

Physical Activity and Obesity among Children and Adolescents- An Evidence Based Review

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Abstract:

Background: One among the most serious public health challenges of this century is childhood obesity. The prevalence of obesity among children and adolescents has increased rapidly, with millions of children affected. Physical activity plays an important role in the prevention of overweight and obesity among children and adolescents.

Methods: PubMed/Medline and Google Scholar databases were searched to identify studies published from 2011 to 2020 covering children and adolescents using key search terms such as Obesity in children and adolescents, Childhood obesity, prevalence of child hood obesity and Physical activity & childhood obesity.

Results: Many study findings show that lack or limited physical activity has caused overweight and obesity among children and adolescents.

Conclusion: Childhood obesity is common among children with less physical activity and hence structured teaching programme and increasing the awareness regarding prevention of obesity among children and adolescents are recommended.

Key words: Physical activity; obesity; children; adolescents

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I. Introduction

Obesity has been affecting an increasing proportion of children and adolescents worldwide. Prevention of overweight and obesity among children and adolescents, in turn reduces the risk of obesity in adulthood. Puberty and the adolescent period are considered vulnerable times for the development of obesity due to sexual maturation and reduction in physical activity. A large proportion of children and adolescents in the western world do not meet the recommended physical activity guidelines and physically active children have less body fat. A fundamental goal of obesity prevention is to engage children and adolescents in physical activity and sport [1].

The WHO European Childhood Obesity Surveillance Initiative reported that children tend to overeat and do not perform enough physical exercise. Primary prevention is essential to reduce obesity incidence. Working on prevention programs and body weight reduction could help to tackle the spread of correlated diseases. Hence, prevention programs must be prioritized both at a national and international levels [2].

In the present 21st century the incidence of overweight and obesity in children and adolescents is reaching the size of a global epidemic. It is therefore, recommended to promote a healthy lifestyle and to educate children, adolescents and adults about the dangerous consequences of being overweight or obese. It is crucial for prevention programs so that lifestyle of children is changed for better. The overall effectiveness of these activities could be achieved by the commitment of both the obese child and the school environment and the media. Only integrated efforts can increase patients' awareness and reverse the growing trend in incidence of obesity around the world [3].

II. Search Strategy

An online literature/ articles search was conducted by the authors in the PubMed/Medline database and Google Scholar to identify studies published from 2011 to 2020 covering children and adolescents using key search terms such as Obesity in children and adolescents, Childhood obesity, Prevalence of child hood obesity and Physical activity & childhood obesity. In the initial stages, titles, abstracts and, if needed, full articles were screened for eligibility. In the final stage, all included articles were read for appropriateness and relevant data were extracted.

The central questions for this review, which incorporated literature from 2011 to 2020 were:

1. What is the prevalence of obesity among children and adolescents?
2. What is the relationship between physical activity and obesity among children and adolescents?

3. What are the causes, risk factors and impact of overweight and obesity among children and adolescents?
4. What are the study results and recommendations of the researches?

III. Inclusion And Exclusion Criteria

From the identified related articles, the inclusion and exclusion criteria were applied. The initial screening process was conducted to include only articles in English published between 2011 until 2020. Following this, the titles, abstracts and, when needed, the articles' full text were screened according to their relevance and scope of this review. Articles that were not relevant to the scope of this study were excluded. Furthermore, studies focusing on physical activity, prevalence and causes of obesity among children and adolescents were included. The final inclusion criterion that applied was age; articles reporting results from children, teenagers up to 18 years of age were included, whereas findings related to adults were excluded. A few relevant articles where the full-text articles were not accessible were also excluded. This resulted in articles being included for this review from countries like: Oman, India, Kingdom of Saudi Arabia, Iran, Turkey, Ethiopia, Italy, China, Egypt and Qatar.

