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Original article

Occlusion and occlusal characteristics of the primary dentition in Emirati schoolchildren

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ABSTRACT

Background: *The prevalence of occlusion and various occlusal characteristics differ between populations. Major contributions to these different types of occlusion and occlusal features include ethnic, genetic and environmental factors.* ***Purpose:*** *The objective of the study was to understand the type and prevalence of terminal plane relationships and other occlusal traits, including physiological spacing and primate spacing, in Emirati schoolchildren.* ***Methods:*** *A cross-sectional study was conducted involving 458 participants in the age range of 3–6 years. A clinical evaluation was performed to record other occlusal characteristics. The data was then subjected to statistical analysis.* ***Results:*** *The present study revealed that the bilateral flush terminal plane was seen in 40.8% of the examined children, the bilateral mesial step in 37.3% and the bilateral distal step in 1.7%. It was found that 44.5% of the examined children had physiologic space in both the upper and lower arches, while 14.19% of them had physiologic space only in the upper arch, 2.18% had it only in the lower arch, and 39% of them had no physiologic space. Primate space was found to be present in both the upper and lower arches in 46% of the examined children.* ***Conclusions:*** *The bilateral flush terminal plane relationship was the most common, and the bilateral distal step was the least common of the terminal plane relationships. In addition, primate spacing had a lower prevalence when compared to other studies.*

Keywords: *occlusion; occlusal characteristics; primary dentition; terminal plane relationships*

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INTRODUCTION

Occlusion in dentistry is a term that describes the relationship between the teeth of the upper and lower jaws.[1] Correct dental occlusion plays a very important role in oral functions, including mastication, swallowing, speech and respiration, which greatly affect quality of life.[2–6] In the primary dentition, dental occlusion is usually established by the age of three years; by then, all the deciduous teeth have usually erupted, and this lasts until the age of six years when the first permanent tooth starts to erupt.[2] Occlusal relationship traits vary among different populations depending on multiple factors, including ethnicity, genetics and environment. [1–3,5,6] The status of occlusion in the deciduous dentition acts as a mirror that reveals a prospective picture of the occlusal conditions in the permanent dentition.[2,6] The following are the characteristics of normal occlusion in the primary dentition: spacing between anterior teeth, primate spaces, flush terminal plane molar relations, and ovoid arch forms.[2] Each characteristic has a specific indication for occlusal relationship traits in the permanent dentition. The presence of spacing in deciduous teeth denotes the possible proper alignment of the permanent dentition and the absence of crowding, while canine relationships in permanent teeth can be predicted by evaluating the primate spaces, which are present mesial to the maxillary canines and distal to the mandibular canines in the deciduous dentition.[2,3] The relationship between the distal surfaces of the upper and lower primary second molars is the major predictor of

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the permanent molar relationship, which is categorised into three different types: the flush terminal plane, the mesial step and the distal step.[6,7] Thus, evaluations of occlusal characteristics in the primary dentition play a crucial role in the early detection and prevention of malocclusion development in the permanent dentition.[1,7] The development of malocclusion can be considered a disorder of the craniofacial complex that affects the development of the dental maxillofacial region and the masticatory function, leading to compromised physiological and psychological health.[6]

There is a paucity of literature available with regards to occlusal characteristics in pre-school children in the United Arab Emirates (UAE). The objective of the study was to understand the type and prevalence of terminal plane relationships and other occlusal factors, such as physiological spacing and primate spacing, in Emirati schoolchildren.

MATERIALS AND METHODS

This was a cross-sectional study conducted at Ras Al Khaimah College of Dental Sciences (RAKCODS), Ras Al Khaimah Medical and Health Sciences University (RAKMHSU), Ras Al Khaimah (RAK), the United Arab Emirates (UAE). This research was approved by the Research and Ethics Committee of the university and the RAK Research and Ethics Committee, Ministry of Health (Proposal number: RAKMHSU-REC-108-2018-UG-D). Prior to the commencement of the study, consent forms were provided to the children's parents through the school authorities. The parents were given two weeks' time to return the consent forms. Children whose parents had given their consent were recruited for the study. Children aged between 3 and 6 years were included in the study. Children who had any medical conditions were not included in the study to prevent any bias in the findings. Children with decayed teeth and children with any permanent teeth were excluded from the study. Request letters were sent to the schools, and approvals were received before going to the schools. Eight schools agreed to participate in the study, and they had a total population of 780 children in the selected age group. Considering a margin of error of 5% and a confidence level of 90%, the appropriate sample size was calculated to be 258. However, during the school visits, all the students whose parents had given their consent were examined to cover as much of the population as possible. 458 Emirati children (233 girls and 225 boys) aged 3–6 years were finally included and examined. Their basic demographic data was recorded, and then the data sheet was used to evaluate and record the terminal plane relationships in the selected sample. The observation form was also used to determine the prevalence of physiological and primate spacing in the children's teeth.

