

Preventive Dentistry

Lec.10

أ.د. عذراء مصطفى

Fluoride Toxicity

Toxicity is due to excessive ingestion of fluoride and can be acute or chronic.

Acute toxicity is due to ingestion of large dose of fluoride in a short period of time while chronic toxicity is due to ingestion of excess fluoride in low doses over a prolonged period of time.

- Certainly Lethal dose of fluoride (CLD) is : A lethal dose is the amount of drug likely to cause death if timely interception by antidote is not initiated.
- In Adult: CLD is 5–10 gm of sodium fluoride taken at 1 time.
- The fluoride ion equivalent is 32–64 mg Fluoride (F) per kg body weight.
- In Children: CLD is approximately 0.5–1.0 gm. It varies with age and weight of the child.
- For children under 6 years of age, however, 500 mg would be lethal
- probably toxic dose : the minimum dose that could cause toxic signs and symptoms, including death, and that should trigger immediate therapeutic intervention and hospitalization ,that dose has generally been accepted to be ≤ 5 mg F/kg body weight.

Factors influencing acute toxicity:

1- Form of administration: Fluoride administered in liquid form is absorbed quickly, hence the symptoms of toxicity is rapidly seen.

2-Age: Younger the age more severe and faster are the symptoms of toxicity.

3-Rate of absorption: Rate of absorption depends on many factors

4- Type of fluoride compound e.g. stannous fluoride is slightly more toxic than sodium fluoride because high doses of tin ion adversely affect the kidney and other organs.

Signs and symptoms of acute fluoride toxicity

- Nausea, vomiting, abdominal pain, increased salivation, nasal discharge
- Generalized weakness, muscle spasm
- Reduced plasma calcium level, increased plasma potassium level
- Weak thready pulse, fall in blood pressure
- Depression of respiratory center
- Cardiac arrhythmia
- Coma and death.

Management of acute toxicity

Immediate management should be aimed at:

- Reducing the fluoride absorption by inducing vomiting through emetics
- Increasing fluoride excretion by increasing the alkalinity of the urine and fluid replacement
- Plasma calcium and potassium level monitoring

Management based on the amount of fluoride ions ingested

- | | |
|---------------|------------------------------|
| • < 5.0 mg/kg | Milk + Induce vomiting |
| • >5.0 mg/kg | Induce vomiting |
| | Milk,+ 5% calcium gluconate, |
| | Hospitalization |

- > 15.0 mg/kg

Induce vomiting

Cardiac monitoring - peaking of T wave and prolonged QT interval in a ECG

Slow administration of 10 ml of 10% calcium gluconate

Maintain adequate urine output

Supportive measures for shock

Some sources of fluoride poisoning(probable toxic doses)

1-Fluoride supplements	Amount contain (PTD)
0.25 mg F 1 tab/day (toddler)	200 tablets
0.5 mg F 1 tab/day (3–6 years)	100 tablets
1.0 mg F 1 tab/day >6 years	50 tablets
2-Fluoridated toothpaste	
NaF 0.22% Pea-size amount per brushing (0.5 cc)	50 cc
MFP 0.76% Pea-size amount per brushing (0.5 cc)	50 cc
SnF2 0.4% Pea-size amount per brushing (0.5 cc)	50 cc

Recommendations for parents:

- Parental supervision
- Child-proof containers (for fluoride tablets)
- Keep products out of reach of young children
- Supervise children when brushing / rinsing , Small amount of tooth paste to be used

- Products with low fluoride level to be used
- Teaching children not to swallow paste or rinse
- Strict adherence to professional advice

Calculations of the percentage of fluoride ion in the total amount of fluoride agent swallowed

- Multiply the percentage of the fluoride agent with the molecular conversion ratio of that particular fluoride agent to obtain the percentage of fluoride ions present

Example: For 2% sodium fluoride, molecular conversion ratio = 1/2.2

$$2 \times 1/2.2 = 0.9\% \text{ fluoride ions}$$

- To convert the percentage of fluoride ion to fluoride mg/gm, multiply the percentage of fluoride ions with 10

