Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva / Italian Journal of Health Education, Sports and Inclusive Didactics - ISSN 2532-3296 - Anno 4 n. 1 - gennaio - marzo 2020 - ISBN 9788860223753 - CC BY-NC-ND 3.0 IT - doi: 10.32043/gsd.v4i1.160

OVERWEIGHT AND OBESITY IN CHILDREN. A BRIEF REVIEW

SOVRAPPESO E OBESITÀ NEI BAMBINI. UNA BREVE REVISIONE

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Abstract

Overweight and obesity are conditions of excessive body fat accumulation. In clinical practice, child and adolescent overweight and obesity are commonly identified by age- and gender-specific body mass index (BMI) percentiles, BMI standard deviation scores, and waist circumference (WC) percentiles relative to a reference population. A recent analysis of population data of children aged five to 19 years estimated that in 2016 obesity was identified in 50 million girls and 74 million boys worldwide. In the USA in 2014, the prevalence of child and adolescent obesity (BMI > 95th centile) was 9.4% (two to five years), 17.4% (six to 11 years), and 20.6% (12 to 19 years). In Europe, obesity prevalence was on average 4.0% in adolescents, with vast differences between countries. Childhood obesity prevalence is increasing in middle- and low-income countries, for example, up to 40% of children in Mexico were living with obesity or overweight, 32% in Lebanon and 28% in Argentina. Health problems are common in children and adolescents with obesity. These include cardiovascular conditions (e.g. hyperlipidaemia, hypertension), endocrinologic conditions (e.g. Type 2 diabetes, metabolic syndrome), gastrointestinal conditions (non-alcoholic fatty liver disease), respiratory conditions (e.g. obstructive sleep apnoea), musculoskeletal disorders, (e.g. slipped capital femoral epiphysis) and psychosocial disorders (e.g. depression, anxiety.

Sovrappeso e obesità sono condizioni di eccessivo accumulo di grasso corporeo. Nella pratica clinica, il sovrappeso e l'obesità nei bambini e negli adolescenti sono comunemente identificati dai percentili dell'indice di massa corporea (BMI) specifici per età e genere, punteggi di deviazione standard dell'IMC e percentili di circonferenza della vita (WC) rispetto a una popolazione di riferimento. Una recente analisi dei dati sulla popolazione di bambini dai 5 ai 19 anni ha stimato che nel 2016 l'obesità è stata identificata in 50 milioni di ragazze e 74 milioni di ragazzi in tutto il mondo. Negli Stati Uniti nel 2014, la prevalenza dell'obesità infantile e adolescenziale (BMI> 95 ° centile) è stata del 9,4% (da due a cinque anni), del 17,4% (da sei a 11 anni) e del 20,6% (da 12 a 19 anni). In Europa, la prevalenza dell'obesità è stata in media del 4,0% negli adolescenti, con grandi differenze tra i paesi. La prevalenza dell'obesità infantile è in aumento nei paesi a medio e basso reddito, ad esempio fino al 40% dei bambini in Messico viveva con

obesità o sovrappeso, il 32% in Libano e il 28% in Argentina. I problemi di salute sono comuni nei bambini e negli adolescenti con obesità. Questi includono condizioni cardiovascolari (ad es. Iperlipidemia, ipertensione), condizioni endocrinologiche (ad es. Diabete di tipo 2, sindrome metabolica), condizioni gastrointestinali (epatopatia adiposa non alcolica), condizioni respiratorie (ad es. Apnea ostruttiva del sonno), disturbi muscoloscheletrici, e disturbi psicosociali (es. depressione, ansia).

Keywords

Overweight, Obesity, Children, Physical activity, Childhood
Sovrappeso, Obesità, Bambini, Attività fisica, Infanzia

Introduction

Growing overweight and obesity rates increasingly represent a growing problem in the World Health Organization (WHO) European region, despite actions developed to reverse the rising trend. Since the 1980s the prevalence of obesity has more than tripled in many European countries, with a concomitant increase in rates of non-communicable diseases (NCDs). Each year large part of the National health expenditure is due to diseases related to obesity, like diabetes, hypertention, cardiovascular diseases (CVDs), metabolic syndrome (MetS), etc.: these are leading causes of disability and death, together accounting for 77% of the burden of disease and almost 86% of premature mortality (Nittari et al. 2019).

In addition, there are important indirect sanitary and social costs due, for example, to absence from work for illness with a consequent loss of productivity (GHO 2018; Spáčilová et al. 2007). A strong correlation has been demonstrated between obesity, NCDs and incorrect lifestyles (tobacco and alcohol use, drug abuse), unhealthy diets, sedentary habits. Several researchers have pointed out (Karch et al. 2016) that compulsive eating habits and drug abuse induce similar neuroadaptive responses in brain reward circuits, since the same brain cells are associated both with binge-eating and conducts unrelated to food, but involving drugs of abuse such as cocaine, heroine, stimulants, hallucinogens, and ensuing complications (Peña-Alvarez et al. 2006). Plus, in alcohol abusers, the administration of pain relievers, such as paracetamol, may give rise to a greater risk of hepatotoxicity, especially with pre-existing liver disorders (Tittarelli et al. 2017).

In fact, both obesity and drug addiction have been linked to a dysfunction in the brain's reward system. In both cases overconsumption can trigger a gradual increase in the reward threshold requiring more and more palatable high-fat foods or reinforcing drug to satisfy the craving over time. The motivation to eat, like the motivation to take addictive drugs, activates the forebrain dopamine systems (N.D. et al. 2013). Despite the remarkably high level of public awareness of the noxious influence of overweight and obesity on human health, the prevalence of these risk factors has reached an alarming level, which leads to the conclusion that obesity has reached epidemic proportions in Europe. Furthermore, the situation is exacerbated by excessive body weight, excessive caloric intake, saturated and trans fats, sugar and salt (as well as low consumption of vegetables, fruits and whole grains) that represent leading risk factors and priority concerns (N.D. et al. 2013). Overweight and obesity are noticeable among adults of the WHO European region, but are also highly prevalent among children and adolescents (Petrelli et al. 2018).

