The negative impact of missing primary teeth with the importance of space maintainer among children attending the college of dentistry, hawler medical university in Erbil: Iraq.

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Background and Objectives: Primary teeth play a critical role in the eruption of permanent teeth. Premature tooth loss can cause undesirable tooth movement, resulting in space loss in the permanent teeth. The space maintainer (SM) is a tool-based procedure that is used in both preventive and corrective orthodontics. After a premature tooth loss, space maintainers were introduced to effectively preserve the space. The objective of this study was to examine the impact of primary tooth loss on arch dimensions in children aged 5 to 13 years old, as well as to assess the prevalence of various space maintainers among children attending the pedodontics department at Hawler Medical University's College of Dentistry.

Methods: This was a retrospective study in which data was collected utilizing case sheets from patients who visited the pedodontics department at Hawler Medical University's college of dentistry. The data was collected from September 2020 to May 2021 and consisted of 815 case sheets, with 395 boys and 420 females ranging in age from 5 to 13 for both genders. The number of missing teeth, the site of missing teeth (whether it is from the upper or lower arch), the quadrant of missing teeth, and the types and location of space maintainers that were made for the patients were all recorded as demographic data. Using the SPSS software for statistical analysis by IBM of version 26 in which frequency table and Fisher Exact test was used and the level of significance was set at 0.05.

Results: With a P-value of 0.016, there was a significant difference in missing teeth among different age groups of the sample, with the most missing teeth found among 6-12 year - old. When there was at least one tooth missing or extracted, the most common type of space maintainer was band and loop (0.6 percent of the cases), and there was no significant difference between male and female of the sample (P- value= 0.477). When there was at least one tooth missing or extracted, there was a significant difference between teeth in the upper left side of the dental arch, and the most common type of space maintainer was band and loop (0.6 percent of the cases). According to the results of the study, patients aging 6 to 12 years old were more likely to have space maintainers constructed in lower left side of the dental arch.

Conclusions: The study draws attention to the fact that space maintainers are used in paediatric dentistry as a part of preventive orthodontics. the most common type of space maintainer was band and loop in the age group 6-12 years.

Keywords: Missing Teeth, Space Maintainers, Pediatric Dentistry, Preventive orthodontics.

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Introduction

The primary dentition is critical to a child's growth and development, not only in terms of speech, chewing, appearance, and the prevention of harmful oral habits, but also in the guidance and eruption of permanent teeth. [1] Premature deciduous tooth loss is defined as the loss of primary teeth before their normal term of exfoliation due to dental caries, trauma, periodontal disease, and premature root resorption. This can result in tooth rotation, extrusion of the antagonist's tooth, dental crowding, harmful habits, craniofacial growth disturbances, and successor tooth impaction. In addition, phonetic, psychological, morphological, and functional

