Frontiers in Dentistry

Effect of Primary Molar Caries on Caries Development in the Adjacent Permanent First Molars

Ahmad Jafari[1,2,3], Saideh Aslani[4], Mahboobeh Zangooei[4], Hossein Hessari[1,4], Ahmad Reza Shamshiri[1,4], Mojgan Kargar[5], Majid Mehran[6*]

1. Research Center for Caries Prevention, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Pediatric Dentistry, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
3. Department of Pediatric Dentistry, School of Dentistry, Al Hussain University College, Karbala, Iraq
4. Department of Community Oral Health, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
5. Department of Pediatric Dentistry, School of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
6. Department of Pediatric Dentistry, School of Dentistry, Shahed University, Tehran, Iran

Article Info

Article type:
Original Article

Article History:
Received: 20 Feb 2021
Accepted: 24 Jun 2021
Published: 22 Jul 2021

**** Corresponding author:***
Department of Pediatric Dentistry, School of Dentistry, Shahed University, Tehran, Iran

Email: m.mehran@shahed.ac.ir

A B S T R A C T

Objectives: Dental caries is among the most common chronic diseases of the childhood. This study sought to assess the effect of caries experience in primary molars on caries development in the adjacent permanent first molars.

Materials and Methods: This cross-sectional study evaluated 413 students aged 7 and 8 years. Clinical dental examination was performed by two independent examiners using disposable dental instruments and a head light. Dental caries was evaluated using the International Caries Detection and Assessment System (ICDAS) for all four permanent first molars and the decayed, missing, and filled teeth (dmft) index for the primary molars. Data were analyzed using the Pearson's Chi-squared test and Fisher's exact test.

Results: When primary first molars were sound, 22.9% of the permanent first molars of the same quadrant were sound. When primary second molars were sound, 25.7% of the adjacent permanent first molars were sound. A carious primary second molar had a stronger correlation with development of dentin caries in the adjacent permanent first molar than a carious primary first molar (P<0.001).

Conclusion: The current results confirmed that carious primary molars can significantly affect caries development in the adjacent permanent first molars, and a carious primary second molar has a significantly greater effect than a carious primary first molar in this respect. Thus, special attention should be paid to oral hygiene and proper tooth brushing of primary molars, particularly second molars.

Keywords: Oral Health; Public Health; Dental Caries

➢ **Cite this article as:** Jafari A, Saideh Aslani S, Zangooei M, Hessari H, Shamshiri AR, Kargar M, Mehran M. Effect of Primary Molar Caries on Caries Development in the Adjacent Permanent First Molars. *Front Dent*. 2021;18:24.

INTRODUCTION

Dental and gingival health are important parameters determining oral health. Dental caries is among the most common chronic diseases of the childhood. One reason for its high prevalence rate is the failure in early detection of incipient caries. Detection of the extent and progression rate of caries has always been challenging. It is important to detect carious lesions prior to cavitation. Thus, it is imperative to detect the first signs and symptoms of enamel demineralization. Enamel demineralization is

the earliest macroscopic change in the process of caries development, which cannot be normally observed. In order to detect incipient caries, the tooth surface should be completely cleaned and dried. Under such circumstances, white spot lesions can be detected on surfaces, pits, or fissures [1]. As the process of demineralization continues, the white spots become apparent even in presence of saliva. The carious lesion is still reversible in this phase. However, if enamel demineralization continues, a cavity is formed, which necessitates tooth restoration to prevent further progression of caries. Elimination of active caries or its restoration does not necessarily mean eradication of dental caries.

Risk of caries in different individuals can change over time following the variations in factors affecting caries development. New carious lesions can develop adjacent to restorations or on sound tooth surfaces [2,3]. Thus, the International Caries Detection and Assessment System (ICDAS) was introduced for more accurate evaluation of dental caries and to confront the existing challenges in detection of incipient carious lesions [4,5].

The oral health policies should be efficient enough to ideally solve the oral health problems. School-aged children have been the target population for preventive and educational programs for the past two decades. Management of enamel caries by preventive strategies, and promotion of preventive care during the childhood are cost-effective approaches that would lead to prevention or early detection of incipient carious lesions and would therefore eliminate the need for complex restorative treatments. Moreover, people would acquire more knowledge about oral health and preventive care as such. At present, the required instruments and techniques for early detection of caries are available [6,7].

