

# Assessment of anterior open bite prevalence in children visiting a dental hospital - A retrospective evaluation

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## ABSTRACT

Anterior open bite (AOB) is the insufficient vertical overlapping between the maxillary and mandibular anteriors when the teeth are in centric occlusion. The purpose of this study was to determine the prevalence of AOB in children and adolescents who visited a private dental hospital. In this study, subjects aged between 16 and 18 years with AOB were included. Data about orthodontic examination of patients were taken from preentered dental records of the hospital. Data of patients with AOB regarding age, gender, and intraoral and extraoral features were collected from the case records of the subjects, and statistical analysis was performed (Chi-square test and nonparametric correlations). The prevalence percentage of open bite in the anteriors was 2.7%, with more prevalence in Class 1 subjects (81.5%). Subjects with AOB had competent lips (81.8%), straight nasolabial angle (86.8%), and shallow palatal vault (49.5%). AOB had no significant relationship with the type of malocclusion, palatal vault, and lip competency, according to the Chi-square test. AOB and the nasolabial angle had a significant association. Both acute and right-angled nasolabial angles were commonly seen in adolescent patients with AOB. In children and adolescents visiting a private dental hospital in Chennai, the prevalence of AOB was found to be 2.7%. A significant association was observed between AOB and nasolabial angle.

**Key words:** Anterior open bite, habits, innovative, malocclusion, vertical overlap

## INTRODUCTION

Anterior open bite (AOB) is a “skeletal or dentoalveolar” malrelationship in the vertical plane as defined by Moyers (1958). It is characterized by an absence of

contact between the opposing incisors. This is a difficult ailment to cure, and it necessitates long-term follow-up after treatment. Many relapses occur following surgical orthognathic therapy or any treatment for AOB, most likely as a result of insufficient etiologic factor diagnosis or therapeutic failure.<sup>[1]</sup> Heredity and environmental factors are the major determinants in malocclusion. These multiple reasons make it impossible to differentiate which factors are primary or secondary. As Proffit has pointed out, 5% of cases have a specific known cause.<sup>[2]</sup> Dental open bites are seen mainly due to the reduced dentoalveolar vertical heights.<sup>[3,4]</sup>

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The prevalence of open bites in anterior teeth ranges from 1.5% to 11% and varies by age and dentition and also between different ethnicities.<sup>[5-7]</sup> The overall frequency of AOB ranged from 1.6% to 47.1% in prior investigations. Females were known to possess higher incidence of AOB when compared to males. AOB was more commonly observed among children than adults (1.5%–24.5%).<sup>[8]</sup> Skeletal AOBs are characterized by an increase in lower face height.<sup>[9,10]</sup> Incompetency of lips at rest is observed and a visible muscle stain is observed on consciously holding the lips together.<sup>[11,12]</sup> Marked antegonial notch and steep Frankfort mandibular plane angle are observed. Due to increased lower anterior facial height, the face appears more longer and narrow from the frontal aspect. A gummy smile will result from a shorter upper lip, which will display a high lip line and minor imbrications in the anterior region.<sup>[13]</sup> Maxillary and mandibular arches contact in the region of second permanent molars in severe open bite conditions resulting in excessive vertical opening in the anterior segment.<sup>[14]</sup> In open bite conditions, the tongue is positioned in a more forward position that seems like a larger tongue, but true macroglossia is rare. Tongue thrusting habit is evident among those with open bite due to lateral and forward movement of the tongue which is open and forms a seal with the lips.<sup>[15]</sup> Since AOB leads to mouth breathing habits, the gingival condition is hypertrophic.<sup>[16]</sup> In general, these treatment modalities are employed by orthodontists and surgeons for the correction of open bites of anterior teeth: (i) advice on early problems and observation, (ii) interceptive orthodontic treatment, (iii) camouflage, and (iv) a combination of orthodontic treatment and surgery. A significant clinical challenge that orthodontists often encounter when treating AOB includes restoring facial esthetics and function. Various nonsurgical treatment modalities are also employed by orthodontists as well for correction of open bites.<sup>[4,6]</sup>

The extensive knowledge and experience in research of our team have translated into high-quality publications.<sup>[17-36]</sup> This study is important as we can learn the prevalence of open bites of anterior teeth, and this may aid in early diagnosis and treatment planning. This research was done to find the frequency of open bite in anterior region among children of age 6–18 years and to know the correlation of AOB with various intraoral and extraoral features.

