ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

The Effect of Nutritive and Non-nutritive Sucking Habits on Primary Dentition and Malocclusion-related Quality of Life: A Cross-sectional Study

Besleyici Olan ve Olmayan Emme Alışkanlıklarının Süt Dentisyon ve Maloklüzyon ile İlişkili Yaşam Kalitesi Üzerine Etkisi: Kesitsel Araştırma

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This study was prepared based on the findings of Nihan Çakır's thesis study titled "Besleyici Olan ve Olmayan Emme Alışkanlıklarının Süt Dentisyon ve Maloklüzyon ile İlişkili Yaşam Kalitesi Üzerine Etkisi" (Trabzon: Karadeniz Teknik University; 2024)

ABSTRACT Objective: Early detection of sucking habits, which play a role in oral development, may help mitigate their potential adverse effects on children's quality of life. Evaluate the impact of sucking habits on primary dentition and the quality of life associated with malocclusion in children. **Material and Methods:** This cross-sectional study was carried out among 220 children aged 3-6 years. During intraoral examination, Decayed, Missed, Filled Teeth (DMFT) scores; primary molar and canine relationship; presence/absence of crossbite, midline deviation, overbite and overjet were recorded. The parents were asked to complete a questionnaire that includes information about sucking habit. The Early Childhood Oral Health Impact Scale (ECOHIS) was used to assess the effect of malocclusion on quality of life. Kruskal-Wallis, Mann-Whitney U and chi-square tests were used to analyse the data (statistical significance; p<0.05). **Results:** The pacifier using duration was detected to be associated with the duration of nutritive sucking habits (p<0.001). Feeding style and breastfeeding duration were associated with DMFT scores (p<0.05). Relationships were observed between the duration of pacifier use and both the primary molar plane, primary canine relationships, and overbite (p<0.05). The primary molar plane relationships were associated with the type of pacifier used (p<0.05). The frequency of pacifier usage was found to be related to primary molar plane and canine occlusion (p<0.05). Malocclusion and ECOHIS scores were not associated (p>0.05). **Conclusion:** Nutritive sucking habits were found to be associated with caries scores, and pacifier use was shown to affect primary dentition. These findings suggest the need to raise parental awareness.

Keywords: Breast feeding; pacifier; malocclusion; quality of life; deciduous; tooth; pediatric dentistry

ÖZET Amaç: Oral gelişimde önemli olan emme alışkanlıklarının erken teşhisi, çocukların yaşam kalitesi üzerindeki olumsuz etkilerin önlenmesinde yardımcı olabilir. Emme alışkanlıklarının süt dentisyon ve çocuğun maloklüzyon ile ilişkili yaşam kalitesi üzerindeki etkilerini değerlendirmektir. **Gereç ve Yöntemler:** Kesitsel çalışma, 3-6 yaş arası 220 çocuk arasında gerçekleştirildi. Çocukların ağız içi muayenesi sırasında DMFT skoru, süt 2. molar terminal düzlem ve süt kanin ilişkisi, çapraz kapanış varlığı, orta hat sapması, overbite ve overjet miktarı kaydedildi. Ebeveynlere, emme alışkanlıklarına ilişkin verileri içeren bir anket uygulandı. Maloklüzyonun yaşam kalitesi üzerindeki etkisini değerlendirmek için Erken Çocukluk Çağı Ağız Sağlığı Etki Ölçeği [Early Childhood Oral Health Impact Scale (ECOHIS)] kullanıldı. Analizler Kruskal Wallis, Mann-Whitney U ve ki-kare testleri kullanılarak yapıldı. İstatistiksel anlamlılık düzeyi p<0,05 olarak kabul edildi. **Bulgular:** Emzik kullanma süresinin, besleyici emme alışkanlıklarının süresi ile ilişkili olduğu tespit edildi (p<0,001). Beslenme şekli ve emzirme süresi, DMFT ile ilişkili bulundu (p<0,05). Emzik kullanma süresi ile süt molar düzlem ilişkisi, süt kanin ilişkisi ve overbite arasında bir ilişki gözlemlendi (p<0,05). Süt molar düzlem ilişkisinin kullanılan emzik türü ile ilişkili olduğu tespit edildi (p<0,01). Emzik kullanma sıklığı ile süt molar düzlem ilişkisi ve süt kanin kapanışı ilişkili bulundu (p<0,05). Maloklüzyon ile ECOHIS skorları arasında bir ilişki saptanmadı (p>0,05). **Sonuç:** Çalışmamızda, besleyici emme alışkanlıklarının çürük skorları ile ilişkili olduğu ve emzik kullanımının süt dişlenme üzerine etkileri tespit edilmiş olup; velilerin bu konularda farkındalıklarının artırılması gerekliliği düşünülmektedir.

