

MALOCCLUSION AND ITS RELATIONSHIP WITH DENTAL CARIES IN A SAMPLE OF PAKISTANI SCHOOL CHILDREN

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ABSTRACT

Malocclusion is one of the most prevalent dental problems observed in children which may cause oral health problems, loss of function and psychosocial problems related to impaired dentofacial aesthetics. Malocclusion and dental caries have a negative impact on Oral Health Related Quality of Life (OHRQoL).

The objective of the study was to assess the prevalence of malocclusion and dental caries in school children, using Index Of Orthodontic Treatment Need (Dental Health Component) IOTN (DHC) and Decayed, Missing, Filled, Teeth (DMFT) score. Also to evaluate any relationship between malocclusion / orthodontic treatment need and dental caries.

A cross-sectional study was conducted among 574 school children aged 11 to 16 years having permanent dentition, no history of orthodontic treatment and no dental anomalies. Each student's number of DMFT was computed and the IOTN (DHC) was recorded based on contact point displacement only.

Results of the current study which comprised of 574 school children, with 320 males and 254 females, exhibited a mean IOTN grade of 2.4 ± 1.016 and a mean DMFT score of 2.57 ± 2.7 . The prevalence of malocclusion was found to be 75.6% while the prevalence of dental caries was 64.6%. The Pearson correlation coefficient found a significant correlation between IOTN and DMFT scores. The brushing frequency and gender did not correlate with DMFT scores, while sugar intake, age and SES had a significant correlation with DMFT. Taking IOTN into consideration, age and diet showed no correlation with it, whereas gender and Socio Economic Status (SES) status displayed a significant correlation with IOTN grades.

The current study yielded a significant correlation between malocclusion and dental caries. Healthy diet and proper brushing technique are important to maintain a healthy dentition, despite the presence of malocclusion.

Key Words: Malocclusion, dental caries, OHRQoL, IOTN, DMFT.

INTRODUCTION

Malocclusion is one of the most prevalent dental problems observed in children.^{1,2} It can be defined as an irregularity of teeth or an incorrect relationship of the dental arches that lies beyond the ideal limits. Besides the irregularity of the teeth or jaws, maloc-

clusion may cause oral health problems,¹ disturbances of oral function such as mastication, swallowing, and speech,³ and psychosocial problems related to impaired dentofacial aesthetics.⁴ It is also believed that children with malocclusion and/or caries experience a greater negative impact on OHRQoL.⁵

During the last couple of decades there has been a widespread surge in people's preoccupation with personal aesthetics and their awareness of malocclusion, which in turn has led to a significant increase in the demand for orthodontic treatment.⁶ In view of the time and expenditure involved in orthodontic treatment, precise information about the prevalence and distribution of malocclusions is vital for planning orthodontic treatment within a public health system.⁷

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Several indices have been developed⁸ to determine the distribution of malocclusions and record their prevalence and severity in different ethnic groups.^{9,10,11} The IOTN is considered to be the most valid and reliable.¹² The limited studies on analysis of the relationship between malocclusion and dental problems such as caries and periodontal diseases, have revealed inconsistent results.¹ Some researchers^{13,14} demonstrated a positive association between malocclusion and dental health, while others^{15,16} found no association between oral hygiene conditions and various orthodontic treatment needs.

The aims of this study were to survey the prevalence of malocclusion as an etiological factor of dental caries. Other etiological variables such as dietary intake, oral hygiene maintenance trends and socioeconomic status were also taken into consideration. These relationships have not been previously studied in the local literature available. Nevertheless, foreign studies which attempted to investigate the association of malocclusion and caries yielded conflicting or inconclusive results.^{17,18}

METHODOLOGY

Following approval from ethical committee, informed consent from participants and permission from school authorities was obtained to survey 5 secondary schools of Lahore, cross-sectional study was conducted among 860 students. No funding was sought and there was no conflict of interest. Based on the inclusion criteria, 574 students aged 11 to 16 years with permanent dentition, no history of orthodontic treatment and no dental anomalies were selected. Each student's number of DMFT was computed according to the WHO recommendations. The IOTN was recorded based on contact point displacement only.

- Grade 1 (No treatment need): 0 – 1mm
- Grade 2d (Minimal treatment need): 1.1 – 2mm
- Grade 3d (Moderate treatment need): 2.1 – 4mm

- Grade 4d (Definite treatment need): > 4mm
- Grade 5i (Extreme treatment need): impeded eruption due to crowding, displacement, supernumerary, retained deciduous teeth or pathology.

