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Original Article

Prevalence of Malocclusion and its Social Impact Among Underprivileged Children Living in Lahore, Pakistan

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ABSTRACT

Background: Malocclusion is a common pediatric oral health condition that may coexist with poor oral hygiene, unmet orthodontic treatment need, and appearance-related psychosocial concerns, particularly among children from low-resource settings. Objective: To estimate the prevalence and pattern of malocclusion, determine orthodontic treatment need, and examine the association between malocclusion severity and self-reported psychosocial distress among underprivileged schoolchildren in Lahore, Pakistan. Methods: This retrospective cross-sectional analysis included routinely collected school dental screening data from 574 children aged 7–15 years at an underprivileged school in Lahore. Malocclusion was classified using Angle's classification, and orthodontic treatment need was assessed using the Index of Orthodontic Treatment Need. Secondary oral health indicators included DMFT/DEFT, Gingival Index, and OHI-S scores. Psychosocial concerns were assessed using a simplified locally adapted child-friendly questionnaire. Descriptive statistics, chi-square tests, ANOVA, and correlation analysis were performed. Results: Malocclusion was present in 394 children (68.6%), with Class I malocclusion being most frequent (47.2%), followed by Class II (16.4%) and Class III (5.1%). Definite orthodontic treatment need was observed in 32.4%, while 59.2% had borderline or definite need. Mean DMFT/DEFT, Gingival Index, and OHI-S scores differed significantly across occlusion categories. Embarrassment about dental appearance was reported by 40.4% of children, and IOTN severity correlated moderately with psychosocial distress ($r = 0.462$, $p < 0.001$). Conclusion: Malocclusion and orthodontic treatment need were common in this underprivileged school population and were associated with self-reported psychosocial concerns. School-based screening, oral hygiene education, and early referral pathways may help identify children requiring further dental and orthodontic assessment. Keywords: malocclusion; orthodontic treatment need; psychosocial distress; oral hygiene; underprivileged children; Lahore; Pakistan

INTRODUCTION

Malocclusion is a common developmental and functional oral health condition in children and adolescents, with implications that extend beyond dental alignment alone. It may affect mastication, speech, oral hygiene maintenance, facial aesthetics, and oral health-related quality of life, particularly when visible anterior irregularities, crowding, spacing, increased overjet, or altered bite relationships become socially noticeable during school age. Evidence from pediatric and adolescent populations has shown that malocclusion may be associated with orthodontic treatment need, psychosocial discomfort, self-consciousness, teasing, avoidance of smiling, and reduced social confidence, although the strength and nature of these associations vary by population, setting, severity of malocclusion, and method of psychosocial assessment (1,2).

The psychosocial relevance of malocclusion is especially important during late childhood and early adolescence, when peer perception, appearance-related confidence, and social participation contribute substantially to emotional development. Studies from different child and adolescent populations have reported that visible dental irregularities can be associated with poorer oral health-related quality of life, emotional discomfort, social avoidance, and concerns about facial or dental appearance (3,4). These effects are not only cosmetic; malocclusion may coexist with functional limitations and oral hygiene difficulties, particularly in children with crowding or abnormal tooth positioning, where effective plaque control is more difficult. Previous research has also linked malocclusion with social, functional, and emotional domains of child wellbeing, supporting the need to evaluate both clinical severity and the child's reported social experience rather than relying only on orthodontic classification (5,6).

In low-resource settings, the burden of malocclusion may be amplified by limited access to preventive dental care, low oral health literacy, delayed orthodontic screening, and financial barriers to specialist treatment. Underprivileged schoolchildren may remain undiagnosed until malocclusion becomes functionally or socially problematic, and dental irregularities may be normalized or neglected because families prioritize urgent medical, educational, or economic needs. Pakistani studies have reported variable patterns of malocclusion and orthodontic treatment need among school-aged and adolescent populations, while local evidence also suggests that dental appearance can influence quality of life and psychosocial wellbeing in children and adolescents (7–10). However, much of the available local work has either focused on general prevalence, orthodontic clinic populations, or broader dental health indicators, leaving a need for community- and school-based evidence from underserved urban populations.

