

Can fluoridation of water 'cause' blindness? A validity check

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Abstract

Tumkur district of Karnataka state in India has reported that 4000 children have lost their vision in Pavagada taluk and it has been attributed to high fluoride contents in the water the taluka. That has given rise to a very serious question on whether high fluoride content in water in Pavagada region could cause blindness in the affected community. The paper examines the biological plausibility and possible reasons and finally concludes with Epidemiological reasoning that fluoridation water does not cause blindness. The said association between fluoridation and blindness could be spurious in nature and explained by confounding effect. However, it is also stressed to investigate every reported adverse effect of fluoridation as there is increasing evidence that fluoridation of water does not help in prevention Caries on the contrary, Flouridation of water poses health risk hence there is need for policy decision on fluoridation of water as public health intervention.

Tumkur district of Karnataka state in southern India has reported that 4000 kids have lost vision in Pavagada taluk and it has been attributed to high fluoride contents in the water the taluka [1,2,3]. That has given rise to a very serious question on whether high fluoride content in water in Pavagada region could cause blindness of such high magnitude in the affected community? The said association between fluoridation and blindness could be spurious in nature and could explained by confounding effects of other reasons for blindness. However, perplexing it may sound but we need to answer two basic questions: Does high fluorides have causal association with blindness? & secondly if there is association, can it cause vision impairment on as large-scale magnitude to become a public health problem in a given locality?

Literature review on adverse health effects show obvious effects due to dental and skeletal fluorosis. Some literature also reports adverse effects on Thyroid, Kidney and Brain. Some Studies also have shown high levels fluorides as risk factor to lowered IQ, Diabetes and Cancer [4]. No published literature has reported any eye effects. At best, there is a passing reference to blurred vision, which is again explained as sequel effect to neural or hormonal involvement. There is not single paper that links high fluoride levels to complete loss of vision. On the contrary literature show fluorine compounds are used as preservatives in the field of ophthalmology. Fluorine compounds are routinely used in vitreoretinal surgery in which post vitrectomy, vitreous gel from eye is aspirated and the empty vitreous cavity is filled with fluorine compound to stabilize retina [5]. Compounds of fluorines are widely used in manufacture of contact lenses.

However, alternate biologically plausible explanations linking fluorides to loss of vision is a theoretical possibility as fluorine indirectly affects eyes through different Via medium.

Studies have shown that high fluoride level affect thyroid functioning that results in increased Thyroid stimulating Hormone (TSH) which in turn leads to thyroid eye syndrome [6,7]. High fluorine level has been associated with impaired glucose tolerance Test that has been associated with increased risk of Diabetes [8]. Hyperglycemia

will lead to poly-dipsia, increased thirst would induce increased water intake. Since the water in the locality already has high fluorine content and individual's hyperglycemia status tend to make them take repeated and increased water intake with high fluoride content which in turn would make them susceptible to fluorosis on one hand and diabetic retinopathy on the other hand. Other possibility is Fluoride is known to increase calcification of tissues, specially bones. but It is now known that it increases calcium deposition even in soft tissues like arteries (Drs in AIIMS is doing some work with pregnant women on this, and this may result in decreased blood supply to most organs like the uterus (cause of a low birth weight due to decreased perfusion of the placenta, hemorrhagic in the per menopausal women, some evidence from NIN). Calcification of blood vessels supplying the heart muscle contributes to narrowing and CHD, and calcification of the lens causing early cataract [9].

It may appear that we may seem to have "proved" high fluorides in the region as the causative factor for the large number blindness cases in the community. But that is a flawed conclusion because high fluoride level have primary (causal) effects on dental/skeletal fluorosis, hence they can occur in large numbers to manifest as public health problem in the community. Whereas Blindness is a secondary effect (complication) other primary effects like hypothyroidism or hyperglycemia, which is unlikely to cause so many blindness cases (4000 cases) in a Pavagada taluk (6.7 lakh population) giving prevalence of 6% in the Pavagada taluka, which is not feasible. Hence occurrence of for such large number of blindness cases (6 cases per 100 persons) in Pavagada taluk cannot be explained either due to fluorosis in the region either patho-physiologically or epidemiologically.

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Conclusion

1. High fluorides and blindness have No Causal relationship.
2. The observed association between high fluorides in Pavagada region of Karnataka and Blindness can be attributed typical error committed in ecological observation called ecological fallacy
3. However, biological plausibility could be explained theoretically through Indirect Association between fluorosis and blindness that is possibly mediated through set of confounders i.e., Hyperthyroidism, Hyperglycemia or other risk factors that have causal association with impaired vision and they are also correlated with fluoride levels in the ecosystem of affected region.
4. Only those health outcomes which have direct causal association between exposure and outcome generally emerge as public health problem in a given community. When the health outcome is secondary effect or complication of primary outcome they are unlikely to occur in unusually high magnitude so as to become public health problem.

However, the author believes that very reported adverse effect of fluoridation needs to be investigated and analysed thoroughly as there is increasing evidence that fluoridation of water does not help in prevention Caries[10,11] as believed all these decades on the contrary there are reports around the world that Fluoridation of water poses a health risk [4,6-9] so that policy decision on fluoridation of water as public health intervention can be re-evaluated.

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