



## Gender Variations of Patients with Anterior Crossbites

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### ABSTRACT

Anterior crossbites is defined as an abnormal reversed relationship of a tooth or teeth to the opposing teeth in the buccolingual or labiolingual direction. Early diagnosis and treatment are very essential to avoid complications later in the adult stage. Prevalence of 24%-36% have been reported in orthodontic patients. Varied treatment options are available to treat anterior crossbites. The appropriate method would be to treat depending on the etiology, age, compliance, and space availability. The aim of this study was to assess the gender variations of patients with anterior crossbite. Case records of 89,000 patients were reviewed and analysed accordingly. The sample size was 404 patients with anterior crossbite. Data was tabulated with parameters of name, age, gender, diagnosis, individual tooth relation. Data was imported to SPSS software for descriptive analysis and Chi square test. 58.9% of the population was found to be males and 41% were females. It was also found that 94.3% of the patients had anterior crossbite alone and 5.7% of the patients had coexistence of anterior and posterior crossbites. Chi-square test showed no significance between gender and diagnosis (*p* value-0.05). Males were found to have higher prevalence of anterior crossbite and combined anterior with posterior crossbite as well compared to females.

**Keywords:** Anterior crossbite, Posterior crossbite, Reverse relation, Labiolingual

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### INTRODUCTION

Anterior crossbite is defined as a malocclusion resulting due to the lingual positioning of maxillary anterior teeth in relationship with mandibular anterior teeth [1]. This is also termed as reverse articulation. According to a study, the prevalence of anterior crossbite is from 4.5% - 9.5% [2,3]. In another study it has been reported to be 24%-36% in orthodontic patients [4]. Etiology of anterior crossbite is due to various reasons. It can be due to lingual eruption of tooth due to insufficiency of space, retained deciduous dentition, potential crowding, class III skeletal pattern or even the presence of a supernumerary tooth. It is based on the nature of the crossbite as skeletal, dental or based on functional

entities [5]. In case of skeletal crossbite, the maxillary teeth are generally proclined or at a normal angulation but are positioned behind the mandibular incisors. This is due to a genetic or hereditary influence or a discrepancy in the size of the mandible and maxilla [6,7]. Discrepancy is seen either because of maxillary retrognathism, mandibular prognathism or a combination of both characterised by deficient height or anteroposterior relationship [8]. The discrepancies are also associated with diseases like obstructive sleep apnea which bring about change in craniofacial morphology [9,10]. A dental crossbite has few teeth affected due to retroclination or palatal repositioning. A functional crossbite is due to a premature contact which results in deflection of mandible to the anterior side which is developed as pseudo class III [11]. A dental anterior crossbite sometimes can be habitual due to biting of the upper lip or delayed exfoliation of primary incisors [12].

Proper clinical examination, diagnosis and treatment planning is very important before starting the treatment procedure. The clinical treatment is decided based on whether it's skeletal or a dental crossbite. The severity determines the need for skeletal or dental correction. It is only dental correction needed when the patient can attain a Class I molar with edge to edge incisor relationship while guiding the mandible to centric relation [13]. It is always considered to be more advantageous if the anterior crossbite is treated in the deciduous dentition stage itself. According to few authors, this will prevent dysplastic growth of skeletal and dentoalveolar components [14,15]. This also prevents periodontal problems like gingival recession, traumatic occlusion since there is always a risk of increased masticatory forces as the age advances and bite deepens. In addition to this, it is seen that anterior crossbite can cause abnormal wear of these teeth [16,17].

