

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



Bed Rest Linked to Bone Loss during Pregnancy

During pregnancy, growth of the fetus and expansion of the mother's blood volume increase the demand for calcium. Compared to the non-pregnant state, absorption of calcium is more efficient during pregnancy, but some of the additional needs may also be met by drawing calcium from the mother's bone. Weight-bearing activity is protective against bone loss, but no studies have ever examined the impact of bed rest on bone mineral density in pregnant women. Thus, the purpose of this study was to examine the effects of bed rest and other factors on bone loss during pregnancy.

The study design involved follow-up of 181 healthy pregnant women (> 18 years), who were enrolled in a larger study in the Pennsylvania area. About half of the sample was African American; the remainder, white. The researchers measured bone mineral density from radius and ulna at 16 and 36 weeks of gestation using dual energy x-ray absorptiometry (DXA). Staff also interviewed the women twice during pregnancy to collect data on calcium intake using a food frequency questionnaire, exercise, smoking, caffeine use, and other demographic and health history factors. Weight gain was measured at each clinic visit.

At baseline, initial bone density was greater for those who were African American, had higher prenatal body mass index (BMI), or had never been pregnant before. Over the course of pregnancy, trabecular bone loss of about 1.9% occurred. According to medical records, bed rest was prescribed for about 14% of the sample. Bone loss was significantly higher among women for whom bed rest was prescribed, compared to other pregnant women (4.5% vs. 1.5%, $p < 0.001$). Other factors related to increased bone loss during pregnancy included age of the mother (< 21 or > 30 yrs) and low prenatal weight gain (10 lbs or less). High levels of calcium intake (>2000 gm per day) were modestly protective against bone loss. One limitation of the study is the inability to determine whether the women actually remained on bed rest, as prescribed. Therefore, if the true numbers of women who stayed on bed rest

were known, the impact on bone loss would probably be greater than reported here.

Conclusions and Implications: Substantial bone loss may occur during pregnancy particularly among women who are prescribed bed rest. The authors suggest that, given the risks, financial costs, and limited proven benefits, further evaluation of bed rest as a treatment is needed.

Source: Promislow JHE, Hertz-Picciotto I, Schramm M, Watt-Morse M, Anderson JJB. Bed rest and other determinants of bone loss during pregnancy. *Am J Obstet Gynecol* 2004; 191: 1077-83

Breastfeeding Reduces Risk of Childhood Leukemia

Leukemia is a leading cause of cancer among children under 15 years of age. Acute lymphoblastic leukemia (ALL) accounts for about 78%, and acute myeloid leukemia (AML) accounts for 16% of all cases. Although the causes are not well known, risk factors include genetic factors, exposure to ionizing radiation, gender, race, and age. Some experts believe that pre-cancer cells in the most common type (ALL) may arise following an abnormal response to infections. Since breast milk is rich in antimicrobial, anti-inflammatory, and other substances affecting immune response, breastfeeding may play a protective role in preventing the ALL type of childhood leukemia. However, previous studies have yielded mixed results and did not always adequately control for the effects of socioeconomic status. A recent article presents a careful meta-analysis of several studies to determine the effects of breastfeeding duration on risk of childhood leukemia.

In their literature search, the authors identified 14 studies that analyzed the effects of breastfeeding duration on the odds of any type of childhood leukemia. For the meta-analysis, they classified breastfeeding for 6 months or less as "short-term" and for more than 6 months as "long-term". They examined the relationship of breastfeeding to risk of ALL and AML in separate analyses. From each of the 14 articles, the authors extracted the reported odds ratio and confidence intervals. Wherever possible, they selected the odds ratio that had been adjusted for socioeconomic factors but they also compared the results of studies that did and did not adjust for these factors.

Both short- and long-term breastfeeding were protective against ALL, the most common type of leukemia. Long-term breastfeeding reduced risk of ALL more than short-term breastfeeding (24% compared to 18%). In addition, long-term—but not short-term--breastfeeding was protective against AML. Overall, socioeconomic status did not appear to play a substantial role as a confounder in either the short-term or long-term studies. Although the authors had expected to find a protective effect of breastfeeding against ALL, they did not anticipate finding an association between breastfeeding and AML. Thus, the underlying mechanism is unknown.

Conclusions and Implications: While the results suggest that breastfeeding plays a protective role for both types of leukemia, larger population-based studies are needed to confirm these findings.

Source: Kwan ML, Buffler PA, Abrams B, Kiley VA. Breastfeeding and the risk of childhood leukemia: a meta-analysis. *Public Health Reports* 2004; 119: 521-535.

Changes in Diet Quality from 1977 to 1998 among US Preschoolers

A better understanding of the trends in dietary patterns over the past 20 years may be helpful in our efforts to prevent obesity in children. The authors of this study use a Child Diet Quality Index (CDQI) to examine these trends in young children.