Caries preventive programs are imperative for children to prevent caries development in permanent teeth and assess the progression of caries [8]. Dental caries can affect several teeth of an individual. Caries transfer from the anterior to posterior teeth or from mother to child are among the caries patterns [9,10]. Considering all the above, this study aimed to assess the effect of caries experience in primary molars on caries development in the adjacent permanent first molars. For this purpose, we examined the permanent first molars of 7 and 8-year-old children in Tehran. The caries status of primary molars was evaluated by the decayed, missing, and filled teeth (dmft) index, while caries development in permanent first molars was evaluated using the ICDAS.

MATERIALS AND METHODS

First, the proposal of a comprehensive program including examination, screening, and education of students and their mothers for fluoride varnish therapy was prepared and approved by the ethics committee of Tehran University of Medical Sciences. It was then registered in the Iranian Registry of Clinical Trials (IRCT2013121515806N1). This cross-sectional study evaluated 413 students aged 7 and 8 years. Four elementary schools (2 girl schools and 2 boy schools) were randomly selected. Since the aim of the study was to assess the effect of carious primary molars on caries development in the adjacent permanent first molars, the confounding factors such as the socioeconomic status had to be controlled for. For this purpose, the students were enrolled from downtown area where the community has moderate socioeconomic status in terms of level of income and financial status. A total of 228 boys and 185 girls were examined. After obtaining the required permits from the Ministry of Education, list of all schools in District 11 of Tehran was obtained, and two girl schools and two boy schools were randomly selected from the list. The school administrators were contacted, and the study objectives and the examination protocol were thoroughly explained to them. Next, written informed consent was obtained from the parents for clinical dental examination of their children. Students whose parents consented to their participation in the study were enrolled. The students' verbal consent was also obtained by asking them "do you mind showing me your teeth?"

Two examiners including a pediatric dentist and an oral medicine specialist clinically examined the children and two assistants filled out the checklists. They were all informed about the

study. Prior to the study onset, the examiners were calibrated to ensure adequately high inter- and intra-examiner agreements. For this purpose, they participated in some informatory sessions, and the definitions and the scoring systems of the dmft (for primary teeth) and ICDAS (for permanent first molars), the images related to each code, and the technique of clinical dental examination were explained to them. Next, the examiners participated in a test session, and coded the teeth of several children without consulting each other. They also obtained some images of different stages of caries progression. The disagreements were discussed after the test based on the images. The assistants filled out the forms in the same session to gain the required expertise and skills. In the final session of calibration, the two examiners clinically examined 13 children who all had permanent first molars (a total of 52 teeth), and the correlation coefficient was found to be 92%.

Disposable dental instruments were used for clinical dental examinations. The child and the examiner sat on regular chairs face to face. The child rested his/her head on a head rest. Clinical dental examination was performed under daylight and also a head light. The two examiners performed the clinical examinations, and the results were recorded by the assistants for the four permanent first molars using the ICDAS and for the primary molars using the dmft index [5,10].

Dental caries is a multifactorial microbial disease, characterized by demineralization of the inorganic phase and destruction of the organic phase of the tooth structure. We evaluated dental caries from early white spot lesions and initial enamel decalcifications to deep caries with extensive crown destruction. In the ICDAS coding, a two-digit code is allocated to each tooth. The first digit indicates the presence/absence of restoration or sealant on the respective tooth, and the second digit indicates presence/absence of caries (Tables 1 and 2).

The children were asked to brush their teeth. Also, Q-tips and gauze were used to ensure absence of dental plaque on tooth surfaces during clinical examination. The children were requested to clean their tooth surfaces by a moist gauze prior to clinical examination, if required. Since clinical examination had to be performed on the posterior teeth, they were requested to wrap the gauze around their finger and scrub their posterior teeth similar to tooth brushing. Another gauze was used to dry the respective teeth. After clinical examination, the correct technique of tooth brushing was instructed to children, and the significance of oral hygiene and regular dental visits was emphasized. Also, the examination report of the children was sent to their parents. The collected data were entered into SPSS software. The data were weighed to standardize the number of males and females. Data were analyzed using the Pearson's Chi-squared test and Fisher's exact test.

