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PREVALENCE OF MALOCCLUSION IN EARLY CHILDHOOD AND ITS IMPACT ON ORAL HEALTH-RELATED QUALITY OF LIFE OF CHILDREN: A CROSS-SECTIONAL STUDY

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ABSTRACT

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Objective: This study aimed to detect the prevalence of malocclusion in early childhood and determine its effect on quality of life of preschool children

Materials and methods: 371 children aged 2 - 6 years were screened for the presence of malocclusion based on the criteria of The Dental Health Component of the Index of Orthodontic Treatment Need (IOTN). The quality of life of children with malocclusions were assessed using the Malocclusion Impact scale for Early Childhood (MIS-EC) questionnaire.

Results:

- A total of 33 children (8.9%) exhibited some form of malocclusion.
- The most common malocclusions were increased overjet (27.3%), deep bite (21.2%), and crowding (21.2%).
- Grade 2 malocclusion was the most frequent (39.4%), followed by grade 3 (36.4%).
- The overall impact on OHRQoL was low, with most parents reporting minimal effect on their child's daily activities.

Conclusion: The occurence of malocclusion in preschool Egyptian children is relatively low, with increased overjet, deep overbite, and crowding being the most frequent occlusal abnormalities. The effect of malocclusions at this age on OHRQoL was found to be minimal.. Longitudinal studies are particularly recommended to assess the progression of malocclusions and their broader implications on OHRQoL.

KEYWORD: Prevalence, malocclusion, orthodontic treatment need, oral health-related quality of life of children

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INTRODUCTION

Malocclusion refers to any deviation from normal tooth alignment ^[1]. Its etiology can be genetic, environmental, or a combination of both. Contributing factors may include adverse oral habits, and abnormalities in the number, shape, or developmental positioning of teeth, all of which can lead to malocclusion ^[2].

Malocclusion significantly impacts an individual's quality of life due to functional and social limitations, such as impaired aesthetics, speech difficulties, and disruptions to normal growth and development, and temporomandibular joint disorders ^[3]. Children with malocclusion at higher risk of developing tooth decay and gum diseases due to difficulties in maintain proper oral hygiene^[4]. The aesthetic and functional issues associated with malocclusion can affect a child's psychological well-being, influencing their self-confidence and social interactions ^[5].

Therefore, recognizing malocclusion in dentistry highlights the importance of timely planning the appropriate preventive or orthodontic measures. Such planning requires epidemiological studies on malocclusion prevalence and an assessment of treatment needs, enabling early detection of developing malocclusions and reducing the likelihood of costly future treatments ^[6]. Since comprehensive orthodontic treatment in permanent dentition is often lengthy due to the involvement of fully erupted permanent teeth, early intervention proves beneficial for most children^[7]. In countries with a high demand for orthodontic care, experienced practitioners can perform preventive and interceptive treatments as part of primary dental care before referring patients to orthodontists. To guide health authorities in providing appropriate education, studying the prevalence of malocclusion the necessary treatment needs in primary and dentition is important^[8].

The Index of Orthodontic Treatment Need (IOTN) is a commonly applied tool for determining

the necessity of orthodontic treatment in individuals with permanent dentition. The index comprises two main components: the Dental Health Component (DHC) and the Aesthetic Component (AC). It is designed to identify cases requiring the most urgent orthodontic treatment, ensuring that limited resources are allocated to patients with the greatest need. This approach prevents the allocation of costly and scarce treatments to mild cases ^[9].

Factors such as pain, aesthetics, and functionality—important indicators of Oral Health-Related Quality of Life (OHRQoL)—are considered to evaluate the impact of oral conditions ^[10]. The Early Childhood Oral Health Impact Scale (ECOHIS) is a questionnaire designed to evaluate the impact of oral conditions on the quality of life of preschool children aged 2 to 5 years and their families in epidemiological studies ^[11, 12].

Limited studies have investigated the prevalence of malocclusion in Egypt. Abd ElMotaleb et al. examined 5,000 Egyptian adolescents and found that 1.6% exhibited an anterior open bite, with a higher occurrence in girls than boys (ratio 5:3). The condition was most commonly associated with tongue thrusting and mouth breathing^[13]. In 2017, a systematic review of the distribution of malocclusion worldwide was published, however, data specific to the Egyptian population remained lacking ^[14]. Therefore, this study aimed to determine the prevalence of malocclusion in early childhood and its impact on OHRQoL for preschool children and their families.