## MATERIALS AND METHODS

The Institutional Ethical Board had given prior ethical approval for this retrospective study which was done under university hospital setup (IHEC/SDC/ORTHO/21/236). The data of patients who visited Saveetha Dental Hospital from June 2019 to April 2021 were taken from the outpatient treatment records. After describing the purpose of the study to the participants, oral consent was acquired. Case records of subjects between the age group of 6 and 18 years and

both genders with open bite of anterior teeth were included in this study. The total sample of case records obtained in that period was 303.

The obtained data were evaluated using SPSS (version 20.0; SPSS, Chicago, Ill). An external reviewer evaluated and confirmed all the case sheets used in the study in order to prevent recording errors. In addition, data were cross-verified using photographs<sup>[29]</sup> and direct interaction with dentists. The data needed for the study were gathered and tallied in the Excel sheet. Age and gender were among the variables that were included and correlated. Frequency of all the parameters considered was drafted. Parametric and nonparametric correlations were done. In order to determine the relationship between AOB and age and gender, descriptive statistics for frequency distribution and the Chi-square test were used. It was determined that  $P = 0.05$  indicates significant significance.

## RESULTS AND DISCUSSION

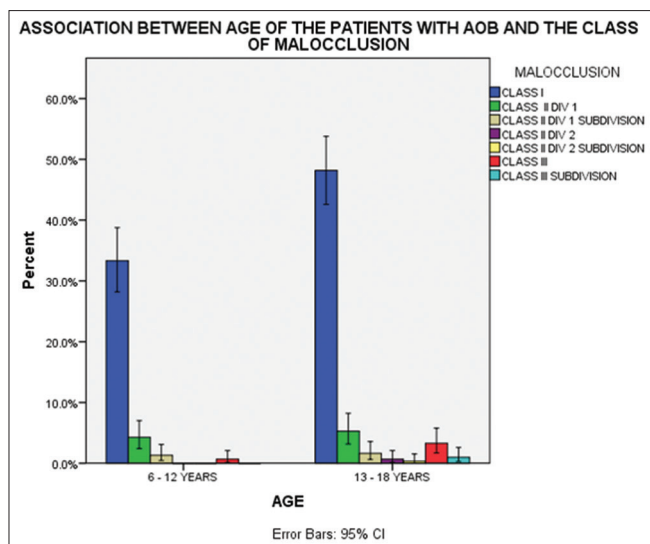
Among 11,555 subjects who had come to the dental hospital during June 2019 to April 2021, 303 subjects in the age range of 6–18 years were diagnosed with AOB. This contributes to about 2.7% incidence of AOB in children aged between 6 and 18 years. In the current study, 39.6% of patients with AOB were in the age between 6 and 12 years and 60.4% of patients were between the age range of 13 and 18 years [Table 1]. Of the total patients evaluated, AOB was commonly prevalent among females in the age of 6–12 years (32%) and males in the age range of 13–18 years (28.3%) [Table 1].

The frequency of subjects with AOB and the related malocclusion is shown in Figure 1. Patients aged 6–18 years were most likely to have a Class 1 dental malocclusion. Figure 2 depicts the relationship between the palatal vault and the age of individuals with AOB. Shallow palatal vault was commonly seen in patients with AOB. The correlation between the age of patients with AOBs and the head type is shown in Figure 3. Chi-square test revealed no significant association. Figure 4 gives the correlation graph between the age of patients with AOB and nasolabial angle. Nasolabial angle of 90° was commonly seen in 13–18-year-old patients with AOB. Figure 5 gives the bar graph of association of age of patients with AOB and lip competence. Chi-square test revealed no significant association.

