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## Malocclusion in Children with and without Cleft Palate -A case -Control Study

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### ABSTRACT

There is a principle agreement that malocclusion is a major health concern as it is the third most common oral disease, next only to dental caries and periodontal disease. As it is a major challenge for even normally abled children to handle these problems, questions arise as to the difference in the extent or severity of manifestation of malocclusion in the oral cavity of patients with cleft palate. The study aims to determine the prevalence of malocclusion in children with and without cleft palate. A sample size of 18 case sheets was reviewed for malocclusion in children with cleft only. The data was obtained from record management software of a private dental institute. Data was analysed using SPSS software, and Mann-Whitney was done. The results were recorded. Children with cleft palate showed higher incidence of malocclusion when compared to children without cleft palate. Within the limitations of the present study, children with cleft palate (case) showed a higher incidence of malocclusion than the control group.

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### INTRODUCTION

Malocclusion is a problem affecting the teeth where there is misalignment of those teeth in relative to a standard alignment (Mtaya *et al.*, 2009). Some of the most common dental malocclusion includes crowding, overbite, underbite, open bite, crossbite, malocclusion of the anteroposterior plane, which are Class

II and III, and skeletal malocclusion. These are the most commonly occurring deviations of the teeth from the ideal occlusion. Malocclusion is usually an inherited condition but sometimes may manifest as consequences to oral habits such as thumb sucking or mouth breathing that leads to imbalance of force acting on the teeth causing malocclusion. It can be even due to trauma in a few isolated cases. Malocclusion has been identified as the third most common dental health problem, following dental caries and periodontal disease with a global prevalence that varies from 20 to 88 percent. A study conducted in Rajasthan, India reported a prevalence rate of 36.42 percent and another in the state of Tamil Nadu, India showed a prevalence rate of 15 percent (Dhar *et al.*, 2007; Shivakumar *et al.*, 2010). Malocclusion is a serious health problem as the teeth are unable to perform vital functions due to the misalignment and has been proven to be a predisposing factor for several major dental problems. In this present study, alteration to the shape of the jaw that is also a rea-

son for malocclusion was focused on, in particular cleft palate.

Orofacial clefts or cleft lip and/or palate are opening or splits in the upper lip, roof of the mouth (palate) or both. Cleft lip and/or palate are oral and facial malformations that occur very early in pregnancy, during the development phase inside the uterus. A cleft palate can involve the bony front (hard palate) and/or the soft back (soft palate). They are categorized into unilateral or bilateral and occur when tissues of the face and mouth fail to fuse. The cause is believed to be an interaction of genetic and environmental factors, though in many cases, a definite cause is yet to be established (Govindaraju *et al.*, 2017b). Cleft lip and/or palate is a major public health problem affecting 1 in every 500 to 1000 births worldwide according to a World Health Organization study conducted back in 2001 (Mossey, 2003). The number of children born every year with cleft lip and/or palate is 28 000 approximately in India alone, amounting up to a significant number of 78 births per day of babies with some form of the cleft (Mossey and Little, 2009). Children with cleft, amongst social and psychological problems, also face physical difficulties in the form of function, feeding, dental problems, speech, and aesthetics (Somasundaram *et al.*, 2015). Among these complications, dental problems, in particular malocclusion, is a major drawback (Jeevanandan and Govindaraju, 2018). Previous studies, regarding malocclusion in patients with cleft lip and/or palate reported that they were more prevalent and severe in cleft lip and/or palate patients when compared to non-cleft lip and/or palate patients. (Vettore and Campos, 2011) In a study by (Gupta *et al.*, 2016), he reported that prevalence of Class II and III, a malocclusion along the horizontal plane, was more prevalent in cleft lip and/or palate patients when compared to non-cleft lip and/or palate patients. This study was aimed to determine the prevalence of malocclusion in children with cleft palate only and to establish if there is a positive association between the patients with cleft palate and the occurrence of malocclusion. This knowledge can be used to educate the parents of cleft patients so that they can be better prepared to provide proper care for their children and also to prompt dentists to consider malocclusion as a plausible complication in the future, thus being able to procure a more efficient treatment plan (Govindaraju *et al.*, 2017c; Ravikumar *et al.*, 2017).

