

Fluoride toxicity: A review article on adverse effects of fluoride

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Abstract

Fluoride is an element & is used for various purposes in dentistry. Dental caries is prevented by the usage of fluoride. Fluoride is used in the form of milk, water, tablets etc. Fluoride acts as a double-edged sword. Fluoride used in recommended safe values is beneficial for health, but it can be toxic if overdose. Fluoride toxicity can lead to damage of brain, kidney, bones etc. depending on the dosage.

Keywords: Fluoride, Dental fluorosis, Skeletal fluorosis, Fluoride toxicity, Acute Fluorosis, Chronic fluorosis, Dental caries, Prevention.

Introduction

Fluoride is important for the prevention of dental caries.¹ Fluoride is added in the drinking water, salt & milk. It is also used in the form of tablets and drops.² According to studies there are many side effects of fluoride too. Some of the effects include acute and chronic fluorosis. The mineralized tissues such as dental or skeletal tissues are affected in cases of chronic fluoride toxicity, which may lead to dental or skeletal fluorosis. Acute fluorosis leads to gastrointestinal symptoms, which may at times lead to death.³

There are various effects seen after the chronic administration of fluoride on the blood, brain, kidney leading to abnormal behavior pattern, altered neural and cerebrovascular integrity and metabolic lesions.⁴

Fluoride can also be lethal if consumed in higher quantity (15mg/kg). The optimum fluoride level recommended varies with climatic changes.⁵ In cold climate recommended fluoride concentration is higher of about 1.2 ppm but in extremely hot climatic conditions as the consumption of water increases therefore the recommended fluoride level is 0.7.⁶

Fluorosis causes number of biological changes in the body.

Materials and Methods

All epidemiological studies from 1970 to 2000 (cross-sectional, case-control, cohort and clinical trials) involving fluoride toxicity on health were considered eligible for the present review.

The study selection was conducted in two phases: (1) In the first phase abstracts and titles were selected and in the second phase a full text of the selected titles were obtained and read to determine the final sample set.

The study selected was from literature electronic search, carried out in PubMed, Cochrane Library google scholar databases, Medline, Embase and from the papers between March 1995 and May 2013.

Results

There were eight databases. A total of 1500 relevant records were found in them, out of which 145 were duplicated.

As per studies, 65 references were selected for full-text analysis, & 14 of which were selected for inclusion & 400 references were excluded based on the abstracts.⁷

Fluoride is available in various forms like 0.25-1 mg/tablet or 1000-1500mg of fluorine per kg of tooth paste in low concentrations or as liquids containing 10000 mg/l and gels containing 4000-6000 mg/kg used for local applications in high concentrations.⁸

It was reported that the prevalence of skeletal fluorosis and non-skeletal fluorosis was 56.87% (116). In female patients, the prevalence was 43.13% (88).⁹

Discussion

Types of Toxicity

1. Acute Toxicity

The cases of ingestion of an acute fatal dose of fluorides are very rare. The considered lethal dose of fluoride is 35-70 mgF/kg body weight of soluble fluoride. Such fluoride amount can lead to various symptoms such as nausea, vomiting, abdominal pain, diarrhea, dehydration, etc.

2. Chronic Toxicity

Smaller amounts of fluoride taken for a longer duration.

Dental Fluorosis: During the tooth development if the excessive intake of fluoride occurs i.e. until 5 years (excluding 3rd molars), it leads to several clinical features, such as: lusterless, opaque white patches in enamel, which may be mottled, striated or pitted.

1. Mottled areas may become stained yellow or brown.

2. Hypo-plastic areas seen in severe cases is lost.

A. Skeletal Fluorosis: 20-80mgF/day for 10-20years leads to pathological skeletal fluorosis.

1. The most vulnerable groups are: pregnant women, lactating mother and children.

2. Sodium fluoride is less toxic than calcium fluoride.

3. In severe forms of fluorosis spine becomes rigid and joints stiffer leading to virtually immobilization the patient.

Manifestations

1. Severe pain in back bones, joints, hips, stiffness, joints and spine.

2. In advance stages the outward bending / bowing of legs and hands occurs.

2. There is calcification of ligaments seen.

B. Kidney Damage: Dosage: 5-10 mg/day**Duration:** 6-12 months.**Conclusion**

The effect of fluoride is dose dependent. Fluoride can be useful as well as harmful depending on the dosage, that's why fluoride is known as DOUBLE- EDGED- SWORD. Effects of fluoride toxicity are commonly seen on bones, thyroid, kidney, and other organs. There are many other factors which lead to Fluoride poisoning and biological responses leading to ill-effects on the body. They are total daily intake of fluorides in various forms, duration of exposure to fluorides age of individual etc.

Conflict of Interest: None.**References**

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