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Obesity at an Early Age and Its Impact on Child Development

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Introduction

Obesity is characterized by the accumulation of excess body fat and can be conceptualized as the physical manifestation of chronic energy excess. Since 1980, the prevalence of obesity has doubled in more than 70 countries and has continuously increased in most other countries.[1] In 2016, 50 million girls and 74 million boys worldwide had obesity.[2] Although the rising trends in childhood obesity have plateaued in many high-income countries, albeit at high levels, they have accelated in parts of Asia.[2] The current and future health burden of obesity is considerable, and experts recommend that prevention and intervention strategies should begin at the earliest age possible.[3]

Subject

A complex and interacting system of factors contributes to increasing rates of overweight and obesity – biological, behavioural, social, psychological, technological, environmental, economic and cultural – operating at all levels from the individual to the family to society as a whole. Public, private, non-profit and community sectors, parents, school boards and municipal governments all have a role to play, and their collective efforts will be required to start the significant society-wide shift needed to reverse the trend of childhood obesity. Attenuating these

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high rates of child obesity is a high priority in many countries not only from a population health perspective, but from a health care system's economic perspective. It is well known that obesity persists from childhood to adolescence to adulthood.[4] Unfortunately, it is very difficult to treat once it has developed. This emphasizes the importance of prevention early in life and mathematical modeling suggests that targeted obesity interventions for young children (0-6 years) could yield considerable cost savings and important improvements in well-being.[5]

Problems

Obesity results in much suffering to individuals affected by this condition. Evidence from many studies indicates that childhood obesity contributes to the early development of a number of conditions, such as type 2 diabetes, dyslipidemia, hypertension, sleep-disordered breathing, nonalcoholic fatty liver disease, and polycystic ovarian syndrome.[6-8] The greater risk of health complications associated with early morbidity affects normal childhood development and quality of life and thus the long- term health care burden is extraordinary if we include the obesity associated chronic co-morbid conditions. It has been projected that the current generation of children will be the first in modern history to see a shorter life-expectancy than their parents.[9] Obesity is also associated with stigma, discrimination and reduced psychological well-being.[10] Consequences of obesity stigma, such as isolation or social withdrawal, could contribute to the exacerbation of obesity through psychological vulnerabilities that increase the likelihood of over-eating and sedentary activity.

Research Context

There is no doubt that obesity is an important public health issue and strategies to address obesity and *obesogenic environments* will require a multifaceted, long-term approach involving interventions that operate at multiple levels and in complementary ways. Despite an impressive amount of research over the past decades, no methods have proven to reduce body weight over the long term for a significant number of individuals. Our failure to reverse the trend in obesity prevalence has helped us in realizing that a focus on weight loss as an indicator of success is not only ineffective at producing thinner, healthier bodies, but also damaging, contributing to food and body preoccupation, repeated cycles of weight loss and regain, reduced self-esteem, eating disorders, and weight stigmatization and discrimination.[11] There is an accumulating body of evidence showing that most health outcomes can be improved through changing health behaviours, regardless of whether weight is lost.[12,13] However, an important challenge of today's world is that our so-called "obesogenic environment" encourages the consumption of energy and

discourages the expenditure of energy. Modern, computer-dependent, sleep- deprived, physically-inactive humans live chronically stressed in a society of food abundance.[14,15] The excess weight gain observed in prone individuals should be perceived as a normal physiological adaptation to a changed environment, rather than a pathological process.[16] In other words, weight gain is a sign of the modern way of living or a "collateral damage" in the struggle for modernity. Accordingly, prevention and treatment strategies for obesity should ideally focus on modifying the environment and lifestyle in order to make the healthy choice the easy one.

Key Research Questions

There is accumulating evidence showing the negative effects of obesity at an early age on many health-related indicators later in life and on the development of the child. Additionally, there is increased recognition of the importance of active play for the motor, cognitive, language, social and emotional development of young children.[17] However, many critical questions will need to be addressed, including:

- Are the benefits of weight loss interventions attributed to weight loss per se or to the changes in lifestyle habits?
- What are the root causes of weight gain in children? Are over-eating and lack of physical activity symptoms of something else? If yes, can we really impact body weight over the long term by simply targeting energy intake and energy expenditure?
- What are the main barriers faced by children that preclude them from spontaneously adopting a healthy lifestyle?
- Can we address childhood obesity without first addressing adult obesity?

