ORIGINAL ARTICLE

ORTHODONTIC TREATMENT NEEDS AND ASSOCIATION BETWEEN MALOCCLUSION AND ORAL HYGIENE BEHAVIORS

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ABSTRACT

The objective of the study was to determine orthodontic treatment needs and investigate the relationship between malocclusion and oral hygiene behaviors and oral problems among male Saudi schoolchildren in Dammam. This cross-sectional study involved male intermediate schoolchildren (age 12-16 years) from public schools of Dammam, Saudi Arabia. A sample of 376 children was selected using multistage random sampling. The orthodontic treatment needs were assessed using dental aesthetic index (DAI).The World Health Organization (WHO) questionnaire was used to collect data about oral hygiene habits and problems. The prevalence of malocclusion was 19.7%. Thirty four (9%) children had DAI scores (26-30), and had definite malocclusion that required elective treatment. Twenty two (5.9%) children had severe malocclusion (DAI scores 31-35), and treatment was highly desirable. DAI score of ≥ 36 was found in 18 (4.8%) children with severe or handicapping malocclusion that required mandatory orthodontic treatment. A higher proportion of children (85.1%) with malocclusion cleaned their teeth daily in comparison with children without malocclusion (76.8%). A significantly (p = 0.023) higher proportion of students with malocclusion (60.8%) was dissatisfied with their dental appearance than those with normal occlusion (46%). In conclusion, a high prevalence of malocclusion was observed among male schoolchildren in Dammam. The study found no statistically significant relationship between malocclusion and oral hygiene behaviors.

Key Words: *Malocclusion; orthodontic treatment needs; oral hygiene behaviors.*

INTRODUCTION

According to World Health Organization (WHO), dentofacial anomalies affect 10% of the world population.[1] Malocclusion is the third most common oral condition after dental caries and periodontal disease.[2] Although, malocclusion is not a pathological condition, however, it can negatively affect the quality of life.[1] Malocclusion can cause difficulty in speech, mastication, and swallowing, and can increase a person's susceptibility to periodontal disease and dental traumatic injuries.[3] Several genetic, environmental, and local factors are involved in the etiology of malocclusion,[4] and it can be either due to skeletal or dental relation discrepancy.[5]

The prevalence of malocclusion was between 20% and 43% in Indian school children.[6] Another study from India reported that 15% of children (ages 11-15 years) required orthodontic treatment.[7] The prevalence of malocclusion was 92% in Jordanian schoolchildren.[8] Similarly, 86% of Kuwaiti adolescents had malocclusion.[9] The studies have evaluated the prevalence of different types of malocclusion in some parts of the Kingdom of Saudi Arabia but the results differ because of inconsistency in clinical assessment tools, data collection methods, and non-representative samples of the studied populations.[4,10-13]

Given the high prevalence of malocclusion, its psychological and social impacts, and difficulty in speech and swallowing, it is important to evaluate its treatment needs in children. Data are scarce on oral hygiene

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behaviors in children with malocclusion. Similarly, limited information is available about dental visits of children with malocclusion. In addition, there is limited research regarding oral problems such as pain, difficulty in chewing and biting, and self-perception about appearance in children with malocclusion. Therefore, the study aimed to determine orthodontic treatment needs, and oral hygiene practices and problems among male Saudi schoolchildren in Dammam.

METHODOLOGY

A cross-sectional study design was employed for the conduct of the research project. The study population consisted of male intermediate school students in Dammam because male researchers were allowed to visit only male school students due to cultural norms in the country. Dammam is a metropolitan city that also includes the towns of Al-Khobar and Dhahran, and is situated in the Eastern Province of Kingdom of Saudi Arabia. There are 49 public intermediate schools in Dammam with a total population of 6,965 students, 11 schools in Dhahran with a total population of 1,859 students, and 16 schools in Al-Khobar with a total population of 1,943 students. The grand total of the students was approximately 10,767.[14] A random sample of 430 was calculated. The sample size calculation was based on estimated student population, 95% confidence level, 5% confidence limit, estimated prevalence of malocclusion, and design effect.[15] The students were randomly selected from public schools using multi-stage sampling technique. A random number generator in Microsoft Excel (2010) was used for simple randomization at the level of schools, classes, and study participants. The school administration was contacted to obtain permission for the study. The students with mixed dentition, history of dental trauma, dental and skeletal anomalies such as cleft lip and palate, and syndromes were excluded from the study. The students with permanent tooth extractions, previous orthodontic treatment and prosthetic dental treatment were also excluded from the study. The researchers excluded the study participants based on patient history and clinical dental examination.

