



IQ Alterations in Children at 7-13 Years Old: The Roles of Prenatal and Childhood Fluoride Exposure

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Background: Chronic exposure to excessive fluoride will cause multiple pathological changes for humans. However, the effects of prenatal and childhood fluoride exposure on children's intelligence quotient (IQ) are rarely reported.

Objective: A cross-sectional study was performed to evaluate the roles of prenatal and childhood high fluoride exposure in alterations of children's IQ at age 7-13. **Methods:** A total of 678 children in one fluoride exposure school and three control schools were selected in Henan province of China. Urinary fluoride level was measured by fluoride ion-selective electrode assay. Children's IQ level was assessed by the third revision of Chinese children's norm for Combined Raven Test (rural children's version). **Results:** Children in prenatal fluoride exposure group (BG) had lower IQ scores than childhood fluoride exposure group (AG), both prenatal and childhood exposure group (DG), and control group (CG) ($P < 0.05$, respectively). Ratio deficits of excellent and extremely excellent grades were observed in children from BG compared with those from the other three groups ($P < 0.05$, respectively). When urinary fluoride level does not exceed 0.9 mg L^{-1} , children's IQ increases with the increase of urinary fluoride level ($P < 0.05$). For every 0.1 mg L^{-1} increase in urinary fluoride, children's IQ score increased by 0.12 in multiple adjustment regression analysis.

Conclusions: Prenatal fluoride exposure in drinking water could cause loss of children's IQ, especially in the proportion of children with excellent and extremely excellent IQ grades. Particularly, appropriate concentration of fluoride exposure in childhood may improve intellectual development of children in some degree.

Keywords: Fluoride, Pregnancy, Childhood, Children, Intelligence development