The data for the trend analysis came from three waves of national surveys including: 1) the National Food Consumption Survey (1977-79); 2) the Continuing Survey of the Food Intakes of Individuals (CSFII) (1989-91); and 3) the CSFII and child supplement surveys (1994-96 and 1998). The researchers included in their analysis all non-breastfed children, who were between two to five years and for whom at least two days of dietary intakes were available. The final sample included 2342 children from the first wave (1977-79); 849 from the second wave (1989-91), and 5437 from the third wave (1994-98). To assess quality of the overall diet, the researchers developed a diet quality index for children based on eight components: total fat, saturated fat, added sugar, grain servings, fruit and vegetable servings, dairy servings, iron intake (mg), and excess juice (> 6 oz/day). The scoring for each component was calculated so that an increased score implies improved diet quality. The CDQI is similar to the Healthy Eating Index that has been used among adults but includes components that are particularly relevant to children's diets.

Average energy intake of young children has increased over the 20-year period from a mean of 1389 kcal in 1977-79 to 1558 kcal in 1994-98. Small but significant increases in the CDQI indicate improvement in overall dietary quality (overall scores: 43.7 in 1977-79, 45.0 in 1989-91, and 45.7 in 1994-98 ($p < 0.0019$)). However, while improvements have occurred in total and saturated fat intakes and servings of grains, dairy and fruit/vegetables, scores for added sugar and excess juice worsened between 1977-79 and 1994-98. Moreover, although fat as a percentage of total energy intake has improved, the absolute amount of fat in the diet actually increased.

Conclusions and Implications: Overall increases in energy consumption may have contributed to the recent rise in childhood obesity, despite small improvements in dietary quality among young children over the past 20 years. A limitation of the CDQI used here is that its development pre-dated the release of the latest set of the Dietary Reference Intakes. A revised version would be useful for research purposes and potentially for program monitoring.

Source: Kranz S, Siega-Riz AM, Herring AH. Changes in diet quality of American preschoolers from 1977 to 1998. *Am J Pub Health* 2004; 94: 1525-1530.

Mother's Weight, Infant Feeding Patterns, and Growth at One Year

A research study carried out in Denmark is the first longitudinal study to examine the effects of mother's weight status, duration of breastfeeding, and timing of complementary feeding on infant growth in large cohort of infants. The data come from the on-going Danish National Cohort Study which began in 1996 and has collected information among pregnant women from 12 weeks of pregnancy through 18 months after delivery. This analysis included only healthy mothers and breastfed infants for whom complete data at all time points were available ($n=3768$ mother-infant pairs). The researchers were able to link data about the infant's birth from the Danish National Patient Registry but obtained the rest of the information from phone interviews at 12 and 26 weeks of pregnancy and 6 and 18 months postpartum. Although this population of Danish women is much leaner than the US women of the same age range, the variation in mother's pre-pregnancy weight status (measured by

body mass index, BMI) and the large sample size make it possible to tease out separate and combined effects of mother's weight, breastfeeding duration, and age of introduction to solid foods on infant weight gain. A few other limitations include reliance on self-reported weight and height data from the mothers and lack of information on the exact age when formula was introduced.

Higher pre-pregnancy BMI, shorter duration of breastfeeding, and early introduction to solid foods were all associated with greater infant weight gain at one year of age. In particular, the combination of short duration of any breastfeeding (less than 20 weeks) and early introduction to complementary foods (< 16 weeks) was positively related to greater infant weight gain at one year ($p < 0.005$). An interesting way to examine the combined influence of these factors on infant growth is to compare the following results:

- A baby born to a mother of normal weight (BMI=23.4) gains 6489 grams from birth to one year, when breastfed for more than 40 weeks and introduced to solid foods no earlier than 16 weeks of age.
- A similar infant, born to a mother of normal weight < would gain 624 grams more than the first baby (9.6% more), if breastfed for less than 20 weeks and introduced to solid foods before 16 weeks of age
- A baby born to an obese mother (BMI > 30) but fed similarly to the first infant (breastfed > 40 wks and solid foods > 16 wks) would gain 102 gm (1.6%) more than the first baby; and
- Finally, the baby born to the obese mother, breastfed < 20 weeks, and introduced to solid foods before 16 wks would gain 726 gm more (11.2%) than the first baby.

Conclusions and Implications: Since this study was conducted in a Danish population of well-educated mothers, our ability to generalize the findings to other populations is limited. Nevertheless, the findings are noteworthy, particular since the additional weight gain associated with high maternal pre-pregnancy BMI, short duration of breastfeeding, and early introduction to complementary foods is enough to move an infant into being "at-risk of overweight" by one year of age.

Source: Baker JL, Michaelsen KF, Rasmussen KM, and Sørensen TIA. Maternal prepregnant body mass index, duration of breastfeeding, and timing of complementary food introduction are associated with infant weight gain. *Am J Clin Nutr.* 2004; 80: 1579-88

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