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Evaluation of some oral factors and periodontal health status in primary school-children

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ABSTRACT

Background **:**There is no doubt that examining the factors affecting oral health and feeding them with health information among primary school students will improve the behavior of oral and dental health and post-community oral hygiene.

Gingivitis in children is a pathological condition that makes the gingiva in children red and tends to dark purple, a variety of oral parameters which have an impact factor on the development of gingival disease.

Aim of the study : Evaluation and analysis of some oral factors and periodontal heath status in a primary schoolchildren

Material and method: 111 healthy child from primary school in Baghdad-Iraq were enrolled in this study. Salivary flow rate of unstimulated saliva were collected, clinical examination included gingival index (GI), plaque index(PLI), DMFS (Decay messing and filling) and dmfs were observed and recorded for each child.

Result **:**Males are more likely to have bad dental health than females as binary logistic regression revealed. Females are likely to have significant corruption of their primary teeth at age of 10.5 years and plaque index of 1.89. Males and females are started to have significant corruption of their permanent teeth at the age of 7.5 years. Age and plaque index are significantly affecting the primary teeth of both males and females. DMFT was found to have positive significant correlation with plaque index. Guardian diseases like diabetes mellitus of parents found to have significant negative impact on DMFT of children

Conclusion : Males are more likely to have bad periodontal heath than females. At the age of 7.5 years, females start practicing the corruption of their deciduous teeth and have a plaque index of almost 1.89. Corruption of permanent teeth starts at the age of 7.5 years for both gender groups.

Keywords: *Childhood gingivitis, Plaque index, Gingival index, DMFT, Binary logistic regression.*

INTRODUCTION

Gingival disease is one of the most common factors that threatening not just adulthood but also childhood as well. Oral health is the gate where periodontal disease can be classified due to its influence on the performance of the community from different points of view. Researchers continue tackling this issue in a hope that they might role the main factors that believed to affect this health issue.1

Dental plaque probably induced gingival disease and periodical dental checkup would be very important to detect whether there is gingivitis or not. Epidemiological studies indicated that the most observed gingivitis in children and adolescents is dental plaque-induced gingivitis 2

Doubtless, good quality of life is associated with good oral health. The rapid rhythm of modern life contribute essentially to the quality of human's life due to many changes related to growing of cities from small areas to metropolitan. The polluted air and increased daily working hours are real threatening factors to the public oral health. In developing countries as well as undeveloped countries such issues becomes more significant particularly when health authorities have real shortages in almost everything.

Children are influenced by their parent's behavior and one of the major factors affecting children mouths health is the family's dental behavior. Children are at their first years of life mimic their parent's behavior and that will be the initiation of accummulated corruption that will gradually grow up1.

Many studies announced that gingivitis is a very common health problem in adults and children all over the world3,4. Also, according to classification of gingival disease and conditions 5, children as well as adolescents can have any of the forms prescribed the severity of the disease.

The most appropriate environment to nourish children with dental health information is school because children in school are already in learning program 6. Therefore, school dental education programs will improve children′s oral health behavior and hereafter community oral hygiene.

According to the previous argument and in order to cast some ideas about periodontal disease in schoolchildren, the present work was performed. Age was found to be significantly correlated with plaque and gingival indices.

SUBJECTS AND METHODS

Randomly selected of 111 child from primary school in Baghdad city, range from 6-14 years old. A questionnaire has been sent to parents of children included: name, age, gender, and medical histories of children and their parents.

After getting the information, unstimulated salivary samples collected at least one hour after breakfast between 9-11 a.m, salivary sample was collected from children's mouth by spitting into a graduated cylinder and the average salivary volume is measured in milliliters per min. (ml/min). Oral health status and gingival health status were determined by plaque index (PI), gingival index (GI) depending on Silness and Loe, (1964).

Primary and permanent teeth were evaluated by dmft , dmfs, DMFT and DMFS using WHO criteria. Oral examination was performed with the same examiner.7,8

Inclusion criteria

All children who appear to be between the ages of 6 and 14 are in this study

Exclusion criteria

Every child who practicing any chronic disease or any type of disability or Children who wear orthodontic appliance was excluded from this study. Collected data were coded, tabulated and subjected to descriptive and inferential statistics. All results were obtained by the use of IBM SPSS ver. 25.

