The Association between Malocclusion and Dental Caries among Yemeni School Children in Sana’a City

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Received: 01 Oct, 2020 | Accepted: 16 Oct, 2020 | Published: 23 Oct, 2020

Introduction

Researches and studies on dental health problems in Yemen are still modest and limited, despite the presence of studies that dealt with problems of tooth decay, gingivitis, causes of permanent tooth extraction and spread, formation of biofilms after introduction of fixed orthodontic devices and susceptibility to of Candida to antifungal drugs and the pattern of third molar impaction [1-9], but only one research deals with malocclusion [10] and this is the second study that deals with malocclusion and the first study that studies malocclusion and its relationship to dental caries. Malocclusion can be defined as an irregularity in the teeth or a malfunction of both arches outside of what is acceptable as normal. Malocclusion is thought to be a risk factor in the formation and progression of tooth decay [10,11].

Malocclusion is the most common oral problem, along with tooth decay, gum disease, and fluorosis [11]. According to international studies and the World Health Organization, major dental problems should be subjected to periodic epidemiological surveys; knowing the population’s epidemiological situation is vital to planning and providing prevention and treatment services [10-15].

The causes of malocclusion can be genetic or environmental, and/or a combination of both factors, along with various local factors such as negative oral habits, dental abnormalities, the shape of the teeth and the location of their growth, can cause the malocclusion [10-15]. The prevalence of malocclusion varies from country to country and between different age groups and nationalities [10-15]. Globally, epidemiological studies of malocclusion show the prevalence to be...
Subjects and Methods

This descriptive cross-sectional study was conducted to measure the prevalence of malocclusion associated with dental caries among Yemeni school children in primary schools (government and private) in Sana’a, Yemen. A total of 1079 boys and girls aged 7-12 years from Sana’a schools were randomly selected and screened, and the schools are located in different areas of the city to avoid having children from the same area. The criteria for each assessment of malocclusion described by Angle, (1899) [20] divide the malocclusion into different categories based on the occlusal relationships of the first molar. Teeth affected by dental caries and their restoration/extraction as a result of dental caries were recorded using World Health Organization, (1997) [21]. Data were collected by one examiner who is the first researcher using the standard method [22].

Before starting the study, ethical considerations were taken after the approval of the Faculty of Dentistry at Sana’a University, Yemen, for the study. The test was administered with permission from the relevant educational authorities. Permission was obtained from the District Education Office and the target school principals, after informed consent was obtained from the parents of the participating children.

Statistical Analysis

The data were analyzed by SPSS program (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp) and presented by using tables. Percentage (%) was used to describe the qualitative variables. Mean and standard deviation was used to describe the quantitative variables for the normally distributed data. Chi-square with Yate correction and Fisher tests were used to show the significance of the association between the outcomes at the level of significance less than 0.05 (P).

Results

The malocclusion rate was 81.1%, there was an association between malocclusion and the younger age group (7-9 years) of 84.2%, odds ratio=1.5 (CI=1.1-2), p=0.01. There was no significant association between malocclusion and sex or school type (Table 1). Class I malocclusion had the highest percentage of sample 70.4%, with 73.2% in age group 7-9 higher than age group 10-12 (67.8%) (P<0.05). Class II malocclusion was 9.5%, while Class III had the lowest incidence and was present in only 1.1% of the entire sample. According to age, there was a significant difference with Class II malocclusion (P<0.05). On the other hand, normal Class I occlusion was in 18.9% of the sample. It was found that 21.9% of the age group 10-12 years was greater than the age group 7-9 years (15.8%), and the age difference was significant (Table 2, Figure 1). The prevalence of caries in the deciduous teeth was present at 92.4% as shown in figure 2. There was a significant association between dmft (dental caries) and malocclusion with a rate of 82.1% positive caries in positive malocclusion with the associated odds ratio equal to 2.13 times, interval Confidence=1.30-3.48; P<0.05. There was also a significant association between missing primary teeth and malocclusion with a rate of 99.7% positive malocclusion with an associated odds ratio of 106.64 times, confidence interval=14.88-764.46; P<0.001 (Table 3, Figure 3).

Discussion

The current cross-sectional study was carried out to assess the prevalence of malocclusion and dental caries among 7-12 year-old children in Sana’a city, Yemen. Most studies [14-19] that evaluate the prevalence of malocclusions use samples that include various age groups. The present study covered an age group which orthodontic clinics are the most sought after due to the emergence of clinical situations that involve alterations in the arches and faces. This could be attributed to the normal sequence of eruption in 9-year olds as many deciduous teeth exfoliate at this age. Moreover, this is a

Table 1: The association between malocclusion with age, gender and school type.

| Variable     | Malocclusion | Normal | OR (95%CI) | p-value |
|--------------|--------------|--------|------------|---------|
|              | freq. | %    | freq. | %    |          |         |
| Age (year)   |        |      |        |      |          |         |
| 7 - 9 yrs.   | 444   | 84   | 83    | 16   | 1.5 (1.1-2) | 0.010* |
| 10 - 12 yrs. | 431   | 78   | 121   | 22   | Reference  |         |
| Gender       |        |      |        |      |          |         |
| Boys         | 443   | 81   | 103   | 19   | 1.0 (0.7-1.3) | 0.972 |
| Girls        | 432   | 81   | 101   | 19   | Reference  |         |
| School type  |        |      |        |      |          |         |
| Government   | 620   | 82   | 141   | 19   | 1.08 (0.7-1.5) | 0.624 |
| Private      | 255   | 80   | 63    | 20   | Reference  |         |
| Total (n=1079) | 875  | 81   | 204   | 19   |          |         |

