

Lec.5

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**Communal Water fluoridation**

There is an extensive literature on the effectiveness of water fluoridation, with studies carried out in different parts of world. A review of fluoridation studies among children prior to 1980 reported caries reduction in children’s permanent teeth. Based on studies, reduction in the prevalence of dental caries in primary teeth ranged from 40 to 50 percent and in permanent teeth was 50 to 60 percent approximately. In those countries where fluoridation is widespread, differences in caries experience between children in fluoridated and non fluoridated communities are now more commonly in the range of 18 to 35 percent, clearly less than approximately 50 percent difference reported earlier.

An apparent reduction is likely to be due to the phenomenon of declining caries prevalence recognized throughout the developed world since mid 1970, and influence of fluoride coming from other sources, e.g. use of fluoride toothpaste and supplements. Also due to indirect exposure to fluoride from food and beverages processed in fluoridated areas called as “Halo effect”. This Halo effect occurs when residents of non fluoridated and fluoridated communities are exposed to the benefits of fluoridation to some degrees by consuming food and beverages manufactured and processed in fluoridated communities.

**Artificial Fluoridation**

Fluoridation is the controlled adjustment of a fluoride compound to a public water supply in order to bring the fluoride concentration up to a level which effectively prevents caries. The studies of Dean and others up to 1943; shown that fluoride was associated with a lower prevalence of caries, and that there was a sound basis for hypothesis that the introduction of fluoride into a water supply would result in a lower communal prevalence of caries. Water fluoridation requires a level of dental caries in the community that is high or moderate, or a firm indication that the caries level is increasing.

**History of artificial water Fluoridation**

Water naturally fluoridated at 1ppm clearly benefited dental health.Following Dean’s studies they tried to add fluoride to unfluoridated water to test for beneficial effect.In1945 Grand Rapids,Michigan city ,became the first town in the world to be artificially fluoridated with Muskegon city as control.

The previous year(1944) a baseline study comparing Grand Rapids with

the neighboring town of Muskegon had found similar decay levels in deciduous and permanent teeth in both areas. Six years later, surveys indicated that decay levels in 6-year-old children (i.e. those born since fluoridation commenced) in Grand Rapids was almost half of that of Muskegon,in ‘non-fluoride’ Muskegon the average number of teeth with decay experience was 5.7, compared with 3.0 in ‘fluoridated’ Grand Rapids *.*

The study was successful that it was decided to fluoridate the drinking water of Muskegon. There are 40 countries have artificial water fluoridation in some cases, only a small proportion of the population is covered by the schemes. In some countries only small proportion of population covered by artificial water fluoridation as example USA (64%),UK 10% ,China40%,Spain 10%,Hong Kong 100%.

**Fluoride Level**

In 1984 WHO (World Health Organization) guidelines suggested that in areas with a warm climate, the optimal fluoride concentration in drinking water should remain below 1 mg/ liter (1 ppm or part per million), while in cooler climates it could go up to 1.2 mg/liter. (A range of 0.7-1.2 ppm). The differentiation derives from the fact that perspiration is more in hot weather and consequently intake is more. Then the National Advisory Committee on Oral Health suggested a range 0.6-1.1 mg/L with variation within that range according to the mean maximum daily temperature.

**Fluoride compound used in water fluoridation**

1. Fluorspar: It is a mineral containing calcium fluoride (CaF2).

2. Sodium fluoride.

3. Silicofluorides.

4. Sodium silicofluorides: Most commonly used due to its low cost. Solutions of this compound are corrosive hence materials for piping, etc. should be chosen accordingly.

5. Hydrofluosilicic acid.

6. Ammonium silicofluoride (NH)2SiF6

Advantages:

1. Low cost.

2. No motivation or behavioral changes necessary.

3. Had pre and post eruptive benefit.

4. Caries reduction 50-60% in permanent teeth, and 40-50% in primary teeth.

And the disadvantage is the possibility of mild to moderate fluorosis.

Advantages of water fluoridation:

1. Low cost.

2. No motivation or behavioral changes necessary

Disadvantages

1. Political and/or emotional objections to water additives.

2. Possibility of mild to moderate fluorosis if other sources of fluoride are ingested 3. Alleged toxicity.

**Safety of Water Fluoridation**

safety of water fluoridation was a research concern from the time of fluoride’s identification in water in 1931. According to World Health Organization’s monograph ‘fluoride and human health’ there is evidence that ingestion of fluoride at recommended levels presents no danger to humans.

Health benefits and risk of fluoridation has been the subject of searching reviews by expert committees throughout the world including the WHO. None has found evidence that drinking water with a concentration of around 1 ppm is harmful to health.In fact other than dental fluorosis only endemic skeletal fluorosis is known to result from long-term ingestion of water containing high levels of fluoride.

In recent years opponents of fluoridation have attempted to link fluoridation with a wide range of diseases, e.g. cancer, Alzheimer diseases or that it interferes with the immune function. But there is overwhelming agreement between the scientific, medical and dental community worldwide that fluoridation of water is a safe and effective public health measure.

**Water fluoridation simply delay dental decay**

* Since the introduction of fluorides, estimates for the delay in tooth eruption range from 0.7 years to as much as 2 years.
* Fluoride incorporation in the primary dentition and in the alveolar bone, which must be resorbed prior to the eruption of the permanent teeth is believed to be the cause of this generalized delay in tooth eruption. Using existing data, it is possible to estimate the effects on dental decay rates of a delay of tooth eruption of 1.0 year to 20% and for 1.5 years to 33.3%, These delays, could account for apparent difference in dental decay rates.

**School Water Fluoridation**

* It is most applicable in rural schools, where fluoridation of community water is not practical. Reduction in dental caries was found to be about 40%.
* Disadvantages:

1. The children do not receive the benefits until they begin school
2. Children consume the fluoridated water only when the school is in session

To compensate for this belated and abbreviated exposure the school water is usually fluoridated at 4.5 times the optimum concentration recommended for that place.

Fluorides during tooth development

I.preeruptive: mineralization stage

Fluoride is deposited during the formation of the enamel, starting at the dentinoenamel junction, after the enamel matrix has been laid down by the ameloblasts. Fluoride is incorporated directly into the hydroxyapatite crystalline structure during mineralization of all the parts of the teeth to become fluorapatite. Preeruptive fluoride also results in alteration in tooth morphology by development of shallower occlusal grooves, reducing the risk of fissure caries.

II. Preeruptive: maturation stage:

After mineralization is complete and before eruption, fluoride deposition continues in the surface of the enamel. Fluoride is taken up from the nutrient tissue fluids surrounding the tooth crown. Much more fluoride is acquired by the outer surface during this period than in the underlying layers of enamel during mineralization.

III. Posteruptive

After eruption and throughout the life span of the teeth. The concentration of fluoride on the outermost surface of the enamel is dependent upon topical sources of fluoride from fluoridated drinking water, dentifrices, mouthrinses, and other surface exposures. The fluoride on the outermost surface is available to inhibit posteruptive demineralization.



