Occlusion Characteristics of Preschoolers in Chennai: A Cross-sectional Study

X.L. Anitha, BDS, MDS Sharath Asokan, BDS, MDS, PhD

ABSTRACT

Purpose: The purpose of this study was to assess occlusion characteristics of preschool children in Chennai, Tamil Nadu, India, and assess gender differences of various features of the primary dentition occlusion.

Methods: Various occlusion characteristics, such as primary molar relationship, type of spacing in the primary dentition (open or closed), and presence of malocclusion, were evaluated. Data was analyzed using Pearson's chi-square test.

Results: A total of 1,836 3- to 6-year old children participated. Flush terminal plane was the most commonly seen type of primary molar relation (41%). There was no significant difference between genders in relation to primary molar relationships. Open spacing was more common in the maxilla and in males. There was a statistically significant difference between the type of spacing in the primary dentition (open or closed) and flush terminal relationship. Anterior crossbite was seen in approximately 2% of the children, posterior crossbite in 1%, and anterior open bite in 3%.

Conclusion: There was as a low prevalence of asymmetric molar relationship, distal step molar relationship and malocclusions such as anterior crossbite, posterior crossbite and anterior open bite in preschool children in Chennai. (J Dent Child 2013;80 (2):62-6)

Received November 25, 2011; Last Revision April 17, 2012; Revision Accepted April 23, 2012.

KEYWORDS: PRIMARY DENTITION, SPACED DENTITION, CLOSED DENTITION, CROSSBITE, OPEN BITE

In its simplest definition, occlusion is the way the maxillary and mandibular teeth articulate. In reality, dental occlusion is a much more complex relationship because it involves the study of tooth morphology and angulation, muscles of mastication, skeletal structures, temporomandibular joint, and functional jaw movements.[1] On the other hand, the term "malocclusion" defines any tooth or dental arch anomalies that can cause esthetic problems or functional incapacities. Malocclusion is found in all populations, with no reported geographic, ethnic, gender, age or social class predilection.

It is essential for the clinician to understand and recognize the scope of the changes that normally occur in the dentition to be able to diagnose any abnormal development.[1] It is important that conditions predisposing to malocclusion in the permanent dentition be detected early in the primary dentition to enable either prevention or intervention to correct the problem.[2-4] The primary dentition is, therefore, believed to provide the basis for studying occlusion and predicting the occlusion of the permanent dentition.

The purpose of this study was to assess the occlusion characteristics of a group of preschool children from Chennai, Tamil Nadu, India, and assess gender differences of the various features of the primary dentition occlusion.

METHODS

This cross-sectional study was conducted in the Department of Pedodontics and Preventive Dentistry, Meenakshi Ammal Dental College, Chennai, India and approved by the institutional review board of Meenakshi Academy

Dr. Anitha is senior lecturer, Department of Pedodontics and Preventive Dentistry, Kannur Dental College, Kerala, India, and Dr. Asokan is reader, Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research, Tiruchengode, Tamil Nadu, India. Correspond with Dr. Anitha at aniphilo@gmail.com

of Higher Education and Research, Chennai. The study sample consisted of children attending various primary schools in Chennai. Prior to the study, consent to examine the children was obtained from the head of the schools. After their approval, letters explaining the nature of the study and requesting informed consent were sent to the children's parents by the school's principals. The children's age was obtained from school records.

In order to be included in the study, subjects had to be between 3 and 6 years of age, have a complete primary dentition and be regularly attending school. Children were excluded if they had extensive caries, dental anomalies, such as supernumerary teeth and partial anodontia, partially or completely erupted permanent dentition, and a disability or a medical condition.

Examinations were conducted in the respective schools under natural light using a mouth mirror and a cheek retractor. Clinical examinations were performed by a single calibrated examiner (test-retest reliability value=0.8), who was aided by an assistant. Participants and their teachers received instructions related to oral hygiene at the end of the clinical examination.

