THE PREVALENCE OF DENTAL CARIES AMONG PRIMARY SCHOOL CHILDREN IN RELATION TO FLUORIDE CONTENT OF THEIR WATER SUPPLY FROM DIFFERENT ENVIRONMENTAL SOURCES

THESIS

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BY

HOSNI AHMED KASSEM

Director of Oral Surgery and Medicine, CID's Company

Under the supervision of

Prof. Dr. MOHAMED HOSNI MOSTAFA

Professor and Chairman of Oral Medicine, Faculty of Oral and Dental Medicine, Cairo University.

Prof. Dr. AHMED SHERIF HAFEZ

Professor of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain-Shams University.

Prof. Dr. MOHSEN ABDEL-HAMED GADALLAH

Ass. Prof. of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain-Shams University.

Institute of Environmental studies and Research
Ain-Shams University

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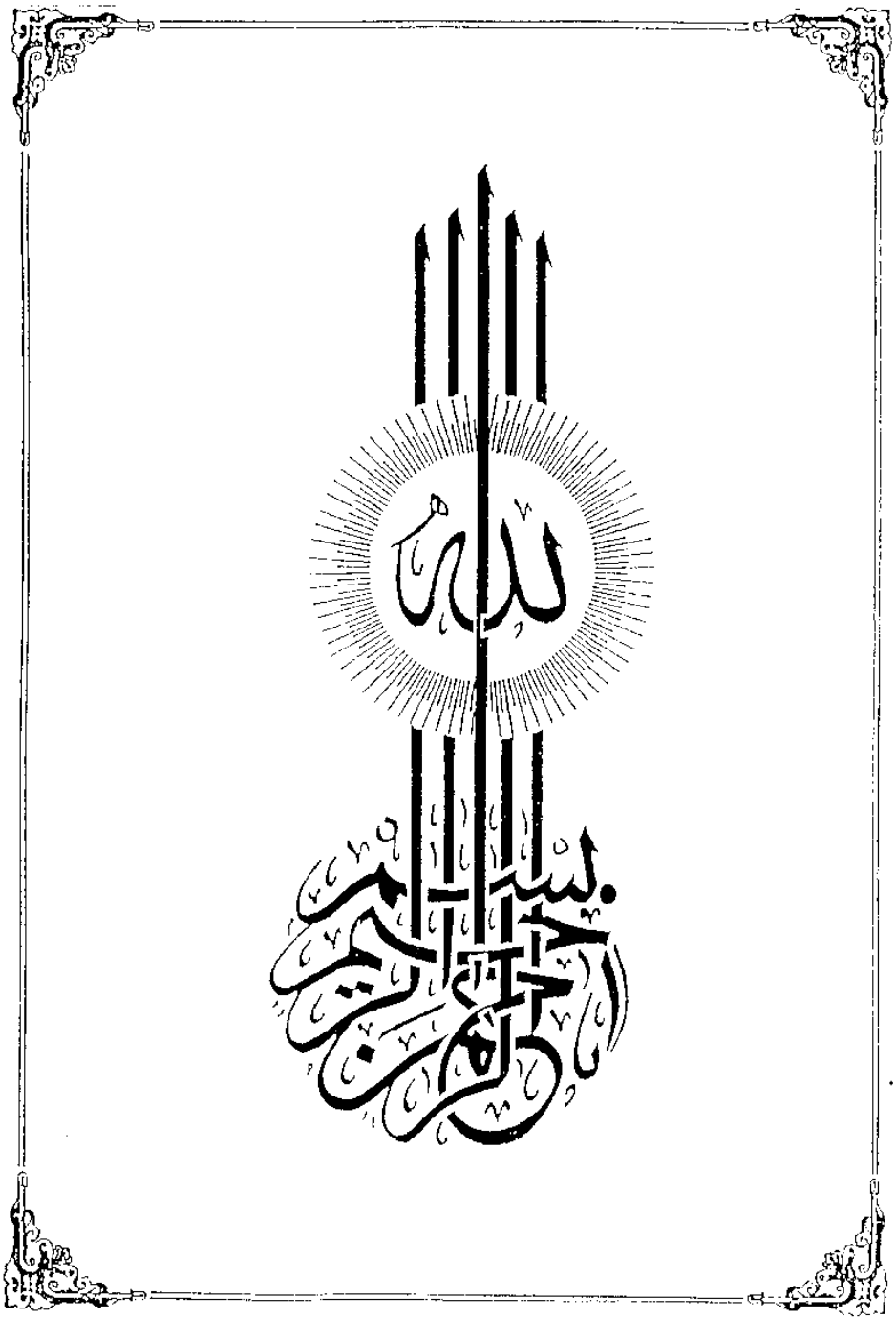

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TO MY
WIFE
SONS
& BROTHERS

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Dental caries is considered the commonest disease affecting hard tooth structure. It affects deciduous as well as permanent teeth.

The sequelae of the disease persist throughout life *(SHAFER, 1963)*. Dental caries is a multi-factorial disease. It is difficult to achieve a full understanding of the factors in which host, agent, and environment interact to produce irreversible destruction of the hard tissues of the teeth, that may influence the occurrence and progress of the disease. Many theories regarding the cause and progress of the dental caries have been established.

