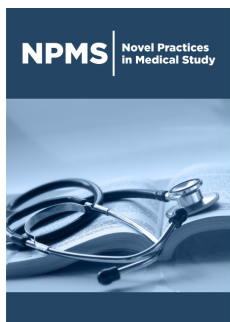


Mental Health and Obesity in Childhood and Adolescence

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Abstract

Obesity in childhood and adolescence is considered a significant public health concern both nationally and globally, as it results in several health problems and long-term psychosocial complications. In addition, this concern has been growing due to overweight and obesity, showing an increase worldwide of more than 340 million children and adolescents aged 5 to 19 years being overweight. Research has produced a vast amount of literature about obesity, namely in terms of the impact of intervention with cognitive-behavioral therapy. However, conclusions on this review article point to the need to intensify the investigation of obesity in childhood and adolescence, so that this problem can be monitored from an early age, minimizing the impact of medium and long-term consequences.

Keywords: Childhood obesity; Adolescent obesity; Overweight; Risk factors; Cognitive-behavioural theory

Introduction

For many years, human beings have lived intending to achieve health and quality of life, defined by the ancients as the absence of disease. However, "health" is nowadays classified as a broader concept, designated by complete biopsychosocial well-being [1]. In this sense, childhood obesity is a complex disease encompassing epidemic dimensions [2] and can also be considered a chronic disease with a multifactorial etiology. Thus, overweight and obesity can be defined as an abnormal or excessive clumping of fat that can impair physical and mental health [3]. A simple index of weight for height is used to classify overweight and obesity and is called the Body Mass Index (BMI). This index is defined by a person's weight in kilograms divided by the square of their height in meters (kg/m^2) [3]. According to the WHO [3], obesity-related statistics worldwide show that since 1975, obesity has tripled. More than 340 million children and adolescents ages 5 to 19 were, in 2016, overweight, whereas just under 1% of children and adolescents ages 5 to 19 were claimed to be obese in 1975. According to Paula and colleagues, in 2022, 1 in 4 children in Europe suffered from being overweight or obese. It is further noted that being overweight or having obesity is one of the leading causes of death in Europe [3]. The primary cause of obesity and overweight is an energy imbalance between consumed and spent calories. In the last years, the intake of energy-dense foods that are high in fat and sugars is growing, and on the other hand, there is a decrease in physical activity in the routines of a sedentary population [3].

According to Childhood Obesity Surveillance Initiative (COSI), regarding the statistics associated with obesity in Portugal, in 2008, 37.9% of children were overweight and 15.3% obese. However, between 2008 and 2019, there was a decrease in the prevalence of overweight and obesity, 29.7% of children were overweight and 11.9% were obese. This has enabled Portugal to move from the 2nd to the 14th European country with a high prevalence of childhood overweight and obesity [4]. According to the COSI study realized in 2019, the regions with the highest prevalence of overweight were the North (31.3%), Madeira (31.7%) and the Azores (35.9%). However, concerning prevalence of childhood obesity, a higher prevalence resided in the regions of the North (12.3%), Centre (13.4%), Madeira (13.7%) and the Azores (17.9%) [4]. Although Portugal has seen a decrease in childhood obesity and overweight, it is essential

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to note that the prevalence of overweight in Portugal continues to affect 1 in 3 children [4], and it is estimated that 2.8% of annual health care spending is associated with obesity [5]. It is central to consider the multifactorial conditions that are associated with the start of childhood obesity. As previously mentioned, obesity is a complex disease with multifactorial etiology, that is, with a variety of factors, such as biological, behavioural, cultural and environmental, that play a predominant role in their development and maintenance [6]. Therefore, according to the WHO [3], obesity causes more than 1.2 million deaths per year in Europe and increases the risks of non-communicable diseases.

Accordingly, being overweight harms the health of children and adolescents, negatively affecting their physical and metabolic conditions and contributing to insulin resistance and chronic inflammation [7]. On the other hand, the accumulation of body fat in children and adolescents can generate the reduction of both physical well-being and their self-esteem, providing an impact of diseases in their lives, which are often associated with medical complications and comorbidities, such as a) cardiovascular diseases, b) type II diabetes, c) hypertension, d) apnea syndrome, e) several types of cancer, which result in decreased quality of life and f) various psychosocial problems and g) psychopathological disorders [8].

