

Short Communication**Iron Deficiency a Public Health Problem in India****Agarwal KN****President Health Care & Research Association for Adolescent, & ex-Hon Scientist Indian National Science Academy*

Nutrition Foundation Of India studies in 7 states (Assam, HP, Hy, Kerala, MP, Orissa, TN) by Agarwal et al; IJMR.2006 & 2007, showed that anemia prevalence in Pregnancy was 86.1% with Hb <7.0g/dl- severe anemia being 9.5%; while in Lactation 81.7 % had anemia with Hb <7.0g/dl in - 7.3%. In maternal anemia (hypoferremia) fetal liver iron stores are reduced significantly. Infants born before 36 weeks of gestation had half the iron content in hepatic reserve (Agarwal et al; Acta Paediatr 1985). In rodent model Fetal brain iron content decreased, irreversibly in fetus of latent iron deficient rat mother (Shukla et al Biol & Tr El Res 1989). Offspring's of anemic mothers had- hypotonia in 72% and hypoexcitability in 56%, modification of responses in several reflexes e.g. limp posture, poor recoil of limbs, incomplete Moro's and crossed extensor responses. EEG of these had shortening of sleep cycle (REM AND NERM), the reduction was more marked for REM sleep. There was some inter and intra hemispheric asymmetry and abnormal paroxysmal discharges; suggesting dysmaturity of brain (Agarwal et al. Acta Paediatr Scand 1979 & Arch Dis Child 1980). Recent studies confirm such findings as infants with cord serum ferritin concentrations <35 mcg/L have electrophysiologic evidence of abnormal auditory recognition memory, where these infants do not discriminate a familiar stimulus (e.g. maternal voice) from a novel stimulus (e.g. stranger's voice) with the same robustness as iron sufficient infants [1]. In an urban Integrated Child Health Services block in East Delhi with nutrition supplementation programs 545 children (9-36 months), and health care provided by the neighbouring medical college examined for haemoglobin and serum ferritin had prevalence of anemia as 63.5% (Hemoglobin < 11.0g/dl) and low serum ferritin (CRP -ve) in 87% children indicated anemia (Kapur et al 2003).

Importance of Iron in Brain Growth and Development

- It is essential for normal neurological functions because of its role in oxidative metabolism and because it is a cofactor in the synthesis of neurotransmitters and myelin (Agarwal Brit Journal Nutr 2001).
- The highest levels of iron in the brain are found in the basal ganglia, though iron is distributed throughout the brain, including the white matter.
- It performs functions specific to neurologic activity, such as synthesis of dopamine.

- Iron also plays an essential role in myelination and influences dendritic growth in the hippocampus
- It is important to learn that 50% of human brain grows in first year of life. Maximum brain growth occurs in last 8 wk of gestation to 30th month of life. At birth 25%; by 1st birthday 75% of the adult brain; so 50% brain is added in the first year of life.
- Time courses for synaptogenesis and cognition are shown below indicating that sensory pathways, language and higher cognitive functions develop in first year of life.

Breast milk iron in an infant of well-nourished mother provides sufficient iron-as 49% is absorbed sufficient for 6 months of life, by the time infant doubles the weight. But in case of undernourished/ anemic mother breast milk will not be able to meet the iron needs of the growing infant. Studies are available to show that breast fed infants have lower iron and ferritin levels after 4 months of age as compared to bottle fed (unpublished).

The question remains how to approach the control and prevention of Iron deficiency in this period.

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- Treat adolescent-pregnancy-lactation anemia. For Iron healthy births.
 - Feeding in early infancy-Baby should be breast fed colostrum and mature milk; both have 49% absorbable iron.
 - Iron fortified weaning food.

Approaches Adopted in Other Countries Using Iron Fortified Food are

Iron EDTA -Egyptian flat breads, curry powder in South Africa, fish sauce and flour in Thailand, and sugar in Guatemala. In Grenada, flour used in commercial baking is enriched with iron and B. Pasteurized milk (iron 15 mg/ l and Vit. C 100 mg/l.)-Stekel 1986.

- Almost one-fourth of iron intake in the US diet come from fortified sources, much of that from flour products.
- India has successfully fortified salt with IRON; but we cannot feed large quantity of salt to children, as it can be harmful and cause hypertension.
- India needs IRON fortified hygienically prepared WEANING FOODS right from weaning or SIX months of age.

Caution for Iron supplementation-Excess iron cannot be excreted by the human body and it has recently been suggested that excessive iron supplementation in prenatal period/or infants may have adverse effects on growth, risk of infections, and even on cognitive development .Due to the potential for oxidative stress, indiscriminate iron supplementation should be avoided in preterm infants. Iron supplemented foods are prepared under scientific care.

References

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