

CHARACTERISTICS OF OCCLUSION IN PRIMARY DENTITION AND ITS RELATIONSHIP WITH CARIES IN PRESCHOOL CHILDREN IN AYDIN

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ABSTRACT

Objective: The purpose of this study was to determine the clinical characteristics of occlusion in primary dentition and examine its relationship to caries experience in preschoolers in Aydın, TÜRKİYE.

Materials and Methods: The study was conducted among 962 children aged 3–5 years from preschoolers in a cross-sectional design. The clinical features were evaluated according to Björk et al and the caries examination was carried out with dft index.

Results: The most common type of terminal plane relationship was flush type (46.7%) and primary canine relationship was Class I (69.6%). The most common type of irregularity was the prevalence of deep overbite (55.7%) followed by midline deviation (15.8%). Approximately half of the children (51.2%) had at least one carious tooth but caries experience was not related with any of the occlusal irregularities.

Conclusion: Occlusal characteristics of the preschool children were defined and no relationship was found between these features and gender or caries experience.

Keywords: primary dentition, occlusal features, caries, epidemiology

ÖZET

Amaç: Bu çalışmanın amacı, Aydın TÜRKİYE’de okul öncesi çocuklarda süt dişlenme dönemindeki oklüzyonun klinik özelliklerini ve bunun çürük deneyimi ile ilişkisini belirlemektir.

Materyal ve Metot: Enine kesitsel tasarımdaki bu çalışma planında, okul öncesi dönemdeki 3-5 yaş arası 962 çocuk çalışmaya dahil edildi. Okluzal klinik özellikler Björk ve arkadaşlarına göre değerlendirilmiş ve çürük muayenesi dft indeksi ile yapılmıştır.

Bulgu: En sık görülen terminal düzlem ilişki tipi vertikal tip (%46,7) olarak bulunmuştur. Kanin dişlerinin okluzal ilişkisine bakıldığında en sık Sınıf I (%69,6) kapanış görülmüştür. En yaygın düzensizlik türünün derin overbite (%55,7) olduğu ve bunu orta hat sapmasının (%15,8) takip ettiği bulunmuştur. Çocukların yaklaşık yarısının (%51,2) en az bir dişinde çürük olduğu ancak çürük deneyiminin herhangi bir okluzal düzensizlik ile ilişkili olmadığı belirlenmiştir.

Sonuç: Okul öncesi çocukların okluzal özellikleri tanımlanmış ve bu özellikler ile cinsiyet ve çürük deneyimi arasında herhangi bir ilişki bulunamamıştır.

Anahtar Kelimeler: Süt dişlenme, oklüzyon özellikleri, çürük, epidemiyoloji

INTRODUCTION

Malocclusion is defined as the absence of a normal occlusal relationship when the upper and lower jaws are in centric occlusion. Malocclusion may affect human oral health as much as caries and gingival problems and cause

symptoms, such as inability to chew, impaired speech, and alterations in the development of the jaws (1). Furthermore, the presence of malocclusion in primary dentition may cause psychosocial problems in the future. As it is known that diagnosis and early management of malocclusion in primary dentition may prevent development of

malocclusion in permanent dentition, occlusal features in primary dentition should be carefully analyzed (2). Epidemiological studies play a vital role in determining the extent of health problems, providing the necessary data and, if applicable, creating and analyzing related hypotheses. As a result of these studies, priorities can be determined and health policies can be developed. In different parts of the world, research has been conducted on occlusion in primary dentition among children of different age groups, and different outcomes have been demonstrated among various ethnic groups (3,4). However, there is very limited information about the characteristics of occlusion in primary dentition in Turkish children (5-7). To our knowledge, the relationship of primary malocclusion and caries experience of 3- to 5-year-old children in Türkiye has not been studied previously. The present study aims to evaluate the occlusal features in primary dentition and its relation to caries experience in 3- to 5-year-old children in Aydın, Türkiye.

MATERIALS AND METHODS

This study has been reviewed and approved by the Ethical Committee of Adnan Menderes University, Faculty of Dentistry (2018/039). Written informed consent was obtained from parents for each child. The study has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

Sample selection

This study was planned as a school-based cross-sectional study involving dental examinations of children aged 3-to- 5 years in Aydın province, Türkiye. Permissions from Aydın Governorship Directorate of National Education were obtained before examinations. The city was geographically divided into four regions: north, south, east and west. One district was selected by a simple random method from each region: Efeler for the centrum, Söke for the west, Nazilli for the east and Çine for the south region. Preschools were sampled in proportion to the population of the respective region. Finally, 14 preschools were chosen; where nine of them were public preschools and five were private preschools. The power analysis required a sample size of at least 941 children, with 95% confidence interval. The survey was conducted among 1053 children aged 3- to 5 years old. Ninety-one children who did not match various study criteria were excluded from the study. As a result, 962 children were included in this study. The inclusion criteria were as follows: all primary teeth were erupted and second primary molar teeth were in occlusion. The exclusion criteria were as follows: the presence of permanent teeth, dental agenesis, history of orthodontic treatment, uncooperative children, any known syndrome, craniofacial anomaly or congenital malformation (such as cleft lip/palate).

