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Review Article

The Impact of COVID-19 Pandemic on Childhood Obesity: A Review

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Abstract

In the recent past, the public health sector has experienced a spike in the number of individuals affected by obesity and overweight, leading to a global pandemic. According to the World Health Organization, in 2016, approximately 1.9 billion adults were overweight, with 13% being children. Obesity is linked to the development of a range of chronic illnesses and is currently the leading cause of death. Childhood obesity has also been on the rise and has achieved pandemic levels on a global scale. Obesity in childhood has detrimental effects and a significant impact on the affected individuals' psychological and physical health. The development of obesity is a concept that is not fully understood in terms of its development, and it is linked to various causes and has profound consequences on affected children. The Covid-19 pandemic is another issue that has an impact on childhood obesity which affects the health and well-being of children. COVID-19 has led to lifestyle changes that expose children to obesity risks. This article addresses the causes and consequences of paediatric obesity and describes the impact of COVID-19 on its prevalence and health risks.

Keywords: *Paediatric Obesity; Childhood Obesity; Obesity; Prevalence of Obesity; Obesity and COVID-19*

Introduction

The prevalence of childhood obesity has gradually increased over the years. Childhood obesity is currently one of the major health concerns globally in the 21st century [1]. In 2012, more than 33% of children were estimated to have a higher BMI, depicting obesity [2]. In 2019, about 38.2 million children aged below five years had obesity and obesity-related complications [3]. The trend in obesity cases is associated with previously lacking factors in the past centuries, such as poor nutrition, uptake of processed foods, and decreased engagement in physical activities [4]. Childhood obesity has several impacts, including lifestyle diseases. in addition to economic and psychological consequences [5]. The COVID-19 pandemic has also accelerated the occurrence of obesity and obesity-related complications among children, as noted through the social interventions placed to combat COVID-19 [6]. Obesity, as a global pandemic, has several aetiologies and consequences that have been further reinforced by the COVID-19 pandemic.

Methodology

The scoping review approach was used in the completion of the research paper. Scholarly databases like CINAHL, PubMed, and Medline were used to find eligible scholarly reviews and articles eligible for incorporation into the study. Articles with top quality evidence related to the causes and consequences of obesity and the impact of COVID-19 were selected from the search. The selection was based on relevance with a time range of 15 years. The relevance of the title and the abstract were reviewed to ensure the articles were eligible and published in the English language. The articles that did not match up with the systemic review were excluded.

Literature Review

The articles reviewed showed the growing concern for an increase in childhood obesity. Workman [7] states that obesity affects over 337 million children globally, with rates varying based on age, ethnicity, location, and social determinants. In the US, the prevalence of COVID-19 among children reached 11% of all cases, with the number of cases not confirmed through testing being unknown. The early adiposity rebound increases the risk of obesity in late childhood and adolescence. However, the cause of obesity is still not yet well understood, and a combination of different factors is often cited [8]. Freemark [8] indicated that the most powerful predictor of obesity is increased BMI during childhood. Moreover, a severe strain of the disease, multisystem inflammatory syndrome (MIS-C), affecting children, was identified in March 2020. MIS-C has been associated with many deaths and severe cases of COVID among children.

Sahoo., *et al*. [1] quoted other studies and indicated that a major cause of obesity was the caloric and fat intake. The study also indicated that excessive sugar intake, increased portion size, and a decline in physical activity played a critical role in globally increased obesity rates. Studies by Albataineh., *et al*. [9] and Calcaterra., *et al*. [10] indicated that unhealthy dietary patterns, non-dietary factors, and environmental factors as easy access to high caloric foods were a primary reason for the obesity. They also mentioned lifestyle factors such as sedentary screen time and abnormal meal structures contributing to pediatric obesity. Tambalis., *et al*. [11] echoed these sentiments with a review of the effects of screen time on childhood obesity.

From psychological perspective, Sahoo., *et al*. [1] stated that children's physical, emotional, self-esteem, and social well-being were profoundly affected by obesity. The consequences include poor academic performance and reduced quality of life. Furthermore, Sagar and Gupta [12] state that obese children experience psycho-social issues and emotional problems which influence their health outcomes. The research further stresses, depression, anxiety, eating disorders, stress, concerns with body shape, and low self-esteem as consequences of the COVID-19. According to Sagar and Gupta [12], obese children are further predisposed to non-communicable diseases such as stroke, diabetes, cancer, and cardiac issues. On the other hand, Sahoo., *et al*. [1] stated that childhood obesity is associated with primary co-morbid conditions such as metabolic, cardiovascular, neurological and renal disorders.

Stipančić and Šepec [13] research indicates syndromes' existence in which obesity is an important clinical feature. Among these, The Prader-Willi Syndrome (PWS) which is a complex genetic disorder that causes reduced muscle tone, impaired feeding and development in addition to obesity-related complications. Another syndrome is Bardet-Biel Syndrome (BBS) which affects ciliary function leading to severe obesity at an early age. Other syndromes included in the study are Alstrom's syndrome (AS), Carpenter Syndrome, Cohen syndrome, and Albright hereditary osteodystrophy. These syndromes increase the risks of developing childhood obesity in addition to the associated consequences of these conditions.

