

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



Zinc Intake of US Preschoolers Exceeds Requirements

In 2001, the Food and Nutrition Board released new recommendations for zinc intake. According to their guidelines, the Estimated Average Requirement (EAR) is the level of a nutrient meeting the needs of 50% of a specific age and gender group. The EAR should be used in determining the adequacy of intake for a population group. If EAR is not available for a nutrient, then the Adequate Intake (AI) is to be used. Nutrient intakes should also be compared to the Upper Tolerable Level (UL), the highest level of intake that poses no risk of toxic effects. The purpose of this paper was to determine the prevalence of adequate and excessive zinc intakes among US preschoolers, based on the new 2001 reference values.

The dietary data were from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals (CSFII), a nationwide survey conducted by the US Department of Agriculture. The sample (n=7474) included all children less than 6 years, who were not breast-feeding and had two days of dietary data. The dietary data, collected by parental recall of the child's intake, captured zinc intake only from foods (i.e., not from supplements). The researchers calculated the percentage of children with zinc intakes less than the EAR and for infants 0-6 months, less than the AI. They also calculated the ratio of phytate to zinc in the diets. Phytate is found in plant foods and interferes with the absorption of zinc. If the molar ratio of phytate to zinc is low (i.e. less than 5:1), then bioavailability of zinc is high.

From 1994 to 1998, zinc intakes increased significantly among young children and infants in the US. According to the latest national data, less than 1% of the infants and children have inadequate zinc intakes. On the other hand, 86-92% of infants and 51% of 1-3 year olds have zinc intakes above the UL. Since zinc from supplements was not considered in the analysis, percentages of excessive intakes are likely to be much higher. Moreover, among children with the highest zinc intakes, bioavailability of zinc in the diet, based on phytate:zinc ratios, appears to be acceptable. In infants, the high zinc intake is primarily due to infant formula, which accounts for 77% of their zinc intake. A major source of zinc intake among

children is ready-to-eat fortified cereals. The percentage of zinc coming from zinc-fortified foods doubled from 1994 to 1998. Low-income level and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children Nutrition are independently associated with higher intakes of zinc.

Conclusions and Implications: Even without counting zinc from supplements, zinc intakes among infants and young children in the US exceed the new Dietary Reference Intakes. If dietary zinc intakes continue to increase, the amounts consumed by this population may become excessive. Since excessive intake of zinc can interfere with copper absorption or immune function, more research is needed to determine if current zinc intakes from food and supplements have any adverse effects in these children.

Source: Arsenault JE and Brown KH. Zinc intake of US preschool children exceeds new dietary reference intakes. *Am J Clin Nutr* 2003; 78: 1011-1017.

Glycemic Index and Increased Risk of Neural Tube Defects

Diabetes, obesity, and hyperinsulinemia are all associated with poor pregnancy outcomes. Since fetal pancreas cells are not functional at the time of neural tube closure, poor control of blood glucose may interfere with this process. Foods with a high glycemic index, such as highly processed grains, sodas, and white potatoes, raise blood glucose levels more quickly than low glycemic index foods. Epidemiological studies have found an association between high glycemic index foods and increased risk of type 2 diabetes. The purpose of this study was to determine whether intake of sugars and high glycemic index foods in early pregnancy increases the risk of neural tube defects.

To examine factors associated with neural tube defects, the authors compared babies with and without these defects. All infants were born in California between 1989-91. The cases included all single live births, fetal deaths, and aborted fetuses with neural tube defects (n=454). Controls were single live births without birth defects born in the same counties during the same months (n=462). Within 5 months of delivery, research staff interviewed the mothers to collect data on their diet 3 months before to 3 months after becoming pregnant, using the Block 100-item food frequency questionnaires. The authors then calculated an average glycemic index for each woman's diet, based on the glycemic index, amount of carbohydrate, and number of servings of each food. Using logistic regression, they determined the risk of neural tube defects, after accounting for race/ethnicity, folic acid intake, vitamin use, mother's education, pre-pregnancy body mass index, and mother's physical activity level.

Risk of neural tube defects was associated with high sucrose intake and a high glycemic index diet. Sucrose intake in the highest quartile (> 46.25 g) doubled the risk of neural tube defects (odds ratio: 2.34 95% CI: 1.39, 3.96). Similarly, diets with a high glycemic index increased the risk of spina bifida by 2-fold (odds ratio: 2.11 95% CI: 1.36, 3.27). Upon closer examination, the risk of birth defects was mainly among the obese mothers (i.e., women with body mass index > 29), but the sample size may have been too small to reliably estimate risk in these women. The results were not different when women with a history of type 1 or 2 diabetes or gestational diabetes during this pregnancy were dropped from the analysis.

