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### **Iron status influences cognitive development in Santal children of Purulia district, West Bengal, India**

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**Background:** Iron deficiency in early part of life has been considered as a key factor for delayed brain development. The impairment of children's cognitive development has been found to be closely associated with the iron deficiency. Recently, poor cognitive development, poor nutritional status and a positive association between these two have been established in Santal children. Deficiency of iron in their diet was also reported in recent past. The association between cognitive development and iron status has not been evaluated in Santal tribal population. It is pertinent to investigate this association as it may provide a valuable contribution in the field of cognitive research. Therefore, the purpose of the present study was to characterize a relationship between iron status and cognitive development in 5 to 12 years aged Santal children of Purulia district of West Bengal.

**Methods:** The present study was cross-sectional and conducted on 170 (90 boys and 80 girls) school children aged 5-12 years from Balarampur and Bagmundi areas of the Purulia district of West Bengal. Some biochemical parameters such as hemoglobin concentration, serum iron, serum ferritin, total iron binding capacity (TIBC), serum transferrin, and transferrin saturation were measured to assess the iron status of each subject. Stages of iron depletion have also been measured in surveyed children. Raven's Coloured Progressive Matrices (RCPM) was applied for measuring the general intelligence. Intelligent quotient (IQ) classes were calculated from RCPM scores.

**Results:** The Hb concentration ( $p < 0.05$ ), serum iron ( $p < 0.01$ ), serum ferritin ( $p < 0.05$ ), transferrin saturation ( $p < 0.05$ ) levels of both boys and girls having RCPM scores below 5th percentile value were significantly lower than that of RCPM scores above 5th percentile (maximum 25<sup>th</sup> percentile) value of standard. The Hb concentration, serum iron, serum ferritin and transferrin saturation levels of 'intellectually deficit' group (for both boys and girls) and 'below average' group (only in girls) were significantly lower ( $p < 0.05$ ) than that of 'above average' group of IQ level. According to IQ classes based on RCPM scores, about 9.53% of 'below average' class were found in stage III whereas about 19.04% of boys of 'below average' class were found in stage II of iron depletion. RCPM scores of children (boys, girls and total children) belonging to iron depletion stage II and III were significantly lower ( $p < 0.05$ ) than that of normal children. Pearson's correlation study indicated that all the iron status parameters were found to be significantly correlated ( $p < 0.05$ ) to RCPM scores.

**Conclusions:** The present study suggests that the iron status is linked with cognitive development in surveyed children as vulnerable iron status causes impairment of cognitive functions. Cognitive development was affected more in girls than boys as iron status is lower in girls than boys.

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