Impact Of Malocclusion On Oral Health-Related Quality Of Life Of Early Adolescents in Erbil city

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ABSTRACT
Background: Malocclusion is a frequent dental problem whose consequences are impact on functions such as speech and mastication, aesthetics of the face, and general health. The present study aimed to assess the effect of malocclusion on the oral health-related quality of life among early adolescents in Erbil City, Iraq.
Methods: Cross-sectional survey in which included 800 students aged between 7 and 18 years, divided into primary, middle, and high school groups. Data were collected by use of a bilingual questionnaire (English and Kurdish), which included 15 questions with Likert type answers and addressed all sociodemographic factors and dental-related difficulties, such as problems in talking, problems eating, and embarrassment. The data will be sorted and analyzed with the SPSS program version 28, with a level of statistical significance of $p \leq 0.05$.
Results: The females were 60.9%, and the male percentage was 39.1%, with a mean age of 14.33 years. By malocclusion pattern: Class I 55%, Class II 33%, Class III 12% were found. It was predictable that different malocclusion types were significantly related to some kinds of dental-related problems. For instance, 54.3% of the participants had an on-and-off worsening in the sense of taste, 39.8% of them had painful aching, and 36.1% of them had pronunciation problems very often. Interpretation: The study revealed that the malocclusion status significantly affects the OHRQoL related to functional and psychosocial well-being.
Conclusion: A high prevalence of malocclusion among early adolescents in Erbil City significantly impairs OHRQoL. This has given impetus to advise early diagnosis and correction of malocclusion to alleviate the problems of adolescents in their day-to-day activities.

1. Introduction

Malocclusion refers to the misalignment or improper positioning of teeth within the same dental arch or between the upper and lower arches. It involves deviations from the typical relationship and teeth alignment, affecting dental function and aesthetics. Between 20% to 100% of the population suffers from malocclusion, making it one of the most common oral disorders. [1-3]
An unsatisfactory dental look may hurt a child's self-esteem and relationships when they grow. [4] An earlier analysis from Saudi Arabia conveyed a malocclusion prevalence of about 68%. Due to the high prevalence of malocclusion. The WHO believes malocclusion to be a considerable public health issue. [5, 6] Investigators have taken a more enthusiastic interest in the link between malocclusions and OHRQoL, and many analyses have indicated an adverse correlation between the two. [7, 8] The oral health-related quality of life, also known as OHRQoL, is described as a self-reporting component that pertains explicitly to oral health and captures the functional, social, and psychological implications oral disease has on a person. [9] Malocclusions have a multiplicative effect on the destructive results they have on OHRQoL, and as an outcome, they may negatively impact an individual's overall well-being. According to Simes et al. [10], children with highly severe malocclusions had a more significant negative influence on their OHRQoL than those with moderate or no malocclusions. The harmful effect on OHRQoL caused by malocclusions is amplified.
It is essential to understand the effects of malocclusion from the patients' point of view to have a complete appreciation for how various individuals perceive it. It has been demonstrated that using subjective assessments in conjunction with the objectively confirmed therapy need is helpful in the treatment planning method in orthodontics. [11] Several tools have been used to consider the OHRQoL of children, Oral Health Impact Profile-14 (OHIP-14). [12] Child Oral Health Impact Profile (COHIP), Early Childhood Oral Health Impact Scale (ECOHIS). [13, 14]
It is necessary to note that even in nations where the public health system shows orthodontic treatment, the interest in receiving therapy, as shown by normative criteria, is more than the available resources could provide. This is the case even when orthodontic treatment is a service supplied by the

public health system. [15] Changes in occlusion are possible with mixed dentition., affecting children's self-image. Children's perceptions of their dental look begin to form at a young age, around eight years old. [16, 17]

This investigation aimed to analyze the effect of malocclusions and oral health-related quality of life of early Adolescents in Erbil city. This was done to get a better understanding of how malocclusion influences the day-to-day lives of early Adolescents.

