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Caries Prevalence of the First Permanent Molars and Treatment Needs in Children Aged 7-13 Years in the Western Mediterranean Region of Turkey

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ABSTRACT

Aim: This study aimed to determine the caries prevalence of the first permanent molars and treatment needs in children aged 7-13 years living in the Western Mediterranean Region of Turkey.
Material and Methods: The study included 1912 patients aged between 7 and 13 years who attended to the Pedodontics Clinic for dental reasons and required panoramic radiographs. The number of sound, decayed (D), missing (M), and filled (F) teeth (T) in the first permanent molars of the patients were evaluated. The relationships of these values with gender, age, age groups, and location were analyzed. First permanent molars needing treatment were grouped according to the treatments needed.
Results: The mean age of 1912 patients (977 females, 935 males) was 9.60±1.93 years. The caries prevalence in the first permanent molars was 26.8% and the mean DMFT6 value was 1.53±1.54. There was no difference between mean DMFT6 values and gender ($p>0.05$), but mean DMFT6 values increased statistically significantly with increasing age ($p<0.001$). While the mean D, M, F, and DMF values of the first permanent molars were higher in the mandibular teeth ($p<0.001$), there was no statistically significant difference between the right and left jaws ($p>0.05$). Of the first permanent molars, 19.6% needed single-surface restoration, 2.2% needed two-surface restoration, 0.2% needed ≥three-surface restoration, 4.5% needed endodontic treatment, and 0.4% needed extraction treatment.
Conclusion: To protect first permanent molars from caries, families and children should be made aware of oral care, and preventive practices should be carried out by determining the caries risk status of individuals.

Türkiye'nin Batı Akdeniz Bölgesi'nde 7-13 Yaş Arası Çocukların Daimi Birinci Azı Dişlerinde Çürük Prevalansı ve Tedavi İhtiyaçları

Makale Bilgisi

Makale Geçmişi

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ÖZET

Amaç: Bu çalışma, Türkiye'nin Batı Akdeniz Bölgesi'nde yaşayan 7-13 yaş arası çocukların daimi birinci büyük azı dişlerinde çürük prevalansını ve tedavi ihtiyaçlarını belirlemeyi amaçlamıştır.
Gereç ve Yöntemler: Çalışmamıza, Pedodonti Kliniği'ne dişsel sebeplerden dolayı başvuran ve panoramik radyograf gereksinimi olan yaşları 7-13 arasında değişen 1912 hasta dahil edildi. Hastaların daimi birinci büyük azı dişlerindeki sağlıklı, çürük, çürük nedeniyle çekilmiş, dolgulu diş sayıları değerlendirmeye alındı. Bu değerlerin; cinsiyet, yaş, yaş grupları, lokasyon ile olan ilişkileri incelendi. Tedavi ihtiyacı olan birinci büyük azı dişleri ihtiyaç duyulan tedavilere göre gruplandırıldı.
Bulgular: Çalışma grubunu oluşturan 1912 hastanın (977 kız, 935 erkek) ortalama yaşları 9,60±1,93'dü. Daimi birinci büyük azı dişlerinde çürük prevalansı %26,8, ortalama DMFT6 değeri 1,53±1,54 olarak kaydedildi. Ortalama DMFT6 değerleri ile cinsiyet arasında herhangi bir farklılık bulunmadı ($p>0,05$), ancak artan yaşla birlikte ortalama DMFT6 değerlerinin istatistiksel olarak anlamlı şekilde arttığı belirlendi ($p<0,001$). Daimi birinci büyük azı dişlerinin ortalama D, M, F ve DMF değerleri alt çene dişlerinde daha fazla iken ($p<0,001$), çenelerin sağ ve sol bölgesine göre istatistiksel olarak anlamlı farklılık oluşmadı ($p>0,05$). Daimi birinci büyük azı dişlerinin %19,6'sının tek yüzlü restorasyona, %2,2'sinin iki ve %0,2'sinin ≥üç yüzlü restorasyona, %4,5'inin endodontik tedaviye ve %0,4'ünün çekim tedavisine ihtiyacı vardı.
Sonuç: Daimi birinci büyük azı dişlerini çürüklerden korumak için aileler ve çocuklar ağız bakımı konusunda bilinçlendirilmeli, bireylerin çürük risk durumları belirlenerek koruyucu uygulamalar yapılmalıdır.