issues may arise. Primary molars play an important role in occlusion, phonetics, and psycho-emotional well-being, so they should be maintained in good condition. [2]
Along with caries and periodontal disease, tooth malalignment is regarded as the most serious problem in dentistry. Furthermore, it is linked to a lack of self-confidence as a result of difficulties with speech and normal oral functioning .[3] it is widely believed that prevention is preferable to cure.
Preventive orthodontics is defined as "the action taken at a specific time to preserve the integrity of what appears to be a normal occlusion." Preventive orthodontics is based on the early detection of a potential problem. One of the most difficult challenges in pediatric dentistry is managing space loss caused by the premature loss of primary teeth. Any disruption in the transition from deciduous to permanent dentition results in an occlusion that is neither functionally stable nor aesthetically pleasing. As a result, there is a need to prevent such malocclusions in the early stages to benefit the patient's functional and psychological development. [4]
Space maintenance is concerned with the preservation of space lost due to the early loss of a primary tooth, either through the use of a passive appliance or by regaining the lost space. Depending on the patient's age, the growth and development of the dental arches, and patient compliance, a variety of appliances can be used for space maintenance.[5]
When primary teeth are shed off away early, the need for this procedure becomes even more pressing. As a result, it becomes more or less mandatory to fill this space so that malocclusion does not occur in the future. [6] It is critical to educate the general public about this dental appliance and its benefits for their children's oral health. Parents are solely responsible for detecting and managing this situation, which they can do by taking their child to the dentist as soon as the primary tooth falls out. To accomplish this, it is critical to be aware of the importance of maintaining space between teeth. [7]
Lack of parental knowledge about restoring such primary teeth, as well as lack of knowledge about the consequences of early deciduous tooth loss, may be contributing factors. As a result, this study sheds light on the prevalence of early tooth loss while also emphasizing why specific appliances were chosen. It focuses on comprehending the current state of affairs in the use of space maintainers for children aged 5 to 13 years.
There is a scarcity of studies in the literature assessing the prevalence of different types of space maintainers among children in their mixed dentition phase in the given region. The purpose of this study was to shed light on the use of various space maintainers and their prevalence as a treatment modality to prevent malocclusion or other consequences of early tooth loss in a growing child in Erbil, Iraq.
This study aims to evaluate the percentage of loss of primary teeth in different arch quadrants in 5 to 13 year-old patients attending pedodontics department at College of Dentistry, Hawler Medical University. In addition it will assess the percentage of various space maintainers among children aged 5 to 13 years attending the pedodontics department at the College of Dentistry, Hawler Medical University.
Finally the study motivates community about the importance and function of primary teeth and their effects on the dental health of children in addition to the importance of space maintainers.

METHODS

This is a retrospective study in which data collection was done using the case sheets of patients visiting the pedodontics department at the college of dentistry, Hawler Medical University. The data used was from September 2020 to May 2021 and consisted of 815 case sheets, of which 395 were males and 420 were females, with an age range of 5–13 for both genders.
The inclusion criteria for this study were mainly patients undergoing extraction due to caries, patients between the age group of 5-13 years with no other lesions, medical history and systemic complications, children who received any type of space maintainer, and complete available data were considered.
The following information was recorded for each patient: age, gender, number of missing teeth, the site of missing teeth (whether

it is from the upper or lower arch), the quadrant of missing teeth (upper right, upper left, lower right, or lower left) and the type of space maintainer that was constructed for the patients (band and loop, crown band and loop, Nance appliance, lingual arch appliance or partial denture) in addition to patients without space maintainer.

Statistical analysis

The collected data were statistically analyzed using IBM SPSS software version 26 with the frequency table and Fisher Exact test, and the level of significance was set at 0.01.

RESULTS

There were 815 case sheets, from which 395 (48.5%) male cases and 420 (51.5%) female cases were examined. The data was divided into three age groups, and the age group of 6 -12 had the highest percentage, which was 96.1% of the sample. Table 1 is the frequency table showing the age group and gender of the study sample.

From the analyzed data, it appeared that 578 (70.9%) cases had no missing teeth, while 237 cases had missing teeth, from which 180 cases had at least one tooth missing or extracted, of which 124 (15.2) teeth were in the upper arch and 113 (13.9) teeth were in the lower arch, and most of the missing teeth were in the upper left quadrant. Regarding the types of space maintainers being constructed for the patients, it appeared that the most common one was band and loop space maintainers, which were constructed for 0.6 % of the cases, as shown in table 2.

Regarding the relationship of different types of space maintainers with the parameters of the study, the likelihood ratio test was used as shown in table 3. Accordingly, sex and age group had no significant relationship with the types of space maintainers being constructed, with a p-value of 0.107 and 0.994, respectively.

While assessing the relation between different types of space maintainers and the missing teeth number, the result showed a significant relation with a p-value of $P < 0.001$. It appeared that the most common type of space maintainer was band and loop (0.6 % of the cases) when there was 1 tooth missing or extracted.

Upper and lower arches had significant relationships with the type of space maintainers with a p-value of $P < 0.001$. It turned out that most of the space maintainers were constructed for the lower arch.

