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 revealeda 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 includestudents 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 mineralizedFluoride has beneficial effects on teeth at low concentrations in drinking-water, but excessive exposure to fluoride, or exposure to fluoride from other sourceswhich 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)].

(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

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 (127) student in all area of Al- Salman sector with (72) boys and (55) girls. In this study the students that selected should be born and lived in area of examination and do not used any form of fluoride supplement, children without permission from their parents, with serious systemic diseases were not examined, all these questions was be recorded, the child who did not meet these criteria should be excluded

from the study, 15 students were excluded from the while samples.

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 =

$$\frac{\sum \text{No. of individual X statistical wight}}{\text{total No. of individual examinatied}}$$

RESULTS

Figure (1) demonstrated thecomparison 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 thatmaleswas higher than femalesin 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 ofcase 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.

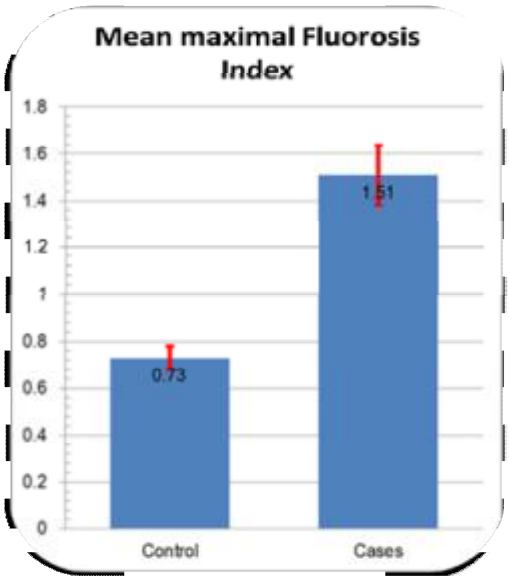

Figure 1: Mean maximal fluorosis index in case and control groups

Table 1: Maximum fluorosis score in case and control group according to severity from dental fluorosis.

Study group					
Maximum fluorosis score	Case group		Controlgroup		p-value
	N	%	%	N	
Normal	50	39.4	51.1	194	<0.001**
Questionable	2	1.6	6.6	25	
Very mild	14	11.0	22.8	87	
Mild	14	11.0	12.6	48	
Moderate	39	30.7	6.1	23	
Severe	8	6.3	0.8	3	
Total	127	100.0	100.0	380	
Median	Very mild		normal		

****Highly Significant**

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

Study group						
Community fluorosis Index (CFI)	Male		Female		P	Difference in mean
Case group	Mean ± SE	N	Mean ± SE	N	NS	-0.51
	1.80±0.19	55	1.29±0.16	72		
Control group	Mean ± SE	N	Mean ± SE	N	NS	-0.07
	0.76±0.06	187	0.69±0.06	193		

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

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

*** Significant ** highly significant**

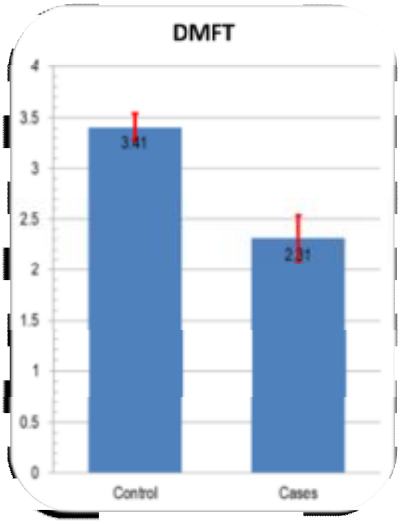

Figure 2: DMFT in case and control group

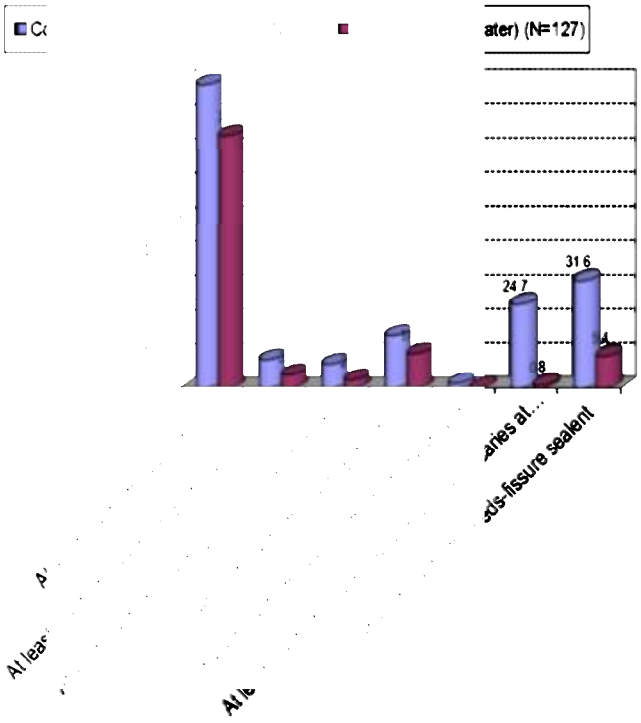

Figure 3: Treatment needs in case and control group.

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 thatit was 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 back ground, 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 waterin 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-Muthanaa 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 [19] 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].