The relationship between malocclusion and oral health status is also clinically relevant in underprivileged children. Dental caries, gingival inflammation, plaque accumulation, and poor oral hygiene may coexist with malocclusion, particularly where crowded or misaligned teeth make cleaning difficult and where regular professional dental care is inaccessible. Previous work has highlighted the possible association between socioeconomic status, dental caries, oral hygiene, and malocclusion in pediatric populations, supporting the inclusion of oral hygiene and caries-related indicators as secondary clinical descriptors in studies of orthodontic need (11–13). These variables should be interpreted cautiously in cross-sectional designs, but they provide useful context for understanding the broader oral health profile of children with different occlusal patterns.

Despite the clinical and psychosocial importance of malocclusion, there remains limited school-based evidence from underprivileged children in Lahore regarding the combined distribution of malocclusion types, orthodontic treatment need, oral hygiene status, and self-reported psychosocial concerns. This gap is important because public health planning for underserved children requires data that capture both objective treatment need and the child's lived social experience. A purely clinical estimate of malocclusion prevalence may underestimate its broader relevance, while psychosocial findings without clinical classification may not adequately guide screening and referral pathways. Therefore, the present study aimed to estimate the prevalence and pattern of malocclusion, determine orthodontic treatment need, describe selected oral health indicators, and examine the association between malocclusion severity and self-reported psychosocial distress among underprivileged schoolchildren aged 7–15 years in Lahore, Pakistan.

MATERIALS AND METHODS

This study was designed as a retrospective cross-sectional analysis of routinely collected school dental screening data from underprivileged children in Lahore, Pakistan. The cross-sectional design was appropriate because the objective was to estimate the prevalence and distribution of malocclusion, describe orthodontic treatment need and selected oral health indicators, and examine associations

between malocclusion severity and self-reported psychosocial concerns at a single point in time. The study was descriptive and analytical in scope, and all interpretations were limited to associations rather than causal effects.

The study was conducted at Door of Awareness School, located in an underprivileged urban area of Lahore, Pakistan, where routine dental screening activities were carried out as part of school-based oral health outreach. The source population comprised school-going children aged 7–15 years who were enrolled at the selected school and were screened during the dental outreach activity. This age range was selected because it includes mixed dentition and early adolescent stages, during which occlusal development, visible dental irregularities, peer perception, and appearance-related self-consciousness are clinically and socially relevant. Children were eligible for inclusion if they were aged 7–15 years, enrolled in the school, present during the screening activity, and had complete clinical and questionnaire data available for analysis. Children were excluded if they were undergoing active orthodontic treatment, had known craniofacial anomalies or syndromic conditions affecting dentofacial development, were unable to cooperate during oral examination, or had incomplete screening or psychosocial response records.

Participants were selected using convenience sampling, which reflected the school-based outreach nature of the screening activity and the practical constraints of accessing underprivileged schoolchildren in the target setting. Although the minimum sample size was estimated using a conservative 50% expected prevalence assumption, 95% confidence level, and 7% margin of error, all eligible children with complete records from the screening activity were included to improve the precision of prevalence estimates. This resulted in a final analytical sample of 574 children. The non-probability sampling approach was considered appropriate for this school-based screening analysis, but it was recognized as a potential source of selection bias and was accounted for in the interpretation of generalizability (14).

Data were obtained from standardized clinical screening forms and a simplified child-friendly psychosocial questionnaire. Clinical examination was performed by a trained dental examiner under field screening conditions using sterile mouth mirrors and periodontal probes. To improve consistency of assessment, the examiner used standardized diagnostic criteria and photographic references before screening, with emphasis on uniform identification of Angle's malocclusion classes, occlusal features, and treatment-need categories. Malocclusion was classified according to Angle's classification as normal occlusion, Class I malocclusion, Class II malocclusion, or Class III malocclusion. Additional occlusal characteristics were recorded, including crowding, spacing, increased overjet greater than 3 mm, increased overbite greater than 3 mm, anterior open bite, and anterior or posterior crossbite. Because these features could coexist in the same child, they were treated as non-mutually exclusive clinical findings.

Orthodontic treatment need was assessed using the Index of Orthodontic Treatment Need and categorized as no or little need, borderline need, or definite treatment need. The primary clinical outcome variables were presence and type of malocclusion and orthodontic treatment-need category. Selected oral health indicators, including DMFT/DEFT score, Gingival Index score, and Simplified Oral Hygiene Index score, were included as secondary descriptive clinical variables to provide broader oral health context. These secondary variables were not treated as primary endpoints but were used to describe whether children with different occlusal patterns also showed differences in caries experience, gingival health, or oral hygiene status.

