

# Prevalence of Posterior Crossbite for Orthodontic Treatment Timing

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**Objective:** To evaluate the prevalence and distribution of posterior crossbite in different dentition stages in a Turkish sample. **Study Design:** 1554 subjects (843 girls, 711 boys) aged 4-25 years were evaluated to determine the prevalence of posterior crossbite in a Turkish sample. The subjects were classified according to four dentition stages (primary, early mixed, late mixed and permanent) and transversal occlusal status. The statistical evaluation was done by Chi-square, Fischer exact tests. **Results:** Bilateral and unilateral crossbite on the right and left sides had the highest frequency in the permanent dentition (51.0%, 47.3%, and 53.6%; respectively). No significant differences were found between unilateral (right and left) and bilateral crossbite with regard to dentition stages. No significant differences were found between unilateral right or left side posterior crossbite with regard to dentition stages. **Conclusion:** An increasing trend in the prevalence of posterior crossbite was observed from the primary dentition towards permanent dentition in this study.

**Key Words:** Malocclusion, Epidemiology, Posterior Crossbites

## INTRODUCTION

Early treatment of posterior crossbite was recommended to expand the maxilla, eliminate functional shift and thereby to prevent the occurrence of an abnormal transverse growth of the maxilla and the mandible leading to normal occlusal development.<sup>1-6</sup> The role of treatment timing has been highlighted in literature and various clinical perspectives were proposed.<sup>1,2,5</sup> The correction of transverse maxillary deficiencies is routinely done by rapid or slow maxillary expansion. Adults with untreated unilateral posterior crossbite and skeletal asymmetry, indicate that untreated unilateral posterior crossbite in a child might lead to mandibular asymmetric development.<sup>7-12</sup>

In the effective results of maxillary expansions, the relapse rate of rapid maxillary expansion was reported more in the early mixed dentition than in late mixed dentition.<sup>3</sup> Some authors reported that 50% of the crossbite cases treated in the primary dentition had to be retreated in the early or late mixed dentition.<sup>13,14</sup>

Epidemiological researches that show the prevalence of malocclusions in different ages or dentition stages are valuable data about the diagnosis, characteristics, etiologies of orthodontic anomalies,

treatment strategies, and necessary public health resources.<sup>6,15-17</sup> However, prevalence of malocclusions has been found to vary widely on the basis of ethnic differences, registration methods, sample size, and age or dentition stages of the subjects.<sup>6,11,15,16</sup> There appears to be no studies comparing the prevalence of posterior crossbite in different dentition stages. Thereby, the aim of this epidemiologic study was to evaluate the prevalence and distribution of posterior crossbite in a Turkish sample and to lighten the way guiding to the decision of treatment timing.

## MATERIAL AND METHOD

This study was approved by the Ethics Committee of Ankara University, Dental Faculty (36290600/62).

Subjects who admitted to the Oral and Dentomaxillofacial Radiology of the University were randomly selected for their initial intraoral clinical examination. The number of initially examined subjects referring to the Department was 4437. Exclusion criteria for this study were subjects with craniofacial anomalies, non Turkish nationals, edentulous, and partially edentulous subjects. None of the subjects had undergone previous orthodontic treatment. The data of remaining 1554 subjects (843 girls, 711 boys) aged 4-25 years was evaluated to determine the prevalence of posterior crossbite types in a Turkish sample.

The subjects were categorized according to four dentition stages (primary, early mixed, late mixed, and permanent) rather than chronological age to eliminate individual variation during development. Early mixed dentition stage begins with emerging of incisors on the maxilla or mandible; late mixed dentition stage begins with replacement of the primary molars by permanent premolars, and permanent dentition starts with emerging of all permanent teeth. The second and third molars were not taken into consideration.

The subjects were also categorized according to the presence of posterior crossbite, and bilateral, unilateral posterior crossbite

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on the right and left sides were registered and classified to define the transversal occlusal status. Edge to edge relationship was also included.

### Statistical analysis

Statistical analysis was performed by the SPSS, Version 15.0 (SPSS Inc., Ill, USA). The comparison of absolute frequencies of posterior crossbite patterns by dentition stages was evaluated by Chi-square, Fischer exact tests. The level of significance used was  $p < 0.05$ .

### RESULTS

The prevalence of posterior crossbite in this sample was 15.6%. The highest percentage of subjects without posterior crossbite was in the permanent dentition (35.7%).

The prevalences of unilateral (9.5%) and bilateral posterior crossbite (6.2%) were found significantly less than the prevalence of absence of posterior crossbite (84.3%) ( $p < 0.001$ ).

Unilateral posterior crossbite was 5.9% on the right side, 3.6% on the left side and bilateral crossbite was 6.2% of all the subjects.

No significant differences were found between unilateral (right and left) and bilateral crossbite with regard to the dentition stages ( $p = 0.978$ ).

No significant differences were found between unilateral right and left side posterior crossbite with regard to the dentition stages ( $p = 0.652$ ).

The prevalence of posterior crossbite in different dentition stages was shown in Table 1.

Bilateral and unilateral crossbite on the right and left sides had the highest frequency in the permanent dentition (51.0%, 47.3%, and 53.6%; respectively).

