Prevalence on the Early Loss of Primary Molars and Indication for Space Maintainers

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ABSTRACT

The Aim of study was to investigate the prevalence of early loss of primary molar teeth and the need for different types of space maintainers in children in the Dravidian population. In this study 3000 Dravidian children between 3 and 10 years of age were examined for early loss of primary molars and the type of space maintainer indicated. The data were obtained from a patient management software and the data were analyzed using Chi-square test. The results indicated that prevalence of early primary molar loss was 32.1% from 3000 children examined with mean age of 7.8 ± 1.7 years with predominance of maxillary first molar (312 teeth) followed by mandibular first molar (298 teeth). Band and loop space maintainer was indicated in 536 children followed by lingual arch space maintainer in 66 children. Conclusion: Based on the findings of this study, the prevalence of early loss of primary molar is 32.1% with predominance of primary maxillary first molar and the commonly indicated space maintainer is band and loop. Clinical significance: Premature loss of the primary dentition is related to several morpho functional problems, and the utilization of space maintainers may help in the treatment of such problems.

KEY WORDS: EARLY LOSS, PREVALENCE, PRIMARY TEETH, SPACE MAINTAINER.

INTRODUCTION

The primary dentition plays a significant role in the growth and development of the child, in terms of facial aesthetics, phonation, mastication, prevention of deleterious oral habits, development of the dental arches, guidance and eruption of permanent teeth and also harmony of jaws and muscles of the face. Premature loss of primary tooth, principally the molars, may lead to lack of space in the dental arch, malocclusion and midline discrepancies in the permanent dentition. The reduction in arch length reduces the space required for succeeding teeth and thereby predisposes crowding, rotation or impaction of the permanent teeth. These factors accentuate the importance of maintaining them until the normal time of exfoliation (Leite-Cavalcanti et al., 2008; Setia et al., 2013; Christabel and Linda, 2015; Gurunathan and Shanmugaavel, 2016; Jeevanandan, 2017; Lakshmanan et al., 2020).

Dental caries, trauma, or early root resorption are the prevailing sources for premature loss of primary teeth. Traumatic dental injuries to the primary teeth will substantially lead to avulsion, premature exfoliation, or extraction due to any complications or feeble prognosis. Primary tooth root resorption is affected by the environmental, hereditary, nutritional, and endocrine factors whereas the root formation of permanent dentition remained undisturbed. The premature loss of primary molars determines the early eruption of permanent teeth if it occurs in an interval close to its normal exfoliation and delay in the eruption of its successors if it occurs at an interval certainly early to that of its normal exfoliation. This is by reason that at the site of loss there is new bone formation on the dental germ, in addition to fibrosis in the gingival tissue due to the trauma caused by mastication. (Sleichter, 1963; Haralabakis et al., 1994; McDonald; 2004; Leite-Cavalcanti et al., 2008; Ahamed et al., 2012; Holan and Needleman, 2014; Govindaraju and Gurunathan, 2017; Packiri et al., 2017; Govindaraju et al., 2017; Panchal et al., 2019; Lakshmanan et al., 2020; Lakshmanan et al., 2020).

Management of space complications associated with the transitional stages from primary to permanent dentition is

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an integral part of pedodontic practice. The post-extraction site has a space loss in the initial few months, primarily due to the distal movement of the primary canine rather than the mesial movement of permanent molar. The rate and extent of space closure in maxilla that develop due to the movement of the teeth distal to the extraction site in a mesial direction is greater than the mandible in which the closure occurs due to distal movement by the teeth present mesial to the extraction site. The earlier the tooth loss, the greater the possibility for drift. Degree of crowding is directly related to the rate and amount of space loss after primary tooth loss. (Baume, 1950; Avramaki et al., 1998; Ibrahim et al., 1995; Cardoso et al., 2005; Jayachandar et al., 2019; Lakshmanan et al., 2020).

In case of premature loss of a primary tooth, it is crucial to fix a space maintainer in order to avoid detrimental impact on the normal development of occlusion, that can lead to future occlusal discrepancies such as arch shortening, mesial inclination of the first molar and impaction of the second premolar or canines, accompanied by rotation, supraeruption of the antagonistic teeth and impairment of the future periodontal support. (Terlaje and Donly, 2001; Da-Costa et al., 2019; Lakshmanan et al., 2020).