Psychosocial concerns related to dental appearance were assessed using a simplified, locally adapted questionnaire based on domains commonly represented in child oral health-related quality-of-life tools, including functional concerns, embarrassment about dental appearance, avoidance of smiling, teasing or bullying related to teeth, avoidance of social participation, and perceived low confidence. The questionnaire was used as a screening-oriented measure of self-reported psychosocial concerns

rather than as a full psychometric diagnostic instrument. Responses were recorded in a child-friendly format, and the psychosocial distress score was derived from affirmative responses across relevant items. Subscale indicators for self-esteem-related concerns and social avoidance were used descriptively and analytically to examine their relationship with malocclusion severity.

Data were reviewed for completeness and internal consistency before analysis. Records with incomplete clinical classification or incomplete psychosocial responses were excluded from the analytical dataset. Data were entered into a secure digital database and checked to reduce transcription errors. Variables were coded using predefined categories before analysis, including gender, occlusion type, specific occlusal features, IOTN category, oral health index scores, and psychosocial response variables. The analytical dataset contained no direct personal identifiers, and results were reported only in aggregate form.

Statistical analysis was performed using IBM SPSS Statistics version 26. Categorical variables were summarized as frequencies and percentages, while continuous variables were summarized as means and standard deviations. The prevalence of malocclusion was calculated as the proportion of children classified as having Class I, Class II, or Class III malocclusion among the total sample. The distribution of occlusion types and IOTN categories was compared by gender using chi-square tests. Mean DMFT/DEFT, Gingival Index, and OHI-S scores were compared across occlusion categories using one-way analysis of variance, with statistical significance set at $p < 0.05$. Correlation analysis was used to assess the association between IOTN severity and psychosocial distress scores. Because the study used cross-sectional screening data, all statistical associations were interpreted as non-causal. Missing data were handled by complete-case analysis, and only records with complete information for the relevant variable set were included in each analysis.

Potential sources of bias were considered during study planning, data handling, and interpretation. Selection bias was possible because participants were recruited from a single school-based outreach setting through convenience sampling. Information bias was reduced by using standardized clinical screening criteria and a trained examiner. Response bias was possible for psychosocial items because children may underreport embarrassment, bullying, or avoidance behaviors. Confounding by age, gender, socioeconomic background, oral hygiene practices, and access to dental care was considered conceptually; however, the analysis was primarily descriptive and exploratory, and findings were interpreted with caution. The study design did not permit assessment of temporality or causal pathways between malocclusion and psychosocial outcomes.

The study was conducted in accordance with ethical principles for research involving children and secondary use of screening data. Ethical approval was obtained from the relevant institutional review authority for analysis of the screening data, and administrative permission was obtained from the school. Parental or guardian consent and child assent were obtained in relation to the school dental screening activity. Participation in screening was voluntary, and children were allowed to decline examination or questionnaire participation. Data were anonymized before analysis, stored securely, and reported in aggregate form to protect confidentiality. Children requiring dental or orthodontic attention were advised to seek further clinical evaluation through appropriate dental care pathways (15,16).

RESULTS

A total of 574 schoolchildren aged 7–15 years were included in the final analysis. The sample comprised 301 males and 273 females. Overall, 394 children had some form of malocclusion, giving an overall malocclusion prevalence of 68.6% (95% CI: 64.7–72.3), while 180 children had normal occlusion, representing 31.4% (95% CI: 27.7–35.3) of the sample. Class I malocclusion was the most frequent occlusal pattern, observed in 271 children, followed by Class II malocclusion in 94 children and Class III malocclusion in 29 children.

The distribution of occlusion categories did not differ significantly by gender (χ^2 = 0.443, p = 0.931, Cramer's V = 0.028), indicating a negligible gender-related difference in malocclusion pattern within this sample. Among males, Class I malocclusion was present in 139 of 301 children (46.2%), while among females it was present in 132 of 273 children (48.4%). Class II malocclusion showed almost identical proportions in males and females, affecting 16.3% and 16.5%, respectively. Class III malocclusion was uncommon in both groups, affecting 5.0% of males and 5.1% of females.

