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Prevalence of Dental caries in Relation to water fluoride level in some areas of Yemen Republic

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معدل إنتشار النخر السني وعلاقتة بمستوى مادة الفلور في مياة الشرب في بعض مناطق اليمن

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خلاصة: كان الغرض من هذه الدراسة تقييم معدل إنتشار النخر السني بين طلاب وطالبات المدارس في اليمن الذين يسكنون في مناطق كان فيها معدل مستوى مادة الفلور في مياة الشرب أعلى وأدنى من المستوى الطبيعي (2.03-0.25) جزء من المليون من مادة الفلور وعلاقتها بمستوى نخر الأسنان. العينات المستهدفة في هذه الدراسة شملت فئات عمرية تتراوح بين 9-20 سنة ينتسبون إلى مدارس حكومية. كان عدد من شملهم التقصي 793 حالة تم اختيارهم من مدارس مختلفة في سبع محافظات تمثل مناطق جغرافية مختلفة في اليمن. كان الوسيط والمتوسط للأعمار 13.3إلى 12 على التوالي وكان متوسط العمر للعينات من 9-20 سنة. اشتملت الدراسة على 439 (55.4%) ذكور، 354 (44.6%) إناث. تم تسجيل النخر السني وفقاً لمعيار منظمة الصحة العالمية. تبين أن معدل إنتشار النخر السني في خمس محافظات (إب، حجة، لحج، تعز وأمانة العاصمة) كان أعلى من 75% من الرقم الإجمالي ممن شملتهم الدراسة. أما متوسط معدل إنتشار النخر السني في باقي المحافظات (الحديدة وعدن) فكان 64% . كما تبين أن معدل إنتشار النخر السني كان على وجه التقريب مرتفعاً سواءً في المحافظات التي كان بها معدل مادة الفلور في مياة الشرب أعلى أوأدنى من المستوى الطبيعي.

Abstract: The purpose of this study was to assess the caries prevalence of children living in areas with either above optimal and below optimal 2.03 or 0.25 ppm fluoride level in the drinking water, and to relate caries experience to the concentration of fluoride in the drinking water. Population subjects targeted for this study were boys and girls aged 9-20 years attending public schools. The study population comprised 793 subjects selected from various school and work places in seven towns to represent different geographical areas in Yemen. Mean and median ages of the population were 13.3 and 12 years respectively. The age range of the subjects was 9-20 years. The subjects included 439 (55.4%) boys, and 354 (44.6%) were girls. Caries was recorded according to WHO criteria (WHO, 1987). The criteria for selection was conducted as the following, in each town selected, schools represented different socio-economic classes were clustered for the study. Finally a total of 14 schools were randomly selected from the cluster. In the schools selected classes with children of the concerned age were randomly selected. It was also decided that, drinking water samples from the main water supplies in the community under investigation to be collected for analysis for fluoride content. The prevalence of DMFT in five towns (Ebb. Hajah, Lahaj, Taiz and Al-amannah) was above the 75% of the affected total study subjects. The mean DMFT in these towns was (78%) and ranged from 75% to 95%. The mean DMFT in the rest of the towns (Al-hodydah and Aden) was 64%, and the range was 59% to 69%. The prevalence of dental caries seems to be high in both high and low water fluoride level.

Introduction:

Prevalence of dental caries in relation to fluoride level in drinking water in developing countries was reported by several studies. The data in this respect is conflicting, both decreasing, and increasing trends where reported [1, 2, 3, 4, 23].

Information on prevalence of dental caries in the republic of Yemen has not been previously reported.

There was only one study on the relationship between dental caries and water fluoride level in Northern part of Yemen [5]. She assessed the oral health of 1100 children and she found that 80% of the children suffered from dental caries and periodontal diseases. Our study showed no significant difference in the caries prevalence in permanent teeth of children living in areas with high and low water fluoride level [4].

The relative importance of fluoride from different sources has changed. From the 1950's to the early 1980's, water fluoridation was the principal source, and the benefits of fluoridation were believed to limited to teeth that mineralized in the presence of fluoride.

Martial and methods:

The material and methods used in this study was reported [6, 10]. For purpose of studying the prevalence of dental caries in relation to water fluoride levels.

This study was designed to obtain information on the degree of risk for dental caries resulting in teeth affected by severe dental fluorosis. To achieve this goal, it was necessary to identify communities meeting the specific requirement of the study. The requirements for each community were constant fluoride level during the last 20 years. These communities must have drinking water supply containing varied ranges (below optimal, optimal and above optimal) level of fluoride in drinking water. Seven towns satisfy these criteria and were selected for the study. Inquiries were made to the water corporation of this revealed that, there have been no changes in the distribution or the content of the water supply during the last 20 year period, nor is there any naturally occurring or artificial fluoridation of the water supply.

