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Original article

Correlation of Malocclusion with Oral Health–Related Quality of Life and Socioeconomic Status among Libyan Schoolchildren

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Abstract
Malocclusion is a major contributor to oral health issues and has a significant negative effect on oral health-related quality of life (OHRQoL). A significantly underrepresented factor in research on OHRQoL is socioeconomic status (SES), particularly in developing and underdeveloped countries such as Libya. This study seeks to assess the relationship between malocclusion and OHRQoL in Libyan school children, as well as to examine the influences of socioeconomic factors. 350 Libyan school children aged 11-12 from both governmental and private schools participated in this study, which employed a cross-sectional design. The Dental Aesthetic Index (DAI) and the child perceptions questionnaire (CPQ 11-14) were used to assess malocclusion and OHRQoL, respectively. Parental education, income, and occupation are factors used in determining socioeconomic status (SES). Pearson's correlation and Poisson regression were included in statistical analyses. A noteworthy relationship was found in Pearson coefficients (r) and p-value between malocclusion features (DAI parts) and CPQ11-14 scores among 350 Libyan school-children. A significant negative correlation was observed between incisor diastema, and the results demonstrated that CPQ11-14 scores increased with increasing severity of malocclusion. Children in grade 4 (DAI ≥36) exhibited the highest mean scores for all oral symptoms (17.2 ± 1.8) and total CPQ11-14 (119.4 ± 5.1), indicating a greater negative impact on oral health-related quality of life. In contrast, children in grade 1 (DAI ≤25) showed the lowest scores for oral symptoms (9.3 ± 1.9) and total CPQ11–14 (86.7 ± 5.9). The female participants faced more severe social and emotional impacts compared to their male counterparts (R 1.22, p < 0.01). This study concluded that malocclusion has a significant negative association with OHRQoL in children aged 11 to 12 years old, in additions socioeconomic status play an important effect on that relation. Females report considerably greater emotional and social effects.
Keywords. Malocclusion, OHRQoL, Socioeconomic Status, Schoolchildren.

Introduction

It is now very well understood that quality of life and normal functions are negatively affected by poor oral health [1,2]. In the modern-day, self-reports of oral health-related quality of life (OHRQoL) have been accepted in clinical tests as vital but supplemental information that allows us to fully understand the full weight of dental disease [3]. Malocclusion is understood to have a substantial negative effect on the general quality of life. It is defined by abnormal tooth alignment and the lack of a link between the upper and lower arches. Furthermore, orthodontic treatment has now become more available in more nations. Malocclusion can increase the likelihood of tooth damage, caries, periodontal issues, and oral dysfunctions such as chewing, swallowing, and speaking difficulties [3].

OHRQoL is self-reported by patients in a questionnaire, and this process is used to assess the psychological effects of dental health. To represent the multifaceted and unique perception of oral health, OHRQOL is more precisely defined as the interaction of oral health variables, such as biological and physiological functional status, as well as personal attributes, such as role functioning, social functioning, and psychological functioning [4]. The body of literature relating to the relationship between OHRQoL and malocclusion has grown in the past 15 years [5].

Zhang et al. (2006) showed how conflicting OHRQoL research was greatly influenced by diverse demographic groups and assessment methodologies [6]. Furthermore, in 2009, Liu et al. carried out a literature analysis and determined that there was only a weak relationship between OHRQoL and malocclusion in people of all ages [7]. A cross-sectional study was conducted on students in Chennai, India, that explored the relationship between malocclusion, orthodontic treatment needs, and various oral health conditions, 46.7% of the study subjects had malocclusion. The findings of this study indicate that there is a very strong relationship between poor oral health, weak OHRQoL, and malocclusion [8]. A study by Momeni et al. [9] showed that mothers from Tehran possessed an inadequate level of knowledge regarding the oral health of their children, regardless of their SES. Moreover, children living in low socioeconomic conditions had very few options for preventative dental treatment; the outcomes included overall poor dental hygiene, higher prevalence of dental caries, and early primary tooth loss. If not properly managed, these conditions are expected to increase the incidence of crowding and malposed teeth, which in turn increases the risk of periodontal disease and plaque accumulation [10].

