

DOHaD 2026 ABSTRACT

Beyond Birthweight: Unravelling the Roles of Genetics and Early Life Nutrition in Mitigating Child Obesity

Wang CA^{1,2}, Connor KL³, Mohammadkhani S³, Lye SJ⁴, Mori TA⁵, Beilin L⁵, Oddy WH⁶, Pennell CE^{1,2}

¹University of Newcastle, Newcastle, Australia

²Hunter Medical Research Institute, Newcastle, Australia

³Carleton University, Ottawa, Canada

⁴Lunenfeld-Tanenbaum Research Institute, Toronto, Canada

⁵University of Western Australia, Perth, Australia

⁶University of Tasmania, Tasmania, Australia

Email: carol.wang@newcastle.edu.au; craig.pennell@newcastle.edu.au

Background: Despite the observed relationship between birthweight (BW) and non-communicable disease, focusing on BW alone has delayed progress in preventing obesity. Polygenic scores (PGS) and gene-environment interactions (GxE) have identified population subgroups who could benefit from enhanced nutritional support to prevent obesity. The role of PGS in childhood obesity (ChOB) prevention remains unknown. The aim of this study was to evaluate BW- and ChOB-PGS as tools to identify individuals who could benefit from interventional studies to reduce obesity, specifically assessing gene-environment (GxE) interactions with early nutrition on early-life and childhood BMI.

Methods: Data were obtained from the Raine Study (n=1328), Perth, Australia. Five obesity predictors (birthweight, early BMI (1-3 years), two BW-PGSs, ChOB-PGS) and three nutrition measures (breastfeeding duration, diet quality at 1- [EAT₁] and 3-years [EAT₃]) were analysed. Multivariable analyses examined associations and GxE interactions with early nutrition and child BMI at 5-, 8-, and 10-years.

Results: BW-PGSs were not associated with early or child BMI. In univariate analyses, Early BMI and ChOB-PGS were significant predictors of child BMI (all p-values<0.001). In univariate analyses, EAT₁, but not EAT₃ or breastfeeding, was inversely associated with child BMI (all p-values<0.005). Three significant GxE interactions were observed; BW-PGSxEAT₁ for early BMI (p=0.023) and 8-year BMI (p=0.044), and ChOB-PGSxEAT₁ for BMI at 10-years (p=0.015). Higher nutritional quality appeared to reduce early and child BMI among participants with higher PGSs. No other significant GxE interactions were identified.

Conclusions: Polygenic scores and nutrition, particularly in the first year, could guide and target interventions to optimise resource allocation for early nutritional support in high-risk subgroups to prevent childhood obesity.