Conversion of two-digit ICDAS codes to one-digit codes:

For data analysis, the two-digit codes were converted to one-digit codes to show the status of each tooth. For codes with the decimal figures of 1 or 2, the first digit was only entered into the analysis. This was done because codes 1 or 2 show sealant therapy, and sealants are applied on sound teeth. Thus, teeth with fissure sealant restorations were considered sound, and their status was coded as such. For example, teeth with codes 12, 15, and 24 were recorded as 2, 5, and 4.

Two-digit codes with the decimal figure of 3 were coded 3 if their first digit was 0, 1, 2, or 3. If their first digit was 4, 5 or 6, their first digit was included in the analysis. This was done because composite restorations at this age were considered as preventive resin restorations although the tooth could have dentin caries as well. However, the expert panel only considered enamel breakdown to prevent overestimation.

Two-digit codes with a decimal figure of 4 were allocated code 4 if their first digit was 0, 1, 2, 3, or 4. If their first digit was 5 or 6, the first digit was included in the analysis. This was done because amalgam restorations at this age were considered as restoration of dentin caries, although the tooth could have advanced dentin caries (codes 5 and 6). However, the expert panel only considered code 4 for dentin caries to prevent overestimation.

Table 1. International caries detection and assessment system codes and criteria

Code	Tooth Description	Code	Treatment Description
0	Sound tooth surface: No evidence of caries after 5 s of air drying	**0**	No treatment
		1	Sealant, partial
1	First visual change in enamel: Opacity or discoloration (white or brown) is visible at the entrance to the pit or fissure seen after prolonged air drying	**2**	Sealant, full
		3	Tooth-colored restoration, Preventive resin restoration
2	Distinct visual change in enamel visible when wet, lesion must be visible when dry	**4**	Amalgam restoration
		5	Stainless steel crown
3	Localized enamel breakdown (without clinical visual signs of dentinal involvement) seen when wet and after prolonged drying	**6**	Porcelain or gold or PFM crown or veneer
		7	Lost or broken restoration
4	Underlying dark shadow from dentin	**8**	Temporary restoration
5	Distinct cavity with visible dentin	**9**	96 = Tooth surface cannot be examined; Surface excluded 97 = Tooth missing because of caries (tooth surfaces will be coded 97) 98 = Tooth missing for reasons other than caries (all tooth surfaces will be coded 98) 99 = Unerupted (tooth surfaces coded 99)
6	Extensive (more than half the surface) distinct cavity with visible dentin		

If the decimal figure was 5, the code 6 was considered for the tooth because stainless steel crowns at this age were considered as extensive dentin caries. If the decimal figure was 8, code 5 was allocated to the tooth because temporary restoration at this age would translate to restoration of cavitated dentin caries, although extensive dentin caries was another possibility (code 6). However, the expert panel decided to allocate code 5 to dentin caries to prevent overestimation. Code 9 was excluded from the study except for 97 when tooth #6 could not be examined. Code 97 was considered equal to 6.

Definitions:

For primary first molars and primary second molars, the definitions were as follows:

* Sound: Primary teeth without cavitation or visible dentin caries.
* Unsound: Carious teeth. Teeth with a dmft index of 1, which could be carious, restored, or lost due to caries.

The definitions for the permanent first molars were as follows:

* Sound: Teeth with ICDAS code of 0 for all three surfaces of buccal, occlusal and oral.
* Oral surface: Palatal surface of maxillary teeth and lingual surface of mandibular teeth
* Non-destructive decalcifications: Teeth with initial caries without enamel breakdown with maximum ICDAS code of 1 or 2 in one of the buccal, occlusal or oral surfaces
* Caries with enamel breakdown: Teeth with maximum ICDAS code of 3 in one of the buccal, occlusal or oral surfaces
* Caries with dentin destruction: Teeth with maximum ICDAS code of 4, 5 or 6 in one of the buccal, occlusal or oral surfaces

Statistical analysis:

The Pearson's Chi-squared test was used to analyze the correlation between caries experience in primary molars and dentin caries in the adjacent permanent first molars. We used McNemar test to compare the trueness of sound primary second molar

Table 2. Primary tooth status in the dmft index

Code	N	Status	dmft
A	1	Sound	Sound
B	2	Caries	Decayed (d)
C	3	Filled with caries	Decayed (d)
D	4	Filled, no caries	Filled (f)
E	5	Missing due to caries	Missed (m)
F	6	Fissure sealant therapy	Sound
G	7	Crown	filled (f)

versus sound primary first molar for predicting the soundness of permanent first molar of the same side. We once again used this statistical test to compare the trueness of decayed primary second molar versus decayed primary first molar for prediction of caries in the permanent first molar of the same side.