These complications can be prevented or their severity can be alleviated if the dentist performs appropriate planning and utilizes space maintainer during initial treatment in the mixed dentition. Various types of appliances are used as space maintainers, depending on the dental developmental stage, dental arch status, the number, location and type of primary teeth involved and also based on the child's cooperative ability. Previously our team has a rich experience in working on various research projects across multiple disciplines. Now the growing trend in this area motivated us to pursue this project. (Ke et al., 1938; Ramakrishnan et al., 2019; Sharma et al., 2019; Varghese et al., 2019; Venu et al., 2019; Samuel et al., 2019; Mehta et al., 2019; Gheena and Ezhilarasan, 2019; Venu et al., 2019; Vignesh et al., 2019; Malli et al., 2019; Vijayakumar et al., 2019; Sathish and Karthick, 2020; Samuel et al., 2020; Krishnaswamy et al., 2020; Muthukrishnan et al., 2020; Jose et al., 2020).

The purpose of the current study was to investigate the prevalence of early loss of primary molar teeth and the need for space maintainers in Dravidian children between 3 to 10 years of age.

MATERIAL AND METHODS

This cross-sectional study was conducted in a university setting. The ethical clearance was obtained from the Institutional Review Board prior to the start of the study (SDC/SIHEC/2020/DIASDATA/0619-0320). Dental records of 3,000 children who had visited the department for extraction from June 2019 to April 2020 were retrospectively examined by a single examiner. Healthy children aged between 3 to 10 years and only children of Dravidian origin were chosen for the study. The data were collected from an existing patient management software and details obtained from the patient records were as follows: age and gender of the child, type and number of teeth lost and type of space maintainer indicated.

Statistical analysis: The data were tabulated into a spreadsheet (Excel 2017: Microsoft office) and statistical analysis was done using SPSS software 17.0 version (SPSS Inc., Chicago, IL, USA). Descriptive statistics and Chi-square tests were performed to compare the obtained results.

Figure 1: Image represents the correlation of early loss of primary molar teeth and the type of tooth loss, where X-axis denotes the type of teeth and Y-axis denotes the type of tooth loss. Blue denotes unilateral loss and red denotes bilateral loss. Both unilateral loss and bilateral loss were most seen in primary maxillary 1st molar followed by primary mandibular 1st molar and statistically significant difference was obtained on comparing the type of tooth loss and the type of teeth (Chi-square test; P=0.02- statistically significant).

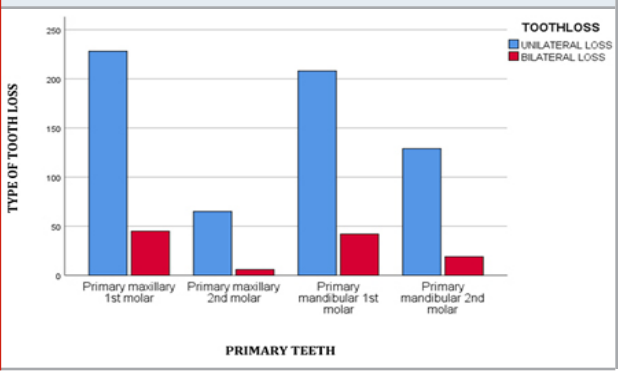
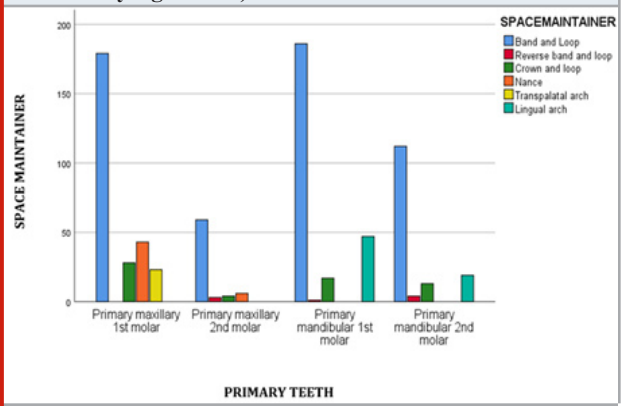


Figure 2: Image represents the correlation of type of space maintainer indicated in relation to the loss of primary molar teeth, where X-axis denotes the type of teeth and Y-axis denotes the type of space maintainer. Blue denotes band and loop, red denotes reverse band and loop, dark green denotes crown and loop, orange denotes nance, yellow denotes transpalatal arch, and light green denotes lingual arch. Band and loop were the most indicated space maintainer in case of early loss of any primary molars which was statistically significant (Chi-square test; P value=0.01- statistically significant).