Prevalence of obesity among children and adolescents

Overweight and obese children are likely to stay obese in adulthood and more likely to develop chronic and non-communicable diseases at a younger age. One child out of 3, is overweight or obese in the WHO European Region. Children and adolescents, aged 5-19 years have shown increasing obesity rates in most countries. In many countries, the prevalence rate is almost double: Israel has gone from 5.8% in 1975 to 11.9% in 2016, Andorra from 6.2% to 12.8%, and Malta from 7.4% to 13.4%. In 1975, the prevalence was less than 10% in most European countries. In 2016, there is a hike in the number of European countries with a high prevalence of overweight (over 30%) and obesity (over 10%).

The prevalence of obesity among children and adolescents (aged 2-18 years) has increased rapidly, with more than 100 million affected in 2015. Childhood and adolescent obesity tracks adulthood obesity and has been implicated in many chronic diseases like type 2 diabetes, hypertension, and cardiovascular disease. It is also linked to adulthood mortality and premature death. Although physical activity is a principal cause of childhood and adolescent obesity, environmental factors are exclusively important for development of obesity among children and adolescents. Early identification and prevention have become the key to control obesity in addition to genetic and socioeconomic factors. An effective prevention strategy is to focus on overweight youth, who are at high risk for developing obesity. A multifaceted, comprehensive strategy involving behavioural, psychological, and environmental risk factors must be developed to prevent obesity among children and adolescents [4].

Several studies have been conducted to study the prevalence of obesity among adolescents, as it constitutes a serious public health problem. A cross-sectional study among 2-17 years old adolescents participating from 6 schools in Northern Jordan was conducted with an aim to investigate the association between socioeconomic factors and obesity perceptions, and prevalence of overweight and obesity. There were 53.6% male and 46.4% female students. Students who were obese, or overweight were 202 (28.8%). The authors concluded that the family factors, adolescents' pocket money and perceptions about obesity were significant predictors of obesity among adolescents in Jordan. The researchers recommended for effective intervention strategies to be implemented in schools and other primary care settings to reduce the relatively high prevalence of adolescent's obesity observed in this study [5].

The prevalence of overweight and obesity in school children and adolescents in a Brazilian city was studied among 1,125 children and adolescents between the ages of 5.6 and 18 years (681 girls and 444 boys) from public and private schools. The results showed that 364 participants were with excess weight; 17.3% were overweight and 15.0% were obese. Among the girls, 18.0% were overweight, and 12.5% were obese; among the boys, 15.3% were overweight, and 18.0% were obese. These prevalence rates were higher when the time spent watching TV or participating in media-related activities surpassed 5 hrs/day. This trend could be reversed by improving healthy eating habits and physical activity and reducing time spent watching TV and participating in other media activities including video games and social networking [6].

Relationship between physical activity and obesity

Childhood obesity may be related to school environment, but many previous studies have often focused on food environment only. A cross-sectional study with an aim to examine the relationship between physical activity environment and childhood obesity was conducted in Hong Kong among 20,8280 students (6-18 years of age) from 438 schools. The study results showed that the prevalence of obesity was 5%. Students in schools with at least 3 physical activity-friendly environmental factors (11.7%) had a much lower risk of obesity than those without (23.7%). The authors concluded that a physical activity-friendly school environment is associated with lower risk of obesity [7].

Lack of physical activity and increased prevalence of obesity have become a major public health concern among Chinese younger populations. A cross-sectional and national survey of 131,859 students (aged 7 to 19 years) from 986 public schools were conducted with the purpose to provide updated estimates on the prevalence of meeting moderate-vigorous physical activity (MVPA) and screen viewing time guidelines, and overweight and obesity among Chinese school-aged children and adolescents. The study results showed that in 2017, 34.1% of children and adolescents met MVPA guidelines and 65.4% adhered to screen viewing time guidelines. The prevalence of overweight and obesity were 15.1% and 10.7%. The authors concluded that there was a low prevalence of meeting MVPA guidelines and high prevalence of overweight and obesity in Chinese school-aged children and adolescents. School policies and programs must be aimed to increase physical activity and reduce and prevent obesity in younger populations in China [8].

