



Maternal and Infant Nutrition Briefs

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Prenatal Weight Gain and Risk of Overweight in Children

Since 1990, the Institute of Medicine (IOM) guidelines have been used to steer pregnant women towards adequate prenatal weight gain, based on their pre-pregnancy weight status. Weight gain within the IOM ranges has been associated with the best outcomes. However, some question whether IOM guidelines still apply in more developed countries where obesity is prevalent. The purpose of this study was to examine the influence of prenatal weight gains on risk of overweight and other indicators of fatness in the children in the Project Viva study.

Project Viva involved a prospective or longitudinal study of 1044 mother-infant pairs in Massachusetts. About 74% of the sample was white; 11%, black; and 6%, Hispanic. The researchers weighed the women during pregnancy and their children at birth, six months, and three years later. Childhood overweight was defined as a body mass index for age \geq 95th percentile.

According to the IOM prenatal guidelines, 51% of the women gained excessive, 35% gained adequate, and 14% gained inadequate amounts of weight during pregnancy. Compared to women with inadequate weight gains, mothers with adequate or excessive weight gains were 3-4 times more likely to have an overweight child at three years of age. This association held true, regardless of the mother's pre-pregnancy weight status. Compared to inadequate prenatal weight gain, adequate gain did not decrease the risk of delivering a small-for-gestational age infant. However, risk of preterm birth was higher for women with extremely low rates of weight gain.

Conclusions and Implications Excessive prenatal weight gain, in relation to the IOM guidelines, increases the risk of overweight in the offspring at three years of age. Other findings from this study suggest that the current IOM guidelines may need to be re-visited and possibly revised, particularly in populations where maternal obesity is prevalent.

Source: Oken E, Taveras EM, Kleinman KP, Rich-Edwards JW, Gillman MW. Gestational weight gain and child adiposity at age 3 years. *Am J Obstet & Gynecol* 2007; 196: 322.e1-322.e8

How Much Caffeine is Safe for Pregnant Women?

Should women avoid caffeine during pregnancy? Caffeine crosses the placenta and may lead to vasoconstriction and fetal hypoxia, both of which may reduce fetal growth.

However, the evidence is conflicting on the safety of caffeine with some but not all studies linking high intakes of caffeine to miscarriage and low birth weight. The current position of the American Dietetic Association is to limit caffeine to 300 mg or less daily during pregnancy. To put that in perspective, a 16 oz cup of regular brewed coffee contains 188 mg of caffeine, with a range of 143-259 mg. The purpose of this study was to determine if reducing caffeine intake to levels well below 300 mg would improve birth outcomes.

The study involved a randomized, controlled trial in which pregnant women, drinking at least three cups of coffee a day, were asked to replace their usual coffee with either decaffeinated or regular coffee provided by the study. Starting around 18 weeks of gestation, the researchers shipped packages of coffee directly to the women but did not tell them how much to drink or whether to avoid coffee. Overall, 1207 pregnant women in Denmark participated in the study. Researchers and subjects were “blinded” to the group assignment, but 35-49% of the women were able to guess the type of coffee they received. Main outcomes measured in the study included birth weight and length.

At baseline, the groups consumed similar amounts of coffee daily. The intervention was successful in reducing the amount of caffeine consumed. Women in the decaffeinated coffee group consumed 117 mg, compared to 317 mg of caffeine consumed by the regular coffee group. In the total sample, reducing the amount of caffeine had no effect on birth weight or length; ponderal index; or length of gestation. However, in a subset of women who smoked more than 10 cigarettes a day, mean birthweight was 263 g lower in the group drinking regular coffee, compared to the decaffeinated group ($p=0.001$).

Conclusions and Implications In this randomized controlled trial, reducing caffeine intake in pregnant women to levels well below 300 mg daily does not appear to improve birth weight or length of gestation, except in women who smoke. Since the intervention took place after 18 weeks of gestation, the effects of reducing caffeine intake either pre-conception or during the first few weeks remain to be determined.

Source: Bech BH, Obel C, Henriksen TB, Olsen J. Effect of reducing caffeine intake on birth weight and length of gestation: randomized controlled trial. *BMJ* 2007; 334: 409 Available at <http://bmj.com/cgi/content/full/334/7590/409>

Folate Status Worsens in US Women of Childbearing Age

In 1998, fortification of cereal grains with folic acid became mandatory to help prevent poor pregnancy outcomes, specifically neural tube defects. Since neural tube defects occur very early in pregnancy, public health recommendations have focused on increasing folic acid intake in women who might become pregnant. Folic acid is the crystalline, synthetic form of the B-vitamin, which is known as folate. Leafy greens and legumes are good sources of dietary folate, but the natural form of folate is not as bioavailable as folic acid. Therefore, women are encouraged to consume at least 400 µg/day of folic acid from supplements and fortified foods, in addition to folate from a

varied diet. The purpose of these two articles is to report on folic acid intake and folate status of women of childbearing age in a national sample.

