Breastfeeding, complementary (solid) foods, and long-term risk of obesity

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The modern world, including most industrialized countries and an increasing number of low- and middle-income countries, is experiencing an unprecedented epidemic of overnutrition. As a result, life expectancy has been predicted to decline for the first time in recent history: children born today may die at a younger age than their parents (1). Because established obesity is notoriously resistant to treatment, much attention has focused on prevention, especially during infancy and childhood when lifelong habits of dietary intake and physical activity may be established and metabolic pathways may be set (“programmed”).

Much of the research and public health advocacy on preventing obesity has centered on the possible long-term effects of infant feeding, and particularly of breast- compared with formula-feeding (2, 3), and of rapid infant growth (4). Although the potential etiologic role of complementary (solid) foods has received less scrutiny, several previous studies have examined associations between age at introduction of complementary foods and infant growth, with most [including several randomized trials (5–8)] reporting no significant association. The evidence suggests that infants are capable of regulating their energy intake and that complementary foods displace breast milk or infant formula, with no clear effect on energy intake or weight or length gain.

Observational (nonexperimental) studies of infant feeding effects on growth and adiposity are plagued by reverse causality. Both infant feeding and growth are dynamic processes in which feeding may affect subsequent weight gain, but prior size may also affect subsequent feeding decisions. Thus, a small or slowly growing infant may undermine the mother’s confidence in the adequacy of her milk supply or her infant’s formula intake and, regardless of whether the mother is breastfeeding or formula-feeding, family members or health care providers may be led to recommend the addition of complementary foods to the infant’s diet. Whether or not those foods actually cause a subsequent increase in weight gain, regression to the mean will result in higher average weight gains in small infants than in large ones. The added solid foods then get the “credit” for the weight gain. The fact that the above-cited randomized trials (5–8) found no increased weight gain should make us very cautious about inferring a causal effect of infant feeding practices from any observational study.

The study by Schack-Nielsen et al (9) reported in this issue of the Journal is a welcome addition to the evidence base, because it includes follow-up to 42 y of age. Although it uses an observational design, the data were collected prospectively and have been carefully analyzed and interpreted. Surprisingly, despite no effect of age at introduction of complementary foods on sex- and age-standardized body mass index (BMI) z score during infancy or even later childhood, a significant inverse relation (later introduction associated with lower BMI) was observed at age 42 y, even after adjustment for duration of breastfeeding, maternal prepregnancy BMI, maternal smoking, and socioeconomic status. The authors speculate that the observed association might be explained by latent (delayed) effects on appetite, adipogenesis, or brain development associated with later behavior affecting body weight.

Caution is advised, however, before accepting the authors’ inference that earlier introduction of complementary foods is a cause of higher body mass in adulthood. A glance at the graph for spoon-feeding in their Figure 1 reveals no hint of an inverse relation (i.e., a point estimate to the left of the solid vertical line) until adolescence, when widening CIs raise the question of selection bias due to differential (by infant feeding) losses to follow-up. The only statistically significant effect was observed at age 42 y, when the CI narrowed due to more complete follow-up. But the higher follow-up rate at that age was achieved via questionnaire, and the potential for biased self-reported weight (differentially reported according to feeding history) cannot be dismissed.

In addition, the subjects studied in the Copenhagen Perinatal Cohort were born in 1959–1961, a time when the socioeconomic and cultural patterns of breastfeeding and of obesity were very different from those of today. I am not suggesting that the biological effect of age at introduction of complementary food has changed over the last half century, nor even that differences over time in the nutrient content of solid foods detract from the pertinence (generalizability) of the findings for today’s mothers and infants. But the fact that the median age at introduction of
complementary foods was 1 mo later than the median age at which breastfeeding was discontinued is very different from the current pattern; today, solid foods are routinely started while breastfeeding continues. Moreover, infant and child obesity were far less prevalent 50 y ago, and most obesity developed during adulthood.

Given the patterns of diet and physical activity that are typical of contemporary societies, I am pessimistic that delayed introduction of complementary foods or prolonged exclusive and partial breastfeeding will have useful effects on stemming the obesity epidemic. Starting infants and children on the road toward a healthy body weight is a very important public health goal but will require difficult lifestyle choices by individuals, families, and communities.

The author coauthored 2 manuscripts with the senior author (KFM) of the paper that prompted this editorial. He had no other conflicts to report.

REFERENCES