



Gingival Health Status in Patients With And Without Anterior Crossbite: A Case Control Study

Kuzhalvaimozhi P¹, Vignesh Ravindran*², Subhashini V C³

¹Saveetha Dental college and hospitals, Saveetha Institute of Medical and Technical sciences, Saveetha University, Chennai-600077, Tamil Nadu, India

²Department of Pediatric and Preventive dentistry, Saveetha Dental college and hospitals, Saveetha Institute of Medical and Technical sciences, Saveetha University, Chennai-600077, Tamil Nadu, India

³Department of Public Health Dentistry, Saveetha Dental college and hospitals, Saveetha Institute of Medical and Technical sciences, Saveetha University, Chennai-600077, Tamil Nadu, India

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ABSTRACT

Anterior crossbite is an anteroposterior malocclusion resulting from an abnormal axial inclination of maxillary anterior teeth. Anterior crossbite can cause periodontal damage leading to gingival recession. To assess the gingival health status in patients with an anterior crossbite, and also compare with patients without anterior crossbite. The present study consisted of 56 patients divided into two groups: patients with anterior crossbite and patients without anterior crossbite. 89000 Case sheets were reviewed from the dental treatment records for DMFT index in children with and without anterior crossbite from June 2019 to March 2020. In both groups, the following parameters were recorded - Oral Hygiene Index - Simplified (OHI-S) and Plaque Index (Silness and Loe). Mean Plaque Index for case group (patients with anterior crossbite) is 0.89, and Mean Plaque Index for the control group (patients without anterior crossbite) is 0.68. Mean OHI-S Index for case group (patients with anterior crossbite) is 0.46 and Mean OHI-S Index for the control group (patients without anterior crossbite) is 0.45. On the Mann-Whitney test, the difference was not statistically significant (P-value - 0.088 and 0.096). In this study, gingival health status in patients with anterior crossbite is poor compared with patients without anterior crossbite.



*Corresponding Author

Name: Vignesh Ravindran
Phone: +91 9789934476
Email: vigneshr.sdc@saveetha.com

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INTRODUCTION

Adults and children are prone to several types of periodontal disease. But there is a less incidence of periodontal disease in children. Although aggressive periodontitis occurs mostly in children (Shah and Jeevanandan, 2018). Moyers defined anterior tooth crossbite as a dental malocclusion resulting from the abnormal axial inclination of maxillary anterior teeth (Moyers, 1988). Anterior crossbite is highly prevalent during the mixed dentition period. Minor malocclusion is one of the major concerns for the orthodontist or pedodontist to guide the dentition with the growth of orofacial structures (Al-Sehaibany and White, 1998). Anterior dental crossbite is usually due to palatal malposition of maxillary

incisors resulting from a lingual eruption path (Moyers, 1988). Other etiologies would include trauma to primary maxillary incisor causing lingual displacement of the permanent tooth buds, crowding in the anterior region, supernumerary teeth like mesiodens, an over-retained deciduous root or tooth, delayed exfoliation of primary teeth and sometimes the presence of odontomas (Bhalajhi et al., 2009). The first notice of a crossbite is the best time to treat it (Bhalajhi et al., 2009). Anterior crossbite requires an immediate and effective treatment to prevent the mobility of anterior teeth and fracture and also prevent from periodontal and temporomandibular disturbances (Valentine and Howitt, 1970; Estreia et al., 1991).

Gingival recession can be a true recession and pseudo recession (Jacobs, 1989). True recession is where there is root exposure, whereas the pseudo recession is where there is a slight difference in gingival margin level in relation to a contralateral tooth (Stoner and Mazdyasna, 1980). Trauma from occlusion promotes the destruction of periodontal tissues leading to gingival lesions. Depending upon the etiology of anterior crossbite; skeletal or dental, stage of dentition - mixed or permanent, a variety of treatment approaches can be used to prevent, intercept or correct it (Profit and Field, 2000). Treatment modalities for correction of anterior crossbite include tongue blade therapy, inclined plane, a removable appliance with finger spring, maxillary two × four appliances, bonded - resin composite slopes, fixed orthodontic mechanotherapy or orthognathic surgical procedures (Graber, 1961). There are many advantages for two ×, four appliances. It includes ease of application, prevents malocclusion in an early stage, there is a minimal application of force when compared with conventional orthodontic treatment and minimal root resorption. It cannot be used for the correction of skeletal crossbite and requires patient cooperation (Subramanyam, 2019). Malocclusion can hinder the proper function of oral hygiene measures resulting in plaque and calculus formations, thereby disrupting the healthy state of the periodontium. Assessing the gingival health would provide an idea on the difference in the status of the accumulation of plaque and calculus, which would help in providing proper oral hygiene measures.