RESULTS

A total of 228 boys and 185 girls aged 7 and 8 years were examined. The dmft index of primary molars revealed that around two-thirds of them had caries experience. The mandibular primary first molars had maximum rate of caries (67%) followed by the mandibular primary second molars (62.5%). The maxillary primary first and second molars had the same status (59.5% and 59%, respectively). Among teeth with caries experience, most of them were still carious. Sound teeth had a significantly lower frequency in the mandible (P=0.007). Table 3 presents further details in this respect.

The buccal, occlusal and oral surfaces of permanent first molars were examined using the ICDAS. Teeth with code 0 in all three surfaces were considered sound.

In both males and females, the frequency of sound permanent first molars was significantly lower in the mandible (P=0.019). Table 4 presents further details in this respect. Final status of the permanent first molars was the maximum code of ICDAS.

The correlation between the caries index of primary molars and the permanent first molars was also analyzed. The results showed that when primary first molars were sound, 22.9% of the permanent first molars in the same quadrant were completely sound while when primary first molars were carious, 12.3% of the permanent first molars of the same quadrant were sound. When primary second molars were sound, the frequency of sound permanent first molars in the same quadrant was 25.7%; while, when primary second molars were carious, the adjacent permanent first molars were sound in 10.3%. Table 5 shows more details in this regard.

The Pearson's Chi-squared test was applied to analyze the correlation between caries experience in primary first molars and dentin caries in the adjacent permanent first molars. When primary first molars were sound, the likelihood of no dentin destruction due to caries (ICDAS code <4) in the adjacent permanent first molars was 92.9%. Also, the likelihood of dentin caries (ICDAS codes 4-6) was 7.1%. However, when primary first molars were carious, the likelihood of no dentin destruction in the adjacent permanent first molars was 90.2%, and the likelihood of dentin caries increased to 90.2%. This difference was close to significant (P=0.07). The Pearson's Chi-squared test was applied to analyze the correlation of caries experience in primary second molars and dentin caries in the adjacent permanent first molars.

Table 3. dmft status (%) of the primary first (D) and second (E) molars of the maxilla and mandibl

Tooth	Jaw	Sound	Caries experience		
			Filled	Decayed	Missing
D	Maxilla	40.5	10.5	37.5	11.5
	Mandible	33	17	39.5	10.5
E	Maxilla	41	11.5	43	4.5
	Mandible	37.5	18.5	38	6

Table 4. Maximum international caries detection and assessment system code status (%) of the permanent first molars of the maxilla and mandible

Gender	Jaw	0	1	2	3	4	5	6
Girls	Maxilla	20.7	19.65	43.55	10.05	4.5	0.85	0.3
	Mandible	18.2	21.1	38.8	13.45	6.1	1.55	0.8
Boys	Maxilla	16.55	20.55	45.1	13.05	3.2	1.35	0.2
	Mandible	14.85	18.55	45.55	14.4	5.55	0.85	0.2

The results showed that when primary second molars were sound, the likelihood of no dentin destruction due to caries (ICDAS<4) in the adjacent permanent first molars was 96.5%, and the likelihood of dentin caries (ICDAS 4-6) was 3.5%. However,_when primary second molars were carious, the likelihood of no dentin destruction in the adjacent permanent first molars decreased to 87.7%, and the likelihood of dentin caries increased to 12.3% (P<0.001). Based on our findings when primary molars were both sound, the likelihood of soundness of the adjacent permanent first molars (no dentin caries) was 95.9%. This rate was 92.2% when only primary first molars or primary second molars were sound, and 88.2% when neither the primary first molar nor the primary second molar were sound.

