Dental fluorosis, dental caries, and treatment needs in Al-Muthana'a governorate among 12 years old students

Hiba A. AL-Shuker, B.D.S. (1)
Athraa M. AL-Waheb, B.D.S., M.Sc. (2)

ABSTRACT
Background: A case-control study design revealed a relationship between the present of fluoride, and the reduction of dental caries and the increase prevalence and severity of dental fluorosis. The aim of this study was to assess the prevalence and severity of dental caries in relation to dental fluorosis among school children in Al-Muthana'a Governorate.

Materials and methods: It was conducted among primary school students aged 12 years old, the age was taken according to the criteria of World Health Organization (1997) (1). The number of students was selected in each sector of control group according to number of schools in that sector. Sectors of control group which depend on water of river as source of drinking water. Case group which include AL-Salman sector that depend on underground water as source of drinking water include students in all area of Al-Salman sector in 4 schools

Results: Results showed that the prevalence of dental fluorosis in case group, is (60.6%) and the mean of maximal fluorosis index (1.15 ±0.12). In control group, the prevalence of dental fluorosis is (49.0%) and the mean of maximal fluorosis index (0.73±0.4). The DMFS/DMFT values of dental caries for case sample (3.83± 0.44) (2.31± 0.22), while for control DMFS/DMFT is (5.95±0.26) (3.41±0.13) respectively with significantly difference. The prevalence of caries free in case sample is 23.6% while for control is 8.4% with significantly difference between case and control.

Conclusions: A study revealed that a high prevalence of dental fluorosis, dental caries thus there is a need for preventive programs among those children.

Key words: Dental fluorosis, Dental caries, Dean Index. (J Bagh Coll Dentistry 2015; 27(2):142-147).

INTRODUCTION
Dental fluorosis, a specific disturbance in tooth formation and an esthetic condition, is defined as a chronic, fluoride-induced condition, it is a condition in which an excess of fluoride is incorporated in the developing tooth enamel, in which enamel development is disrupted and hypo mineralized.

Fluoride has beneficial effects on teeth at low concentrations in drinking-water, but excessive exposure to fluoride, or exposure to fluoride from other sources which contain very low levels of fluoride; exceptions are some fish and tea, which particularly high in fluoride may participate in fluorosis (2,3) can give rise to a number of adverse effects. These range from mild dental fluorosis to crippling skeletal fluorosis as the level and period of exposure increases (4,5).

Dental caries or tooth decay is one of the most common prevalent chronic preventable (infectious) diseases. Individuals are more susceptible to this disease throughout their lifetimes; it is reversible in its early stages by modifying or eliminating etiologic factors and increasing protective factors (6). There is also mounting evidence that dental fluorosis in it is more advanced stages render the teeth more susceptible to cavities as noted by many resources (7, 8).

but in general fluoride prevents tooth decay by changing the structures of enamel in infant, making it more resistant to acid attack. It also encourages the remineralization of teeth and may inhibit enzymes used by bacteria to form acid (9, 10).

MATERIALS AND METHODS
The sample included all school children at age of (12 years old) males and females that selected randomly among primary school students in Al-Muthana’a governorate. Permission was obtained from the General Direction of Education of Al-Muthana’a governorate to conduct the study with no obligation, also an informed consent prepared and distributed before doing the oral exam. The representative sample that selected randomly (507), (242) girls and (265) boys. Control group which depend on water of river as source of drinking water, include (380) students divided to (193) male and (187) female.

Case group which include Al-Salman sector that depend on underground water as source of drinking water, include (380) students divided to (193) male and (187) female.

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(1) M.Sc. Student Department of Pedodontics and Preventive Dentistry, College of Dentistry, University of Baghdad
(2) Professor, Department of Pedodontics and Preventive Dentistry, College of Dentistry, University of Baghdad
Oral examination
Examinations and oral health assessments were performed according to the Basic Methods of WHO (1997). All the examined teeth were dried with cotton wool, the tooth was considered a fully erupted when at least 2/3 of the crown erupted with no gingiva covering it (i.e. the examination included all fully erupted permanent teeth and all primary teeth were excluded from the examination also permanent teeth with crown or labial veneer or retained root were excluded from the examination.

Statistical tests used in analysis Kolmogorov-Smirnov test, Chi-square, Mann-Whitney U test. The diagnosis of dental fluorosis was recorded according to the criteria of Dean Index (11). Each tooth had been graded as normal or one of the following degrees of fluorosis (questionable, very mild, mild, moderate and severe) for assessment of prevalence of dental fluorosis within individual and teeth. In addition to assessing the degree of dental fluorosis within individual, Dean devised means of calculating the degree of fluorosis within a community by the use of community fluorosis index (12).