The following characteristics were recorded during the study:

1. Primate spaces: recorded separately in each arch if space was present mesially to the maxillary canine or distally to the mandibular canine.
2. Physiological spaces: open or closed inderdental spaces.
3. Primary molar relationship:
    a. Flush terminal plane: the distal surfaces of primary maxillary and mandibular second molars lie in the same vertical plane.
    b. Mesial step: The distal surface of the primary mandibular second molar is mesial to that of the primary maxillary second molar.
    c. Distal step: The distal surface of the primary mandibular second molar is distal to the distal surface of the primary maxillary second molar.
4. Presence of anterior or posterior crossbite.
5. Presence of open bite.

Statistical analysis was performed using SPSS 16.0 software (SPSS Inc, Chicago, Ill.) For all statistical tests, a confidence interval of 95% and significance level of 5% ($P<.05$) was adopted. A comparison between the different characteristics and gender differences was done using Pearson's chi-square test.

RESULTS

A total of 2,837 children were available to participate in the study but only 1,836 (mean age=4.15±0.86 years) consented to be examined. The sample consisted of 1,022 males (56%) and 814 were females (44%). Bilateral flush terminal plane was seen in 760 children (41%), mesial step in 691 children (38%), and distal step in 320 children (17%). Unilateral flush terminal plane with distal step was observed in 36 children (2%), whereas unilateral flush terminal plane with mesial step was observed in 29 children (2%). No child had unilateral mesial step and distal step. There was no statistically significant difference between males and females in relation to primary molar relationship ($P>.05$).

In the maxilla, the most common type of spacing was open spacing (72%), followed by primate space and closed contacts (28% each). The most common type of spacing in the mandible was open spacing (62%) followed by closed contacts (38%). Mandibular primate spaces were observed in 18% of the cases. There was a statistically significant difference between the maxilla and mandible regarding the type of primary dentition spacing ($P<.001$; Table 1). The prevalence of spaced dentition in the maxilla was higher that of the mandible. Closed contacts were more commonly seen in the mandible than in the maxilla. Tables 2 and 3 show gender differences based on the type of dentition, which were all statistically significant.

There was a statistically significant difference between the type of primary dentition spacing and flush terminal plane relationship in both arches (Table 4). Open spacing was the most prevalent type of spacing in the

Table 1. Primary Dentition Spacing According to Arch

Type of spacing	Maxilla (%)	Mandible (%)	*P*-value*
Open spaces	72	62	<.001
Closed contacts	28	38	<.001

** P–value was calculated using chi–square test (P≤.05).*

Table 2. Primary Dentition Spacing in the Maxilla According to Gender

Type of spacing	Males (%)	Females (%)	*P*-value*
Primate space	29	25	<.03
Open spacing	47	42	<.05
Closed contacts	24	33	<.001

** P–value was calculated using chi–square test (P≤.05).*

Table 3. Primary Dentition Spacing in the Mandible According to Gender

Type of spacing	Males (%)	Females (%)	*P*-value*
Primate space	20	15	.01
Open spacing	47	41	.008
Closed contacts	33	44	<.001

** P–value was calculated using chi–square test (P≤.05).*

primary dentition with a flush terminal plane relationship in the maxilla and mandible. No statistical significance was observed, however, when comparing the type of primary dentition spacing with mesial and distal step.

Malocclusion was seen in approximately 6% of the children examined, among whom anterior crossbite was seen in 2%, posterior crossbite in 1%, and anterior open bite in 3%. There was no statistically significant difference between males and females regarding the type of malocclusion (P>.05).

DISCUSSION

Flush terminal plane was the most commonly occurring molar relationship in this study, which is in agreement with previous studies.[5-8] There are a few Indian studies supporting these findings. In a study involving 2- to 6-year-old children, Nanda et al.[9] found flush terminal plane in 72% of the population. Alexander and Prabhu[10] showed that flush terminal plane was the most commonly observed molar relation in South Indian children. Clinch[11] stated that, until the permanent first molars erupted, the normal termination of primary dentition was straight. Baume[5] and Pruvost[12] reported, however, that straight and mesial terminal planes were normal. The results of this study, in which a much larger sample was used, confirm their observations. There was no statistically significant difference between males and females regarding primary molar relationships.