Table 5. Correlation between the caries index of primary first (D) and second (E) molars and permanent first molars

Side	dmft	Status	International caries detection and assessment system codes N(%)						
			0*	1	2	3	4	5	6
Upper Right	D	Sound	42(26.4)	29(18.2)	63(39.6)	17(10.7)	7(4.4)	1(0.6)	0
		Unsound	31(13.5)	48(21.0)	93(40.6)	39(17.0)	15(6.6)	2(0.9)	1(0.4)
	E	Sound	50(30.3)	29(17.6)	65(39.4)	14(8.5)	6(3.6)	1(0.6)	0
		Unsound	26(11.1)	49(20.9)	96(40.9)	44(18.7)	17(7.2)	2(0.9)	1(0.4)
Upper Left	D	Sound	34(22.2)	32(20.9)	64(41.8)	13(8.5)	6(3.9)	3(2.0)	1(0.7)
		Unsound	35(15.0)	42(18.0)	106(45.5)	31(13.3)	16(6.9)	3(1.3)	0
	E	Sound	43(27.4)	36(22.9)	64(40.8)	9(5.7)	3(1.9)	2(1.3)	0
		Unsound	28(11.7)	40(16.7)	109(45.4)	37(15.4)	21(8.8)	4(1.7)	1(0.4)
Lower Right	D	Sound	29(21.5)	35(25.9)	46(34.1)	13(9.6)	11(8.1)	1(0.7)	0
		Unsound	24(9.0)	40(15.0)	120(45.1)	54(20.3)	23(8.6)	3(1.1)	2(0.8)
	E	Sound	31(20.0)	46(29.7)	58(37.4)	15(9.7)	5(3.2)	0	0
		Unsound	24(9.4)	29(11.4)	110(43.1)	56(22.0)	30(11.8)	4(1.6)	2(0.8)
Lower Left	D	Sound	27(20.8)	29(22.3)	47(36.2)	16(12.3)	8(6.2)	3(2.3)	0
		Unsound	33(12.3)	43(16.0)	109(40.5)	51(19.0)	27(10)	4(1.5)	2(0.7)
	E	Sound	37(24.8)	37(24.8)	56(37.6)	14(9.4)	5(3.4)	0	0
		Unsound	24(9.4)	37(14.5)	100(39.1)	56(21.9)	30(11.7)	7(2.7)	2(0.8)

*Sound

Also, when primary first molar was carious, the risk of caries in the permanent first molar of the same side was 1.38 times; but, it was not significant (95% confidence interval: 0.97-1.96; P=0.07). However, when primary second molar was decayed, the risk of caries in the adjacent permanent first molar was 3.49 times, and, it was significant (95% confidence interval: 2.24-5.44; P<0.001).

DISCUSSION

This study evaluated 228 boys and 185 girls aged 7 and 8 years. Selection of this age group was due to the eruption of permanent first molars at the age of 6. However, not all 6-year-olds have erupted permanent first molars. On the other hand, primary first molars start to exfoliate at the age of 9, and the dmft index can no longer be calculated for them. However, 7 and 8-year-olds are expected to have primary first and second molars and permanent first molars all at the same time.

The current results revealed that carious primary molars affected caries development in the adjacent permanent first molars, and this effect was greater when primary second molars were carious, compared with primary first molars. Stronger correlation of carious primary second molars with carious permanent first molars was probably due to the closer position of the carious lesion and site of food impaction to the permanent first molar when primary second molar is carious.

In order to assess the correlation between the dmft index of primary teeth and ICDAS codes 1-6 for permanent first molars, we assessed the correlation between the presence of caries in primary first and second molars and ICDAS codes ≥4 in the adjacent permanent first molars. The reason was that carious lesions with ICDAS codes 1, 2 and 3 are clinically confined to the enamel, and are not invasive. Thus, they can be prevented by simpler hygienic and preventive measures.