Several towns having drinking water supply containing varying fluoride level as well as geographically distributed as to be representative of the country were selected.

Method of measuring fluoride was carried out by collecting samples of drinking water from the main water supplies of the communities under investigation were collected and sent for analysis of fluoride content. Clean polyethylene bottles 25-30 ml capacities were rinsed in distilled water. A series of water samples from each water source was collected in the containers and was transported for laboratory investigation in the water supply department in Yemen. Analysis was done using spectrophotometric method [22].

Subjects boys and girls aged 9-20 years attending public schools were targeted for this study.

A sample of 1000 individuals was considered necessary to compute valid DMFT prevalence.

Permission to examine school children was obtained from the school authority.

In each town a maximum of two schools and children satisfying the age criteria were randomly selected. Schools represented different socio-economic classes were clustered for the study. Finally a total of 14 schools were randomly selected from the cluster. In the schools selected classes with children of the concerned age were randomly selected. It was also decided that, drinking water samples from the main water supplies in the community under investigation to be collected for analysis for fluoride content.

Before the clinical examination, each individual was interviewed. The information reported include age, sex, area of residence, type of regular water supply (piped, rain, well-water), whether they have a car or television and children were asked about tooth brushing habits.

Concerning the temperature, in this study the selected towns were selected to represent different climatic changes in Yemen. The towns selected classified into high land, midland and see land areas which characterized by low, moderate and high degree of temperature respectively.

This work has been conducted during the period of 2002-2003.

DMFT Was recorded according to WHO criteria (1997), All the examination was conducted by (AIA) in day light using mouth mirror, explorer (Briault probe) which has a thin, flexible, wire like working end with a sharp point at the tip. This thin tip enables the dentist (examiner) to use tactile sensitivity to distinguish areas of caries, with the subjects setting on a chair. Data was computer feed into the SPSS statistical and was checked for extreme values and outliers by frequency distribution-when all values were checked data was analyzed by calculating the mean DMFT using the DMFT formula level of significance was assessed by chi-square. (DMFT= Decayed, Missing, Filled, Tooth).

Statistically view point, in the study of human populations, the most acceptable measure of the strength of association between an exposure and health is the relative risk. A specifically applied to dental fluorosis, the exposure would be defined as the clinical evidence of enamel fluorosis (teeth contain more than optimal level of fluoride), given a prior exposure to fluoride source, compared with normal (no fluorosis), teeth contain less than optimal level of fluoride in their structure. The relative risk would be defined as the risk of developing dental caries given, prior susceptibility to fluoride source, presence of dental fluorosis compared to no prior susceptibility to dental fluorosis. The relative risk can be validly estimated either directly by a cohort study or indirectly by a case –control or cross-sectional study.

In this cross-sectional study subjects were randomly selected from the population without regards to either exposure (fluoride) or disease (caries). The ascertainment of both exposure and disease occurred simultaneously at the time of examination. Thus the study can be conceptualized as the case-control analogue of the general population follow up study.

Results :

Table (1) shows the water fluoride level in the study areas. The highest fluoride concentration in drinking water was found in Taiz (2.03 ppm), and the lowest was from Ebb (0.25). Above optimal fluoride level in drinking water (1.35, 1.29 and 1.01 ppm) was also found in Aden, Lahaj and Al-hodydah respectively. Below optimal fluoride level in dirinking water (0.55, 0.51 and 0.25 ppm) was found in Al-ammanah, hajah and Ebb respectively (Fig. 1).

Table (2) shows the relative frequencies of caries affected subjects in relation to water fluoride level. The relative frequency of caries ranged between (70-95%) except in Aden where the relative frequency of caries was (58%). The prevalence of dental caries seem to be high in both high and low water fluoride level (Fig 2).

The age and sex distribution of the study population was shown in table (3). The study population comprised 793 subjects selected from various schools and work places. Mean and median ages of the population were 13.3 and 12 respectively. The age range of the subjects was 9-20. The subjects included 439 (55.4%) boys, and 354 (44.6%) were girls.

Number and percentage of caries-free subjects according to sex was shown in table (4). The prevalence of dental caries was 75% in the study subjects. Although relatively higher number of boys (n=332) had more caries than girls (n=264), The prevalence of dental caries among boys and girls remained similar at 75% level.

Number and percentage of caries-free subjects according to age was shown in table (5). Both the number and prevalence of DMFT among children aged 9-14 years (n=397; 78.8%) was significantly higher than subjects aged 15-20 years (n= 199; 68.9%). Although the number of caries free

children (n=107) in the age group 9-14 years was relatively higher than the number of caries free subjects (n=90) in the age group 15-20 years, the percentage (21.2%) of caries children was significantly lower than in the age group 15-20 years (31.1%).