## MATERIALS AND METHODS

### Sampling

The sampling population was made up of paediatric patients aged 4-17 years old with the presence of cleft palate that reported to a private dental institute in Chennai, India. The study was conducted from June 2019 to March 2020. Total of 36 patients were identified and 17 were excluded as the inclusion criteria required that the patients needed to be of age four and above, making the number of case samples as 18 patients. Control group, with age and gender, matched as to the subject group sample, but without cleft lip and/or palate, reporting to the same institute were chosen. Ethical approval for this study was granted by the institute's ethical committee (ethical approval number: SDC/ SIHEC/ 2020/ DIASDATA/ 0619-0320). Cross-checking of data including digital entry and intra oral photographs was done by an additional reviewer, and as a measure to minimise sampling bias, samples for the group were picked by simple random sampling.

### Data Collection

The selected case and control group were examined by three people; one reviewer, one guide and one researcher. A digital entry of clinical examinations, specifically orthodontic examination, and intraoral photographs of selected subjects were assessed, and this included the assessment of both upper and lower jaw for the incidence of malocclusion which includes all the variations mentioned beforehand in the literature. The examiner was trained to add data for malocclusion as absent or present and if present, the type of malocclusion, for both case and control group by tabulation using excel software. Censored data was excluded from the study.

### Statistical Analysis

Data analysis was done using SPSS PC Version 23.0 (IBM;2016) software for statistics. The incidence of malocclusion in the case and control group was compared by Mann-Whitney U Test. Both independent and dependent variables were recorded. A pretested format was used to record the malocclusions. The final sample pertaining to the exclusion patients were 18 patients. Control patients were randomly selected, matched to age and gender.

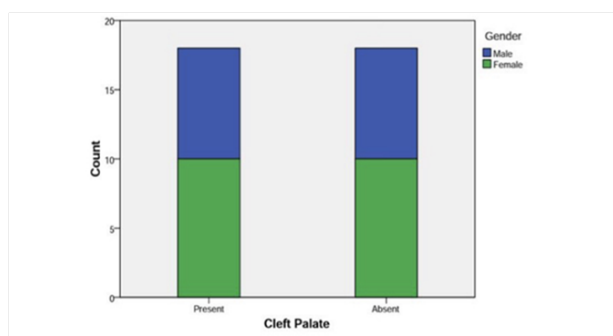
## RESULTS AND DISCUSSION

The study population consisted of 36 patients totally, divided into case and control group. All the patients were aged between 4-17 years old, with a mean age of 8 years old for both the groups. In the case group, case sheet of all 18 patients were reviewed, in which 8 (44%) were male patients, and 10 (56%) were female patients. In the control group, there were also 8 (44%) male patients

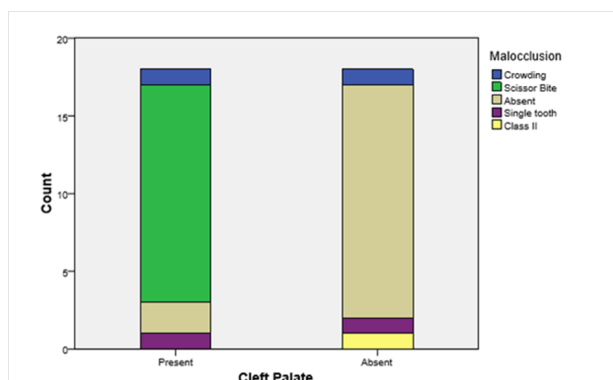
and 10 (56%) female patients. An equal number of male and female children were present in the case and control group [Figure 1]. A total of 16 (89%) patients in the case group had malocclusion. X-axis represents presence or absence of cleft palate; Y-axis represents the number of cases, blue color represents males and green color represents females. Notice the equal distribution in both groups.

In this, 6(38%) patients were male, and 10(62%) were female patients. Among children without cleft palate, 3(17%) patients had malocclusion, in which 1(33%) were male patients, and 2(67%) were female patients. In the case group, 1(6.25%) patient had crowding, 14(87.5%) had scissors bite and 1(6.25%) had individual tooth variation like. In the control group, 1(33.3%) patient had crowding, 1(33.3%) patient had a class II malocclusion, and 1(33.3%) patient had individual tooth variation [Figure 2].