Targeting physical inactivity in children is appropriate to decrease the obesity rates among children. Only 33% of adolescents achieve the recommended goal of at least 60 min of physical activity in a day. In a review by Foster, C et al. (2018), it is suggested that available guidelines need an improved approach to address the role of the parents and caregivers in targeting physical activity and weight management among adolescents. It is also recommended that efforts must be taken to provide suitable and enjoyable physical activity. Sports, games, free play and other age-appropriate activities are enough ways to improve moderate to vigorous physical activity in children [9].

Another study was conducted in Mid- North-eastern Poland with the purpose to assess the relationship between the body mass index and sports and physical activities among children and adolescents aged 10-19 years. The overall prevalence of overweight was not higher than 8%. Participants who were underweight were only 0.6%. About 68% of them confirmed participating in sports. Boys (>70%) were frequently more active than girls (> 60%). Participants mostly played soccer, volleyball, handball, or basketball (30.5%); 7% participants practiced martial arts and 16.5% of them participated in swimming. Sports activity significantly influenced body mass index. The authors reported that obesity and overweight was prevalent among boys and girls. Obesity was significantly related to less physical activity in boys, and the likelihood of obesity or overweight increased in inactive teenagers [10].

The impact of obesity on acute and chronic diseases, general health, development and well-being is significant. A review done by Brown T, et al (2019) concluded that interventions which included diet combined with physical activity interventions can reduce the risk of obesity in young children aged 0 to 5 years. It is also mentioned that interventions that only focus on physical activity can reduce the risk of obesity (BMI) in children aged 6 to 12 years, and adolescents aged 13 to 18 years. There was some evidence that diet combined with physical activity interventions may be effective. This updated review also suggests that interventions to prevent childhood obesity do not result in adverse effects or health inequalities [11].

A nonrandomized trial to examine the effects of Build Our Kids Success- a 12-week, 1-hour before-school physical activity program-on BMI and social-emotional wellness among 707 students was conducted among 24 schools in Massachusetts (2018). Children in the 3 days/week group had improvements in BMI z-score and this mean change was significantly different from the comparison group. Children in the 2 days/week program had no significant changes in BMI outcomes. Children in the 3 days/week group demonstrated improvement in their student engagement scores and had non-significant improvements in reported peer relationships, affect, and life satisfaction versus comparison. The authors concluded that a 3 days/week before-school physical activity program resulted in improved BMI and prevented increase in child obesity [12].

Preventive strategies are proven to be the most effective public health intervention in limiting obesity. A multi-component approach involving dietary modification and advocacy for a healthy lifestyle comprising of regular physical activity, minimizing screen time and behavioral interventions have been found valuable in preventing obesity. A life-cycle approach involving family, school and community is important for long term results. Policies should be developed to create an environment and opportunities for healthy diet and physical activity. Management of childhood obesity includes following a structured weight reduction programme individualized for every child, along with healthy diet and life style [13].

A longitudinal study was conducted among urban South African adolescents with an aim to identify longitudinal patterns and associations between physical activity, sedentary behavior and sleep. Behaviors were self-reported annually between ages 12 and 17 years. The results showed that a large majority of males (82%) and all females failed to meet the WHO physical activity recommendation for adolescents of 60 minutes of moderate-vigorous intensity physical activity per day. The authors concluded that most adolescents in this South African population did not meet WHO recommendations for physical activity [14].

There is a rising prevalence of overweight and obesity and its co-morbidities among children in western-high income developed countries. In the European Union, the prevalence of overweight and obesity is increasing quickly among children in Poland. The association of obesity with physical fitness, physical activity, sedentary behavior and diet among 641 children (10-15 years) were studied. It was recommended for education and intervention programs to increase physical fitness through aerobic training for Physical Education teachers,

parents and children in order to reduce the rate of overweight and obesity among children in the Lower Silesia region of Poland [15].