Anahtar Kelimeler: Emzirme; emzik; maloklüzyon; yaşam kalitesi; geçici; diş; çocuk diş hekimliği

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Sucking is an innate reflex that satisfies an infant's nutritional needs. This behavior is generally classified into 2 categories: nutritive and non-nutritive sucking.[1] Nutritive sucking, such as breastfeeding, plays a significant role in the development of oral motor functions by promoting muscle tone. In contrast, bottle-feeding-another form of nutritive sucking-requires less muscular effort than breastfeeding and consequently exerts a reduced influence on mandibular development.[2,3] Non-nutritive sucking behaviors, including pacifier use and finger sucking, while offering soothing and calming effects for infants, have also been linked to various types of malocclusion as documented in the literature.[2,4] Nevertheless, research findings regarding the association between the type and duration of feeding habits and the development of malocclusion remain inconsistent.[5-8]

Malocclusion, a developmental dental anomaly affecting both primary and permanent dentition, has a multifactorial etiology involving genetic, environmental, or combined factors.[9] Understanding the role of environmental influences-particularly sucking habits-in contributing to or preventing malocclusion may facilitate the development of more effective strategies to enhance children's oral and dental health. Given that the primary dentition serves as the foundation for proper alignment in the permanent dentition, early identification of malocclusion is critical.[10]

Malocclusion can adversely affect children's quality of life by impairing masticatory function, speech development, and facial aesthetics. The aesthetic impact of malocclusion may also lead to psychosocial consequences, such as teasing in school settings.[11] Several assessment tools have been developed to evaluate oral health-related quality of life (OHRQoL) in preschool-aged children, including the Early Childhood Oral Health Impact Scale (ECOHIS), the Parental-Caregiver Perceptions Questionnaire, and the Family Impact Scale.[12] Among these, ECOHIS has been the most widely applied instrument in studies assessing the impact of malocclusion on quality of life.[13-18] The present study aims to investigate the influence of nutritive and non-nutritive sucking habits on primary dentition and malocclusion-related quality of life in children aged 3-6 years.

MATERIAL AND METHODS

The present observational cross-sectional study received approval from the Department of Education and the Ethical Committee of the Dentistry Faculty of Karadeniz Technical University (date: June 19, 2023; no: 2023/17). The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. The required sample size was determined based on the study by Sakaryali et al. which recommended a minimum of 180 children.[16] To account for potential data loss, the final sample size was increased to 220 pediatric participants.

The data for this cross-sectional study was collected from oral examination conducted by the principal investigator and face-to-face interview with the parents of randomly selected children who fulfilled the inclusion criteria at the age of 3-6 years and visited the Pediatric Dentistry Clinic at Karadeniz Technical University Faculty of Dentistry for treatment or check-up purposes between August 2023-March 2024.

Children included in the study had no significant dental anomalies (in number, shape, or size), no systemic or neurological conditions affecting craniofacial development, were cooperative during examination, in the primary dentition stage without erupted permanent teeth, and had parents who were native Turkish speakers. Written informed consent was obtained after explaining the study protocol.