RESULTS

In this research work 111 pupils were enrolled, 48 (43.24%) were males and 63 (56.76%) were females. The school is of 739 pupil, of them 393 (53.18%) males and 346 (46.82%) females. Males and females of this sample constitute almost 6.5% and 8.53% of all pupils respectively. According to the 95% confidence interval for the difference between the two percentages (-5.292% to 9.474%), there is not significant difference between the two percentages value .

Table 1 shows the distribution of the sample' subjects on the school classes with regard to gender groups.

TABLE 1: Distribution of pupils according to classes and gender groups.

	Males		Females		Total	
Class	No.	%	No.	%	No.	%
1	10	50.00	10	50.00	20	18.02
2	7	43.75	9	56.25	16	14.41
3	9	47.37	10	52.63	19	17.12
4	8	44.44	10	55.56	18	16.22
5	5	27.78	13	72.22	18	16.22
6	9	45.00	11	55.00	20	18.02
Total	48	43.24	63	56.76	111	100.01

Ages of pupils included in this sample ranged between 6 to 14 years. Males' age ranged betwee 6 and 13 years old while the ages of the females ranged between 6-14 years old

Table 2 shows the two sample t-test for comparing mean ages with respect to classes.

Obviously, the one-way analysis of variance for the age variable according to the calsses revealed a significant difference in mean ages with respect to the classes (F-ratio=190.398, p-value=0.0001).

According to the bivariate Pearson linear correlation, age was found to be significantly correlated with, plaque index, gingival index, saliva flow rate, dmft and DMFT (table 3).

TABLE 2. Two-sample t-test for comparing mean ages according to classes.

Class	Males		Females		t-test	
	Number	Mean ± SD	Number	Mean ± SD	t	p-value
1	10	6.30±0.483	10	6.10±0.316	1.095	NS
2	7	7.29±0.756	9	7.78±0.667	-1.382	NS
3	9	8.22±0.441	10	8.30±0.483	-0.365	NS
4	8	9.63±1.061	10	9.80±0.632	-0.436	NS
5	5	10.60±0.548	13	10.46±0.660	0.415	NS
6	9	11.67±0.707	11	12.00±0.894	-0.908	NS

Saliva flow rate increased as dmft decreased and increased as DMFT increased. It is also positively correlated with age (table 3).

These findings cannot be thought separately from their association with other factors like plaque and gingival inflammation.

TABLE 3. Pearson's linear correlation matrix

	Plaque index	Gingival index	dmft	DMFT	SalivaFR	Age
Plaque index	1	.245**	-0.153	.264**	0.025	.271**
Gingival index	.245**	1	0.015	0.082	0.110	.188*
dmft	-0.153	0.015	1	-0.066	-.198-*	-.427-**
DMFT	.264**	0.082	-0.066	1	.237*	.366**
SalivaFR	0.025	0.110	-.198-*	.237*	1	.359**
Age	.271**	.188*	-.427-**	.366**	.359**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Diabetes mellitus, heart and other were the concern of this study and related information that obtained from pupils interview are presented in figure 4.