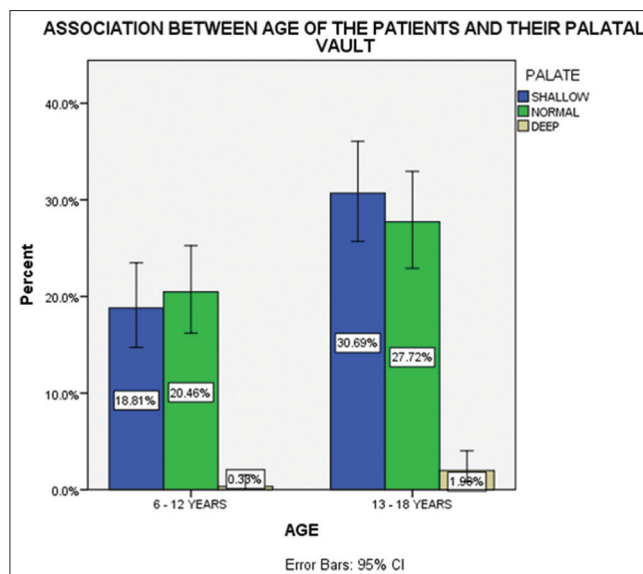
**Table 1: Demographic details of patients with anterior open bite**

Age	Gender		Total
	Female	Male	
6-12 years	64	56	120
13-18 years	97	86	183
Total	161	142	303

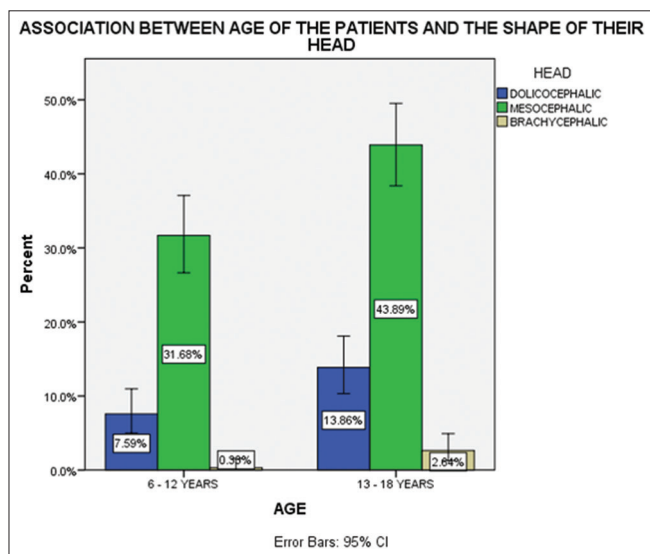
AOB was shown to be very common among females than males.



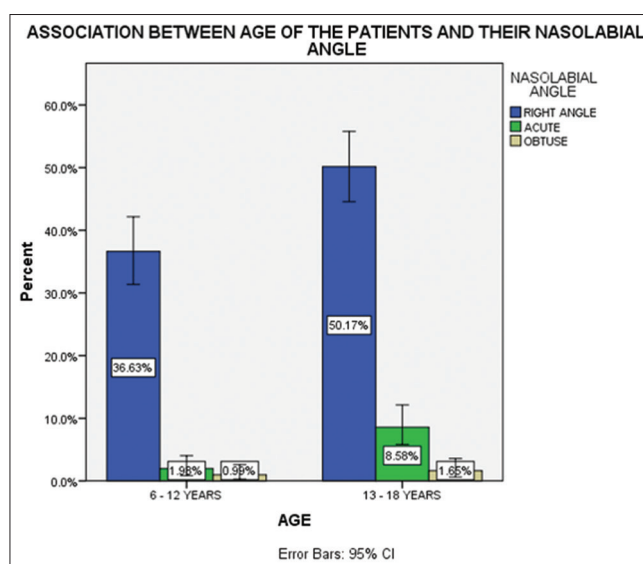
**Figure 1:** Age group of subjects with AOB and their dental malocclusion are shown in a bar graph. Patients with an open bite between the ages of 6 and 18 years were more likely to have a Class 1 molar connection. A Chi-square test indicated no statistically significant relationship (Pearson Chi-square value: 7.1;  $P = 0.3$ )



**Figure 2:** Bar chart depicting the relationship of AOB and their palatal vault. Shallow palatal vault was commonly seen in patients with AOB. The Chi-square test indicated no statistically significant relationship (Pearson Chi-square value: 2.5;  $P = 0.2$ )



**Figure 3:** The association between age groups, AOB, and head type is depicted as a bar graph. Patients with AOB frequently have a mesoprosopic head type. The Chi-square test indicated no statistically significant relationship (Pearson Chi-square value: 4.05;  $P = 0.1$ )