Community fluorosis index = \[ \frac{\sum \text{No. of individual} \times \text{statistical weight}}{\text{total No. of individual examined}} \]

RESULTS
Figure (1) demonstrated the comparison in mean and standard error of maximal fluorosis index between case and control group, the mean value in case group (1.51± 0.04) was higher than in control one (0.73± 0.12) with difference in mean (0.78), and highly significant difference between two means (p<0.05). While in Table (1) shows the prevalence of students who suffer from dental fluorosis, each tooth has been graded according to Dean Index for assessment of prevalence of dental fluorosis for individual. According to table. In cases, 60.6% of persons suffer dental fluorosis range from questionable to severe score with highest score was moderate and the median was very mild, in controls, the percentages of individuals suffer from dental fluorosis reaches to 49%, range between questionable to severe score with highest score was very mild and the median was normal, the difference between case and control group statistically highly significant (p<0.001).

In Table (2) it was illustrated the maximum fluorosis score in case and control group and the difference in mean (CFI) between males and females in two groups, and the Table revealed that males was higher than females in means of two groups. Statistically, non-significant difference between two means in case and control group.

Table (3) revealed the mean value and standard error of the caries experience of DMFS for permanent teeth and its components (DS, MS, FS) for the total sample of case and control group in general, it was found that caries experience represented by DMFS was higher among control group (5.95±0.26) as compared with case group (3.83±0.44), Statistically; DMFS illustrates highly significant differences between two groups (p<0.001). The decay surface (DS) fraction was higher among controls with highly significant difference, the same was seen for missing surface (MS) with significant difference, while for filling surface fraction (FS) no significant differences was found between case and control. In Figure (2) found that DMFT in control group have mean value and standard error (3.41± 0.13), it was higher than DMFT in case group (2.31± 0.22).

In Figure (3) illustrates the percentage of children with each category of treatments needs in case and control group. Children in needs of restoration were showed the highest percentage, followed by fissure sealant, preventive care, extraction, and need for other care like pulp care, orthodontic treatment and crowns, in all categories show treatment needs in control group higher than in case group.
Table 1: Maximum fluorosis score in case and control group according to severity from dental fluorosis.

<table>
<thead>
<tr>
<th>Study group</th>
<th>Maximum fluorosis score</th>
<th>Case group</th>
<th>Control group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Normal</td>
<td>50</td>
<td>39.4</td>
<td>51.1</td>
<td>194</td>
</tr>
<tr>
<td>Questionable</td>
<td>2</td>
<td>1.6</td>
<td>6.6</td>
<td>25</td>
</tr>
<tr>
<td>Very mild</td>
<td>14</td>
<td>11.0</td>
<td>22.8</td>
<td>87</td>
</tr>
<tr>
<td>Mild</td>
<td>14</td>
<td>11.0</td>
<td>12.6</td>
<td>48</td>
</tr>
<tr>
<td>Moderate</td>
<td>39</td>
<td>30.7</td>
<td>6.1</td>
<td>23</td>
</tr>
<tr>
<td>Severe</td>
<td>8</td>
<td>6.3</td>
<td>0.8</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>100.0</td>
<td>100.0</td>
<td>380</td>
</tr>
</tbody>
</table>

**Highly Significant

Table 2: Maximum fluorosis score in case and control group (mean ± standard error) according to gender

<table>
<thead>
<tr>
<th>Community fluorosis Index (CFI)</th>
<th>Male</th>
<th>Female</th>
<th>P</th>
<th>Difference in mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case group</td>
<td>Mean ± SE</td>
<td>N</td>
<td>Mean ± SE</td>
<td>N</td>
</tr>
<tr>
<td>Mean ± SE</td>
<td>1.80±0.19</td>
<td>55</td>
<td>1.29±0.16</td>
<td>72</td>
</tr>
<tr>
<td>Control group</td>
<td>Mean ± SE</td>
<td>N</td>
<td>Mean ± SE</td>
<td>N</td>
</tr>
<tr>
<td>Mean ± SE</td>
<td>0.76±0.06</td>
<td>187</td>
<td>0.69±0.06</td>
<td>193</td>
</tr>
</tbody>
</table>

Table 3: DMFS means for case and control group with fractions.

<table>
<thead>
<tr>
<th>Study Group</th>
<th>Caries experience</th>
<th>Case group /N=127</th>
<th>Control group /N=380</th>
<th>P</th>
<th>Difference in mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean± SE</td>
<td>Mean± SE</td>
<td>Mean± SE</td>
<td>Mean± SE</td>
<td></td>
</tr>
<tr>
<td>DS</td>
<td>3.48±0.37</td>
<td>4.88±0.20</td>
<td>&lt;0.001**</td>
<td>-1.4</td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td>0.35±0.15</td>
<td>0.93±0.13</td>
<td>0.015*</td>
<td>-0.58</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>0</td>
<td>0.14±0.07</td>
<td>NS</td>
<td>-1.14</td>
<td></td>
</tr>
<tr>
<td>DMFS</td>
<td>3.83±0.44</td>
<td>5.95±0.26</td>
<td>&lt;0.001**</td>
<td>-2.12</td>
<td></td>
</tr>
</tbody>
</table>

* Significant ** highly significant

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DISCUSSION

The association between dental caries and dental fluorosis has been well established in this present study and it is revealed clearly that increase in dental fluorosis lead to decrease in dental caries experience. So through all the studies carried out in this field, it is apparent that there was optimal level of fluoride in drinking water for beneficial dental effects that is with 1ppm of fluoride there will be reduction of dental caries and esthetically accepted development.