There are a number of validated OHRQoL scales that can be used with both adults and children [11]. The Parental Caregiver Perceptions Questionnaire (P-CPQ), created by Jokovic et al. in 2003 [12], and the Family

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Impact Scale (FIS), created by Locker et al. in 2002 [13], are two components of the Child COHRQoL questionnaire, a tool for assessing OHRQoL. Instead of asking young children directly, both were instructed to use parental information [13]

This array of tools shares many commonalities, yet they also differ in other ways. For instance, some tools use parent forms, whereas others ask children the questions directly. Some stress the severity of oral impacts on OHRQOL, while others concentrate on their frequency. A comprehensive review and meta-analysis of numerous studies could be used to investigate and explain how study differences affect the association between malocclusion and OHRQOL. Since the majority of orthodontic patients are children and adolescents, this study emphasizes the relationship between malocclusions or the need for orthodontic treatment and OHRQOL among participants under the age of 18 [11].

Several reviews, including Kragt et al., 2016; Liu et al., 2009 [14,15], have combined the findings of research relating malocclusion to a lower OHRQoL. In general, this research supports the theory that malocclusion negatively impacts people's daily lives. A recent meta-analysis found that children with malocclusion are 1.74 times more likely to report an impact [14]. Quality of life (QoL) is a dynamic notion that is impacted by a few non-clinical factors. People's daily lives may not be affected in the same way by similar clinical statuses. The relationship between clinical status and quality of life is influenced by factors such as individual experiences and expectations [9].

Numerous cross-sectional investigations have shown that malocclusion harms OHRQoL; however, many of these studies did not consider variables that could influence this association [14]. The impact of oral issues like malocclusion on OHRQoL can be influenced by both personal and environmental factors. The effects of malocclusion on OHRQoL are known to be influenced by age, gender, and psychological health. Furthermore, socioeconomic status (SES) may have an impact on the relationship between malocclusion and OHRQoL. Lower SES is linked to worse OHRQoL after controlling for the effects of other oral illnesses [16].

Earlier research that varied in socioeconomic position demonstrated the unfavorable effects of clinical conditions on OHRQoL. There are multiple means to elucidate the relationship between OHRQoL, SES, and clinical signs and symptoms. Both direct (like access to services) and indirect (like psychological resources) mediation links have been described by researchers. SES can affect the health outcomes of people via psychological traits such as optimism, coping mechanisms, and life satisfaction [2,5].

Although the relationship between malocclusion and OHRQoL has been extensively studied, to our knowledge, no previous study has employed nationally representative data to assess the SES variance in this association. This study examined the relationship between SES, OHRQoL, and malocclusion in adolescents aged 11 and 12 who were enrolled in governmental and private schools in Libya. The purpose of this study was to investigate how malocclusion affects OHRQOL in Libyan students, and to evaluate how Libyan pupils' OHRQOL is affected by the socioeconomic situation of malocclusion children.

Methods

Study design

This cross-sectional study examined the impact of socioeconomic status on children's OHRQOL and malocclusion in Libyan students.

Setting

The study was conducted in governmental and private schools in Libya.

Study population

Children at Libyan private and public schools between the ages of 11 and 12, along with their parents or caregivers, made up the study population.

Inclusion criteria: Children and parents/caregivers must be literate in Arabic to be included.

Exclusion criteria: oral pathologists and orthodontists identified children with cognitive deficits, craniofacial abnormalities, or previous orthodontic treatment.

Sample size calculation

The total enrolment number of children aged 11-12 years in these schools was about 1,500 during the 2025 academic year, according to enrolment records from the Libyan Ministry of Education. Using a 95% confidence level, 5% margin of error, and an assumed prevalence of 50% to account for the greatest given the amount of variability, the estimated sample size was 384 children. The final sample eventually included a few 350 children who were selected through random sampling using a lottery method within participating classrooms due to some logistics associated with the data collection process.

Calibration and pilot study

The study researchers conducted all clinical examinations for malocclusion and dental caries. The assessor was calibrated using the Dental Aesthetic Index (DAI) for malocclusion examination and the WHO's DMFT index for caries evaluation. Trained examiners reviewed standardized color slides and compared

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assessments with an experienced reference dentist. Inter-rater reliability revealed excellent agreement between the trained assessor and the reference dentist (Kappa=0.90 for DAI and 0.92 for dental caries). Inter-rater reliability was evaluated through duplicate examination of 20 children one week apart, and was almost perfect (Kappa =0.98 for both measures). A pilot study with 25 children confirmed the feasibility of the methods and clarity of questionnaires; these participants were eliminated from the main study.