Intraoral examination

All of the examinations were performed by a single researcher. For the purpose of assessing reproducibility and intra-observer variability, 100 children were re-evaluated at 2-week intervals. Intra-observer reliability as a result of

Cohen's Kappa assessment, the measurements were found to be reliable. The study consisted of oral assessment measurements without radiography, which are based mostly on WHO basic methods for conducting oral health research (8). While the child was sitting upright on the chair, measurements were made with a sterile dental mirror-probe and disposable paper ruler under portable penlight in well-lit rooms with sunlight. Caries experience of the primary dentition was recorded by using dft index. The occlusal characteristics of the children were examined based on the criteria determined by Björk et al. (9).

Sagittal evaluation

The terminal plane relationship of distal surfaces of the second primary molars was evaluated in three groups as flush type, mesial type and distal type (10). The primary canine relationship was evaluated according to the relationship between the tubercle of the upper primary canine tooth and the distal surface of the lower primary canine tooth; and it was recorded as class I, class II, class III (11). The relationship of primary molars and canines were recorded as "asymmetric type" if right and left ones were different. The most protruded maxillary primary incisor was measured from the mesial corner of the palatal surface to the labial surface of the respective mandibular primary incisor. Maxillary overjet measurements were recorded as 0 mm edge-to-edge, 0-3 mm normal, 3-6 mm mild, ≥ 6 mm as increased maxillary overjet. When one or more of the maxillary primary anterior teeth are positioned more palatal than the mandibular primary anterior teeth, they are recorded as mandibular overjet.

Vertical Evaluation

Vertical evaluation is defined as the amount of coverage of mandibular primary incisor of maxillary primary incisor in centric occlusion. Overbite measurements were recorded as $\leq 1/2$ normal, $\geq 1/2$ deep overbite. In addition, children with anterior and posterior open-bite were recorded unilaterally or bilaterally (12).

Transversal Evaluation

When one or more mandibular primary canines or molars were placed buccal to the maxillary primary canines or molars at maximum intercuspation, it was recorded as posterior crossbite. The midline displacement (at least 2 mm) was also recorded. Crowding (anterior and posterior) ≥ 2 mm was recorded. Maxillary and mandibular primate spaces were also recorded, but they were not taken as occlusal regularities.

Statistical Analysis

Statistical Package for Social Science (SPSS) 19.0 (IBM corp.) was used for the analyses. Chi-square test was used to determine the difference between categorical data Kappa analysis was performed to evaluate the reliability of the observer. Type 1 error level = 0.05 was accepted.

RESULTS

A total of 962 children (478 girls and 484 boys) were included in this study. The intra-observer reliability measurements were in excellent agreement (Kappa coefficient score = 1.00). No correlation was found between the pres-

ence of at least one type of malocclusion and gender ($p < 0.05$). The mean age of the participants was 4.3 ± 0.7 (12.9% three years old, 35.0% four years old, and 52.1% five years old children). Table 1 presents occlusal features of the participants.

Table 1: Occlusal characteristics of participants

	Presence		Absence	
	n	%	n	%
Maxillary overjet	44	4.6	918	95.4
Edge to edge	65	6.8	897	93.2
Mandibular overjet	27	2.8	935	97.2
Deep overbite	536	55.7	426	44.3
Anterior open bite	22	2.3	940	97.7
Posterior open bite	6	0.6	956	99.4
Posterior cross bite	47	4.9	915	95.1
Midline displacement	152	15.8	810	84.2
Maxillary crowding	15	1.6	947	98.4
Mandibular crowding	30	3.1	932	96.9
Maxillary primate space	576	59.9	386	40.1
Mandibular primate space	367	38.1	595	61.9

The most common type of irregularity was deep overbite (55.7%), followed by midline displacement (15.8%). The majority of the children showed flush terminal plane (46.7%) in primary second molar relationship. Mesial step and distal step were 29.5% and 14.9% respectively. Asymmetric molar relationship was seen in 8.9% of the participants. The primary canine relationship was found to be 69.6% Class I, 17.9% Class II and 6.3% Class III. In 6.1% of the participants asymmetric canine relationship was observed. Maxillary overjet measurements ≥ 6 mm was found in 4.6% of the children. Edge to edge and mandibular overjet relationship was 6.8% and 2.8% respectively. In 2.3% of the children anterior open bite, and in 4.9% of the children posterior cross bite was recorded. Data showed that 1.6% of the children had maxillary crowding while this ratio was 3.1% in the mandibular teeth. The ratio of primate space presence was 59.9% and 38.1% in maxillary and mandibular jaws respectively. 51.2 of the children (493 child) had at least one decayed tooth (Figure 1). The mean dft index of the participants was 2.7 ± 3.5 . The mean dft was 2.6 ± 3.5 in girls and 2.9 ± 3.6 in boys. There was no significant difference between girls and boys concerning dft indices ($p < 0.05$). No correlation was found between presence of at least one type of malocclusion and caries ($p < 0.05$).

