Dental Caries in Children with and without Anterior Crossbite : A Case - Control Study

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Abstract

Dental caries and malocclusion are one the most common dental health problems affecting individuals worldwide.There are conflicting opinions about the contribution of malocclusions to the development of dental caries and periodontal disease. The aim of the study was to determine the dental caries experience in children with and without anterior crossbite. Case sheets were reviewed from the dental treatment records for dental caries in children with anterior crossbite over 9 months. Inclusion criteria for case sample required children to be above the age of 10 and below the age of 18 and with presence of anterior crossbite. Final sample size taken for the study was 12 children. Data was analysed using SPSS software and Mann-Whitney was done. The results showed that the mean DMFT score for children with anterior crossbite is 0.75 and for the control group is 2.67. Within the limitations of the present study, children with anterior crossbite (case) showed lower incidence of dental caries than the control group.

Keywords : *Dental caries, anterior crossbite, incidence, dental health*

Introduction

Malocclusion is a problem affecting the tooth where the teeth are misaligned as compared to a standard normal. Some of the common non-complex malocclusion is crowding, overbite, underbite, open bite and crossbite. These are deviations from the ideal occlusion as proposed in many literature. Malocclusion is usually an inherited condition but on occasions, can also be due to oral habits like thumb sucking and mouth breathing which causes imbalance in the forces acting on the teeth leading to this condition. In a study conducted in Rajasthan, India reported a prevalence rate of 36.42 percent for malocclusion and another study conducted in South India reported that the prevalence rate for malocclusion is 19.9 percent and 15 percent in Karnataka and Tamil Nadu, respectively.[1,2] In this present study, crossbite in particular is the malocclusion of concern. Anterior crossbite is the term used to define a malocclusion due to palatal positioning of the upper (maxillary) anterior teeth in relation to the lower (mandibular) anterior teeth. Anterior crossbite can be categorized into skeletal and dental, where in dental, the etiological factors result from a lingual path of eruption for maxillary incisors, trauma to the anterior teeth, supernumerary like mesiodens, crowding and few others.[3]

In a South Indian population study consisting of 1554 subject samples, 7.3 percent of the subjects had anterior crossbite.[4] Several complications may arise due to this condition, and dental caries is of the utmost concern. Dental caries is the destruction of dental hard tissue made up of inorganic material caused by the acid by-products released from the bacterial breakdown of carbohydrates mainly, which is the food particles that are lodged on the surfaces of the teeth.[5] Dental caries

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if left untreated, would progress down the layers of the teeth, causing more severe dental problems like pulpitis and abscess.[6,7] Dental caries is the most common dental health problem, followed by periodontal disease and malocclusion. The prevalence rate of dental caries varies from 49 percent to 83 percent across different countries.[8] In a recent study by Anand et al.[9], he reported that the incidence rate of dental caries experience among primary school children across India to be 78.9 percent. Previous studies on dental caries documented that the incidence rate was reported higher in individuals with malocclusion compared to individuals without any form of malocclusion.[10] According to Ralph et al.[11], anterior and posterior crossbite patients had higher DMFT score compared to patients without malocclusion. This study is aimed at determining the prevalence rate of dental caries in children with and without anterior crossbite and to investigate if they could be correlated. This knowledge will enable health professionals to educate the common people about the seriousness of malocclusion and the need to seek treatment for it, besides encouraging dental practitioners to consider dental caries in the treatment planning stage which eliminates the need for invasive methods.[12]