Regarding economic impact, a study by Bhasin [14] assessed the health-economic burden of obesity trends. It was demonstrated that obesity has a pronounced impact on morbidity and severely impairs the quality of life. The economic burden of childhood obesity is not

limited to direct costs but is also incurred later when these children become obese adults. Bhasin [14] states that the cost of treating obesity-related comorbidities is $147billion, which increases the economic burden; it is also associated with delayed skills acquisition affecting the earnings of the affected individuals. These sentiments were echoed by the research conducted by Chu., *et al* [15].

Discussion

Causes and consequences of childhood obesity

Childhood obesity is mostly correlated with multiple social and behavioral factors that need to be considered when tackling this issue.

Engagement in physical activities

One social factor is decreased ability to carry out physical activities in social community settings such as schools. Some schools prevent children from undertaking physical activities and emphasize mental and cognitive programs [16]. Children that have little playtime are at increased risk to develop obesity. Subsequently, children who present with signs of being overweight are excluded from most competitive co-curricular activities as they are viewed as being slow. Such social problem contributes to low self-esteem, decreased confidence levels, and negative body image in a child, leading to stress and psychological problems resulting in obesity [16].

Stress and lack of interaction

Another social factor that contributes to obesity is stress. The majority of children with obesity come from families with multiple social stressors that impact the child's health [17]. The majority of children in the overweight category also tend to have fewer friends than normal-weight children. Consequently, the children are afraid to engage in social interactions and spend more time in sedentary lifestyles.

Dietary patterns and lack of outdoor activities

There are equally several behavioral risk factors that contribute to obesity. The dietary pattern among children is one of the factors. Most children who develop obesity have a pattern of eating fast foods and snacks [18]. Fast foods contain high contents of total energy, total fat, and saturated fats that cause obesity. Another behavioral risk factor correlated with obesity is parenting style. Most parents have a habit of keeping children indoors with the fear that outdoor activities endanger a child's safety [19] This behavior activates the sedentary lifestyle, which escalates the risk of obesity as it decreases a child's metabolism rate. Parents that raise children while serving unhealthy junk meals also diffuse the behavior to their children who grow up with unfavorable meal selection full of unhealthy foods. Research illustrates that maternal pressure to eat is associated with an increase in BMI of children between 5 and 7 years [20]. Another behavioral risk factor that should be considered is the meal frequency. Some children have a habit of taking frequent meals and snacks several times a day. Subsequently, this increases the total caloric intake in 24 hours, resulting in obesity and overweight.

Consequences

Lifestyle diseases

Childhood obesity presents with multiple impacts in the community. Children with obesity maintain the obesity status to teenage and early adulthood stages. As a result, this increases the number of individuals in the community with lifestyle diseases such as diabetes and cardiovascular diseases that develop secondary to obesity [5].

Economic consequences

From economic perspective, childhood obesity has also been linked to medical, economic, and psycho-social consequences that impact individuals, families, and communities. A lot of the community funds are channeled to treating individuals with preventable diseases that arise from obesity. Furthermore, if a community has significant numbers of individuals with obesity and other lifestyle diseases, the community becomes less productive. Literature exemplifies that it is more costly to treat a patient with a medical condition who also

has obesity compared to a patient with the same condition and average weight [21]. The community equally loses an intelligent and able workforce that can expand it due to high morbidity and mortality rate. The community is also economically drained as it has to focus on strategies of curbing obesity as a public health issue, which diverts the community's efforts to focus on other developmental programs [22]. Therefore, strategies must be instituted promptly to prevent such effects on the community.

Academic consequences

Childhood obesity affects academic performance due to the negative effects on self-esteem and emotional well-being. Moreover, chronic conditions affecting the children such as asthma and diabetes increase truancy [1]. The academic performance is therefore dented by obesity. Obese children will also find it difficult to concentrate and interact with peers due to the negative attitude towards them affecting their performance.

The impact of COVID-19 on childhood obesity

Reduced immunity

Obesity and COVID-19 are both pandemics that negatively influence the well-being of children. COVID-19 is a highly contagious disease that has led to high rates of illness, hospitalization, and deaths since the first case was identified [23]. Obesity is recognized as an independent risk factor for the severity of Covid-19. According to Workman [1], children with obesity have a higher risk for a severe COVID-19 trajectory in comparison to those with a healthy weight as excess weight decreases the immune response of an individual. Also, chronic inflammation causes a decrease in the immune response. For instance, inflammation caused by obesity and covid-19 hyper inflammation with weak immune systems increases the risk for the development of sepsis and organ failure [23,24].

Lifestyle changes

Measures for the containment of COVID-19 led to significant lifestyle changes that may increase the prevalence of childhood obesity. In a bid to achieve social distancing, stay-at-home measures, and physical distancing was imposed by many states [25]. Children lost the safety net for access to nutritious foods, a safe place, social networks, familiar routines, and mandatory engagement in physical activities. These factors threaten the health and well-being of children with obesity.