Following intraoral examinations, face-to-face interviews were conducted with parents using a questionnaire adapted from previous studies.[2,5,10,19] The questionnaire form collected sociodemographic data (e.g. child's and mother's age, parental education levels) and information on sucking habits, including infant feeding method, duration of breastfeeding and bottle use, and frequency of pacifier or finger sucking.

To assess the impact of malocclusion on oral health-related quality of life, the ECOHIS was used. This 13-item scale includes child and family impact sections, covering domains such as pain, functional limitations, emotional well-being, parental distress, and family activity disruptions. Each item is scored from 0 (never) to 4 (very often), with "don't know" responses scored as missing. Total scores range from

0-52, with higher scores indicating greater negative impact.

CLINICAL EXAMINATION

Caries experience was assessed using the DMFT index, as defined by the World Health Organization.[20] Occlusal evaluation included primary molar terminal plane, primary canine relationship (right and left), anterior/posterior crossbite, midline deviation, overbite, and overjet.[21] For primary 2nd molars, if a vertical relationship was present on one side and a mesial or distal step on the other, it was classified as a vertical plane. In cases of differing primary canine relationships (e.g. Class I on one side and Class II or III on the other), the relationship was recorded as Class I.[22] Malocclusion was scored as follows: 0 for no deviation, 1 for a single deviation (mild malocclusion), and 2 for multiple deviations (moderate/severe malocclusion).[16]

STATISTICAL ANALYSIS

In the statistical analyses, the SPSS 17.0 statistical software package was used, and the normality of data distribution was assessed with the Kolmogorov-Smirnov test. Descriptive statistics were presented according to data type as frequency (%), or as mean, standard deviation, median, minimum, and maximum values. For statistical comparisons, the Kruskal-Wallis test, Mann-Whitney U test with Bonferroni correction, and chi-square tests (Pearson or Fisher's) were employed. $p < 0.05$ were considered statistically significant.

RESULTS

In total, 108 participants (46.4%) were female and 112 (53.6%) were male. The age distribution showed that 41.4% were aged 36-54 months and 58.6% were 55-72 months. Breastfeeding for more than 12 months was reported in 66.4% of children. While 48.2% were exclusively breastfed, 51.8% received both breastfeeding and bottle-feeding. Bottle use for 6-18 months was noted in 26.4% of participants. Notably, 91% of exclusively breastfed children and 43% of those with mixed feeding were breastfed for over 12 months. Pacifier use was reported in 39.1% of cases, and thumb-sucking in 3.7%.

The mean DMFT score was detected to be 8.20±3.55. A statistically significant relationship was observed between feeding method and DMFT score (p=0.029; p<0.05). A statistically significant relationship was also found between breastfeeding duration and DMFT scores (p=0.033; p<0.05) (DMFT scores were higher in children who were breastfed for more than 12 months) (Table 1).

Clinical examination revealed that the most common terminal plane was the vertical type, while Class I was the predominant primary canine relationship. Malocclusion was present in 77.3% of participants-36.4% had a single deviation and 40.9% had multiple deviations. The most frequent malocclusions were midline deviation and deep bite, whereas anterior crossbite was the least observed (Figure 1 and Figure 2).

A significant association was found between breastfeeding and bottle-feeding durations (p<0.001).

TABLE 1: The correlation between feeding method, duration of breastfeeding and DMFT score

| | DMFT score | | |
| | (0-7) | (8-15) | |
Duration of breastfeedig	n %	n %	p value
0-6 months	23 (52.3)	21 (47.7)	
6-12 months	14 (46.7)	16 (53.3)	0.033*
>12 months	47 (32.2)	99 (67.8)	
Feeding method			
Exclusive breastfeeding	33 (30.8)	74 (69.2)	
Breast-feeding and bottle feeding	51 (45.1)	62 (54.9)	0.029*