Conclusions and Implications: This is the first study to report an association between glycemic index of the mother's diet during early pregnancy and risk of neural tube defects. Based on the design and findings of this study alone, we cannot conclude that following a

lower glycemic index diet would prevent birth defects in normal, healthy, pregnant women. Additional studies are needed to confirm whether an association exists between sugar intake, glycemic index, and neural tube defects.

Source: Shaw GM, Quach T, Nelson V, Carmichael SL, Schaffer DM, Selvin S. and Yang W. Neural tube defects associated with maternal periconceptional dietary intake of simple sugars and glycemic index. *Am J Clin Nutr* 2003; 78: 972-8.

Anemia and Postpartum Depression

During the first few weeks after delivery, many new mothers experience some degree of postpartum depression, commonly referred to as "the baby blues". Although several studies have examined psychosocial factors that may trigger postpartum depression, few have looked at physiological factors that may be involved. Some evidence suggests that fatigue, abnormal thyroid function, and possibly anemia may play a role in the onset of maternal depression. The purpose of this study was to determine whether anemia in the early postpartum period increases the chances that postpartum depression will develop.

Thirty-seven healthy mothers, mostly white, married, and breastfeeding, participated in this observational study. Women who had complications, including postpartum hemorrhage, were not included in the study. The researchers interviewed the mothers within 24 hours after delivery and again in their homes 7, 14, and 28 days later. At each time point, a blood sample was collected for measurement of hemoglobin. At the final visit, the interviewers used a 20-item instrument to screen for symptoms of depression. This instrument, known as the Center for Epidemiological Studies-Depressive Symptomology Scale (CES-D), is considered valid and reliable and has been used frequently in postpartum women. A score on this test above 11 indicates mild depression and above 16, severe depression.

Of the 37 women in the study, 8 women had hemoglobin values less than 120 g/L at one week postpartum, despite the fact that all of them had been taking prenatal vitamins. At 28 days postpartum, 22% of the mothers experienced moderate, and 16%, severe depression. Occurrence of depression was not associated with having other kids at home, mother's age, or mother's marital status. However, women who had a low hemoglobin level at 7 days postpartum reported more symptoms related to depression at 28 days than women with normal hemoglobin values (CES-D for low hemoglobin: 16.36 vs. 6.90 for normal hemoglobin, $p < 0.001$).

Conclusions and implications: Anemia, occurring in the first few days postpartum, may be a predictor of postpartum depression. It is not clear from this study, however, that a cause-and-effect relationship exists between anemia and maternal depression.

Source: Corwin EJ, Murray-Kolb LE, Beard JL. Low hemoglobin level is a risk factor for postpartum depression. *J Nutr* 133: 4139-4142.

Rapid Infant Weight Gain is Related to Obesity in Adults

Although rapid infant gain has been linked to overweight among children, this study is the first to establish a relationship to obesity in young adults. The study was based on data from the National Collaborative Perinatal Project which included 9020 African American pregnant women enrolled from 1959-66. The researchers collected follow-up data on the children, including weight; length or height; and triceps and subscapular skinfold measurements at 4

months, 12 months, and 7 years of age. At 18-22 years of age, 300 subjects were contacted and measured again. This sample was limited to those who had been born full-term (i.e., 37-42 weeks). Rapid infant weight gain during the first 4 months of life was defined as an increase in weight-for-age z-score > 1 standard deviation on the CDC reference growth curves. Obesity in adulthood was defined as a body mass index (BMI) > 30. An alternate definition -- overweight and overfat—was a BMI > 25 and skinfolds > 85th percentile. Risk of obesity or overweight/overfat was calculated after accounting for other potentially confounding factors, namely gender, birth weight, gestational age, birth order, birth year, maternal BMI, maternal smoking, and maternal education.

Among the 86 infants who gained weight rapidly during the first 4 months of life, 14% were obese as adults, compared to 6% of those with normal weight gain patterns. Young adults who had gained weight rapidly as infants were 5 times as likely to be obese ($p < 0.008$) and 6 times as likely to be overweight/overfat ($p < 0.003$). Unfortunately, no data were collected on breastfeeding practices, but most were probably formula-fed which was typical of that time period. Since African American babies tend to have relatively low birth weights, early catch-up growth might also be expected to be more common in this population than in white babies.

Conclusions and Implications: Early infancy may be another critical time period for the development of obesity, but additional studies in this and other populations are needed. Exclusive breastfeeding is the recommended way to feed young infants.

Source: Stettler N, Kumanyika S, Katz SH, Zemel BS, Stallings VA. Rapid weight gain during infancy and obesity in young adulthood in a cohort of African Americans *Am J Clin Nutr* 2003; 77: 1374-8

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.

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