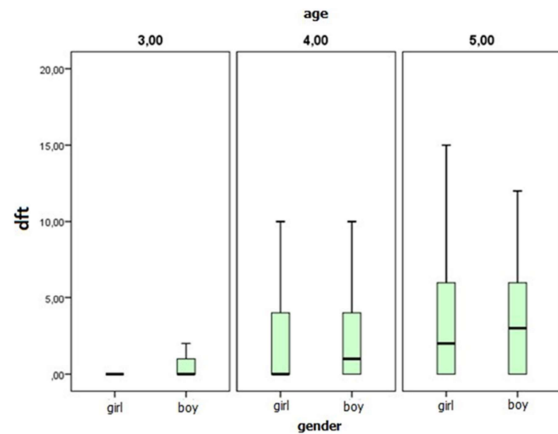


Figure 1: dft index according to age and gender.

DISCUSSION

In recent years there has been a huge increase in the need for orthodontic treatment in children. Since malocclusions in the primary dentition are thought to be a precursor to malocclusions in the permanent dentition, characteristics of occlusion in the primary dentition should be taken into consideration. The key occlusal characteristics change between ethnic groups and countries. There is little information about the occlusal features of 3-to 5-year-old children in Türkiye (5-7), so we aimed to examine the occlusal characteristics of preschool children in Aydın, Türkiye. In primary dentition, it is difficult to differentiate between normal occlusion and malocclusion (13). While planning this study, many studies were examined and it was found that there was no consensus on malocclusion criteria in primary dentition (3). In many recent studies, Björk's malocclusion criteria have been used (7, 12, 14-16). In this study, we also used malocclusion evaluation criteria by Björk et al (9, 12). According to the results of our study, there was no significant difference in any of the malocclusion types by gender. This result is in accordance with most of the similar studies (3, 5, 6, 17). However, in a study conducted in Brazilian preschoolers, Bauman et al (18) reported higher malocclusion in females. When the results of this study were examined, the most common molar relationship was found to be flush terminal plane (46.7%). The second was mesial type occlusion (29.5%) and the least frequent was distal type occlusion (14.9%). These results were consistent with the previous studies in the literature conducted in different countries (3, 14, 17, 20). In studies searching Turkish population, although the most common type of molar relationship was also found as flush terminal plane, Dalcı et al (5) and Yılmaz et al (6) reported the ratio of flush terminal plane as 88.2% and 73.4% respectively. These differences may be due to the different geographical regions where the studies were conducted and differences in sample sizes. In our study the molar terminal plane relationship was found to be asymmetrical in 86 children (8.9%). This ratio was 12% in the Tunisian children (17), 18.8% in the Indian children (20), and 5.03% in the Chinese children (3). The differences