MATERIALS AND METHODS:

This cross-sectional study included 371 children (189 males and 181 females) aged 2 to 6 years. The participants were selected from the outpatient diagnostic clinic of the Pedodontics department, Faculty of Dentistry, Cairo University, Egypt. The study protocol was accepted by the Research Ethics Committee of the Faculty of Dentistry, Cairo University. Parents provided informed consent before data collection.

The sample size was calculated based on Abdellatif et al. (2024) ^[15] using the G*Power statistical analysis program (version 3.1.9.4). A total sample size of 371 was sufficient to detect a large effect size (f = 0.35) with 80% power (1- β error) and a 5% significance level (α error) for a two-sided hypothesis test.

Inclusion Criteria of the children who participated in the study:

- 1. Children aged 2–6 years.
- 2. patients in primary dentition stage
- 3. No acute dental pain.
- 4. No history of dental trauma within one month before the examination.
- 5. No prior use of orthodontic appliances.
- 6. Parents agreed to participate and signed informed consent.

One examiner performed the diagnosis in the outpatient clinic using latex gloves, disposable mouth mirrors, and a periodontal probe. The child was seated on a dental chair for clinical examination. The interarch and intraarch relationships were assessed, and findings were recorded in a diagnostic chart. Radiographs and study models were not utilized.

Primary Outcome

The evaluation of malocclusion was conducted using the Dental Health Component (DHC) of the Index of Orthodontic Treatment Need (IOTN) ^[16] Figure (1).

Secondary Outcome

The oral health-related quality of life (OHRQoL) was assessed using the Malocclusion Impact Scale for Early Childhood (MIS-EC) question-naire^[17]. Data were gathered through clinical oral examinations and parent/caregiver-completed questionnaires.

Grade 1	Other variation in occlusion including displacement less than or equal to 1 mm
Grade 2	Increased overjet greater than 3.5 mm but less than or equal to 6 mm with competent lips at rest; reverse overjet greater than 0 mm but less than or equal to 1 mm; increased overbite greater than 3.5 mm with no gingival contact; anterior or posterior crossbite with less than or equal to 1 mm displacement between retruded contact position and intercuspal position; small lateral or anterior open bites greater than 1 mm but less than or equal to 2 mm; pre-normal or post-normal occlusion with no other anomalies; mild displacement of teeth greater than 1 mm but less than or equal to 2 mm
Grade 3	Increased overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lips at rest; reverse overjet greater than 1 mm but less than or equal to 3.5 mm; increased and complete overbite with gingival contact but without indentations or signs of trauma; anterior or posterior crossbite with less than or equal to 2 mm but greater than 1 mm displacement between retruded contact position and intercuspal position; moderate lateral or anterior open bite greater than 2 mm but less than or equal to 4 mm; moderate displacement of teeth greater than 2 mm but less than or equal to 4 mm
Grade 4	Increased overjet greater than 6 mm but less than or equal to 9 mm; reverse overjet greater than 3.5 mm with no reported masticatory or speech difficulties; reverse overjet greater than 1 mm but less than or equal to 3.5 mm with reported masticatory or speech difficulties; anterior or posterior crossbite with greater than 2 mm displacement between retruded contact position and intercuspal position; posterior lingual crossbite with no occlusal contact in one or both buccal segments; severe displacement or teeth greater than 4 mm; extreme lateral or anterior open bite greater than 4 mm; increased and complete overbite causing notable indentation on the palate or labial gingivae; patient referred by colleague for collaborative care, e.g. periodontal, restorative or TMJ considerations; less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis (not more than one tooth missing in any quadrant)
Grade 5	Defects of cleft lip and/or palate; increased overjet greater than 9 mm; reverse overjet greater than 3.5 mm with reported masticatory or speech difficulties; impeded eruption of teeth (with the exception of third molars) due to crowding, displacement, the presence of supernumerary teeth, retained primary teeth and any other pathological cause; extensive hypodontia with restorative implication (more than one tooth missing in any quadrant) requiring pre-restorative orthodontics

Fig. (1) Figure for table of The Dental Health Component Of The Index Of Orthodontic Treatment Need (IOTN) [16]

The MIS-EC consisted of eight items, with six questions in the **Child Impact** section and two in the **Family Impact** section. The **Child Impact** section assessed three domains: functional limitations, psychological effects, and social interaction/selfimage. The **Family Impact** section evaluated parental distress and financial burden.