### DISCUSSION

Determination of the orthodontic treatment timing for posterior crossbite seems to be related to the prevalence and distribution of the occlusal trait.<sup>18</sup> However, the prevalence of posterior crossbite in literature has shown wide variations due to ethnic differences, registration methods, and sample sizes as well as ages and dentition stages of the patients.<sup>6,11,15,16</sup> Some studies assessed posterior crossbite in only one dentition stage or age ranges of subjects in these studies were very wide and included more than a single dentition stage.

Subjects in this study were categorized according to four dentition stages rather than chronological age to eliminate individual variations in development; primary, early mixed, late mixed or permanent dentition stages. This epidemiologic study intends to

evaluate the prevalence and distribution of posterior crossbite in a Turkish sample in different dentition stages and to lighten the way guiding to the decision of the treatment timing.

Data about prevalence of malocclusions in different dentition stages provides valuable data in relation to the decision of treatment timing of the malocclusion. Some authors recommended early interception of posterior crossbite as early as possible.<sup>19,20,21</sup> Asymmetric occlusion and condylar position were exhibited in children with unilateral posterior crossbite and symmetry was shown to improve after treatment.<sup>12</sup> Kurolo and Berglund<sup>22</sup> reported that correction of 64% of the cases with crossbite was achieved by selective grinding, and 45% of 20 children with untreated lateral deviation showed spontaneous correction in Sweden. They also observed 8% of 171 patients who had no crossbites in the primary dentition developed crossbites in the permanent dentition. Some studies have reported that 50% of the crossbite cases treated in the primary dentition had to be retreated in the early or late mixed dentition.<sup>13,14</sup> Therefore, while considering early treatment, self-correction and risk of relapse as well as functional status seem to be important.

Bilateral and unilateral crossbite (on the right and left sides) were observed in similar frequency in all stages of dentition in this study. On the contrary, Celikoglu *et al*<sup>6</sup> reported that the bilateral crossbite (16%) was the most frequently observed pattern of crossbites in patients with 12-25 age ranges which was higher than our prevalence in the permanent dentition (49 patients, 3.2%). This is most probably due to the selection of the examined subjects, since our subjects were randomly chosen from the ones referring to the Department of Dentomaxillofacial Radiology, whereas theirs were from the subjects referring directly to the Orthodontic Department.<sup>6</sup>

Prevalence of crossbite in a six-year old school children population from Argentina was found to be 0.3% which is close to the prevalence of this study in the primary dentition.<sup>23</sup> Even though we have included edge to edge position, the prevalence of crossbite of this study is lower than Kurolo and Berglund<sup>22</sup> who reported 23.3% prevalence in the primary dentition.

A strong association has been shown between pacifier use and sucking habits.<sup>24,25</sup> The changes in the occurrence of posterior crossbite might reflect alterations in the children's pacifier use and sucking habits due to recommendations of dental professionals to stop using pacifiers much earlier, and breastfeed for almost two years of life.

The prevalence of posterior crossbite was reported between 8-23% in the primary and mixed dentition<sup>8-11,20</sup> with less than 16% of incidence of self correction.<sup>7</sup> In this study, the prevalence of posterior crossbite in the primary dentition (1.2%) increased towards permanent dentition stages (% 12.7 early mixed; % 17.8

**Table 1. Distribution of posterior crossbite in subjects of each dentition stage.**

Posterior Crossbite	Primary Dentition		Early mixed Dentition		Late mixed Dentition		Permanent Dentition		Total		p
	n	%	n	%	n	%	n	%	n	%	
No posterior crossbite	162	12.4	399	30.4	282	21.5	468	35.7	1311	84.4	p<0.001
Unilateral Right	1	1.1	21	23.1	26	28.6	43	47.3	91	5.9	
Unilateral Left	0	0.0	14	25.0	12	21.4	30	53.6	56	3.6	
Bilateral	1	1.0	23	24.0	23	24.0	49	51.0	96	6.2	

late mixed; %20.7 permanent) which might be due to differential reasons contributing to posterior crossbite such as mouth breathing.

A lateral shift into crossbite is caused by constriction of the maxillary arch, frequently. Even a small constriction can create dental interferences that force the mandible to shift to a new position for maximum intercuspation.<sup>26</sup> The risk of children with unilateral posterior crossbite to develop facial asymmetries including the condylar process and glenoid fossa due to functional shift<sup>12,15</sup> and also asymmetric bite force.<sup>27</sup> In this study, posterior crossbite was assessed both in centric occlusion and centric relation. The symmetry of the maxillary arch was evaluated and true unilateral posterior crossbite due to unilateral maxillary constriction was selected as unilateral.

Although this study sample was sufficiently large to demonstrate changes in the prevalence of posterior crossbite from one dentition stage to another, individual changes could not be assessed. However, longitudinal research is impossible to perform due to ethical considerations. It was clearly observed that increases in the prevalence of posterior crossbite in different dentition stages occurred. Despite being cross-sectional, the present study may thus guide the orthodontist to use this valuable data in treatment timing. If deviation is severe enough to reliably indicate the need of orthodontic treatment at some point in the occlusal development, then early treatment would be preferable. However, when the traits are subtler, prediction of future development might be beyond a reliable estimation.

## CONCLUSIONS

An increasing trend in the prevalence of posterior crossbite was observed from primary dentition towards permanent dentition in this study, and this needs to be considered in treatment timing. Treatment of unilateral posterior crossbite should be started as soon as observed which would prevent facial shift and asymmetries.

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