Aim of the study was to assess the gingival health status in patients with anterior crossbite and to compare with patients without anterior crossbite and to create awareness about oral hygiene instructions among the patients.

MATERIALS AND METHODS

This is a retrospective study. This study was carried out in a hospital-based university setting. This study was evaluated and ethically approved by an institutional ethical review committee—retrospective data collected from 89,000 case records from June 2019 to March 2020. Informed consent was obtained from the parents or guardian before starting the treatment. Inclusion criteria were patients with an anterior crossbite, patients aged from 11 to 30 years and patients without anterior crossbite (age, gender-matched control). Exclusion criteria were patients below ten years of age, and above 30 years of age, incomplete available data and improper photographs.

Total cases acquired for this study was 56 patients which include 28 anterior crossbite patients and 28 age, gender-matched controls. OHI-S score was collected for patients with and without anterior crossbite. OHI-S index is a sum total of Debris Index and Calculus Index. To measure the OHI-S index, the arch was divided into three segments and measured the calculus and plaque on the buccal and lingual surfaces of each segment of both arches. By assessing the photographs, we recorded the values which were added up and divided them by the total number of tooth surfaces in each segment to get the debris index. Similarly, the calculus index was calculated. Then we added up both values to get the OHI-S score. OHI-S scores were tabulated for patients with and without anterior crossbite. If the OHI-S score is 0.1-2, oral hygiene is good, if the OHI-S score is 1.3-3.0, oral hygiene is fair and if the OHI-S score is 3.1-6.0, oral hygiene is poor. The Plaque Index was given by Silness and Loe in 1964. Plaque Indexes were also collected for the patients with and without anterior crossbite. Scoring criteria for Plaque index as follows. Score 0 represents no plaque. Score 1 represents a film of plaque adhering to the free gingival margins and adjacent area of the tooth. Score 2 represents a moderate accumulation of soft deposits within the gingival pocket or tooth and gingival margin which can be seen with the naked eye. Score 3 represents an abundance of soft matter within the gingival pocket and or the tooth and gingival margin. If the plaque index score is 0.1-0.9, oral hygiene is excellent, if the plaque index score is 1.0-1.9, oral hygiene is fair, and if the plaque index score is 2.0-3.0, oral hygiene is poor.

Selected case and control group were examined by three people; one reviewer, one guide and one researcher. Patient's case sheets were reviewed thoroughly. Cross-checking of data including digital entry and intraoral photographs was done by an

additional reviewer, and as a measure to minimise sampling bias, samples for the group were picked by the simple random sampling method. A digital entry of clinical examination and intraoral photographs were assessed. Then OHI-S score was entered into Microsoft Excel and then transferred into Statistical Package for the Social Sciences Software for statistical results. A correlation test (Mann-Whitney test) was done between the patients with anterior crossbite and patients without anterior crossbite. The difference was statistically significant when the p-value was less than 0.05.

RESULTS AND DISCUSSION

The final study sample size included a total of 56 patients with 28 patients with anterior crossbite (case group) and 28 patients without anterior crossbite (control group). Note the equal distribution of cases in both case (patients with anterior crossbite) and control group (patients without anterior crossbite) (Figure 1). In this study, the control group was age and gender-matched to the case group. Note the equal distribution of cases in both case and control group (Figure 2). The mean Plaque index score for patients with anterior crossbite was 0.89 and the mean Plaque index score for patients without anterior crossbite was 0.68 (Figure 3). Out of 28 patients without anterior crossbite, 12 patients had excellent Plaque index scores and 14 patients had fair Plaque index scores. Out of 28 patients with an anterior crossbite, seven patients had poor plaque index scores. The gingival status of patients without anterior crossbite based on plaque index scores was better than patients with an anterior crossbite (Figure 4). However, this difference was not statistically significant. ($p = 0.096$) Mean OHI-S index of patients with anterior crossbite was 0.46 and mean OHI-S index of patients without anterior crossbite was 0.45 (Figure 5). An equal number of patients in both groups had good OHI-S scores, but this did not show any statistical significance ($p = 0.088$). The gingival status of patients without anterior crossbite based on OHI-S index scores was similar to patients with an anterior crossbite (Figure 6).