Increased stressors

In terms of psychological stress, COVID-19 imposed potentially traumatic events into the lives of children and their families. Therefore, children experienced intense, frequent and prolonged stress that could lead to health issues, including obesity. The safety net provided by parents was also affected by the pandemic, which led to job loss, isolation and drastic lifestyle changes. The ability of parents to provide a safe environment for their children was affected. Studies suggest that parental stress is a cause of childhood obesity where disturbances in infants and children's social environment play a critical role in weight gain. The onset of the COVID-19 pandemic increased the toxic stress affecting vulnerable populations. The rates of domestic violence and child abuse have increased during the pandemic. Children with pre-existing conditions are at a higher risk of experiencing stressors. The mental health and behaviour of children have been adversely affected by COVID-19.

Exposure to obesity causes

Among the causes explored, the out-of-school period which has been associated with weight gain among the affected children as lack of school may affect children and their ability to maintain a healthy weight [26]. Many schools provide their students with access to healthy food. However, the pandemic led to a steady increase in food insecurity globally [27]. On the other hand, Access to health care provided in the school setting was also affected, preventing vulnerable students from gaining access to healthcare.

The pandemic inspired families to stock shelf-stable foods with high-calorie content, negatively impacting weight gain among children [28]. Increased stress resulting from the pandemic makes it difficult for parents' to focus on providing healthy nutrition. The loss of jobs and income led to health insurance's disappearance affecting access to health care and immunization. The exacerbation of poverty by COVID-19 provides insight into existing health disparities with childhood obesity among vulnerable populations [19]. Figure 1 in the appendix shows the increasing prevalence of obesity among children with varying social-economic status. Children are now exposed to extra screen time and a lack of physical activity, which increases the risk for obesity [31,32].

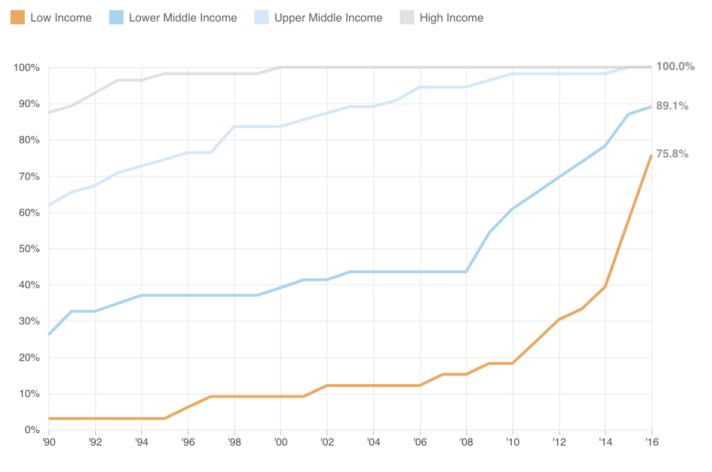

Figure 1: *Increased prevalence of childhood obesity with an effect of social-economic factors [29].*

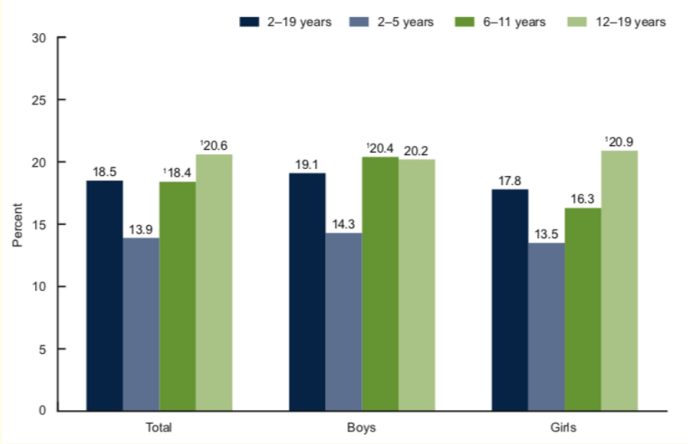

Figure 2: *Prevalence of obesity among youths aged 2 - 19 years, by sex and age in the United States 2015 - 2016 [30].*

Conclusion

Conclusively, overweight, and obesity have exacerbated globally and posed health risks to the population that affects people of all ages. Obesity has economic, social and health consequences, with significantly associated comorbidities, such as diabetes, cancer, and cardiovascular diseases. Obesity exerts much pressure on the economy since it requires significant economic resources to fight against the pandemic. The evidence is clear that childhood obesity and COVID-19 are global pandemics. Combining these pandemics and the subsequent changes in the bioecological environment has increased the risk of children developing obesity and increased the severity of the disease. The changes brought about by the onset of the COVID-19 pandemic have increased stress and reduced the healthy options for food and physical activities for children exposing them to obesity risks. The impact of stress on obesity and COVID-19 characterized by inflammation and weakened immune response and increased disparities affected health, economic and social outcomes. Measures have to be undertaken for the reduction of the negative impact of obesity and covid-19 on children.

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