Also, the role of the anti-aging gene Sirtuin 1 may need to be considered with relevance to the severity of obesity in children. Dietary activators may need to be consumed early to activate Sirtuin 1 and prevent obesity. Environmental factors repress Sirtuin 1, and the diet and water consumed should be assessed (A, B, C, D). This work aims to report what is already known about obesity in childhood and adolescence, specifically what has been investigated in the age range from 5 to 18 years. According to Papalia & Feldman [9], several transitions and phenomena are expected to occur as humans develop throughout the cycle of life. Children's growth is considered constant in the second childhood (from 3 to 6 years old) at different rates. Around the age of 3, children are expected to start losing their plump shape, a characteristic present in infants, assuming a more slender and athletic appearance. The large belly begins to strengthen while the torso and limbs get longer. However, all these events may not occur as expected due to obesity. When growth slows down, preschool children do not need as many calories as they did at the earlier stage of their lives [9]. Therefore, later childhood is considered a great time to treat overweight or obesity when a child's diet is still subject to the influence and control of their parents or tutors [9,10]. As for the third childhood (6 to 11 years old), children grow more slowly, 5 to 7.5 centimeters per year, reaching about twice the weight [11]. For example, girls retain more adipose tissue than boys, a characteristic expected to persist into adulthood.

The average weight at ten years is about 40kg for girls and 37kg for boys, and in this age group, a child is expected to consume, on average, 2,400 calories daily. Professionals recommend a varied diet of fruits, vegetables, and high levels of complex carbohydrates [9]. However, when obesity is present in the lives of these children, it is expected that boys are more likely to be overweight [12]. At

this stage of life, body image concerns become more prevalent, especially for girls which later in life can result in eating disorders [9]. Finally, when it comes to adolescence (from age 11 to approximately age 20), physical growth and other changes are more accelerated and more profound, and reproductive maturity occurs at this stage. At this stage of life, the risk of behavioral issues, eating disorders, and increased substance abuse emerges [9]. There are many reports, especially from girls, of health problems such as headaches, stomachaches, nervousness, loneliness, and fatigue, all of which could be avoided by the lifestyle they experience. Good nutrition is crucial to support the faster growth of adolescence and to create healthier eating habits. However, what happens is that adolescents eat fewer fruits and vegetables, consuming more foods higher in cholesterol, fat, and low in nutrient calories (American Heart Association et al., 2006). However, it is expected that eating disorders such as obesity and anorexia are more present in industrialized societies, where food is more abundant and being considered thin is the standard of attractiveness [9].

Methodology

A search was performed in the literature published between 2002 and 2022 in the B-on, PubMed, Taylor & Francis, Scielo, ResearchGate and Google Scholar databases. Studies were included if they had the following keywords in the title or abstract: "Obesity", "Childhood Overweight", "Cognitive-Behavioral Theory", "School Context", "Intervention", "Risk Factors". Also, as inclusion criteria, the studies had to address the childhood and or adolescent development phase. As such, studies that focused on approaching obesity in adults were excluded. Additionally, only studies published in English or Portuguese in an open-access regimen were included. After selection, a total of 44 were considered for analysis.

Cognitive-Behavioural Approach and Motivational Strategies

Since obesity is associated with psychological variables, psychotherapy and clinical interventions are vital components to entice subjects into a lifestyle change and motivate them to achieve weight loss with the help of multidisciplinary teams [2]. Both old and newer cognitive-behavioural strategies are successful techniques among many medical protocols and rehabilitation procedures; in this case, it aims to modify dysfunctional eating patterns and prevent possible relapse [2]. It is crucial to work with modifiable factors, especially psychological factors, to reduce or prevent obesity. Thus, obesity-related psychotherapies can help patients achieve weight loss by decreasing dysfunctional behaviour with a more cognitive focus, such as changing utopian weight goals and negative perceptions about body image. However, in addition to reducing and preventing obesity, it aims to improve psychological skills, such as the patient's ability to self-monitor, control stimuli using restraint of food amounts, and behaviour change strategies, such as chewing slowly and increasing awareness of pleasure associated with taste [13]. Thus, the Cognitive-Behavioural Theory is characterized as the best treatment for obesity [11], aiming to promote binge-free days, enable acceptance-related self-regulation skills and monitor eating, leading to decreased concern about