Discussion:

The caries preventive efficacy of optimal level for both ingested and topically applied fluorides has been well established [10, 11, 24] Generally caries prevalence is reduced with an increase of fluoride level in the drinking water to the optimal level [3,7,8,9]. Some reports from Africa, however, have presented contradictory results [4].

The findings of the present study were in agreement with the observations made by other investigators [12]. They examined the relationship between mean DMFS scores of children and fluorosis classifications according to criteria described in the Dean's index [13].

All the children included in the study sample were borne and had been living continuously in the areas selected for the study. The drinking water of the study areas had a fluoride content ranging from 0.25 to 2.03 ppm F (table 1. Fig. 1).

There are no studies from Yemen to provide information for optimal levels of fluoride in drinking water in various part of the country. Based on the world wide recommended 1ppm F- level in drinking water [15, 16 17, 18,19], the seven communities included in the survey showed wide variations of their water fluoride concentration. Four of the communities showed water fluoride concentration at the recommended 1ppm F- optimal or above optimal level in the range of 1.01 to 2.03 ppm F- (table.1. Fig.1). The difference between the combined mean of DMFT among population living in negligible fluoride areas on the other hand was not significant. This is in disagreement with the repeatedly reported protection against dental caries inferred by optimal and above optimal fluoride level [14].

A review by Heifetz et al, 1988 suggested that caries prevalence (DMFS scores) in above optimal fluoride areas were lower than in the optimal area. The findings of the present study don't offer support for Heifetz et al, 1988 findings and concerns [20].

The prevalence of dental caries in Yemen seems to be high in both high and low water fluoride areas. The evidence for the lower protection against dental caries in the population living in areas with optimal and above optimal level of fluoride in drinking water compared to negligible levels is shown by presence of severe fluorosis in these areas. The relationship between increased dental caries and fluorosed teeth has been observed in the state of Illinois in the USA. It was speculated that, because severe fluorosis is characterized by a loss of enamel structure (pitting), the tooth surface may be render more susceptible to the decay in the affected areas [20, 21, 25].

Conclusion:

This study has determined the prevalence of dental caries in 7 towns or communities in Yemen and according to the international standard, both the prevalence of dental caries and dental fluorosis were found to be high.

It was also been proved that the association between high level of dental fluorosis and susceptibility of dental caries was positive and high.

It has also proved that there is a positive relationship between level of fluoride in water and prevalence of dental fluorosis.

Our study showed no significant difference in the caries prevalence in permanent teeth of children living in areas with high and low water fluoride level.

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Table (1). Water fluoride level in the study area.

Area	Water fluoride Concentration (ppm)
Taiz	2.03
Aden	1.35
Lahaj	1.29
Al-hodydah	1.01
Al-ammanah	0.55
Hajah	0.51
Ebb	0.25

Table (2). Description of caries-free subjects according to water fluoride level and area of residence.

Area	Water fluoride Concenration (ppm)	DMFT		Total
		Caries-free n (%)	Caries affected n (%)	
Taiz	2.03	86 (23.2)	285 (76.8)	371
Aden	1.35	14 (41.2)	20 (58.8)	34
Lahaj	1.29	1 (4.5)	21 (95.5)	22
Al-hodydah	1.01	38 (30.9)	85 (69.1)	123
Al-ammanah	0.55	23 (25.8)	66 (74.2)	89
Hajah	0.51	21 (21)	79 (79)	100
Ebb	0.25	14 (25.9)	40 (74.1)	54

Table (3). description of the study population according to age and sex.

Age (years)	Boys & Girls n (%)	Boys n (%)	Girls n (%)
9-14	504 (63.6)	260 (59.2)	244 (68.9)
15-20	289 (36.4)	179 (40.8)	110 (13.3)
Total	793 (100)	439 (100)	354 (100)

Age: mean = 13.3, median = 12, and range = 9-20

n = number of subjects

Table (4). Number and percentage of caries free subjects according to sex.

Sex	Caries free n (%)	Caries affected n (%)	Total n (%)
Boys	107 (24.4)	332 (75.6)	439 (100)
Girls	090 (25.4)	264 (74.6)	354 (100)
Total	197	596	793 (100)

Table (5). Number and percentage of caries free subjects according to age.

Age (year	Caries free n (%)	Caries affected n (%)	Girls n (%)
9-14	107 (21)	332 (79)	405 (100)
15-20	090 (31.1)	264 (68.9)	289 (100)