A blinded evaluator was responsible for determining the scores. The supervising faculty had trained the evaluator to correctly diagnose and report the findings. The evaluations of the children were completed in 20 days. Each day only 25–30 children were examined to ensure the evaluator was not fatigued, which could otherwise have resulted in unintended mistakes while recording the details. The examination was conducted in optimal natural light with the aid of a mouth mirror, an explorer and a cheek retractor. The occlusal characteristics and terminal plane relationships were assessed with the children in a centric relation position. This position was achieved by requesting each child to close their mouth as they swallowed. This step also allowed the process to be standardised. The prevalence of malocclusion was reported by age and gender and in total. The prevalence rates of the terminal plane relationships and other occlusal characteristics were reported in percentages.

RESULTS

The present study evaluated the occlusal traits of 458 Emirati schoolchildren aged 3–6 years. Most of the children included were aged 4 or 5 years (Figure 1). The study population had 50.9% females and 49.1 % males (Figure 2). We assessed the prevalence of occlusal traits, including terminal plane relationships, physiological spacing, primate spacing and deep bite in the primary dentition. All of these traits are normal occurrences in the

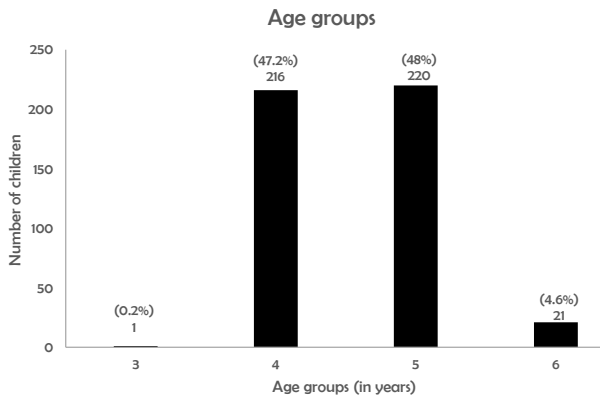

Figure 1. Age groups included in the study.

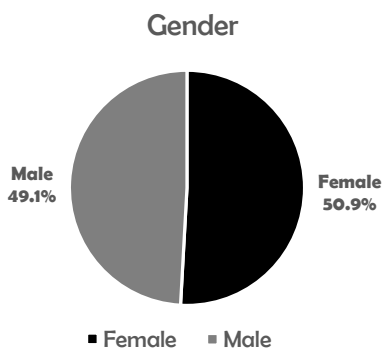

Figure 2. Percentages of children by gender included in the study.

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primary dentition, and their presence suggests possible normal adult occlusion in the future. In terms of the prevalence of terminal plane relationships, the results revealed that the bilateral flush terminal plane was seen in 40.8% of the examined children, the bilateral mesial step in 37.3% and the bilateral distal step in 1.7%. Right flush and left mesial was seen in 14.19%, right mesial and left flush in 4.14%, right distal and left mesial, and right flush and left distal were found to have an equal percentage of 0.7%, followed by right distal and left flush, and right mesial and left distal in 0.21% of the cases (Table 1).

When evaluated, 44.5% of the examined children were found to have physiologic space in both the upper and lower arches, while 14.19% of them had physiologic space only in the upper arch, 2.18% of them had physiologic space only in the lower arch, and 39% of them were found to have no physiologic space (Table 2). Primate space was found to be present in both the upper and lower arches in 46% of the examined children, while it was present only in the upper arch in 27.2% of the cases and only in the lower arch in 1.31% of them. However, 25.3% of the children presented with no primate space in either the upper or lower arch (Table 3). The last trait observed was the prevalence of a deep bite, which was seen in 40.8% of the children and absent in 59.1% of them (Table 4).