On comparing the presence or absence of malocclusion against children with and without cleft palate, the difference was not statistically significant. (Mann-Whitney U-Test; p-value = 0.18).



**Figure 1: Bar graph representing gender distribution in the case group (children with cleft palate) and control group (children without cleft palate)**



**Figure 2: Bar graph representing the comparison of types of malocclusion with the presence or absence of cleftpalate**

Figure 2 shows the X-axis represents the presence or absence of cleft palate; Y-axis represents the number of cases; blue color represents crowding, green color represents scissor bite, beige color represents absence of malocclusion, violet color represents single tooth malalignments like rotations, yellow represents a class II overjet. Higher incidence of malocclusion was noticed in the case group (children with cleft palate) when compared to control group (children without cleft palate). However, it was not statistically significant. (Mann-Whitney U-test; p=0.18 - not significant).

The importance of identifying these malocclusion in children cannot be emphasized enough as they do not only have aesthetic concerns but also function and oral health (Panchal et al., 2019). This is an added disadvantage for cleft palate patients due to their variation in jaw shape and size, as reported in a study (Akcem et al., 2008). There were no significant differences in gender between groups, though more females were recruited in both the sample groups; 56 percent, as opposed to findings that documented more male predilection for cleft lip and/or palate. (Maciel et al., 2005). This might be due to the small sample size of this study (Ramakrishnan and Shukri, 2018). The present study data supports that children with cleft palate have a higher incidence of malocclusion compared to the non-cleft palate group. The mean rank for malocclusion in the case group was 12.17 and 24.83 in the control group with a Mann-Whitney test value of 48.00. A supportive study by (Vettore and Campos, 2011). In 2011 on 117 subject samples reported that individuals with cleft lip and/or palate had higher incidence and more severe form of malocclusion as compared to non-cleft lip and/or palate. As theorised in a study prior, alteration in the dimensions of the jaw may be a possible explanation as to why malocclusion is more prevalent in cleft lip and/or palate group. Sometimes, due to the poor oral health condition of cleft patients, the children develop dental caries which leads to loss of tooth structure followed by drifting of teeth, eventually ending in malocclusion (Govindaraju et al., 2017a; Jeevanandan, 2017).

The unusual tongue placement/movement which also leads to altered pattern of swallowing or poor swallow reflex has also been theorized as a major factor for malocclusion as the tongue plays an important role in guiding the teeth into occlusion (Chopra et al., 2014). Malocclusion like crowding and spacing due to alteration in the dimensions of the jaw, making them relatively larger or smaller as compared to the teeth size, as we know, also supports this fact (Christabel, 2015). The study done by (Baek, 2002) also revealed an affinity between

the varying types of orofacial clefts and malocclusion. Hopefully, more studies are employed in the future to determine or correlate the types of malocclusion in a variation of cleft lip and/or palate groups. As mentioned by (Zhou *et al.*, 2016), genetic disturbances in the embryonic period, along with genetic interactive pathways could be another explanation as to why malocclusion is more prevalent in cleft lip and/or palate group, as it is already theorised for being a factor that causes cleft lip and/or palate, thus making it a possibility. Malocclusion, besides being a major concern by itself, is also a catalytic factor for the development of dental caries due to presence of areas prone for accommodating dental plaque (Ranta, 1986; Subramanyam *et al.*, 2018). This study will help to provide knowledge for better educating the people, especially the parents of children with cleft, on malocclusion and the need for seeking treatment (Gurunathan and Shanmugaavel, 2016; Govindaraju, 2017). Studies like this could aid dentists who are predominantly handling cleft lip and/or individuals, to predict malocclusion that may occur along the course of treatment so that they may be able to prepare themselves or incorporate minor prophylaxis treatment also in the treatment plan for these patients which could prove to be cost and time efficient (Packiri *et al.*, 2017; Lakshmanan *et al.*, 1822).

The advantages of the study were that this was a case-control study with age and gender matched controls to provide better results and high internal validity. The limitations of the study were that this was a unicentric study with geographic limitations, limited sample size and has lower external 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.

## CONCLUSION

Within the limitations of the present study, the incidence of malocclusion was found to be higher in children with cleft palate when compared to children without cleft palate. Anterior crossbite was the most commonly noticed malocclusion among children with cleft palate.

## Conflict of interest

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

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