Clinical oral examination

All oral examinations followed Libyan national biosafety guidelines. Children were assessed at their schools using natural daylight, disposable instruments, mouth mirrors, and tongue depressors. Malocclusion was evaluated using the DAI, which assessed 10 components of dental alignment and occlusion. DAI scores were categorized as: ≤25 (normal/minor malocclusion requiring no treatment), 26- 30 (definite malocclusion with elective treatment need), 31-35 (severe malocclusion where treatment is highly desirable), and ≥36 (very severe/handicapping malocclusion requiring mandatory treatment). For statistical analysis, malocclusion was simplified to a binary variable (absent if DAI ≤25, present if ≥36). Dental caries was assessed using WHO criteria, with children grouped as having no untreated caries (D/d=0) or one or more untreated caries (D/d≥1) [17].

Assessment of quality of life

The CPQ11-14 questionnaire was translated into Arabic to assess the oral health-related quality of life (OHRQoL) of children. The thirty-seven questions in CPQ11-14 were divided into four categories: six questions to examine oral symptoms, ten questions on functional limitations, nine questions about emotional well-being, and twelve questions about social well-being. There were five possible answers to each question. These possible options receive scores ranging from 0 to 4, where a lower status is indicated by greater scores. The scores from each domain were added to determine the CPQ11-14 scores. Higher scores indicate a greater impact of oral disorder on children's quality of life [17]. The CPQ11-14 total score ranges from 0 to 148.

Socioeconomic status assessment

Children's parents complete a socioeconomic questionnaire adjusted by Libyan household surveys evaluating ownership of durable goods, parental education, and income levels. Responses were inserted into category families ranging from high (A1, A2, B1, B2) to low (C1, C2, D, E) socioeconomic groups.

Variables and statistical analysis

The primary result was OHRQoL impact (total CPQ11-14 score). Independent factors such as malocclusion classification, socioeconomic status, and school type (private or public), with untreated dental caries as potential variables. Data analysis used SPSS version 27. After checking data distribution with the Kolmogorov-Smirnov test, descriptive statistics have been accomplished on the entire CPQ11-14 and subscale scores, in addition to the total DAI score, malocclusion status, and demographic/socioeconomic variables. Pearson's correlation coefficients were used to determine the relationship between malocclusion and OHRQoL. The variables were classified in a hierarchy, from distal to proximal determinants. The three categories were socioeconomic variables, sociodemographic factors, and clinical oral status (in that order). A Poisson regression with resilient variance was used to connect the total CPQ11-14 with the independent factors.

Ethical considerations

School administrators provided written permission for research procedures. Parents provided written informed consent forms, while children gave verbal consent. All study activities complied with regulations governing human subjects research and the ethical principles of the Declaration of Helsinki. Participant confidentiality was protected through anonymous data coding and secure storage.

Results

Table 1 exhibited that there was an equal distribution of gender among participants, with 50% being male and 50% female. Most of the children joined public institutions (70%), while (30%) attended private schools. In terms of socioeconomic status, 60% of families were classified as low (C1-E), and 40% as high (A1-B2). Most mothers (56.9%) and fathers (60%) had less than eight years of education. Employment was more common with fathers (87.3%) than with mothers (63.5%).

Regarding the characteristics of malocclusion, 30% of participants had no malocclusion, while 27.1% had elective, 24.3% had highly desirable, and 18.6% had fundamental malocclusion based on the DAI. Anterior crowding affected 60% of children, and maxillary and mandibular crowding of ≥2mm. Missing teeth were uncommon, with 4.3% and 5.7% of teeth missing in the maxillary and mandibular arches, respectively. Anterior open bite ≥2mm was found in 2.9%, and anterior cross-bite was present in only 0.3% of the sample.