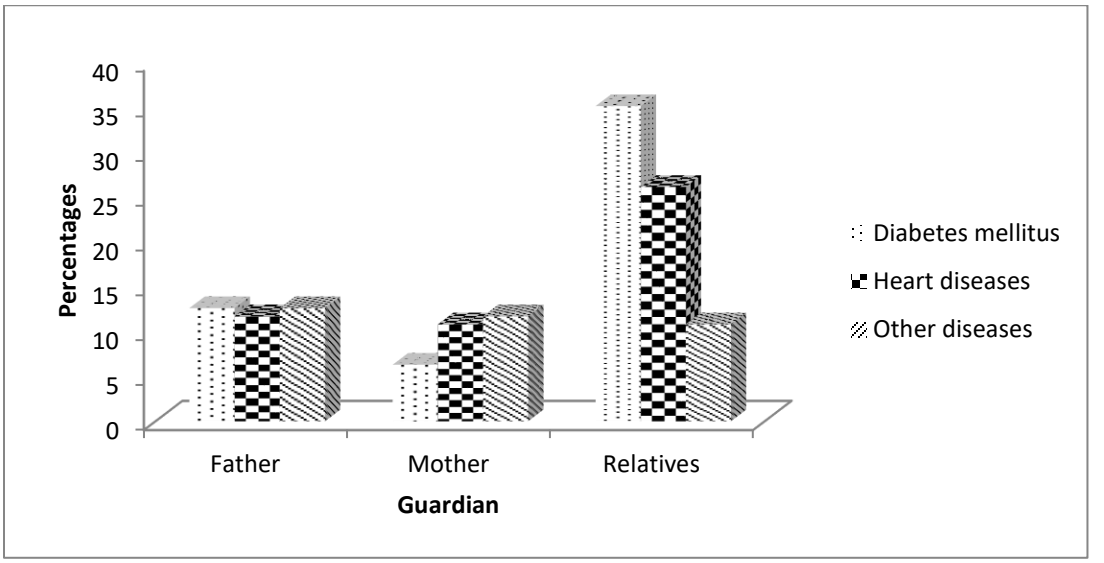

FIG.4. Bar chart of guardian diseases

Even though all of the pupils involved in this study are apparently healthy individuals, but some of their parents and relatives are practicing chronic diseases as shown on figure 4. Relatives have higher percentages of diabetes mellitus and heart diseases compared to parents. The process of heritage impact on transmission of such diseases is not very well understood. Probably when both parents or one of them have diabetes mellitus it may affect in a way or another their children in comparison to other parent who are not having the disease. In order to investigate the association between dmft and DMFT with parent's diabetes mellitus status, the Chi-square test for association was used.

The Chi-square test for association showed a significant association (Chi-square=5.58, p-value=0.018) between parents' diabetes mellitus status and DMFT indicator as presented in table 5. The contingency coefficient for such association was 0.22. In this context it can be concluded that diabetic parents have negative impact on the permanent teeth status of their children.

With respect to the primary teeth, the Chi-square test for association revealed no significant association between diabetic parents and status of primary teeth (Chi-square=2.823, p-value=0.093).

TABLE 5. Cross classification of parents diabetes mellitus status and DMFT indicator.

Diabetes mellitus	DMFT		Total
	No loss	Loss	
No	58	33	91
Yes	7	13	20
Total	65	46	111

Logistic regression technique is used in dental studies to cover areas similar to that of this underwent research8,9. The binary logistic regression was used to measure the effect of age, plaque index and gingival index on the status of primary teeth as dichotomous response variable taking the value of 0 if no primary teeth loss and 1 elsewhere. The same technique was also used for permanent teeth status with same predictors.

The binary logistic regression was performed for primary teeth first. In the case of male pupils, the results of this technique were very poor and the model cannot be used for the cases of classification. Nevertheless, in the case of female pupils, the binary logistic regression model was very good and revealed the confusion matrix as presented in table 6.and table 7 shows the parameters of the model accompanied by their level of significance.

TABLE 6. Confusion matrix as obtained by binary logistic regression for primary teeth.

		Predicted			% Correct Classification
		No loss	Loss	Total	
Observed	No loss	9	6	15	60
	Loss	6	41	47	87.2
	Total	15	47	62	80.6

TABLE 7. Parameters of the binary logistic regression model.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	-1.108	0.372	8.873	1	0.003	0.330
	PI	-4.642	1.818	6.518	1	0.011	0.010
	GI	1.741	2.352	0.548	1	0.459	5.706
	Constant	20.088	6.502	9.544	1	0.002	529797658.012

a. Variable(s) entered on step 1: Age, PI, GI.

According to table 7, age and plaque index play an essential role in the status of female primary teeth. The percentage of correct classification which exceeds 80%

When permanent teeth considered, males are more likely to have dental corruption than females. The total percentage of correct classification exceeds 81% (table 8). Age and plaque index were the only significant predictors in the model (table 9).

TABLE 8. Confusion matrix as obtained by binary logistic regression for permanent teeth with respect to male pupils.

		Predicted			% Correct Classification
		No loss	Loss	Total	
Observed	No loss	30	3	33	90.9
	Loss	6	9	15	60
	Total	36	12	48	81.3

TABLE 9. Parameters of binary logistic regression for permanent teeth with respect to male pupils.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	0.370	0.208	3.167	1	0.075	1.448
	PI	3.712	1.605	5.350	1	0.021	40.950
	GI	-8.194	5.186	2.497	1	0.114	0.000
	Constant	-2.624	4.749	0.305	1	0.581	0.073
a. Variable(s) entered on step 1: Age, PI, GI.							