*p<0.05 Pearson chi-square test
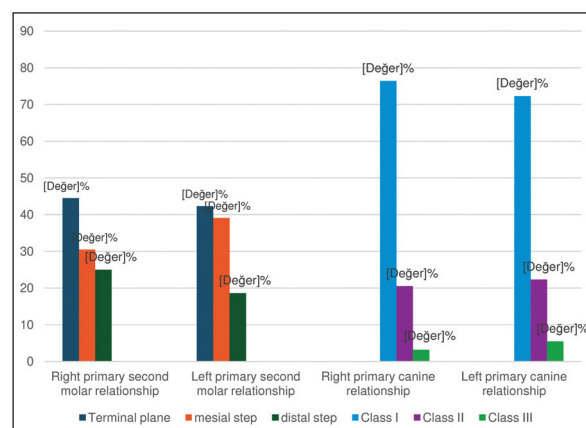
FIGURE 1: The distribution of primary 2nd molar relationship and canine relationship
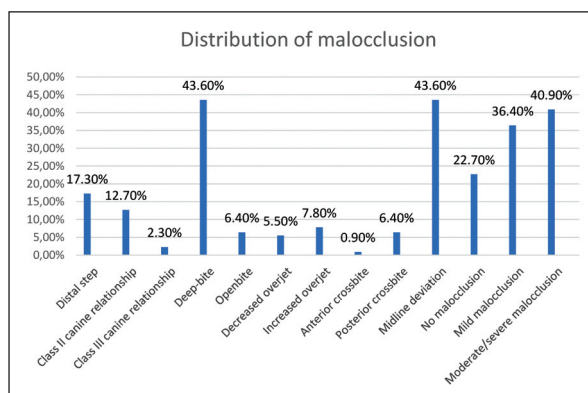
FIGURE 2: The distribution of malocclusion

Children breastfed for over 12 months were about seven times more likely to have never used a bottle compared to those breastfed for less than 6 months (Table 2). The duration of pacifier use was also significantly associated with nutritive sucking habits (p<0.001); children breastfed for less than 6 months had nearly three times higher rates of prolonged pacifier use, and those who used a bottle for more than 18 months had over four times higher rates compared to non-bottle users (Table 3). No significant relation-

ship was found between feeding habits and the presence of malocclusion (p>0.05).

A significant correlation was found between pacifier use and the terminal plane relationship of primary second molars on both sides. Increased pacifier use duration and frequency were associated with a lower prevalence of mesial step and a higher prevalence of distal step relationships (p<0.01). The type of pacifier also showed a significant association: children using orthodontic pacifiers had a higher rate of distal step relationships than those using conventional ones (p<0.01). Additionally, the time of day pacifiers were used affected terminal plane patterns; combined daytime and nighttime use was linked to the highest frequency of distal step, while the lowest was found in children who never used pacifiers (p<0.05) (Table 4).

The primary canine relationship on both the right and left sides was significantly associated with pacifier use duration (p=0.005; p<0.01, p=0.037; p<0.05), frequency (p=0.007; p<0.01, p=0.034; p<0.05), and time of use during the day (p=0.039, p=0.027; p<0.05). Children who used a pacifier for more than

TABLE 2: The relationship between duration of breast-feeding and duration of bottle-feeding					
	Duration of bottle-feeding				
Duration of breast-feeding	Never n (%)	0-6 months n (%)	6-18 months n (%)	>18 months n (%)	p value
0-6 months	4 (9.1)	0 (0)	20 (45.5)	20 (45.5)	
6-12 months	5 (16.7)	0 (0)	12 (40)	13 (43.3)	0.000*
>12 months	97 (66.4)	3 (2.1)	26 (17.8)	20 (13.7)	

*p<0.001 Pearson chi-square test

TABLE 3: The correlation between the duration of nutritive sucking habits and pacifier use duration				
	Pacifier use duration			
	Never n (%)	<1 year n (%)	>1 year n (%)	p value
Duration of breast-feeding				
0-6 months	15 (34.1)	6 (13.6)	23 (52.3)	
6-12 months	14 (46.7)	3 (10)	13 (43.3)	0.000*
>12 months	105 (71.9)	16 (11)	25 (17.1)	
Duration of bottle-feeding				
Never	81 (76.4)	14 (13.2)	11 (10.4)	
0-6 months	3 (100)	0 (0)	0 (0)	0.000*
6-18 months	27 (46.6)	5 (8.6)	26 (44.8)	
>18 months	23 (43.4)	6 (11.3)	24 (45.3)	