The clinical examination of the students was performed in their schools in good daylight with the students seated in a portable dental chair. Two researchers were trained to perform the clinical examination and administer the questionnaire. Intra-examiner and inter-examiner calibrations were carried out on 20 school children who were not included in the main study.[16] The examination was completed by using dental mirror and explorer following WHO guidelines for "Oral Health Surveys".[16] The dental aesthetic index (DAI) was used to determine the prevalence of malocclusion and orthodontic treatment needs.[17] The index assesses 10 occlusal characteristics to determine the final score which is used to classify patients in to four categories depending on the severity of malocclusion. A score between 0-$\leq$ 25 shows minor or no anomaly and no or slight orthodontic treatment is needed. When DAI score lies between 26-30, then there is definite malocclusion and elective orthodontic treatment can be provided. There is a severe malocclusion and treatment is highly desirable if the DAI score is between 31-35. A score of $\geq$ 36 shows handicapping malocclusion and treatment is mandatory.[17]

In addition to clinical examination, WHO oral health questionnaire for children was distributed among students to collect data.[16] The questionnaire was translated in to Arabic language by the researchers and further verified by an experienced Arab faculty member in dental public health. The questionnaire inquired about cleaning of teeth, use of toothbrush, miswak, dental floss, wooden toothpick, plastic toothpick, and visiting a dental office. Oral health problems were assessed by asking the questions related to dissatisfaction with dental appearance, feeling of pain, avoidance of smiling due to maligned teeth, children making fun due to crowding, school absence because of discomfort, and difficulty in chewing and biting. In addition, the study participants provided their responses about self-perceived health of their teeth and gums.

Statistical analyses were performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Frequencies and percentages were generated for various categorical variables of the study. Cross-tabulations and Chi-square tests (Fisher's exact test where appropriate) were performed to observe associations between categorical variables and malocclusion. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 376 students agreed to participate in the study with a response rate of 87.5%. The age of the participants ranged from 12-16 years with a mean age of 14.3 (±0.99) years. The prevalence of malocclusion was 19.7% among male intermediate school children. Almost 9.0%

TABLE 1: MALOCCLUSION AND ORTHODONTIC TREATMENT NEEDS BASED ON DAI SCORE

Malocclusion and Orthodontic Treatment Needs	Frequency/Percentage N (%)
No or slight treatment need (DAI score < 25)	302 (80.3)
Definite malocclusion with treatment elective (DAI score between 26 and 30)	34 (9.0)
Severe malocclusion with treatment highly desirable (DAI score between 31 and 35)	22 (5.9)
Severe (handicapping) malocclusion with treatment mandatory (DAI score ≥ 36)	18 (4.8)

TABLE 2: DISTRIBUTION OF DAI COMPONENTS AMONG STUDENTS

DAI Components		Frequency (%)
No of missing incisors, canines, and premolar teeth in mandibular and maxillary arches	0	336 (89.4)
	≥1	40 (10.6)
Crowding in incisal segment (Number of segments crowded in upper and lower arches)	0	266 (70.7)
	1	66 (17.6)
	2	44 (11.7)
Spacing in incisal segment (Number of segments spaced in upper and lower arches)	0	283 (75.3)
	1	81 (21.5)
	2	12 (3.2)
Midline diastema (mm)	0	342 (91.2)
	>1	34 (9.8)
Largest maxillary anterior irregularity	0	291 (77.4)
	1-2mm	63(16.7)
	≥ 3mm	22 (5.9)
Largest mandibular anterior irregularity	0	275 (73.1)
	1-2mm	88 (23.4)
	≥ 3mm	13 (3.5)
Anterior maxillary overjet	0	22(5.9)
	1-3mm	343(91.2)
	> 3mm	1(0.3)
Anterior mandibular overjet	0	362 (96.3)
	> 0	14 (3.7)
Vertical Anterior open bite	0	357 (94.9)
	? 0	19 (5.1)
Anterior-posterior molar relation	Normal	308 (81.9)
	1/2 cusp either mesial/ distal	54 (14.4)
	1 full cusp or mesial/distal	14 (3.7)