Gingival recession is the exposure in the roots of teeth caused by retraction of the marginal gingiva from the crown of the teeth. Several classification systems were given by Sullivans and Atkins in 1968, Mlinek et al. in 1973, Miller in 1985, Smith in 1997, Mahajan in 2010 for gingival recession. Miller's classification is Class I, which is marginal tissue recession which does not extend to mucogingival junction with no bone loss or soft tissue loss and complete root coverage. Class II is a marginal tissue recession which extends to or beyond the mucogingival junction with no alveolar bone loss or soft tissue loss and complete root coverage. Class III is a marginal tissue recession beyond the mucogingival junction with bone or soft tissue loss and partial root coverage. Class IV is a marginal tissue recession beyond the mucogingival junction, with bone or soft tissue loss and no root coverage. Gingival recession is one of the most common esthetic concerns for anterior crossbite patients. It is associated with thermal and tactile sensitivity, tendency towards root caries. Etiological could be developmental (ectopic eruption, inadequate arch, bone fenestration, and abnormal

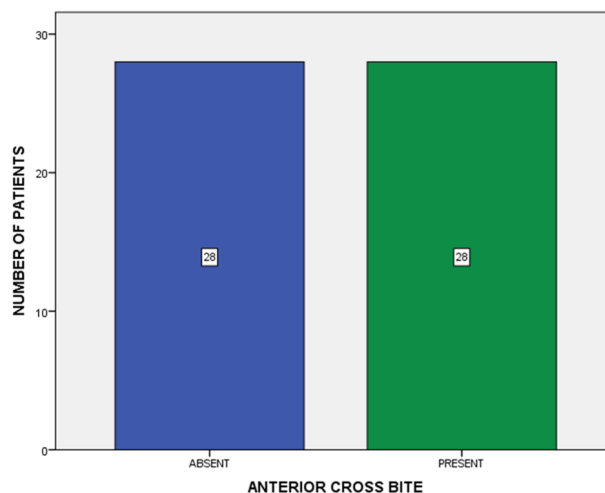


Figure 1: Bar graph represents the number of cases in case (patients with anterior crossbite) and control group (patients without anterior crossbite).

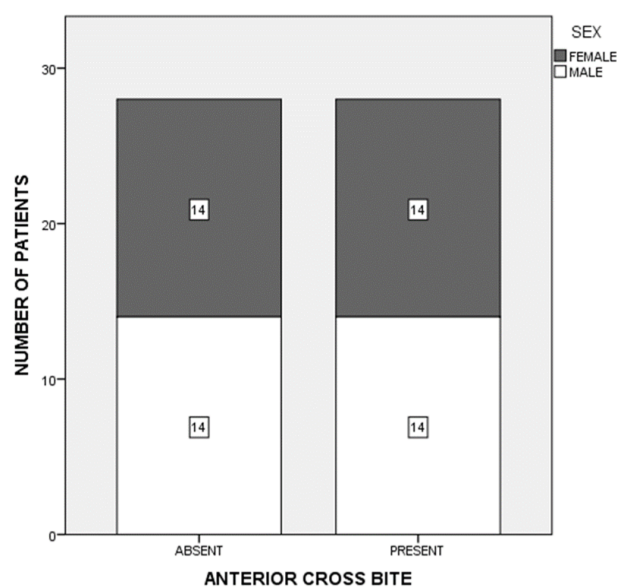


Figure 2: Bar graph represents the gender distribution of cases in case (patients with anterior crossbite) and control group (patients without anterior crossbite).

tion which extends to or beyond the mucogingival junction with no alveolar bone loss or soft tissue loss and complete root coverage. Class III is a marginal tissue recession beyond the mucogingival junction with bone or soft tissue loss and partial root coverage. Class IV is a marginal tissue recession beyond the mucogingival junction, with bone or soft tissue loss and no root coverage. Gingival recession is one of the most common esthetic concerns for anterior crossbite patients. It is associated with thermal and tactile sensitivity, tendency towards root caries. Etiological could be developmental (ectopic eruption, inadequate arch, bone fenestration, and abnormal