*p<0.001 Pearson chi-square test

TABLE 4: The correlation between pacifier use and primary second molar relationship									
		Primary 2nd molar relationship							
		Right				**Left**			
		Flush terminal plane	Mesial step	Distal step		Flush terminal plane	Mesial step	Distal step	
		n (%)	n (%)	n (%)	p value	n (%)	n (%)	n (%)	p value
Duration of pacifier use	Never	67 (50)	45 (33.6)	22 (16.4)	0.007**	56 (41.8)	62 (46.3)	16 (11.9)	0.008**
	<1 year	8 (32)	8 (32)	9 (36)		9 (36)	9 (36)	7 (28)	
	>1 year	23 (37.7)	14 (23)	24 (39.3)		28 (45.9)	15 (24.6)	18 (29.5)	
Frequency of pacifier use	Never	67 (49.3)	46 (33.8)	23 (16.9)	0.007**	57 (41.9)	63 (46.3)	16 (11.8)	0.003**
	Daily	24 (39.3)	16 (26.2)	21 (34.4)		28 (45.9)	17 (27.9)	16 (26.2)	
	Non daily	7 (30.4)	5 (21.7)	11 (47.8)		8 (34.8)	6 (26.1)	9 (39.1)	
Type of pacifier	Orthodontic	16 (32)	13 (26)	21 (42)	0.003**	21 (42)	12 (24)	17 (34)	0.001**
	Conventional	5 (41.7)	6 (50)	1 (8.3)		4 (33.3)	8 (66.7)	0 (0)	
	Both	2 (50)	0 (0)	2 (50)		2 (50)	0 (0)	2 (50)	
	None	67 (50)	45 (33.6)	22 (16.4)		56 (41.8)	62 (46.3)	16 (11.9)	
	Unknown	8 (40)	3 (15)	9 (45)		10 (50)	4 (20)	6 (30)	
The frequency of pacifier use during the day	Daytime	8 (40)	5 (25)	7 (35)	0.045*	11 (55)	4 (20)	5 (25)	0.014*
	Night	4 (36.4)	4 (36.4)	3 (27.3)		3 (27.3)	6 (54.5)	2 (18.2)	
	During sleep	15 (32.6)	12 (26.1)	19 (41.3)		19 (41.3)	13 (28.3)	14 (30.4)	
	Combined	4 (44.4)	1 (11.1)	4 (44.4)		4 (44.4)	1 (11.1)	4 (44.4)	
	Never	67 (50)	45 (33.6)	22 (16.4)		56 (41.8)	62 (46.3)	16 (11.9)	

**p<0.01; *p<0.05 Pearson chi-square test

1 year exhibited a higher prevalence of Class II canine relationship compared to those who never used one. Similarly, daily pacifier users had a lower frequency of Class I and a higher frequency of Class II canine relationship on both sides, relative to non-daily users. Class II canine relationship was most frequently observed when pacifier use occurred during or before sleep.

No significant association was found between the type of pacifier and the canine relationship (p>0.05). However, pacifier use duration was significantly associated with the amount of overbite (p=0.033; p<0.05), with a higher incidence of anterior open bite in children who used a pacifier for over a year compared to non-users. No significant relationships were identified between pacifier type, frequency, or time of use during the day and overbite (p>0.05) (Table 5). Additionally, no significant associations were found between pacifier-related variables and posterior crossbite, midline deviation, or overjet (p>0.05).

The mean ECOHIS score was 5.52±4.87 for the child subscale and 2.85±2.62 for the family subscale,

resulting in a total mean score of 8.37±6.73. Within the child subscale, the highest scores were reported for "pain" (1.37±0.939) and "eating difficulties" (0.93±1.049). In the family subscale, the highest score was observed for the item "family being upset" (1.10±1.121).