TABLE 3: RELATIONSHIP BETWEEN MALOCCLUSION AND ORAL HYGIENE BEHAVIORS

Variables	Malocclusion (N=74)	Normal Occlusion (N=302)	P-value
Cleaning of teeth	63 (85.1)	232 (76.8)	0.473
Using tooth brush	62 (83.8)	253 (83.8)	0.883
Using miswak	46 (62.2)	180 (59.6)	0.825
Using dental floss	9 (12.2)	42 (13.9)	0.718
Using tooth paste	65 (88.4)	267 (87.8)	0.902
Using wooden tooth pick	17 (23.0)	97 (32.1)	0.265
Using plastic tooth pick	11 (14.9)	49 (16.2)	0.846
Vising dental office	42(51.9)	150 (50.8)	0.873

(n=34) of respondents had DAI scores between 26 and 30. This indicated that these male intermediate school children had definite malocclusion that required elective treatment. Similarly, 5.9% (n=22) of children with DAI scores (31-35) had severe malocclusion and orthodontic treatment was highly desirable among these children. DAI score ≥ 36 was found in 4.8% (n=18) of the sample and they had severe or handicapping malocclusion that required mandatory orthodontic treatment. No significant malocclusion was found in 80.3% of children and hence no, or minor treatment was needed for this group of children (Table 1).

Table 2 shows the distribution of DAI components. It can be seen that 29.3% (n=110) of students had crowding in incisal segment and 9.8% (n=34) had midline diastema of more than one millimeter. Normal anterior-posterior molar relationships were found in 81.9% (n=308) of participants. There was no significant difference (p>.05) between children with normal occlusion and those with malocclusion in terms of various oral hygiene practices and dental visit (Table 3). A significantly (p = 0.023) higher proportion of students with malocclusion (60.8%) were dissatisfied with their dental appearance than those with normal occlusion (46%).

TABLE 4: RELATIONSHIP BETWEEN MALOCCLUSION AND ORAL PROBLEMS

Variables	Malocclusion (N=74)	Normal Occlusion (N=302)	P-value
Dissatisfied with dental appearance	45 (60.8)	139 (46)	0.023
Often feel pain/discomfort	9 (12.2)	33 (10.9)	0.966
Avoid smiling because of maligned teeth	16 (21.6)	63 (20.9)	0.886
Children make fun of my teeth	13 (17.6)	36 (11.9)	0.196
School absence due to discomfort	3 (4.1)	31(10.3)	0.067*
Have difficulty chewing	9 (12.2)	60 (19.9)	0.125
Have difficulty biting	4 (5.4)	35 (11.6)	0.118
Vising dental office	42(51.9)	150 (50.8)	0.873

