
Effects of interventions to prevent and manage child and adolescent overweight and obesity: a systematic review

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Title of the review

Effects of interventions to prevent and manage child and adolescent obesity in low- and middle-income countries: a systematic review

Background

Overweight and obesity have emerged from primarily being concerns of affluent societies to becoming global public health threats, having reached alarming levels in all regions, age and socio-economic groups (Seidell, 2015). Recent estimates indicate 40% of adults globally are overweight, with 13% obese, 41 million children under 5 years are overweight or obese, and more than 340 million children and adolescents 5-19 years are overweight or obese (WHO, 2017). The increasing onset of overweight and obesity at a young age is of particular concern and poses immense current and future global public health challenges.

The burden in low- and middle-income countries (LMICs) is largely attributed to the “nutrition transition”, a shift away from generally nutritious traditional diets to high-energy and low-nutrient foods and increasingly sedentary lifestyles (Popkin, 2012). Many countries are now faced with a double burden of malnutrition: an increasing prevalence of overweight and obesity and related illnesses coexisting with a high prevalence of undernutrition, particularly micronutrient deficiencies, placing a large burden on health systems.

Risk factors for childhood obesity include: genetic predisposition; environmental and neighbourhood factors; increased intake of sweetened beverages, fast-foods, and processed snacks; decreased physical activity; and increased stress (Brown, 2015). Interventions to prevent and manage excess weight gain in children are critical to averting overweight and obesity and their serious health consequences later in life. Hyperlipidaemia, hypertension, insulin resistance, and abnormal glucose tolerance occur with increased frequency in obese children and adolescents (Weiss, 2004).

Preventing and managing overweight and obesity requires a lifecycle approach with good prenatal, infant, child, adolescent, and adult nutrition. are restricted to either children or adolescents (Al-Khudairy et al., 2017; Colquitt et al., 2016; Mead et al., 2017; Hiltje Oude Luttikhuis et al., 2009; Waters et al., 2011) or these are not comprehensive reviews (assessing a single intervention). Furthermore, existing systematic reviews have restricted their inclusions to randomised trials without focusing on various contextual factors that might potentially impact the effect of these interventions in this age group. The last comprehensive review on children and adolescents was done in 2011 (Waters et al., 2011). With the rapidly growing body of evidence in the field of obesity prevention and management and the recent

development of the WHO action plan on NCDs, it is important to update the evidence on effectiveness of interventions along with exploring the various contextual factors that might impact the effectiveness of these interventions. The proposed review will summarize up-to-date evidence for both children and adolescents with additional information regarding various contextual factors. Additionally, we will use the PROGRESS (place, race, occupation, gender, religion, education, socioeconomic status, social status) checklist to record whether outcome data were reported by socio-demographic characteristics known to be important from an equity perspective and to assess whether studies included specific strategies to address diversity or disadvantage (O'Neill et al., 2014). This review aims to update the evidence that exists from trials, as well as collate relevant data from evaluations of existing programmes on the effectiveness of various interventions for prevention and management of overweight and obesity in children and adolescents in low- and middle-income countries. It is intended that the results of this work will inform programme, policy and guideline development to effectively prevent and manage these conditions in LMICs and, thereby, improve the physical, emotional and social well-being of children and adolescents to help them achieve their maximum potential.

Objectives

1. What is the effectiveness of interventions to prevent and manage childhood obesity?
2. What is the effectiveness of interventions to prevent and manage adolescent obesity?

Existing reviews

Objective 1: Childhood obesity

Colquitt JL, Loveman E, O'Malley C, Azevedo LB, Mead E, Al-Khudairy L, Ells LJ, Metzendorf MI, Rees K. Diet, physical activity, and behavioural interventions for the treatment of overweight or obesity in preschool children up to the age of 6 years. *Cochrane Database Syst Rev* 2016, Issue 3. Art. No: CD012105. doi:10.1002/14651858.CD012105.

Kelishadi R, Azizi-Soleiman F. Controlling childhood obesity: A systematic review on strategies and challenges. *Journal of Research in Medical Sciences : The Official Journal of Isfahan University of Medical Sciences*. 2014;19(10):993-1008.

Mead E, Atkinson G, Richter B, Metzendorf MI, Baur L, Finer N, Corpeleijn E, O'Malley C, Ells LJ. Drug interventions for the treatment of obesity in children and adolescents. *Cochrane Database Syst Rev* 2016 Nov 29;11:CD012436.

Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, Summerbell CD. Interventions for treating obesity in children. *Cochrane Database Syst Rev* 2009 Jan 21;(1):CD001872. doi:10.1002/14651858.CD001872.pub2.

Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, Armstrong R, Prosser L, Summerbell CD. Interventions for preventing obesity in children. *Cochrane*

Database Syst Rev 2011, Issue 12. Art. No: CD001871.
doi:10.1002/14651858.CD001871.pub3.

Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW. Effectiveness of weight management interventions in children: a targeted systematic review for the USPSTF. *Pediatrics* 2010 Feb;125(2):e396-418. doi: 10.1542/peds.2009-1955.

Objective 2: Adolescent obesity

Boff RM, Liboni RPA, Batista IPA, de Souza LH, Oliveira MDS. Weight loss interventions for overweight and obese adolescents: a systematic review. *Eat Weight Disord* 2017;22(2):211-29. doi:10.1007/s40519-016-0309-1.

Lassi ZS, Moin A, Das JK, Salam RA, Bhutta ZA. Systematic review on evidence-based adolescent nutrition interventions. *Annals of New York Academy of Sciences* 2017;1393:34-50. doi:10.1111/nyas.13335.

Mead E, Atkinson G, Richter B, Metzendorf MI, Baur L, Finer N, Corpeleijn E, O'Malley C, Ells LJ. Drug interventions for the treatment of obesity in children and adolescents. *Cochrane Database Syst Rev* 2016 Nov 29;11:CD012436.

Salam RA, Hooda M, Das JK, Arshad A, Lassi ZS, Middleton P, Bhutta ZA. Interventions to Improve Adolescent Nutrition: A Systematic Review and Meta-Analysis. *J Adolesc Health* 2016; 59(4S):S29-S39. doi:10.1016/j.jadohealth.2016.06.022.

Al-Khudairy L, Loveman E, Colquitt JL, Mead E, Johnson RE, Fraser H, Olajide J, Murphy M, Velho RM, O'Malley C, Azevedo LB, Ells LJ, Metzendorf MI, Rees K. Diet, physical activity and behavioural interventions for the treatment of overweight or obese adolescents aged 12 to 17 years. *Cochrane Database of Systematic Reviews* 2017, Issue 6. Art. No.: CD012691. DOI: 10.1002/14651858.CD012691.

Intervention

The following interventions targeting children and adolescents will be included:

Dietary interventions

- Dietary education (school based, peer-based, community based, social media, parent education)
- Provision of balanced meals (school or community)

2. Physical activity

- Promoting exercise
- Reducing sedentary behaviour

3. Behavioural Therapy

4. Combination of any of the above interventions

These will be compared against no intervention or standard of care (whatever is applicable in the setting the study was conducted).

Population

The target populations are children under 5 years of age, school-aged children 5-9 years of age, and adolescents 10-19 years of age in low- and middle-income countries, regardless of health status.

Outcomes

Primary outcomes

- Change in body weight
- Change in body mass index (BMI)
- Change in body composition
- Adverse effects

Secondary outcomes

- Waist circumference, skinfold thickness
- Biomarkers such as lipid profile, glucose and insulin metabolism, leptin, adipocytokines and other obesity or inflammatory markers
- Health-related quality of life and self-esteem
- Change in knowledge, attitudes and behaviours regarding diet and physical activity
- All-cause mortality
- Morbidity
- Cost-effectiveness of the intervention

Study designs

We will include primary studies, including large-scale programme evaluations, that assess the efficacy and/or effectiveness of interventions using experimental and quasi-experimental study designs that allow for causal inference:

1. Studies where participants were randomly assigned, individually or in clusters, to intervention and comparison groups.
2. Studies where non-random assignment to intervention and comparison groups is based on other known allocation rules, including a threshold on a continuous variable (regression discontinuity designs) or exogenous geographical variation in the treatment allocation (natural experiments).
3. Controlled before-after studies in which allocation to intervention and control groups was not made by study investigators, and outcomes were measured in both intervention and control groups at baseline, and appropriate methods were used to control for selection bias and confounding, such as statistical matching (e.g., propensity score matching, or covariate matching) or regression adjustment (e.g., difference-in-differences, instrumental variables).
4. Interrupted time series studies in which outcomes were measured in the intervention group at least three time points before the intervention was implemented and at least three time points after.

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Weiss, R., Dziura, J., Burgert, T.S., Tamborlane, W.V., Taksali, S.E., Yeckel, C.W..... Caprio, S. (2004). Obesity and the metabolic syndrome in children and adolescents. *New England Journal of Medicine*, 350(23):2362-2374. doi: 10.1056/NEJMoa031049.

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Potential conflicts of interest

The authors are not aware of any conflicts of interest arising from financial or researcher interests.

Preliminary timeframe

- Date you plan to submit a draft protocol: 15 February 2018
- Date you plan to submit a draft review: 30 June 2018