Comparison of ECOHIS and DMFT scores according to malocclusion severity showed no statistically significant differences among children without malocclusion, those with mild malocclusion, and those with moderate/severe malocclusion in terms of DMFT scores, child and family subscales, or total ECOHIS scores (Kruskal-Wallis test; p>0.05) (Table 6).

DISCUSSION

This study aimed to evaluate the impact of sucking habits on deciduous dentition and OHRQoL associated with malocclusion. Previous research has frequently reported a negative association between the duration of breastfeeding and pacifier use.[1,2,10,23] Telles et al. found that children who were never breastfed had a significantly higher rate of prolonged

TABLE 5: The correlation between pacifier use and primary canine relationship and overbite

| | | Primary Canine Relationship | | | | | | | | Amount of overbite | | | |
| | | Right | | | | Left | | | | | | | |
		Class I n (%)	Class II n (%)	Class III n (%)	p value	Class I n (%)	Class II n (%)	Class III n (%)	p value	<1/2 n (%)	>1/2 n (%)	Openbiten (%)	p value
Duration of pacifier use	Never	113 (84.3)	18 (13.4)	3 (2.2)	0.005**	106 (79.1)	21 (15.7)	7 (5.2)	0.037*	74 (55.2)	54 (40.3)	6 (4.5)	0.033*
	<1 year	19 (76)	5 (20)	1 (4)		14 (56)	10 (40)	1 (4)		10 (40)	15 (60)	0 (0)	
	>1 year	36 (59)	22 (36.1)	3 (4.9)		39 (63.9)	18 (29.5)	4 (6.6)		26 (42.6)	27 (44.3)	8 (13.1)	
Frequency of pacifier use	Never	114 (83.8)	19 (14)	3 (2.2)	0.007**	107 (78.7)	22 (16.2)	7 (5.1)	0.034*	75 (55.1)	55 (40.4)	6 (4.4)	0.110
	Daily	42 (68.9)	16 (26.2)	3 (4.9)		40 (65.6)	17 (27.9)	4 (6.6)		27 (44.3)	27 (44.3)	7 (11.5)	
	Non daily	12 (52.2)	10 (43.5)	1 (4.3)		12 (52.2)	10 (43.5)	1 (4.3)		8 (34.8)	14 (60.9)	1 (4.3)	
Type of pacifier	Orthodontic	33 (66)	15 (30)	2 (4)	0.310	31 (62)	16 (32)	3 (6)	0.257	19 (38)	26 (52)	5 (10)	0.112
	Conventional	9 (75)	2 (16.7)	1 (8.3)		7 (58.3)	4 (33.3)	1 (8.3)		5 (41.7)	7 (58.3)	0 (0)	
	Both	3 (75)	1 (25)	0 (0)		2 (50)	2 (50)	0 (0)		1 (25)	1 (25)	2 (50)	
	None	113 (84.3)	18 (13.4)	3 (2.2)		106 (79.1)	21 (15.7)	7 (5.2)		74 (55.2)	54 (40.3)	6 (4.5)	
	Unknown	10 (50)	9 (45)	1 (5)		13 (65)	6 (30)	1 (5)		11 (55)	8 (40)	1 (5)	
The frequency of pacifier use during the day	Daytime	14 (70)	5 (25)	1 (5)	0.039*	13 (65)	6 (30)	1 (5)	0.027*	7 (65)	13 (35)	0 (0)	0.153
	Night	6 (54.5)	4 (36.4)	1 (9.1)		6 (54.5)	4 (36.4)	1 (9.1)		5 (45.5)	5 (45.5)	1 (9.1)	
	During sleep	29 (63)	16 (34.8)	1 (2.2)		28 (60.9)	17 (37)	1 (2.2)		21 (45.7)	20 (43.5)	5 (10.9)	
	Combined	6 (66.7)	2 (22.2)	1 (11.1)		6 (66.7)	1 (11.1)	2 (22.2)		3 (33.3)	4 (44.4)	2 (22.2)	
	Never	113 (84.3)	18 (13.4)	3 (2.2)		106 (79.1)	21 (15.7)	7 (5.2)		74 (55.2)	54 (40.3)	6 (4.5)	