The dental arch quadrants showed a significant relationship with the type of space maintainers with a p-value of $P < 0.001$. The analyzed data revealed that most of the space maintainers were constructed for the lower left side of the dental arch.

Moreover, the analyzed data revealed that missing teeth have no significant difference between males and females in the sample (P -value = 0.477), while there was a significant difference in missing teeth among different age groups of the sample, showing that the most missing teeth are present among those aged 6–12 years, with a P-value of 0.016, as shown in tables 4 and 5 respectively.

Table 1: Frequency table of age group and sex of the sample

Frequency table		Number	%
Age group	1-5	19	2.3%
	6-12	783	96.1%
	>12	13	1.6%
Sex	Male	395	48.5%
	Female	420	51.5%

Table 2: Frequency table showing the percentage of missing teeth number (according to arches and different quadrants) and the percentages of different types of space maintainers being constructed.

Frequency table		Number	%
Missing Teeth Number	0	578	70.9%
	1	180	22.1%
	2	51	6.3%
	3	5	0.6%
	4	1	0.1%
Arches	Upper arch	124	15.2%
	Lower arch	113	13.9%
	No Missing	578	70.9%
Quadrants	Upper Right	56	6.9%
	Upper Left	68	8.3%
	Lower Left	62	7.6%
	Lower Right	51	6.3%
	No Missing	578	70.9%
Types of Space Maintainer	No space maintainer	806	98.9%
	Band and loop	5	0.6%
	Crown and loop	0	0.0%
	Nance appliance	0	0.0%
	Lingual arch appliance	3	0.4%
	Partial denture	1	0.1%

Table 3: The relation of Type of space Maintainers with different parameters using the Fisher Exact test

		Type of Space Maintainers												Fisher Exact test (p-value)
Parameter		No space maintainers		Band and loop		Crown and loop		Nance appli-ance		Lingual arch appliance		Partial denture		
		N	%	N	%	N	%	N	%	N	%	N	%	0.107
Sex	Male	388	47.6%	3	0.4%	0	0.0%	0	0.0%	3	0.4%	1	0.1%	
	Female	418	51.3%	2	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0.994
Age Group	1-5	19	2.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
	6-12	774	95.0%	5	0.6%	0	0.0%	0	0.0%	3	0.4%	1	0.1%	
	>12	13	1.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
Missing Teeth Number	0	578	70.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
	1	174	21.3%	5	0.6%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	
	2	48	5.9%	0	0.0%	0	0.0%	0	0.0%	3	0.4%	0	0.0%	P<0.001**
	3	5	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
	4	1	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
Arches	Upper	121	14.8%	2	0.2%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	
	Lower	107	13.1%	3	0.4%	0	0.0%	0	0.0%	3	0.4%	0	0.0%	P<0.001**
Quadrants	UR	55	6.7%	1	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	
	UL	66	8.1%	1	0.1%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	
	LL	57	7.0%	3	0.4%	0	0.0%	0	0.0%	2	0.2%	0	0.0%	P<0.001**
	LR	50	6.1%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	0	0.0%	

Table 4: Occurrence of missing teeth between male and female of the sample

		Sex				p-value*
		Male		Female		
		Number	%	Number	%	
Missing Teeth Number	0	285	35.0%	293	36.0%	0.477
	1	79	9.7%	101	12.4%	
	2	27	3.3%	24	2.9%	
	3	3	0.4%	2	0.2%	
	4	1	0.1%	0	0.0%	

*Fisher Exact Test

	Age group						P-value*
		1-5		6-12		>12	
		Number	%	Number	%	Number	%	
Missing Teeth	0	18	2.2%	556	68.2%	4	0.5%	0.016**
	1	1	0.1%	171	21.0%	8	1.0%	
	2	0	0.0%	50	6.1%	1	0.1%	
	3	0	0.0%	5	0.6%	0	0.0%	
	4	0	0.0%	1	0.1%	0	0.0%	