For the eight MIS-EC items, response options (Response options: never = 0, hardly ever = 1, sometimes = 2, often = 3, very often = 4, and I don't know = no score). The total score ranged from 0 to 32, with questionnaires having two or more missing/"I don't know" responses excluded from analysis. The **Child Impact** section had a scoring range of 0–24 points, while the **Family Impact** section ranged from 0–8 points.

Data was taken from the records collected from the children, by the primary investigator, and then organized using Excel sheets to avoid missing any data. A personal computer was used to enter and save the data. To avoid data loss, a backup copy was made on an external flash memory. Data was added and managed in an encrypted file with only access to the researchers.

The data were statistically analyzed using the SPSS software (Statistical Package for the Social Sciences, Version 20.0, SPSS Inc., Chicago, IL, USA). A Chi-square test,_Kruskal Wallis test and _Mann Whitney test were conducted to assess statistical significance, with a p-value of ≤ 0.05 considered statistically significant.

RESULTS

Data were collected from a sample of 371 children, aged 2 to 6 years, who attended local pediatric dental clinics. The analysis focuses on the classification of malocclusion types and grades, as well as the assessment of its effects on daily functioning, psychosocial well-being, and family impact.

The results are organized into two main parts: first, the prevalence of different malocclusion types and their severity levels, followed by the impact of these conditions on OHRQoL, based on both childrelated and family-related measures. Statistical comparisons were made to explore possible associations between malocclusion characteristics and the reported quality of life outcomes.

Demographic data of all participants (n=371):

The distribution of 371 participants across gender and age groups was presented in Table (1). Comparison between different groups was performed by using Chi square test.

- In gender, 189 participants (51.1%) were males, while the female group included 181 participants (48.9%). The gender distribution is balanced, with no statistically significant difference (p = 0.41).
- In age distribution: 63 children (17.0%) were in the 3-<4 years group, 133 children (35.9%), were in the 4-<5 years group, 143 children (38.6%) were in the 5-<6 years group, while 31 children (8.4%) were in the 6 years group. There is a statistically significant difference in age distribution (p = 0.0001).

Total	(N=371)	Count	Column N %	P value
Gender	Male	189	51.1%	0.41
	Female	181	48.9%	
Age	3-4 years	63	17.0%	0.0001*
	4-5 years	133	35.9%	
	5-6 years	143	38.6%	
	6 years	31	8.4%	

 Table (1): Gender and age distribution among all participants:

*Significant difference as P <0.05.

Demographic data of participants with malocclusion (n=33):

The distribution of 33 participants with malocclusion across gender and age groups was presented in Table (2). Comparison between different groups was performed by using Chi square test.

- In gender, The male group comprised of 21 participants (63.6%) and the female group consisted of 12 participants (36.4%). There was a statistically significant difference between (p = 0.02).
- In age distribution: 3-<4 years group had 7 children (21.2%), 4-<5 years group had 16 children (48.5%), 5-<6 years group had 8 children (24.2%), while 6 years group had 2 children (6.1%). There is a statistically significant difference in age distribution (p = 0.0001).

TABLE (2) Gender and age distribution participants with malocclusion:

		Count	Column N %	P value
Gender	Male	21	63.6%	0.02*
N=33	Female	12	36.4%	
Age	3-<4 years	7	21.2%	0.0001*
4.15 ±0.83	4-<5 years	16	48.5%	
	5-<6 years	8	24.2%	
	6 years	2	6.1%	

*Significant difference as P <0.05.

Descriptive results of different malocclusion grades:

The distribution of malocclusion grades among 33 participants was presented in Figure (2). Comparison between different groups was performed by using Chi square test. There was a significant difference between grades (P=0.004) as grade 2 was significantly the highest 13 children (39.4%), then grade 3 was 12 children (36.4%), then grade 4 was 5 children (15.2%), while Grade 1 was significantly the least 3 children (9.1%).



Fig. (2): pie chart showing malocclusion grade distribution among participants.

Distribution of different malocclusion grades among gender

Comparison between different grades distribution among gender was performed by using Chi square test which revealed that there was insignificant difference between male and female as P = 0.42, as presented in Table (3).