*p<0.05; **p<0.01 Pearson chi-square test

pacifier use compared to those breast-fed for 7-12 months, and also reported a correlation between the cessation of bottle-feeding and pacifier discontinuation.[23] Similarly, Moimaz et al. observed that bottle-fed infants were 26 times more likely to be weaned compared to non-bottle users.[1] In line with these findings, our study demonstrated that the duration of nutritive sucking habits significantly influenced pacifier use (p<0.001). Children breastfed for less than 6 months were approximately 3 times more likely to use a pacifier for over 1 year than those breastfed for 12 months or longer. Moreover, bottle use lasting 18 months or more was associated with a fourfold increase in prolonged pacifier use compared to children who had never used a bottle. A significant association was also identified between breastfeeding and bottle-feeding durations (p<0.001), with children breastfed for at least 12 months being more likely to have never used a bottle compared to those breastfed for 6 months or less. These findings support the notion that breastfeeding may reduce non-nutritive sucking behaviors by fulfilling the infant's innate needs for comfort, security, and oral stimulation.[10]

Vasconcelos et al. reported a higher prevalence of anterior open bite in bottle-fed children compared to exclusively breastfed children aged 30-59 months.[24] Conversely, Viggiano et al. found no significant association between feeding method and anterior open bite but reported a significantly lower prevalence of posterior crossbite in breastfed children than in those who were bottle-fed.[4] Similarly, Lopes-Freire and Lin et al. did not observe any significant relationship between feeding methods and different types of maloc-

TABLE 6: The relationship between malocclusion groups and ECOHIS and DMFT score			
	No malocclusion (0)	Mild malocclusion (1)	Moderate/severe malocclusion(2)
	Median (minimum-maximum) $\overline{X}\pm SD$		p value
DMFT	8 (0-14)	8 (0-15)	9 (0-14)	0.318
	7.86±3.207	7.99±3.495	8.57±3.766	
ECOHIS-child	4 (0-19)	4 (0-21)	4 (0-18)	0.545
	5.40±4.150	5.36±4.928	5.72±5.199	
ECOHIS-family	2 (0-11)	2 (0-14)	3 (0-13)	0.494
	2.86±2.466	2.64±2.687	3.04±2.677	
ECOHIS total	7 (0-30)	7 (0-27)	7 (0-29)	0.711
	8.26±5.886	8.00±6.816	8.77±7.134	

Kruskal-Wallis test. ECOHIS: Early Childhood Oral Health Impact Scale

clusion.[5,7] In accordance with these findings, our study also found no significant association between feeding type and the occurrence of malocclusion when comparing exclusively breastfed children with those who were both breastfed and bottle-fed (p>0.05).

In the literature, there are studies identifying a significant correlation between breastfeeding duration and the presence of posterior crossbite and open bite.[2,6,8] However, Lopes-Freire et al. and Warren et al. found no significant effect of breastfeeding duration on any type of malocclusion in their studies.[5,25] Similarly, in our study, no statistically significant relationship was found between breastfeeding duration and any type of malocclusion (p>0.05).

Studies investigating the association between bottle-feeding duration and malocclusion have reported inconsistent findings. Chen et al. observed that bottle-feeding beyond 18 months was linked to a higher prevalence of Class II canine relationships and non-mesial terminal planes.[2] Galán-González et al. reported an association between prolonged bottle use and posterior crossbite.[26] In contrast, Lin et al. and Lopes-Freire et al. found no significant correlation between bottle-feeding duration and malocclusion.[5,7] Consistent with these latter findings, our study also revealed no significant association between bottle-feeding duration and any type of malocclusion (p>0.05).

