

Editorial

Pediatric Obesity: It's Time to Act!

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Introduction

According to the World Health Organization, childhood obesity is one of the most serious public health challenges of the 21st century [1] and this translates into an increased childhood risk for numerous physiological [2] and subsequently long term medical complications [3-6] such as hypertension, dyslipidemia, type 2 diabetes, sleep apnea and musculoskeletal impairments- as well as psychosocial conditions (e.g.; stigmatization) [2-9]. Obese children and adolescents are also at greater risk for becoming obese adults [10], who in turn are at an increased risk for developing serious lifelong comorbidities (cardiovascular, metabolic disease and cancer) [3-6,11].

The “weight” of the problem

Globally, the prevalence of overweight and obesity increased by 28% in adults and 47% in children between 1980 and 2013 [12]. Current estimates suggest that there are nearly 2,1 billion people in the world who are either overweight or obese [12]. In the United States, approximately one third of children and adolescents are overweight or obese [12,13].

Mechanisms behind the obesity

Several factors [14,15] can contribute to the increased prevalence of childhood obesity. A combination of excessive calorie consumption, sugar-sweetened beverage [16], coupled with a lack of physical activity, excess screen time, as well as the excess use of electronic games creates an energy imbalance, which then leads to weight gain [17]. However, multiple other factors play a significant role in excess weight gain [18], such as genetic predisposition, socioeconomic factors and other various conditions (Table 1).

The consequences of obesity

Obesity is an independent risk factor for excess morbidity and mortality [19] and it represent the fifth leading cause of death [12]. Although exact numbers are difficult to define, in 2000, 15% of deaths in the United States were attributable to excess weight [19]. Obesity contributes to an estimated 111,909 to 365,000 deaths in the US and at least 2.8 million deaths worldwide each year [20,21]. For both women and men, obesity as an adult is associated with a significant reduction in life expectancy. In addition to the increased risk of overall mortality [22], overweight and obesity are associated with an increased risk for multiple morbidities [23] (Table 2). In fact, the risk of developing a chronic disease (hypertension, stroke, heart disease,

gallstones and colon cancer) increases with increasing BMI [24,25]. One of the strongest associations is with diabetes mellitus: more than 80% of type 2 diabetes mellitus, in fact, is attributable to overweight and obesity [26]. Overweight individuals have a 3-fold higher risk and obese individuals have a 7-fold higher risk of developing type 2 diabetes compared with normal-weight peoples [27]. Obesity also increased the risk of certain cancers [28] in both men (renal, colon, thyroid, and esophageal cancers) and women (renal, gallbladder, and esophageal cancer) [29].

Furthermore, obesity has a particularly strong relationship with cardiovascular disease [30,31], increasing the risk of stroke, hypertension, heart failure, coronary disease, atrial fibrillation, and lipid abnormalities. Stroke and ischemic heart disease are one of the leading causes of death around the world³⁰. Multiple studies show an increased risk of ischemic stroke with increasing BMI [32-34]. Lipid abnormalities, including a reduction in high-density lipoprotein cholesterol along with an increase in low-density lipoprotein cholesterol, very low -density lipoprotein cholesterol, triglycerides, and total cholesterol, are associated with obesity [35].

Concurrent with the rising prevalence of childhood obesity in the last 30 years, Non-Alcoholic Fatty Liver Disease (NAFLD) [36,37]- which encompassing a wide spectrum of disorders such as simple steatosis, to Non Alcoholic Steato Hepatitis (NASH) and ultimately advanced fibrosis or cirrhosis- is the most common cause of chronic liver disease in pediatrics [37]. NAFLD is strongly associated with insulin resistance, glucose intolerance, and dyslipidemia and is currently regarded as the liver manifestation of the metabolic syndrome, a highly atherogenic condition even at a very early age [38,39]. At the present time, it involves between 3% and 11% of the pediatric population and affects about the 46% of overweight and obese children and adolescent [37,40]. Osteoarthritis increases with increasing BMI as well: obesity, in fact, represent, and the second risk factor after age- for development of osteoarthritis [41]. Excess mechanical forces lead to excessive joint loading and early osteoarthritis of the knee in obese people [42,43].

How can we challenge the obesity?

Dietary patterns, television viewing and other sedentary activities, and an overall lack of physical activity are predictors of obesity for both genders and therefore represent opportunities for intervention [44].

Overweight and obesity may be established as early as 2-5 years of age, highlighting the need for evidence-based effective prevention and treatment programs early in life [45]. Calls for the management of childhood obesity are urgent and frequent. Initiating and maintaining changes through lifestyle intervention, in order to prevent overweight and obesity progressing into adulthood, are major challenges [46]. The potential health consequences of lifestyle changes in young populations with overweight or obesity are well established, but treatments effects are modest, and sustainability has not been

Table 1: Causes of obesity.

