

Dental Caries and its Relationship to Malocclusion in Permanent Dentition Among 12-15 Year Old School Going Children

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Abstract:

Background: This study aimed to know the prevalence of dental caries among children having malocclusion.

Materials and Methods: This cross-sectional study included 880 students aged 12-15 years, among whom 488 were boys and 392 were girls. A proforma was prepared to record dental caries status and dental esthetic index (DAI) using the WHO Oral Health Assessment Form (1997). Data were analyzed using Student's *t*-test and ANOVA. The *P* value of 0.05 or less was considered as statistically significant.

Results: It was found that 644 (73.2%) had no abnormality or minor malocclusion, whereas 115 (13.0%), 100 (11.4%) and 21 (2.4%) had definite, severe and very severe or handicapping malocclusion, respectively. Overall mean of decayed teeth (DT) component was found to be 0.95 ± 1.006 , missing teeth 0.23 ± 0.670 and filled teeth 0.23 ± 0.559 and decayed, missing, filled tooth (DMFT) was 1.41 ± 1.483 . DT and overall DMFT component significantly increased with increasing DAI of malocclusion ($P \leq 0.05$).

Conclusion: The severity of dental caries showed positive relation with DAI and age.

Key Words: Dental esthetic index, dental caries, malocclusion

Introduction

Oral health diseases and disorders can negatively affect a child's life.¹ Caries is one of the most common infectious multifactorial diseases of the childhood, which interferes with

normal nutrition intake and all other daily activities. It is a result of the acid production by bacterial fermentation of food debris and results in localized dissolution and destruction of calcified tissues of the teeth that leads to cavity formation.

The earliest sign of a new carious lesion is the appearance of a chalky white spot on the tooth surface, which indicates an area of demineralization of enamel surface. Caries is considered predisposing factors for occlusal anomalies in the mixed as well as permanent dentitions.²

Irregularity in dental occlusion beyond the accepted range of normal level is considered as a malocclusion.³ It could occur due to hereditary or environmental factors that cause psychosocial problems, problems with oral functions and trauma and dental diseases in the affected individual.⁴ Malocclusion affects social interactions that have a negative effect on self-image, and have all been associated with an unacceptable dental appearance. These conditions have increased demand for orthodontic and restorative treatments in most among the population. Normal tooth alignment contributes to not only the oral health, but also the overall well-being and personality of children.

Dental caries is a common complication of malocclusion. Due to the presence of malocclusion, it is difficult for patients to maintain good oral hygiene results in the increases of plaque accumulation on the teeth surfaces and hence is more susceptible to caries development. Good oral health is crucial for proper mastication; appearance and speech.⁵ However, variable access to dental care, inadequate oral hygiene and many other disability-related factors may account for differences.

Malocclusion may not be life-threatening, but it is an important public health issue as it compromises the health of oral tissues and also can lead to psychological and social problems.⁶ Therefore, the aim of this study is to estimate the occurrence of caries in the permanent dentition and its relationship to malocclusion among 12-15 year old children.

Materials and Methods

The present descriptive study was conducted to know the prevalence of dental caries in relation to malocclusion among 12-15 year old school going children of Karad district, Maharashtra, India.

An ethical clearance was obtained from the Ethical Committee of the Institute. An official permission was obtained from the principals of all the schools.

Study sample

Eight schools were selected from the city using random sampling technique. From each selected school, the required numbers of students between the eligible age group having malocclusion were diagnosed. A total of 1242 students were surveyed. Children with medical problems such as xerostomia, epilepsy, having mixed dentition and those undergoing orthodontic procedure were excluded. All the willing children with permanent dentition were included, so the final sample had 880 students including 488 boys and 392 girls.

In the presence of an instructor, a pilot study among 50 children was carried out to assess the prevalence of dental caries and these subjects were not included in the study. Furthermore, the inter examiner reliability was done with Kappa statistics as 84% for decayed, missing, filled tooth (DMFT).