Table 6. Cross tabulation of 'matched primary first (D) and permanent first molar' and 'matched primary second (E) and permanent first molar'

Enamel caries in the permanent first molar (ICDAS*<4)				
		Matched E and 1st molar (%)		
		Sound E with 1st molar ICDAS<4	**Unsound E with 1st molar ICDAS<4**	**Total**
Matched D and 1st molar (%)	**Sound D with 1st molar ICDAS<4**	27.8	9.6	37.4
	Carious D with 1st molar ICDAS<4	13.5	49.1	62.6
	Total	41.3	58.7	100
Caries of permanent first molar with dentin destruction (ICDAS≥4)				
		Matched E and 1st molar (%)		
		Sound E with 1st molar ICDAS≥4	**Unsound E with 1st molar ICDAS≥4**	**Total**
Matched D and 1st molar (%)	**Sound D with 1st molar ICDAS≥4**	12.2	17.3	29.5
	Unsound D with 1st molar ICDAS≥4	2.9	67.6	70.5
	Total	15.1	84.9	100

* International caries detection and assessment system codes

However, when dentin is involved, the carious lesion cannot be prevented and should be restored. The current results revealed a significant correlation between caries experience in primary molars and ICDAS codes 4-6 of the adjacent permanent first molars. This correlation was stronger for carious primary second molars than for carious primary first molars.

In 2005, Leroy et al [11] evaluated the effect of caries experience in primary molars on development of cavitated dental caries in the adjacent permanent first molars, and showed that cavity formation in permanent first molars was significantly affected by the status of the adjacent primary molars, and the role of primary second molars was more prominent in this respect. The same result was obtained in our study. Moreover, we not only assessed cavitated caries of permanent first molars, but also evaluated caries with ICDAS codes 1-3 (prior to dentin destruction), which was not evaluated by Leroy et al [11].

In 2010, Topaloglu-Ak and Eden [12] evaluated the role of carious primary molars in 6 and 7-year-olds as risk indicators for future dental caries in permanent molars. They examined the primary molars at 6 and 7 years of age and examined permanent first molars at 10 and 11 years of age. They found that the dmft of primary first and second molars had a significant correlation with the DMFT of permanent first molars 4 years later. Among the assessed variables, caries experience in primary second molars was the strongest indicator of caries development in permanent first molars.

In a cohort study, Li and Wang [13] evaluated whether caries in primary dentition can predict caries development in permanent dentition. They evaluated 362 children between 3-5 years at the onset of study and followed them up for 8 years. They used the dmft index for primary teeth and the DMFT for permanent teeth, and observed that children with primary caries were 3 times more susceptible to caries development in their primary dentition. Caries in primary molars had the highest predictive effect. The results of Topaloglu-Ak and Eden [12] and Li and Wang [13] were in agreement with our findings. However, our study had the advantage of using the ICDAS to report caries in permanent first molars, which is more accurate than DMFT.

In 2019, Songur et al [14] evaluated the effect of early childhood caries (ECC) on caries development in permanent first molars. They evaluated 90 children between 6 to 9 years who had treated or untreated ECC. Caries development in primary and permanent teeth was reported using the dmft and ICDAS, respectively. They showed that irrespective of treatment or no treatment of ECCs, they significantly affected caries development in permanent first molars, which was in agreement with our findings. The main advantage of our study was evaluation of caries in a larger sample size. Also, 7-8-year-olds were evaluated in our study, which have higher likelihood of having primary molars and permanent first molars all at the same time. In 2015, Srinivasan and Louis [15] evaluated 310 children between 6-11 years to assess the effect of carious primary second molars on the adjacent permanent first molars during the mixed dentition period. They used the dmft index to report caries in primary teeth. Also, they reported the number of involved surfaces in permanent teeth separately for occlusal, distal, mesial, buccal and lingual/ palatal surfaces. In this study, although a paired association was noted between carious primary second molars and carious permanent first molars in many cases, it was not statistically significant. Their results were different from ours, which may be due to the wide age range of children because in a wider age range, carious exfoliated teeth are not included. Thus, we limited the age range of our study population.

In 2017, Doneria et al [16] evaluated the caries status of primary and permanent molars in 7 and 8-year-olds in Shimla using Caries Assessment Spectrum and Treatment index. They studied 301 children and found a poor correlation between carious primary molars and permanent molars. Their results were different from our findings, which may be due to the use of different indices. The Caries Assessment Spectrum and Treatment index is not highly accurate to record carious tooth surfaces.

This study evaluated a large sample (413

children), which increased the accuracy of the results. Also, a pediatric dentist and an oral medicine specialist performed the examinations, which further ensured the accuracy of the collected data. We used the ICDAS, which is a highly accurate index for assessment of caries (presence/absence) in permanent first molars and the effect of carious primary molars in this respect.

