

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Does Iron-Deficiency Anemia Affect Child Development?

Sally Grantham-McGregor

Pediatrics 2003;112:978

DOI: 10.1542/peds.112.4.978

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/112/4/978>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2003 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



Does Iron-Deficiency Anemia Affect Child Development?

ABBREVIATIONS. IDA, iron deficiency anemia, RCTs, randomized, controlled trials.

The global prevalence of iron-deficiency anemia (IDA) is extremely high. The possibility that IDA affects children's development is therefore a serious public health problem and has implications not only for individuals' development but also for national development in countries with high prevalence. Although infants with mild-to-moderate IDA have poor development both concurrently and in later childhood,^{1,2} a causal link is not well-established.³

A major problem is that IDA is associated with many socioeconomic disadvantages^{1,2} that are likely to have independent effects on children's development. Therefore randomized, controlled trials (RCTs) of iron supplementation are essential to allow causal inferences. Trials of treating IDA indicate whether the effects are remediable whereas preventive trials provide the strongest evidence of causality.

Surprisingly few RCTs of iron supplementation have been conducted in infants. Previous treatment trials have often lacked randomized designs and failed to find benefits; however, 2 RCTs found benefits. One was extremely small⁴ and the other involved children highly infected with parasites and very low initial levels of hemoglobin.⁵ Preventive trials have had small samples and inadequate measures of IDA and/or been confounded by other dietary components.³

The study by Lozoff and colleagues⁶ comprises the largest preventive trial of iron supplementation in infants to date. Furthermore, the investigators used adequate measures of iron status and more comprehensive developmental measures than previous studies. They found no effect on the children's scores on the Bayley Scales or a test of recognition memory but a benefit was found in speed of information-processing, behavior, and the age of creeping. As planned, the study should have provided definitive answers. It is a tragedy and a classic example of false economy that their funding was reduced and the investigators had to abandon their randomized design and resort to a quasi-experimental approach. The low- and high-iron groups were separated by time and consumed different amounts of cows' milk. We, therefore, cannot infer with confidence that iron deficiency caused these small differences. Furthermore, as in nearly all studies, high-risk infants (low birth weight or IDA at 6 months) were excluded but

may be the most vulnerable and form a large proportion of children in low resource countries.

There is consensus that severe anemia is harmful, and these findings increase the suspicion that IDA affects children's development. However, considering the expense and difficulties of large treatment programs, there remains an urgent need to know whether mild to moderate anemia affects children's development and to what extent. The authors correctly call for more RCTs.

SALLY GRANTHAM-McGREGOR, FRCP, MD
Center for International Child Health
Institute of Child Health
University College London
London, United Kingdom WC1N 1EH

REFERENCES

1. de Andraca I, Walter T, Castillo M, Pino P, Rivera P, Cobo C. *Iron Deficiency Anemia and Its Effects Upon Psychological Development at Pre-school Age: A Longitudinal Study*. Nestle Foundation Annual Report. Lausanne, Switzerland: Nestle Foundation; 1990:53-62
2. Lozoff B, Jimenez E, Hagen J, Mollen E, Wolf AW. Poorer behavioral and developmental outcome more than 10 years after treatment for iron deficiency in infancy. *Pediatrics*. 2000;105(4). Available at: <http://www.pediatrics.org/cgi/content/full/105/4/e51>
3. Grantham-McGregor S, Ani A. Review of studies on the effect of iron deficiency on cognitive development in children. *J Nutr*. 2001;649S-668S
4. Idjradinata P, Pollitt E. Reversal of developmental delays in iron-deficient anemic infants treated with iron. *Lancet*. 1993;341:1-4
5. Stoltzfus RJ, Kvalsvig JD, Chwaya HM, et al. Effects of iron supplementation and anthelmintic treatment on motor and language development of preschool children in Zanzibar: double blind, placebo controlled study. *BMJ*. 2001;323:1-8
6. Lozoff B, De Andraca I, Castillo M, Smith JB, Walter T, Pino P. Behavioral and developmental effects of preventing iron-deficiency anemia in healthy full term infants. *Pediatrics*. 2003;112:845-854

Child and Adolescent Immunizations: New Recommendations, New Standards, New Opportunities

ABBREVIATIONS. VFC, Vaccines for Children (Program); NVAC, National Vaccine Advisory Committee; AAP, American Academy of Pediatrics, VIS, vaccine information statements.

In the movie *Spiderman*, Peter Parker's guardian, Uncle Ben, tells him, "With great power there must also come great responsibility." Over the past decade, pediatricians, family physicians, nurse practitioners, physician assistants, office nurses, and the entire primary care staff have been handed increased power and responsibility. The power to protect our children from vaccine-preventable diseases and the responsibility to ensure that every child receives all necessary vaccines in a safe and effective manner.

Received for publication Jul 22, 2003; accepted Jul 22, 2003.

Address correspondence to Alan E. Kohrt, MD, Department of Pediatrics, Rm 8596, Children's Hospital of Philadelphia, 34th St and Civic Center Blvd, Philadelphia, PA 19104-4399. E-mail: kohrta@email.chop.edu
PEDIATRICS (ISSN 0031 4005). Copyright © 2003 by the American Academy of Pediatrics.

Received for publication May 2, 2003; accepted May 2, 2003.

Address correspondence to Sally Grantham-McGregor, FRCP, MD, Center for International Child Health, Institute of Child Health, University College London, 30 Guilford Street, London, United Kingdom WC1N 1EH. E-mail: s.mcgregor@ich.ucl.ac.uk
PEDIATRICS (ISSN 0031 4005). Copyright © 2003 by the American Academy of Pediatrics.

Does Iron-Deficiency Anemia Affect Child Development?

Sally Grantham-McGregor

Pediatrics 2003;112:978

DOI: 10.1542/peds.112.4.978

Updated Information & Services

including high-resolution figures, can be found at:
<http://www.pediatrics.org/cgi/content/full/112/4/978>

References

This article cites 3 articles, 1 of which you can access for free at:

<http://www.pediatrics.org/cgi/content/full/112/4/978#BIBL>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):

Blood

<http://www.pediatrics.org/cgi/collection/blood>

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:

<http://www.pediatrics.org/misc/Permissions.shtml>

Reprints

Information about ordering reprints can be found online:

<http://www.pediatrics.org/misc/reprints.shtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

