

## Maternal & Infant Nutrition Briefs

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*A research-based newsletter prepared by the University of California for professionals interested in maternal and infant nutrition*



### **Obesity Linked to Breast-Feeding Problems**

While the negative impact of maternal undernutrition on breast-feeding has been well-studied, few studies have looked the effects of obesity on breast-feeding. In rats, obesity lowers milk production and changes the composition of milk (increases milk fat and decreases protein and lactose). As a result, pups of obese rats grow poorly and have higher death rates than pups of normal weight rats. Some epidemiological work suggests that obesity in humans may adversely affect initiation and duration of breast-feeding. However, these previous studies have not been able to separate the role of sociocultural and biological factors that may be involved. The purpose of this study was to examine the relationship of obesity to breast-feeding initiation and duration, independent of the potentially confounding factors of race, ethnicity, and social class.

The study involved a retrospective chart review of 1296 medical records from a hospital in rural New York. The sample was limited to mother-infant pairs (99% white) at low risk for contraindications to breast-feeding and thus excluded pre-term or adopted infants and infant cases of cleft lip or palate, neural tube defects, phenylketonuria, or diabetes. Data extracted from the chart included the following: birth weight; whether breast-feeding was attempted at delivery; whether the baby was still breast-feeding at discharge; mother's self-reported prepregnancy weight and height; mother's weight at delivery; mother's education, parity, age, and smoking habits; c-section or vaginal delivery; presence of gestational diabetes; and participation in the federal Women, Infants, and Child nutrition (WIC) program. Follow-up data on how the baby was being fed at 2 weeks and at 2, 4, 6, 9, 12, 15, 18, and 24 months was also taken from the pediatric records. Mother's pre-pregnancy weight status according to body mass index (BMI) was defined as follows: normal (BMI: < 26.1); overweight (BMI: 26.1-29.0); and obese (BMI > 29.0). The influence of being overweight or obese on initiation of breast-feeding (i.e., breast-feeding at discharge) was examined using multiple regression among mothers who tried to nurse after delivery. Mother's weight status and duration of exclusive breast-feeding or of breast-feeding to any extent was also examined in separate

analyses.

The authors reported that the decision to breast-feed (attempt nursing after delivery) was not associated with either a mother's prepregnancy or postpartum BMI. However, among women who tried to breast-feed, the risk of not continuing to nurse after discharge was 2.54 times greater for overweight women ( $p < 0.05$ ) and 3.65 times greater for obese women ( $p < 0.0007$ ), compared to normal weight women. Women who were overweight or obese before pregnancy were also more likely than normal weight women to stop breast-feeding early (42-43% more likely to end exclusive breast-feeding and 68-73% more likely to end any breast-feeding at all). The relationship between mother's BMI and breast-feeding initiation and duration was similar when data for WIC and nonWIC participants were analyzed separately.

This study is the first to examine the relationship between maternal fatness and the initiation of breast-feeding. Certain sociocultural or demographic factors, such as race, ethnicity, and income, are unlikely to explain these results, because the study was designed to control for these factors. The authors speculate that overweight and obese women may remain hyperinsulinemic during the transition from pregnancy to lactation. High insulin levels may interfere with the delivery of nutrients to the mammary glands, which in turn could lower milk production. Alternatively, latching on may be more difficult for infants of obese women than infants of normal weight women. Although more research is needed to identify the mechanisms involved, health providers should anticipate the need to provide additional breast-feeding guidance and support to women who were overweight or obese before pregnancy.

**Source:** Hilson, J. A., K.M. Rasmussen, C. L. Kjolhede. (1997) Maternal obesity and breast-feeding success in a rural population of white women. *AJCN* 66: 1371-8.

### **Lead: A Risk Factor for Lower Birth Weights?**

Previous studies have yielded inconsistent results on the relationship of lead in maternal blood to preterm delivery and birth weight. One explanation for the lack of consistency may be that lead level in whole blood is not a good indicator of fetal exposure since lead bound to red blood cells cannot freely pass the placental barrier. On the other hand, lead existing in a "free" state in the plasma is able to cross the placenta and correlates with bone lead levels. Lead remains in bone stores for many years, but pregnancy and lactation stimulate bone turnover, which could release the lead and adversely affect the baby's growth and development.

Women who have lived in Mexico City for many years may have a sizable depot of lead in their bones through exposure to lead from lead-gazed cookware and leaded gasoline. Recently, a Mexican study examined the relationship of maternal bone and blood lead levels to birth weight in 272 mother-infant pairs. Measurements of maternal bone lead levels in the tibia and patella were made at one month postpartum, since ethics did not permit exposure to K-X-ray fluorescence during pregnancy. Detailed maternal health and reproductive history and demographic data, anthropometric measurements of mothers and babies, and umbilical cord and maternal blood lead levels were also collected. The relationship of lead levels to birth weight was analyzed, independent of other factors related to birth weight including mother's nutritional status (anthropometry), smoking habits, parity, age, education, economic status, and infant gender and gestational age.

