Prevalence and Associated Factors of Crossbite Malocclusion in Subjects Reporting to A Private Dental Hospital

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Abstract
Background: Crossbite is a transverse plane malocclusion that can affect a single tooth or numerous teeth, be bilateral or unilateral, and be anterior or posterior. **Aim:** To determine the prevalence and associated factors for crossbites among subjects visiting private dental college. **Materials and Methods:** The case records of patients who came to Saveetha Dental College's OP department for orthodontic treatment were used in this retrospective study. The data on age, gender, type of crossbite and the arch involved in crossbite of the patients was collected and statistical analysis was done. The descriptive statistics and chi square test were performed using SPSS software. **Results:** In total, 430 people with crossbites took part in the research. Patients with posterior crossbite made up 21% of the total, while those with anterior crossbite made up 79%. The Chi square correlation and the kind and number of teeth implicated in crossbite was not significant (p value >0.05), however the relationship between age and the side of involvement was significant (p value 0.05). There was an association between gender, type of cross bite, and side of cross bite involved (p value <0.05). **Conclusion:** Adult males had a higher incidence of cross bites than females, and anterior crossbites with unilateral involvement were more common than posterior crossbites.
Keywords: Anterior, Epidemiology, Habits, Malocclusion.

1. Introduction

Crossbites are transverse plane malocclusions that can be skeletal or dental in origin. An aberrant axial inclination of the maxillary anterior teeth can cause anterior or posterior crossbites. (Ulusoy and Bodrumlu, 2013). Dental crossbite in the anterior region occurs in 4-5 percent of the population and is caused by palatal malposition of the maxillary incisors as a result of a lingual eruption path (Major and Glover, 1992). An anterior crossbite is a typical occurrence in mixed dentition, and because it seldom self-corrects, it should be addressed as soon as possible, as it can lead to a more significant malocclusion or traumatic injury to periodontal tissues (Miamoto et al., 2018). A removable or fixed appliance, or a combination of both, can be used to correct dental anterior crossbites. Treatments for anterior dental crossbite included the Catlan's appliance, tongue blade therapy, bonded composite sloping bite planes, reversed stainless steel crowns and removable appliances with finger springs (Bayrak and Tunc, 2008)(Heikinheimo, Salmi and Myllarniemi, 1987).

Crossbites in the posterior region are one of the most prevalent malocclusions in various dentitions, manifesting as a narrowing of the upper arch's lateral dimensions (Fo *et al.*, 1991). Kutin and Hawes estimated the prevalence of this malocclusion in the deciduous dentition to be 8% (Kutin and Hawes, 1969) and 12% in the mixed dentition by Hanson et al (Hanson, Barnard and Case, 1970). Harmful oral habits, early loss of primary teeth, genetics, non-nutritive sucking and restricted nasal breathing caused by swollen tonsils or adenoids could all be factors in this malocclusion (Almeida *et al.*, 2012). The occurrence of posterior crossbite varies between 8 and 16 percent, according to published studies (Kisling, 1981)(Fo *et al.*, 1991). It's important to note that diagnosing, correcting, or referring these occlusal irregularities to a specialist early will help prevent harmful effects on a child's facial complex development(Lee, 1978).

In view of the increased interest in early detection and treatment of malocclusions, as well as the concomitant emphasis on preventative therapy, more information is required. The burden of malocclusions in a population should be studied to plan for treatment. Our team has extensive knowledge and research experience that has translated into high quality publications (Choudhari and Thenmozhi, 2016; Govindaraju, Jeevanandan and Subramanian, 2017; Ravi *et al.*, 2017; Vikram *et al.*, 2017; Gupta, Ariga and

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Deogade, 2018; Hannah *et al.*, 2018; Kavarthapu and Thamaraiselvan, 2018; Pandian, Krishnan and Kumar, 2018; Ramamurthy and Mg, 2018; Ashok and Ganapathy, 2019; Ramesh *et al.*, 2019; Sharma *et al.*, 2019; Venu, Raju and Subramani, 2019; Wu *et al.*, 2019; Samuel, Acharya and Rao, 2020). The goal of this study was aimed to assess the prevalence of crossbites in subjects reporting to a private dental hospital and evaluate the associated factors.

