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Long-term effects of breastfeeding: a “healthier” eating index?

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Over the past 25 y, many studies have reported an association between breastfeeding (and its duration) and long-term nutritional outcomes, such as food consumption patterns or the prevalence of obesity during childhood and beyond. Nearly all have been observational studies and therefore inferences made about causal relation between the duration of breastfeeding and nutritional status thereafter can lead to false conclusions (1). This is due to the many codependent variables, confounders, and biases that can affect both breastfeeding duration and later nutritional outcomes; for example, the relation between breastfeeding and obesity has been shown to be affected by publication bias (2), reverse causality (3), and misclassification and confounding (1). In fact, analysis of the same data set using an observational compared with an experimental analytical design has led to opposite conclusions on this very question (3, 4). Therefore, although observed associations between breastfeeding duration and obesity have been widely reported and spark important interest for future study, there is no compelling evidence that longer breastfeeding duration causes improved nutritional outcomes (e.g., less obesity) in resource-rich settings.

In this issue of the Journal, Borkhoff et al. (5) refocus our attention on the relation between duration of breastfeeding and nutritional outcomes in children, with a novel analytic approach. They performed a cross-sectional analysis of data from the population of infants followed longitudinally in The Applied Research Group for Kids (TARGet Kids!) cohort. The authors studied 2987 children aged 3–5 y and assessed their “nutritional risk” using a validated tool (NutriSTEP), which captures information about dietary intake, eating behaviors, parental concern, screen time, and supplement use. They also asked parents to recall how long the child was breastfed in infancy. The design and findings are most similar to a previous observational report by Perin et al. (6) who found that consumption of more water, fruit, and vegetables, and fewer sugar-sweetened beverages at 6 y of age, was associated with breastfeeding duration in infancy. However, in this report, Borkhoff et al. (5) analyzed breastfeeding duration as a continuous variable ≤ 36 mo using restricted cubic spline (RCS) modeling with segmented linear regression to better examine the nonlinear relation between breastfeeding duration and nutrition risk. They report an association between breastfeeding for ≤ 12 mo and lower nutritional risk, specifically decreased sugar-sweetened beverage consumption and healthier

eating behaviors at 3–5 y; they did not find an association between breastfeeding beyond 12 mo and those nutritional outcomes.

Although the authors appropriately acknowledge that their study design was cross-sectional (despite the longitudinal nature of the cohort) and that causality cannot be determined, they suggest causality by citing several biologically plausible explanations for the observed association. These include a role for breastfeeding in enhancing the awareness of satiety and in supporting the acceptance of a wider variety of foods, as a result of exposure to flavors from the mother’s diet passed through the breast milk to the infant. However, none of these factors—maternal diet, infant hunger cues, or infant satiety—was directly assessed in this report. The determinants of infant and early childhood dietary intake are highly complex and human behavioral elements (of the child and caregivers) play central roles. Kramer et al. (3) recently argued that prolonged breastfeeding may merely be a marker of a satisfied infant, who goes on to be a less hungry, lower-weight toddler than does an infant who conveys additional hunger signals leading to formula supplementation who then might go on to be a hungrier, higher-weight toddler. In other words, there are infant and maternal factors that drive breastfeeding duration, which then likewise affect later childhood feeding behaviors, rather than the prevailing presumption that the breastfeeding duration itself influences later childhood feeding behaviors.

Beyond breastfeeding, there are a wide range of factors that greatly influence nutritional outcomes in early childhood, particularly with the introduction of complementary foods. Children at this age are limited to food provided by the family and caregivers—most often what they themselves are eating—and school or peer influences have yet to play a role. There are also critical family dynamics and circumstances which, in turn, affect which foods are offered, how meals are structured, and therefore which foods are accepted and most frequently consumed. Income, education, parenting strategies, siblings, meal structure, and many other factors can all influence the experience with new foods in the diet at these early ages. Food acceptance can also be affected by flavor exposure early

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in life (7, 8) and particularly in the case of vegetables can require ≥ 10 noncoercive exposures before acceptance (9). This is often not apparent to parents and can seem untenable in under-resourced families. An authoritative (but not authoritarian) approach to feeding children has also been associated with improved nutritional intake (10). Although Borkhoff et al. (5) attempted to control for some potential confounders such as maternal age and education, family income was not directly evaluated (data were adjusted based on zip code), and factors including parenting style, food introduction strategies, and foods available and usually consumed by the families of the study subjects were not reported.

Thus, family feeding practices and behaviors play a very important role in the development of a child's food choices. The high prevalence of overweight and obesity among children and adolescents across the globe threatens their short- and long-term health and longevity. It is important that we carefully design research to establish predictors of poor nutritional practices and outcomes to appropriately target intervention and prevention strategies. The use of prospective, longitudinal study designs with randomization—at least in analysis, if not in study design—whenever possible is essential to assess causality and to test hypotheses to inform future guidelines and recommendations. The complexity of human behavior and its role in feeding practices cannot be understated and attention to that complexity is required for successful research progress in this vital area.

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