Females are less exposed to permanent teeth loss than males as concluded from the output of the model. Table 10 shows the confusion matrix that revealed 62.9% total correct classification which remarkably lower than that of males.

Moreover, age (table 11) was the only significant predictor in the model that all changes in the permanent teeth can be attributed to.

TABLE 10. Confusion matrix as obtained by binary logistic regression for permanent teeth with respect to female pupils.

		Predicted			% Correct Classification
		No loss	Loss	Total	
Observed	No loss	20	11	31	64.5
	Loss	12	19	31	61.3
	Total	32	30	62	62.9

TABLE 11. Parameters of binary logistic regression for permanent teeth with respect to female pupils.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	0.396	0.149	7.089	1	0.008	1.486
	PI	-0.088	0.798	0.012	1	0.912	0.915
	GI	0.865	2.098	0.170	1	0.680	2.374
	Constant	-4.428	2.838	2.435	1	0.119	0.012
a. Variable(s) entered on step 1: Age, PI, GI.							

The receiver operating characteristic ROC curve was used in order to set a cut-off values of plaque index, gingival index and age that should be considered when evaluating oral health of individuals similar to that of the study sample. The cut-off values were determined by the use of Youden's index10. The ROC technique was used in the same manner that binary logistic regression used. The primary teeth was considered first with respect to males once and females another, and the same procedure repeated for the case of permanent teeth.

Area under the curve AUC for the ROC was calculated to give an indication about how well is the model when discriminating between the groups of primary and permanent teeth status. In this context, AUC below 0.7 is considered not accepted, AUC values ranged between 0.7 and 0.8 are accepted, values ranged between 0.8 and 0.9 are excellent, and values above 0.9 are outstanding.

Figure 5 shows the ROC curves of age, plaque index and gingival index for females primary teeth. According to AUC (table 12), age is considered excellent predicator for primary teeth status while plaque index considered accepted. Figure 6 and table 13 showed the ROC and AUC results of performing the same procedure on permanent teeth. Age is the only accepted predictor that can be used to distinguish between females permanent teeth status. Cut-off values of all procedures are listed in table 16.

With reference to male pupils, figures 7 and 8, and tables 14 and 15 showed the ROC and AUC for primary and permanent teeth status respectively.

The procedure revealed non acceptable cut-off values in the case of primary teeth which emphasis the previous argument that this gender group is affected by many uncontrolled diet habits that resulted in such a paradox of dental health. On contrast, age and plaque index showed acceptable cut-off values as presented in table 16.

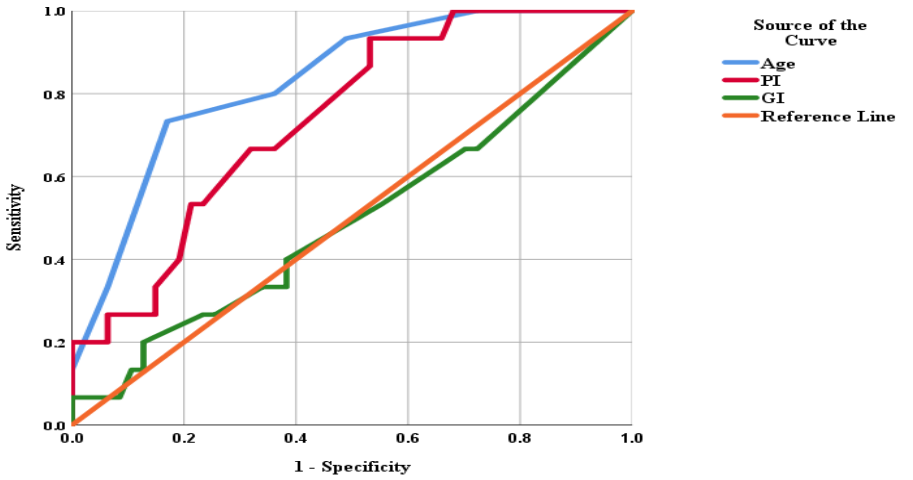

FIG.5. ROC chart of females' primary teeth

TABLE 12. Area under the curve for females' primary teeth

Test Result Variable(s)	Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Age	0.832	0.057	0.000	0.721	0.943
PI	0.741	0.067	0.005	0.610	0.873
GI	0.494	0.090	0.948	0.319	0.670