Materials and Methods

This retrospective study was conducted under a university setting. Ethical approval for this study was granted by the institute's ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). Consent to use treatment records for research purposes were obtained from parents/guardians at the time of patient entry into the university for dental needs. The retrospective data were collected by obtaining and analysing the 89000 dental case records of the university from June 2019 to March 2020. The inclusion criteria for the current study were children between the age of 11-17 years, presence of anterior crossbite involving any anterior teeth, complete photographic and written records regarding the crossbite and DMFT/dmft scores. Age and gender matched controls i.e. children without anterior crossbite, were taken according to the relevant cases obtained from the inclusion criteria. The exclusion criteria were patients above 18 years of age and below 11 year of age, incomplete and censored dental records and absence of photographic evidence of anterior crossbite. The selected case and control group were examined by three people; one reviewer, one guide and one researcher. The patients' case sheets were reviewed thoroughly. Digital entry of clinical examinations and intra oral photographs of selected subjects were assessed and this included the assessment of every patients' dental caries experience by calculating their individual DMFT index score. A pretested format was used to record the caries score based on the DMFT Index. The examiner was trained to add data on the DMFT score to calculate caries experience for both case and control group by tabulation using excel software. Data analysis was done using SPSS PC Version 23.0 (IBM;2016) software for statistics. The dental caries score for case and control group was compared by Mann-Whitney U-Test.

Results and Discussion

The study population consisted of 24 children, with 12 children in the case group (children with anterior crossbite) and 12 children in the control group (without anterior crossbite)(Figure 1). All the children were aged 11-17 years old with mean age of 13 years old for both case and control sample. In the case and the control group, 6 children (50%) were males and 6 children (50%) were females respectively. (Figure 2) In the case group, 6 out of 12 children had a DMFT score of 0. But in the control group 2 out of 12 children had a DMFT score of 0. The mean DMFT score for children with anterior crossbite was higher (0.75) than children without anterior crossbite (2.67), but this difference was not statistically significant (Figure 3). (Mann-Whitney U-Test; $p \geq 0.05$).

It is important to identify these dental caries in children as they do not only impact aesthetics, but also function if left untreated, leading to debilitating conditions and instill psychological trauma in a child.[13,14] This is in particular to children with malocclusion such as anterior crossbite because of higher retention of food substance in areas of malocclusion as given in a study.[10] There were no significant differences in gender between both groups, as there was no gender predilection of significant value as reported in a study by Srikanth et al.[15]. The present study data as analysed does not support the theory that dental caries experience is higher in anterior crossbite patients than compared to control group. The sum of mean rank for case group was 416 and 522 for control group.

Higher DMFT mean score was recorded in the control group compared to case group, contradictory to the findings in the study that reported anterior crossbite patients had a higher mean DMFT score than the control group. The reason as to why the incidence is higher has yet to be investigated and information on it is scarce, thus more studies are required to find the etiological factor as well as the predilection. A plausible explanation could be the orientation of teeth to one another that makes it an area prone to food entrapment.[16] Dental caries could lead to space loss which is also a precursor for malocclusion development.[17–19] As other literature supports evidence of higher DMFT score in malocclusion patients, this study shows that DMFT score is lower for case group than compared to control group. The reason as to why the results of this study contradicts other studies could not be identified. In fact, it maybe is not a single definitive factor, but rather a collection of confounding factors that has not been taken into considerations in this study that has cumulatively contributed to the outcome of this study.

The limitations of the study were that this was a unicentric study with geographic limitations, limited sample size and has lower external validity. The oral hygiene habits were not considered, as dental caries incidence is reduced in patients with good oral hygiene than compared to one with poor oral hygiene practice. Patients with good oral hygiene negates the conducive environment required for the growth of microorganism that is responsible for demineralization of tooth hard tissue. Besides that, the patients' diet history was also not taken into account as an individual's dietary practices has been proved to affect the individuals dental caries experience. On top of that, history of past dental visits of both groups were also not assessed in particular as they may have revealed factors such as prior treatments that may have led for the development of caries such as orthodontic appliances which makes it harder for the patient to maintain their oral hygiene as it is less accessible to clean areas between the appliances and the teeth.