* Fisher exact test

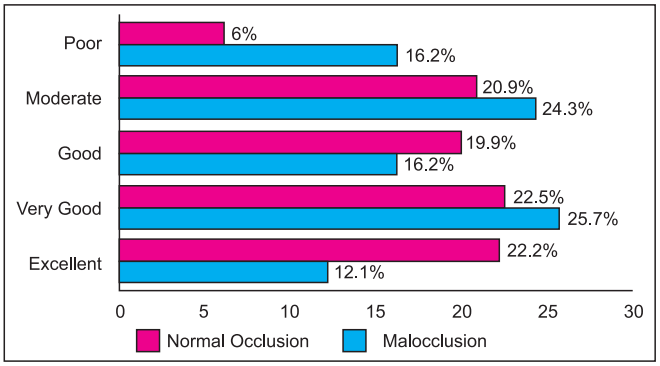

Fig 1: Self-perceived health of teeth among those with and without malocclusion

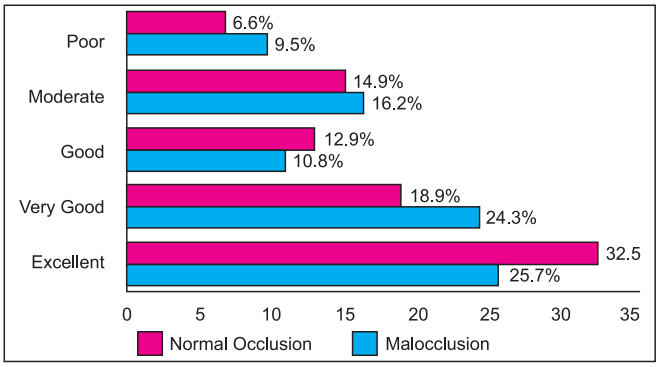

Fig 2: Self-perceived gingival health status among those with and without malocclusion

No significant differences (p>0.05) were found between two groups in relation to various oral problems (Table 4). Similarly, no significant differences were identified regarding the perceived health of teeth and gingivae between students with and without malocclusion (Fig 1, 2).

DISCUSSION

The present study was conducted to evaluate the prevalence of malocclusion and orthodontic treatment needs in schoolchildren in Dammam, Saudi Arabia. The study found that a considerable proportion of children had malocclusion, and required elective to mandatory orthodontic treatment.

DAI score was ≤ 25 (no or minor malocclusion) in most of the participants (80.3%) in this study which was similar to the findings by Siluvai et al[18] who demonstrated DAI score ≤ 25 in 97.2% of students in India. Similarly, Otuyemi et al[19] reported that 77.4% of secondary school students had normal occlusion in Nigeria. The study conducted by Khanehmasjedi et al[20] found that 70.9% of the participants had normal occlusion in Iran. Similarly, Hamamci et al[21] observed no malocclusion in 66.5% of the respondents in Turkey. The results of a study by Baca-Garcia et al[22] revealed 58.6% of Spanish adolescents without malocclusion. The difference in the prevalence of malocclusion in different studies can be explained by the differences in ethnic backgrounds and study designs including sample size calculations.[8]

In the present study, 9% of participants had DAI score between 26 and 30, meaning a definite malocclusion with treatment elective. These results are in agreement with the study by Hamamci et al[21] in Turkey, where 12% of the participants had DAI score of 26-30. However, the studies conducted in Spain[22] and South Africa[23] found DAI Score (26-30) in 21.2% and 20.3% of the respondents respectively. Our study found severe malocclusion with treatment highly desirable (DAI 31-35) in 5.9% of students. Similar results were shown by Danaei et al[24] who found a DAI score of 31-35 in 7.9% of the participants. Severe (handicapping) malocclusion with mandatory treatment was 4.8% in our study, which was almost same as reported by Danaei et al[24] in Iran (4.2%). However, Khanehmasjedi et al[20] found 2.2% of the participants with severe (handicapping) malocclusion.

We found a statistically significant relationship between malocclusion and self-reported dissatisfaction with dental appearance. Borges et al[25] reported that malocclusion was associated with dissatisfaction with dental appearance, and adolescents (15-19 years) with severe and very severe malocclusion had higher dissat-

isfaction than those with normal occlusion. In another study of adolescents, Tessarollo et al[26] found that there was higher likelihood of dissatisfaction with dental appearance with increasing severity of malocclusion and each unit increase in DAI score was associated with 5% increase in dissatisfaction. However, Peres et al[27] identified a positive association between malocclusion and dissatisfaction with dental appearance only in female adolescents. In contrast, a previous study by Lilja-Karlander et al[28] observed that 94% of 19 years old individuals were satisfied with dental appearance whether they had malocclusion or not.

The response rate (87.5%) for this study was satisfactory. Some of the students could not participate in the study due to the lack of consent from their parents or refusal for clinical examination. The study was limited to metropolitan area of Dammam and to male schoolchildren from public schools. Therefore, the findings of the present study should be interpreted keeping in view these limitations. However; the study has provided useful base-line information for future broader studies and comparisons.

CONCLUSIONS

- A substantial proportion of schoolchildren had malocclusion and orthodontic treatment needs.
- No statistically significant ($p>0.05$) relationships were observed between malocclusion and oral hygiene behaviors.
- Malocclusion was associated with perceived dissatisfaction of schoolchildren with their dental appearance.

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