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Prenatal micronutrient supplementation and intellectual and motor function in early school-aged children in Nepal.

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Abstract

CONTEXT: Iron and zinc are important for the development of both intellectual and motor skills. Few studies have examined whether iron and zinc supplementation during gestation, a critical period of central nervous system development, affects children's later functioning.

OBJECTIVE: To examine intellectual and motor functioning of children whose mothers received micronutrient supplementation during pregnancy.

DESIGN, SETTING, AND PARTICIPANTS: Cohort follow-up of 676 children aged 7 to 9 years in June 2007-April 2009 who had been born to women in 4 of 5 groups of a community-based, double-blind, randomized controlled trial of prenatal micronutrient supplementation between 1999 and 2001 in rural Nepal. Study children were also in the placebo group of a subsequent preschool iron and zinc supplementation trial.

INTERVENTIONS: Women whose children were followed up had been randomly assigned to receive daily iron/folic acid, iron/folic acid/zinc, or multiple micronutrients containing these plus 11 other micronutrients, all with vitamin A, vs a control group of vitamin A alone from early pregnancy through 3 months postpartum. These children did not receive additional micronutrient supplementation other than biannual vitamin A supplementation.

MAIN OUTCOME MEASURES: Children's intellectual functioning, assessed using the Universal Nonverbal Intelligence Test (UNIT); tests of executive function, including go/no-go, the Stroop test, and backward digit span; and motor function, assessed using the Movement Assessment Battery for Children (MABC) and finger-tapping test.

RESULTS: The difference across outcomes was significant (Bonferroni-adjusted P < .001) for iron/folic acid vs control but not for other supplement groups. The mean UNIT T score in the iron/folic acid group was 51.7 (SD, 8.5) and in the control group was 48.2 (SD, 10.2), with an adjusted mean difference of 2.38 (95% confidence interval [CI], 0.06-4.70; P = .04). Differences were not significant between the control group and either the iron/folic acid/zinc (0.73; 95% CI, -0.95 to 2.42) or multiple micronutrient (1.00; 95% CI, -0.55 to 2.56) groups. In tests of executive function, scores were better in the iron/folic acid group relative to the control group for the Stroop test (adjusted mean difference in proportion who failed, -0.14; 95% CI, -0.23 to -0.04) and backward digit span (adjusted mean difference, 0.36; 95% CI, 0.01-0.71) but not for the go/no-go test. The MABC score was lower (better) in the iron/folic acid group compared with the control group but not after adjustment for confounders (mean difference, -1.47; 95% CI, -3.06 to 0.12; P = .07). Finger-tapping test scores were higher (mean difference, 2.05; 95% CI, 0.87-3.24; P = .001) in the iron/folic acid group.

CONCLUSION: Aspects of intellectual functioning including working memory, inhibitory control, and fine motor functioning among offspring were positively associated with prenatal iron/folic acid supplementation in an area where iron deficiency is prevalent.

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