Table 1. Distribution of occlusion status according to Angle's classification by gender among schoolchildren aged 7–15 years (n = 574)

Occlusion Status	Male, n (%)	Female, n (%)	Total, n (%)	95% CI for Total %	χ^2	p-value	Effect Size
Normal occlusion	98 (32.6)	82 (30.0)	180 (31.4)	27.7–35.3	0.443	0.931	Cramer's V = 0.028
Class I malocclusion	139 (46.2)	132 (48.4)	271 (47.2)	43.2–51.3			
Class II malocclusion	49 (16.3)	45 (16.5)	94 (16.4)	13.6–19.6			
Class III malocclusion	15 (5.0)	14 (5.1)	29 (5.1)	3.5–7.2			
Total	301 (100.0)	273 (100.0)	574 (100.0)	—			

Specific occlusal features were recorded as non-mutually exclusive findings because more than one occlusal abnormality could be present in the same child. Crowding was the most frequently observed feature, affecting 231 children, followed by increased overjet in 148 children and increased overbite in 134 children. Spacing, crossbite, and anterior open bite were less frequent but remained clinically relevant because of their potential implications for function, aesthetics, and orthodontic referral.

Table 2. Distribution of specific occlusal features among participants (n = 574)

Occlusal Feature	Present, n	Percentage (%)	95% CI for %
Crowding	231	40.2	36.3–44.3
Spacing	117	20.4	17.3–23.9
Increased overjet >3 mm	148	25.8	22.4–29.5
Increased overbite >3 mm	134	23.3	20.1–27.0
Anterior open bite	32	5.6	4.0–7.8
Crossbite, anterior or posterior	46	8.0	6.1–10.5

Crowding affected approximately two in every five children, with a prevalence of 40.2% (95% CI: 36.3–44.3), making it the dominant occlusal feature in the sample. Increased overjet was present in 25.8% (95% CI: 22.4–29.5), while increased overbite was present in 23.3% (95% CI: 20.1–27.0). Spacing was observed in 20.4% (95% CI: 17.3–23.9). Less common findings included crossbite in 8.0% (95% CI: 6.1–10.5) and anterior open bite in 5.6% (95% CI: 4.0–7.8). The pattern indicates that crowding and sagittal or vertical incisal discrepancies were the main contributors to the observed orthodontic burden.

Orthodontic treatment need was assessed using IOTN categories. Overall, 234 children had no or little treatment need, 154 had borderline treatment need, and 186 had definite treatment need. When borderline and definite categories were considered together, 340 children, representing 59.2% of the sample, had at least borderline orthodontic treatment need. However, definite treatment need alone was present in 32.4% of children.

Table 3. Distribution of orthodontic treatment need according to IOTN category by gender (n = 574)

IOTN Category	Male, n (%)	Female, n (%)	Total, n (%)	95% CI for Total %	χ^2	p-value	Effect Size
No or little need, Grade 1–2	126 (41.9)	108 (39.6)	234 (40.8)	36.8–44.8	0.978	0.613	Cramer's V = 0.041
Borderline need, Grade 3	83 (27.6)	71 (26.0)	154 (26.8)	23.4–30.6			
Definite treatment need, Grade 4–5	92 (30.6)	94 (34.4)	186 (32.4)	28.7–36.3			
Total	301 (100.0)	273 (100.0)	574 (100.0)	—			

The IOTN distribution did not differ significantly between males and females (χ^2 = 0.978, p = 0.613, Cramer's V = 0.041), suggesting that orthodontic treatment need was comparable across gender groups. Definite treatment need was slightly higher among females than males, affecting 34.4% of females compared with 30.6% of males, but this difference was not statistically significant. Borderline treatment need was present in 27.6% of males and 26.0% of females. Overall, nearly six in ten children

had either borderline or definite treatment need, indicating a substantial burden of unmet orthodontic assessment need in this school-based underprivileged population.

Secondary oral health indicators were compared across occlusion categories to describe whether children with different occlusal patterns also showed differences in caries experience, gingival health, and oral hygiene status. Children with normal occlusion had the lowest mean values across all three indicators, whereas children with Class II and Class III malocclusion generally showed higher mean DMFT/DEFT, Gingival Index, and OHI-S scores.