The criteria selected for assessment of dental fluorosis in this study is Dean Index (1934) which adopted by WHO 1997, these criteria depend on clinical appearance of the teeth and not on the histological background, so it was a simple description pattern and easy to be used to identify groups of lesions that were likely to be good reflection of the prevalence and severity of dental fluorosis within students considered \(^{13}\).

Results of this study supported by results was obtained from National Laboratory for Water (department related to Ministry of Municipalities...
and public works) that was made previously analyzing fluoride ion in many samples of drinking water in different places in governorate from (12/2013 to 5/2014), the results with average between (0.79 -1.76) ppm, with take in the consideration ; the city depend on Euphrates River as main sources of drinking water in comparison with other studies in a Iraq (14) that revealed percentages of fluoride in water in other governorates that lay in Euphrates rivers: (Al-Basrah: 0.10, Karbala: 0.12, Babel: 0.19) ppm, this revealed that concentration of fluoride in drinking water of Al-Muthana governorate was higher than others near. Al-Ajrab (10) in Nineveh governorate found that concentration of fluoride in drinking water in Sinjar province (2.05-2.22 ppm) from borehole and range between (0.11-0.19ppm) in Talkaif province .The results of this study revealed that in case group a prevalence of dental fluorosis of about 60.6, and in control group the prevalence of dental fluorosis is 48.9%. The results of this study revealed that a prevalence of dental fluorosis in case group was 60.6%, while, in control group was 48.9% ,which was lower than Al-Ajrab study who was found that the percentage of affected teeth with dental fluorosis in Sinjar province was 62.9%.This study was found the prevalence of fluorosis is higher than study obtained from Qatar (15).

All these data obtained in these studies indicated that this high prevalence of dental fluorosis comparing with the concentration of fluoride in drinking water was related to climatic condition in this areas, the high temperature especially in hot season (summer) lead to high attitude of the individual for consumption of high quantity of water, this lead to increasing in fluoride concentration reached to body of individual during teeth formation which will affect in teeth an create dental fluorosis. Also the difference between examiners in interpretation of criteria of the index used may cause this variation of prevalence in dental fluorosis (16).

Dental fluorosis prevalence was more among females as compared to males in both case and control group also this is may be due to difference in shedding and eruption time between two genders. The decayed fraction “DS” was the major component of DMFS index and the mean value higher in control than in case group. In case group, however this region relatively far away from governorate oral health services; stay it is means less than control group, this reflects the benefit of fluoride in drinking water for reducing the evidence of dental caries. The mean “MS” was greater than “FS” in both groups; this may indicate that even when dental services are available in control group they were directed towards extraction rather than preserving permanent teeth, which may reflect a knowledge and attitude among some of parents and dentists responsibility and loss governorate oral health services on the part of regional health affairs this result was in agreement with Al-Salman (17), Baram (18) Al-Galebi (20) and Al-Sadam (20).

Concerning treatment needs, this study revealed that most of students were in need for restorations come at first objective, followed by need to fissure sealant and preventive care among other types of dental treatment needs ,this results in both case and control groups ,this was agreed with results reported by other Iraqi studies (20) and disagree with other (21).

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الخلاصة
المقدمة : دراسة المجموعة الضابطة أرضحت العلاقة بين وجود الفلور وانخفاض نسبة التسوس إلى ارتفاع نسبة تفق الأنسان نتيجة الفلورة.
هدف البحث : هو توضيح العلاقة بين شدة التسوس نسبة إلى نسبة ذلك الفلورات المتراوح بين المدارس في محافظة المثنى.
الطريق والوسائل: هذه الدراسة نفذت على طلبة المدارس عمر 12 سنة وهذا العمر اختاره اعتباراً على شروط منظمة الصحة العالمية 1997 عدد الطلبة الذين اختيروا في كل فئة في مجموعة المجموعة الضابطة متفق عليه عند المدارس. وقد تم اختيار الطلبة بصورة عشوائية وتماحي إجراء اختبار فلور تحت سطح المجموعة الضابطة متفق عليه عند المدارس، ثم تم قياس نسبة التسوس ونسبة الفلورات في كل الفئة.
نتيجة: الفلور ينخفض عند الفئة الضابطة المثلث وتظهر نسبة تفق الأنسان نتيجة الفلورة.
المصادر:
الاستنتاجات: ظهرت علاقة وجود نسبة تفق الأنسان، نسبة التسوس عالية بين تلك تبكيها إلى تطبيق برامج وقائية على سطح المدارس.

Keywords: تفق الأنسان، التسوس الأنسان، مقياس Dean.