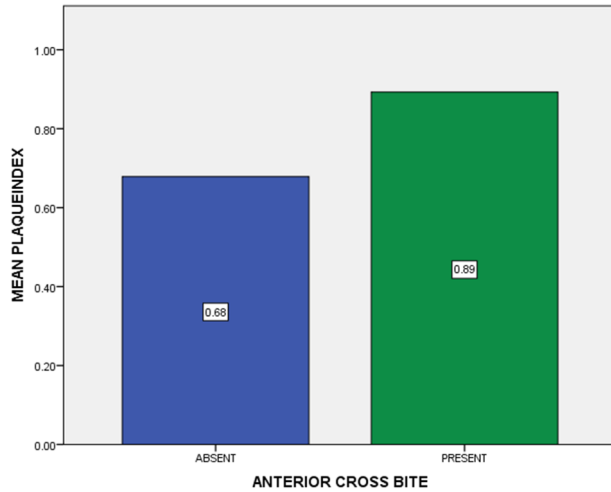


Figure 3: Bar graph represents the Mean Plaque Index in case (patients with anterior crossbite) and control group (patients without anterior crossbite).

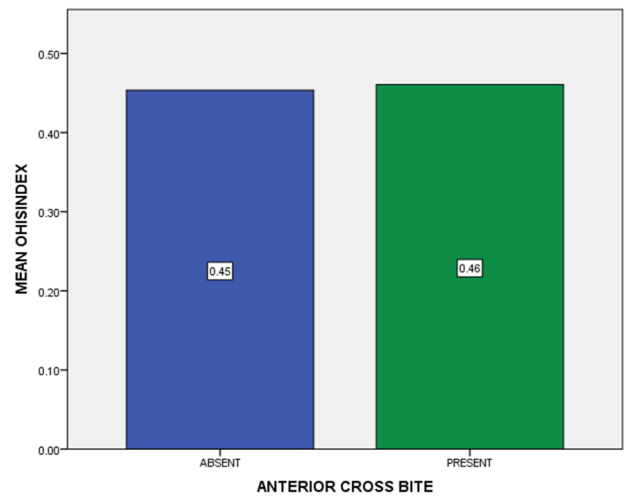


Figure 5: Bar graph represents the Mean OHI-S index scores in case (patients with anterior crossbite) and control group (patients without anterior crossbite).

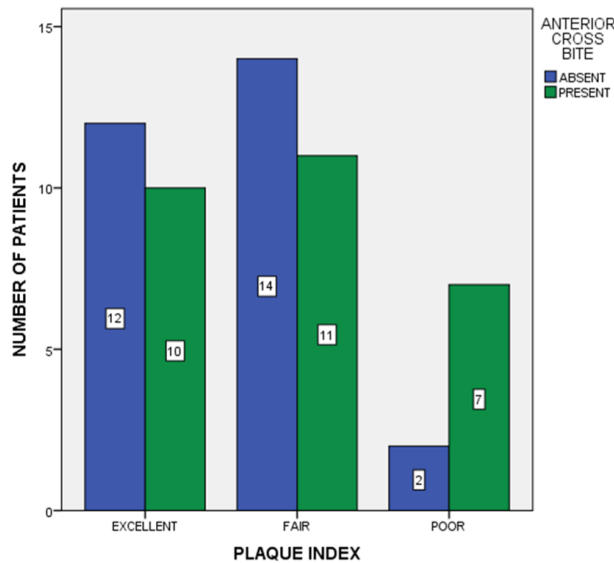


Figure 4: Bar graph represents the comparison of Plaque index scores among the patients with and without anterior crossbite.

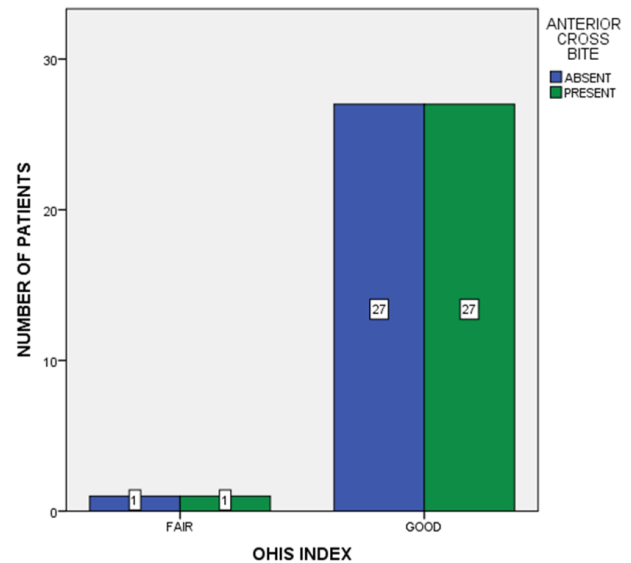


Figure 6: Bar graph represents the comparison of OHI-S index scores among the patients with and without anterior crossbite.

frenal attachments) or acquired (plaque accumulation) (Geiger, 1980).