Data collection

The study proforma consisted of three parts, the first part pertaining to the questions that included demographic information such as age and sex. The second part recorded information regarding dental caries status using the WHO Oral Health Assessment Form (1997).⁷

The third part used to know the prevalence of malocclusion using dental esthetic index (DAI) parameters. The DAI has 10 components as: Missing mandibular and maxillary incisor, canine and premolar teeth; crowding; spacing; diastema; largest maxillary anterior irregularity; largest mandibular anterior irregularity; anterior maxillary overjet; anterior mandibular overjet; vertical anterior open bite and anteroposterior molar relation. Total DAI scores are classified as: 13-25 (normal or minor malocclusion); 26-30 (definite malocclusion); 31-35 (severe malocclusion); and 36+ (very severe, handicapping malocclusion).⁸

Data analysis

A master chart was created in Microsoft Excel (2007) for the purpose of data analysis. The Statistical software namely SPSS version 16.0 (SPSS Inc., USA) was used for the analysis of the data. quantitative values were compared using Student's *t*-test and ANOVA. Calculated values of the test criteria were compared with the tabular value at 95% confidence level to ascertain the significance of the test. The *P* value of 0.05 or less was considered as statistically significant.

Results

The study sample consists of 880 school going children between the age group of 12-15 years. Table 1 shows that boys

were having more decayed teeth (DT) and missing teeth (MT) as a result of caries MT, whereas filled teeth (FT) were more among girls. However, the overall difference between all the components of DMFT was not significant.

Overall mean of DT component was found to be 0.95 ± 1.006 , MT 0.23 ± 0.670 and FT 0.23 ± 0.559 and DMFT was 1.41 ± 1.483 . The mean scores for DT and FT increased with age, but MT were more seen among younger children. The DMFT score also showed an enhancement with age as mentioned in Table 2.

The measured components of the DAI are multiplied by their regression coefficients, the products then being added to the regression equation constant to obtain the standard DAI scores. Based on the standard DAI scores, the severity of malocclusion within the subjects is classified. It was found that 644 (73.2%) had no abnormality or minor malocclusion, who need no or slight treatment; 115 (13.0%), 100 (11.4%) and

Table 1: Distribution of mean number of DT, MT, FT and DMFT according to gender using Student's *t*-test.

Components	Sex	No	Mean	Standard deviation	P value
DT	Boys	488	0.96	1.068	0.977**
	Girls	392	0.94	1.064	
MT	Boys	488	0.25	0.672	0.528**
	Girls	392	0.22	0.668	
FT	Boys	488	0.22	0.545	0.169**
	Girls	392	0.24	0.577	
DMFT	Boys	488	1.41	1.485	0.804**
	Girls	392	1.40	1.482	

DT: Decayed teeth, MT: Missing teeth, FT: Filled teeth, DMFT: Decayed missing filled tooth, **: Non significant

Table 2: Distribution of mean number of DT, MT, FT and DMFT according to age using ANOVA test.

Components	Age (years)	No	Mean	Standard deviation	F value	P value
DT	12	558	0.90	1.006	5.723	0.001
	13	126	0.95	1.137	16.615	0.000
	14	163	1.01	0.975	9.719	0.002
	15	33	1.67	1.762	3.725	0.024
	Total	880	0.95	1.066		
MT	12	558	0.23	0.685	0.436	0.728
	13	126	0.26	0.695	1.078	0.299
	14	163	0.21	0.623	0.455	0.500
	15	33	0.12	0.545	0.426	0.653
	Total	880	0.23	0.670		
FT	12	558	0.22	0.543	1.429	0.233
	13	126	0.18	0.512	3.078	0.080
	14	163	0.28	0.622	2.482	0.115
	15	33	0.36	0.653	0.903	0.406
	Total	880	0.23	0.559		
DMFT	12	558	1.34	1.450	3.355	0.018
	13	126	1.40	1.539	9.670	0.002
	14	163	1.50	1.425	6.355	0.012
	15	33	2.15	1.889	1.856	0.157
	Total	880	1.41	1.483		

DT: Decayed teeth, MT: Missing teeth, FT: Filled teeth, DMFT: Decayed missing filled tooth

21 (2.4%) had definite, severe and very severe or handicapping malocclusion respectively to whom treatment desirable was elective, highly desirable and mandatory respectively. DT and overall DMFT component significantly increased with increasing DAI of malocclusion ($P \leq 0.05$). The mean scores of DT for minor correction group were 0.90 ± 0.999 , and it reached up to the level of 2.00 ± 1.871 in mandatory treatment group. However, nonsignificant results were obtained with missing and FT in Table 3.

