

Maternal & Infant Nutrition Briefs



July/August 2002

Excessive Prenatal Weight Gain Increases Risk of Obesity

Prenatal Exposure to Lead and Infant Development

Breastfeeding Lowers Risk of Breast Cancer

A Woman's Own Birth Weight is Linked to Gestational Diabetes

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



Excessive Prenatal Weight Gain Increases Risk of Obesity

According to national studies, weight problems are most likely to develop in women before middle age. Pregnancy is a period in women's lives when a significant amount of weight is gained. Although several short-term studies have looked at weight retention after pregnancy, none have examined whether excessive prenatal weight gain contributes to obesity over the long-term. This study is the first to examine the effects of excessive prenatal weight gain and failure to lose that weight on obesity a decade later.

From 1989-90, 795 white, middle-class women were weighed at intervals during their pregnancies and after delivery until 24 months postpartum. At each follow-up interview, the women completed a survey with questions about breast-feeding, alcohol and tobacco use, sexual activity, work, and frequency of exercise. Ten years later, the researchers were able to locate and weigh 540 of these women who continued to receive medical care at the same clinic. The outcomes were: 1) weight gain over the 10 years and 2) body mass index (BMI, kg/m²).

Due to the study's design, the authors were able to examine the factors that influenced mother's weight at the early and late follow-up. At 6 months postpartum, neither breast-feeding nor exercise were related to postpartum weight retention. However, women who breast-fed more than 12 weeks—compared to 2 weeks or less—and those who participated in aerobic exercise postpartum gained less weight over the 10 years. Other factors that reduced the risk of long-term weight change were prenatal weight gain within the Institute of Medicine (IOM) recommended ranges and return to pre-pregnancy weight by 6 months postpartum. Breast-feeding, aerobic exercise, and postpartum weight loss were similarly related to BMI at long-term follow-up.

Thus, prenatal weight gain above the IOM recommended ranges and a failure to return to

pre-pregnancy weight within 6 months may be important predictors of long-term obesity. Breastfeeding and postpartum aerobic exercise appear to be beneficial, but the effects could also be due to motivational or other differences among women who breastfeed or exercise and those who do not. Excessive prenatal weight gain in some women, such as young teens, may be needed to avoid delivering a low birth weight infant. Also, overzealous, postpartum dieting and weight loss could interfere with breastfeeding. Therefore, health professionals need to be very careful in communicating this information to the general public.

Source: Rooney BL and Schauberger CW. Excess pregnancy weight gain and long-term obesity: one decade later. *Obstet Gynecol* 2002; 100:245-52.

Prenatal Exposure to Lead and Infant Development

Public health efforts have focused on reducing exposure to lead in young children, but less attention has been paid to reducing lead exposure prenatally. Individuals who grow up in lead-contaminated environments or are exposed to lead through certain industrial occupations may accumulate lead in their bones over time. In Mexican women, use of lead-glazed pottery and low consumption of milk and other calcium-rich foods are other factors contributing to higher levels of lead in bone. Due to changes in bone during pregnancy, bone lead may be released into the mother's blood stream and affect the fetus. A study reported in the July issue of *Pediatrics* that higher levels of lead in maternal bone are associated with lower mental development scores in toddlers.

The study was carried out in Mexico City among 197 mother-infant pairs recruited from hospitals serving a middle-class population. Since Mexican law prohibits nonemergency radiology during pregnancy, maternal bone lead levels were measured within 4 weeks of delivery at two sites, including cortical and trabecular bone. A Spanish version of the Bayley Infant Development Scales was used to measure mental and psychomotor development of the children at 24 months of age. The effects of maternal bone lead on child development scores was examined after adjusting for any effects due to gender, child hospitalization, breast-feeding duration, parental IQ, parental educational level, marital status, and maternal age. Lead levels in cord blood and trabecular bone were independently related to lower mental development scores, but no effect was found on psychomotor development. Along with efforts to reduce environmental exposure to lead, interventions may be needed to prevent release of lead from the mother's bones during pregnancy. Calcium supplements may be one strategy to consider in pregnant women previously exposed to lead, but more research is needed to target these women appropriately.

Source: Gomaa A, Hu H, Bellinger D, Schwartz J, Tsaih SW, Gonzalez-Cossio T, Schnaas L, Peterson K, Aro A, Hernandez-Avila M. Maternal bone lead as an independent risk factor for fetal neurotoxicity: a prospective study. *Pediatrics* 2002; 110:110-118.

Breastfeeding Lowers Risk of Breast Cancer

A number of studies from different countries have tried to determine whether breastfeeding is associated with a lower risk of developing breast cancer later in life. The problem in examining this question is that pregnancy also protects against breast cancer. Since women generally only breastfeed after they have delivered a baby, it is extremely difficult to sort out the separate effects of parity, breastfeeding, and other factors on cancer risk in smaller epidemiological studies. In a study published in *Lancet*, the authors have re-examined the risk of breastfeeding on breast cancer by taking on the ambitious task of pooling data from

47 studies in 30 different countries.