Spacing in the primary dentition is considered a common and desirable condition as it is an indicator of a favorable development of permanent occlusion. Leighton[13] indicated that crowding in the primary dentition always resulted in crowding of the permanent dentition. Therefore, individuals with closed contacts between their primary teeth may have crowding in the permanent dentition, which occurs in spite of the surface remodeling accompanying the eruption of the permanent incisors and from Leeway space.

There was a high prevalence of open spaced dentition in this population, which was in agreement with other studies.[7,8,10,14-16] Closed contacts were more commonly seen in the mandible. The results support reports by Kaufman and Koyoumdjisky,[7] Tschill et al.,[14] and El-Nofely et al.,[17] who stated that spacing was more pronounced in the maxilla.

Primate spacing and open spacing were more common in males in both arches (P<.05). Closed contacts were more commonly seen in females, which was statistically significant (P<.001). This was similar to other studies.[17-19] There was a statistically significant difference between the type of spacing in the maxilla and mandible and flush terminal relationship (P=0.001 and P<0.001, respectively). Open spacing was mostly prevalent in primary dentitions with a flush terminal plane relationship in both arches. No statistical significance was observed, however, when comparing the type of primary dentition with mesial step and distal step. Similarly, Mahmoodian et al.[16] evaluated the occlusion and interdental spaces of 4- to 5-year-old children and reported that there was a significant difference between the occlusion of primary molars and maxillary anterior dental spaces (P<.05). However, they found no significant relationship between primary molar occlusion and maxillary and mandibular primate spaces.

The prevalence of malocclusion in the primary dentition varies among populations. These differences may be explained by individual characteristics, such as socioeconomic factors, cultural issues, and study sample sizes. The study design and statistical analysis may also contribute to the discrepancies seen. The prevalence of malocclusion reported in earlier studies ranges from approximately 38%[20] to 76%[21] in the primary dentition. In this study, the presence of anterior crossbite, posterior crossbite, and anterior open bite was approximately 6%. That is much lower than previous studies,[22,23] probably because only the aforementioned types of malocclusion were considered in this study. The prevalence of anterior crossbite found in this sample (2%) is in agreement with other studies.[6,22] The prevalence of posterior crossbite (1%) agreed with the studies done by Rwakatema et al.[22] and Ho et al.,[24] but it was much lower than others.[14,15,18,21,25,26] Posterior crossbites, particularly those with a lateral shift of the mandible, should be treated in the primary dentition, either by occlusal adjustment or by maxillary expansion. Anterior crossbites caused by a forward mandibular shift should also be treated early.

In this study, the most common type of malocclusion was anterior open bite (3%), which was comparable

Table 4. Primary Dentition Spacing and Primary Molar Relationship

Arch	Type of Spacing	Primary Molar Relationship		
		FTP (%)	MS (%)	DS (%)
Maxilla	Open spacing	61	27	39
	Closed contacts	19	34	37
	P-value	.001	<.31	<.81
Mandible	Open spacing	61	26	40
	Closed contact	28	45	48
	P-value*	<.001	>.20	<.34

** P–value was calculated using chi–square test (P≤.05).*

FTP– flush terminal plane; MS– mesial step; DS– distal step.

to some studies, [9,13,15] but less than others.[14,21,26] In most cases, early orthodontic treatment of open bites is not indicated, as they have a tendency for spontaneous correction after cessation of the sucking habit. Tschill et al. [14] stated that the prevalence of open bite decreases with functional maturation and transition to the permanent dentition. These observations suggest that, in most cases, open bites are of dentoalveolar origin and will improve with age.

The prevalence of most of the occlusal characteristics in this study was similar to other populations although there were substantial differences in some traits. Knowledge of oral health conditions is essential for adoption of preventive/interceptive actions that best meet needs and manage risks. This study also attempted to highlight the importance of identifying children who may be in need of orthodontic treatment at a later time, although a longitudinal study may be warranted. The planning and organization of oral health programs and public services should include both prophylactic and health promotion measures directed toward prevention of malocclusions with a multiprofessional and interdisciplinary perspective.

CONCLUSIONS

This study suggests that preschool children in Chennai have fewer tendencies for malocclusion during the primary dentition stage. A low prevalence of asymmetric molar relationship, distal step molar relation and malocclusions such as anterior crossbite, posterior crossbite and anterior open bite was seen in this study.

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