fitness and weight without directly harming the body [14]. In turn, Motivational Interviewing effectively promotes behavioural modification through a non-judgmental approach and by adopting a communication style that amplifies the patient's autonomy, competence, and intrinsic motivation [2]. The operation of Motivational Interviewing requires directing patients toward self-motivation strategies, improving initiative for change [2].

Theoretical Framework

Social inequalities in health

Given the predispositions and consequences of childhood obesity, it can be differentiated as a "Disease of 3 uuu" [15]: unsustainable due to its radical consequences and irreversible; an example is the prediction of decrease, on average, of life expectancy for the generation born on the turn of the millennium as a result of obesity [16]; unfair, since it is a discriminative and selective pathology since it mainly affects poorer and more vulnerable children and adolescents, which contributes to the amplification of health inequalities [15]; unbearable, as it places children and adolescents in a significant health embarrassment because they not only suffer from limited illnesses during childhood and adolescence, but will experience prolonged and severe morbidity throughout their lives, even if they reach the normative weight [17]. Several studies have found that the higher the prevalence of obesity in childhood and adolescence, the lower the socioeconomic status [17].

This clearly shows the influence of environmental factors on diet and physical activity. Hence, environmental factors are seen as holistic resources, and have shown to be facilitators of obesity, namely: in accessibility to healthy food, availability of parks or gardens, appropriate places for exercise, good interpersonal relationships and safe school environment, among others [17]. Research indicates that children with lower socioeconomic status are more likely to develop obesity. It is assumed that these children are more sedentary since they may live in more inadequate areas, where there is a lack of public spaces, poor accessibility to supermarkets and stores, greater insecurity, and very high rates of violence [15]. Families with low socioeconomic status also have lower incomes and consequently more difficult access to information since they are limited about health services and products, thus leading to a lifestyle with low health standards.

Obesity in the school context

School is a fundamental context for monitoring the health status of students since it is at this stage that habits are integrated and may be perpetuated into adulthood [18]. The school context has become an essential work field for research and interventions since they provide continuous contact with children [19]. Thus, in-school interventions, when conducted directly with and by teachers, they are more acceptable [20]. However, a lack of knowledge about health from teachers' is notable, with evident unhealthy behaviours, high stress levels, and poor health, limiting their expertise to effectively implement interventions and serve as positive role models for children and adolescents [21]. Therefore, it

is essential to offer teachers health encouragement to improve their health knowledge, amplify healthy behaviours, and decrease stress. This will improve their health and increase the fidelity and quality of their intervention in the school context [22]. On the other hand, teachers' role has been considered a major factor in promoting Physical Activity (PA) in children and adolescents [23]. Thus, PA has been widely related to several benefits, such as decreasing the risk of developing metabolic syndrome in adulthood and cardiovascular disease, among others [24]. Maintaining PA during childhood and adolescence may be a prime and critical procedure for preventing obesity and developing future diseases [25]. Researchers report that overweight or obese children tend not to participate in group physical activities since they feel less confident and have low self-esteem. Therefore, PA practice in childhood and adolescence is associated with a healthy lifestyle, such as not smoking, having a nutritious diet, and maintaining body composition [26,27].