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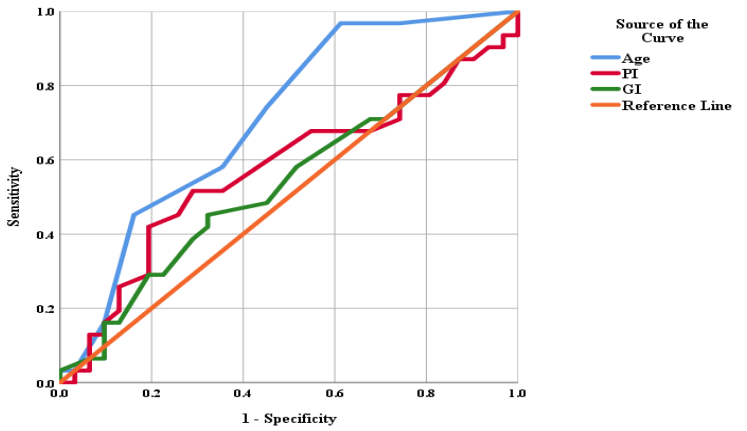

FIG.6. ROC curve of the females permanent teeth

TABLE 13. Area under the curve for females' permanent teeth

Test Result Variable(s)	Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Age	0.708	0.066	0.005	0.577	0.838
PI	0.572	0.074	0.331	0.426	0.718
GI	0.539	0.074	0.598	0.394	0.684

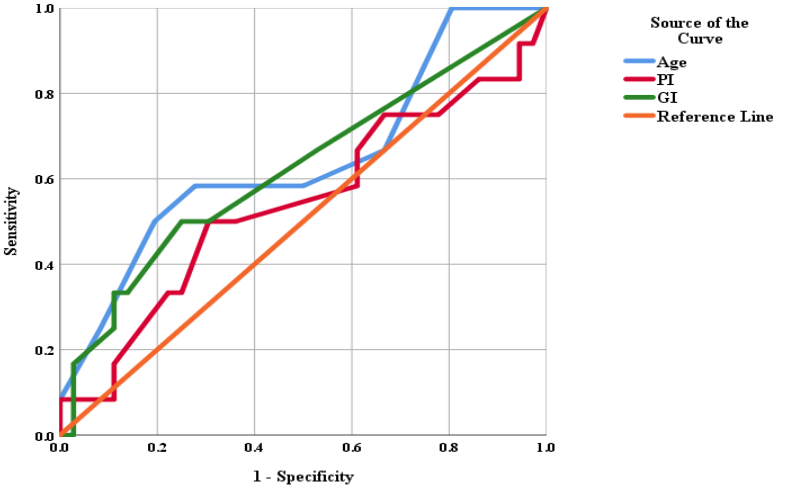

FIG.7. ROC curve for males' primary teeth

TABLE 14. Area under the curve for males' primary teeth

Test Result Variable(s)	Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Age	0.645	0.098	0.137	0.452	0.837
PI	0.543	0.104	0.660	0.339	0.746
GI	0.624	0.100	0.203	0.429	0.819

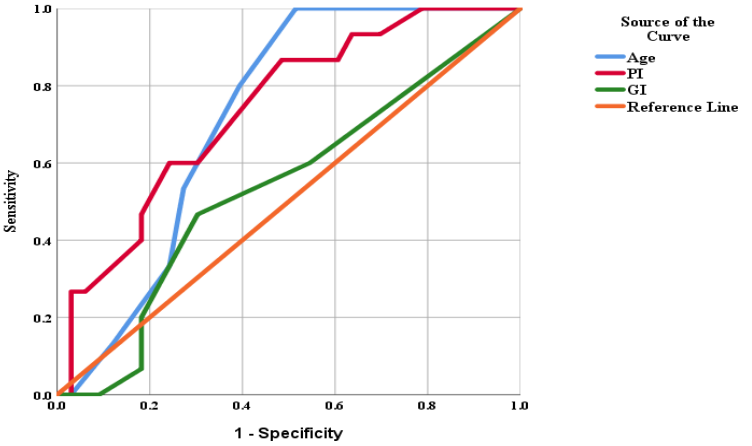

FIG.8. ROC curve for males permanent teeth

TABLE 15. Area under the curve of males' permanent teeth

Test Result Variable(s)	Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Age	0.722	0.071	0.014	0.583	0.862
PI	0.739	0.074	0.008	0.594	0.885
GI	0.536	0.090	0.689	0.360	0.713

TABLE 16. Cut-off values for males and females primary and permanent teeth status.