Their approach was to include all studies that had at least 100 women with breast cancer and data on their reproductive and breastfeeding history which yielded a sample size of 50,302 women with cancer and 96,973 women without cancer (controls). Total months of breastfeeding were calculated for each woman across all of her pregnancies. Since the definition of breastfeeding varied across studies and duration of breastfeeding tended to be rounded-off in 6 month intervals, the authors grouped women who had never breastfed with those who breastfed for 6 months or less across their lifetimes. Given the large sample size, they were able to examine the effects of longer duration of breastfeeding on cancer risk controlling parity, mother's age at first birth, country (developed or developing), ethnicity, education, family history of breast cancer, use of contraceptives, menopausal status, mother's body mass index, and several other factors.

Each year of breastfeeding reduced the risk of breast cancer by 4.3% ($p < 0.0001$), in addition to a decrease of 7% for each birth. The size of the effect was not significantly different for women in developed vs. developing countries nor for any of the other personal characteristics examined (i.e., parity, ethnicity, menopausal status, mother's age when first child was born, etc.).

To expect women in developed countries to return to a pattern typical in some traditional societies of bearing many children and breastfeeding each one for years is unrealistic. Nevertheless, the authors estimate that, if women in developed countries had an average of 2.5 children and breastfed those children for 6 months longer than they currently do, then about 5% of breast cancers might be prevented annually. If they breastfed for an additional 12 months, about 11% of breast cancers might be prevented.

Source: Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50,302 women with breast cancer and 96,973 women without the disease. *Lancet* 2002; 360: 187-195.

A Woman's Own Birth Weight is Linked to Gestational Diabetes

In animals, poor nutrition during pregnancy stunts development of the kidneys and heart, putting the offspring at risk for high blood pressure, heart disease, and other problems. Prenatal exposure to high levels of stress hormones may also cause the body to be hypersensitive to stress and to churn out more glucose, cortisol, and other substances than would normally be needed in response to stress. A number of studies in humans have also shown that low birth weight increases the risk of developing type 2 diabetes and other chronic diseases in adulthood. However, critics have argued that the role of socioeconomic and other environmental factors have not adequately been accounted for in such studies. Examining the influence of low birth weight on risk of developing gestational diabetes (GDM) offers an opportunity to test the "fetal origins of chronic disease" hypothesis in humans a condition that occurs much earlier in life, possibly allowing for better control of other factors.

In New York, researchers have examined the relationship of low birth weight to later risk of GDM in a first pregnancy by linking birth registry data from 1970 or later to the mother's hospital discharge record between 1994-98. Of all discharge records during that time, 60% were successfully matched. Excluded from the study were all pregnancies complicated by use of illegal substances, preexisting diabetes, or other serious conditions, yielding a final sample

size of 440 women with and 22,955 women without GDM. The authors used multiple logistics regression to examine the effect of the woman's own birth weight, before and after adjusting for gestational age, on her risk of developing GDM.

The mother's own birth weight initially had a U-shaped relationship to her risk of developing GDM. That is, both low (<3000 gm) and high (> 4000 gm) birth weights increased risk of GDM, with or without controlling for gestational age. However, when the researchers considered the mother's body mass index before pregnancy and history of diabetes in the woman's mother, then the effect of high birth weight on GDM risk disappeared. The end result was a strong dose-response relationship between low birth weight and risk of GDM later in life, providing more evidence that early life factors influence the later development of chronic disease.

Sources:

Innes KE, Byers TE, Marshall JA, Baron A, Orleans M, Hammans RF. Association of a woman's own birth weight with subsequent risk for gestational diabetes. *JAMA* 287: 2534-2541.

Couzin J. Quirks of fetal environment felt decades later. *Science* 2002; 296: 2167-2169.

Maternal and Infant Nutrition Briefs is a research-based newsletter prepared by Dr. Lucia Kaiser (lkaiser@ucdavis.edu), a Cooperative Extension Specialist in the Department of Nutrition, University of California at Davis. This newsletter is written for health professionals interested in nutrition of mothers and young children.

The University of California, in commonplace with the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, and the Rehabilitation Act of 1973, does not discriminate on the basis of race, creed, religion, color, national origin, sex, or mental or physical handicap in any of its programs or activities, or with respect to any of its employment policies, practices, or procedures. The University of California does not discriminate on the basis of age, ancestry, sexual orientation, marital status, citizenship, medical condition (as defined in section 12926 of the California Government Code), nor because individuals are disabled or Vietnam era veterans. Inquiries regarding this policy maybe directed to the Director, Office of the Affirmative Action, Division of Agriculture and Natural Resources, 300 Lakeside Drive, Oakland, CA 94612-3550. (510) 987-0097.