2. Methodology

Study design and participants: The current study designed as a descriptive cross-sectional survey in which 800 students were represented with the impact of malocclusion on oral health-related quality of life (OHRQoL). The participants were early adolescent students aged between 7-18 years old categorized into three groups based on level of study which classified as primary, middle and high school. The study was carried out during the academic year from February 22nd 2022 to February 20th 2023 at three different dental centers: Azadi, Hawler and Khanzad dental center in Erbil city-Iraq. We assessed the prevalence of malocclusions and its impact on oral health-related quality of life (OHRQoL) among early adolescence.

Data collection: The questionnaire was designed in two different languages English and Kurdish to facilitate the process for students. The questionnaire consisted of 15 questions with Likert scale response options (never, hardly never, occasionally, fairly often, very often) which provided with sociodemographic questions and difficulties that students faced for instance, pronunciation, eating discomfort, sense of taste, diet unsatisfactory, feeling embarrassed, irritation and life unsatisfactory. Data were collected using a convenience sampling technique to collect information on target population in an approachable manner before orthodontic treatment.

Data management and statistical analysis: The data recorded on a specially designed questionnaire, collected and entered in the computer via Microsoft Excel worksheet (Excel 2016) and then analyzed using appropriate data system which is called Statistical Package for Social Sciences (SPSS) version 28 and the results were compared between patients with different variables, with a statistical significance level of ≤ 0.05. The results presented as rates, ratio, frequencies, percentages in tables and figures and analyzed using t-test, and Chi square tests.

Exclusion criteria: Exclusion criteria included participants aged less than 7 years and more than 18 years old. Cases with birth defects such as craniofacial deformities: cleft lip or palate and those who underwent orthodontic treatment, in addition to students who refused to answer or participate in the study were excluded.

Inclusion criteria: A total of 800 early adolescents aged only between 7-18 years of both genders included in the data analysis process. Respondents with no history of orthodontic treatment systemic and healthy individuals who gave consent were included.

Ethical considerations: This study was submitted to the Ethics and Scientific committees of Dental Research Ethics Committee at Kurdistan Higher Council of Medical Specialties which was granted. This study explained for each early adolescents and a verbal consent obtained from their care givers or parents.

3. Results and discussion

A total of 800 students enrolled in our study, the oldest case considered to be 18 years old and the youngest categorized in 7 years in which resulted in an average of 14.33 years, most (60.9%) of them were female and 39.1% were male, more than half (52%) of cases studied at high school, 34.1% of them were at primary and finally 13.9% of participants were at middle school. (Table 1)

Table 1: Gender and education level of participants.

Variables	Categories	Frequency	Percent

Gender	male	313	39.1
	female	487	60.9
Level of education	primary	273	34.1
	high school	416	52
	middle school	111	13.9
malocclusion type	Class I	440	55
	Class II	264	33
	Class III	96	12
Total		800	100%

Table 2 shows that more than one third (36.1%) of cases struggled with pronunciation difficulty very often, more than half (54.3%) of patients' sense gotten worse occasionally, 39.8% of them faced painful aching occasionally, 19.1% of cases experienced eating discomfort fairly often, 24.6% of students hardly never had dental problem concern, occasionally 35.4% of cases had tense condition and 14.1% of them faced diet unsatisfactory very often.

Table 2: Dental related difficulties among students.

Variables	**Very often**	**Fairly often**	**Occasionally**	**Hardly never**	**Never**
pronunciation difficulty	289 (36.1%)	42 (5.3%)	215 (26.9%)	159 (19.9%)	95 (11.9%)
sense of taste gotten worse	56 (7%)	150 (18.8%)	434 (54.3%)	125 (15.6%)	35 (4.4%)
painful aching	151 (18.9%)	124 (15.5%)	318 (39.8%)	168 (21%)	39 (4.9%)
eating discomfort	108 (13.5%)	153 (19.1%)	316 (39.5%)	187 (23.4%)	36 (4.5%)
dental problem concern	84 (10.5%)	185 (23.1%)	305 (38.1%)	197 (24.6%)	29 (3.6%)
tense condition	77 (9.6%)	189 (23.6%)	283 (35.4%)	214 (26.8%)	37 (4.6%)
diet unsatisfactory	113 (14.1%)	173 (21.6%)	209 (26.1%)	231 (28.9%)	74 (9.3%)

Table 3 shows that there was a significant statistical association between malocclusion type and gender, most of females had class I and class III of malocclusion while male group had class II of malocclusion. Chi square test was done and p-value was 0.004.

