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Edited by Rashmi Laddha

E-mail: drashmirdaga@gmail.com

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Linking primate and interdental spaces to caries occurrence in primary dentition: A cross-sectional study

Sugandha Sharma*, Shalini Garg & Anil Gupta

Department of Paediatrics & Preventive Dentistry, Faculty of Dental Sciences SGT University, Gurugram, Haryana, India;

*Corresponding author

Affiliation URL:

<https://sgtuniversity.ac.in/>

Author contact:

Sugandha Sharma - E-mail: sugandhasharma333@gmail.com

Shalini Garg - E-mail: garg124@gmail.com
Anil Gupta - E-mail: anilgupta@hotmail.com

Abstract:

Closed primary dentition lacking physiologic or primate spaces creates tight contact points that restrict plaque removal, significantly increasing the risk of proximal dental caries. Therefore, it is of interest to assess the relationship between physiologic and primate spaces and caries occurrence in primary anterior teeth. A cross-sectional study of 100 preschool children aged 3–6 years from six schools assessed interdental and primate spaces and recorded DMFT and DMFS indices. Interdental spaces were present in 61% of children in the maxilla and 36% in the mandible, while primate spaces occurred in 73% and 29%, respectively. Caries occurrence was higher in spaced than non-spaced dentition for interdental spaces, but showed smaller differences for primate spaces in both arches. Caries occurrence was correlated with total DMFT, irrespective of whether the dentition was spaced or non-spaced.

Keywords: Preschool children, primary dentition, dental cavity

Background:

A favorable development of the permanent dentition is indicated by spaced primary dentition. Interdental and Primate Spaces are required to account for the size differences in teeth between primary and permanent dentition and helps in development of occlusion and eventual eruption of permanent teeth [1-3]. There are two categories of spaces in the primary dentition: Interdental space and Primate Space [3, 4] deciduous teeth that lack these spaces may be at a higher risk of developing caries [5, 6]. Therefore, it is of interest to assess the relation of presence or absence of primate and interdental spaces to caries occurrence in primary dentition.

Materials and Methods:

One hundred pre-school children between the age of 3 and 6 years-old were examined in accordance with the inclusion and exclusion criteria (listed below) after ethical clearance. Children underwent a clinical evaluation that included clinical examination to determine the Interdental and Primate spaces. The parent or caregiver of the children provided written informed consent prior to the examination being conducted. Inclusion criteria: Age 3-6 years, Complete Primary Dentition, No Erupted Permanent Teeth. Exclusion criteria: Children with special health care needs. Interdental space is present in the space between the incisors of the upper and lower arches and Primate Spaces are located between the lateral incisors and canines in the upper arch and in the lower arch between the first molars and canines. The DMFT index was recorded to count the caries experience in all teeth. Presence or absence of caries was noted surface-wise in all anterior teeth contributing to interdental and primate spaces.

Results:

Table 1 shows out of total 600 interdental space in maxillary arch spaced dentition was more (334) than non-spaced dentition

(266). Spaced dentition had more caries present (295) and mean total DMFT (2.42) than non- spaced dentition (caries present - 106, mean total DMFT-0.73). Table 1 shows out of total 400 primate space in maxillary arch non- spaced dentition was more (300) than spaced dentition (100). Non-spaced dentition had more caries present (161) than spaced dentition (caries present - 67). Mean total DMFT among spaced dentition (2.94) was more than non-spaced dentition (2.48). Table 2 shows out of total 1000 interdental space in mandibular arch (non- spaced dentition (698) was more than spaced dentition (302)). Spaced dentition had more caries present (58) and mean total DMFT (1.96) than non- spaced dentition (caries present - 44, mean total DMFT- 0.49). Table 2 shows out of total 400 primate space in mandibular arch (non- spaced dentition (284) was more than spaced dentition (116)). Non-spaced dentition had more caries present (118) than spaced dentition (caries present -55). Mean total DMFT among spaced dentition (2.72) was more than non-spaced dentition (2.55). Table 3 shows a positive correlation between total DMFT and caries occurrence in interdental spaces and indicate that the presence of interdental spaces did not prevent the occurrence of caries if high DMFT was present (CC- 0.998). Table 4 shows positive correlation of total DMFT and caries experience in primate spaces and signifies that presence of primate spaces did not prevent occurrence of caries if high DMFT were present (CC- 0.969). Table 5 shows a positive correlation of total DMFT and caries occurrence in non-spaced dentition and signifies that absence of both interdental and primate spaces did not prevent occurrence of caries if high DMFT were present (CC- 0.985). Table 6 shows a positive correlation between total DMFT and caries occurrence in spaced and non-spaced dentition and indicate that the presence or absence of spaces did not prevent the occurrence of caries if high DMFT were present (CC- 0.990).