Primary	Secondary
Environmental factors (e.g.; caloric intake, sugar-sweetened beverages, physical inactivity)	Genetic factors (e.g; monogenic obesity, syndromic obesity, predisposing polymorphisms)
Socioeconomic factors (e.g.; sedentary behaviors)	Endocrine diseases (e.g.; Cushing syndrome, hypothyroidism)
	Medications (e.g.; glucocorticoids, antidiabetics, antipsychotics, antidepressants)
	Psychological factors

Table 2: Obesity related morbidities.

System	Disease
Cardiovascular	Hypertension, coronary disease, stroke
Endocrine	Impaired Glucose Tolerance, Insulin Resistance, Dyslipidaemia Metabolic Syndrome, Type 2 Diabetes, Polycystic Ovary Syndrome, menstrual irregularities, precocious puberty,
Gastrointestinal	Gallstones, Gastroesophageal reflux, Nonalcoholic fatty liver disorders
Musculoskeletal	Osteoarthritis, Flat feet, Tibia vara, Ankle sprains, forearm fracture, slipped capital femoral epiphysis
Neurologic	Pseudotumor cerebri
Psychological	Depression , eating disorders, poor self-esteem, body image disorder, social isolation and stigmatisation
Pulmonary	Asthma, obstructive sleep apnea, exercise intolerance
Renal	Glomerulosclerosis

extensively researched. Family units and the home environment are recognized to have the greatest influence on child lifestyle habits and behaviors and hence serve as targets for prevention and treatment of obesity during childhood [47]. Parents have been acknowledged as the primary influence on the development of child eating and physical activity behaviors with their parenting styles also playing a role in development of healthy lifestyles. Thus, they are the primary focus for prevention efforts.

The decline of physical activity during adolescence occurs globally, and traditional approaches to weight management (information and advice) largely remain ineffective. Multidisciplinary approaches focusing on behavioral change techniques appear to be a suitable option. Specifically, recently more promising management of body weight occurred when behavioral lifestyle interventions replaced standard care. (e.g.; to reduce or eliminate intake of sugar-sweetened beverages, to reduce screen time, and track food and beverage intake).

In addition to traditional approaches to combating childhood obesity, web- and mobile phone- based interventions for weight management are promising [48-50]. Current advances in mobile technology may improve the attractiveness and accessibility of weight management support for children and adolescents with overweight or obesity. E-contact should be used for its significant capacity to prolong engagement and decrease withdrawal during sustainability phases that follow intensive intervention for weight management in young populations with a synergic effect. Internet-based intervention are effective on improving healthy behavioral changes and BMI z-score reduction [48-50], but additional researches are needed to design and test the effectiveness of the impact of mobile apps in pediatric weight loss programs.

Finally, bariatric surgery [51] is a limited therapy available for carefully selected adolescents.

The costs of the obesity

Calculating the exact cost of obesity is difficult. Beyond the global health concern is the fact that overweight and obesity are an economic

burden. Medical obesity-related costs – associated with the diagnosis and treatment of obesity- are estimated to be as high as \$209.7 billion [52-54], which represent approximately 21% of annual US health care expenditures. Estimates of the indirect costs from obesity [55] – related to morbidity and mortality and to events such a lost wages secondary to illness or disability and a loss of future gaining's due to premature death- are as high as \$66 billion per year, which yield total (direct and indirect) cost outcomes that may exceed \$ 275 billion annually [55]. Much of the direct cost of obesity is attributable to treating high-cost comorbidities such as cardiovascular disease (\$193-\$315 billion) and type 2 diabetes (\$105-\$245 billion) [56].

If, however, costs associated with obesity stayed constant and did not increase from 2010-2030, savings in medical spending would total \$549.5 billion [54,57].

Therefore, obesity imposes considerable external costs on society through health care expenses. Externalities associated with the current obesity epidemic merit adequate public interventions and policy change, with involvement at all levels of the health care system.

Conclusion

Obesity prevention across lifespan is vital and the main role is played by education. Behavioral change is difficult and takes time. However, a good working relationship between patient and provider, tailored information to individuals, and addressing motivational issues represent a potential effective tool to greatly reduce the incidence of obesity and improve the health. Early intervention is essential because of the widespread of childhood obesity: behavior modification and healthy lifestyle changes, however, remain the corner store to successful pediatric obesity prevention and treatment.