Table 3: Association between malocclusion and gender.

Variable	**Categories**	**Gender**		**p-value**
		male	female	
Malocclusion type	Class I	184 (58.8%)	256 (52.6%)	0.004
	Class II	83 (26.5%)	181 (37.2%)	
	Class III	46 (14.7%)	50 (10.3%)	
Total		313 (100%)	487 (100%)	

Table 4 shows that there was a significant statistical association between malocclusion type and pronunciation difficulty, majority (85.3%) of class I never experienced pronunciation difficulty while (45.2%) of class II group had the same difficulty and only 4.8% of class II cases reported pronunciation difficulty fairly often. Chi square test was done and p-value was <0.001.

Table 4: Association between malocclusion and pronunciation difficulty (Functional limitation).

Variables	**Pronunciation difficulty**					**p-value**
Malocclusion type	very often	fairly often	occasionally	hardly never	never	
Class I	161 (55.7%)	21 (50%)	102 (47.4%)	75 (47.2%)	81 (85.3%)	<0.001
Class II	82 (28.4%)	19 (45.2%)	82 (38.1%)	70 (44%)	11 (11.6%)	
Class III	46 (15.9%)	2 (4.8%)	31 (14.4%)	14 (8.8%)	3 (3.2%)	
Total	289 (100%)	42 (100%)	215 (100%)	159 (100%)	95 (100%)	

The result of Table 5 shows that there was a significant statistical association between malocclusion and sense of taste gotten worse, most (63.2%) of class I fairly often faced worsen of their sense of

taste while this phase occurred to 36.9% of class II occasionally and only 23.2% of cases had class III of malocclusion. Chi square test was done and p-value was <0.001.

Table 5: Association between malocclusion and sense of taste gotten worse.

Variables	**sense of taste gotten worse**					**p-value**
Malocclusion type	very often	fairly often	occasionally	hardly never	never	
Class I	27 (48.2%)	93 (62%)	217 (50%)	79 (63.2%)	24 (68.6%)	<0.001
Class II	16 (28.6%)	43 (28.7%)	160 (36.9%)	34 (27.2%)	11 (31.4%)	
Class III	13 (23.2)	14 (9.3%)	57 (13.1%)	12 (9.6%)	0 (0%)	
Total	56 (100%)	150 (100%)	434 (100%)	125 (100%)	35 (100%)	

Table 6 reveals that there was a significant statistical association between malocclusion and sense of feeling embarrassed, most (68.3%) of class I fairly often felt embarrassed while hardly never 41% of class II felt this way and only 5.9% of class III felt embarrassed fairly often. Chi square test was done and p-value was <0.001.

Table 6: Association between malocclusion and feeling embarrassed (physiological disability).

Variables	feeling embarrassed					p-value
Malocclusion type	very often	fairly often	occasionally	hardly never	never	
Class I	40 (41.7%)	151 (68.3%)	121 (59.9%)	100 (45%)	28 (47.5%)	<0.001
Class II	26 (27.1%)	57 (25.8%)	67 (33.2%)	91 (41%)	23 (39%)	
Class III	30 (31.3%)	13 (5.9%)	14 (6.9%)	31 (14%)	8 (13.6%)	
Total	96 (100%)	221 (100%)	202 (100%)	222 (100%)	59 (100%)	

There was a significant statistical association between malocclusion and sense of job difficulty, 66.7% of class I very often confronted job difficulty very often while hardly never 40.8% of class II faced job difficulty and only 9.2% of class III never found job easily. Chi square test was done and p-value was 0.001. (Table 7).

Table 7: Association between malocclusion and job difficulty (social disability).