Table 1: Relationship of caries occurrence with spaced and non-spaced dentition in maxillary arch

Maxillary Arch	Spaced/Non-Spaced Dentition	Caries	N	Mean Total DMFT Of Subject
Interdental Space (N=600)	Spaced (N=334)	Caries Present	295 (88%)	2. 42
	Non Spaced (N=266)	Caries Present	106 (40%)	0. 73
Primate Space (N=400)	Spaced (N=100)	Caries Present	67 (67%)	2. 94
	Non Spaced (N=300)	Caries Present	161 (54%)	2. 48

Table 2: Caries occurrence and mean total DMFT in relation to spaced and non-spaced dentition in the mandibular arch

Mandibular Arch	Spaced And Non-Spaced Dentition	Caries	N	Mean Total DMFT Of Subject
Interdental Space (N=1000)	Spaced (N=302)	Caries Present	58 (19.2%)	1.96
	Non Spaced (N=698)	Caries Present	44 (6.3%)	0.49
Primate Space (N=400)	Spaced (N=116)	Caries Present	55 (47.4%)	2.72
	Non Spaced (N=284)	Caries Present	118 (42%)	2.55

Table 3: Correlation of total DMFT and caries occurrence in interdental spaces

CARIES OCCURRENCE		
DMFT	Pearson Correlation	0.998**
	Sig. (2-tailed)	0
	N	75

Table 4: Correlation of total DMFT and caries occurrence in primate spaces

CARIES OCCURRENCE		
DMFT	Pearson Correlation	0.969**
	Sig. (2-tailed)	0
	N	29

Table 5: Correlation of total DMFT and caries occurrence in absence of interdental and primate spaces (non-spaced dentition)

CARIES OCCURRENCE		
DMFT	Pearson Correlation	0.985**
	Sig. (2-tailed)	0
	N	75

Table 6: Correlation of total DMFT and caries occurrence in spaced and non-spaced dentition

CARIES OCCURRENCE		
DMFT	Pearson Correlation	0.990**
	Sig. (2-tailed)	0.000
	N	75

Discussion:

There has been debate for a long time regarding the importance of closed or spaced dentition in the primary dentition for the eventual development of permanent dentition. Numerous studies have examined preschooler's primary dentition across a range of ethnic backgrounds [7, 8]. In our study males had more Interdental (Maxillary arch-55.4%, Mandibular arch – 57.6%) and primate spaces (Maxillary arch- 64.4%, Mandibular arch – 65.5%) than females. A study showed that spaced dentition was more common than Non-spaced dentition and males had more spacing than females after studying the primary dentition of 100 Gujarati children aged three to six [9]. In our study Interdental spaces were present in 61% of children in maxilla while 36 % of children in mandible. Primate spaces were 73% of children in maxilla and 29% of children in mandible. A study of 525 Nigerian children aged 3 to 4 reported that 32% of the children had generalized anterior segment spacing, 4% had only primate space and 18% had anterior crowding or contact between all of their teeth in both arches [10]. In our study primate space in maxillary arch and mandibular arch was 73% and 29% respectively and space increase upto 4-5 years age then decreased. A study reported that in 90% of Polish children had primate spaces in their upper dental arch and 84% in their lower dental arch [3]. Many studies had reported similar findings for British children, Canadian population, Jordanian children, Egyptian children, Nigerian children [3, 10-13]. Ravn reported that the primate space prevalence in both dental arches was the same, but it was not the same in the maxilla [14]. A study by Cho *et al.* (2020) examined the relationship between caries experience and primary dentition spacing demonstrating the link between

the two. A study found that at the tooth surface level (DMFS) children without spaces had a statistically significant increase the risk of developing carious lesions. The absence of spaces is positively correlated with an increased risk of caries because close tooth contacts help retain plaque and foster an environment that is favorable to the development and spread of caries lesion [5]. Mean DMFT in total sample size was 10.4(N=100). The study shows that the Correlation of total DMFT and Caries Occurrence in Spaced (Interdental CC-.998, Primate CC-.969) and Non- spaced (CC-.985) signifies that the presence or absence of Interdental and Primate spaces did not prevent the occurrence of caries if high DMFT were present and were statistically significant (CC of Spaced & Non spaced-.990). Clinically speaking it highlights how important mechanical cleaning is especially for children whose dentition is closed, which include flossing the proximal contact areas. Various programs are run by government to decrease the prevalence of ECC among 3-6 years old children whether it is spaced or non-spaced dentition. Recent evidence also emphasizes that dental caries in preschool children is influenced by multiple factors, including age, dietary habits, oral hygiene practices, and socioeconomic characteristics. Studies among preschool children have reported a substantial burden of early childhood caries and highlighted the importance of preventive oral healthcare and parental awareness [15, 16]. Protective factors such as regular tooth brushing, fluoridated toothpaste, supervised oral hygiene, and nutritional counselling have also been reported [17]. Furthermore, caries experience in primary teeth has been associated with an increased risk of subsequent caries in permanent teeth, emphasizing the importance of early prevention and management [18].

Conclusion:

The presence of interdental and primate spaces was not sufficient to prevent caries occurrence in primary dentition. Caries occurrence showed a strong positive correlation with total DMFT, irrespective of spaced or non-spaced dentition. Overall, caries risk appeared to be more closely associated with the child's total caries experience than with the presence or absence of physiologic spaces.

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