A varied range of treatment modalities are available to treat anterior crossbites depending on the age of the patient, patient compliance, affordability, etiology, space availability, eruption status [18]. Various options include removable appliances like a tongue blade, Z-spring, Catlan's appliance or fixed appliance therapy [12,19]. Fixed appliances are a good treatment option in which bonding adhesives like Orthofix prove to have a low bond failure rate [20]. Good bonding depends on factors like type of enamel conditioner, acid concentration, composition of the adhesive, bracket material etc [21]. The enamel conditioning influences the adhesive for adhesion by creating microporosity and increasing surface energy for more mechanical retention [22]. A reversed stainless-steel crown could help deliver heavy intermittent forces to correct the crossbite [23]. But these are unesthetic and generally not preferred. Rapid maxillary expansion and Frankel III appliance are used to treat skeletal anterior crossbites. Face mask and chin cup therapy can also be used for complex cases as extraoral devices [5,24]. Removable appliances have palatal coverage, tend to loosen easily and pose difficulty in speech. There is also limited tooth movement and it appears to be bulkier [25]. Fixed orthodontic appliances to treat anterior crossbite allows three-dimensional tooth movement especially in the mixed dentition stage. Best one being a 2 x

4 appliance which poses no retention problems as compared to removable appliances [26]. Therefore, to treat anterior crossbite, early intervention is vital ensuring that there is muscle harmony maintained and malocclusion treated.

The aim of this study is to find the gender variation of anterior crossbite patients and to assess the variation in these patients with the coexistence of posterior crossbites.

## MATERIALS AND METHOD

### Study setting

This was a retrospective study of patients who had an anterior crossbite. It revolved around a university setting study having patients visiting Saveetha Dental College and Hospitals. The approval for this study was given by the Institutional Ethical Committee (Ethical Approval Number - SDC/SIHEC/2020/DIASDATA/0619-0320). The sample size of this study was 404 patients with an anterior crossbite. Sampling bias was minimized by verifying the photographs. Inclusion criteria was all patients who had an anterior crossbite. Exclusion criteria for this study were all the patients who had any other malocclusion other than crossbite, those with isolated posterior crossbites and those case records with incomplete data.

### Data Collection and Tabulation

The case records of 89,000 patients who had visited the hospital between June 2019 and April 2020 were reviewed and analysed accordingly. The data was collected and tabulated. Tabulation included information/parameters-Name of the patient, Age, Gender, Diagnosis and the Individual tooth relationship. The diagnosis was patients with only anterior crossbite or who had anterior and posterior crossbite.

### Statistical analysis

After further verification of data by an external reviewer, it was imported to the SPSS software by IBM for statistical analysis. Percentages, mean, frequency of certain parameters were employed in the analysis. Chi-square test was used to detect the significance between gender and diagnosis. p value <0.05 was statistically significant.

## RESULTS

The data collected was then imported to SPSS

software and used for descriptive statistics. The total sample size of the patients with anterior crossbite was found to be 404. It was seen from (Table 1) that there was a higher prevalence in males (58.9%) as compared to females (41.1%). These patients were diagnosed as ones with only anterior crossbite and the ones which had both anterior and posterior crossbite. Table 2 shows a higher prevalence of anterior crossbite alone (94.3%) than patients with anterior and posterior crossbite (5.7%). Chi square tests were performed to find the association of gender and frequency of crossbite (Table 3 and Figure 1). It

**Table 1:** This table represents the frequency and percentage distribution of the gender variation in anterior crossbites. It shows that anterior crossbites are more commonly found in males (58.9%) than females (41.1%).

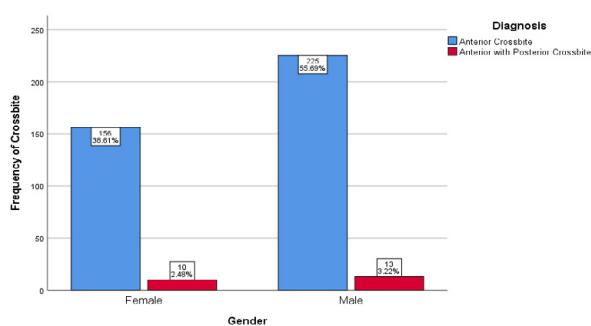
Sex	Frequency	Percentage (%)
Female	166	41.1
Male	238	58.9
Total	404	100

**Table 2:** This table represents the frequency and percentage distribution of patients with only anterior crossbites or combined anterior and posterior crossbite. Anterior crossbites are more common (94.3%) than a combination of anterior, posterior crossbites (5.7%).