Gender	Primary teeth		permanent teeth	
	Age	PI	Age	PI
Males	*	*	7.5	1.88
Females	10.5	1.89	7.5	*

DISCUSSION

Social behavior of males and females is not the same as it well known in Iraq or even most of Arab countries. Actually, the difference can be attributed to the social standing of males in Arab families. This difference constitute for many privileges like pocket money, permission to play or stay out home, and many others. Accordingly, these things will open a wide space for the kids to be affected by the environment where they live and that will leave its impact on them and one of the major factors influence kids' behavior is food habits. The polluted environment and low economic standard of living are interacting with each other to produce problems in public health.

Dental caries is multifactorial disease; there are several factors responsible for severity of dental caries like diet, host bacteria, time and other variables like oral hygiene and saliva that considered the primary defense dental caries.9

In this study DMFT has significant positive association with plaque index. However, it was observed in this study that the negative correlation of age with dmft can be interpreted in terms that primary teeth loss reduced as age increased. Nevertheless, the positive correlation of DMFT with age indicated the impact of plaque and gingival inflammation on the permanent teeth that will by accumulation initiate a real threatening to the oral health not only of the pupils but also to the community.

Caries in primary teeth is caused by a lack of knowledge of effective preventive behaviors at a young age, which leads to plaque and gingival index formation as well as inappropriate eating habits such as frequent consumption of sugary foods and snacks, and a higher resistance to caries in permanent teeth compared to primary teeth 10

Age and plaque index index play role in primary teeth of female. The percentage which exceeds 80% indicated that females significantly more exposed to teeth corruption than males of this sample.

Such a result may be interpreted in terms of growing process of females compared to that of males. Perhaps, the nutrition habits of females at early ages are also contributed to this problem.

Girls' permanent teeth erupt earlier than boys 58 and women tend to take care of themselves, visit the dentist, and use dental services more than men 59. In addition to the above reasons, cultural issues should not be overlooked, as parents in the Middle East often place more emphasis on the appearance of their daughters than the boys11,12

On other hand, males are more likely dental corruption than females and total percentage of correct classification exceeds 81% (table 8) indicated a high potentiality of males bad dental health compared to females. It is not easy to understand the many changes happened to such pupils during their early age era. Age and plaque index were the only significant predictors in the model (as in table 9)

Hariri et al. discovered in 2006 that a positive family history predicts diabetes in almost 73 percent of all participants.13 The family history will be written as part of public awareness and preventative programs aiming at lowering diabetes's burden and risk factors. As a result, if parents are aware of the dangers of sickness in the family, they may be more motivated to engage their children in healthy habits. However, considerable study on the most successful ways to incorporate family history into these initiatives and campaigns, particularly for children and young adults, is needed. Individual techniques may be less effective than family-based lifestyle programs coached with parents.14

parents with diabetes mellitus in this study found to affect DMFT which is in contrast with Venkatesh K, et al. (2018) 15 and HassellTM (1995)16. Even though, some studies reported that periodontitis bacteria may be transmitted from parents to their children17. In this context Arsalan W, et al. (2013), stated the bidirectional relationship between some non-communicable diseases such as chronic kidney disease, diabetes mellitus and cardiovascular disease with periodontal disease 18.

CONCLUSION

Dental health is an issue that draws the attention of researchers and organization. Children as well as teenagers are the most part of population exposed to different risk factors affecting their dental health. In this study parents with diabetes mellitus found to have significant negative impact on DMFT of their children and/or teenagers. In this context DMFT was significantly associated with plaque index. Age and plaque index have a joint effect on the health of primary teeth. The binary logistic regression suggests that males are more likely to have bad dental health than females. At the age of 7.5 years, females start practicing the corruption of their deciduous teeth and have a plaque index of almost 1.89. Corruption of permanent teeth starts at the age of 7.5 years for both gender groups. Families should be alerted at this age stage in order to facilitate healthy food as well as healthy environment to their children besides encouraging them to always follow dental program to maintain their teeth.

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