Despite all the research on childhood obesity, we have not been able to reverse the epidemic. One explanation may be that obesity, like all health conditions that are primarily socially determined, resists durable solutions until there is a change in societal norms and the values underlying those norms.[18] The childhood obesity epidemic is just one symptom of our modern way of living. Reversing the trend may require that we apply a new approach to improving child health in the 21st century. One approach is to make societal changes to enhance human well-being rather than to prevent a particular symptom, such as childhood obesity. In the process, we may address obesity and other socially-determined health conditions while preventing new ones from emerging.

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Recent Research Results

An impressive body of evidence on the association between childhood obesity and its impact on child development has been published over the past years. Optimal child development involves many dimensions, from physical to emotional development, and our intention is not to cover the literature on this issue here but rather to highlight two topics of interest: active play and short sleep duration.

Active play

Decades of research have shown that play is an important mediator in the physical, social, cognitive, and language development of young children.[17] In spite of this, play faces many threats in America. The growing emphasis on standards, assessment and accountability in schools has led to a reduction in outdoor and active physical play. In many schools and centres, play has been eliminated to make room for quieter academic learning. Preschools and kindergartens in public school settings have become particularly regimented and adult-directed, with teachers feeling compelled to increase literacy and numeracy instruction at the expense of play time.[17] Passive television viewing and use of other media also are replacing active play and have even been found to interrupt the play of young infants.[17] Unfortunately, indoor active video gaming seems to replace outdoor active play in today's society. Given that physical play is important in physical development, learning, emotional and social development, we should embrace and defend play as a crucial part of children's daily lives, in and out of school. Active play should be promoted as part of a healthy and balanced lifestyle, not for body weight stability.

Short sleep duration

Sleep curtailment has become an endemic condition in modern societies, with population statistics revealing that sleep duration has decreased by more than an hour over the past few decades in children.[19] A growing body of evidence shows that short sleep duration is associated with mental distress, depression, anxiety, weight gain, hypertension, diabetes, high cholesterol levels, premature death, and adverse health behaviours such as physical inactivity and poor eating habits.[20,21] The evidence that short sleep duration is a determinant of obesity is accumulating.[22-24] A number of mechanisms have been invoked to account for this association, including an up-regulation of appetite-stimulating hormones, a longer exposure to an obesogenic environment as well as a decrease in spontaneous physical activity.[23,24] Thus, insufficient sleep is an under-recognized public health problem that has a cumulative effect on physical and mental

health. Sleep is not a waste of time – its beneficial effects far exceed the restoration and maintenance of tissue structure and function. It is important to remember that a good night's sleep is the "normal" biological condition. No one can effectively argue that lack of sleep is healthy, and therefore there is minimal risk in taking a pragmatic approach and encouraging a good night's sleep as an adjunct to other health promotion measures.

Conclusions

Prevention of obesity in children should be the first line of treatment. Given the complex and multi-factorial nature of obesity, preventive interventions should target to root causes of the problem in order to be successful. The Institute of Medicine published a report titled Early Childhood Obesity Prevention Policies that outlines several policy recommendations and potential actions for implementation designed to prevent obesity in infancy and early childhood by promoting healthy environments for young children.[25] The recommendations of this report are shown in the table below.

