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Iron Deficiency and *Neurocognition*: Issues in Children

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The term, *neurocognition*, denotes the mental action or function. In elaborate terms, it is the process of acquisition of knowledge, skills (e.g. communication, self-help, and socialization) and understanding via thought, experience and the senses, and interpreting these and causing their applicability [1,2]. It involves the use of existing knowledge and generates new knowledge.

Falling under its umbrella are such important aspects of intellectual faculty as attention, concentration, knowledge, memory (both old and ongoing), evaluation, reasoning, past and present problem-solving, decision-making, comprehension and production of language.

Cognitive impairment can result from conditions that occur during intrauterine life (fetal development), at birth, shortly after birth, or at any point of time in subsequent life. Hypothyroidism, epilepsy, cerebral palsy, genetic and chromosomal disorders (Down syndrome), etc., are some of the medical conditions that are well known to lead to cognitive impairment in children

Micronutrient deficiencies are common in paediatric population, especially in the resource-limited segments of society. Whereas iodine deficiency as a cause of cognitive impairment has been known since long, apt recognition of the role of iron deficiency in causing cognitive dysfunction is a recent development. In view of a very high prevalence of iron deficiency anemia (IDA) in the underprivileged compared to just 2-6% prevalence in prosperous communities, it is not difficult to imagine the enormous damage it may well be causing in the poor communities.

Neurocognitive impairments caused by iron deficiency in children include the following areas [3]

A. Usual

- Concentration,
- Attention span,
- Intelligence, and
- Sensory perception functions.

B. Frequent

- Motor,
- Emotional, and
- Behavioural problems.

The iron deficiency in relation to proper cognitive development in infants, children and adolescents is associated with clinical manifestations that can persist through adulthood [3,4].

As a result of several studies with varying methodology, there is a consensus that iron deficiency has a negative impact on cognition, behaviour, and motor skills (4). Nonetheless, a review of the current state of knowledge about cognition in iron deficiency brings to surface quite a few issues that remain ambiguous.

First, since cognitive deficit is observed in iron deficiency anemia as well as non-iron deficiency anemia as such, it is desirable to determine the difference in cognitive status of these two situations. Secondly, there is convincing evidence that cognition is clearly

related to alterations in areas such as the hippocampus, mitochondrial damage, brain dopamine metabolism, and myelination. Is the same mechanism in operation in non-iron deficiency anaemia?

Thirdly, appropriate duration of administration of iron supplements in different age groups (infants, children, adolescents,) remains ambiguous – subjective rather than objective.

Fourthly, we need to know the effect of iron deficiency in LBW infants. Fifthly, it will be interesting to ascertain in which way combination of iron deficiency and iron deficiency anaemia with comorbid pathology indeed worsen the cognitive status.

Finally, does the iron therapy lead to improvement in cognition and eventually development?

Clearly, studies are warranted to obtain answers to these and, perhaps, some more issues. Neurocognition dysfunction in iron deficiency, including iron-deficiency anemia, is not just a health issue. It also has socially significant repercussions.

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