

Obesity prevention:

are we missing the (conception to infancy) window?

Despite decades of research and public policy efforts, obesity continues to be a major public health threat. Effective, sustainable weight loss treatments in adults have been elusive¹ and prevention and treatment efforts aimed at children, although somewhat more promising, have failed to have a significant impact on the obesity epidemic.

More recently, some obesity researchers have started to focus on the earliest period of life, from conception to infancy, and have found compelling evidence to suggest that this period may be a critical window of opportunity for prevention of lifelong obesity.^{2,3}

It is commonly believed that obesity is caused by a simple thermodynamic equation (energy in, minus energy out) and that an individual's weight is the result of personal choices of excess consumption and inadequate activity. This assumption forms the basis of almost all of our obesity prevention and treatment programmes but it oversimplifies a very complex condition. In fact, individual choices may only be symptoms of an underlying problem in regulation of appetite or energy metabolism.⁴ We all know 'metabolically gifted' individuals who remain thin with no apparent effort or extraordinary willpower. Every individual seems to have a pre-determined weight 'set point' and a strong biologic tendency to defend it. Though much of this is genetically determined, there is a growing body of evidence to suggest that it may also be related to modifiable factors established early in life.

PERINATAL ORIGINS OF OBESITY

Many of the risk factors associated with obesity have their origins in the perinatal period: maternal weight, smoking and diabetes, very low or high birth weight, breastfeeding, sleep duration, early introduction of solids, and parental feeding style.³ Rapid weight gain during the first year of life is one of the strongest predictors of later obesity and metabolic syndrome. Though not yet completely understood, several promising mechanisms to explain these observations have been described. The expression of genes can be influenced by factors in the early environment and specific epigenetic changes have been identified in genes that regulate energy metabolism. Critical neural and endocrine pathways for

hunger, satiety, energy metabolism and behaviour are established during early life.² Alterations in the microbiome have also been proposed as a potential mechanism.

These observations lead to the attractive possibility that we may be able to deliberately control the early feeding environment to programme the development of healthy patterns of appetite, satiety, and energy metabolism to avoid lifelong struggles with obesity. The amount of energy an individual consumes and expends remains important at any age but attending to this balance very early in life appears to have a far greater potential for impact.

Animal studies have confirmed that over-feeding in infancy leads to obesity in later life.² Epidemiologic studies of populations exposed to perinatal over- or under-feeding such as survivors of famine or premature babies subjected to over-feeding for 'catch-up' growth are at increased risk of later obesity.³ Prospective human studies examining a variety of interventions and outcomes to test this programming hypothesis are just beginning.⁵ Most studies demonstrated some effect on either behaviour or growth. For example, Machuca *et al* performed a non-randomised observational control study of paediatricians running a well-baby group on obesity prevention for low income mother-baby dyads from birth to 18 months and found that babies in the intervention group were significantly less likely to be overweight at 2 years than children receiving traditional well-child care (2.1% versus 15.0%; OR 0.12; 95% CI = 0.02 to 0.94; $P = 0.02$).⁶ An Australian randomised controlled trial (RCT) employed home visits by nurses from 0-24 months and showed a significant difference in BMI at age 2 years ($P = 0.009$) but this effect disappeared by the follow-up at age 5 years.⁷ The Growing Leaps and Bounds RCT examined infants exposed to several brief paediatric office-based interventions and showed a significant decrease in consumption of sugar-sweetened beverages ($P = 0.02-0.006$) and delayed introduction of solids ($P < 0.05$) but no difference in growth.⁸ Several other studies have shown similar results.

BENEFITS OF EARLY PREVENTION

More research is needed to identify which interventions during pregnancy and infancy may be most effective and sustainable

but there are many practical reasons for clinicians to consider introducing obesity prevention discussions at an early stage.

During pregnancy and the newborn period, health care providers see patients frequently and growth monitoring is an established routine which provides many opportunities for discussion of both maternal and infant weight. Later in childhood, routine health maintenance visits become less frequent and the opportunity to share evidence-based childhood obesity prevention messages is lost. If unhealthy weight patterns are detected, there is less stigma around discussing this when children are 12 months rather than 12 years old.

Given that up to 36% of preschoolers are already overweight,⁹ beginning obesity education after the age of 2 years may already be too late for primary prevention. Children are also demonstrating unhealthy behaviours at a very young age. Studies from the US show that by 18 months, the most commonly consumed 'vegetable' is French fries. High-calorie desserts and sweetened beverages are consumed by nearly 45% of infants aged 9-12 months.³

Finally, the perinatal period has been found to be a uniquely 'teachable moment'¹⁰ during which parents are highly motivated and biologically programmed to make decisions to protect and nurture their babies. During infancy, parents have total control over what, when and where food is served but this control decreases as children gain mobility and become exposed to more caregivers and environments. It is a critical time to establish healthy routines since food preferences, eating and activity habits and parenting styles are all established at a very early age, often in the first 2 years.³ We can harness this early opportunity and parents' motivation for babies' benefit.