A cross-sectional study of data from the 2015 Ontario Student Drug Use and Health Survey (OSDUHS), Canada, was conducted among 9866 students aged 11-17 years. The independent variables for healthy weight behaviors examined were: moderate-to-vigorous physical activity (MVPA), screen time, fruit and vegetable consumption and sleep. Only 2% of students met the recommendations for all four healthy weight behaviors and 33% of students did not meet any of the four recommendations. Findings from this study show that inadequate levels of MVPA is a critical behavioral predictor of obesity status in adolescents. The authors recommend for policies and programs targeted at reducing obesity and increasing the physical activity rates of adolescents [16].

Obesity and lower physical fitness levels in children are related to the progress of cardiometabolic risk factors. A study to determine the relationship between health-related physical fitness and physical activity levels, blood pressure, and anthropometric parameters for different weight statuses was conducted among 272 girls and 333 boys. The results showed that VO₂max was higher in schoolchildren of normal weight. Systolic and Diastolic blood pressure were higher in obese schoolchildren. The results show that physical fitness has an inverse relationship with systolic blood pressure and a positive relationship with physical activity levels. Cardiorespiratory fitness (CRF) and SLJ are inversely associated with the predictors of risk factors for cardiovascular diseases. The authors concluded that obese children presented lower physical fitness and the higher proportion of individuals with hypertension [17].

Causes, risk factors and impact of overweight and obesity among children and adolescents

The factors associated with BMI categories of Malaysian adolescents by physical activity (PA) status was examined by Tan A, et al. (2019) among 24,339 adolescents. The results showed that early (ages 11-13) and middle-stage (ages 14-16) adolescents were associated with higher overweight and obesity risks than their older peers (ages 17-18). Male adolescents had higher underweight and obesity likelihoods than females. Hunger was associated with higher likelihoods of underweight and normal weight BMI categories. The authors concluded that male adolescents faced a double burden of underweight and obesity. Other sociodemographic and dietary-lifestyle factors were associated with adolescent BMI categories. The researchers recommended the public health authorities to take these factors into consideration when considering programs to ensure healthy adolescent body weight [18].

The global rise in obesity prevalence among children and adolescents has been linked to modifiable lifestyle factors, including lack of physical activity. A randomized control trial with an aim to estimate whether exercise intervention meaningfully improves body composition and cardiometabolic risk factors in overweight and obese adolescents was conducted. Structured exercise intervention was implemented. Control group did not receive any physical activity. Participants overweight or obese (BMI \geq 85th percentile) aged between 10 and 19 years were included in the study. The study results showed that exercise intervention reduced BMI, body weight, body fat percentage and waist circumference. The effects of exercise on cardiometabolic risk factors were inconclusive. The current evidence suggests that exercise intervention in overweight and obese adolescents improves body composition, particularly by lowering body fat [19].

Obesity risk among adolescents can have an impact by family environments. A sample of overweight/obese adolescents (172 parent-adolescent dyads) were explored on how parenting practices and/or parental modeling of physical activity (PA) behaviors relate to adolescents' PA while examining the moderating role of parenting styles and family functioning. The study results showed that more healthful PA parenting practices and parental modeling of PA were both associated with higher levels of adolescents' self-reported moderate-vigorous physical activity (MVPA). The authors of this study suggest that parenting practices and parental modeling play a role in adolescent's PA, and therefore emphasize the importance of integrating parenting styles into current familial interventions to improve their efficacy [20].