TABLE (3) Distribution of different malocclusion grades among gender:

	Ν	Iale	Fe	Dyoluo			
	Count	Column N %	Count	Column N %			
Grade 1	3	11.5%	0	0.0%	0.42		
Grade 2	9	34.6%	4	30.8%			
Grade 3	6	23.1%	6	46.2%			
Grade 4	3	11.5%	2	15.4%			

Distribution of different malocclusion grades among different age ranges

Comparison between different grades distribution among age ranges was performed by using Chi square test which revealed that there was insignificant difference between male and female as P = 0.47, as presented in Table (4).

	Age									
	3	years	4 y	vears	5 y	ears	6 y	- D l		
	0 1	Column	C (Column	C (Column	C (Column	- r value	
	Count	N %	Count	N %	Count	N %	Count	N %		
Grade 1	1	14.3%	2	10.5%	0	0.0%	0	0.0%	0.47	
Grade 2	4	57.1%	6	31.6%	3	30.0%	0	0.0%		
Grade 3	0	0.0%	7	36.8%	4	40.0%	1	33.3%		
Grade 4	2	28.6%	1	5.3%	1	10.0%	1	33.3%		

TABLE (4) Distribution of different malocclusion grades among different age ranges:

Descriptive results of different types of malocclusions prevalence among cases:

The frequency and percentages of different types of malocclusions among cases were presented in Table (5). Comparison between the presence and absence of different types was performed by using Chi square test which revealed that absence was significantly higher than presence as P = 0.0001.

Comparison between different types was performed by using Chi square test which revealed that there was insignificant difference between them regarding prevalence of different types

Analysis of Responses to the B-ECOHIS Questionnaire

Frequency and percentages of different answers to questions related to the B-ECOHIS questionnaire

were presented in Table (6) and Figure (3). A comparison between different answers was performed by using Fischer's Exact test which revealed there was a significant difference between different answers as P = 0.0001 (never was significantly the highest).



Fig. (3) Stacked chart showing analysis of responses related to the B-ECOHIS questionnaire.

TABLE (5) Descriptive results of different types of malocclusions among cases

	Al	osent	Pr		
	Ν	%	Ν	%	P value
Crowding	26	78.8%	7	21.2%	0.0001*
Increased overjet	24	72.7%	9	27.3%	0.0001*
Deep overbite	26	78.8%	7	21.2%	0.0001*
Anterior open bite	28	84.8%	5	15.2%	0.0001*
Scissor bite	30	90.9%	3	9.1%	0.0001*
Anterior crossbite	29	87.9%	4	12.1%	0.0001*
	C	0.06	().17	

*Significant difference as P ≤0.05.

Comparison between the presence and absence of different types of malocclusions among child impact, family impact, and total impact using Mann Whitney test:

Table (7) compares six types of malocclusions (crowding, increased overjet, deep overbite, anterior open bite, scissor bite, and anterior crossbite) across three impact categories Child impact (scale 1-6), Family impact , and Total impact (sum of child and family impacts), all comparisons were performed by using Mann Whitney test, which revealed that there was no statistically significant differences were found for any malocclusion type (all p-values > 0.05).

TABLE (6) Analysis of Respo	onses to the B-ECOHIS Questionnaire:
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	I don't know		r	never		almost never		sometimes		often		y often	Dyahua
	N	%	N	%	Ν	%	Ν	%	Ν	%	Ν	%	- P value
Q1	0	0.0%	31	93.9%	0	0.0%	1	3.0%	1	3.0%	0	0.0%	0.0001*
Q2	5	15.2%	26	78.8%	1	3.0%	0	0.0%	1	3.0%	0	0.0%	0.0001*
Q3	0	0.0%	32	97.0%	1	3.0%	0	0.0%	0	0.0%	0	0.0%	0.0001*
Q4	0	0.0%	32	97.0%	0	0.0%	0	0.0%	1	3.0%	0	0.0%	0.0001*
Q5	0	0.0%	32	97.0%	1	3.0%	0	0.0%	0	0.0%	0	0.0%	0.0001*
Q6	0	0.0%	32	97.0%	1	3.0%	0	0.0%	0	0.0%	0	0.0%	0.0001*
Q7	0	0.0%	29	87.9%	1	3.0%	1	3.0%	0	0.0%	2	6.1%	0.0001*
Q8	0	0.0%	32	97.0%	0	0.0%	1	3.0%	0	0.0%	0	0.0%	0.0001*

*Significant difference as $P \leq 0.05$.