Ling et al. reported that pacifier use beyond 1 year increased the likelihood of anterior open bite.[10]

Similarly, Adair et al. found that pacifier users had significantly higher rates of distal step molar relationships, Class II canine relationships, posterior crossbite, anterior open bite, and increased overjet compared to non-users.[27] In line with these findings, our study showed that children who used a pacifier for more than 1 year had higher rates of Class II canine relationships, anterior open bite, and distal step molar relationships than those who did not use a pacifier. These variations may be influenced by additional oral habits or differences in pacifier types.[10]

In our study, the relationships of the primary 2nd molars and primary canines were found to be associated with pacifier use frequency. Children who did not use a pacifier daily exhibited higher rates of Class II canine and distal step molar relationships than daily users. A previous study also reported a significant association between daily pacifier use duration and anterior open bite.[19] The differing outcomes in our study may be due to variations in the evaluated parameters, reliance on parental recall for data collection, and inconsistencies in total pacifier usage duration.

Lima et al. reported that conventional pacifier use was associated with a higher rate of severe anterior open bite compared to orthodontic pacifiers.[28] However, a 2016 systematic review found no significant difference between the effects of orthodontic and conventional pacifiers on the stomatognathic system.[29] In our study, pacifier type was significantly associated with the terminal plane relationship of deciduous 2nd molars, with orthodontic pacifier users

exhibiting a higher frequency of distal step molar relationship. Similarly, Adair et al. found that children using orthodontic pacifiers had higher rates of distal step molar and Class II canine relationships than those using conventional pacifiers.[27]

Our study found a correlation between feeding practices and DMFT scores, with exclusively breastfed children showing higher scores than those who were both breastfed and bottle-fed. This contrasts with a meta-analysis reporting lower caries prevalence in breastfed children compared to bottle-fed ones.[30] The discrepancy may be explained by in our sample while 91% of exclusively breastfed as 43% of mixed-fed children were breastfed for over 12 months.

We also observed higher DMFT scores in children breastfed for more than 12 months. Similarly, Dini et al. reported a higher prevalence of caries in children who were breastfed for more than 24 months or not breastfed at all.[31] While some studies in the literature have reported a significant association between malocclusion and dental caries, others have found no such relationship.[32-34] Similarly, our study did not identify a significant correlation between dental caries and malocclusion.

In terms of malocclusion-related quality of life, Sakaryalı et al. reported that mild malocclusion negatively affected only parental quality of life, whereas severe malocclusion impacted both the child and the parent.[16] Similarly, although no statistically significant association was found between malocclusion and ECOHIS scores in our study, children with moderate to severe malocclusion had higher child, family, and total ECOHIS scores than those without malocclusion. Other studies using ECOHIS have also reported that malocclusion does not significantly impair oral health-related quality of life, supporting our findings.[14,15,17]

The discrepancies between our findings and those reported in the literature may be attributed to demographic differences within the study population, variations in the assessment criteria, and differences in the statistical analysis approaches employed. The limitations of our study include the reliance on retrospective data, as information regarding sucking habits was obtained through questionnaires. Additionally, the assessment of the duration and frequency of non-nutritive sucking habits was challenging, as it is not practical for families to monitor their children continuously throughout the day.

CONCLUSION

The findings of our study demonstrate a significant correlation between the duration, frequency, and type of pacifier sucking and malocclusion parameters. However, no significant association was observed between sucking habits and quality of life. These results underscore the importance of informing parents about the potential negative effects of non-nutritive sucking behaviors on occlusion, and emphasizing the necessity of intervening to help children discontinue these habits at an appropriate developmental stage. Moreover, to further elucidate the relationship between malocclusion and quality of life, future research involving larger, more diverse populations is essential to provide a more robust understanding of these factors.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Nihan Çakır; Design: Nihan Çakır, Nagehan Yılmaz; Control/Supervision: Nagehan Yılmaz, Nihan Çakır; Data Collection and/or Processing: Nihan Çakır; Analysis and/or Interpretation: Tamer Tüzüner, Nihan Çakır; Literature Review: Nihan Çakır; Writing the Article: Nihan Çakır; Critical Review: Tamer Tüzüner, Nagehan Yılmaz.

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