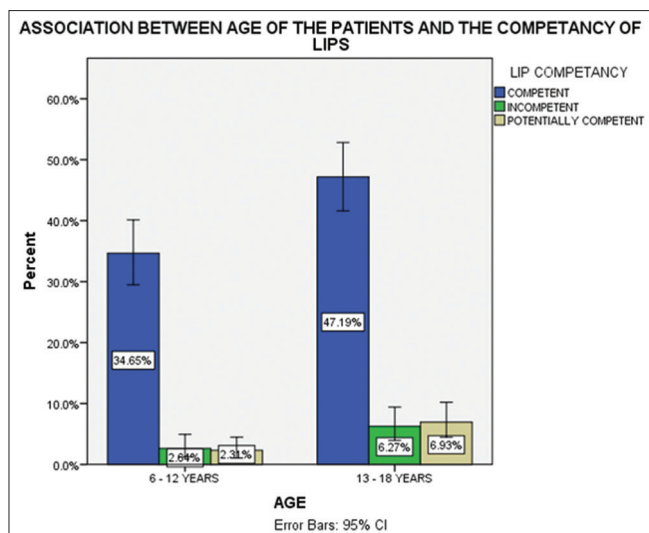


**Figure 4:** The relationship between the age of AOB patients and their nasolabial angle is depicted as a bar graph. Chi-square tests revealed a significant association (Pearson Chi-square value: 6.5;  $P = 0.03$ )

AOB was found to be present in 2.7% of the participants in this study. This finding is in line with a recent research of the Nigerian population, which indicated that between 2.1% and 4.1% of school pupils aged 11–16 years suffer from AOB. Prevalence of AOB showed racial differences, and the values ranged from 4% to 8% in Americans, 7%–16% in African Americans, 10%–16.5% in East Africans, and 2%–4% in Britishers.<sup>[37]</sup> Habits such as thumb sucking, tongue thrusting, and lip sucking can be major causes of AOB. Long-term thumb sucking causes AOB and disrupts dentofacial development in all three planes (vertical,

anteroposterior, and transverse), with the anterior teeth being the most affected.<sup>[38-41]</sup>

When the prevalence of AOB among age groups was compared, we noticed that subjects aged 13–18 years (60.4%) had the highest prevalence when compared to individuals aged 6–12 (39.6%). Among the cases reported, AOB was more prevalent among females aged 6–12 years (32%). Among males, AOB was common in the age category of 13–18 years (28.3%). Furthermore, 33.3% of children were aged between 6 and 12 years and 48.1% of patients in the



**Figure 5:** Bar graph depicting the relationship between the age of AOB patients and their lip competency. Patients with an anterior open bite were more likely to have competent lips. The Chi-square test indicated no statistically significant relationship (Pearson Chi-square value: 4.3;  $P = 0.11$ )

age range of 13–18 years had Class 1 malocclusion. This is in agreement with Gudipaneni. findings, which found that 52.8% of AOB subjects had Angle's Class 1 malocclusion.<sup>[42]</sup>

Mesocephalic head was commonly observed in patients having AOB in both age groups (31.6% in 6–12 year olds and 43.8% among patients of age group 13–18 years). Right-angled nasolabial angles were commonly encountered in both the age groups (36.6% among patients of age 6–12 years and 50.1% among patients of age 13–18 years). Patients with AOBs in the age group of 13–18 years (47.1%) had competent lips when compared to patients of 6–12-year age group (34.6%). On evaluating the palatal vault in patients with AOB, shallow palatal value was commonly observed in both the age groups: 18.8% in 6–12-year-old patients and 30.6% in 13–18-year-old subjects.

The findings of our results conclude that a majority of the subjects with AOB had a Class 1 malocclusion. The findings of the present investigation are in line with studies by Al-Balkhi Zah-rani and Al-Emran *et al.*,<sup>[43]</sup> which concluded that Class I malocclusion was the most typical type of malocclusion seen in the Saudi population followed by Class II division I and Class III.<sup>[37,43-45]</sup> According to Abdullah MA, the dental malocclusion which is prevalent in the Saudi population is Angle's Class I, followed by asymmetrical molar relationship in patients with AOBs. A small sample size and the inclusion of only participants who reported to a private dental institution are few limitations of the study.

## CONCLUSION

The prevalence of AOB among children and adolescents was 2.7%. Class 1 malocclusion was commonly observed in

patients with AOB. Nasolabial angle of 90° was commonly seen in 13–18 years patients with AOB.

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## Conflicts of interest

There are no conflicts of interest.

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