Diversity and acceptance of bodies and the inclusive fashion

Because of subjective factors that create the act of perception, boys and girls understand their bodies in different ways, granting divergent symbolic meanings, even though they both have the same sensory perceptions. However, there is also an objective basis, where more social demands are made on girls' physical appearance. They are associated as the weaker sex, subordinated and mainly with domestic tasks, while the beauty of the boy's image is attributed to social and economic achievements, associated with virility, aggressiveness, and social expectations [28,29]. It is crucial to point out that most clothing-themed items made available in the market fit declared body standards, resulting in the discomfort that several buyers face. Consumers who have differentiated measures and distance themselves from the prevailing aesthetic standards, more specifically people with obesity, are excluded from fashion, encountering difficulties when it comes to acquiring a piece of clothing. As far as girls are concerned, they tend to suffer discrimination and feel great dissatisfaction regarding the clothes available in stores [29]. Studies infer that shopping can be very painful and torturous for people who are overweight or obese. The stigma of obesity is noticeable, and this may be one factor that influences many people to prefer their clothes made by seamstresses or to look for specialized stores. This stigma results in the self-image of these subjects being loaded with constant comparison and feelings of inferiority due to not feel in accordance with the body standards established by society, and may consequently incite states of restlessness, low self-esteem, and even social isolation [29].

Environmental sustainability - A Reflection

Research has shown that more interdisciplinary solutions are needed to address pandemics like the Covid-19 one. To this end, we present an environmental sustainability approach linked to obesity prevention [30,31]. There are current indications that recent food production, transportation, and land use have negative impacts on both global warming, climate change and global obesity outcomes [32]. Robinson [33] suggested that one possible approach that

fits with an interdisciplinary solution is to identify social and ideological movements that share behavioural purposes for obesity prevention. Therefore, the fundamental principle is that subjects are motivated to make positive behaviour modifications to improve their health and to fit the goals of the proposed movement dynamic. In this way, an individual may, for example, bike to work to help decrease their “carbon footprint”, which will consequently benefit his/her health. This may help decrease life-threatening conditions such as the development of future diseases [30]. With children, for example, this approach is well supported with evidence since their participation in environmental education programs has been growing exponentially. Children tend to demonstrate an excellent understanding of complex environmental issues and can internalize positive environmental values and influence their own outcomes [34]. That said, education motivates and supports behaviour change in two ways: firstly, it encourages one to act in a manner that is solid with one’s perceived self-identity, that is, behave following one’s morality and values, and then inspires one to behave in a manner consistent with other group members [33]; secondly, cooperation in social movements offers subjects an opportunity to develop their social networks, interact among peers, and gain social support throughout the process of modifying “idealized” behaviours.

Influence of COVID-19

It is important to address this more recent issue experienced worldwide, which has mainly contributed to the growth of obesity in childhood and adolescence. The coronavirus (COVID-19) has been classified by the WHO [35] as an infectious disease from the SARS-CoV virus. The globality of people infected present mild to moderate respiratory illness, recovering without requiring special treatment, although medical attention is required for situations where subjects become severely ill. Thus, in order to respond to the COVID-19 pandemic, some multinational measures were implemented by the authorities, which consisted of school closures, quarantine and social distancing recommendations, to mitigate the spread of the virus, as well as reducing the pressure on health systems [36]. Consequently, more than 2.6 million people were subjected to home confinement, which led to a variety of behavioural changes in the lifestyles of individuals, such as buying and consuming huge quantities of canned and processed foods for fear of food shortages. Concomitantly, an increase in sedentary behaviours and a reduction in physical activity occurred. These events might be related to an increase in obesity numbers [37].

In this work, several investigations have reported that there is often weight gain by children and adolescents during the summer vacations, which usually leads to predictions on rates of childhood obesity exponentially according to the number of months that educational facilities were closed [38]. Several studies carried out during the pandemic have mentioned that children and adolescents increased their food intake and have consequently suffered weight gain. In this continuum, other conditions that resulted in weight gain were families’ financial situation, stress due to separation from family and friends, and worry and apprehension of the impact produced by Covid-19 [39,40]. Regarding PA, it has suffered a decrease due to the reduction of movement in public

spaces, resulting in a decrease in physical practice by children and adolescents and, consequently, the development of sedentary behaviours [38]. One of the restrictions that limited the daily routine of children and adolescents who attended physical education classes was the prolonged closure of educational establishments. This also increased the insecurity of families since most of them depended on the meals that were provided in schools, needing them to maintain a healthy diet for their children [39].