The problem of dental caries and its prevention has driven the attention of many researchers. Several methods for dental caries prevention by fluorides is the most practical and effective method. The main action of fluorides in reducing dental caries is through the ionic exchange between enamel surface and fluoride ion in solution. Their reaction will change the surface calcium hydroxyapatite of the enamel to calcium fluorapatite which is more resistant to dissolution in acids

The optimal percentage of the fluoride level in communal water supply to prevent dental caries without producing mottling of the enamel was found to be one part per million (1 ppm). It reduces dental caries by approximately 60%.

This is achieved by a daily fluoride intake 0.5 to 1 ppm fluoride/day in children and 1 to 1.5 ppm fluoride/day in adults. In trying to solve the dental caries problem in Egypt on the community level, it is a must to know the levels of fluoride in drinking water supply from different environmental sources of Egypt.

Many studies were done in different developed and developing countries to explore the relation between fluoride and dental caries which revealed that the high prevalence of dental caries is more common in areas with no/or low fluoride ions in water.

REVIEW OF LITERATURE

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The effect of fluoride in reducing the incidence of dental caries is well known *(MUCLURE etal., 1962)-(FINN, 1967)-(MURRAY, 1976)*. Numerous studies on caries reducing effect of fluoride pointed to drinking water as being the most reliable vehicle for fluoride supplementation since it is the easiest and most effective method *(SOGNNAES, 1958)-(MUCLURE ETAL., 1962)-(FINN, 1967)*.

The history of fluoridation started with the arrival of Dr. Frederick McKay in Clorado Springs in 1901. He noticed that many of his patients particularly those who had lived in the area all their life, had an apparently permanent stain on their teeth which was known as "Clorado stain". McKay called this stain "mottled enamel". He observed that the condition of mottled enamel was found in different cities and the families whether rich or poor were affected. This led him to believe that something in the water supply is responsible for mottled enamel. In 1928, Robertson, - a dentist in Benton, Pennsylvania, U.S.A. - reported to the state Board of Health that the citizens of Bauxite - a nearby town - seemed to have body stained teeth, while the citizens of Benton had normal teeth *(MURRAY, 1976)*.

Churchill in 1931, reported that examination of water samples from areas where mottled enamel was endemic invariably showed high content of fluoride ions. He concluded that endemic regions had water containing 2 ppm fluoride ion concentration or more, while those areas without mottling had water supplies with fluoride ion concentration less than 1 ppm *(MAIER, 1970)-(MURRAY, 1976).*

Fluoride can decrease the incidence of dental caries through several mechanisms :

a) Fluoride decreases the solubility of enamel in acids by replacing the hydroxyl group of the hydroxyapatite crystals present in the enamel surface by ionic exchange forming fluorapatite which is less soluble in acids *(HARDWICK, 1963), (MURRAY, 1976)-(JOYSTON and KIDD, 1982).*

b) Fluoride has a direct antimetabolic effect on plaque microorganisms resulting in reduction of bacterial ability to ferment carbohydrate and to produce acids *(PEARCE and JENKINS, 1976)-(ZICKERT and EMILSON, 1982)-(SVANBERG and WESTERGEN, 1983).*

c) Fluoride may interfere with the action of bacterial enzymes in the breakdown of fermentable carbohydrates into organic acids *(MORENO and HAY, 1978)-(EGGEN and ROLLA, 1983).*

d) Fluoride decreases the surface energy of enamel-surface fluoride can interfere with the tendency of plaque to adhere to the tooth surface *(GROSS and TINANOFF, 1977)-(JACKSON, 1982)-(ROLLA, 1983) and (DEJONG etal., 1984).*

e) Fluoride has the ability to precipitate minerals from saturated solutions, so it favours the precipitation of calcium phosphate from saliva on enamel surface ; thus, it ends in post eruptive maturation of enamel as well as in the remineralization of partially demineralized enamel in early caries *(SHANNON and EDMONDS, 1978)-(JOYSTON and KIDD, 1982).*

F) Fluoride may alter the morphology of teeth in areas with high fluoride ion content in drinking water. The teeth in these areas are smaller in size with shallower fissures on low cusp and high *(LEVINE, 1976).*

Optimum level of fluoride :

In communal water supplies fluorides are present in the form of free fluoride ions in a less physiologically active form of complexed fluoride. One of the most effective elements in water to complex fluoride is Aluminum *(NICKOLSON and DUFF, 1981).*

On communal basis, it was found that at fluoride level of about 1 ppm in drinking water, optimum reduction in dental caries occurs with insignificant mottling *(MUCLURE, 1962)-(FINN, 1967)-(MAIER, 1970)-(MURRAY, 1976)*. At a level of 1 ppm fluoride ion concentration in drinking water there is 60 - 65 percent reduction of "DMFT" among the children 12 - 14 year old *(KLEIN, 1946)-(MUCLURE, 1962)-(MAIER, 1970)-(MURRAY, 1976)*. ***DEAN***, (1934) developed a standard classification of mottling in order to record the severity of mottling in a given area. He proved that the severity of mottling increases with increasing fluoride concentration in drinking water. Dean examined 7000 children in 21 cities where mottled enamel was endemic. He found that at a concentration of 5 ppm fluoride ion or more almost the entire population had mottled enamel. As the fluoride concentration decreases there was reduction in the severity of mottling. At a fluoride level of 1 to 1.5 ppm less than 10 percent of the examined children were affected by faint white opacities on the enamel surface.

Dean classified typical fluoride mottling into six grades according to its severity. In order to compare the severity and distribution of dental fluorosis in various communities, Dean (1942) developed an epidemiological ndex according