NO SILVER BULLET

It is exciting to recognise that altering the early feeding environment may make individuals more resistant to obesity by inducing permanent changes that favourably mediate the way energy is processed and stored. If we have learned anything about obesity, however, it is that there is no single intervention which will solve the problem in isolation. There are many factors which contribute to an individual's tendency to become overweight. Even if we can lower

"It is exciting to recognise that altering the early feeding environment may make individuals more resistant to obesity by inducing permanent changes that favourably mediate the way energy is processed and stored."

a person's risk for developing obesity, we must continue to encourage public policies to create a less obesogenic environment and promote education about the importance of exercise and healthy eating. But we should reconsider the current focus on treatment of individuals with established obesity which has shown little long-term effectiveness. Instead, it may be more cost effective to shift the focus of our efforts towards research and education during the very brief period of time from conception through to infancy, where a small investment to promote the establishment of a healthy weight set point may yield far greater returns in the long term.

As yet, there are no clear guidelines on the most effective interventions for very early prevention of obesity but there is good evidence to support education about healthy eating and activity as a basic health promotion strategy at any age. Providing anticipatory guidance for parents during pregnancy and infancy on the importance of starting healthy feeding habits early

and avoiding over-feeding can build the foundation for a lifelong obesity prevention strategy at a time when practitioners already have the attention of their audience, and when the potential for benefit and success may be greatest. Failure to share these messages during infancy may represent an important missed opportunity to permanently alter a child's weight and health trajectory.

Ilona Hale,

Clinical Assistant Professor, University of British Columbia Department of Family Practice UBC Department of Family Practice Clinician Scholar Program; Kimberley Medical Clinic; Faculty of Medicine, Centre for Rural Health Research, Department of Family Practice, University of British Columbia, Canada.

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The author has declared no competing interests.

DOI: <https://doi.org/10.3399/bjgp18X696269>

ADDRESS FOR CORRESPONDENCE

Ilona Hale

622 5th Avenue, Kimberley, British Columbia, V1A 2T2, Canada.

Email: ilona.hale@alumni.ubc.ca

REFERENCES

1. Mann T, Tomiyama AJ, Ward A. Promoting public health in the context of the 'obesity epidemic': false starts and promising new directions. *Perspect Psychol Sci* 2015; **10**(6): 706–710.
2. Desai M, Jellyman JK, Ross MG. Epigenomics, gestational programming and risk of metabolic syndrome. *Int J Obesity* 2005; **39**(4): 633–641.
3. Dattilo AM, Birch L, Krebs NF, *et al*. Need for early interventions in the prevention of pediatric overweight: a review and upcoming directions. *J Obesity* 2012; DOI: <http://dx.doi.org/10.1155/2012/123023>.
4. Chaput J-P, Ferraro ZM, Prud'homme D, Sharma AM. Widespread misconceptions about obesity. *Can Fam Physician* 2014; **60**(11): 973–975.
5. Redsell SAS, Edmonds B, Swift JA, *et al*. Systematic review of randomised controlled trials of interventions that aim to reduce the risk, either directly or indirectly, of overweight and obesity in infancy and early childhood. *Matern Child Nutr* 2016; **12**(1): 24–38.
6. Machuca H, Arevalo S, Hackley B, *et al*. Well baby group care: evaluation of a promising intervention for primary obesity prevention in toddlers. *Child Obesity* 2016; **12**(3): 171–178.
7. Wen LM, Baur LA, Simpson JM, *et al*. Sustainability of effects of an early childhood obesity prevention trial over time: a further 3-year follow-up of the Healthy Beginnings Trial. *JAMA Pediatr* 2015; **169**(6): 543–551.
8. Schroeder N, Rushovich B, Bartlett E, *et al*. Early obesity prevention: a randomized trial of a practice-based intervention in 0–24-month infants. *J Obesity* 2015; <http://dx.doi.org/10.1155/2015/795859>.
9. Twells LK, Newhook LA. Obesity prevalence estimates in a Canadian regional population of preschool children using variant growth references. *BMC Pediatr* 2011; **11**: 21.
10. Phelan S. Pregnancy: a "teachable moment" for weight control and obesity prevention. *Am J Obstet Gynecol* 2010; DOI: [10.1016/j.ajog.2009.06.008](https://doi.org/10.1016/j.ajog.2009.06.008).