. (79)

In a retrospective cohort study, (80) the prevalence of overweight and obesity combined, increased from 11.5 % at 2–4 years of age and 13.7 % at 5–7 years of age, to 20.1 % at 15–17 years of age, implying a progressive increase of overweight/obesity from childhood to adolescence. These data hinted that preventive and treatment initiatives among children at high risk of overweight and obesity should start early during infancy and toddlerhoodand that good prophylactic steps targeting all children are most important to avoid adulthood obesity. (80)

Consequences of childhood obesity

Numerous complications are associated with children being overweight or obese, even at a very young age. Subsequent to the growing prevalence of obesity, there was an increased frequency in all obesity-related comorbidities, including type 2 diabetes mellitus, hypertension, dyslipidemia, non-alcoholic fatty liver disease (NAFLD), and cardiovascular disease. (81-83)

Moreover, in a Finnish adult population, the risk of the cardiometabolic syndrome was lower among obese adults who had not been obese as children than among the obese adults who had also been obese as children. Half of the obese children in their study went on to become obese adults. Nearly all cases of cardiometabolic syndrome were diagnosed in obese adults, and the majority of these occurred among the group that was obese as children. (84,85)

The Princeton Follow-up Study provided an age-related, particular link between metabolic abnormalities in youth and the development of cardiovascular disease. This study demonstrated an increased risk of cardiovascular disease of 24% for each increase in BMI of 10 percent. Their correlation analyses showed age-related links between cardiometabolic syndrome and cardiovascular disease and between adiposity and cardiovascular morbidity. (86)

Increased carotid intima-media thickness (IMT) and stiffness has been shown in obese children, and this is a reliable predictor of cardiovascular disease. Those individuals with cardiovascular risk factors persisting from childhood into adulthood had a significantly higher carotid artery IMT when compared to others examined. A direct relationship has been found between the presence of risk factors in childhood and cardiovascular pathology later in early adulthood. (87,88)

Strategies to prevent overweight in childhood

Guidelines and recommendations

The effective use of the studied environmental, behavioral, and social factors to plan for decreasing the risk of developing childhood obesity in a specific population is mediated through inventing and implementing prevention strategies and guidelines. (11,12)

Here we present five examples of strategies and guidelines released by the CDC and the American Academy of Paediatrics for the prevention and management of childhood obesity. (89-92)

(1) **Screening for obesity in pediatric primary care**. The U.S. Preventive Services Task Force recommended that primary care providers screen for obesity and offer or refer to comprehensive, intensive behavioral weight management interventions. The American Academy of Paediatrics Expert Committee Recommendations suggest screening all children for obesity (>=2 years) and providing tiers of care regarding the treatment and prevention of obesity.

(2) **The U.S. Dietary Guidelines** for Americans and the American Academy of Pediatrics recommend exclusive breastfeeding alert icon for about 6 months, and then continuing breastfeeding while introducing complementary foods alert icon until your child is 12 months old or older.

(3) **Recommendations aiming to increase the consumption of fruits and vegetables**. They provide guidance on how to select strategies to develop healthy eating habits, provide plenty of vegetables, fruits, and whole-grain products and include low-fat or non-fat milk or dairy products, including cheese and yogurt. In addition, choosing lean meats, poultry, fish, lentils, and beans for protein is supported. They encourage families to drink lots of water and to limit sugary drinks, sugar and saturated fat.

(4) **The CDC Guide to strategies to increase physical activity** in the community provides guidance for program managers, policy makers, and others on how to select strategies to increase physical activity.

(5) **School health guidelines that aim to promote healthy eating and physical activity**. They provide nine guidelines that serve as the foundation for developing, implementing, and evaluating school-based healthy eating and physical activity policies and practices for students in grades K-12.

