

# Gestational Diabetes, Low SES Ups ADHD Risk

*There was a ninefold increased risk of ADHD diagnosis in 6-year-olds.*

BY MITCHEL L. ZOLER

FROM THE ANNUAL MEETING OF THE AMERICAN ACADEMY OF CHILD & ADOLESCENT PSYCHIATRY

NEW YORK – Children born to mothers with gestational diabetes during pregnancy had a significantly increased risk of developing attention-deficit/hyperactivity disorder when they reached 6 years old, based on a study with 216 children.

The risk was even greater in children

of families with low socioeconomic status. The combined effect of gestational diabetes and low socioeconomic status was linked with a statistically significant, ninefold increased rate of attention-deficit/hyperactivity disorder (ADHD) in children when they reached age 6 years, Alexandra S. Jordan reported in a poster at the meeting.

The findings “raise the possibility that manifestations of ADHD are not simply genetically mediated. Rather, susceptibility may increase as a function of the uterine environment (as with gestational diabetes) and may be further aggravated as a result of socioeconomic hardship during childhood,” Ms. Jordan and her associates reported in their poster.

Prior published reports had identified both gestational diabetes and low socioeconomic status as risk factors for the subsequent development of ADHD in young children.

But in this study, when the researchers looked at the

impact of both factors together, “something bizarre happened.” The risk increased “way beyond the expected impact,” Ms. Jordan said in an interview. She and her colleagues do not currently have an explanation for this apparent synergistic interaction.

The study assessed 216 unselected children for ADHD symptoms at age 4 years and for a diagnosis of ADHD at age 6 years. The mothers of 21 of the children had gestational diabetes during pregnancy, and this subgroup had a 2.19-fold increased risk for having a diagnosis of ADHD at age 6 years, compared with the children born to mothers who never had gestational diabetes.

In addition, 104 of the children came from low socioeconomic status households, and these children had a 2.05-fold increased rate of having ADHD, compared with the other children from higher socioeconomic families, said Ms. Jordan, a researcher in the department of counseling and clinical psychology at Columbia University in New York.

The group included nine children whose mother had gestational diabetes and who came from low socioeconomic family.

In this subgroup, the prevalence of the ADHD diagnosis at age 6 years was

9.23-fold higher than it was for the children whose mothers did not have gestational diabetes and who came from families with higher socioeconomic status.

The apparent effect of gestational diabetes and low socioeconomic status on ADHD prevalence remained statistically significant after researchers adjusted for whether one or both parents had ADHD.

“These findings may be useful in educating women considering pregnancy, particularly those in low socioeconomic environments, about the potential lingering effects of gestational diabetes on offspring into childhood,” the researchers said in their poster.

“This information may encourage women to control gestational diabetes symptoms during pregnancy.” In addition, it may help “educate health care providers on the importance of assessment and control of gestational diabetes symptoms throughout pregnancy and on ADHD’s etiologic link to gestational diabetes.” The findings might also help “target early interventions to those low socioeconomic status families who are most vulnerable” to this interaction with gestational diabetes, they said. ■

## VITALS

**Major Finding:** Six-year-old children from low socioeconomic families and born to mothers who had gestational diabetes had a ninefold increased rate of diagnosis for attention-deficit/hyperactivity disorder, compared with children from higher socioeconomic families whose mothers did not have gestational diabetes.

**Data Source:** Multicenter study of 216 children, 9 of whom came from low socioeconomic families and were born to mothers who had gestational diabetes.

**Disclosures:** Ms. Jordan had no relevant financial disclosures.

## Prenate<sup>®</sup> Essential<sup>™</sup>

Rx prenatal vitamin & DHA

**DESCRIPTION:** PRENATE ESSENTIAL<sup>™</sup> is a prescription prenatal/postnatal multivitamin/mineral/essential fatty acid softgel. Each softgel is blue-green in color, opaque, and imprinted with “Prenate” on one side.

## Supplement Facts

Serving Size 1 Softgel

Amount Per Serving:		% DV For Adults	% DV for Pregnant and Lactating Women
Vitamin C	85 mg	142%	142%
Vitamin D <sub>3</sub>	200 IU	50%	50%
Vitamin E	10 IU	33%	33%
Vitamin B <sub>6</sub>	25 mg	1250%	1000%
Folate	1 mg	250%	125%
(L-methylfolate as Metafolin 600 mcg) (folic acid, USP 400mcg)			
Vitamin B <sub>12</sub>	12 mcg	200%	150%
Biotin	250 mcg	83%	83%
Calcium	140 mg	14%	11%
(calcium carbonate)			
Iron (ferrous fumarate)	28 mg	156%	156%
Iodine (potassium iodide)	150 mcg	100%	100%
Magnesium	45 mg	11%	10%
(magnesium oxide)			
Docosahexaenoic Acid (DHA)	300 mg	†	†
Eicosapentaenoic Acid (EPA)	40 mg	†	†
(from 340 mg omega-3 fatty acids from fish oil)			

\* Percent Daily Values are based on a 2,000 calorie diet  
† Daily Value (DV) not established

**Other Ingredients:** fish oil, gelatin, hydrogenated vegetable oil, glycerin, sorbitol, beeswax, soy lecithin, titanium dioxide, vanillin, FD&C blue No. 1, propylene glycol, hypromellose.