 TABLE (7) Comparison between presence and absence of different types of malocclusions among child impact, family impact, and total impact using Mann Whitney test:

			Chi	ld impac	t		Family impact						Total impact				
		Minimum	Maximum	Median	Mean	Standard Deviation	Minimum	Maximum	Median	Mean	Standard Deviation	Minimum	Maximum	Median	Mean	Standard Deviation	
Crowding	Absent	5.00	12.00	6.00	6.19	1.27	2.00	6.00	2.00	2.42	1.14	7.00	14.00	8.00	8.62	1.79	
	Present	5.00	11.00	6.00	6.71	1.98	2.00	4.00	2.00	2.29	0.76	7.00	13.00	8.00	9.00	2.00	
	P value	0.62				0.94					0.53						
Increased	Absent	5.00	12.00	6.00	6.50	1.62	2.00	6.00	2.00	2.54	1.22	7.00	14.00	8.00	9.04	2.01	
overjet	Present	5.00	6.00	6.00	5.78	0.44	2.00	2.00	2.00	2.00	0.00	7.00	8.00	8.00	7.78	0.44	
	P value	0.19					0.37					0.08					
Deep	Absent	5.00	12.00	6.00	6.38	1.60	2.00	6.00	2.00	2.31	0.93	7.00	14.00	8.00	8.69	1.91	
overbite	Present	6.00	6.00	6.00	6.00	0.00	2.00	6.00	2.00	2.71	1.50	8.00	12.00	8.00	8.71	1.50	
	P value			0.88			0.53						0.59				
Anterior	Absent	5.00	11.00	6.00	6.11	1.03	2.00	6.00	2.00	2.25	0.84	7.00	13.00	8.00	8.36	1.31	
open bite	Present	5.00	12.00	7.00	7.40	2.70	2.00	6.00	2.00	3.20	1.79	7.00	14.00	11.00	10.60	3.05	
	P value			0.19			0.29							0.21			
Scissor	Absent	5.00	12.00	6.00	6.33	1.49	2.00	6.00	2.00	2.30	0.88	7.00	14.00	8.00	8.63	1.79	
bite	Present	6.00	6.00	6.00	6.00	0.00	2.00	6.00	2.00	3.33	2.31	8.00	12.00	8.00	9.33	2.31	
	P value		Ģ	93.00			0.53					0.61					
Anterior	Absent	5.00	12.00	6.00	6.34	1.52	2.00	6.00	2.00	2.45	1.12	7.00	14.00	8.00	8.79	1.92	
crossbite	Present	6.00	6.00	6.00	6.00	0.00	2.00	2.00	2.00	2.00	0.00	8.00	8.00	8.00	8.00	0.00	
	P value			0.92					0.61					0.69			

Malocclusion - grade	Child impact 1-6					Family impact 7-8						total impact			
	Minimum	Maximum	Median	Mean	Standard Deviation	Minimum	Maximum	Median	Mean	Standard Deviation	Minimum	Maximum	Median	Mean	Standard Deviation
Grade 1	6	6	6	6	0	2.00	2.00	2.00	2.00	0.00	8.00	8.00	8.00	8.00	0.00
Grade 2	5	11	6	6	1	2.00	3.00	2.00	2.08	.28	7.00	13.00	8.00	8.38	1.50
Grade 3	5	12	6	6	2	2.00	6.00	2.00	2.50	1.24	7.00	14.00	8.00	8.92	2.27
Graded 4	6	7	6	6		2.00	6.00	2.00	3.20	1.79	8.00	12.00	8.00	9.40	1.95
P value			0.91					0.29					0.73		

TABLE (8) Comparison between different grades regarding child impact, family impact, and total impact using Kruskal Wallis test:

Comparison between different grades regarding child impact, family impact, and total impact using Kruskal Wallis test:

Table (8) compares 4 grades across three impact categories Child impact (scale 1-6), Family impact, and Total impact (sum of child and family impacts), all comparisons were performed by using Kruskal Wallis test, which revealed that there were no statistically significant differences were found between different grades (all p-values > 0.05).

DISCUSSION

The occurrence of malocclusion in children has been documented to vary from 39% to 93%. The World Health Organization (WHO) ranks malocclusion as the third most common oral health condition, following periodontitis and dental caries^[18]. The wide variation in prevalence rates can be attributed to differences in ethnic groups, age groups, and registration methods. However, it is important to note that a high prevalence of malocclusion does not always indicate that all children or adolescents with malocclusion require orthodontic treatment. Malocclusions can vary from mild to severe, with differing impacts on appearance and/or function^[19]. This study is significant for both clinical practice and public health. Identifying malocclusion at an early age can facilitate timely interventions, potentially reducing the need for extensive orthodontic treatments later in life. The

findings also underscore the psychological and social impact of malocclusion on young children, emphasizing the importance of integrating oral health education and preventive measures into pediatric care.

