Original Article

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Prevalence of Crossbite and Open Bite among Patients Visiting Orthodontic Clinics at Tertiary Care Hospital in Bangladesh

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Abstract

Malocclusion remains a common orthodontic problem worldwide, with crossbite and open bite contributing significantly to functional, esthetic, and psychosocial disturbances. Data on the prevalence of these conditions in Bangladeshi orthodontic populations are limited, particularly from prospective clinical settings. This study aimed to determine the prevalence and distribution of crossbite and open bite among patients visiting orthodontic clinics at tertiary Care Hospital, Bangladesh. This prospective cohort study was conducted at Multicenter, Bangladesh, from January 2024 to December 2024. A total of 550 patients attending the orthodontic clinic were enrolled using purposive sampling. Clinical examination was performed using standard orthodontic diagnostic criteria to identify the presence and type of crossbite (anterior, posterior, unilateral, bilateral) and open bite (anterior, posterior). Sociodemographic and clinical data were recorded systematically. Statistical analysis was carried out using SPSS version 23.0. Descriptive statistics were used to calculate prevalence, while associations were explored using appropriate inferential tests, with significance set at $p < 0.05$. Among the 550 participants, crossbite was observed in 168 patients (30.5%), while open bite was identified in 96 patients (17.5%). Posterior crossbite constituted the majority of crossbite cases (62.5%), with unilateral presentation being more common than bilateral. Anterior open bite accounted for 71.9% of all open bite cases. Both conditions were more prevalent among adolescents and young adults, with a slightly higher occurrence in females; however, the gender difference was not statistically significant ($p > 0.05$). Crossbite and open bite were found to be prevalent among orthodontic patients in this tertiary care setting, underscoring the need for early diagnosis and timely orthodontic intervention to prevent functional and esthetic complications.

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Introduction

Malocclusion is one of the most prevalent oral health problems worldwide. It is considered a significant public health concern due to its impact on oral function, facial esthetics, and psychosocial well-being.[1] Among the various forms of malocclusion, crossbite and open bite are clinically important because they are often associated with impaired mastication, speech difficulties, abnormal tooth wear, and temporomandibular joint disorders.[2] These conditions may also negatively influence self-esteem and quality of life, particularly among adolescents and young adults seeking orthodontic care.[3] Crossbite is defined as an abnormal transverse or sagittal relationship between the maxillary and mandibular teeth, which may present as anterior or posterior and as unilateral or bilateral involvement.[4] Posterior crossbite is frequently associated with maxillary constriction, altered chewing patterns, and facial asymmetry if left untreated.[5] Anterior crossbite, on the other hand, may be dental or skeletal in origin and can contribute to abnormal incisal wear and compromised esthetics.[6] The etiology of crossbite is

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multifactorial and includes genetic predisposition, oral habits, premature loss of primary teeth, and airway-related factors.[7] An open bite is characterized by the absence of vertical overlap between opposing teeth when the jaws are in centric occlusion.[8] It can be classified as anterior or posterior and may involve dental, skeletal, or combined components. Anterior open bite is more commonly encountered in orthodontic practice and is often associated with deleterious oral habits such as thumb sucking, tongue thrusting, and prolonged pacifier use, as well as vertical skeletal discrepancies.[9] Posterior open bite is relatively rare and is usually linked to eruption disturbances or temporomandibular joint pathology.[10] Epidemiological studies have demonstrated considerable variation in the prevalence of crossbite and open bite across different populations, influenced by age, ethnicity, environmental factors, and diagnostic criteria.[11] Recent studies from Asia and other developing regions suggest that the prevalence of these malocclusions is increasing, possibly due to greater awareness and improved access to orthodontic services.[12] However, population-specific data remain essential for understanding local treatment needs and planning appropriate preventive and interceptive strategies. In Bangladesh, orthodontic services have expanded rapidly over the last decade, yet there is a paucity of updated, systematically collected data regarding the prevalence of specific malocclusion traits such as crossbite and open bite. Most available studies are either cross-sectional, limited in sample size, or conducted in mixed dental populations rather than dedicated orthodontic clinics.[13] Moreover, prospective clinical data reflecting real-world orthodontic patient flow are scarce. Such information is crucial for clinicians and policymakers to anticipate case complexity, allocate resources, and emphasize early diagnosis and intervention. Therefore, assessing the prevalence and patterns of crossbite and open bite among patients attending orthodontic clinics in a tertiary care dental hospital setting is both timely and necessary. The present prospective cohort study was designed to generate updated, clinic-based epidemiological evidence from Dhaka, Bangladesh, contributing to the existing literature and supporting improved orthodontic care planning and preventive strategies.

Methods

This prospective cohort study was conducted in the Department of Orthodontics at Mandy Dental College and Hospital, Bangladesh Medical University, Dhaka, Bangladesh, Islami Bank Medical College, Rajshahi, Udayan Dental College & Hospital, Rajshahi. from January 2024 to December 2024. The study population consisted of patients attending the orthodontic outpatient department during the study period. A total of 550 patients were enrolled using a purposive sampling technique, reflecting routine patient flow in a tertiary care orthodontic setting.