Anterior crossbite is the lingual positioning of maxillary anterior in relation to mandibular anteriors (Tsai, 2001). The ideal time for the correction is between 8 to 11 years because root formation is completed (Prakash and Durgesh, 2011). Clinicians should determine whether the crossbite is skeletal or dental by means of profile analysis and intraoral examination before starting with the treatment. Space loss for the eruption of maxillary incisors is the most common cause of dental anterior crossbite (Pinkham et al., 2005). In a young child, Hawley’s appliance with finger springs would

be enough (Profit and Field, 2000) which is helpful in maintenance of good oral hygiene, reduce chair-side time but needs patients’ cooperation (Bhalajhi et al., 2009). Tongue blade therapy is indicated in case of erupting crossbite. However, the success of therapy depends on patients’ cooperation and it has one disadvantage. Amount and direction of force applied cannot be controlled (Lee, 1978). The catalan’s appliance is a fixed appliance which uses resin slopes for anterior crossbite correction (Christabel, 2015). Advantages of this appliance include rapid and easy alternative method and disadvantage include difficulty in speech and mastication (Ulusoy and Bodrumlu, 2013). Duration of treatment

for removable appliances varies from 6 to 12 weeks. With a slower expansion rate, treatment can take up to 6 to 12 months (Kotadiya, 2019). In the present study, Gingival status of case group (anterior cross-bite patients) was poor when compared with the control group (without anterior crossbite). Puguca in 2007 (Pugaca *et al.*, 2007) found that there is an association between gingival recession and cross-bite in the lower jaw. Stauffer k et al. (Stauffer and Landmesser, 2004) conducted a study in 2004 about the effects of crowding in the lower anterior segment and found a correlation between crowding and gingival recession. This is in accordance with our study.

Parents and children should work together to maintain good oral hygiene. Good attitude of parents reflects as good oral health in children and vice versa (Gurunathan and Shanmugaavel, 2016). Preservation of primary teeth in the dental arch is important to guide the eruption of the permanent teeth in the optimal position (Jeevanandan and Govindaraju, 2018; Govindaraju *et al.*, 2017a). Grossly decayed primary teeth which are extracted before exfoliation causes space in the dental arch which causes malocclusion if space maintainer was not given (Lakshmanan, 2020; Panchal *et al.*, 2019). Bacteria play a vital role in the initiation and progression of pulpal and periodontal disease (Jeevanandan, 2017). Untreated dental caries eventually leads to pulpitis and periapical periodontitis which is treated by means of root canal procedure (Govindaraju *et al.*, 2017b,c). Fluoridated toothpaste should be used which removes dental plaque effectively, thereby decreasing the incidence of oral disease (Ramakrishnan and Shukri, 2018; Somasundaram, 2015). Chewable toothbrush can be used instead of the manual toothbrush for effective removal of dental plaque (Govindaraju and Gurunathan, 2017; Ravikumar *et al.*, 2017). Thus, intensive oral hygiene measures have to be taken along with orthodontic treatment for anterior cross-bite patients (Subramanyam, 2018; Packiri, 2017).

Advantages of this study were that this was a case-control study with age and gender-matched controls to provide best results with high internal validity, reasonable data, Disadvantage of the study was that this was a unicentric study with geographic limitations, limited sample size and had lower external validity. The dietary factors, feeding and oral hygiene factors were not taken into consideration while interpreting the results. Future scope for this study includes a larger sample size which is not confined to a particular geographic area and to assess the dental caries index by clinically examining the anterior crossbite patients.

CONCLUSION

Within the limitations of the present study, the gingival status of patients without anterior cross-bite based on plaque index scores was better than patients with an anterior crossbite, but the gingival status of patients without anterior crossbite based on OHI-S index scores was similar to patients with an anterior crossbite.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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