Although all indicators of lead exposure were negatively associated with birth weight, only

tibia lead levels had a statistically significant relationship ( $p < 0.005$ ). An increase of 10  $\mu\text{g}$  lead/g of bone mineral in tibia was associated with a decrease in birth weight of 75 grams. However, birth weight did not decrease linearly as tibia lead increased but rather dropped sharply among infants born to mothers with bone lead levels in the upper quartile. Babies of mothers in the upper quartile were 156 grams lighter than babies of mothers with the lowest tibia lead levels.

Although a cross-sectional study cannot establish a cause and effect relationship, the results are consistent with some other studies that have found a link between lead-burden and stunting in children. Since this study is the first to report a relationship between mother's bone lead level and birth weight, the findings will have to be confirmed by other studies. If confirmed, efforts will need to focus on ways to minimize mobilization of lead from bone during pregnancy and lactation, possibly through calcium supplementation trials.

**Source:** Gonzales-Cossio, T., K. E. Peterson, L. H. Sanin, E. Fishbein, E. Palazuelos, A. Aro, M. Hernandez-Avila, and H. Hu. (1997) Decrease in birth weight in relation to maternal bone-lead burden. *Pediatrics* 100 (5): 856-862.

### **The Dangers of Too Much Water**

In recent years, cases of water intoxication in babies have been reported with increasing frequency, particularly in poor, urban areas. An article from the electronic pages of *Pediatrics* describes 2 recent case studies and a retrospective chart review of 25 other infants hospitalized in due to hyponatremic seizures, associated with water intoxication.

Water intoxication is characterized by a spectrum of symptoms, including irritability or sleepiness, hypothermia, edema, and seizures. Typically, these symptoms follow a rapid fall in serum sodium levels, resulting from an overload of solute-free water that increases total body water by 7-8% or more. In calculating excess total body water in their patients, the authors found that an infant who consumes 260 to 540 mL of solute-free water may develop symptoms over a relatively short period of time. Yet, they emphasize that these estimates are crude and not well-correlated with the patient's age. Infants less than 6 months of age are particularly susceptible, perhaps because they are unable to excrete as much water per unit time as older children and adults. In all of the cases reviewed in this article, infants had been given at least one form of solute-free water: 63% were given tap water; 15%, sugar water; 15%, tea, soda or Kool-aid; and 26% overly dilute formula. In the 2 most recent cases, infants were fed commercial bottled water, which was a relatively inexpensive product marketed for babies. Since this report, the FDA has recommended that such products bear labels reminding consumers that the water should not be used as an electrolyte solution. Yet, the print on these containers is small, and many stores continue to stock the products next to oral electrolyte solutions.

Although the reasons for the increased frequency of water intoxication cases are not known, some feel that changes in infant formula resulting in lower sodium content could be involved. Moreover, poverty, care giver inexperience, and lack of proper instruction from health care providers have been implicated in almost all of the cases. For these reasons, health care providers should continue to spend the extra time to educate patients about optimal infant feeding practices and the potential hazards of misusing bottled water products.

**Source:** Bruce, R.C. and R.M. Kliegman (1997) Hyponatremic seizures secondary to oral water intoxication in infancy: association with commercial bottled drinking water. *Pediatrics*

100 (6), p e4. ( <http://www.pediatrics.org>).

### **Could Excessive Juice Be Linked to Short Stature and Obesity?**

Juice consumption among young children has increased in the last 30-40 years. Since 1978, some have voiced concerns about excessive consumption of juice, which can result in diarrhea, abdominal pain, and bloating due to carbohydrate malabsorption. Excessive juice consumption (12 to 30 oz per day) was a contributing factor to nonorganic failure to thrive in 8 children, aged 14 to 27 months. In a more recent study, researchers have found that excessive juice drinkers (> 12 oz per day) were more likely to be either too short or too heavy (but not both), compared to children drinking less juice.

How can excessive juice consumption be associated with two such opposite effects? Dietary intakes of the children, assessed by 7 day food records, were very similar to those in the latest National Health and Nutrition Examination Survey, giving external validity to their dietary data. A relationship between excessive juice intake and short stature could be due to carbohydrate malabsorption and/or displacement of more nutritious foods. However, the basis for a relationship between excessive juice drinking and child obesity is not clear. Unfortunately, parental beliefs and attitudes about juice drinking were not examined in this study. Furthermore due to the cross-sectional design of the study, we do not know whether excessive juice (and over consumption of other foods in general) leads to obesity or whether child obesity prompts parents to offer more of certain foods, including juice, that they consider "healthful". Until longitudinal studies can sort out the factors involved, the authors recommend that parents limit juice intake in their preschoolers to less than 12 oz. per day.

#### **Sources:**

Dennison, B.A., H.L. Rockwell, and S.L. Baker (1997) Excess fruit juice consumption by preschool-aged children is associated with short stature and obesity. *Pediatrics* 99 (1): 15-22.  
Levine, A. (1997). Excessive fruit juice consumption: how can something that causes failure to thrive be associated with obesity? *Journal of Pediatric Gastroenterology and Nutrition* 25: 554-555.

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