Implications

The modest effects of past health education interventions have increased interest in environmental and policy approaches to increase physical activity, decrease sedentary behaviour and/or reduce dietary energy intake to prevent obesity. These approaches attempt to alter the social, regulatory or physical environments resulting in individuals adopting more healthful behaviours, whether or not they are aware of their decisions to adopt those behaviours. Environmental and policy approaches may be particularly attractive for helping to shape child behaviours because (1) children spend a large part of their days in a relatively small number of settings that are susceptible to environmental and policy changes (e.g., home, school, transportation to/from school, child care and after-school programs); (2) children are often considered unable to make responsible behavioural decisions for themselves; and (3) presumed child vulnerabilities justify both pre-emptive and remedial protective actions by parents, institutions and policy-makers. Environmental and policy solutions designed to prevent obesity at an early age are enticing to many policy-makers at all levels of society, from parents to international agencies. However, implementing new strategies and policies without evidence of efficacy or effectiveness may lead to large investments of resources, effort and time that may or may not result in any benefits.

Table. Goals and recommendations from the 2011 Institute of Medicine's Report on Early Childhood Obesity Prevention Policies.

Goals	Recommandations
1. Assess, monitor, and track growth from birth to age 5	Healthcare providers should measure weight and length or height in a standardized way, plotted on World Health Organization growth charts (ages 0-23 months) or Centers for Disease Control and Prevention growth charts (ages 24-59 months), as part of every well-child visit. Healthcare professionals should consider 1) children's attained weight-for-length or BMI ≥ 85th percentile, 2) children's rate of weight gain, and 3) parental weight status as risk factors in assessing which young children are at highest risk of later obesity and its adverse consequences.
2. Increase physical activity in young children	Child care regulatory agencies should require child care providers and early childhood educators to provide infants, toddlers, and preschool children with opportunities to be physically active throughout the day. The community and its built environment should promote physical activity for children from birth to age 5.
3. Decrease sedentary behaviour in young children.	Child care regulatory agencies should require child care providers and early childhood educators to allow infants, toddlers, and preschoolers to move freely by limiting the use of equipment that restricts infants' movement and by implementing appropriate strategies to ensure that the amount of time toddlers and preschoolers spend sitting or standing still is limited.

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4. Help adults increase physical activity and decrease sedentary behaviour in young children.	Health and education professionals providing guidance to parents of young children and those working with young children should be trained in ways to increase children's physical activity and decrease their sedentary behaviour, and in how to counsel parents about their children's physical activity. Adults who work with infants and their families should promote and support exclusive breastfeeding for 6 months and continuation of breastfeeding in conjunction with complementary foods for 1 year or more.
5. Promote the consumption of a variety of nutritious food, and encourage and support breastfeeding during infancy.	To ensure that child care facilities provide a variety of healthy foods and age-appropriate portion sizes in an environment that encourages children and staff to consume a healthy diet, child care regulatory agencies should require that all meals, snacks, and beverages served by early childhood programs be consistent with the Child and Adult Care Food Program meal patterns and safe drinking water be available and accessible to the children. The Department of Health and Human Services and the U.S. Department of Agriculture should establish dietary guidelines for children from birth to age 2 years in future releases of the Dietary Guidelines for Americans.
6. Create a healthful eating environment that is responsive to children's hunger and fullness cues.	State child care regulatory agencies should require that child care providers and early childhood educators practice responsive feeding.
7. Ensure access to affordable healthy foods for all children.	Government agencies should promote access to affordable healthy foods for infants and young children from birth to age 5 in all neighbourhoods, including those in low-income areas, by maximizing participation in federal nutrition assistance programs and increasing access to healthy foods at the community level.

8. Help adults to support children's healthy eating.	Health and education professionals providing guidance to parents of young children and those working with young children should be trained and educated and have the right tools to increase children's healthy eating and counsel parents about their children's diet.
9. Limit young children's screen time and exposure to food and beverage marketing.	Adults working with children should limit screen time, including television, cell phone, or digital media, to less than two hours per day for children aged 2-5. Healthcare providers should counsel parents and children's caregivers not to permit televisions, computers, or other digital media devices in children's bedrooms or other sleeping areas.
10. Promote age-appropriate sleep durations among children.	Child care regulatory agencies should require child care providers to adopt practices that promote age-appropriate sleep durations. Health and education professionals should be trained in how to counsel parents about their children's age-appropriate sleep durations.

Adapted from the 2011 Institute of Medicine Report.[25]

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