Effect of iron supplementation on growth of normal children and in anemic children.

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Introduction

Iron is essential for all tissues in a young child's developing body. Iron is reversibly stored within the liver as ferritin and hemosiderin and is transported between different compartments in the body by transferrin. Ferritin is the stored form of iron used by the cells, and a better measure of available iron levels than serum iron. Fe performs vital functions including carrying of oxygen from lung to tissues, transport of electrons within cells, acting as co-factor for essential enzymatic reactions, including synthesis of steroid hormones and neurotransmission. Mitochondria supply cells with adenosine triphosphate, heme, and iron-sulfur clusters, and mitochondrial energy metabolism involves both heme-and iron-sulfur clusters-dependent enzymes. Mitochondrial iron supply and function require iron regulatory proteins that control messenger RNA translation and stability and iron is positively correlated with mitochondrial oxidative capacity [1].

Many authors have reviewed the effect of routine iron supplementation on growth in children. A systematic review analyzed 25 randomized controlled trials that evaluated the effect of iron supplementation on physical growth in children interventions included oral or parenteral iron supplementation, or iron-fortified formula milk or cereals. The pooled estimates random effects model did not document a statistically significant positive effect of iron supplementation on any anthropometric variable. However, greater Wt-for-age in supplemented children in malaria hyper-endemic regions and greater Wt-for-Ht for children above five years of age were noted, along with a negative effect on linear growth in developed countries and with supplementation for 6 months or longer.Two other meta-analysis of examining iron (supplementation) interventions in children aged eighteen years found that the iron-supplementation had no significant effect on growth [2].

The second meta-analysis included iron-fortified foods, iron-fortified formula, or iron supplements and evaluated Height, Weight,head circumference, birth weight, or length of gestation in infants, children, and adolescents, and seven studies conducted in pregnant women.

The overall pooled result random-effects model showed no significant effects of iron intervention on any of the parameters measured.When results were stratified according to dose of iron, duration of intervention, age, and baseline iron status, only doses of 40–66 mg of supplemental iron and intervention in children six years of age showed a slight but significant association with weight.

Iron supplementation in anemic children

Only few controlled studies have investigated the effect of Iron deficiency anemia, and the effect of treatment with iron, on growth in children. Treatment of Iron deficiency anemia with oral iron for 2 months was associated with a significantly greater increase in weight velocity compared to the placebo group. Other studies have confirmed these observations, and also suggest that the correction of anemia is associated with a reduction in the increased morbidity (fever, respiratory tract infections, diarrhea) seen in children with Iron deficiency anemia. The effects of Iron deficiency anemia, and its correction with Fe, in school going children on anthropometric parameters. Pre-supplementation values of Iron deficiency anemia children were significantly lower in girls and in boys, when compared to the control group. Iron supplementation-induced improvement in hematological parameters was associated with significant improvement of Height, Weight. Post therapy, the anemic girls and boys grew faster than their respective control groups [3].

Growth and parameters in 40 children with Iron deficiency anemia before and for 6 months after iron therapy in comparison with normal controls. Before treatment children with Iron deficiency anemia were significantly shorter and had slower growth compared with age-matched controls. After treatment, their growth velocity, length standard deviation scores and body mass index increased significantly (significant catch-up of growth). Their growth velocity was correlated significantly with mean Hb concentration. Similarly, assessed the growth status of anemic and normal children [4].

The anemic children had significantly lower body weight, height and weight for age. Iron treatment for both groups of children for six months produced a significant increase in Hb levels of both groups compared to their respective controls who received sugar placebos. Growth performance of anemic children supplemented with iron was superior to that of anemic placebo-treated children as indicated by a better weight gain and a significantly higher weight for height. In summary, Iron deficiency anemia in children, especially during the first two years of life significantly impairs growth that can be corrected by adequate iron therapy [5].

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Thalassemia and growth are linked by different, multifactorial mechanisms. Growth retardation occurs almost invariably in homozygous β-thalassemia. Significant size retardation is observed in stature, sitting height, weight, biacromial, and bicristal breadths. After the age of four years, the longitudinal growth patterns display rates consistently behind those of normal controls. Growth retardation becomes markedly severe with the failure of the pubertal growth spurt. With the introduction of high transfusion regimes and efficient iron chelation in thalassemia management, prepubertal linear growth has improved markedly.

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