References

1. Buckley H. Clinical brief: severe acute respiratory syndrome (SARS). AAOHN J. 2003; 51: 303-305.
2. Pulgarón ER. Childhood obesity: a review of increased risk for physical and psychological comorbidities. Clin Ther. 2013; 35: A18-32.
3. Clinical Guidelines on the Identification, Evaluation, and Treatment of

- Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health. *Obes Res.* 1998; 6: 51S-209S.
4. Wijga AH, Scholtens S, Bemelmans WJ, De Jongste JC, Kerkhof M, Schipper M, et al. Comorbidities of obesity in school children: a cross-sectional study in the PIAMA birth cohort. *BMC Public Health.* 2010; 10: 184.
 5. Hopkins KF, Decristofaro C, Elliott L. How can primary care providers manage pediatric obesity in the real world? *J Am Acad Nurse Pract.* 2011; 23: 278-288.
 6. Biro FM, Wien M. Childhood obesity and adult morbidities. *Am J Clin Nutr.* 2010; 91: 1499S-1505S.
 7. Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *JAMA.* 2003; 289: 1813-1819.
 8. Tang-Péronard JL, Heitmann BL. Stigmatization of obese children and adolescents, the importance of gender. *Obes Rev.* 2008; 9: 522-534.
 9. Puhl RM, Latner JD. Stigma, obesity, and the health of the nation's children. *Psychol Bull.* 2007; 133: 557-580.
 10. Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet.* 2002; 360: 473-482.
 11. Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. *N Engl J Med.* 1992; 327: 1350-1355.
 12. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet.* 2014; 384: 766-781.
 13. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA.* 2014; 311: 806-814.
 14. Wardle J, Carnell S, Haworth CM, Plomin R. Evidence for a strong genetic influence on childhood adiposity despite the force of the obesogenic environment. *Am J Clin Nutr.* 2008; 87: 398-404.
 15. Pérusse L, Rankinen T, Zuberi A, Chagnon YC, Weisnagel SJ, Argyropoulos G, et al. The human obesity gene map: the 2004 update. *Obes Res.* 2005; 13: 381-490.
 16. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *Am J Clin Nutr.* 2013; 98: 1084-1102.
 17. Bäcklund C, Sundelin G, Larsson C. Validity of armband measuring energy expenditure in overweight and obese children. *Med Sci Sports Exerc.* 2010; 42: 1154-1161.
 18. Karnik S, Kanekar A. Childhood obesity: a global public health crisis. *Int J Prev Med.* 2012; 3: 1-7.
 19. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. *JAMA.* 2004; 291: 1238-1245.
 20. Flegal KM, Graubard B, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. *JAMA.* 2005; 293: 1861-1867.
 21. Ellulu M, Abed Y, Rahmat A, Yazan Ranneh, Faisal Ali. Epidemiology of obesity in developing countries: challenges and prevention. *Glo Epidemi Obes.* 2014; 2: 2.
 22. McTigue K, Larson JC, Valoski A, Burke G, Kotchen J, Lewis CE, et al. Mortality and cardiac and vascular outcomes in extremely obese women. *JAMA.* 2006; 296: 79-86.
 23. Hruby A, Hu FB. The Epidemiology of Obesity: A Big Picture. *Pharmacoeconomics.* 2015; 33: 673-689.
 24. Field AE, Coakley EH, Must A, Spadano JL, Laird N, Dietz WH, et al. Impact of overweight on the risk of developing common chronic diseases during a 10-year period. *Arch Intern Med.* 2001; 161: 1581-1586.
 25. Willett WC, Dietz WH, Colditz GA. Guidelines for healthy weight. *N Engl J Med.* 1999; 341: 427-434.
 26. National Diabetes Information Clearinghouse, US Department of Health and Human Services. Diabetes fact sheet. 2015.
 27. Abdullah A, Peeters A, De Courten M, Stoelwinder J. The magnitude of association between overweight and obesity and the risk of diabetes: a meta-analysis of prospective cohort studies. *Diabetes Res Clin Pract.* 2010; 89: 309-319.
 28. Polednak AP. Estimating the number of U.S. incident cancers attributable to obesity and the impact on temporal trends in incidence rates for obesity-related cancers. *Cancer Detect Prev.* 2008; 32: 190-199.
 29. Renehan AG, Tyson M, Egger M, Heller RF, Zwahlen M. Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet.* 2008; 371: 569-578.
 30. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet.* 2012; 380: 2095-2128.
 31. Global Burden of Metabolic Risk Factors for Chronic Diseases Collaboration (BMI Mediated Effects), Lu Y, Hajifathalian K, Ezzati M, Woodward M, Rimm EB, Danaei G. Metabolic mediators of the effects of body-mass index, overweight, and obesity on coronary heart disease and stroke: a pooled analysis of 97 prospective cohorts with 1.8 million participants. *Lancet.* 2014; 383: 970-983.
 32. Emerging Risk Factors Collaboration, Wormser D, Kaptoge S, Di Angelantonio E, Wood AM, Pennells L, Thompson A, et al. Separate and combined associations of body-mass index and abdominal adiposity with cardiovascular disease: collaborative analysis of 58 prospective studies. Emerging Risk Factors Collaboration. *Lancet.* 2011; 377: 1085-1095.
 33. Kurth T, Gaziano JM, Rexrode KM, Kase CS, Cook NR, Manson JE, et al. Prospective study of body mass index and risk of stroke in apparently healthy women. *Circulation.* 2005; 111: 1992-1998.
 34. Kurth T, Gaziano JM, Berger K, Kase CS, Rexrode KM, Cook NR, et al. Body mass index and the risk of stroke in men. *Arch Intern Med.* 2002; 162: 2557-2562.
 35. Poirier P, Giles TD, Bray GA, Hong Y, Stern JS, Pi-Sunyer FX, et al. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss. *Arterioscler Thromb Vasc Biol.* 2006; 26: 968-976.
 36. Welsh JA, Karpen S, Vos MB. Increasing prevalence of nonalcoholic fatty liver disease among United States adolescents, 1988-1994 to 2007-2010. *J Pediatr.* 2013; 162: 496-500.
 37. Marzuillo P, Del Giudice EM, Santoro N. Pediatric non-alcoholic fatty liver disease: New insights and future directions. *World J Hepatol.* 2014; 6: 217-225.
 38. D'Adamo E, Cali AM, Weiss R, Santoro N, Pierpont B, Northrup V, et al. Central role of fatty liver in the pathogenesis of insulin resistance in obese adolescents. *Diabetes Care.* 2010; 33: 1817-1822.
 39. Marzuillo P, Grandone A, Perrone L, Miraglia Del Giudice E. Understanding the pathophysiological mechanisms in the pediatric non-alcoholic fatty liver disease: The role of genetics. *World J Hepatol.* 2015; 7: 1439-1443.
 40. Marzuillo P, Miraglia del Giudice E, Santoro N. Pediatric fatty liver disease: role of ethnicity and genetics. *World J Gastroenterol.* 2014; 20: 7347-7355.
 41. Radin EL, Paul IL, Rose RM. Role of mechanical factors in pathogenesis of primary osteoarthritis. *Lancet.* 1972; 1: 519-522.
 42. Felson DT, Anderson JJ, Naimark A, Walker AM, Meenan RF. Obesity and knee osteoarthritis. The Framingham Study. *Ann Intern Med.* 1988; 109: 18-24.
 43. Smith KB, Smith MS. Obesity Statistics. *Prim Care.* 2016; 43: 121-135.
 44. Govindan M, Gurm R, Mohan S, Kline-Rogers E, Corriveau N, Goldberg C, et al. University of Michigan Health System. Gender differences in physiologic markers and health behaviors associated with childhood obesity. *Pediatrics.* 2013; 132: 468-474.