Variables	**job difficulty**					**p-value**
Malocclusion type	very often	fairly often	occasionally	hardly never	never	
Class I	56 (66.7%)	145 (64.4%)	109 (47.4%)	91 (46.4%)	39 (60%)	0.001
Class II	18 (21.4%)	56 (24.9%)	90 (39.1%)	80 (40.8%)	20 (30.8%)	
Class III	10 (11.9%)	24 (10.7%)	31 (13.5%)	25 (12.8%)	6 (9.2%)	
Total	84 (100%)	225 (100%)	230 (100%)	196 (100%)	65 (100%)	

There was a statistically significant association between malocclusion and unable to function totally, 66.9% of class I very often couldn't function totally while 38.9% of class II were unable to function hardly never and only fairly often 6.5% of class III were unable to function totally. Chi square test was done and p-value was 0.009.

Table 8: Association between malocclusion and unable to function totally.

Variables	**unable to function totally**					**p-value**
Malocclusion type	very often	fairly often	occasionally	hardly never	never	
Class I	96 (51.6%)	103 (66.9%)	130 (54.2%)	90 (50%)	21 (52.5%)	0.009
Class II	56 (30.1%)	41 (26.6%)	84 (35%)	70 (38.9%)	13 (32.5%)	
Class III	34 (18.3%)	10 (6.5%)	26 (10.8%)	20 (11.1%)	6 (15%)	
Total	186 (100%)	154 (100%)	240 (100%)	180 (100%)	40 (100%)	

Outcomes of Table 9 show that there was a significant statistical association between gender and sense of taste, more than half (59.7%) of male group felt worsen of their taste occasionally while nearly half (50.7%) of female case experienced the identical condition, sense of taste gotten worse in (8.3%) of male participants while only (6.2%) of female groups had the same situation very often. There was as statistically significant association between gender and feeling embarrassed, 28.1% of male cases felt embarrassed while 27.3% of female participants experienced embarrassing moments

fairly often, the feeling of embarrassing never occurred to (7.8%) of female students and (6.7%) of male cases. Chi square test was done and p-value was < 0.05.

Table 9: Association between gender and sense of taste and feeling embarrassed.

Variable	Categories	Gender		p-value
		Male	Female	
Sense of taste gotten worse	very often	26 (8.3%)	30 (6.2%)	0.013
	fairly often	42 (13.4%)	108 (22.2%)	
	occasionally	187 (59.7%)	247 (50.7%)	
	hardly never	44 (14.1%)	81 (16.6%)	
	never	14 (4.5%)	21 (4.3%)	
Feeling embarrassed	very often	38 (12.1%)	58 (11.9%)	0.020
	fairly often	88 (28.1%)	133 (27.3%)	
	occasionally	96 (30.7%)	106 (21.8%)	
	hardly never	70 (22.4%)	152 (31.2%)	
	never	21 (6.7%)	38 (7.8%)	
Total		313 (100%)	487 (100%)	

Discussion

The current study included 800 students aged 7 to 18 years, with a mean age of 14.33. The sample included 60.9% females and 39.1% males, with a majority of the study group in high school (52%), 34.1% in primary school, and 13.9% in middle school. The degrees of malocclusion severity were amongst Class I (55%), Class II (33%), and Class III (12%). In This study, 54.3% of the participants occasionally reported worsening sense of taste, with 18.8% often. The study concluded that malocclusion can distort one's taste perception due to the alteration of the anatomy of the oral cavity. This explains why some students in the present study reported it as an annoyingly worsening sense of taste. [18]

Painful aching was occasionally reported by 39.8% of the participants, with 18.9% pretty often. From a study by Al-Bitar et al., dental pain is common among patients with malocclusion. This can only mean that, in cases of severe malocclusion, dental pain is a complaint in most of these participants. [19] Discomfort when eating was occasionally reported by 39.5% of the participants and pretty often in 19.1% of them. According to Proffit et al., malocclusion can severely compromise eating and chewing. Poor tooth arrangement eventually fails to bring about proper tooth contact, hence affecting chewing efficiency. This explains what has been found in the present study. [20]