Final Considerations

Overweight and obesity in childhood and adolescence have reached alarming proportions in our society over the last two decades. Therefore, it is necessary to intervene in this issue to prevent these numbers from increasing daily. The high prevalence of this issue already conveys a severe concern about the impact on the lives of these children and adolescents. Still, with further exploration of this topic, it was possible to verify that this disease is supported by multiple factors, which are at the basis of the wellbeing of each individual’s life, which can be biological, behavioral, cultural and environmental [6].

One of the factors influencing obesity that stands out from the literature is the environmental factor. It consists of a long “list” of possible predisposing factors for obesity in childhood and adolescence, such as access to safety, to contexts essential for the individual’s wellbeing, and is also associated with the socioeconomic level of each family. Despite the information available about obesity, several topics within this theme triggered the need to investigate and deepen the knowledge. One of these issues concerns inclusive fashion for people with obesity since social stigma is still very much present in the daily lives of these people. This tends to trigger, especially in girls, anxious and depressive symptoms since it is usually an excessive appreciation of the thin body as the ideal standard body associated with beauty and perfection. Thus, it is notorious that these teenagers try to conform to this standard to feel good about themselves and belong to a social group. On the other hand, environmental sustainability has also raised much interest due to the advice to prevent climate change providing a chance to improve environmental outcomes and transform our eating and physical activity environments to benefit a healthier energy balance [33]. Thus, it is crucial to maintain a focus on intervention with children to prevent obesity and promote sustainability. Children are in the process of forming their self-identity and are more likely to adopt such values at an earlier age, thus leading to a more significant impact throughout their lives [33]. Thus, it is possible to establish psychological intervention processes dedicated to psychoeducation techniques for individuals to help them work on their dysfunctional beliefs and thoughts associated with obesity so that they can change them (da Silva, 2018).

The importance of intervention in overweight and obesity issues in children and adolescents by implementing lifestyle changes like new eating habits and regular physical activity is not only beneficial for their health, but it is also essential to adopt a long-term perspective [20]. Strengthening efficient and healthy

environments can be a promising and long-lasting strategy to improve the individual and collective health of individuals with obesity. As mentioned above, the environment is a holistic resource that interferes with the lives of all subjects and social communities. In summary, after collecting and analyzing a panoply of information, it was clear that the research about obesity in childhood and adolescence presents some limitations. An example is that, despite being a gold standard for treating obesity, the cognitive-behavioural theory, given its comprehensiveness and practical nature, does not necessarily produce successful weight loss [41]. It is further noted that simultaneously with psychological treatments, traditional medication protocols have a short-term efficiency compared to placebo (Reas & Grilo, 2008). Another limitation relates to the school context and obesity. It is evidenced that teachers need more time to cooperate on initiatives to help their students due to being occupied by school-related bureaucracies and having limited knowledge of this disease [21]. Finally, another problem highlighted was the lack of information about environmental sustainability associated with obesity [42-47]. It was clear that it is still considered of little importance that society uses more ecological and sustainable ways in their routines to obtain more beneficial health and take care of the world in general.

