

EDITORIAL

Obesity and Metabolic Syndrome in Adolescents: A Growing Clinical Challenge

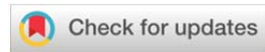
NAVEED SHUJA¹¹Professor of Biochemistry, Continental Medical College, Lahore - PakistanCorrespondence to: Naveed Shuja, Email: rananaveedshuja@gmail.com, Cell: +923334205687**This Editorial may be cited as:**

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The consequences of adolescent obesity extend beyond physical health¹¹. Affected adolescents often have low self-esteem, are anxious, depressed, socially isolated, bullied and have decreased involvement in school and sports activities¹². These psychological effects can even exacerbate eating habits and physical inactivity, which can further perpetuate a negative cycle of effects.¹³ Thus, it is important that management should not be limited to weight loss, but that the emotional health, the family support and the sustainable behavioral change as well should be taken into account¹⁴.

Early screening is of critical importance¹⁵. Body mass index percentile, waist circumference, blood pressure,

INTRODUCTION

Nowadays, adolescent obesity has emerged as one of the major clinical and public health problems¹. Obesity, once viewed primarily as a cosmetic or lifestyle issue, is now understood as a complex medical condition linked to insulin resistance, hypertension, dyslipidaemia, fatty liver disease, psychological stress and early cardiovascular risk². In 2022, the World Health Organization (WHO) reported that over 390 million children and adolescents aged 5-19 years were overweight, with overweight prevalence rising from 8% in 1990 to 20% in 2022³. This quick increase reflects that obesity is no longer confined to adulthood but is starting to take root in childhood and adolescence⁴.

Metabolic syndrome in adolescents represents a clustering of cardiometabolic abnormalities, including central obesity, raised blood pressure, impaired glucose regulation, high triglycerides, and low high-density lipoprotein cholesterol⁵. The significance of its importance is that these abnormalities are frequently subclinical in the early years and slowly contribute to the increased risk of type 2 diabetes mellitus, cardiovascular disease, chronic kidney disease, and non-alcoholic fatty liver disease (NAFLD)⁶. The risk of metabolic syndrome is significantly higher for adolescents with overweight and obesity than for normal-weight adolescents, and research indicates that the risk for overweight adolescents is several-fold higher⁷.

Changing social and environmental patterns compound the clinical challenge. Increased consumption of calorie-dense processed foods, sugar-sweetened beverages, sedentary screen-based behavior, reduced outdoor activity, poor sleep, academic stress, and family history of metabolic disease all contribute to the problem⁹. However, obesity is also commonly overlooked in many communities, with overweight in teens sometimes being confused as a natural part of growth or “a healthy look.” This late recognition permits the metabolic complications to develop in a silent way¹⁰.

fasting glucose, lipid profile, liver enzymes, and family history should be assessed in adolescents with obesity or rapid weight gain¹⁶. Additional work-up for insulin resistance, fatty liver disease, sleep apnea, and endocrine diseases may be warranted in high-risk patients¹. The goal should be to achieve early detection, before irreversible cardiometabolic damage occurs².

Prevention is the best approach³. It is important for schools, families, health care providers and policy makers to collaborate to encourage healthy eating, physical activity, limiting screen time, good sleep hygiene, and early counseling⁴. Treatment should be tailored to the person and not stigmatizing. Adolescents should not be

blamed for obesity; instead, they should be supported within their family and social environment⁶. Lifestyle modification remains the foundation of treatment, but multidisciplinary care involving pediatricians, nutritionists, psychologists, endocrinologists, and physical activity specialists is often needed for sustained improvement⁷.

In conclusion, obesity and metabolic syndrome in adolescents represent a growing clinical challenge with lifelong consequences⁸. The adolescent period provides a critical window for prevention, early diagnosis, and intervention⁹. Taking action early can minimise the risk of diabetes, cardiovascular disease and other metabolic problems in adulthood¹⁰. Addressing this problem requires not only medical treatment but also a broader public health approach that reshapes diet, activity, education, and community awareness¹¹.