Interventions that modify social and environmental risk factors

Knowledge on the effectiveness of structured early childhood obesity treatment programs is incomplete, preventing the widespread implementation of such programs. In a recent review (93) thirty studies involving 23,185 children from nine countries were included. (93) Twenty-two were randomised controlled trials. These studies comprised 4 different categories: home-based interventions with family involvement (n = 12), preschool/early childhood settings (n = 9), multicomponent interventions across multiple settings (n = 6) and healthcare settings (n = 3). The length of the interventions ranged from 14 weeks to 4 years, with follow-up from none to 4 years. The majority of these studies were undertaken in the United States (17) and Australia (6). They concluded that the only one important constant in a child's life is their parents and carers. Therefore, engaging parents in attempts to prevent childhood obesity seems an obvious move. A particularly influential time period appears to be new motherhood when mothers are receptive to health messages, as exemplified by the studies focusing on infant feeding and weaning practices. The ability to influence obesity risk factors at this early age suggests a need for universal provision of engaging infant nutrition practices, but particularly to families living in areas of deprivation. (93)

Interventions with preschool age children

A systematic review by Blake-Lamb et al. (94) showed that new mothers are receptive to health-related messages and suggest that obesity interventions begun early in life may have the greatest preventive effect; however, interventions during infancy need to be followed up to determine long-term benefits. Six home-based studies used interventions focused on promoting healthy feeding practices and parenting skills had varying degrees of success. Intervention through providing eight home visits from trained nurses around growth milestones (n= 667) resulted in a significantly lower mean BMI in the intervention group than in the control group.

Paul et al. (95) conducted a pilot study, including 160 mother and child dyads with a 2 × 2 design, and the group that received both interventions had lower weight for length percentiles (p = .009).

Campbell et al. (96) carried out a randomized controlled trial (RCT) with infants and their mothers (n = 542) to assess the effectiveness of a parent-focused intervention on infant's obesity risk behaviours and BMI. The intervention involved six 2-hour dietician delivered sessions over 15 months on parental knowledge, skills and social support around infant feeding, diet, physical activity and television (TV) viewing. At mean age

19.8 months, intervention group children consumed fewer grams of sweet snacks and viewed fewer daily minutes of TV.

Ostbye et al. (97) carried out an eight-month RCT study called KAN-DO (n = 400) with children aged two to five years, involving instruction on parenting style and skills alongside techniques for stress management and education about healthy behaviours. There were small reductions in parental instrumental feeding (i.e., rewarding children with food for perceived correct behaviors and punishing by taking away food for perceived incorrect behaviors) and TV snacks and improvements in emotional feeding, fruit and vegetable intake and number of dinners eaten in front of the TV. (97)

A four-contact telephone-based intervention that focused on changing characteristics of preschoolers' home food environment was successful to increase parents' fruit and vegetable consumption. Telephone-delivered parent interventions was an effective way of increasing children's fruit and vegetable consumption in the short term. (98,99)

A six month long pilot RCT was performed by Stark et al. (100) called 'Learning About Activity and Understanding Nutrition for Child Health' (LAUNCH). They aimed to reduce obesity through a behavioural intervention with children aged two to five years (n = 18). These sessions were run in clinic for both parents and children and then applied in the home environment with the supervision of research team members. LAUNCH showed a decrease in BMI at month 6 (post-treatment), which was maintained after 12 months.

Multilevel studies suggested that including different elements of society that surround children (homes and schools) and those who are highly influential in the early development of children, (parents, childcare staff and teachers) improves the effectiveness of the interventions. (101,102)

Additionally, many studies stressed the importance of targeting vulnerable parents who need the necessary interventions for successful prevention of childhood obesity. Educational workshops for parents and young children focusing on diet and activity should become standard practice. Accomplishment of successful approaches can reduce the number of children starting school overweight or obese and encountering the problems of being an obese child.(93)