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INTRODUCTION

Although dental caries, which affects 60-90% of school-age children, can be prevented, it is a chronic disease with a high prevalence in countries where preventive programs are not widely implemented.[1]

First permanent molars (FPMs) are the first permanent teeth to erupt in the oral cavity, reflecting the beginning of the mixed dentition period at the end of early childhood. They are also the teeth most affected by caries.[2] The susceptibility of FPMs to carious attacks is due to the occlusal surface anatomy (deep and narrow pit-fissure structure), parents' lack of knowledge of the eruption time (mistaking these teeth with deciduous teeth), and children's inability to brush their teeth effectively.[3,4] The period between FPM eruption and the completion of occlusion is the most critical in maintaining dental health.[2]

Although FPMs are the key to occlusion and their early loss due to caries has significant effects on a child's dental health, the importance of these teeth has not been sufficiently emphasized. However, FPMs have important roles in chewing, maintaining vertical facial height, and ensuring the function and balance of occlusion. Early loss due to caries can cause premature contact of teeth and occlusal and functional disorders due to tooth displacement.[5]

Thus, it is important to determine the prevalence of caries in FPMs to establish preventive programs. Previous epidemiological studies on the prevalence of caries in the FPMs of children in different geographical regions of Turkey revealed that the prevalence was quite high.[6-10]

The Western Mediterranean Region of Turkey is one of the regions with the highest population growth rate which constitutes 4% of Turkey's population.[11] In reviewing the literature, there is a lack of information regarding the prevalence of caries in the FPMs and treatment needs among the pediatric population in this region. Knowing sufficient data is useful for planning preventive measures earlier and emphasizing the importance of caries prevention. The data obtained will assist in future program and policy planning for community oral health as well as current public health initiatives in the Western Mediterranean region of Turkey.

This study aimed to determine the prevalence of caries in the FPMs and treatment needs among 7-13-year-old children in the Western Mediterranean Region of Turkey and to evaluate their relationship with various factors.

MATERIAL AND METHODS

Ethical aspects

Ethical approval was obtained from the Research Ethics Committee at Suleyman Demirel University, Faculty of Medicine (13.12.2018/233). The written informed consent was obtained from the parents. The study was conducted by the Helsinki Declaration.

Sample size

The required sample size was estimated using G*Power V. 3.1.9.6 (Franz Faul Universitat, Kiel, Germany). Based on the "DMFT" values in a previous study,[12] the total number of people who should be included was determined as 1794, including 598 people in each age group, with 95% confidence (1-α), 95% test power (1-β), and f=0.093 effect size.

Study samples

For this cross-sectional epidemiological study, the intraoral examination of 2050 children, aged between 7 and 13 years who visited the Department of Pediatric Dentistry for dental treatments from January 2019 to January 2021 was performed. Among these patients, 1912 systemically healthy patients who had to take a panoramic film for any reason and had good quality radiographs, all FPMs fully

erupted, no developmental enamel defects, and no history of orthodontic treatment or dental trauma were included in the study.

Panoramic radiographs were taken with the Planmeca ProMax® panoramic radiography device (Planmeca, Helsinki, Finland), and the exposure time was 14 s. No other panoramic radiograph was obtained from any patient.

The participants were classified into three groups (7-8 years, 9-10 years, and 11-13 years). Sociodemographic details including age, gender, toothbrushing frequency, and parental education, were recorded on each participant's form.

Clinical examinations

The clinical oral examinations were carried out by a pediatric dentist (E.O) under reflector light using a dental explorer and a mouth mirror. The caries status was recorded using the decayed, missing, and filled teeth (DMFT) and decayed, missing, and filled surface (DMFS) index based on the World Health Organisation (WHO) criteria.[13] In the evaluation, teeth with pit and fissure lesions, temporary fillings, restored teeth with seconder caries, and broken teeth were recorded as having caries. The number of sound, decayed, missing (according to caries), and filled (included root canal treated) FPMs were assessed. Mean D, M, F, DF, DMFT values, and percentages of FPMs were calculated according to gender, age, age groups, and localization (jaw and side). The dental status of FPMs was recorded as decayed [occlusal, mesial-occlusal/ distal-occlusal (MO/DO) and mesial-occlusal-distal (MOD)], filled (occlusal, OM/OD, MOD), root canal treated, missing and sound. An individual with no decayed, missing or filled first permanent molars (DMFT6 index score of 0) was recognized as Caries Free (CF). If "decayed'', "missing'', and "filled'' features were observed in any of the first four permanent molars, they were assigned a score of 1. FPMs in need of treatment were grouped according to the treatments needed.