RESULTS AND DISCUSSION

In this study, the prevalence of early loss of primary molar teeth was 32.1% (963 teeth) from 3,000 children (males- 1520; females- 1480) examined with mean age of 7.8 ± 1.7 years with predominance of primary maxillary first molar (32.4%), followed by primary mandibular first molar (31%), mandibular second molar (24%) and maxillary second molar (12.6%). These differences were statistically significant (P<0.05) (Table 1). Unilateral loss (65%) was observed to be more than the bilateral loss (35%) with statistically significant difference (P<0.05) (Table 2) (Figure 1).

Table 1. Comparison of early loss of primary molar teeth showing a higher prevalence of primary maxillary first molar (32.4%) followed by primary mandibular first molar (31%) and statistically significant difference was noted on comparing all the teeth. (Chi-square test; P-value=0.02- statistically significant).

Primary tooth lost	Number of teeth	Percentage	P value
Primary maxillary 1st molar	312	32.4	0.02
Primary mandibular 1st molar	298	31.0	
Primary mandibular 2nd molar	231	24.0	
Primary maxillary 2nd molar	122	12.6	
Total	963	100	

Table 2. Comparison of location of tooth loss (Unilateral or Bilateral) showing a higher prevalence of unilateral loss (65%) followed by bilateral loss (35%) that was statistically significant. (Chi square test; P=0.02-statistically significant).

Type of tooth loss	No. of cases	Percentage	P value
Unilateral loss	630	65%	0.02
Bilateral loss	112	35%	

Band and loop space maintainer was indicated in 536 children, followed by lingual arch in 66 children. The least indicated space maintainer was the reverse band and loop (8 children). Table 3 shows the types of space maintainers indicated in children and (Figure 2) depicts the distribution of type of space maintainer indicated in relation to the early loss of primary molar teeth. The effect of early loss of primary teeth on the development of the dentition is an element of great interest. The loss of a primary tooth is mediated to be premature when it occurs at least one year earlier its normal exfoliation or after radiographic evidence that the permanent successor is still short of Nolla stage six coronary formation and root formation not yet started. (Terlaje and Donly, 2001; Somasundaram et al., 2015; Jeevanandan and Govindaraju, 2018; Lakshmanan and Gurunathan, 2019).

Table 3. Comparison of different types of space maintainers indicated in relation to the number of children with early loss of primary tooth, where band and loop was indicated in 536 children followed by lingual arch in 66 children. Statistically significant difference was obtained on comparing the types of space maintainers indicated. (Chi-square test; p value=0.01- statistically significant).

Types of space maintainers	No. of Children	P value
Band and loop	536	0.01
Lingual arch	66	
Crown and loop	62	
Nance palatal arch	49	
Transpalatal arch	23	
Reverse band and loop	8	

The premature loss of primary teeth was reported to be responsible for an earlier eruption of permanent successors and intervenes with the harmony of permanent dentition resulting in crowding induced by shifting and / or drifting of teeth toward the extraction space. Furthermore, psychological, morphological, esthetical and functional problems may develop from premature loss of primary teeth. The prevalence of premature loss of primary teeth in children has been previously chartered in a bunch of researches around the world. The current study consisted of screening a total number of 3,000 Dravidian children aged between 3-10 years, of which 1520 were boys (51%) and 1480 were girls (49%) (Saloom, 2005; Ravikumar et al., 2017; Govindaraju et al., 2017).