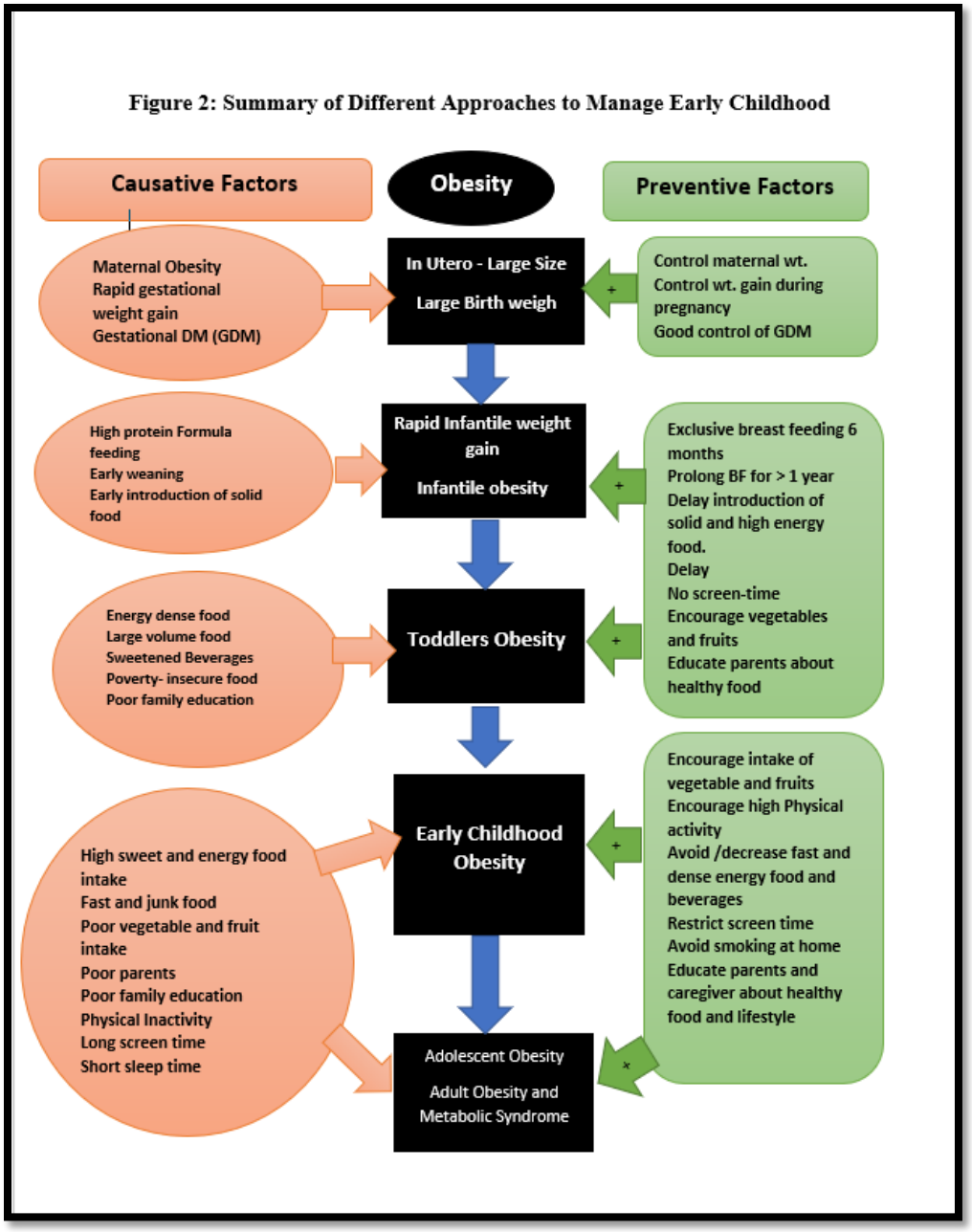
In Figure 2 we present a summary of the different causative factors linked to childhood obesity and approaches discussed in this review for managing it.

CONCLUSIONS

In recent years, researchers and policymakers have recognized that obesity in childhood is not simply a medical or genetic disorder but is a complex social and psychological phenomenon. The global study of the environmental, behavioral and social factors that actively contribute to the development of children's obesity has broadened over the last 10 to 15 years. These national and international data raise ideas and opportunities for developmental scientists and practitioners to form and join transdisciplinary teams to

develop more effective prevention and intervention programs for the prevention and management of childhood obesity.

Figure 2. Summary of different approaches to managing early childhood obesity



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