The calibration was evaluated in a pilot study involving randomly selected 30 children who had not participated in the main study. Intra-examiner reliability was assessed by the same examiner using Cohen's kappa statistic (κ). After 2 weeks, the same patients were re-examined to calculate dental caries (κ= 0.93).

Statistical analysis

The collected data were entered into SPSS 23 (Chicago, IL, USA) software. Descriptive statistics were calculated for categorical variables. The normality assumption was verified using the Shapiro-Wilk test. As the variables were not normally distributed, the Mann–Whitney U and Kruskal–Wallis tests were used to compare groups. The chi-square test was applied to assess the difference between the categorical variables. Intraobserver agreement was evaluated with Cohen's kappa statistic. The significance level was considered as $p < 0.05$.

RESULTS

A total of 1912 patients, 977 females (51.1%) and 935 males (48.9%), with a mean age of 9.60 ± 1.93 years between the ages of 7 and 13, were included in the study. After clinical and radiographic examinations, the distributions of mean D, M, F, DFT, DMFT, and DMFS values of patients according to gender, age, and age groups were shown in Table 1.

In the study, of 1912 patients evaluated, 906 patients (47.4%) were determined to have decayed, 34 (1.8%) have missing, and 411 (21.5%) have filled FPMs. The overall mean DMFT6 index was 1.53 ± 1.54. There was no significant difference between females and males in the mean of DMFT6 (p>0.05). The lowest and highest mean values of DMFT6 were 0.83 ± 1.23 in the 7-8 age group and 2.19 ± 1.51 in the 11-13 age group (p<0.001). The mean DMFT6 values were increased statistically significantly with increasing age (p<0.001) (Table 2).

Table 1. Distrubition of mean D, M, F, DFT, DMFT, and DMFS values of patients as per age, age groups, and gender

Gender	N (%)	Decayed Mean (SD)	Missing Mean (SD)	Filled Mean (SD)	DFT Mean (SD)	DMFT Mean (SD)	DMFS Mean (SD)
Female	977 (51.1)	1.37 (0.85)	0.03 (0.20)	0.52 (1.21)	1.88 (2.14)	1.90 (2.17)	2.44 (3.14)
Male	935 (48.9)	1.21 (1.72)	0.04 (0.30)	0.46 (1.06)	1.66 (2.02)	1.69 (2.06)	2.22 (3.18)
p		0.213	0.533	0.721	**0.044***	0.058	0.086
Ages							
7	344 (18.0)	0.66 (1.17)	0	0.08 (0.39)	0.73 (1.21)	0.72 (1.20)	0.80 (1.40)
8	316 (16.5)	0.78 (1.17)	0	0.18 (0.63)	0.95 (1.30)	0.95 (1.30)	1.05 (1.54)
9	324 (17.0)	1.09 (1.42)	0.02 (0.18)	0.28 (0.75)	1.37 (1.50)	1.39 (1.52)	1.66 (2.07)
10	284 (14.9)	1.52 (1.91)	0.04 (0.30)	0.49 (1.03)	2.00 (2.02)	2.03 (2.02)	2.58 (3.00)
11	259 (13.6)	1.61 (1.83)	0.04 (0.22)	0.75 (1.36)	2.37 (2.06)	2.39 (2.07)	3.19 (3.13)
12	198 (10.4)	1.84 (2.28)	0.10 (0.57)	0.99 (1.61)	2.83 (2.73)	2.90 (2.83)	4.06 (4.35)
13	187 (9.8)	2.32 (2.45)	0.06 (0.24)	1.21 (1.74)	3.53 (2.63)	3.57 (2.66)	5.10 (4.52)
p		**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***
Age groups							
7-8	660 (34.5)	0.71 (1.17)	0	0.13 (0.52)	0.84 (1.25)	0.83 (1.25)	0.92 (1.47)
9-10	608 (31.8)	1.29 (1.68)	0.03 (0.24)	0.38 (0.89)	1.67 (1.79)	1.69 (1.80)	2.09 (2.59)
11-13	644 (33.7)	1.89 (2.18)	0.06 (0.37)	0.96 (1.56)	2.85 (2.49)	2.89 (2.54)	4.01 (4.03)
p		**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***
Total	1912 (100)	1.29 (1.79)	0.03 (0.25)	0.49 (1.14)	1.78 (2.09)	1.80 (2.11)	2.33 (3.16)