2. Materials and Methods

Study Setting

This retrospective study included subjects with crossbite malocclusion among all patients reporting to Saveetha Dental college seeking orthodontic treatment. Case sheets of these patients were reviewed and data regarding crossbites was collected. The study approval was obtained from the scientific review board of SIMATS. The data analysis included data from patients who had been diagnosed with crossbite. The study did not include cases with incomplete record entries.

Data Collection

The case records of 430 patients with crossbite were selected and data on parameters like Age , Gender, unilateral/bilateral involvement, single tooth/multiple teeth involvement and associated skeletal malocclusion was collected.

3. Statistical Analysis

After collecting data about all parameters tabulation was then and statistical significance was tested using SPSS software (version). Chi square tests were used to determine the relationship between crossbites and age, gender, type, and underlying malocclusion. P value of less than 0.05 was used to determine statistical significance.

4. Results

In this study, a total of 430 case records of subjects with crossbite were included with a gender distribution of 57% males and 43% females [Table 1]. 74% of them were between 19-40 years old, 17% were 6-13 years old and about 9% of them were 14-18 years old [Table 1]. Out of the total number of patients, about 77% of them had unilateral crossbite whereas 23% of them had bilateral crossbite [Table 2]. About 54% of the total patients had crossbite involving multiple teeth whereas 46% of them had crossbite involving a single tooth [Table 2]. Out of all patients diagnosed for crossbite, 78% of the patients had anterior crossbites whereas 21% of them had posterior crossbites [Table 2]. Angle's Class I malocclusion was observed in 86% of crossbite patients, Class II Div 1 malocclusion was found in 6%, Class II Div 1 Subdivision Angle's malocclusion was found in 2%, and Class III Angle's malocclusion was found in 5%. [Table 1].

There was no significant link between age and the type of crossbite or the number of teeth affected due to crossbite (chi square p value >0.05) (Figure 1,3). The age group and the side of cross bite implicated were found to have a significant correlation (chi square p value <0.05) (Figure 2). Gender was found to have a significant relationship with the type of cross bite and the side of the cross bite ($p<0.05$) (Figure 4,5). A significant association between type of cross bite and sagittal malocclusion involved was noted ($p<0.05$) (Figure 6).

5. Discussion

The current investigation was carried out by involving all patients with crossbites reporting to a private dental hospital followed by evaluating their frequency distribution and associations in various age groups, genders, and malocclusions.

In the present study we found that anterior crossbites were more common in all age groups than posterior crossbites. Adults were more likely than children to suffer from unilateral crossbites, and there was a significant association between age and the side of the cross bite implicated (p-0.022<0.05). Crossbites involving multiple teeth were more common in adults, but no significant association was noted (p-0.190>0.05) [Table 2]. A higher number of males reported with anterior crossbites, but no significant association was found (p-041>0.05) [Figure 4]. Both unilateral and bilateral crossbites were more common in males with a significant gender association (p-0.015<0.05) [Figure 5]. Both anterior and posterior crossbite were more commonly associated with a class 1 Angle's malocclusion (p-0.000<0.05) [Figure 6].

In a study done by Asiry et al on prevalence of malocclusion in Saudi Arabia, it was found that posterior crossbite was seen more predominantly when compared to anterior crossbite (Asiry and AlShahrani, 2019). The impact of orthodontic treatment with fixed appliances on the quality of life of children and adolescents has been studied previously. The incidence of anterior crossbites in the deciduous teeth has received little attention. Anterior crossbite was noted in 3% of patients in the United States, according to a study by Tausche et al. (Tausche, Luck and Harzer, 2005).