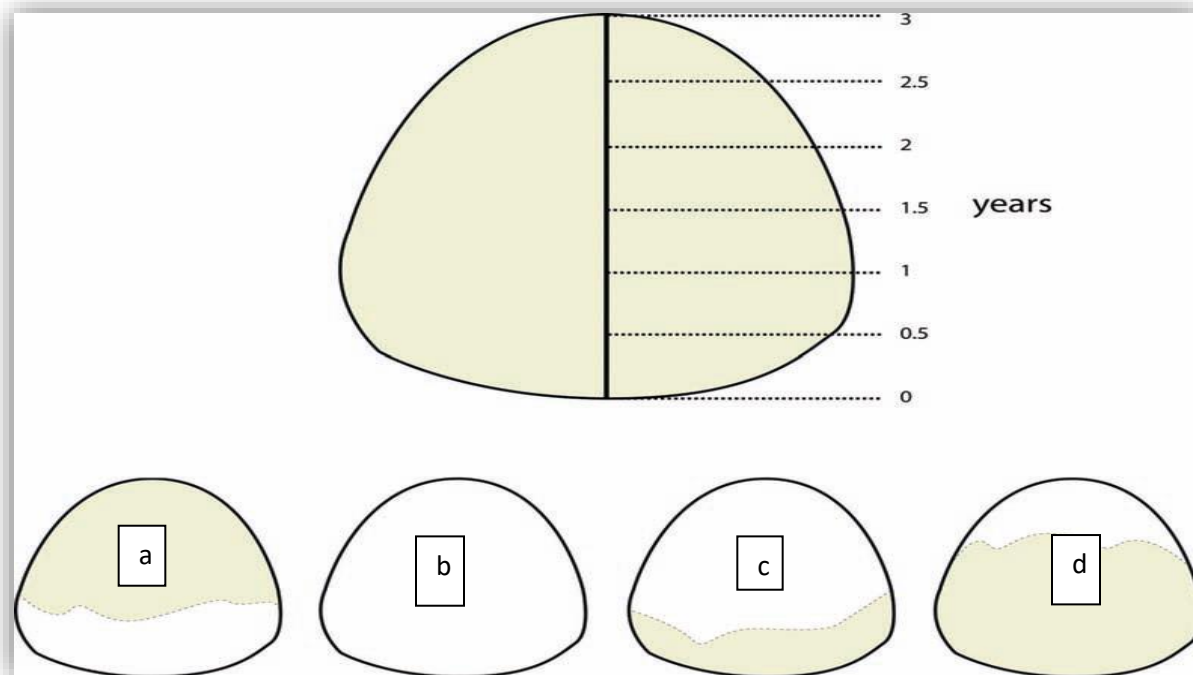
$$0.9 \times 10 = 9 \text{ mg of fluoride ions in one gram of sodium fluoride}$$

- To calculate the amount of fluoride ions swallowed, multiply the fluoride in mg/gm with the total amount of agent swallowed. This gives the total amount of fluoride ions present in the amount swallowed $9 \text{ mg/gm} \times \text{total amount of sodium fluoride swallowed} = \text{total amount of fluoride ions swallowed}$
- From this the toxic dose of fluoride can be calculated for a given child based on the body weight as $\text{total amount of fluoride ions swallowed} / \text{weight of the child in kg}$.

Chronic Toxicity

It is caused due to ingestion of excess amount of fluoride over a prolonged period of time. It can cause dental and skeletal changes referred to as dental and skeletal fluorosis respectively.

Dental fluorosis in relation to the stage of tooth development and exposure to fluoride. The central incisor takes approximately 3 years to go through complete enamel mineralization .



(a) Exposure during the first year of mineralization may only affect the incisal third of the tooth.

(b) Exposure to fluoride throughout the entire mineralization period will affect the entire tooth surface.

(c) Exposure to fluoride in the second and third year of mineralization will leave the incisal third of the tooth unaffected.

(d) Exposure during the last year of mineralization will affect the cervical third of the tooth surface.



Bone fluorosis