Since almost an equivalent number of male and female children were chosen for the study the findings of the study are not biased due to gender inaccuracy. Furthermore, the present study being conducted in an ethnically homogeneous community, could act as a reference for understanding the prevalence of early loss of primary teeth in Dravidian population which necessitates the action to be started for the prevention of early childhood caries among children. The children screened were from diverse socioeconomic status so that there is an outright distribution of children attached to various grades of society. It has been endorsed that child belonging to lower socioeconomic status have a higher incidence of dental caries (Sudha et al., 2006; Saravanan et al., 2008; Subramanyam et al., 2018).

Souza et al., 2016 stated that the major etiological component for the early loss of primary teeth was dental caries that were neglected due to socioeconomic problems and lack of knowledge regarding the importance of primary teeth. The possibility of tooth loss should also be considered due to the hypomineralization of the primary molars, since this deformity does not involve only the permanent incisors and molars, but also the primary molars, which may advance the carious lesion and consequently result in the tooth loss

according to the literature. The increased prevalence of early loss of primary teeth in children may be due to the fact that many general dentists prefer to extract a carious primary tooth rather than restoring it, and it could also be attributed to the parent's knowledge and attitude regarding the extraction of primary teeth as they recognize that the teeth will eventually get replaced (Cavalcanti et al., 2008; Da-Costa et al., 2010; Silva et al., 2010; De-Souza et al., 2016; Da-Costa et al., 2019; Jayachandar et al., 2019).

The primary maxillary first molar (32.4%) followed by mandibular first molar (31%) are the most common teeth affected by premature loss, which is in accordance to the studies conducted by Cavalcanti et al.(2015), and Jayachandar et al.(2019), This outcome can be ascribed to the chronologic age of eruption of the first and second primary molars. The primary first molars which erupt earlier, abide in the oral environment for a longer duration and are ultimately more prone to dental caries. Furthermore, as the distal surface of primary second molar guides the erupting permanent first molar to adequately occlude the antagonist, dentists commonly would prefer to restore a primary second molar rather than extracting the tooth. This could be regarded as one of the reasons for increased prevalence of early loss of primary first molars than second molars. (Kobylińska et al., 2015; Cavalcanti et al.,2015; Jayachandar et al., 2019).

Cardoso et al., (2005) reported the prevalence of premature loss of primary molars to be 54.6% in Brazillian children, da Costa et al., reported it to be 4.04% and Ahamed et al., stated the prevalence to be 16.5% in Indian children that contrast with the current study (32.1%). These differences could be attributed to the different sample size and criteria of the studies. One of the enormous challenges in pediatric dentistry is the management of space loss due to untimely loss of primary teeth. Various appliances can be used for maintaining the space based on the patient's age, status of dental arches and ability to cooperate for the treatment (Ahamed et al., 2012; Da-Costa et al., 2019).

The frequently indicated space maintainer in the current study is the band and loop, which is a non-functional fixed space maintainer indicated for non-collaborative patients, in cases where the premature loss is preferably unilateral. Band and loop space maintainer provided satisfactory results in terms of its survival rate, hygienization, cost factor and dentists cited it to be easy in fabrication, installation and removal of the appliance. Whereas the least indicated space maintainer in the present study is the reverse band and loop that is determined in case of premature loss of primary second molar where the support from permanent first molar is not suitable. For the bilateral loss of molars, the commonly indicated space maintainer is lingual arch followed by nance palatal arch and transpalatal arch depending on the clinical condition. (Setia, 2013; Watt et al., 2018; Chandra et al., 2018; Ramakrishnan et al., 2019).

The shortcomings of the present study were, the reason for specific space maintainers were not included and the treatment plan was not decided by a single operator. In future, long-term studies examining the longevity of different types of space maintainers could be carried out. Our institution is passionate about high quality evidence based research and has excelled in various fields (Ramesh et al., 2018; Pcet al., 2018; Vijayashree, 2019; Ezhilarasan et al., 2019; Sridharan et al., 2019; Ramadurai et al., 2019; Mathew et al., 2020). We hope this study adds to this rich legacy.

CONCLUSION

In the light of available evidence, the prevalence of premature loss of primary molar teeth was 32.1% with predominance of primary first molar. Unilateral loss was more prevalent than bilateral loss and the commonly indicated space maintainer was band and loop.

Clinical Significance: Premature loss of the primary dentition is related to several morphofunctional problems, and the utilization of space maintainers may help in the treatment of such problems.

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