*Fisher Exact Test
** Significant at level (p≤ 0.05)

DISCUSSION

Early deciduous tooth loss can cause arch length to shorten, resulting in crowding, rotation, and impaction of the succedaneous teeth. Space management is critical in preventing malocclusions.[8]

In the current study, 815 case sheets were examined, with 395 (48.5%) male cases and 420 (51.5%) female cases. It appeared that 578 (70.9%) cases had no missing teeth, while 180 (22.1%) cases had at least one tooth missing or extracted, with 124 (15.2) teeth in the upper arch and 113 (13.9) teeth in the lower arch, and the majority of the missing teeth were in the upper left quadrant.

In the present study the Sex and age group had no significant relation with the types of space maintainers being constructed with the P value of 0.107 and 0.994 respectively this is coherent with the results of the study conducted by Khurana et al and Cinthura et al. [2, 9] The current study's findings revealed that the age distribution of the study, which age was mainly grouped into three groups like 1-5 years, 6-12 years, and above 12 years old age as they were the stages of primary dentition and mixed dentition respectively, there was a significant difference in missing teeth among different age groups of the sample showing that the most missing teeth were present among 6-12 years of age.

With the P-value of 0.016 and the study showed that the patients of the age group 6-12 years were more prevalent for the space maintainer placement this result was unclosed to the findings seen in the studies conducted by Soni (2017) and Vignesh et al (2020).[10,11]

There was a significant difference in that at least one tooth was missing or extracted, and the teeth were located on the upper left side of the dental arch. In a study by [12] it was discovered that children aged 6 to 12 years in Kurdistan Iraq are more prone to dental caries. That explains why, at this age, there are more missing teeth due to a high prevalence of dental caries and a lack of treatment, resulting in the extraction of these teeth and an increase in the number of cases of space maintainer placement. This could be attributed to the fact that primary teeth may be especially important for initial mutans streptococci colonization because they emerge into the oral cavity between 16 and 29 months of age and have both fissured occlusal surfaces "window of infectivity." and the morphological variation of posterior teeth, brush accessibility and dexterity, increased consumption of sweets, and genetic pattern[13] or the diverse dietary patterns make children more vulnerable to dental caries and result in the premature loss of primary teeth, necessitating the use of space maintainers.

Our study's gender preference is consistent with the findings of many other studies in that males were more prevalent than females for space maintainer placement, though this difference was not statistically significant.[14, 11,8] This could be due to dietary differences, geographical differences, cultural differences, racial differences, or sampling differences. All previous studies have consistently stated that the band and loop (0.6 percent of the cases) was the most common type of space maintainer when one tooth was missing or extracted [15,14,9,16] Supporting the findings of this study. This could be because the band and loop are simple to make, restore the occlusion, and require little chair time to prepare and place. Upper and lower arches had a significant relationship with the type of space maintainers in the current study, with a p-value of P 0.001.

The majority of the space maintainers were built for the lower left side of the dental arch. and This could be due to greater plaque accumulation and food packing potential in the mandibular posterior region, as opposed to the relative abundance of saliva, which leads to more missing teeth and more space maintainers.

CONCLUSION

The current study's findings revealed that there was a significant difference in missing teeth among different age groups of the sample showing that the most missing teeth were present among 6-12 years of age. Upper and lower arches had a significant relationship with the type of space maintainers in the current study, with a p-value of P 0.001. The majority of the space maintainers were built for the lower left side of the dental arch. That explains why, at this age, there are more missing teeth due to a high prevalence of dental caries and a lack of treatment, resulting in the extraction of these teeth and an increase in the number of cases of space maintainer placement. All previous studies have consistently stated that the band and loop was the most common type of space maintainer when one tooth was missing or extracted. To sum up, raising public awareness regarding the importance of maintaining and caring for primary teeth during mixed dentition is highly required.

Conflict of interest

The author reported no conflict of interests.

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