Inclusion criteria: Patients of both sexes aged 10 years and above who presented for orthodontic consultation were included. Only patients with fully erupted permanent first molars and incisors, allowing reliable assessment of crossbite and open bite, were considered eligible. Individuals who provided informed consent (or assent with guardian consent for minors) were included in the study.

Exclusion criteria: Patients with a history of previous orthodontic treatment were excluded to avoid treatment-related bias. Individuals with craniofacial syndromes, cleft lip and palate, facial trauma, or systemic conditions affecting craniofacial growth were also excluded. Patients with

incomplete clinical records or uncooperative behavior during examination were omitted.

Study procedure: Clinical examinations were performed by trained orthodontists using mouth mirrors and probes under adequate illumination. Crossbite and open bite were diagnosed based on standard orthodontic criteria and classified according to type and location. Relevant demographic and clinical information was recorded in a structured data collection form.

Data analysis: Data were entered and analyzed using SPSS version 23.0. Descriptive statistics were used to calculate prevalence and distribution. Inferential analyses were performed where appropriate, with statistical significance set at $p< 0.05$.

Result

A total of 550 orthodontic patients were included in the analysis. The mean age of the study population was 18.9 ± 6.4 years, with the majority belonging to the 11–20-year age group (45.5%) (Fig. I). Females constituted a slightly higher proportion of the sample (54.5%) compared to males (45.5%) (Fig. II). Most participants were adolescents and young adults seeking their first orthodontic consultation. Overall, crossbite was detected in 168 patients, yielding a prevalence of 30.5%, whereas open bite was identified in 96 patients, corresponding to a prevalence of 17.5% (Table I). The remaining 286 patients (52.0%) did not exhibit either of these malocclusion traits. Although crossbite was more common than open bite, the coexistence of both conditions was uncommon. Regarding the distribution of crossbite, posterior crossbite was the predominant type, accounting for 62.5% of all crossbite cases, followed by anterior crossbite (37.5%). Unilateral involvement was significantly more frequent than bilateral involvement (68.5% vs. 31.5%) (Table II). This pattern suggests a predominance of localized transverse discrepancies among the study population. Analysis of open bite patterns showed that anterior open bite was the most common presentation (71.9%), while posterior open bite accounted for 28.1% of cases (Table III). The majority of open bite cases were mild to moderate in severity based on clinical judgment, with severe skeletal open bite being relatively infrequent. Age-wise analysis demonstrated that both crossbite and open bite were most prevalent in the 11–20-year age group. Crossbite prevalence was highest in adolescents (35.6%), whereas open bite prevalence showed a declining trend with increasing age (Table IV). The association between age group and type of malocclusion was statistically significant ($p < 0.05$). Sex-based comparison revealed a slightly higher prevalence of both crossbite (32.7% vs. 27.8%) and open bite (18.7% vs. 16.0%) among females compared to males; however, these differences were not statistically significant ($p > 0.05$) (Table V). This indicates that sex did not play a decisive role in the occurrence of these malocclusion traits in the studied cohort.

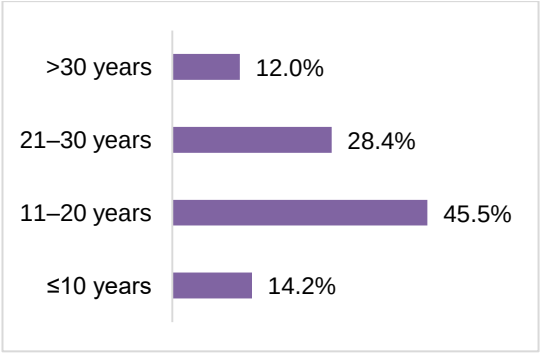

Figure I: Age distribution of participants

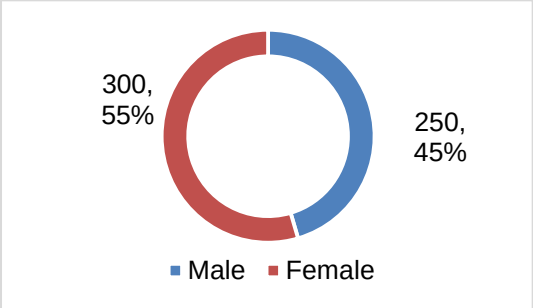

Figure II: Age distribution of participants

Table I: Prevalence of crossbite and open bite

Condition	Presence	n (%)
Crossbite	Yes	168 (30.5)
	No	382 (69.5)
Open bite	Yes	96 (17.5)
	No	454 (82.5)

Table II: Distribution of crossbite types (n = 168)

Parameter	Category	n (%)
Type	Anterior	63 (37.5)
	Posterior	105 (62.5)
Distribution	Unilateral	115 (68.5)
	Bilateral	53 (31.5)

Table III: Distribution of open bite types (n = 96)