Physical activity

Recently, Faught 2017 reported that meeting the Canadian recommendations for diet, physical activity, sedentary behaviour and sleep at age 11 years was associated with favourable

school achievement at age 12 (N = 4253) (Faught et al. 2017). Low levels of physical fitness (Chaddock et al. 2011; Raine et al. 2013) and moderate-to-vigorous intensity physical activity have also been linked to impaired cognitive functions in children (Haapala et al. 2017). In addition to the observational evidence, a substantial body of literature suggests a causal relationship between increased levels of physical activity and cognitive function or school achievement or both. For example, a meta-analysis of 44 experimental and cross-sectional studies (in participants aged four to 18 years) indicates that increased physical activity caused significant overall improvement in cognitive function and school performance (Hedge's g = 0.32; standard deviation (SD) 0.27) (Sibley et al. 2008). A recent meta-analysis of 21 experimental and quasi-experimental studies in children aged four to 16 years (N = 4044) also reported a moderate positive effect of physical activity interventions on cognitive outcomes (Hedge's g = 0.46, 95% confidence interval 0.28 to 0.64) (Vazou et al. 2019). Physical activity may affect cognitive function and school achievement through physiological mechanisms (elevated blood circulation, increased levels of neurotrophins and neurotransmitters), learning and motor developmental mechanisms (Vazou et al. 2019).

Dietary modification

Composition of the diet may impact cognition and school achievement by altering neurotrophic and neuroendocrine factors involved in learning and memory. As shown in animal research, these factors are decreased by high-energy diets containing saturated fat and simple sugars, and are increased by diets that are rich in omega-3 polyunsaturated fatty acids and micronutrients (Martin et al. 2018). These findings were also observed in children. Cross-sectional data of school-aged children linked dietary intake of omega-3 fatty acids to increased memory performance (Baym et al. 2014), while consumption of food rich in saturated fatty acids and refined sugar was associated with decreased memory performance (Baym 2014). Longitudinal observational data suggest that diets high in fat and sugar in preschool children (N = 3966; aged three to four years) are associated with decreased intelligence and school performance at primary/elementary school age (Northstone et al. 2012). A controlled healthy school meal intervention over three years in more than 80,000 children led to improved mathematics, English and science achievement (Belot and James 2011). Promotion of healthier school food at lunchtime and changes in the school dining environment over 12 weeks improved classroom on-task behaviour in preschool children compared to controls (Storey et al. 2011). An improvement in dietary quality could therefore have beneficial effects on cognition and school achievement even without improved weight status.

Sedentary behaviour

A sedentary lifestyle in children, particularly television-viewing for two or more hours a day, is associated with the development of obesity or overweight (Rey-López et al. 2008) and may replace opportunities to engage in activities that promote scholastic and cognitive development. To our knowledge, there is no published literature on the effect of reduced sedentary behaviour and improved cognitive and academic outcomes of children and adolescents. However, epidemiological evidence suggests that high levels of sedentary behaviour are associated with reduced school achievement or cognitive abilities. For example, longitudinal data indicate that children younger than three years of age with low television exposure (less than three hours a day) performed better than those with high television exposure (three or more hours a day) in reading (N = 1031) and mathematics (N = 1797) (Peabody Individual Achievement Test) when at preschool age (Zimmerman and Christakis 2005). Similarly, parent-reported television viewing in preschool children was inversely related to mathematics achievement at age 10 years

(N = 1314) (Pagani et al. 2010) and reading achievement at age 10 to 12 years (N = 308) (Ennemoser and Schneider 2007). Low TV exposure was also linked to improved school achievement in 8061 adolescents aged 16 years (Kantomaa et al. 2016). Longer-term educational outcomes may also be affected. Hancox 2005 found that young people (N = 980; follow-up 21 years) with the highest television viewing time during childhood and adolescence tended to have no formal educational qualifications, and those with a university degree watched the least television during childhood and adolescence (Hancox, Milne, and Poulton 2005). Television viewing for three or more hours a day at age 14 years (N = 678) was associated with a two-fold risk of failing to obtain a post-secondary/high school education at 33 years of age compared with those watching television for less than one hour a day, mediated by attention difficulties, frequent failure to complete homework and negative attitudes about school at 16 years of age (Johnson et al. 2007). Studies relating accelerometer-measured sedentary behaviour to cognitive function or school achievement or both indicated that high levels of sedentary behaviour at age seven years were associated with reduced verbal reasoning skills at age 11 (Aggio et al. 2016), and that low levels of sedentary behaviour were associated with increased school achievement at age 10 to 11 years (Aadland et al. 2017). Reducing sedentary behaviour (TV and screen time, sitting time) might therefore improve cognitive function and school achievement in children and adolescents with obesity or overweight.

Conclusion

It is clear that childhood obesity is associated with a wide spectrum of adverse outcomes, including many outcomes that are similar to those seen in adults. Obesity in childhood affects virtually every organ system in an adverse manner. There is still much to be learned about the pathophysiological mechanisms for specific adverse effects of obesity. It will be important for translational research to be done in this area. Such research will inform how to identify patients with obesity who are at high risk for developing specific adverse outcomes. This type of mechanistic research could also inform more specific strategies for treatment of comorbidities when weight management cannot be accomplished or is slower than desirable.

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