Functional crossbite, also known as pseudo-Class III, is caused by early dental interference, which drives the mandible forward in order to achieve maximum intercuspation (Vadiakas and Viazis, 1992). In a recent study it was shown that 57% of the total sample included in the study were diagnosed with crossbite (Alogaibi et al., 2020). This is in accordance with our study in which it was found that crossbite was found in 0.5% of the patients reporting to the private dental college. Untreated malocclusion increases the risk of tooth decay, poor oral hygiene, and gingival disease, resulting in pain and functional limitations (Kolawole and Folayan, 2019). The number of studies concentrating on the early detection of malocclusion and its treatment in the

deciduous dentition is increasing (Shen et al., 2018). According to a recent study by Zhou et al, anterior crossbite was found to be 7 percent prevalent, whereas posterior crossbite was shown to be 8 percent prevalent (Zhou et al., 2016).

Unilateral posterior crossbite is a common asymmetric malocclusion characterized by a reverse relation between the maxillary and mandibular buccal cusps in the molar and premolar areas only on one side of the dental arch (Cutroneo et al., 2016). Children with unilateral posterior crossbite have abnormal jaw kinematics during mastication when chewing on the affected side (Piancino et al., 2009).

The current study was limited to a specific population of patients. More research with a larger sample size from diverse locations of Chennai, India is needed to develop better screening methods for early intervention and prevention of malocclusion.

6. Conclusion

Within the scope of this research it can be concluded that anterior crossbites with unilateral involvement were more common than posterior crossbites in the studied population and adult males had a higher prevalence of cross bites. These findings will aid in planning of malocclusion prevention and treatment in Chennai city.

Table 1: Frequency distribution in percentage of study subjects

Age (years)			Gender		Malocclusion			
6-13	14-18	19-40	Male	Female	Class I	Class II Division I	Class II Division II	Class III
16.74%	9.07%	74.19%	57.44%	42.56%	86.05%	5.58%	1.86%	4.65%

Table 2: Frequency distribution of cross bite in study subjects

Side involved		Teeth involved		Type of crossbite	
Unilateral	Bilateral	Single tooth	Multiple teeth	Anterior	Posterior
76.74%	23.26%	46.28%	53.72%	78.60%	21.40%

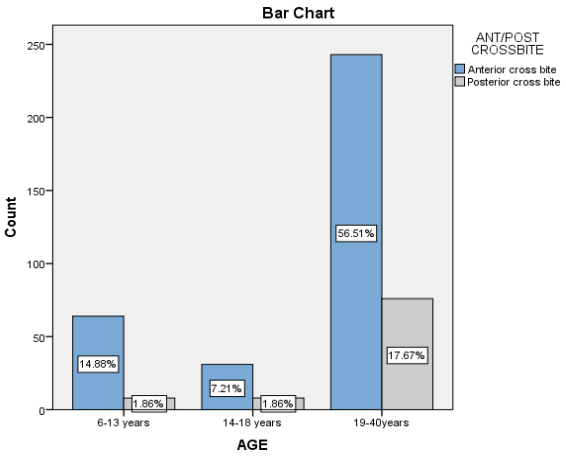

Figure 1: Bar chart representing association between age group and the type of cross bite. Anterior cross bite was common in adults and no significant association between age group and type of crossbite was noted (chi square p value >0.05).

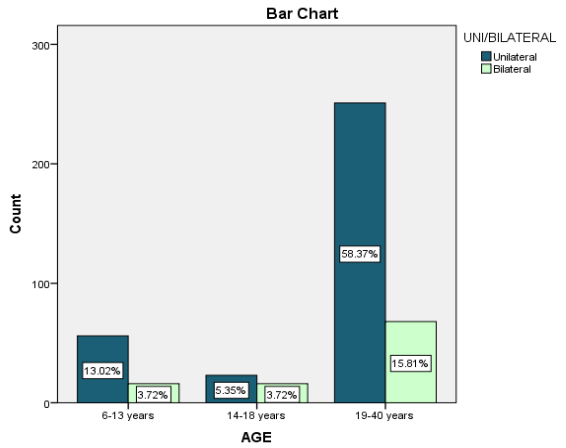

Figure 2: Bar chart representing association of age group and the side of cross bite involved. A significant association was noted and unilateral crossbite was most common in adults. (Chi square p value <0.05).