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Table 1. Distribution of malocclusion characteristics and sociodemographic variables among 11–12-year-old schoolchildren (n=350), Libya

Variable	Category	N	%
Sociodemographic Factors			
Gender	Male,	175	50.0
	Female,	175	50.0
School Type	Governmental	245	70.0
	Private	105	30.0
Socioeconomic Status	High (A1-B2)	140	40.0
	Low (C1-E)	210	60.0
Mother's Education	≥8 years (Complete primary)	151	43.1
	<8 years (Incomplete primary)	199	56.9
Father's Education	≥8 years (Complete primary)	140	40.0
	<8 years (Incomplete primary)	210	60.0
Mother's Occupation	Employed	222	63.5
	Unemployed	128	36.5
Father's Occupation	Employed	306	87.3
	Unemployed	44	12.7
Malocclusion Characteristics			
Malocclusion (DAI)	None (DAI ≤25)	105	30.0
	Elective (DAI 26-30)	95	27.1
	Highly desirable (DAI 31-35)	85	24.3
	Fundamental (DAI ≥36)	65	18.6
Anterior Crowding	None	140	40.0
	1-2 segments	210	60.0
Maxillary Crowding	<2mm	280	80.0
	≥2mm	70	20.0
Mandibular Crowding	<2mm	315	90.0
	≥2mm	35	10.0
Overjet	<4mm	295	84.3
	≥4mm	55	15.7
Anterior Spacing	None	200	57.1
	1-2 segments	150	42.9
Incisor Diastema	<2mm	335	95.7
	≥2mm	15	4.3
Missing Teeth (Maxillary)	None	335	95.7
	Present	15	4.3
Missing Teeth (Mandibular)	None	330	94.3
	Present	20	5.7
Anterior Open Bite	<2mm	340	97.1
	≥2mm	10	2.9
Anterior Cross-bite	Absent	349	99.7
	Present	1	0.3

Results from Table 2 exhibited that there was a noticeable increase in CPQ11-14 scores with increasing severity of malocclusion. School-children in Grade 4 (DAI≥ 36) demonstrated the highest mean scores for symptoms (17.2 ± 1.8) and the total CPQ 11-14 (119.4 ± 5.1), representing a greater negative impact on oral health-related quality of life. However, children in Grade 1 (DAI ≤25) exhibited the lowest scores for oral symptoms (9.3 ± 1.9) and total CPQ11–14 (86.7 ± 5.9). The disparities among DAI grades were statistically significant for oral symptoms ($p = 0.003$) and total CPQ11–14 ($p = 0.02$). In contrast, no statistically significant differences were seen in the functional limitation, emotional well-being, or social well-being domains ($p > 0.05$).

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Table 2. Mean ± SD values of CPQ11–14 scores by malocclusion severity (DAI grades) among Libyan school children (n=350)

Variable	Grade 1 (DAI ≤25) n=105 (30.0%)	Grade 2 (DAI 26-30) n=95 (27.1%)	Grade 3 (DAI 31-35) n=85 (24.3%)	Grade 4 (DAI≥ 36) n=105 (30.0%)	p-value
Oral Symptoms	9.3 ± 1.9	11.1 ± 2.0	13.5 ± 1.6	17.2 ± 1.8	0.003*
Functional Limitation	25.1 ± 1.6	24.2 ± 1.7	24.2 ± 1.4	25.1 ± 1.6	0.381
Emotional Well-being	18.9 ± 1.4	19.7 ± 1.5	22.4 ± 1.3	23.1 ± 1.2	0.175
Social Well-being	19.4 ± 1.7	31.2 ± 1.8	32.5 ± 1.5	37.3 ± 1.6	0.329
Total CPQ11–14	86.7 ± 5.9	95.9 ± 6.3	104.6 ± 4.8	119.4 ± 5.1	0.02*

Table 3 illustrates the Pearson coefficients (r) and p-value between malocclusion features (DAI parts) and CPQ11-14 scores among 350 Libyan school-children. A significant negative correlation was observed between incisor diastema and total CPQ11–14 (r= −0.171, p=0.002). Fewer reported oral symptoms. Mandibular anterior crowding shows a significant, positive correlation with both the total CPQ11-14 score (r =0.115, p =0.032) and functional limitation (r=0.142, p = 0.008), which suggests that increased crowding was linked to more severe functional difficulties and overall perceived impact on oral health-related quality of life. In addition, the maxillary anterior crowding shows a weak positive correlation. No significant correlations were found for overjet, anterior cross-bite, or anterior open bite with any of the CPQ11–14 domains. Total DAI score illustrates a positive association with oral symptoms (r =0.121, p = 0.022), and functional limitation, emotional, and social well-being were weak.