Table 1. Prevalence of terminal plane relationships

Code No.	Types of terminal plane relationship	Number of children	Percentage (%)
1	Bilateral distal	8	1.7
2	Bilateral flush	187	40.8
3	Bilateral mesial	171	37.3
4	Right distal, left flush	1	0.2
5	Right distal, left mesial	3	0.7
6	Right flush, left distal	3	0.7
7	Right flush, left mesial	65	14.2
8	Right mesial, left distal	1	0.2
9	Right mesial, left flush	19	4.1

Table 3. Prevalence of primate spacing

Primate spacing	Number of children	Percentage (%)
Absent	116	25.3
Lower	6	1.3
Upper	125	27.3
Upper & Lower	211	46.1

Table 2. Prevalence of physiologic spacing

Physiologic spacing	Number of children	Percentage (%)
Absent	179	39.1
Lower	10	2.2
Upper	65	14.2
Upper & Lower	204	44.5

Table 4. Prevalence of a deep bite

Deep bite	Number of children	Percentage (%)
Absent	271	59.2
Present	187	40.8

DISCUSSION

The dynamic nature of the primary dentition is well-known, and the significance of spacing in this age group cannot be underestimated. The presence of spacing in the primary dentition is a good predictor of a healthy and well-aligned permanent dentition.[8] Early intervention in terms of interceptive treatment is a major role that paediatric dentists play. For this, a thorough understanding of the anteroposterior changes that occur in the occlusion between the primary and the permanent dentition is crucial.[9] As a consequence, it is of paramount importance that any condition in the primary dentition is identified early to prevent a possible malocclusion in the permanent dentition.[10]

In the present study, when terminal plane relationships were evaluated, a 40.8% prevalence of the bilateral flush terminal plane relationship was seen, compared to a 37.3% prevalence of the bilateral mesial step terminal plane relationship and a tiny 1.7% prevalence of the bilateral distal step terminal plane relationship. In a previous study done in northern India, it was found that there was a higher prevalence of the flush terminal plane relationship when compared to the mesial and distal step terminal plane relationships. The results were similar to the present study.[11] Another study done in southern India also reported similar results, with a higher prevalence of the flush terminal plane relationship.[12] However, studies from Jordan and Turkey have revealed a higher prevalence of the mesial step when compared to the flush terminal plane relationship.[13,14] Generally, it is seen throughout various populations that the flush terminal plane has a higher prevalence than the other types of terminal plane relationships, as reflected in the present study.[11,12]

In the present study, when the population was assessed for physiological space, it was seen that 44.5% of the examined children had physiologic space in both the upper and lower arches, while 14.19% of them had physiologic space only in the upper arch, 2.18% had it only in the lower arch, and 39% of them were found to have no physiologic space (Table 2). In studies worldwide, varying results have been reported.[15–18] It has generally been observed that the prevalence of physiological spacing is higher in European children compared to the rest of the world population. The rates reported have ranged from 55% to 98% in European children.[15,16] However, some studies done in parts of Europe have found lower percentages of physiological space.[17,18] In Asian countries like India, the prevalence rates of physiologic space vary from 69% to 85%.[11,19,20] It can be understood that ethnic factors play a significant role in determining the prevalence rates of physiological spacing in the primary dentition within various populations worldwide. In the present study, it was seen that a large percentage of the population (39%) had no spacing present. It is likely that these children will have a definite crowding in their permanent dentition unless there is a timely intervention.

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In the present study, when primate spacing was assessed, it was found to be present in 46% of cases in both the upper and lower arches, while it was present only in the upper arch in 27.2% of cases and only in the lower arch in 1.31% of them. However, 25.3% of the children presented with no primate spacing in either the upper or lower arch. The results of the present study show a lower prevalence of primate spacing when compared to previous studies done worldwide. Studies done in Europe and Asia have reported prevalence rates ranging from 60% to 90%.[21,22] It can be concluded from the present study that the prevalence of the bilateral flush terminal plane relationship was the most common, and the bilateral distal step terminal plane relationship was the least common. The results of the present study also suggest that physiologic spacing and primate spacing have a lower prevalence when compared to populations elsewhere in the world. The results suggest that this population will need regular observation to ensure that the permanent dentition is free of crowding and other types of malocclusion.

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