Socioeconomic factors which play an important role in the development of dental caries were also not assessed. Low socioeconomic status, low monthly household income and low educational level are generally analogous with less opportunity to dental services and proper oral health care products, poorer awareness on oral health and oral hygiene which led to a greater incidence and severity of dental caries.[20–25]

The advantages of the present study were that this was a case-control study with age and gender matched controls to provide better results and high internal validity. The future scope of this study would be to increase the sample size by making it multicentric which could yield better results and higher correlation with varied interpretations.

ZC34.

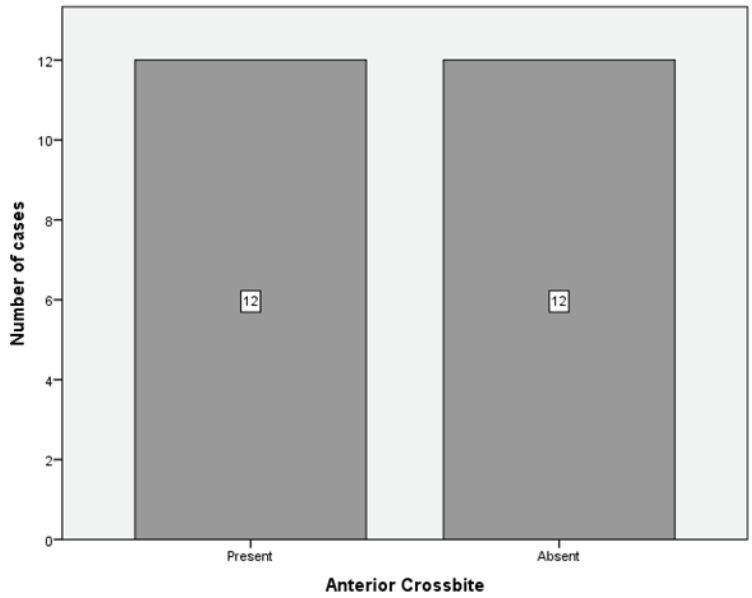

Figure 1- Bar graph showing number of cases in case (with anterior crossbite) and control (without anterior crossbite) group in the total sample population. The X-Axis represents incidence of anterior crossbite and the Y-Axis represents the number of cases. Notice the equal number of children in the case and control group.