Table 4. Secondary oral health indicators according to occlusion category (n = 574)

Parameter	Normal Occlusion (n = 180), Mean ± SD	Class I (n = 271), Mean ± SD	Class II (n = 94), Mean ± SD	Class III (n = 29), Mean ± SD	Test Statistic	p-value	Effect Size
DMFT/DEFT score	1.74 ± 0.82	2.39 ± 1.04	2.61 ± 1.12	2.57 ± 1.09	F(3,570) = 22.666	<0.001	η^2 = 0.107
Gingival Index score	0.78 ± 0.32	0.92 ± 0.35	1.01 ± 0.37	0.98 ± 0.30	F(3,570) = 11.407	<0.001	η^2 = 0.057
OHI-S score	1.36 ± 0.41	1.69 ± 0.45	1.82 ± 0.52	1.76 ± 0.47	F(3,570) = 29.100	<0.001	η^2 = 0.133

Mean DMFT/DEFT score increased from 1.74 ± 0.82 among children with normal occlusion to 2.39 ± 1.04 in Class I, 2.61 ± 1.12 in Class II, and 2.57 ± 1.09 in Class III malocclusion. The difference across occlusion categories was statistically significant ($F(3,570) = 22.666$, $p < 0.001$), with a moderate effect size ($\eta^2 = 0.107$). Gingival Index scores showed a similar pattern, increasing from 0.78 ± 0.32 in normal occlusion to 1.01 ± 0.37 in Class II malocclusion and 0.98 ± 0.30 in Class III malocclusion ($F(3,570) = 11.407$, $p < 0.001$, $\eta^2 = 0.057$). OHI-S scores also differed significantly across occlusion groups, with the lowest mean score in normal occlusion (1.36 ± 0.41) and the highest in Class II malocclusion (1.82 ± 0.52), followed by Class III malocclusion (1.76 ± 0.47) and Class I malocclusion (1.69 ± 0.45). The OHI-S comparison showed the largest effect size among the oral health indicators ($F(3,570) = 29.100$, $p < 0.001$, $\eta^2 = 0.133$). These findings indicate that poorer oral health index scores were observed among children with malocclusion, particularly those with Class II and Class III patterns, although the cross-sectional design does not establish causality.

Self-reported psychosocial concerns related to dental appearance were common in the sample. The most frequently reported concern was feeling shy or embarrassed about tooth appearance, followed by avoidance of smiling or showing teeth in public. Reports of teasing or bullying, avoidance of group or social activities, and low self-esteem or confidence were also documented.

Table 5. Self-reported psychosocial concerns related to dental appearance among participants (n = 574)

Psychosocial Variable	Yes, n	Percentage (%)	95% CI for %
Feels shy or embarrassed about teeth appearance	232	40.4	36.5–44.5
Avoids smiling or showing teeth in public	198	34.5	30.7–38.5
Teased or bullied due to dental appearance	156	27.2	23.7–31.0
Avoids participating in group/social activities	143	24.9	21.5–28.6
Reports low self-esteem or confidence	167	29.1	25.5–32.9

The psychosocial findings showed that 232 children, representing 40.4% of the sample (95% CI: 36.5–44.5), reported feeling shy or embarrassed about the appearance of their teeth. Avoidance of smiling or showing teeth in public was reported by 198 children, corresponding to 34.5% (95% CI: 30.7–38.5). Teasing or bullying related to dental appearance was reported by 156 children, representing 27.2% (95% CI: 23.7–31.0). Social participation concerns were also evident, with 143 children (24.9%; 95% CI: 21.5–28.6) reporting avoidance of group or social activities, while 167 children (29.1%; 95% CI: 25.5–32.9) reported low self-esteem or reduced confidence. These results indicate that appearance-related psychosocial concerns were present in a substantial minority of children.

Correlation analysis was performed to examine the association between IOTN severity and psychosocial distress measures. The overall psychosocial distress score showed a moderate positive

correlation with IOTN score. Positive correlations were also observed for self-esteem-related concerns and social avoidance.

IOTN severity showed a statistically significant moderate positive association with overall psychosocial distress ($r = 0.462$, 95% CI: 0.395–0.524, $p < 0.001$). Similar moderate positive associations were observed between IOTN score and self-esteem-related concerns ($r = 0.438$, 95% CI: 0.369–0.502, $p < 0.001$) and between IOTN score and social avoidance ($r = 0.417$, 95% CI: 0.347–0.482, $p < 0.001$).

