Obesity and Breastfeeding: Exploring the Relationship

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Introduction

OBESITY HAS REACHED epidemic proportions in the United States and throughout much of the developing world. In the United States, 40.4% of women, 35% of men, and 17% of children and adolescents have obesity.^{1,2} With the high proportion of individuals who struggle with obesity, we seek to find strategies to mitigate the high prevalence of this disease. Yet, before we delve into the current literature that explores the relationship between obesity and breastfeeding, we must understand the complexity of obesity.

Obesity is a multifactorial disease in which genetics, behavior, environment, and development play a role in a person's likelihood of developing obesity. There are a host of factors that influence energy balance. Although many factors have yet to be elucidated, we are aware that there are many potential contributors to obesity, which include biological/medical, environmental pressures on physical activity, economic, food, and beverage behavior and environment, social, psychological, and maternal/developmental.³ In addition, we are aware that there are a host of hormonal factors that regulate food intake. In persons with genetic susceptibility to obesity, there is a biological defense of an elevated body fat mass, which is likely secondary to interactions between brain reward and homeostatic circuits.⁴

The Role of Genetics and Fetal Programming

Although it is evident that one factor alone cannot explain the obesity epidemic, it is known that genetics is a significant contributor. Early studies of human obesity demonstrate a heritability of weight and body mass index (BMI) of 0.78–0.81.^{5,6} Several hypotheses have been proposed to explain the heritability of obesity, including the following⁷:

1. Fetal programming hypothesis: Maternal over/under nutrition leads to an appropriate fetal response, which leads to obesity in offspring.⁸
2. Sedentary lifestyle hypothesis: There has been a decrease in physical activity and an increase in calorie-laden foods over time. However, further investigation suggests that physical activity has not decreased significantly, which then places a focus on dietary intake and metabolic enzymes' role in obesity.
3. Thrifty gene hypothesis: Throughout evolution, our bodies favor weight retention to protect against times of famine.
4. The predation release hypothesis: This hypothesis suggests that random genetic drift has occurred and selected for genes that predispose persons to obesity.
5. The ethnic shift hypothesis: As ethnic minority populations have increased, so has the portion of obesity in the population.
6. The increased reproductive fitness hypothesis: Women with higher weights, but not severe obesity, have higher fertility rates. This would increase the likelihood of genetic variants that predispose to obesity.
7. The assortative mating hypothesis: Persons with similar BMI patterns tend to mate with each other. If persons with higher level of obesity mate with each other, this will select for genetic variants that predispose to obesity in the population.
8. The complex hypothesis: This suggests that obesity is secondary to a combination of the aforementioned hypotheses.

One landmark study that supports the fetal programming hypothesis evaluated whether significant weight loss modified obesity-related factors transmitted through the intrauterine environment. This study of children of ages 2.5–26 years born before and after bariatric surgery (biliopancreatic diversion) demonstrated significant improvements in cardiometabolic markers, which were sustained in the adolescence.⁹ In children who were born after maternal bariatric surgery, there was a three-fold decrease in severe obesity, increased insulin sensitivity, improved lipid profile, decreased C-reactive protein, leptin, and increased ghrelin compared with those offspring who were born before maternal bariatric surgery.

Breastfeeding and Childhood Obesity

Kachoria et al. evaluated breastfeeding initiation, continuation, and exclusivity by prepregnancy weight from 2004 to 2011 and the associations between these outcomes and prepregnancy weight.¹⁰ Among 244,196 women, with increasing BMI, a decreasing number of women initiated, continued, and breastfed exclusively. This study demonstrates that women with obesity are most at risk for low rates of breastfeeding. There have been few studies that have examined the association of low breastfeeding with race/ethnicity, but a large, nationally representative

sample that sought to assess racial/ethnic differences in breastfeeding noninitiation among U.S. women of different BMI classifications demonstrated that prepregnancy BMI is a significant factor in breastfeeding initiation and that this is most pronounced in non-Hispanic blacks.¹¹

In another study performed by Ehrenthal et al. that examined the relationship between infant feeding and risk of child overweight and obesity across race and ethnicity in a diverse community-based cohort, 2172 mother–baby dyads who were exclusively breastfed at 2 months of age were evaluated for the outcome of BMI Z-score and BMI $\geq$ 85th percentile at 4 years of age.¹² Although exclusively breastfed children had a lower BMI Z-score and a decreased likelihood of BMI $\geq$ 85th percentile compared with formula-fed children, race and ethnicity significantly moderated these associations such that only the children of non-Hispanic white mothers and not children of non-Hispanic blacks and Hispanics experienced this protective effect.

Since body composition in early life influences development of obesity later in life, Breij et al. investigated appetite-regulating hormones with feeding type (breastfed versus formula fed) and longitudinal fat mass percentage (FM%). Infants with formula feeding for 3 months had significantly higher serum levels of ghrelin, leptin, insulin, glucose-dependent insulinotropic peptide, and pancreatic polypeptide and lower serum levels of peptide YY at 3 months than breastfed infants.¹³ Leptin and ghrelin correlated positively with FM% at 3 months and insulin with change in FM% between 1 and 3 months. Unlike this study, many of the studies performed to evaluate the risk of obesity and breastfeeding are correlative studies instead of causal. In an international investigation of breastfeeding and BMI at age 6–7, data for 76,635 participants from 31 centers in 18 countries failed to demonstrate an impact of breastfeeding on BMI.¹⁴ Yet, meta-analysis of breastfeeding duration and childhood obesity of 25 studies with a total of 226,508 participants from 1997 to 2014 demonstrates that breastfeeding was associated with a significantly reduced risk of obesity in children (adjusted odds ratio = 0.78; 95% confidence interval: 0.74–0.81).

Breastfeeding and Postpartum Weight Change

Breastfeeding is linked to many health benefits in mothers and infants, but the role of breastfeeding in postpartum weight management is unclear. In a systematic review of 37 prospective and 8 retrospective studies, the majority of studies ($n = 27$, 63%) showed little or no association with breastfeeding and weight change in postpartum women.¹⁵ Of the five high-quality studies, four demonstrate positive association between breastfeeding and weight management. More robust studies are needed to assess the impact of breastfeeding on weight in the postpartum period.

Conclusion

At this time, it is unclear whether breastfeeding plays a role in obesity in offspring and weight retention in mothers in the postpartum period. We do know that breastfeeding affects appetite-regulating hormones in offspring. Breastfeeding likely has a positive impact on weight regulation in offspring and mothers. More studies are needed to clearly define the role of breastfeeding in obesity.

Disclosure Statement

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