Early diagnosis and prompt intervention are essential treatment strategies to optimize outcomes, ensuring good occlusion and dentofacial aesthetics.. Early treatment can reduce the need for extensive orthodontic procedures in adolescence, and improve psychosocial outcomes. This is particularly critical in countries like Egypt, where public awareness and access to orthodontic care are limited. This study provided significant insights into the prevalence of malocclusion among preschool children in primary dentition stage and its impact on quality of life .

The well-defined inclusion criteria ensured a homogenous sample by excluding children with acute dental conditions or prior orthodontic treatment that could confound results. A single examiner conducted the clinical assessments, reducing variability in diagnostic interpretations. While the use of clinical tools such as disposable mirrors and periodontal probes facilitated precise measurements, the decision not to include radiographs or study models could potentially limit the comprehensiveness of the assessments, especially for interarch and intraarch relationships.

The use of the Index of Orthodontic Treatment Need (IOTN) for assessing malocclusion in this study highlights its applicability in primary dentition. However, the adaptation of this index for younger children remains a challenge, as it was originally designed for permanent dentition. This classification into normal occlusion and deviations provides a clear framework for identifying various malocclusion patterns, including overjet, overbite, crossbite, and transverse issues.

Out of 371 participants, only 33 (8.9%) exhibited malocclusion, with grade 2 malocclusion being the most common (39.4%), followed by grade 3 (36.4%). These findings align with previous studies, such as those by Abd ElMotaleb et al.^[13] and Alhammadi et al.^[14], which emphasize the prevalence of malocclusion in pediatric populations and the need for early orthodontic intervention.

The current study focuses on a younger (2–6 years) compared to other studies that typically investigate older children or mixed/permanent dentition stages. For example, Khalil et al.^[20] evaluated children aged 9–15 years in Beni-Suef, Egypt, finding a prevalence of Class I malocclusion in 61.4% of the population and Class II in 10.6%. Similarly, Fsifis et al. ^[21] reported a Class I prevalence of 51.5% and a normal occlusion in 25.7% of children in Cairo. These findings indicate a shift in malocclusion types as children age, potentially due to developmental factors or environmental influences.

The study revealed significant variability in the types and grades of malocclusion. Increased overjet (27.3%), crowding (21.2%), and deep overbite (21.2%) were the most prevalent types. Anterior open bite (15.2%) and scissor bite (9.1%) were less common. Similarly, research in Beni-Suef reported a prevalence of 61.4%, with deep bite (49.7%) being the most frequent occlusal abnormality, followed by increased overjet (33.3%) and crowding (29%).^[20] These results highlight the multifactorial etiology of malocclusion, influenced by genetic predisposition, oral habits, and environmental factors such as feeding practices and caries-related tooth loss. The

findings of this study are consistent with a systematic review encompassing 47 studies published between 2010 and 2024. This review found that Africa had the highest rates of anterior open bite, whereas Europe showed the greatest prevalence of posterior crossbite. Furthermore, the Brazilian population displayed notably higher frequencies of both anterior open bite and posterior crossbite relative to other regions.^[22]

Despite the relatively low prevalence of malocclusion in this sample, the findings underscore the importance of early detection. The lack of statistically significant differences in child and family impact across malocclusion types (p>0.05) suggests that even mild cases can influence daily activities, self-esteem, and overall well-being. This aligns with studies such as those by Aldrigui et al. ^[10] and Sousa et al.^[12], which demonstrated the psychosocial and functional impacts of malocclusion on young children and their families.

The Malocclusion Impact Scale for Early Childhood (MIS-EC) revealed that malocclusion had minimal yet noteworthy impacts on OHRQoL. Most parents reported no or low impact on their child's daily life, but higher scores were observed for functional limitations, such as difficulty eating, and psychological impacts, such as self-image concerns. These findings align with the Early Childhood Oral Health Impact Scale (ECOHIS) results in other studies, suggesting that OHRQoL is a critical measure for evaluating the burden of oral conditions in children.