Table 6. Correlation between IOTN severity and psychosocial distress indicators among participants (n = 574)

Variable Pair	Correlation Coefficient	95% CI	p-value
IOTN score × psychosocial distress score	r = 0.462	0.395–0.524	<0.001
IOTN score × self-esteem subscale	r = 0.438	0.369–0.502	<0.001
IOTN score × social avoidance subscale	r = 0.417	0.347–0.482	<0.001

These findings indicate that higher orthodontic treatment-need severity was associated with greater self-reported psychosocial difficulty, particularly in relation to self-esteem and avoidance of social interaction. Because the analysis was cross-sectional, these associations should be interpreted as concurrent relationships rather than evidence that malocclusion caused psychosocial distress.

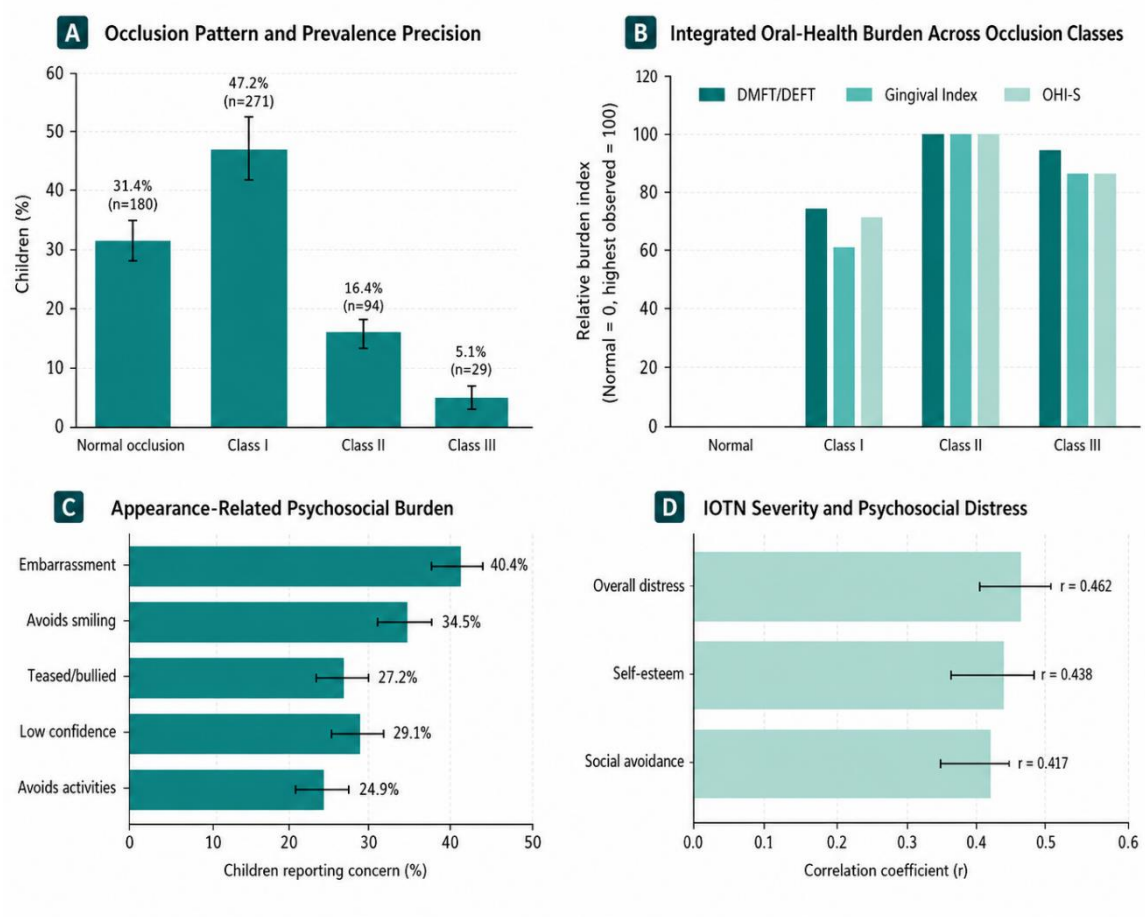

Figure 1 Clinical and Psychosocial Burden Profile of Malocclusion Among Underprivileged Schoolchildren