*p<0.05 statistically significant

Citation: AL-Awadi TAM, AL-Motareb FL, AL-Haddad KA, AL-Akwa AAY, AL-Shamahy HA, et al. (2020) The Association between Malocclusion and Dental Caries among Yemeni School Children in Sana’a City. Int J Dent Oral Health 7(1): dx.doi.org/10.16966/2378-7090.340
Table 2: Prevalence of Angle classification according to age, gender and school type.

| Angle classification | Age (year) | Gender | School type |
|----------------------|------------|--------|-------------|
|          | 7-9yrs | 10-12yrs | Boys | Girls | Government | Private | Total |
| freq. | % | freq. | % | freq. | % | freq. | % | freq. | % | freq. | % |
| Class I normal     | 386     | 73   | 374 | 68 | 384 | 70 | 376 | 71 | 540 | 71 | 220 | 69 | 760 | 70.4 |
| Class II           | 52      | 9.9  | 51  | 9.2 | 53  | 9.7 | 50  | 9.4 | 70  | 9.2 | 33  | 10 | 103 | 9.5 |
| Class III          | 6       | 1.1  | 6   | 1.1 | 6   | 1.1 | 6   | 1.1 | 10  | 1.3 | 2   | 0.6 | 12  | 1.1 |
| P-value            | 0.085*  |      |    | 0.998 |      |    | 0.666 | |
| X²                 | 6.24    |      |    | 0.035 |      |    | 1.57  | |

*P<0.05 statistically significant

The rate of malocclusion in the current study (81.1%) is consistent with results from previous studies by Romano FL, et al. in Brazil (86.6%) [25], and Narayanan RK, et al., in India (83.3%) [26]. On the other hand, the current rate was higher compared to the rate reported by Reddy ER, et al. 52% [27] in Nalgonda, India, Morais CH, et al., (78.50%) [28] in Minas Gerais, Brazil, Disha P, et al. (40.9%) in South India region [29], Sultan S, et al. (78.31%) [30], and by Yu X, et al. in China (79.4%) [31]. Regarding sex, no statistically significant difference (P>0.05) was observed between boys and girls with regard to the prevalence of malocclusion (Table 2), in conjunction with Das UM, et al. [32]; De Souza RA, et al. [33]; Narayanan RK, et al. [26]. According to age groups, the prevalence of malocclusion was more pronounced for the 7-9 year age group than for the 10-12 year age group, with a statistically significant difference (P<0.05). This result is in agreement with Morais CH, et al. [28]. Class I malocclusion predominated in classes II and III in this study (Table 2) and this finding roughly corresponds to data reported in some other studies conducted by De Souza RA, et al. [33]; Brito DI, et al. [34]; Lux CJ, et al. [35]; Almeida MR, et al. [36]; Bourzgui F, et al. [37]; Morais CH, et al. [28]; Narayanan RK, et al. [26]; Disha P, et al. [29]; Sultan S, et al. [30]; and Alajlan SS, et al. [38].

The results obtained in the present study proved that the prevalence of dental caries is high in Sana’a City, and significantly increases with age, in which the percentages of dmft was 92.4% (Table 3, Figure 2). This result comes in agreement with many studies reported a higher prevalence of dental caries by Gandeh MB, et al. [39]; Al-Haddad KA [40]; Wyne AH, et al. [41]; and Al Agili DE, et al. [42]. Increased tooth decay in developing countries is due to a combination of factors, including eating carcinogenic foods, exposure to fluoride, socioeconomic status, race, health, age, access to oral health services and other lifestyle factors [43,44]. The association between caries and malocclusion between the study subjects was statistically significant and that was present in primary teeth (dmft) 82.1% (Table 3, Figure 3). This finding is consistent with the findings of Gabris K, et al. [18];
Table 3: Dental caries prevalence and the association of four indices reflecting decay experience in deciduous (primary) teeth (dmft) with malocclusion.

| Variable               | freq | %  | freq | %  | X^2 | p-value | OR  | Lower | Upper |
|------------------------|------|----|------|----|-----|---------|-----|-------|-------|
| Decayed deciduous teeth| 983  | 91 | 808  | 82.2| 9.14| 0.002*  | 2.03| 1.27  | 3.23  |
| Missing deciduous teeth| 302  | 28 | 301  | 99.7| 94.56| <0.001**| 106.64| 14.88 | 764.46|
| Filled deciduous teeth | 54   | 5  | 37   | 68.5| 5.84| 0.016*  | 0.49| 0.27  | 0.88  |
| dmft index             | 994  | 92 | 816  | 82.1| 9.39| 0.002*  | 2.13| 1.3   | 3.48  |

X^2: Chi-square test  
**P<0.001 statistically significant  
*P<0.05 statistically significant  
OR: odd ratio  
CI: Confidence Interval

Figure 3: Bar chart showing the association of dental caries (dmft) index with malocclusion.

Mitu M, et al. [14]; Shivakumar KM, et al. [15]; Singh A, et al. [19]; Buczkowska-Radlinska J, et al. [17]; and Baskaradoss KL, et al. [16] that demonstrated a positive association between caries prevalence and malocclusion. However, it differs with some other studies by Aashi K, et al. [45]; and Aamodi K, et al. [46], who did not report statistically significant association between caries and malocclusion.

Conclusion

The results of the current study showed that there is an increase in the prevalence of malocclusion among schoolchildren from 7 to 12 years old. The study showed that the prevalence of dental caries was very high in the deciduous teeth, and there was a significant association of the total dmft component with malocclusion (P<0.05). The results of this study provide the basic data for implementing preventive programs in schools in order to take immediate action and obtain more oral health awareness programs through early interception treatment to reduce factors that prevent the development of dental arch as well as structural jaw growth.

Acknowledgments

The authors would like to acknowledge Sana’a University, Sana’a, Yemen which supported this work.

Conflict of Interest

No conflict of interest associated with this work.

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