The study was carried out from 4th March, 2013 to 30th April 2014. The data was then analyzed with SPSS version 20.0. The chi-square test was used to analyze gender differences in the IOTN and DMFT scores. The Pearson correlation coefficient (r) was used to measure the correlation between the DMFT and IOTN scores. A p -value of less than 0.05 was considered significant.

RESULTS

A total of 574 students were selected for this study, comprising of 320 males (55.7%) and 254 females (44.3%). Their ages ranged from 11 to 16 years, with an average age of 13.4 years. As far as socioeconomic status is concerned, 87.1% students belonged to low SES, 10.8% belonged to middle SES while only 2.1% were from high SES. Tooth brushing frequency was such that 51.4% children brushed at least once daily, while 39.7% of them brushed twice daily, whereas 5.2% did not brush at all. The median for dietary intake of sugars was noted as twice per day. The descriptive statistics for the sample selected are summarized in Table 1.

The distribution of DMFT scores for both males and females is displayed in Table 2. Brushing frequency and DMFT were not correlated ($r = -0.57$, $p = 0.172$) whereas the frequency of dietary intake of sugars and DMFT exhibited a definite correlation ($r = 0.22$, $p = 0.00$). DMFT was not correlated with sex ($r = -0.076$, $p = 0.70$) but it was correlated with the age of the subjects ($r = 0.248$, $p = 0.00$).

IOTN grades did not correlate with age ($r = 0.042$, $p = 0.317$) and diet ($r = 0.15$, $p = 0.721$), whereas correlation was found to be significant for sex ($r = 0.144$, $p = 0.001$) and SES ($r = -0.093$, $p = 0.026$). Table 3 shows

TABLE 1: DESCRIPTIVE STATISTICS FOR MALES AND FEMALES

	Sex	Age	SES	Brush	Diet	IOTN	DMFT
Male	Mean	13.80	1.19	1.42	2.06	2.27	2.75
	Std. Deviation	1.977	0.457	0.623	1.438	0.961	2.898
	Median	14	1	1	2	2	2
Female	Mean	12.86	1.10	1.42	1.24	2.56	2.34
	Std. Deviation	1.678	0.341	0.682	1.386	1.060	2.413
	Median	13	1.00	1.00	1	3	2
Total	Mean	13.39	1.15	1.42	1.70	2.40	2.57
	Std. Deviation	1.907	0.412	0.649	1.472	1.016	2.700
	Median	13	1	1	1	2	2

TABLE 2: DISTRIBUTION OF DMFT SCORES FOR MALES AND FEMALES

DMFT	No. of males	No. of females	Total
0	116	87	203
1	22	30	52
2	39	34	73
3	20	26	46
4	45	32	77
5	19	16	35
6	23	8	31
7	11	10	21
8	13	7	20
9	3	4	7
10	5	0	5
11	1	0	1
12	2	0	2
13	0	0	0
14	1	0	1
Total	320	254	574

TABLE 3: DISTRIBUTION OF IOTN AMONG MALES AND FEMALES

IOTN (DHC)	Treatment Need	Males	Fe-males	Total
Grade 1	No treatment need	73	47	120
Grade 2d	Minimal treatment need	131	79	210
Grade 3d	Moderate treatment need	73	68	141
Grade 4d	Definite treatment need	43	58	101
Grade 5i	Extreme treatment need	0	2	2
	Total	320	254	554

the distribution of IOTN grades based on contact point displacement in both males and females.

Pearson chi-square test failed to show significant differences in DMFT scores for males and females ($p = 0.098$), whereas the result for sexual differences in IOTN scores was significant ($p = 0.004$). A positive correlation was found between DMFT scores and IOTN grades of the entire sample. Pearson correlation was significant at the 0.01 level with $r = 0.218$ and $p = 0.00$. This means that as the degree of malocclusion or orthodontic treatment need increases, so does the caries experience.

DISCUSSION

Malocclusion is a multi-dimensional problem which is nearly impossible to be defined by a single index.¹⁹ There are contrasting views about the role of malocclusion as a predisposing factor for dental caries which is an infectious multifactorial microbiological disease that results in localized dissolution and destruction of calcified tissues of the teeth.²⁰ Carious teeth need to be restored, at times complications can even demand extraction of the affected tooth. Several other parameters such as age, sex, oral hygiene trends and dietary intake also need to be considered before establishing a correlation between malaligned teeth and dental caries.