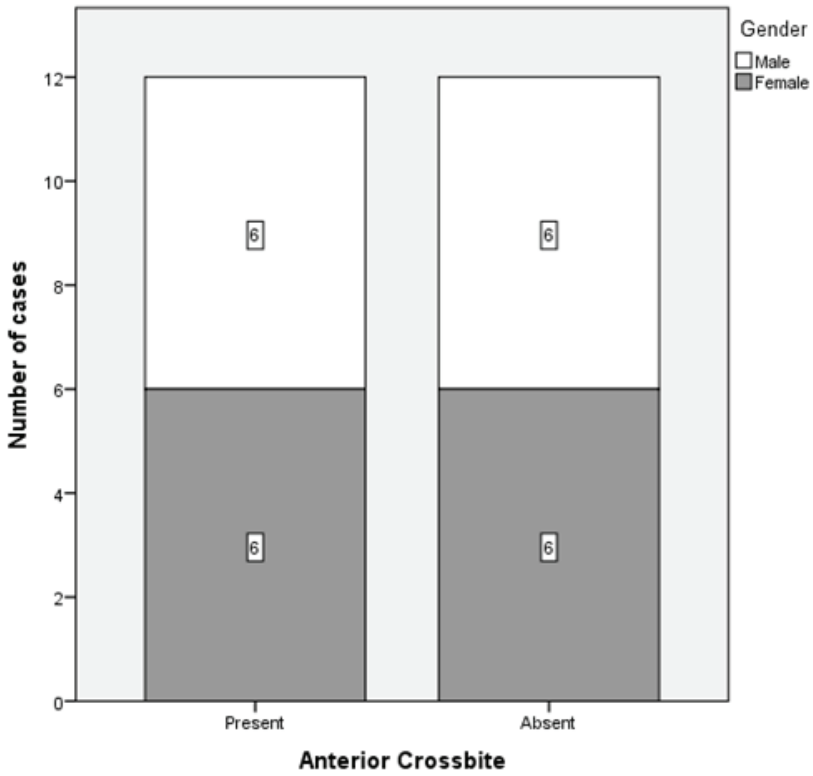

Figure 2 - Bar graph showing the gender distribution in case group (with anterior crossbite) and control sample (without anterior crossbite). The X- axis represents the presence and absence of anterior crossbite and the Y-Axis represents the number of cases, white represents children who were males and grey represents children who were females. Note the equal distribution of gender.

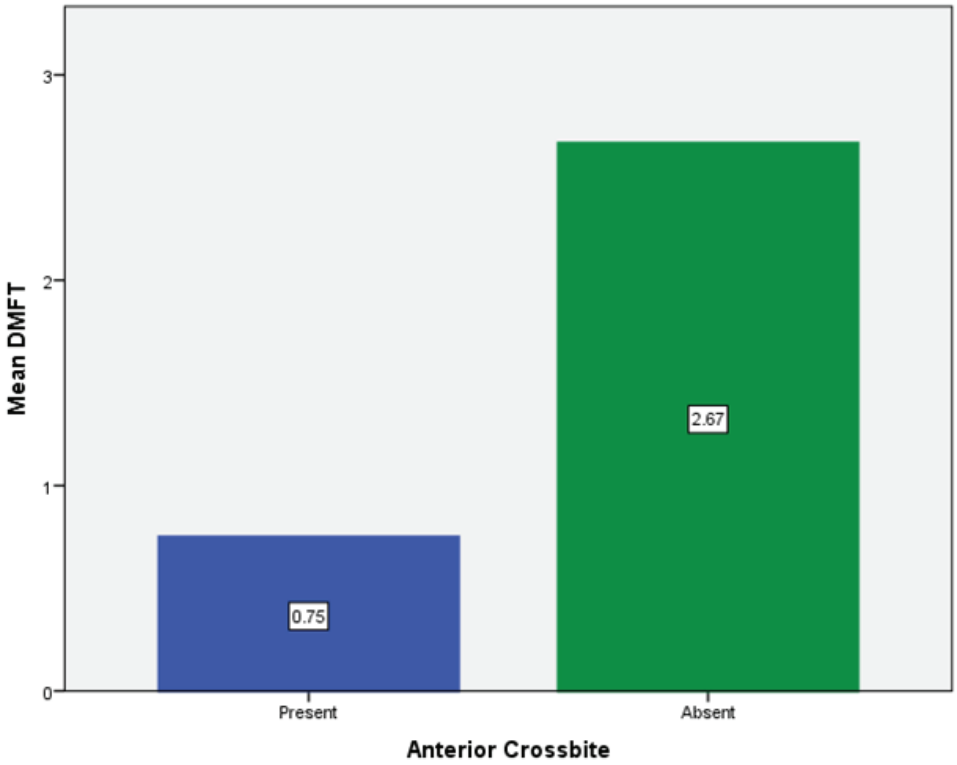

Figure 3 - Bar graph shows the mean DMFT score for both case (with anterior crossbite) and control (without anterior crossbite). The X-Axis represents the presence and absence of anterior crossbite and the Y-Axis represents the mean dmft score and blue represents children with anterior crossbite and green represents children without anterior crossbite. Children with anterior crossbite had lower mean DMFT/deft score (0.75) when compared to children without anterior crossbite (2.67) However this difference was not statistically significant (Mann-Whitney U-Test; p-value = 0.189 - statistically not significant)

Conclusion

Within the limitations of the present study, the mean DMFT score of children with anterior crossbite was higher than children without anterior crossbite. Higher number of children with anterior crossbite had no dental caries when compared to children without anterior crossbite.

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Conflict of Interest: The authors declare that there are no conflicts of interest.

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Ethical Clearance: It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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