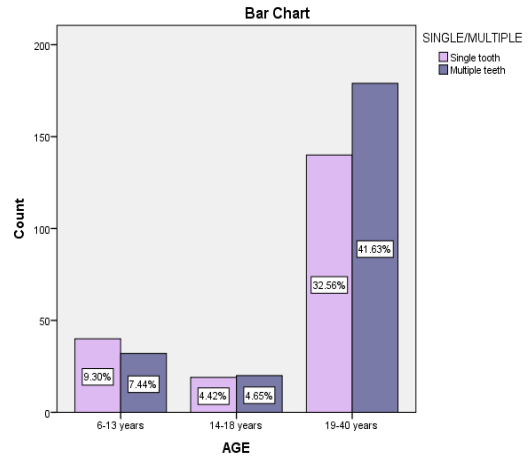

Figure 3: Bar chart representing association of age group and the number of teeth involved in cross bite. No significant association was observed (chi square p value >0.05).

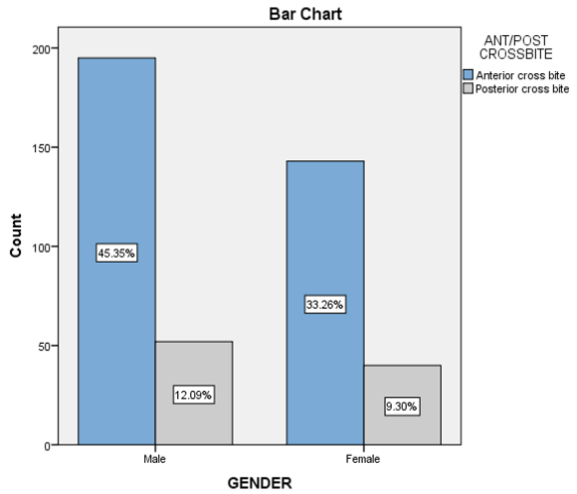

Figure 4: Bar chart representing association of gender with the type of cross bite. A significant association was noted and anterior crossbite was more common than posterior in both males and females (p<0.05).

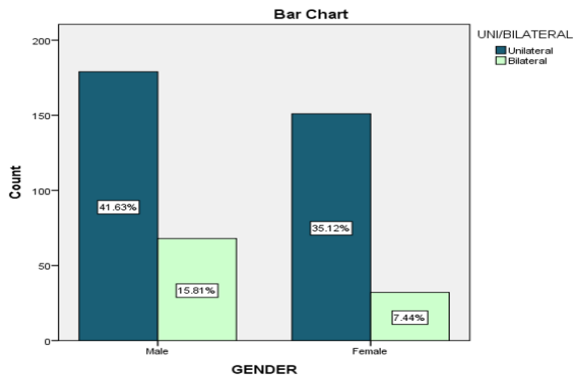

Figure 5: Bar chart representing association of gender and the side involved in cross bite. A significant association was noted and unilateral crossbite was more common than bilateral in both genders (chi square p value <0.05).

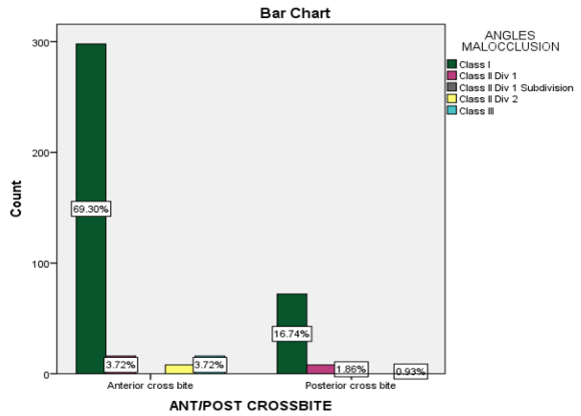

Figure 6: Bar chart representing association between type of cross bite and sagittal malocclusion involved. A significant association was noted and class I malocclusion was more commonly associated with anterior crossbites (chi square p value<0.05).

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