Patients	Frequency	Percentage (%)
Anterior crossbite	381	94.3
Anterior with posteriro crossbite	23	5.7
Total	404	100

**Table 3:** This table shows the association of gender and frequency of crossbite- Chi-square - statistically not significant- p value > 0.05.

Frequency	Sex	Anterior crossbite	Anterior with posterior crossbite	Total	Pearson Chi-square-asymptotic significance
Gender	Female	156	10	166	0.81
	Male	225	13	238	-
	Total	-	23	404	-



**Figure 1:** This graph represents the association of Gender and Frequency of Crossbite where X-axis denotes Gender and Y-axis denotes frequency of crossbite. Blue colour denotes anterior crossbite, red denotes anterior along with hposterior crossbite. The Graph shows that anterior crossbite is more prevalent in males (55.69%) and lesser in females (36.61%). Anterior along with posterior crossbites are slightly higher in males (3.22%) than females (2.48%). However, this is statistically not significant (Chi-square test; p value - 0.810 (>0.05) not significant.

revealed that there was no significance between these two parameters ( $p$  value>0.05). Results show that males show a higher prevalence of having anterior crossbites alone ( $n=225$ ) and also more in having both anterior with posterior crossbite ( $n=13$ ) together when compared with females who show prevalence of  $n= 156$  for anterior crossbites and  $n=10$  for ones with posterior crossbites.

## DISCUSSION

A patient undergoing orthodontic treatment has a primary aim for good facial esthetics to be socially acceptable and good self-esteem. A well-planned treatment will be acquired from clinical examination, cephalometric analysis, and photographic evaluation [27,28]. This study found that 404 patients had an anterior crossbite in Saveetha Dental College and Hospitals. We observed from Table 1 that there was a higher predilection for males having anterior crossbite (58.9%) than females with 41.1%. In a similar study conducted in Bangladesh, it showed contradictory results where females showed more prevalence of anterior crossbites than males [29]. Another study conducted by Vithanaarachchi et al. [30] also showed an increased number of females with anterior crossbite when compared to males. Anterior crossbites clinically manifest with reverse overjet, displacement of the mandible due to premature contact of crossbite teeth, recession of the gingiva and mobility of lower anterior involved in the crossbite [31]. The operator should be knowledgeable about the amount of force being exerted to predict a good outcome. Increased pressure on the tooth will lead to tooth movement around which the bone tends to undergo remodeling [32,33]. Major concerns in orthodontic treatment are anchorage loss and post treatment relapse. It has been proved that bisphosphonates can be used to control relapse and generate anchorage for the teeth [34]. Table 2 shows that there were patients who had anterior crossbite coexisting with posterior crossbite accounting for 5.7% whereas 94.3% was anterior crossbite alone. A study conducted by Dacosta et al, reported that 14.3% had coexistence of anterior and posterior crossbite [35]. This is also in concordance with a study done by Sakib Naeem et al who conducted among Pakistani population [4] Cross tabulations

between frequency of crossbite and gender in Table 3 and Figure 1 showed that crossbites, anterior crossbites, posterior crossbites are all insignificant among male and female ( $p$  value  $> 0.05$ ). A study conducted in Brazil also shows the non-significance between these two parameters [36]. The results of our study showed that in patients with only anterior crossbites, males are 1.44 times more prevalent than females. In case of patients with both anterior and posterior crossbites, males are 1.3 times greater than females. A study conducted by John et al reveals that anterior crossbites associated with anterior overjet are more commonly seen in males and more cases of posterior crossbites seen with anterior open bite in females [37].

The study had its own limitations since it being a descriptive study revolving around a hospital only and so is single centered. Also, it studies an exceedingly small population. From the above study, it was understood that an extensive research involving a larger population was required. Early diagnosis and improved ways of treating crossbites must be adopted at an early stage in order to prevent severe malocclusions.

## CONCLUSION

Within the limitations of the study, it was found that associations between crossbites and gender proved to be insignificant. Gender analysis of anterior crossbites revealed that anterior crossbites and combination of anterior and posterior crossbites are more prevalent in males than compared to females.

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