References

- Vinha W, Nunes AM (2021) Childhood obesity: Diagnosis of body composition of 7 and 10-year-old children from two schools with diferente socioeconomic levels in the municipality of Varginha. *Brazilian Journal of Development* 7(9): 91287-91307.
- Castelnuovo G, Pietrabissa G, Manzoni GM, Cattivelli R, Rossi A, et al. (2017) Cognitive behavioral therapy to aid weight loss in obese patients: current perspectives. *Psychol Res Behav Manag* 10: 165-173.
- (2021) Obesity and overweight. World Health Organization, USA.
- Rito A, Mendes S, Baleia J, Gregório MJ (2021) Childhood obesity surveillance initiative. INSA, Lisboa.
- Hruby A, Hu FB (2015) The epidemiology of obesity: A big picture. *Pharmacoeconomics* 33(7): 673-689.
- Oliveira F, Soares L (2011) Pilot intervention program for parents of children with obesity problems. *Psychology Health & Diseases* 12(2): 197-211.
- Franks PW, Hanson RL, Knowler WC, Sievers ML, Bennett PH, et al. (2010) Childhood obesity, other cardiovascular risk factors, and premature death. *N Engl J Med* 362(6): 485-493.
- Curry SA (2017) Obesity epidemic: Pharmaceutical weight loss. *R I Med J* 100(2): 18-20.
- Papalia DE, Feldman RD (2013) *Human Development 12th (edn)*, In: Monteiro C, De CM, Silva (Eds.), Porto Alegre RS: AMGH.
- Quattrin R, Liu E, Shaw N, Shine B, Chiang E (2005) Obese children who are referred to the pediatric endocrinologist: characteristics and outcome. *Pediatrics* 115(2): 348-351.
- McDowell MA, Fryar CD, Ogden CL, Flegal KM (2008) Anthropometric reference data for children and adults: United States, 2003-2006. *Natl Health Stat Report* 22(10): 1-48.
- Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, et al. (2006) Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA* 295(13): 1549-1555.
- Swencionis C, Rendell SL (2012) The psychology of obesity. *Abdominal imaging* 37(5): 733-737
- Forman EM, Butryn ML, Manasse SM, Crosby RD, Goldstein SP, et al. (2016) Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. *Obesity* 24(10): 2050-2056.
- Nogueira H, Lourenço A, Gama A, Mourão I, Marques VR, et al. (2014) Social inequalities in health: the example of childhood obesity. *Geography Notebooks* (33): 133-140.
- WHO Regional Office for Europe (2007) The challenge of obesity in the WHO European region and the strategies for response. Copenhagen, WHO Regional Office for Europe
- Timperio A, Salmon J, Telford A, Crawford D (2005) Perceptions of local neighbourhood environments and their relationship to childhood overweight and obesity. *International Journal of Obesity* 29(2): 170-175.
- Serra BK, Loch FCC, Carvalho DR, Scheeren EM, Vosgerau DSR (2018) Physical activity and nutrition education interventions to combat childhood obesity at school: a systematic review. *Brazilian Journal of Obesity, Nutrition and Weight Loss* 12(73): 665-679.
- Millimet D, Tchernis R, Husain M (2010) School nutrition programs and the incidence of childhood obesity. *Journal of Human Resources* 45(3): 640-654.
- Ling J, Robbins B, Wen F (2015) Interventions to prevent and manage overweight or obesity in preschool children: A systematic review. *Int J Nurs Stud* 53: 270-28.
- Chan CMS (2014) Health-related quality of life of preschool caregivers in Hong Kong. *Health Promotion International* 29(2): 287-295.
- Reinke WM, Stormont M, Herman KC, Newcomer L (2014) Using coaching to support teacher implementation of classroom-based interventions. *Journal of Behavioral Education* 23(1): 150-167.
- Silva P, Lott R, Mota J, Welk G (2014) Direct and indirect effects of social support on youth physical activity behavior. *Pediatric Exercise Science* 26(1): 86-94.
- Yang X, Telama R, Hirvensalo M, Viikari JSA, Raitakari OT (2009) Sustained participation in youth sport decreases metabolic syndrome in adulthood. *International Journal of Obesity* 33(11): 1219-1226.
- Kimm SYS, Glynn NW, Obarzanek E, Kriska AM, Daniels SR, et al. (2005) Relation between the changes in physical activity and body-mass index during adolescence: a multicentre longitudinal study. *Lancet* 366(9482): 301-307.
- Olivares PR, Cossio BMA, Gomez CR, Almonacid FA, Rubio JG (2015) Influence of parents and physical education teachers in adolescent physical activity. *Int J Clin Health Psychol* 15(2): 113-120.
- Rauber AB, Castro HO, Marinho A, Vicente JB, Ribeiro HL, et al. (2018) Effects of a physical activity and nutritional intervention in overweight and obese children through an educational and recreational camp. *Nutr Health* 24(3): 145-152.
- Bombak AE, Meadows A, Billette J (2019) Fat acceptance 101: Midwestern American women's perspective on cultural body acceptance. *Health Sociology Review* 28(2): 194-208.
- Pacheco B, Renner JS, Nunes MF, Rocha ALC (2019) Inclusive fashion: perception of obese women in relation to their bodies and clothing. *Artemis Magazine*, pp. 443-456.
- Skouteris H, Cox R, Huang T, Rutherford L, Edwards S, et al. (2013). Promoting obesity prevention together with environmental sustainability. *Health Promotion International* 29(3): 454-462.
- Monsell A, Krzanowski J, Page L, Cuthbert S, Harvey G (2021) What mental health professionals and organisations should do to address climate change. *B J Psych Bull* 45(4): 215-221.
- Reisch LA, Gwozd W (2011) Chubby cheeks and climate change: childhood obesity as a sustainable development issue. *International Journal of Consumer Studies* 35(1): 3-9.