may be attributed to ethnicity or living environment. In our study, the most common primary canine relationship was found to be class I relationship (69,6%). Class III relationship was seen as the least common type. In many studies, these findings are similar (12, 18). Dalcı et al (5) and Yılmaz et al (6) reported the ratio of class I relationship as 81% and 87% respectively. Although Zhang et al (14) also found that the most common type of canine relationship was Class I, different from our study they found the prevalence of Class III relationship higher than the Class II relationship in primary canines. In 6.1% of the participants asymmetric canine relationship was observed in our study; however this prevalence was found much higher as 20% by Davidopoulou et al (21). This may be because of ethnical or environmental differences. In our study, an increased overjet exceeding 6 mm was found in 4.6% of the children. In another study conducted in Türkiye, the average overjet was determined as 2.31 mm, and rate of overjet exceeding 6 mm was 3.96% (7). This rate was found as; 3.2% in Germany (24). The studies conducted in China had different results such as 10.16% (3) , 33.9% (12), 34.99% (15). When the results were evaluated, higher rates in Chinese population may be attributed to the differences in evaluation criteria, as they accepted the overjet exceeding 3mm as increased overjet. Edge-to-edge closure was found 6.8% in this study. A similar result was observed in Shen et al.'s study with 7.84%, however Bhat et al. (4), Zhou et al. (15) and Grabowski et al. (24) reported lower results (0.9%, 2.46%, 2% respectively). The rate of mandibular overjet was 2.8% in our study, which is similar with another study in Türkiye (4.7%) (7). In different countries varying results were reported; 8% in Shanghai (12), 6.8% in Xi'an (15), 0.1% in Faridabad (20), 1% in Saudi children (19), 1.9-3.3% in Germany (24, 27), 5.5% in Nigeria (27), 2.2-6.7% in Brazil (18, 22, 26), 12% (14) in Hong Kong and 15% in Colombia (16). Anterior open-bite was observed in the 2.3% of the participants of our study. This ratio was found to be 10.1% in a study from Ankara (7), 3.36-6.98% in China (3, 15), 7.9-11.4% in Brazil (18, 26) and 11.4-12.9% (24, 27) in Germany. The posterior open bite was found to be 0.6% in our study at a similar rate with the previous study in Ankara (7). Deep overbite was found the most common type of irregularity with 55.7% in our study. Many studies have concluded that the most commonly detected malocclusion is a deep overbite, as in our study (3, 12). While it was found as 63.7% in Shanghai (12) and 37.58% in Xi'an (15), the overall prevalence of China was 33.6% (3). It was reported lower results such in different studies as 33.2% in Germany (24) and 10.8-19.7% in Brazil (18, 26). These differences may be because of the age group included, diagnostic criteria used, the living environment and eating habits. Similar posterior cross-bite ratios were found in our study and another study conducted in Türkiye (7) as 4.9% and 5% respectively. However, in different countries varying ratios were recorded; with 7.2% in Colombian (16), 8.7% in Saudi Arabian (19), 13.1-18.7% in Brazilian (18, 26), 7.2% in German (24), 0.4-0.8% in Indian (4, 20) and 0.3-7.56% in Chinese children (3, 12, 14, 15). The dissimilarity in the rate of cross-bite between countries may be explained

by different eating habits that further affect occlusion development. The midline shift was observed in 15.8% of the participants in our study. There are studies reporting this result as 25.32-26.6% in China (12, 15). Maxillary crowding was found as 1.6% and mandibular crowding as 3.1% in the present study. There are differing results from previous studies. In China, crowding was reported as 6.5% in the maxilla and 3.3% in the mandible (3). However, in India this ratio was 1.7% in the maxilla and 4.6% in the mandible. Total crowding in primary dentition in Germany was found to be 4.6% (27). Primate space was observed more in the maxilla than mandible in our study. This result is similar to many studies (14, 15, 20). Our results reported more primate space in boys than girls. In contrast, the relationship between age and gender in the results of Dalcı et al. is not statistically significant (5). The mean dft index of the participants was 2.7 ± 3.5 and 51.2% of the examined children had caries. There was no significant difference between girls and boys concerning dft indices ($p < 0.05$) and no correlation was found between malocclusion type and caries presence. Singh et al. (30) found that children with decayed teeth in mixed and young permanent dentition were more likely to develop malocclusion. Frazao et al. (31) suggested that the severity of malocclusion was significantly associated with caries, but not with gender or ethnicity. In fact, malocclusion has been accepted as a risk factor for tooth decay due to increased food and plaque accumulation in areas with dental crowding. On the other hand, it is clear that an early tooth extraction due to tooth decay may lead to space loss and malocclusion. However, in our study participants were at an early stage of dentition, so the associated factors may not be attributable to them. The present study indicated the characteristics of occlusion in primary dentition in 3-to- 5-year-old children in just one city in Türkiye, which is one of the limitations of this study. The limited population size may not be attributed to the whole population. Expansion of the study with a larger sample size and including participant from different cities in Türkiye would be beneficial so that the results reflect the general population. Another limitation is that, this is cross sectional study. Further longitudinal studies are needed to determine the effect of primary dentition occlusal features on permanent dentition malocclusions.

CONCLUSION

The present study indicated the characteristics of occlusion in primary dentition in 3- to- 5-year-old children in just one city in Turkey, which is one of the limitations of this study. The limited population size may not be attributed to the whole population. Expansion of the study with a larger sample size and including participant from different cities in Turkey would be beneficial so that the results reflect the general population. Another limitation is that, this is cross sectional study. Further longitudinal studies are needed to determine the effect of primary dentition occlusal features on permanent dentition malocclusions.

Ethics

This study has been reviewed and approved by the Ethical Committee of Aydın Adnan Menderes University, Faculty of Dentistry (protocol no: ADÜDFH2018/039, date: 15.08.2018).

Authorship Contributions

Concept: Z.Ç.Ş., I.Ş., Design: Z.Ç.Ş., I.Ş., Data Collection or Processing: Z.Ç.Ş., Analysis or Interpretation: Z.Ç.Ş., Literature Search: Z.Ç.Ş., I.Ş., Writing: Z.Ç.Ş., I.Ş.

Declaration of competing interest

No conflict of interest was declared by the authors.

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