A cross-sectional study was conducted in Jordan among schoolchildren (473 boys and 449 girls) aged 7-18 years to identify certain risk factors associated with childhood obesity related to lifestyle; dietary patterns, physical activity, and sedentary behavior. The study results showed that sedentary activities increased the risk of overweight among schoolchildren by 2-fold. Sedentary activities for less than 3 hours increased the risk of overweight by 0.8-fold. School children who spent <30 min/day in exercising reduced the risk of overweight by 0.5-fold. Students who took one meal per day and daily ate snacks from schools' cafeterias had a higher risk to be obese. A national policy to promote active living and healthy eating among schoolchildren is recommended [21].

Osinski, W & Kantanista, A (2017), in their review have emphasized that children and adolescents with overweight or obesity should also be motivated to undertake activities referred to as non-exercise activity thermogenesis [22].

A study shows in Saudi Arabia that 14.8% of female children and adolescents of less than 20 years old are obese, compared with only 9.4% of male children and adolescents. High prevalence of obesity and related

chronic illnesses could be caused due to inadequate physical activity (PA). Only 25% of female adolescents in Saudi Arabia meet the recommended 60 minutes of moderate to vigorous PA per day. The result shows that 25.3% female adolescents were overweight or obese. This study indicates that Saudi female adolescents are in need of interventions to increase their PA. The study findings suggest that commitment to PA may be a productive approach in nursing interventions to increase PA among Saudi female adolescents [23].

III. Recommendations

Media usage among pre-schoolers contributes to unhealthy diets and extends the time duration spent sitting. Longer periods of sitting may be a risk factor for the development of obesity. A study conducted among 160 preschoolers and their parents (128 mothers, 121 fathers) show deviations from actual recommendations regarding physical activity, time spent sitting, dietary intake, and media usage. Increased screen time was associated with an increased weight status among pre-school-aged children [24]. Decreased screen time and reducing prolonged sitting time is hence recommended.

One particular public health concern is the fourfold increase in overweight and obesity rates among the Chinese youth population. In order to achieve Healthy China 2030 goals, a panel of Chinese experts, agreed on 10 major themes with strong scientific evidence that, in children and adolescents aged 6-17, participating in moderate to vigorous physical activities led to multiple positive health outcomes. The other consensus statement includes: (1) highlight major challenges in promoting physical activity, (2) identify future research that addresses current knowledge gaps (3) provide recommendations for teachers, education experts, parents and policymakers for promoting physical activity among Chinese school-aged children and adolescents. Physical activity guidelines will help to promote physical activity and health and prevent lifestyle-related diseases in children and adolescents. This also provides a foundation for developing culturally appropriate and effective physical activity interventions, health promotion strategies and policy initiatives to improve the health of Chinese children and adolescents [25].

Nutrition and physical activity perceptions of children were assessed for planning a healthy weight curriculum to address childhood obesity in African-American children living in the Lower Mississippi Delta (LMD). There were 46 (66%) females and 24 (44%) males participated in the focus group discussion sessions. It was found that LMD youth recognized a healthy eating pattern and understood that overweight and obesity result from poor eating habits and physical inactivity [26].

Moderate-to-vigorous-intensity physical activity (MVPA) is important for childhood obesity prevention and treatment. Timing and magnitude of the decline in MVPA in children and adolescents are unclear but important for development of effective obesity intervention. A systematic review aimed to determine and compare the yearly changes in MVPA among children and adolescents was done and the results shows that there is a relative decline in MVPA that affects both sexes from an early age and it is greater among girls. The authors recommend that interventions should start before adolescence to promote MVPA [27].

IV. Conclusion

In the current century, the occurrence and prevalence of overweight and obesity in children and adolescents are very high. The authors of many related studies recommend to promote a healthy lifestyle and to educate children, adolescents and adults about the prevention of overweight and obesity and the ill effects. It is found in many studies that childhood obesity is common among children, who has very limited physical activity and thereby prevented by structured teaching programme and increasing the awareness among children and adolescents. It is important for prevention programs to comprise educational and awareness activities so that the participants are encouraged to modify their lifestyle and include physical activities in their daily life for better health.

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CONFLICT OF INTEREST

There is no conflict of interest

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