The panelled figure demonstrates that malocclusion was common among the 574 underprivileged schoolchildren, affecting 68.6% of participants, with Class I malocclusion being the dominant pattern at 47.2%, followed by Class II at 16.4% and Class III at 5.1%. The integrated oral-health burden profile showed a progressive increase in secondary oral health indicators across malocclusion categories, with Class II malocclusion showing the highest relative burden for DMFT/DEFT, Gingival Index, and OHI-S scores. Psychosocial concerns were also frequent, particularly embarrassment about dental appearance, reported by 40.4% of children, and avoidance of smiling, reported by 34.5%. IOTN severity showed moderate positive correlations with overall psychosocial distress ($r = 0.462$), self-esteem-related

concerns (r = 0.438), and social avoidance (r = 0.417), indicating that higher orthodontic treatment-need severity was associated with greater self-reported psychosocial difficulty.

DISCUSSION

This retrospective cross-sectional analysis of school dental screening data demonstrated a high burden of malocclusion among underprivileged schoolchildren aged 7–15 years in Lahore, Pakistan. Overall, 68.6% of the 574 children had some form of malocclusion, with Class I malocclusion representing the largest category at 47.2%, followed by Class II at 16.4% and Class III at 5.1%. Normal occlusion was observed in 31.4% of participants. The distribution of occlusion categories did not differ significantly by gender, indicating that the observed orthodontic burden was broadly comparable among male and female children in this school-based population. These findings are consistent with previous regional and international evidence showing that malocclusion is common among school-aged children and adolescents, although prevalence varies according to age group, diagnostic criteria, ethnicity, sampling frame, and whether participants are recruited from community, school, or clinical settings (17–19).

The predominance of Class I malocclusion in this sample is clinically important because Class I patterns may be underestimated when orthodontic burden is judged only by sagittal molar relationship. In the present study, crowding was the most frequently recorded occlusal feature, affecting 40.2% of children, followed by increased overjet in 25.8% and increased overbite in 23.3%. These findings suggest that a substantial proportion of children had clinically relevant alignment or incisal relationship problems even when the sagittal occlusal class was not severe. Similar observations have been reported in pediatric orthodontic and school-based studies where crowding, increased overjet, spacing, and bite discrepancies contributed substantially to functional and aesthetic concerns. From a public health perspective, these findings support the value of school-based oral screening because children with early or moderate occlusal irregularities may not seek orthodontic consultation unless a visible, functional, or psychosocial concern is identified (20,21).

Orthodontic treatment need, assessed through IOTN categories, further emphasized the clinical relevance of the findings. Although 40.8% of children had no or little treatment need, 26.8% had borderline treatment need and 32.4% had definite treatment need. Therefore, 59.2% of the sample had at least borderline orthodontic treatment need, while nearly one-third required definite orthodontic assessment or intervention. Importantly, the manuscript avoids interpreting borderline need as equivalent to mandatory treatment; rather, borderline need indicates that further clinical assessment may be warranted depending on functional, aesthetic, psychosocial, and resource-related considerations. The absence of a significant gender difference in IOTN distribution suggests that screening and referral strategies should be applied equitably across boys and girls in similar school settings. These findings align with literature indicating that orthodontic need is not restricted to clinic-attending children and may remain unmet in underserved communities because of financial barriers, limited specialist availability, and low parental awareness (22).

Secondary oral health indicators showed statistically significant differences across occlusion categories, with children having malocclusion generally demonstrating higher DMFT/DEFT, Gingival Index, and OHI-S scores than children with normal occlusion. The mean DMFT/DEFT score increased from 1.74 ± 0.82 among children with normal occlusion to 2.39 ± 1.04 in Class I, 2.61 ± 1.12 in Class II, and 2.57 ± 1.09 in Class III malocclusion. Similarly, OHI-S scores were lowest among children with normal occlusion and highest among those with Class II malocclusion. These findings should be interpreted as descriptive associations rather than causal evidence. However, they are clinically plausible because crowded or irregular dentition may complicate oral hygiene practices, while low-resource environments may compound the risk through limited preventive care, irregular dental visits, and reduced access to oral hygiene education. Previous studies have similarly reported associations between malocclusion, dental caries, oral hygiene status, and quality-of-life indicators, supporting the

inclusion of oral health indices as secondary contextual outcomes in school-based orthodontic screening research (23–26).