Parameter	Category	n (%)
Type	Anterior	69 (71.9)
	Posterior	27 (28.1)

Table IV: Association between age group and malocclusion type (n = 550)

Age group (years)	Crossbite n (%)	Open bite n (%)
≤10	18 (23.1)	21 (26.9)
11–20	89 (35.6)	46 (18.4)
21–30	45 (28.8)	19 (12.2)
>30	16 (24.2)	10 (15.2)

Chi-square test; crossbite p = 0.032, open bite p = 0.041

Table V: Association between sex and malocclusion type (n = 550)

Sex	Crossbite n (%)	Open bite n (%)
Male (n = 250)	69 (27.8)	40 (16.0)
Female (n = 300)	99 (32.7)	56 (18.7)

Chi-square test; crossbite p = 0.214, open bite p = 0.356

Discussion

The present prospective cohort study assessed the prevalence and distribution of crossbite and open bite among orthodontic patients attending a tertiary care dental hospital in Dhaka, Bangladesh. The findings revealed that nearly one-third of the patients exhibited crossbite (30.5%), while open bite was present in 17.5% of the study population. These results indicate a substantial burden of these malocclusion traits among individuals seeking orthodontic care, emphasizing their clinical and public health relevance. The observed prevalence of crossbite in this study is comparable to reports from other orthodontic clinic-based studies conducted in Asian and Middle Eastern populations, where prevalence rates ranged from 25% to 35%.[14,15] Posterior crossbite emerged as the predominant type, accounting for over 60% of cases, which aligns with previous studies suggesting that maxillary transverse deficiency is a common finding among orthodontic patients.[16] The higher frequency of unilateral posterior crossbite observed in this cohort is also consistent with earlier evidence indicating asymmetric maxillary constriction and functional mandibular shifts as common etiological factors.[17] Anterior crossbite constituted more than one-third of crossbite cases in the present study. This finding is clinically important, as untreated anterior crossbite during growth may predispose patients to unfavorable dentofacial development and incisal trauma.[18] The relatively high proportion of anterior

crossbite in this orthodontic population may reflect delayed presentation and limited access to early interceptive orthodontic care in the community. Open bite prevalence in this study (17.5%) falls within the range reported in recent orthodontic literature, where rates between 10% and 20% have been documented.[19] Anterior open bite was the most frequent presentation, accounting for nearly three-quarters of all open bite cases. This predominance has been widely reported and is often attributed to persistent oral habits, tongue posture abnormalities, and vertical skeletal growth patterns.[20] The lower prevalence of posterior open bite observed in the present study is consistent with its recognized rarity and association with specific eruption disturbances or temporomandibular joint conditions.[21] Age-wise analysis demonstrated that both crossbite and open bite were most prevalent among adolescents and young adults, particularly those aged 11–20 years. This finding is in agreement with previous studies showing that orthodontic treatment demand peaks during adolescence due to increased esthetic awareness and parental motivation.[22] The statistically significant association between age group and malocclusion type suggests that early adolescence represents a critical period for the detection and management of these occlusal discrepancies. Early intervention during growth may reduce treatment complexity and improve long-term outcomes.[23] Although females exhibited a slightly higher prevalence of both crossbite and open bite compared to males, the difference was not statistically significant. Similar sex distributions have been reported in several contemporary studies, indicating that biological sex may not be a strong determinant of these malocclusion traits.[24] The marginally higher female representation in orthodontic clinics is more likely related to greater esthetic concern and health-seeking behavior rather than true epidemiological differences. The strengths of this study include its prospective design, relatively large sample size, and standardized clinical assessment in a dedicated orthodontic setting. However, the findings should be interpreted in light of certain limitations. As a Multicenter, clinic-based study using purposive sampling, the results may not be fully generalizable to the broader Bangladeshi population. Additionally, etiological factors such as oral habits and skeletal patterns were not analyzed in detail. Despite these limitations, the study provides valuable, updated data on the prevalence of crossbite and open bite in Bangladesh and contributes to the existing regional and international literature. Overall, the findings underscore the need for increased emphasis on early orthodontic screening and preventive strategies. Integrating interceptive orthodontic services into routine dental care could help reduce the burden of complex malocclusions and improve oral health outcomes in the long term.[25]

Limitations

This Multicenter, clinic-based study using purposive sampling may limit generalizability to the wider population. Etiological factors, skeletal patterns, and oral habits were not assessed, and radiographic correlations were beyond the study's scope.

Conclusion

This study demonstrates a high prevalence of crossbite and open bite among orthodontic patients in a tertiary care setting in Bangladesh, with posterior crossbite and anterior open bite being the most common patterns. The findings highlight adolescence as a critical period for detection and emphasize the importance of early diagnosis and timely orthodontic intervention to minimize functional and esthetic complications.

Recommendation

Routine orthodontic screening should be emphasized during early adolescence to facilitate the timely identification of crossbite and open bite. Community awareness programs and integration of interceptive orthodontic services into primary dental care are strongly recommended.

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