Childhood iron deficiency: causes and consequences

Worldwide, nearly half of pre-school children suffer from anemia. Of these, 50-60% are due to iron deficiency. In developing countries such as Bangladesh, there is a >60% prevalence of anemia. What causes iron deficiency, and how does this affect child development? Sally Grantham-McGregor and Helen Baker-Henningham begin by discussing the causes of iron deficiency. Iron deficiency is usually linked to low dietary intake of iron, in combination with high levels of substances that inhibit iron absorption. Parasitic infections that cause blood loss can further deplete iron stores in the host.

“Before discussing the possible effect of iron deficiency on children’s development, it is necessary to understand the basic processes of child development and the ecology of iron deficiency,” state Grantham-McGregor and Baker-Henningham. They begin with a basic question: are there biologically plausible mechanisms through which iron deficiency can affect child development? Indeed, data from animal models reflects the findings from clinical studies, highlighting changes in myelin formation, neuronal metabolism, hippocampal structure, and altered behavior patterns under conditions of iron deficiency.

But despite the large number of published studies, there is a lack of consensus on the effects of iron administration particularly in younger children. In order to understand the latest findings, the authors cherry-pick key observational studies and summarize data from randomized controlled trials (RCTs). In addition, they synthesize the information according to age (under or over 3 years).

Taken together, most studies suggest no potential adverse effects of iron supplementation. However, universal supplementation is still hampered by doubts over the detrimental effects of excess iron in children who are iron-replete. Another complicating factor is that children with iron-deficiency anemia usually come from poor backgrounds, making it difficult to distinguish between the effects of iron deficiency versus environment. “There are relatively few double-blind RCTs of iron supplementation with adequate power,” caution Grantham-McGregor and Baker-Henningham. Although there is insufficient evidence to draw firm conclusions on the risks versus benefits of iron supplementation, this review provides investigators with a list of outcomes and controls which can be used when designing future trials aimed at correcting iron deficiency.

References