REFERENCES

- Christian Flemming GM, Bussler S, Körner A, Kiess W. Definition and early diagnosis of metabolic syndrome in children. *J Pediatr Endocrinol Metab.* 2020;33(7):821-833. doi:10.1515/jpem-2019-0552.
- Jebeile H, Kelly AS, O'Malley G, Baur LA. Obesity in children and adolescents: epidemiology, causes, assessment, and management. *Lancet Diabetes Endocrinol.* 2022;10(5):351-365. doi:10.1016/S2213-8587(22)00047-X.
- Jakubiak GK, Osadnik K, Lejawa M, Osadnik T, Gotawski M, Lewandowski P, et al. Obesity and insulin resistance is the component of the metabolic syndrome most strongly associated with oxidative stress. *Antioxidants (Basel).* 2021;11(1):79. doi:10.3390/antiox11010079.
- Fahed G, Aoun L, Bou Zerdan M, Allam S, Bou Zerdan M, Bouferaa Y, et al. Metabolic syndrome: updates on pathophysiology and management in 2021. *Int J Mol Sci.* 2022;23(2):786. doi:10.3390/ijms23020786.
- Jankowska A, Brzeziński M, Romanowicz-Sołtyszewska A, Szlagatys-Sidorkiewicz A. Metabolic syndrome in obese children: clinical prevalence and risk factors. *Int J Environ Res Public Health.* 2021;18(3):1060. doi:10.3390/ijerph18031060.
- Leone A, Vizzuso S, Brambilla P, Mameli C, Ravella S, De Amicis R, et al. Evaluation of different adiposity indices and association with metabolic syndrome risk in obese children: is there a winner? *Int J Mol Sci.* 2020;21(11):4083. doi:10.3390/ijms21114083.
- Tropeano A, Corica D, Li Pomi A, Pepe G, Morabito LA, Curatola SL, et al. The metabolic syndrome in pediatrics: do we have a reliable definition? A systematic review. *Eur J Endocrinol.* 2021;185(2):265-278. doi:10.1530/EJE-21-0238.
- Orsini F, D'Ambrosio F, Scardigno A, Ricciardi R, Calabrò GE. Epidemiological impact of metabolic syndrome in overweight and obese European children and adolescents: a systematic literature review. *Nutrients.* 2023;15(18):3895. doi:10.3390/nu15183895.
- Noubiap JJ, Nansseu JR, Lontchi-Yimagou E, Nkeck JR, Nyaga UF, Ngouo AT, et al. Global, regional, and country estimates of metabolic syndrome burden in children and adolescents in 2020: a systematic review and modelling analysis. *Lancet Child Adolesc Health.* 2022;6(3):158-170. doi:10.1016/S2352-4642(21)00374-6.
- Ahmadi N, Sadr SM, Mohammadi MR, Mirzaei M, Mehrparvar AH, Yassini Ardekani SM, et al. Prevalence of abdominal obesity and metabolic syndrome in children and adolescents: a community-based cross-sectional study. *Iran J Public Health.* 2020;49(2):360-368. doi:10.18502/ijph.v49i2.3106.
- Amer OE, Sabico S, Khattak MNK, Alnaami AM, Aljohani NJ, Alfawaz H, et al. Increasing prevalence of pediatric metabolic syndrome and its components among Arab youth: a time-series study from 2010–2019. *Children (Basel).* 2021;8(12):1129. doi:10.3390/children8121129.
- Nagrani R, Foraita R, Gianfagna F, Iacoviello L, Marild S, Michels N, et al. Common genetic variation in obesity, lipid transfer genes and risk of metabolic syndrome: results from IDEFICS/I.Family study and meta-analysis. *Sci Rep.* 2020;10(1):7189. doi:10.1038/s41598-020-64031-2.
- Song Y, Wade H, Zhang B, Xu W, Wu R, Li S, et al. Polymorphisms of fat mass and obesity-associated gene in the pathogenesis of child and adolescent metabolic syndrome. *Nutrients.* 2023;15(12):2643. doi:10.3390/nu15122643.
- Perakakis N, Farr OM, Mantzoros CS. Leptin in leanness and obesity: JACC state-of-the-art review. *J Am Coll Cardiol.* 2021;77(6):745-760. doi:10.1016/j.jacc.2020.11.069.
- Hosseinpour-Niazi S, Bakhshi B, Zahedi AS, Akbarzadeh M, Daneshpour MS, Mirmiran P, et al. TCF7L2 polymorphisms, nut consumption, and the risk of metabolic syndrome: a prospective population-based study. *Nutr Metab (Lond).* 2021;18(1):10. doi:10.1186/s12986-021-00542-7.
- Scheidt TB, Brightwell AL, Easson SH, Thompson JA. Maternal obesity and programming of metabolic syndrome in the offspring: searching for mechanisms in the adipocyte progenitor pool. *BMC Med.* 2023;21(1):50. doi:10.1186/s12916-023-02730-z.
- Lu S, Wang J, Kakongoma N, Hua W, Xu J, Wang Y, et al. DNA methylation and expression profiles of placenta and umbilical cord blood reveal the characteristics of gestational diabetes mellitus patients and offspring. *Clin Epigenetics.* 2022;14(1):69. doi:10.1186/s13148-022-01289-5.
- Orsso CE, Colin-Ramirez E, Field CJ, Madsen KL, Prado CM, Haqq AM. Adipose tissue development and expansion from the womb to adolescence: an overview. *Nutrients.* 2020;12(9):2735. doi:10.3390/nu12092735.
- Wu YL, Lin ZJ, Li CC, Lin X, Shan SK, Guo B, et al. Epigenetic regulation in metabolic diseases: mechanisms and advances in clinical study. *Signal Transduct Target Ther.* 2023;8(1):98. doi:10.1038/s41392-023-01333-7.
- Jin X, Qiu T, Li L, Yu R, Chen X, Li C, et al. Pathophysiology of obesity and its associated diseases. *Acta Pharm Sin B.* 2023;13(6):2403-2424. doi:10.1016/j.apsb.2023.01.012.

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