Table 3. Pearson's correlations (r) between malocclusion features (DAI variables) and CPQ11–14 scores among Libyan schoolchildren (n=350)

Variables		Total CPQ11–14	Oral Symptoms	Functional Limitations	Emotional Well-beings	Social Well-beings
Incisor diastema (mm)	R	-0.171	-0.092*	-0.068	-0.041	-0.070
	P- value	0.002	0.086	0.20	0.447	0.189
Maxillary anterior crowding (mm)	R	0.113	0.025	0.005	-0.008	0.028
	P- value	0.03	0.640	0.93	0.880	0.600
Mandibular anterior crowding (mm)	R	0.115*	0.086	0.142*	0.074	0.059
	P- value	0.032	0.11	0.008	0.170	0.270
Overjet (mm)	R	0.018	0.051	-0.010	0.006	0.055
	P- value	0.730	0.332	0.850	0.910	0.300
Anterior crossbite (mm)	R	0.072	0.070	0.073	0.067	0.065
	P- value	0.182	0.192	0.176	0.210	0.230
Anterior open bite (mm)	R	0.043	0.039	0.020	0.063	0.052
	P- value	0.420	0.470	0.710	0.240	0.330
Total DAI score	R	0.101*	0.121*	0.088*	0.083*	0.062
	P- value	0.061	0.022	0.10	0.117	0.250

*: *Statistically significant (p < 0.05)*

Table 4 shows the significant effect of socioeconomic status and OHRQoL among Libyan Children. Females experienced worse OHRQoL than males, as demonstrated by the significantly greater total CPQ11–14 scores (R 1.22, 95% CI: 1.09–1.37, $p < 0.01$), especially in emotional (R 1.45) and social well-being (R 1.28) domains. Children coming from a lower socioeconomic class experienced worse OHRQoL results (R 1.31, 95% CI: 1.17–1.47, $p < 0.01$). Furthermore, children whose mothers have less than 8 years of education displayed significantly higher CPQ11–14 scores (R 1.37, 95% CI: 1.23–1.53, $p < 0.01$), suggesting a wider effect on all quality-of-life domains. The unemployment of fathers suggested a moderate but statistically significant increase in overall OHRQoL impact (R 1.19, 0.04), which mostly affected emotional well-being (R 1.38). From a clinical point of view, overjet of ≥3 mm greatly affected social well-being (R 1.51) and overall CPQ11-14 scores (R 1.19, 0.04). The presence of untreated caries also had a significant negative effect, with greatly elevated scores (R 1.32, 0.03), especially within the social domain (R 1.38).

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Table 4. Effect of Socioeconomic and Clinical Factors on Child Oral Health-Related Quality of Life (COHRQoL) in Libyan Children (n=350)

Category	Variables	Total CPQ11–14	Oral Symptoms	Functional Limitations	Emotional Well-beings	Social Well-beings	p-value
		RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	
Gender	Male	1.00 (Ref.)					
	Female	1.22 (1.09–1.37)	1.03 (0.94–1.12)	1.20 (1.08 - 1.33)	1.45 (1.21–1.73)	1.28 (1.03–1.59)	<0.01
Socioeconomic Status	High	1.00 (Ref.)					
	Low	1.31 (1.17-1.47)	1.19 (1.09–1.30)	1.16 (1.02-1.32)	1.52 (1.26–1.83)	1.42 (1.14–1.77)	<0.01
Mother's Education	≥8 years	1.00 (Ref.)					
	<8 years	1.37 (1.23–1.53)	1.15 (1.06–1.25)	1.25 (1.13–1.39)	1.58 (1.32–1.89)	1.65 (1.35–2.02)	<0.01
Father's Employment	Employed	1.00 (Ref.)					
	Unemployed	1.19 (1.01–1.40)	1.05 (0.92–1.20)	1.12 (0.96–1.31)	1.38 (1.10–1.73)	1.11 (0.82–1.50)	0.04
Clinical Status Overjet	<3 mm	1.00 (Ref.)					
	≥3 mm	1.18 (1.01–1.38)	1.06 (0.94–1.20)	1.11 (0.95–1.30)	1.14 (0.90–1.45)	1.51 (1.17–1.95)	0.04
Untreated Caries	Without	1.00 (Ref.)					
	With	1.32 (1.18–1.48)	1.26 (0.84–1.20)	1.43 (0.95–1.30)	1.24 (0.90–1.45)	1.38 (1.27–1.85)	0.03