CONCLUSION

The current results highlight the significance of soundness of primary teeth particularly primary molars. Further emphasis should be placed on oral health and oral hygiene during primary dentition period with special emphasis on primary molars and particularly primary second molars. When children have carious primary molars, the permanent first molar has high risk of caries, and preventive measures, fluoride therapy and follow-ups should be performed in shorter intervals for such children.

ACKNOWLEDGMENTS

The authors would like to thank Saeid Jafari (data gathering and entering), Mahtab Vahidi (study support), Dean of primary schools, and the parents and students who participated in the study for their sincere cooperation.

CONFLICT OF INTEREST STATEMENT

None declared.

REFERENCES

1. Berg J, Seminario AL. Dental caries: the disease and its clinical management. J Dent Educ. 2009 Apr;73(4):527.
2. Molina-Frechero N, Castañeda-Castaneira E, Marques-Dos-Santos MJ, Soria-Hernández A, Bologna-Molina R. Dental caries and risk factors in adolescents of Ecatepec in the State of Mexico. Rev Invest Clin. 2009 Jul;61(4):300-5.
3. da Silva Tagliaferro EP, Pardi V, Ambrosano GM, de Castro Meneghim M, Pereira AC. An overview of caries risk assessment in 0-18 year-olds over the last ten years (1997-2007). Braz J Oral Sci. 2008;7(27):1682-90.
4. Ekstrand KR, Gimenez T, Ferreira FR, Mendes FM, Braga MM. The International Caries Detection and Assessment System - ICDAS: A systematic review. Caries Res. 2018;52(5):406-19.
5. Pitts NB, Ekstrand KR, ICDAS Foundation. International Caries Detection and Assessment System (ICDAS) and its International Caries Classification and Management System (ICCMS) - methods for staging of the caries process and enabling dentists to manage caries. Community Dent Oral Epidemiol. 2013 Feb;41(1):e41-52.
6. Featherstone JD. Dental caries: a dynamic disease process. Aust Dent J. 2008 Sep;53(3):286-91.
7. Pauli LK, Aarabi G, Kriston L, Jansen A, Heydecke G, Reissmann DR. Clinical instruments and methods for assessing physical oral health: A systematic review. Community Dent Oral Epidemiol. 2017 Aug;45(4):337-47.
8. Alsumait A, ElSalhy M, Amin M. Long-term effects of school-based oral health program on oral health knowledge and practices and oral health-related quality of life. Med Princ Pract. 2015;24(4):362-8.
9. Lin HK, Fang CE, Huang MS, Cheng HC, Huang TW, Chang HT, et al. Effect of maternal use of chewing gums containing xylitol on transmission of mutans streptococci in children: a meta-analysis of randomized controlled trials. Int J Paediatr Dent. 2016 Jan;26(1):35-44.
10. WHO Expert Committee on Biological Standardization. Meeting, World Health Organization. WHO Expert Committee on Biological Standardization: Sixtieth Report. World Health Organization; 2013.
11. Leroy R, Bogaerts K, Lesaffre E, Declerck D. Effect of caries experience in primary molars on cavity formation in the adjacent permanent first molar. Caries Res. 2005 Sep-Oct;39(5):342-9.
12. Topaloglu-Ak A, Eden E. Caries in primary molars of 6–7-year-old Turkish children as risk indicators for future caries development in permanent molars. J Dent Sci 2010 Sep;5(3):150-5.
13. Li Y, Wang W. Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. J Dent Res. 2002 Aug;81(8):561-6.
14. Songur F, Derelioglu SS, Yilmaz S, Koşan Z. Assessing the impact of early childhood caries on the development of first permanent molar decays. Front Public Health. 2019;7:186.
15. Srinivasan D, Louis CJ. Evaluation of caries in deciduous second molar and adjacent permanent molar in mixed dentition. J Pharm Bioallied Sci. 2015 Aug;7(Suppl 2):S572-S5.
16. Doneria D, Thakur S, Singhal P, Chauhan D, Jayam C, Uppal A. Comparative Evaluation of Caries Status in Primary and Permanent Molars in 7-8-year-old Schoolchildren of Shimla Using Caries Assessment Spectrum and Treatment Index. Contemp Clin Dent. 2017 Jan;8(1):128-33.