The data come from the National Health and Nutrition Examination Survey (NHANES), which is collected annually in a national US sample. The NHANES includes a household interview, a physical examination, a single 24-hour dietary recall, and biochemical indicators, measured from blood samples. In the articles reviewed below, only data from nonpregnant women of childbearing age (15-49 yrs) are included.

Although folate status of the population improved initially after 1998, national trends show a significant decline in all racial/ethnic groups from 1999 to 2004 in folate status, measured by serum and red blood cell (RBC) folate. Dietary intake data also show that 60-80% of women of childbearing age are not meeting public health recommendations related to folic acid. Use of supplements containing folic acid is particularly low in NonHispanic Black and Hispanic women. The following table summarizes key findings from these two articles:

Race/Ethnicity	Mean Folic Acid Intake (µg/da)	% with Intake < 400 µg/da	RBC Folate (ng/ml)	
			2001-02	2003-04
NonHispanic White	253	59.4	275	267
NonHispanic Black	147	80.9	199	196
Hispanic	175	79.1	245	235
Total	221	65.7	NA	NA

Conclusions and Implications Folic intake is low, and folate status in US women of childbearing age appears to be deteriorating. The reasons for this trend are not clear and need to be determined. The impact on incidence of neural tube defects also needs to be examined.

Sources:

Yang Q, Carter HK, Mulinare J, Berry RJ, Friedman JM, Erickson JD. Race-ethnicity differences in folic acid intake in women of childbearing age in the United States after folic acid fortification: findings from the National Health and Nutrition Examination Survey 2001-2002. *AJCN* 2007;85:1409-1416.

Centers for Disease Control and Prevention. Folate status in women of childbearing age by race/ethnicity—United States, 1999-2000, 2001—2002, and 2003-2004. *MMWR* (Jan 5, 2007)/55 (51): 1377-1380.

Does Breastfeeding Lower Risk of Type 2 Diabetes?

Early infant feeding and growth appears to play a role in determining health later in life. Several studies have reported that breastfeeding has a small but significant effect on reducing risk of childhood obesity. The purpose of this study was to conduct a thorough review and meta-analysis to examine the relationship between breastfeeding and type 2 diabetes that occurs later in life.

The authors conducted a systematic literature of all studies, reports, and letters published since 1980. Their search yielded 23 studies, relevant to the topic. They kept the definitions of breastfeeding used in the original articles. In seven studies, the authors examined the odds or risk of developing diabetes in adulthood. In other analyses excluding people with diabetes, the authors examined the mean difference in blood glucose or insulin levels between those who had been breastfed or those who were formula-fed. Twelve studies in infants were used to compare differences in preprandial blood glucose. Seven infant studies compared differences in preprandial insulin levels.

People who had been breastfed as infants had a significantly lower risk or odds of developing type 2 diabetes in adulthood (Odds ratio: 0.61, 95% CI 0.44, 0.85). In studies where people with diabetes were excluded, no significant differences in blood glucose levels were observed between those who were and were not breastfed as infants. However, children and adults without diabetes who had been breastfed had marginally lower fasting insulin levels, compared to those not breastfed. Studies in infants found significantly lower mean insulin and glucose levels in breastfed, compared to formula-fed infants.

Conclusions and Implications Observational studies form a critical body of evidence to judge the long-term health benefits of breastfeeding. This meta-analysis provides evidence that breastfeeding may reduce the risk of type 2 diabetes. A limitation of this approach is that several potentially confounding factors, such as social class, birth weight, and maternal weight, have not been fully accounted for and could influence the results. Further research is needed to determine whether duration and exclusivity of breastfeeding matter and the mechanism by which breastfeeding influences later disease risk.

Source: Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Does breastfeeding influence risk of type 2 diabetes later in life? *AJCN* 2006;84:1043-1054.

Maternal and Infant Nutrition Briefs is a research-based newsletter prepared by Dr. Lucia Kaiser, 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. Back issues of this newsletter are available on-line at: <http://nutrition.ucdavis.edu/briefs/>. 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. Inquires 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.