Discussion

Malocclusion is as an occlusion in which there is a malrelationship between the arches in any of the planes, and it increases the prevalence of dental caries.⁹ Different indices have been developed to assess the level of malocclusion as DAI and index of orthodontic treatment need (IOTN).¹⁰ The DAI is relatively easy to use and identifies clinical and esthetic components mathematically to produce a single score unlike the IOTN.¹¹

In our data, 73.2% had no abnormality or minor malocclusion, who need no or slight treatment, whereas 13.0% had definite malocclusion, 11.4% had severe and 2.4% had very severe or handicapping malocclusion. However, there is less range of prevalence in other studies as reported, that is from 20% to 43%.¹² The present results showed higher findings as it included only the subjects with malocclusion rather than the general population in other studies.

The results of DT and MT were more among boys and girls showed more number of FT component. These findings clarified that girls take more care regarding their oral health as

compared to boys. But, the overall results were nonsignificant that agrees with other previous studies.^{13,14} However, many studies showed a significant difference by gender.^{15,16}

In the present study, DT component was much higher while MT and FT component was less compared to a study conducted by Logan *et al.* (2009) in New Zealand.¹⁷ The number of carious lesions increased with age and similar findings were obtained by Tewari *et al.* in 1977 in Chandigarh;¹⁸ Rodrigues and Damle (1998) in Mumbai;¹⁹ Al-Banyan *et al.* (2000) in Riyadh;²⁰ Varenne *et al.* (2004) in Burkino Faso.²¹ With the increase in age, the chance of coronal caries also increases as the teeth gets more exposed to the oral environment. It leads to more plaque accumulation and more presence of microorganisms and results in cavity formation. The increase in filled component was also positively correlated with age; it might be due to more utilization of dental services with age.

DAI was significantly related to DT and DMFT component. It showed that the chances of caries increased as we move from minor malocclusion to handicapping malocclusion. When the occurrence of caries was related to the DAI, Children with DAI scores of >35 were found to have a significantly higher caries experience, as previously reported.^{22,23} Borzabadi-Farahani *et al.* in their study have reported a higher caries experience in subjects with DAI scores of 30, although this relationship was not significant.²⁴

Moreover, Stahl *et al.* in 2003 showed no significant relation between malocclusion and caries experience in the mixed dentition period, but specific types of malocclusion were found to be more prevalent in individuals with a high caries experience.²⁵

Conclusion

This survey showed that 73.2% had no abnormality or minor malocclusion, whereas 13.0%, 11.4% and 2.4% had definite, severe and very severe or handicapping malocclusion. There were not significant results of DAI with sex. However, positive relation was found between the occurrence of dental caries with DAI (from minor malocclusion to handicapping malocclusion) and age. Most of the population examined does not require any orthodontic procedures, but their incidence of caries is really high.

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Table 3: Distribution of mean number of DT, MT, FT and DMFT according to DAI index using ANOVA test.

Components	DAI (malocclusion)	No	Mean	Standard deviation	F value	P value
DT	Minor	644	0.90	0.999	7.876	0.000
	Definite	115	0.94	1.216	22.984	0.000
	Severe	100	1.08	0.961	13.234	0.000
	Handicapping	21	2.00	1.871	5.197	0.006
	Total	880	0.95	1.066		
MT	Minor	644	0.23	0.668	0.513	0.673
	Definite	115	0.19	0.605	0.113	0.737
	Severe	100	0.29	0.756	0.039	0.843
	Handicapping	21	0.14	0.655	0.750	0.473
	Total	880	0.23	0.670		
FT	Minor	644	0.22	0.560	1.492	0.215
	Definite	115	0.20	0.533	4.315	0.038
	Severe	100	0.23	0.529	1.015	0.314
	Handicapping	21	0.48	0.750	1.731	0.178
	Total	880	0.23	0.559		
DMFT	Minor	644	1.35	1.444	5.707	0.001
	Definite	115	1.33	1.566	16.552	0.000
	Severe	100	1.60	1.428	9.471	0.002
	Handicapping	21	2.62	1.910	3.825	0.022
	Total	880	1.41	1.483		

DT: Decayed teeth, MT: Missing teeth, FT: Filled teeth, DMFT: Decayed missing filled tooth, DAI: Dental esthetic index

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