Commentary

Fluoride-containing compounds are very diverse in our living environment, in which sodium fluoride is one of the most common soluble fluoride salts, existing in drinking water that we face every day. Many researchers have documented that people exposed to an excessive level of fluoride would have tendency to get dental fluorosis and skeletal fluorosis, which can alter the appearance of children's teeth during tooth development and which causes pain and damage to bones aadnd joints, respectively.[1] Besides those cumulative toxic symptoms, both animal experiments and epidemiological investigations confirm that excessive fluoride consumption can lead to certain structural and functional damage to nervous system.[2]

As the authors of this article stated, the majority of epidemiological studies investigating the relation of children's intellectual performance to fluoride concentration in drinking water were conducted in China and other countries rather than in India, which means there are little reference that we can learn from India where the prevalence of fluorosis is extremely high. Therefore, I am pleased to see that the revelation of this article, written by Saxena[3] brought us new evidence and proof of the adverse effect of fluoride in drinking water on children's intelligence quotient (IQ) in relatively high fluoride areas in India.

We know, children's intelligence is highly susceptible to many social and natural factors, such as cultural and ecological environment, economic situations, nutritional status of children, as well as other environmental pollutants like lead and arsenic.[4] All of these confounding factors could confuse and dilute the effect of fluoride on children's intellectual performance in the statistical models. Therefore, it is very hard to determine whether the difference of children's IQ scores from different fluoride exposure groups is caused by fluoride concentration or by other factors. To address this issue, this project used questionnaire to collect necessary information on children's nutritional status, education background of parents and the socio-economic status of children's family. In addition, arsenic, lead and iodine concentration in urine samples were detected in this project to evaluate the potential influence of these hazardous materials in environment on children's intelligence. After adjusting for those covariates, the authors could draw their conclusion with the minimum possibility of interruption of intellectual confounding factors.

In my opinion, another enlightenment this scientific article brought to us is the idea that using urine fluoride as a short-term biomarker to reflect the recent fluoride intake condition. From the view of an external environment, fluoride concentration in drinking water fluctuates little in years in a specific area.[5] On the side of inner metabolic mechanism of human body, kidney is the principal organ for the excretion of fluoride.[6] Therefore, it is not difficult to speculate that the urine fluoride concentration seems to keep stable in a short time on the basis of an external fluoride source—drinking water has not changed while the kidney's excretory function works as well. Juxtaposed with traditional methods that only compared different IQ scores in two or three different fluoride exposure groups, this design of combining all the selected children together can obtain more credible results and a larger amount of information. With the help of this internal exposure biomarker, epidemiologists can explore the relation of children's IQ scores to individual exposure conditions by the data derived from full range of urine fluoride concentration, using all kinds of statistical model such as multiple liner regression model and stepwise regression model, with the participation of many covariates as mentioned before.

Although there are many shining and creative points in this survey, limitations still exist as the authors said in this article. First of all, all the involving children were selected from primary schools, which meant they had to spend much time everyday at school. Thence the existing fluoride exposure data in drinking water would be incomplete because of an absence of information on fluoride level in drinking water from the primary schools. In addition, all the conclusions in this article were drawn on the assumption that the quality of education in these two schools was consistent. However, evidence of different educational backgrounds in these two primary schools is not clear. We know that the acquired education plays a very critical role in the growth of children's intelligence. Therefore, if the authors could provide us more specific information on the educational quality of different schools, the results of this research would be more convinced.

Overall, this study suggested that high levels of fluoride exposure in drinking water had negative effects on children's intellectual performance in India, which enrich our knowledge about the relations of fluoride exposure to intelligence damage in different fluorosis areas in the world. Even a small decline of intelligence could lead to a profound influence on individual's developments. Therefore, effectual measurements are badly needed to alleviate long-term fluoride toxicity to children's physical health for the benefit of our future generations all over the world.

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References

1. Fejerskov O, Manji F, Baelum V. The nature and mechanisms of dental fluorosis in man. J Dent Res 1990;69(spec):692-700.
2. Teotia M, Teotia SP, Kunwar KB. Endemic skeletal fluorosis. Arch Dis Child 1971;46:686-91.
3. Saxena S, Sahay A, Goel P. Effect of fluoride exposure on intelligence of school children in Madhya Pradesh, India. J Neurosci Rural Pract 2012;3:144-9.
4. Fulton M, Thomson G, Hunter R, Laxen D, Hunter R, Hepburn W, *et al*. Influence of blood lead on the ability and attainment of children in Edinburg. Lancet 1987;329:1221-6.
5. Li GS, editor. Pathogenesis of Endemic Disease. Beijing: Science Press; 2004. p. 165-73.
6. Spencer H, Lewin I, Wistrowski E, Samachson J. Fluoride metabolism in man. Am J Med 1970;49:807-13.

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