The current study comprising of 574 school children exhibited a mean IOTN grade of 2.4 ± 1.016 and a mean DMFT score of 2.57 ± 2.7 . The Pearson correlation between IOTN and DMFT was found to be significant. These results were similar with previous studies. Nalcaci et al²¹ conducted a study in 2012 using Treatment Priority Index (TPI), and the correlation coefficient showed a significant relationship between TPI and DMFT scores. Helm and Petersen¹² and Gábris et al¹³ demonstrated a positive association between malocclusion and periodontal health. However, Katz¹⁴, Buckley¹⁵ and Mtaya et al¹ found no association between oral hygiene conditions and various orthodontic treatment needs. Obviously, several parameters are involved in the etiology of both caries and malocclusion, which need to be studied in more detail to determine the relationship under study. A consensus of opinion cannot be expected as the studies available were conducted on subjects from various racial and ethnic backgrounds, age groups, socioeconomic status, dietary habits and oral hygiene trends. In this study, brushing frequency and gender did not correlate with DMFT scores, while sugar intake, age and SES had a significant correlation with DMFT. Taking IOTN into consideration, age and diet showed no correlation with it, whereas gender and socioeconomic status displayed a significant correlation with IOTN grades.

In 2014 Vellappally et al²² reported a high prevalence of malocclusion and dental caries among disabled children. An incisal crowding of ≥ 1 mm was the most common orthodontic anomaly observed in these children. However, there was no positive correlation between the severity of malocclusion and the presence of dental caries. This finding does not correlate with the present study which was conducted on children without any mental or physical disability. Furthermore, the prevalence of malocclusion is reported to be higher among physically and/or mentally disabled children compared to healthy children.²³ The oral conditions

of children with disabilities are reported to be worse, either due to the existing disability or due to medical, economic or social reasons.

Some studies even suggest a reciprocal relationship between dental caries and malocclusion. In 2009 Mtaya et al¹ found that children with caries experience (DMFT > 0) were almost two times more likely to have any type of malocclusion compared with their counterparts without caries (DMFT = 0). In 2004 Stahl and Grabowski²⁴ reported dental caries and premature loss of primary teeth as predisposing factors for occlusal and space anomalies in the mixed and permanent dentition. Some of the authors²⁵ explained the relationship of malocclusion and dental caries by the incidence of untreated proximal caries in primary molars or early loss of a second primary molar leading to forward drift of the first permanent molar, ultimately leading to shortening of the arch length. These observations were, however, beyond the scope of the current study which was cross-sectional in type and conducted on permanent dentition.

OHRQoL is a relatively modern but rapidly advancing concept which is particularly significant to three areas: clinical practice of dentistry, dental research and dental education.²⁶ It is important to understand how people perceive the impact of oral diseases on their quality of life. Bendo⁵, Gomes²⁷ and Masood et al²⁸ reported a significant negative impact of malocclusion on OHRQoL, while Loice²⁹ concluded that dental caries affects many aspects of children's OHRQoL but malocclusion has no effect. As OHRQoL is gaining popularity, more researches are welcomed to gain insight into this notion especially at a regional level. It is unquestionably a better tool to communicate with policy-makers and negotiate access to health care.²⁶

The prevalence of malocclusion based on contact point displacement was found to be 75.6%, whereas the prevalence of dental caries was reported as 64.6%. These statistics indicate an alarming need for both orthodontic and restorative treatments, a fact which coheres with the current global trends. The demand for orthodontic treatment is increasing in many countries worldwide, hence, the need for screening and diagnostic methods, and rational treatment planning is essential.³⁰ It is evident that we need more than just IOTN in order to assess the individual treatment need from different perspectives for both clinical and epidemiological purposes. It will help in patient selection and prioritization in our society where orthodontist to patient ratio is negligible considering our massive population.

CONCLUSION

The current study yielded a significant correlation between malocclusion and dental caries. This indicates

the need to minimize chances of developing malocclusion and dental caries in children by spreading oral health awareness and encouraging frequent dental examinations. It is important to understand that healthy diet and proper brushing technique are key to maintaining a healthy dentition, despite the presence of malocclusion.

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