Occasional concern of dental problems was reported by 38.1% of the participants, with 24.6% stating it often. In a previous study by Onyeaso and Sanu, the researchers also concluded that individuals with malocclusion tend to have an increased concern of dental problems. These concerns mostly include the aesthetics of one's teeth and dental health problems. [21] Tense condition was occasionally reported by 35.4% and pretty often by 23.6% of the participants. From a study by Kiyak, they concluded that malocclusion disrupts psychosocial wellbeing. Most people are under stress and more anxious with most dental irregularities. This can be well seen from the present study. [22] Dietary discomfort was a complaint that was occasionally reported by 26.1% of the participants, with 21.6% stating it pretty often. Literature on dietary discomfort has also been reported due to malocclusion. Regarding difficulty in chewing,Li Qu et al. established that since these patients with malocclusion avoid certain foods because of difficulty in chewing, they were not satisfied with their nutritional or dietary maintenance status. [23]

This study established significant associations between the types of malocclusions and each of these dental-related difficulties. This strong statistical significance of pronunciation difficulty, sense of taste worsening, painful aching, eating discomfort, tense conditions, and meal interruption/jobs difficulty indicates a robust correlation between the type of malocclusions and difficulties. These findings on meal interruption and job difficulty are consistent with previous research of Li Qu et al.,

who had reported significant impacts of malocclusion on daily activities and professional lives. Consistently, Kiyak's studies had noted that malocclusion can have a considerable psychosocial impact that can be burdensome, presenting as embarrassment and difficulties in relaxing. [22,23] The experience of this significant association is congruent with a previous report of Bishara et al., in which the gender difference in the prevalence of malocclusion was noted, with males being more prone to having Class II malocclusions. Thilander et al. also found females to be more prone to presenting with Class I malocclusions. [24,25]

The significant association between malocclusions and the reported pronunciation difficulty is consistent with a previous report of Chew and Aw, in which it was reported that malocclusions can significantly impact speech production and articulation. [26] Similarly, Profitt et al. noted that severe malocclusions lead to substantial functional limitations especially in speech. [20] Malocclusion leads to difficulties in taste perception consequent to alterations in oral anatomy. Changes in sensory perception in individuals with severe malocclusions were noted by Silva et al. as well. [27] The psychosocial burden of malocclusion, particularly embarrassment, has previously been reported. Kiyak reported that malocclusion can lead to substantial psychological stress, including embarrassment and social anxiety. [22] Marques et al. had also reported similar findings. [28] This is supported by the results from Johal et al., who reported that malocclusion impacted professional life and resulted in job difficulties and impairment in overall job performance situations. [23]

In fact, in other studies, such as by Alhammadi et al., the social disabilities associated with severe malocclusion were also considered. [29] The relationship between severe malocclusion and functional impairment has been confirmed by studies like that by Proffit et al., which showed that severe dental irregularities may lead to severe functional limitations where one cannot effectively carry out one's daily activities. [20] Other such studies include those by Bishara et al. and those by Thilander et al., which reported gender differences in the psychosocial impacts of malocclusion in relation to embarrassment and sensory experiences. [24,25]

4. Conclusion and future scope

The current study reports that malocclusion burdens a significant decrement in oral health-related quality of life among early adolescents in Erbil City. This study finds that with the high prevalence of malocclusion, in particular of Class I, Class II, and Class III, the misalignment of teeth per se affects significantly both functional and psychosocial domains. The gender differences among the participants are remarkable, with males more likely to have Class I and Class III malocclusion, and females more frequently presenting with Class II. Malocclusion has an effective impact on everyday activities, such as pronunciation, taste perceptions, and eating comfort, and extends to psychosocial fields, such as shame and stress. Such findings call for an appropriate early diagnosis so that early treatment and intervention may take place to minimize major adverse impacts and improve the quality of life of these adolescents. There is, therefore, a strict need for a surge in an effective public health strategy, with the need to maximize access to orthodontic care for the reduction of this major public health challenge in Erbil City.

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