The psychosocial findings indicate that dental appearance-related concerns were common in this sample. Embarrassment about tooth appearance was reported by 40.4% of children, avoidance of smiling by 34.5%, teasing or bullying due to dental appearance by 27.2%, low confidence by 29.1%, and avoidance of group or social activities by 24.9%. These findings are important because they show that malocclusion in underprivileged schoolchildren is not only a clinical occlusal finding but is also accompanied by self-reported social and emotional concerns in a substantial minority of children. The moderate positive correlation between IOTN severity and overall psychosocial distress ($r = 0.462$, $p < 0.001$) further suggests that greater orthodontic treatment-need severity was associated with higher psychosocial difficulty. Similar moderate positive associations were observed for self-esteem-related concerns and social avoidance. These findings are consistent with previous evidence that visible malocclusion can be associated with embarrassment, social withdrawal, teasing, reduced confidence, and poorer oral health-related quality of life among children and adolescents (27–30).

The observed association between IOTN severity and psychosocial distress is particularly relevant in the context of socioeconomic disadvantage. Children from low-resource settings may face delayed diagnosis, limited access to orthodontic care, and lower parental awareness of treatment options. In such circumstances, visible dental irregularities may persist during formative school years, when peer interaction and appearance-related self-perception strongly influence social confidence. However, the cross-sectional nature of this analysis prevents conclusions about directionality. Psychosocial distress may be influenced by multiple factors beyond malocclusion, including family environment, school climate, bullying culture, general self-esteem, socioeconomic stressors, and broader oral health conditions. Therefore, the findings should be understood as evidence of association and public-health relevance, not proof that malocclusion independently caused psychosocial distress.

The study has several strengths. It included a relatively large school-based sample of 574 underprivileged children, used standardized clinical orthodontic classification, incorporated IOTN-based treatment need, and assessed both clinical and psychosocial dimensions of malocclusion. The inclusion of oral health indicators such as DMFT/DEFT, Gingival Index, and OHI-S added clinically useful context, while the analysis of psychosocial variables helped move the interpretation beyond purely aesthetic or mechanical orthodontic assessment. The findings are therefore relevant for school dental screening, early identification, and community oral health planning in low-resource urban settings.

The limitations should also be acknowledged. The use of convenience sampling from a school-based outreach setting limits generalizability to all children in Lahore or Pakistan. The retrospective cross-sectional design does not permit causal inference or assessment of temporal relationships between malocclusion, oral hygiene status, and psychosocial concerns. The psychosocial questionnaire was simplified and locally adapted for screening purposes; therefore, it should not be interpreted as a fully validated psychometric instrument unless formal reliability and validity testing are reported. Self-reported psychosocial responses may also be affected by recall bias, social desirability bias, embarrassment, or underreporting of bullying and emotional concerns. In addition, unmeasured confounders such as parental education, dietary patterns, brushing practices, previous dental visits, household income, and school environment may have influenced both oral health and psychosocial outcomes.

Despite these limitations, the study provides useful evidence that malocclusion and orthodontic treatment need are common among underprivileged schoolchildren in Lahore and that greater treatment-need severity is associated with higher self-reported psychosocial distress. The findings support integration of basic orthodontic screening into school oral health programs, particularly in low-resource communities where early identification may be otherwise delayed. Future research

should use probability-based sampling, validated child oral health-related quality-of-life instruments, and longitudinal designs to clarify whether early detection and referral reduce functional, oral hygiene, and psychosocial burden over time.

CONCLUSION

Malocclusion was common among underprivileged schoolchildren aged 7–15 years in Lahore, with more than two-thirds of participants showing some form of malocclusion and nearly one-third meeting criteria for definite orthodontic treatment need. Class I malocclusion and dental crowding were the most frequent clinical findings, while children with malocclusion also showed higher secondary oral health indicator scores than those with normal occlusion. Self-reported psychosocial concerns were frequent, particularly embarrassment about dental appearance and avoidance of smiling, and higher IOTN severity was moderately associated with greater psychosocial distress, self-esteem-related concerns, and social avoidance. Because the study was retrospective and cross-sectional, these findings should be interpreted as associations rather than causal effects. The results support the need for school-based oral health screening, early orthodontic referral pathways, oral hygiene education, and further longitudinal research in underserved pediatric populations.

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