**INDICATIONS:** PRENATE ESSENTIAL is a multivitamin/mineral/essential fatty acid nutritional supplement indicated for use in improving the nutritional status of women throughout pregnancy and in the postnatal period for both lactating and non-lactating mothers. PRENATE ESSENTIAL can also be beneficial in improving the nutritional status of women prior to conception.

**CONTRAINDICATIONS:** PRENATE ESSENTIAL is contraindicated in patients with a known hypersensitivity to any of the ingredients.

**WARNING:** Ingestion of more than 3 grams of omega-3 fatty acids (such as DHA) per day has been shown to have potential antithrombotic effects, including an increased bleeding time and International Normalized Ratio (INR). Administration of omega-3 fatty acids should be avoided in patients taking anticoagulants and in those known to have an inherited or acquired predisposition to bleeding.

**WARNING:** Accidental overdose of iron-containing products is a leading cause of fatal poisoning in children under 6. Keep this product out of reach of children. In case of accidental overdose, call a doctor or poison control center immediately.

**PRECAUTIONS:** Folic acid alone is improper therapy in the treatment of pernicious anemia and other megaloblastic anemias where vitamin B<sub>12</sub> is deficient. Folic acid in doses above 1 mg daily may obscure pernicious anemia in that hematologic remission can occur while neurological manifestations progress.

**ADVERSE REACTIONS:** Allergic sensitization has been reported following both oral and parenteral administration of folic acid.

**DOSAGE AND ADMINISTRATION:** Before, during, and/or after pregnancy, one softgel daily or as directed by a physician.

**HOW SUPPLIED:** Unit-dose packs of 30 softgels NDC # 59630-419-30

**KEEP THIS AND ALL DRUGS OUT OF THE REACH OF CHILDREN.**

Store at 20°-25°C (68°-77°F). Excursions permitted to 15°-30°C (59°-86°F).

[See USP Controlled Room Temperature]

For inquiries call 1-800-849-9707 extension 1454.

U.S. Patents #5,997,915; #6,254,904; #6,011,040; #6,451,360; #6,673,381; #6,808,725; #6,441,168

Metafolin<sup>®</sup> is a registered trademark of Merck KGaA, Darmstadt, Germany.

PNE-PI-1 Rev. 02/10

Manufactured for:

**SHIONOGI PHARMA, INC.**

Atlanta, Georgia USA 30328

Manufactured by:

Catalent Pharma Solutions, Swindon, UK  
Made in the United Kingdom

Prenate<sup>®</sup> is a registered trademark and Prenate Essential<sup>™</sup> is a trademark of Shionogi Pharma, Inc.

Metafolin<sup>®</sup> is a registered trademark of Merck KGaA, Darmstadt, Germany.

© 2010 Shionogi Pharma, Inc. Atlanta, Georgia. All rights reserved.

PRE.03.10.019.02

**Prenate<sup>®</sup>**  
Rx prenatal vitamin

**References:** 1. Hollowell JG, Staehling NW, Hannon WH, et al. Iodine nutrition in the United States. Trends and public health implications: iodine excretion data from National Health and Nutrition Examination Surveys I and III (1971-1974 and 1988-1994). *J Clin Endocrinol Metab.* 1998;83(10):3401-3408. 2. Zimmermann MB. Iodine deficiency. *Endocr Rev.* 2009;30(4):376-408. 3. Mock DM. Marginal biotin deficiency is common in normal human pregnancy and is highly teratogenic in mice. *J Nutr.* 2009;139(1):154-157. 4. Horrocks LA, Yeo YK. Health benefits of docosahexaenoic acid (DHA). *Pharmacol Res.* 1999;40(3):211-225. 5. Uauy R, Hoffman DR, Mena P, Llanos A, Birch EE. Term infant studies of DHA and ARA supplementation on neurodevelopment: results of randomized controlled trials. *J Pediatr.* 2003;143(suppl 4):S17-S25. 6. Birch EE, Garfield S, Hoffman DR, Uauy R, Birch DG. A randomized controlled trial of early dietary supply of long-chain polyunsaturated fatty acids and mental development in term infants. *Dev Med Child Neurol.* 2000;42(3):174-181. 7. Agostoni C, Trojan S, Bellù R, Riva E, Giovannini M. Neurodevelopmental quotient of healthy term infants at 4 months and feeding practice: the role of long-chain polyunsaturated fatty acids. *Pediatr Res.* 1995;38(2):262-266. 8. Dietary supplement fact sheet: folate. National Institutes of Health Web site. <http://ods.od.nih.gov/factsheets/folate.asp>. Accessed March 15, 2010. 9. March of Dimes<sup>®</sup> Quick Reference. Folic acid. March of Dimes<sup>®</sup> Web site. [http://www.marchofdimes.com/professionals/14332\\_1151.asp](http://www.marchofdimes.com/professionals/14332_1151.asp). Accessed March 15, 2010. 10. Metafolin<sup>®</sup>: about Metafolin<sup>®</sup>. Merck KGaA Web site. <http://www.metafolin.com/servlet/PB/menu/1784410/index.html>. Accessed March 15, 2010.