

Over Nutrition in Children and Adolescents

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Eclipsing infectious diseases and under-nutrition as a significant contributor to mortality and morbidity over the past two decades, overweight and obesity is increasingly emerging as the most prevalent global nutritional problem both in low middle and middle income countries (LMICs) and high income countries (HICs) [1]. Globally, in 2016, an estimated 1.9 billion (39%) adults were overweight, of whom 650 (13%) million were obese. In 1975, under 1% of children and adolescents aged 5 - 19 years were obese, while in 2016 more than 124 million children were obese. Furthermore, between 1975 and 2016, the global obesity prevalence across all age groups has almost tripled [2]. This highlights the importance of the Sustainable Development Goals (SDGs), specifically SDG 2 that focuses on improving nutrition, health and ending malnutrition in children and adults [3]. Furthermore, the World Health Organization (WHO) Global Monitoring Framework for Non-Communicable Diseases (NCDs) target 7 focuses on childhood obesity. This indicates that while the current overweight prevalence in children under five years is 6.1%, the target for the year 2030 is to have eliminated childhood overweight and obesity [4]. In child development both healthy eating and physical activity (PA) are important contributing factors to maintaining good health and healthy attitudes and habits, but may be impeded by psychosocial and ecological factors related to the major current global problem of childhood obesity. The increasing trend of weight gain in children and adolescents as they transition into adulthood has become a major public health concern [5]. The adolescent or mid teen years have been suggested as the "tipping years" during which the co-morbidities leading to chronic diseases emerge as short term obesity health consequences and further progress as long term health conditions into adulthood [6]. These include diabetes, stroke, high blood pressure, cancers and heart disease, as well as mental illness and mortality [5].

The aetiopathogenesis of obesity is multi-faceted, with environmental, metabolic, socio-cultural, psychological and genetic factors [7]. Unhealthy diet and physical inactivity are modifiable risk factors that are the result of a complex interplay of various factors. Prevention of overweight and obesity is important in the reduction of nutrition-related NCDs. Middle-income countries such as South Africa, Brazil and China have increased overweight and obesity rates across all age groups and economic levels [8]. LMICs also face the dual burden of under and over nutrition and the latter may contribute to overweight and obesity risk, as well as associated cardiometabolic disorders, thus putting a larger demand on underdeveloped health systems [9]. Schools have been identified as an ideal environment for interventions as children and adolescents spend much of their time in this setting. Apart from providing an education, schools also can offer the instruction and knowledge required to maintain lifelong healthy eating and PA habits [10]. While literature on school-based interventions that address obesity exists, a lack of resources and funding have made it difficult to conduct and sustain such interventions in LMICs.

LMICs are undergoing a nutrition transition, where there is a shift from traditional diets such as whole grains, low salt, refined oils, sugar and flour, to nutrient-poor, energy-dense foods that are processed and are high in fat and refined carbohydrates [11]. Diets high in carbohydrates and low in fats have been associated with decreased high density lipoprotein cholesterol and increased levels of plasma triglycerides, both of which are associated with and contribute to cardiometabolic disease [12]. The shift from traditional diets have also increased sugar in global diets with sugar-sweetened beverages such as cool drinks, juices and teas, resulting in increased global obesity, especially in LMICs where trade liberal-

ization and globalization play an active role in influencing pricing and availability of foods [13].

Developments in obesity prevention in children and adolescents are ongoing and therefore RCTs focusing on diet and/or PA may provide effectiveness through inclusion of school and community-based obesity prevention interventions that considered cost-effectiveness, use of digital material for description analyses, incorporation of mHealth using mobile phones [14] and exploring the artificial intelligence (AI) and big data research agenda for nutrition studies [15].

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