45. Mackey ER, Olson A, DiFazio M, Cassidy O. Obesity Prevention and Screening. *Prim Care*. 2016; 43: 39-51.
46. Wake M, Gold L, McCallum Z, Gerner B, Waters E. Economic evaluation of a primary care trial to reduce weight gain in overweight/obese children: the LEAP trial. *Ambul Pediatr*. 2008; 8: 336-341.
47. Farnesi BC, Ball GD, Newton AS. Family-health professional relations in pediatric weight management: an integrative review. *Pediatr Obes*. 2012; 7: 175-186.
48. Casazza K, Ciccazzo M. The method of delivery of nutrition and physical activity information may play a role in eliciting behavior changes in adolescents. *Eat Behav*. 2007; 8: 73-82.
49. Gow RW, Trace SE, Mazzeo SE. Preventing weight gain in first year college students: an online intervention to prevent the "freshman fifteen". *Eat Behav*. 2010; 11: 33-39.
50. Haerens L, Deforche B, Maes L, Stevens V, Cardon G, De Bourdeaudhuij I. Body mass effects of a physical activity and healthy food intervention in middle schools. *Obesity (Silver Spring)*. 2006; 14: 847-854.
51. Inge TH, Krebs KF, Barcia VF, Skelton JA, Guice KS, Strauss RS, et al. Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics*. 2004; 11: 217-223.
52. Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. *J Health Econ*. 2012; 31: 219-230.
53. Finkelstein EA, Trogon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Aff (Millwood)*. 2009; 28: w822-831.
54. Spieker AE, Pyzocha N. Economic impact of obesity *Prim Care*. 2016; 43: 83-95.
55. Hammond RA, Levine R. The economic impact of obesity in the United States. *Diabetes Metab Syndr Obes*. 2010; 3: 285-295.
56. Brill A. Health and Economic Benefits of Weight Loss among Obese U.S. Adults. 2014.
57. Finkelstein EA, Khavjou OA, Thompson H, Trogon JG, Pan L, Sherry B, et al. Obesity and severe obesity forecasts through 2030. *Am J Prev Med*. 2012; 42: 563-570.