The limited impact observed may reflect parental perceptions, which are often subjective and influenced by cultural or social norms. As noted by Pahel et al. ⁽¹¹⁾, caregivers' awareness and attitudes significantly shape their responses in quality-of-life assessments. Additionally, the relatively small sample size of children with malocclusion (n=33) might have limited the detection of significant differences across malocclusion types and grades.

Study Limitations

While this study provides valuable insights into the prevalence of malocclusion in early childhood and its impact on oral health-related quality of life (OHRQoL), several limitations should be acknowledged:

- 1. Absence of Radiographic or Study Model Analysis The study relied solely on clinical examination. While these methods are useful for basic occlusal assessments, the lack of radiographic imaging or study models may have limited the ability to detect certain occlusal discrepancies, particularly in the transverse dimension and early skeletal malocclusions.
- 2. Cross-Sectional Design As a cross-sectional study, the findings provide only a snapshot of malocclusion prevalence and its impact on OHRQoL at a single point in time. Longitudinal studies would be beneficial in assessing the progression of malocclusion and its long-term effects.
- **3. Potential Parental Reporting Bias** The OHRQoL data were collected through parental questionnaires, which may be subject to bias. Parents may underreport or overreport the impact of malocclusion due to differences in perception, awareness, or cultural factors. Future studies incorporating direct child assessments or observational measures may provide a more comprehensive evaluation.
- 4. Small Number of Malocclusion Cases Despite a total sample of 371 children, only 33 (8.9%) exhibited malocclusion, which may limit the statistical power to detect associations between malocclusion severity and OHRQoL outcomes. A larger study population could yield more robust conclusions.
- Lack of Consideration for Contributing Factors The study does not extensively analyze potential contributing factors to malocclusion,

such as oral habits (thumb sucking, tongue thrusting) or feeding practices. Incorporating these variables in future research could provide deeper insights into causative factors.

CONCLUSION

Our findings indicate that malocclusion, while relatively infrequent in the 2-6 age group, can still have a noticeable effect on daily functioning and psychosocial well-being, even without severe orthodontic conditions. The study shows no gender effect on the frequency and distribution of malocclusion among the study group. The most observed types of malocclusion observed were increased overjet (27.3%), crowding (21.2%), and deep overbite (21.2%); which emphasize the importance of early detection and intervention. Anterior open bite (15.2%) and scissor bite (9.1%)were less common. The presence of malocclusion in this age group highlights the importance of early examination of children to detect any type of malocclusion and plan the right treatment plan and the proper time for early intervention. Thus would be of primordial importance for the patients who would benefit from early orthodontic treatment such as maxillary expansion and orthopedic functional appliances that target skeletal jaw problems and their effects would be optimum in growing patients. Although no statistically significant differences were found in the OHRQoL impact across malocclusion types, the results suggest that even minor malocclusions can affect a child's quality of life. These findings reinforce the need for comprehensive screening programs that focus on early identification and treatment of malocclusion to prevent more serious orthodontic issues in later years. Further research is needed to refine diagnostic criteria for younger children and to investigate the long-term implications of early malocclusion on oral health and psychosocial outcomes.

In conclusion, ensuring timely orthodontic care and raising awareness among parents about

the importance of early dental evaluations can **I** significantly contribute to improve the oral health and overall well-being of preschool-aged children.

RECOMMENDATIONS

- 1. Early Screening and Intervention Programs Routine dental check-ups for children aged 2 to 6 years should include malocclusion screening using standardized indices such as the IOTN. Early identification of malocclusions can facilitate preventive measures, reducing the need for complex orthodontic treatment later.
- 2. Parental Education Awareness campaigns should target parents to highlight the importance of monitoring oral habits and seeking timely dental consultations. Educating parents about the potential long-term consequences of untreated malocclusion can enhance early intervention rates.
- 3. Integration of Pediatric and Orthodontic Care Collaboration between pediatric dentists and orthodontists is essential to ensure comprehensive care for children with malocclusion. Such integration can improve treatment outcomes and enhance patient satisfaction.
- 4. Further ResearchFuture studies should explore the psychosocial and economic impacts of malocclusion on children and families in greater depth. Longitudinal studies are particularly recommended to assess the progression of malocclusions and their broader implications on OHRQoL. Future research should focus on refining diagnostic tools to better address preschool populations' unique needs
- **5. Policy Development** Health authorities should prioritize preventive and interceptive orthodontic care in public health policies. Providing accessible and affordable orthodontic services can significantly improve oral health outcomes at a population level.

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