**Predicting childhood overweight and obesity using maternal and early life risk factors: a systematic review**

Nida Ziauddeen, Paul J. Roderick, Nicholas S. Macklon, Nisreen A. Alwan

Academic Unit of Primary Care and Population Sciences, Faculty of Medicine, University of Southampton, Southampton, UK (Miss N Ziauddeen MSc, Professor P J Roderick PhD, Dr N A Alwan PhD)

Academic Unit of Human Development and Health, Faculty of Medicine, University of Southampton, Southampton, UK (Professor N S Macklon MD)

Correspondence:

Miss Nida Ziauddeen

Room AC22, Public Health and Medical Statistics,

Southampton General Hospital

Southampton SO16 6YD, UK

N.Ziauddeen@soton.ac.uk

**Abstract**

**Background**: Childhood obesity is a serious public health challenge and identification of high-risk populations for early intervention to prevent its development is a priority. We aimed to systematically review prediction models for childhood overweight/obesity and critically assess the methodology of their development, validation and reporting.

**Methods:** Medline and Embase were searched from their start dates to 31/12/16 for studies published in English describing the development and/or validation of a model that could predict the development of overweight and/or obesity between 1 to 13 years using maternal and early life factors using:

{Pediatric Obesity/ OR Fetal Macrosomia/ OR

[(child or childhood or children or p#ediatric\* or infant\* or toddler or embry\* or prenatal\* or neonat\*).mp. AND (obes\*.mp. OR overnutrition/ or obesity/ or overweight/ OR overweight.mp. OR over weight.mp.)]} AND

[exp causality/ OR ((Reinforc\* or Enabl\* or predispos\*) and factor\*).mp. OR (risk\* or predict\* or causal\* or prognos\* or causation).mp.] AND [exp Maternal Behavior/ OR maternal.mp. OR mother\*.mp. OR early life.mp.]

Data were extracted using the Cochrane CHARMS checklist. The TRIPOD statement was used to assess transparency in reporting.

**Findings:** Ten studies were identified that developed (one), developed and validated (seven) or externally validated an existing (two) prediction model. A median of 23 (interquartile range, 22 to 24) TRIPOD items out of 37 (31 for derivation/validation alone) were reported. Except one, all models were developed using automated variable selection methods. Four studies only included complete cases and two studies used multiple imputation to handle missing data.

Maternal body mass index, birthweight and gender were the most commonly included predictors. Median AUROC was 0.78 in development/internal validation and 0.71 in external validation.

**Conclusion:** It was not possible to combine the results due to considerable model heterogeneity. Some included models have not been externally validated or compared to existing models to assess performance.

New methods are needed to combine findings from existing prediction models. Future prediction models need to be developed, validated and recalibrated to target populations using standard robust methods to refine the applicability of the resulting scores.

**Funding**

NZ is supported by a University of Southampton PhD studentship.

**Contributions**

NZ carried out the literature search and drafted the first version of the abstract. All authors have contributed to the study concept and design and have reviewed and approved the final draft of the abstract.

**Competing interests**

The authors have no competing interests to declare.

**Supporting information**

NZ is a PhD student.