Proceedings of the Nutrition Society (2024), **83 (OCE4)**, E311 doi:10.1017/S0029665124005494

Nutrition Society Congress 2024, 2–5 July 2024

Meal patterns and risk of childhood obesity and metabolically unhealthy obesity: a systematic review of the evidence, methodological issues and research gaps

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Childhood overweight/obesity (Ov/Ob) is a major public health problem, of greater concern when accompanied with comorbidities such as hypertension, insulin resistance leading to metabolically unhealthy obesity (MUO). Current evidence suggests a linkage between meal frequency, diet quality and nutritional status[1–3] in children and adolescents, however data regarding associations between meal patterns, Ov/Ob risk and MUO are limited. The aim was to explore associations between meal patterns and the risk of childhood Ov/Ob and MUO.

The PRISMA methodology was used to retrieve prospective studies and randomized controlled trials conducted in children/adolescents 2-19 years old in Europe, USA, Canada or Oceania, from 01/2013 to 06/2023. Exposures that were considered under the umbrella "meal patterns" included consumption of a meal, meal skipping, timing, format and context. The quality of the studies was assessed with the ROBINS-E and RoB-2 tools.

Of the 3,020 studies initially retrieved, 27 were included. All studies reported on Ov/Ob risk, whilst no studies on MUO were identified. All but one study had a longitudinal study design. Twenty-two studies (81%) had a high/very high risk of bias, mainly due to the methods measures of exposure were assessed. Consumption of/skipping breakfast was the most common exposure, followed by consumption of lunch (n = 5), dinner (n = 5), meal frequency/eating occasion (EO; n = 5) and consumption of fast foods (n = 4). Some studies reported on meal context (eating while watching TV; n = 4). In most studies, frequent breakfast and evening family dinners (i.e. 7 days/week vs <7days/week) were associated with lower odds of childhood Ov/Ob, BMI and %body fat at followup (FU). Four studies also showed that skipping breakfast was associated with increased obesity markers, while three studies showed no associations. There was limited evidence of a positive association between eating while watching TV and weight trajectories (n = 2). No associations were reported in relation to frequency of lunch and fast food intake. Results regarding meal frequency/EO and Ov/Ob at FU are conflicting, with differences attributed to the definition of an EO.

Evidence supports that frequent consumption of breakfast and family dinners may be associated with lower Ov/Ob risk in children and adolescents, while eating in front of TV with increasing weight trajectories. No studies were identified in relation to MUO, highlighting a significant research gap. Nevertheless, clear definition on EOs and improved methodological approach in the assessment of meal patterns emerged as a need, according to current review findings.

Acknowledgments

The Bio-Streams project has received funding from the European Union's HORIZON 2022 research and innovation programme under grant agreement No 101080718.

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