Discussion

This study shows that among Libyan schoolchildren, Oral Health-Related Quality of Life (OHRQoL) was greatly influenced by socioeconomic conditions and clinical dental status. This is an important point in the study, and it agrees with previous research showing that children who have poorer oral health conditions also have more significant negative effects on their quality of life [1, 3-5, 14]. Mostly older populations have reported the effect of socioeconomic factors on OHRQoL [19]; not many studies have investigated the link within children, and to our knowledge, this may be the first study that investigates the link within children in a Libyan context. The multifactorial impact of malocclusion and sociodemographic characteristics on OHRQoL in schoolchildren between the ages of 11 and 12 years is also investigated in this study. Children with severe malocclusion, as measured by the Dental Aesthetic Index (DAI), demonstrated significantly lower CPQ11-14 scores, especially in the Oral Symptoms domain and overall quality of life. These outcomes correlate with previous literature, e.g., the study by Gabriela et al. (2025) in Brazil, which showed how children who had more serious malocclusion experienced more aesthetic concern and discomfort, negatively affecting their self-esteem and daily functioning [20].

In our study, we utilized the CPQ11-14 questionnaire for age-appropriate measurement of OHRQoL and demonstrated that children as young as 8 years old experience sensitivity to dento-facial appearance issues, which agrees with other studies in similar age groups [21, 22]. The findings support the clinical importance of identifying anterior malocclusions early, as it has a significant effect on the child's life both physiologically and psychologically. This shows how vital it is for early orthodontic assessment and possible intervention to promote favorable aesthetic and functional outcomes. In the study, anterior segment malocclusion was shown to correlate with a negative effect on OHRQoL in children aged 11 to 12 years old. This result agrees with previous research that showed that malocclusion, particularly in the anterior region, can negatively impact children's perception of overall well-being and oral health [18].

Gender differences also play an important role, with females reporting considerably greater emotional and social effects. This outcome supports the idea that the female demographic may be more conscious of appearance-related concerns and social feedback. This is consistent with prior research illustrating that children at this age perceive the psychosocial impacts of malocclusion similarly, regardless of gender [23].

A study was held in Hong Kong that reported on the effect of the sociodemographic and clinical factors on the oral health-related quality of life (OHRQoL) of 12-year-old children. A total of 589 participants showed

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that males experienced more oral symptoms but recorded fewer negative emotional effects than the female participants [24].

It is well understood that people from a lower socioeconomic demographic are more likely to experience a large range of risk factors that compromise oral health. This may help to explain how oral health plays a critical role in the functional and psychological aspects of quality of life [2, 4, 19]. The current study agrees with it as it also demonstrates that children from lower socioeconomic backgrounds and whose mothers had a low level of education are more likely to report lower CPQ11-14 scores, which exhibit worse OHRQoL. Previous studies agree with these findings, showing a link between lower income and a negative impact on daily functioning due to worse oral health [4]. There is widespread diversity of socioeconomic backgrounds in oral health [20, 21], and the issues of dental disease are usually greater in deprived areas. Pain, aesthetic concern, and limitations in eating or sleeping can be detrimental to a child's self-esteem, school attendance, and social life. Importantly, we found that the effect of malocclusion on OHRQoL was independent of the presence of socioeconomic status (SES). However, dental caries and premature tooth loss have been shown to correlate with occlusal abnormalities in mixed/permanent dentition [25].