33. Robison TN (2010) Save the world, prevent obesity: piggybacking on existing social and ideological movements. *Obesity* (Silver Spring Md) 18(1): S17-22.
34. Davis JM (2010) What is early childhood education for sustainability? In: Davis JM (Ed.) *Young Children and the Environment: Early learning for sustainability*. Cambridge University Press, Melbourne, pp. 21-42.
35. (2019) Coronavirus disease (COVID-19). World Health Organization.
36. Huizar MI, Arena R, Laddu DR (2020) The global food syndemic: The impact of food insecurity, malnutrition and obesity on the healthspan amid the COVID-19 pandemic. *Prog Cardiovasc Dis* 64: 105-107.
37. Mattioli AV, Pinti M, Farinetti A, Nasi M (2020) Obesity risk during collective quarantine for the COVID-19 epidemic. *Obes Med* 20.
38. Stavridou A, Kapsali E, Panagouli E, Thirios A, Polychronis K, et al. (2021) Obesity in children and adolescents during COVID-19 pandemic. *Children* 8(2): 135.
39. Adams EL, Caccavale LJ, Smith D, Bean, MK (2020) Food insecurity, the home food environment, and Parent feeding practices in the era of COVID-19. *Obesity* (Silver Spring Md) 28(11): 2056-2063.
40. Allabadi H, Dabis J, Aghabekian V, Khader A, Khammash U (2020) Impact of COVID-19 lockdown on dietary and lifestyle behaviour among adolescents in Palestine. *Dynamics of Human Health* 7(2): 1-11.
41. Grilo CM, Masheb RM, Wilson GT, Gueorguieva R, White MA (2011) Cognitive-behavioral therapy, behavioral weight loss, and sequential treatment for obese patients with binge-eating disorder: a randomized controlled trial. *J Consult Clin Psychol* 79(5): 675-685.
42. Martins IJ (2016) Anti-aging genes improve appetite regulation and reverse cell senescence and apoptosis in global populations. *Advances in Aging Research* 5: 9-26.
43. Gidding SS, Dennison BA, Birch LL, Daniels SR, Gillman MW, et al. (2006) Dietary recommendations for children and adolescents: a guide for practitioners. *Pediatrics* 117(2): 544-559.
44. De PMB, Santos ILL, Ide BH, Moraes BL, De MEV, et al. (2022) Interventions aimed at childhood overweight and obesity: a narrative review. *Brazilian Journal of Health Review* 5(2): 6354-6363.
45. Martins IJ (2018) Increased Risk for Obesity and Diabetes with Neurodegeneration in Developing Countries. *Top 10 Contribution on Genetics*. Chapter 1, Avid Science, pp. 2-35.
46. Martins IJ (2017) Nutrition therapy regulates caffeine metabolism with relevance to NAFLD and Induction of type 3 Diabetes. *HSOA J Diabetes and Metab Disord* 4(1): 1-9.
47. Martins IJ (2017) Single Gene Inactivation with Implications for Diabetes and Multiple Organ Dysfunction Syndrome. *J Clin Epigenet.* 3 (3): 24.