REFERENCES

1. WHO. Oral health surveys. Basic methods. 4th ed. Geneva: World Health Organization; 1997, 19.
2. Warren JJ, Levy SM. Current and future role of fluoride in nutrition. Dent Clin of North Am 2003; 47: 224–43.
3. Fomon S, Ekstrand J, Ziegler EE. Fluoride intake and prevalence of dental fluorosis: trends in fluoride intake with special attention to infants. J of Public Health Dent 2000; 60(3): 131–9.
4. Smith RS. World Water Day: oral health. Geneve: World Health Organization; 2008.
5. WHO (2006). Fluoride in drinking-water. Geneva, World Health Organization https://www.who.int/water_sanitation_health/publications/fluoride_drinking_water_full.pdf
6. Zero DT, Fontana M, Martinez-Mier EA, Ferreira-Zandona A, Ando M, Gonzalez-Cabezas C, Bayne S. The biology, prevention, diagnosis and treatment of dental caries. Scientific advances in the United States. JADA 2009; 140(Supp 1): 25S-34S.
7. Zohouri FV, Rugg–Gunn AJ. Sources of dietary fluoride intake in 4 year of children residing in low medium andhigh fluoride areas in Iran. Int J Food Sci Nutr 2000; 51: 317–26.
8. Alarcon–Herrera MT, et al. Well water fluoride. Dental fluorosis, Bone fracture in the Guadiana valley of Mexico. Fluoride 2001; 34(2): 139–49
9. Peterson G, Kambara M. Remineralisation study of artificial root caries lesions of the fluoride treatment. Gerodontol 2004; 21(2): 85–92.
10. Al-Ajrab M. Dental fluorosis and dental caries prevalence in iraqi children living in area with low and high level of natural water fluoride. A master thesis,College of Dentistry, University of Mosul, 2000.
11. Dean HT. Classification of Mottled enamel diagnosis. JADA 1934; 20: 313–9
12. Dean HT. Production of mottled enamel halted by a change in community water supply. Am J Pub Hlth 1939; 29: 567–75
13. IPCS. Fluorides. Geneva, World Health Organization, International Programme on Chemical Safety (Environmental Health Criteria 2002; 227.
14. Al-Azawi LA. Oral health status and treatment needs among Iraqi five years old kinder garden children and

fifteen years old students (A national survey). Ph.D. thesis, College of Dentistry, University of Baghdad, 2000.
15. Khalid A.The presence of dental fluorosis in the permanent dentition in Doha. Eastern Mediterranean Health J 2004; 10(3): 1.
16. Gasper MR, Periera AC, Moreira BH. Estimation of opacities of fluoride origin from fluoride area contained (0.2 ppm) fluoride and optimal (0.7 ppm) concentration. Br Dent J 1995; 5(2): 13–8
17. Al-Salman FD. Prevalence of dental caries among primary school children aged 6,9,12 years old in Mosul city/Nineveh. A master thesis, College of Dentistry, University of Mosul, 1998.
18. Baram A. Oral health status and treatment needs among primary school children in Sulaimani city. A master thesis, College of Dentistry, University of Baghdad, 2007.
19. Al-Ghalibi SN. Oral health status and treatment needs in relation to nutritional status among 9-10 year-old school children in Nassiryia city/ Iraq. A master thesis, College of Dentistry, University of Baghdad, 2011.
20. Al-Sadam N. Oral health status in relation to nutritional and social status in Kerbal'a Governorate for primary school students aged 12 years old. A master thesis, College of Dentistry, University of Baghdad, 2013.
21. Al-Ani N Oral health status, treatment needs and dental anomalies in relation to nutritional status among 12 year-old School Children in Heet city/Al-Anbar governorate/Iraq. A master thesis, College of Dentistry, University of Baghdad, 2013.

الخلاصة

المقدمة :- دراسة المجموعة- الضابطة اوضحت العلاقة بين وجود الفلور وانخفاض نسبة التسوس الى ارتفاع نسبة تبقع الاسنان نتيجة الفلورة .

هدف البحث : - هو توضيح العلاقة بين شدة التسوس نسبة الى تبقع الاسنان بين اطفال المدارس في محافظة المثنى .

الطرائق والاساليب :- هذه الدراسة نفذت على طلبة المدارس عمر 12 سنة وهذا العمر اختير اعتماداً على شروط منظمة الصحة العالمية 1997 عدد الطلبة الذين اختيروا في كل قطاع في مجموعة المجموعه اعتماداًعلى عدد المدارس في ذلك القطاع . وقد تم اختيار الطلبة بصورة عشوائيةعلماً ان قطاعات مجموعة المجموعه تعتمد على ماء النهر كمصدر لماء الشرب . مجموعة الضابطة تشمل قطاع قضاء السلمان الذي يعتمد على مياة الابار كمصدر لماء الشرب والذي شمل كل الطلبة الموجودين في ذلك القطاع عمر 12 سنة والذي طبقت عليهم المواصفات .

النتائج :- النتائج اوضحت شدة فلورة الاسنان في مجموعة الضابطة بلغت (60.6%) واعلى معدل للفلورة بلغ (1.15 ± 0.12) . بينما في مجموعة المجموعه بلغت شدة فلورة الاسنان (49.0%) واعلى معدل للفلورة بلغ (0.4 ± 0.73) . معدل DMFS / DMFT للتسوس في مجموعة الضابطة بلغ (0.44 ± 3.83)(0.22±2.31) بالتتابع بينما في مجموعة المجموعه بلغ نسبة DMFS / DMFT (0.26 ± 5.95)(0.13 ± 3.41) بالتتابع بأختلاف معنوي . نسبة الاسنان الغير مصابة بالتسوس في مجموعة الضابطة بلغت 23.6% بينما في مجموعة المجموعه 8.4% بأختلاف معنوي بين المجموعتين.

الاستنتاجات :- الدراسة اوضحت وجود نسبة تبقع اسنان ونسبة تسوس عالية لذلك تحتاج الى تطبيق برامج وقائية على طلبة المدارس .

مفتاح الكلمات: تبقع الاسنان , تسوس الاسنان , مقياسDean