Our data shows that other etiological factors, such as parafunctional habits, may play a larger part during the mixed dentition phase. This finding may be vital, as it suggests that we should switch our focus from tooth decay to occlusal development patterns in young children. For example, Naseri et al. [26] examined students from two separate city districts (uptown and downtown) in Shiraz, Iran. They found no noteworthy relationship between malocclusion and socioeconomic status or gender. On the other hand, children coming from lower socioeconomic backgrounds exhibited higher rates of missing teeth, crowding, and crossbite. Anand et al. [27] studied pupils in India and discovered that adolescents who come from better socioeconomic backgrounds had significantly higher severity of malocclusion as measured by the Dental Aesthetic Index (DAI). The significant difference between their results and the results of the current study could be due to their choosing students of low SES from rural areas, and those of higher SES were drawn to metropolitan schools. Interestingly, our study did not show a direct association between SES and OHRQoL. However, other studies from Brazil showed that economically disadvantaged children are less likely to receive orthodontic care because of financial constraints and the scarcity of public services [21]. In one of these studies, Marques et al showed that 69% of individuals were unable to access orthodontic treatment because of financial reasons [28].

In the present study, income and maternal education level were used as proxies for SES. Many studies have shown socioeconomic gradients in the prevalence of oral diseases among children and adults, but only a few have shown clear associations with subjective outcomes like OHRQoL [19, 23]. About children, specifically maternal education has been repeatedly shown to affect oral health outcomes [25, 26], most likely because it impacts the knowledge of oral health, attitudes, and behaviors, given in the home environment [4]. As well as socioeconomic factors, specific clinical conditions were also associated with worse OHRQoL. Similarly, children with maxillary overjet and visible caries lesions reported notably higher CPQ11-14 scores. These findings emphasize the importance of the psychological aspects of dentofacial aesthetics during childhood. Like previous studies [27, 28]. Our results demonstrate that increased overjet may cause social issues, such as teasing and bullying, leading to lower self-esteem and social withdrawal.

Strength of the study

This is the first epidemiological survey to apply the CPQ11-14 within a representative sample of 12-year-old schoolchildren in Libya. The broad range and irregularity of CPQ11-14 results shown in this study may reflect the inclusion of a general population sample, differing from previous studies that mostly relied on clinical or convenience samples [1, 3, 5, 12–15]. Notably, emotional well-being was the only domain that exhibited floor and ceiling effects, suggesting more polarized responses in that area. From a methodological point of view, CPQ11-14 scores were handled as count variables, and Poisson regression was used to analyze associations, a fitting method that preserves the continuous nature of the data [27], while some studies are attracted to dichotomizing responses (e.g., "often" or "very often"), this might weaken statistical power and mask important variations in impact [7].

Limitation of the study

A few limitations were noted in our findings. Casual inferences between oral circumstances and OHRQoL were restricted by the cross-sectional design of the study, and selection bias may have been present due to the exclusion of children who were absent or not enrolled in the participating schools. Nevertheless, such studies are still valuable as they provide insight into identifying risk factors to be explored in longitudinal research. Moreover, our findings may not be used to generalize outside of the specific geographic area. The utilization of the DAI (Dental Aesthetic Index, created for permanent dentition) is another limitation. This means applying it to children in mixed dentition may result in misclassification because of development variability. Small transient changes that are common in this age group may be over- or underrepresented, possibly biasing the outcomes.

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Implication and future direction

Early identification of malocclusion may permit timely preventative or interceptive interventions that leverage the child's growth potential. Utilizing both subjective and objective indicators in orthodontic evaluations ensures an all-inclusive approach to treatment planning. This way, psychological well-being is enhanced and accounted for along with aesthetic and functional outcomes. The inclusion of longitudinal and multicenter studies in future research must be used to validate and extend our findings across broader populations. This would provide evidence to leverage public health programs and guide the inclusion of orthodontic care within broader pediatric healthcare frameworks. More accessible early orthodontic screening and intervention could yield long-term benefits in oral health, self-esteem, and quality of life.

Conclusion

This study found a significant association between malocclusion and lower oral health-related quality of life (OHRQoL) among Libyan schoolchildren. The study found that there were more functional and psychological difficulties in those with more severe malocclusion, particularly those with mandibular crowding and increased overjet. Importantly, it was shown in our findings that those of lower socioeconomic status (SES) had a significant impact, with those from lower-income homes and with mothers who have a lower level of education having lower OHRQoL results. The study emphasizes the importance of having integrated public health initiatives that consider both clinical and socioeconomic aspects of oral health. Early orthodontic screening and intervention, focused on underprivileged areas, may provide a long-term benefit to children's well-being. Moreover, educational programs targeting parents and caregivers may assist in raising oral health knowledge and access to care.

Conflict of interest. Nil

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