N: number of patients examined, DFT: Decayed Filled Teeth, DMFT: Decayed, Missing or Filled Teeth,
DMFS: Decayed, Missing or Filled Surface, SD: Standard Deviation, Kruskal-Wallis test, Mann Whitney U tests
p^*<0.05 statistically significant

Table 2. Distrubition of the number of patients of mean D, M, F, DMFT values and percentages of first permanent molars as per age, age groups, and gender

Age groups	N (%)	Decayed N (%)	Decayed Mean (SD)	Missing N (%)	Missing Mean (SD)	Filled N (%)	Filled Mean (SD)	DMFT6 Mean (SD)
7-8	660 (34.5)	225 (34.1)	0.70 (1.15)	-	0 (0)	48 (7.3)	0.12 (0.52)	0.83 (1.23)
9-10	608 (31.8)	306 (50.3)	1.21 (1.43)	9 (1.5)	0.02 (0.16)	121 (19.9)	0.38 (0.90)	1.61 (1.55)
11-13	644 (33.7)	375 (58.2)	1.32 (1.39)	25 (3.9)	0.05 (0.24)	242 (37.6)	0.83 (1.26)	2.19 (1.51)
p		**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***
Ages								
7	344 (18.0)	107 (31.1)	0.65 (1.13)	-	0 (0)	15 (4.4)	0.08 (0.39)	0.72 (1.18)
8	316 (16.5)	118 (37.3)	0.76 (1.16)	-	0 (0)	33 (10.4)	0.18 (0.62)	0.94 (1.28)
9	324 (17.0)	150 (46.3)	1.07 (1.37)	2 (0.6)	0.01 (0.12)	53 (16.4)	0.29 (0.75)	1.37 (1.47)
10	284 (14.9)	156 (54.9)	1.36 (1.48)	7 (2.5)	0.03 (0.19)	68 (23.9)	0.49 (1.03)	1.88 (1.49)
11	259 (13.6)	151 (58.3)	1.29 (1.35)	6 (2.3)	0.03 (0.21)	83 (32.1)	0.67 (1.16)	2.00 (1.49)
12	198 (10.4)	117 (59.1)	1.31 (1.40)	10 (5.1)	0.06 (0.28)	75 (37.9)	0.84 (1.26)	2.21 (1.58)
13	187 (9.8)	107 (57.2)	1.36 (1.43)	9 (4.8)	0.05 (0.22)	84 (44.9)	1.02 (1.36)	2.43 (1.41)
p		**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***	**<0.001***
Gender								
Female	977 (51.1)	460 (47.1)	1.11 (1.40)	17 (1.7)	0.02 (0.15)	208 (21.3)	0.46 (1.02)	1.59 (1.56)
Male	935 (48.9)	446 (47.7)	1.03 (1.29)	17 (1.8)	0.02 (0.18)	203(21.7)	0.43 (0.94)	1.48 (1.51)
p		0.787	0.504	0.897	0.892	0.823	0.992	0.128
Total	1912 (100.0)	906 (47.4)	1.07 (1.35)	34 (1.8)	0.02 (0.98)	411 (21.5)	0.44 (0.98)	1.53 (1.54)

N: number of patients examined, DMFT: Decayed, Missing or Filled Teeth SD: Standart Deviation
Chi-square test, Kruskal-Wallis test, Mann Whitney U tests p^*<0.05 statistically significant

Totally 7648 FPMs were examined. The prevalence of DT in FPMs was 26.8%, MT was 0.5%, and FT was 11.1%. No statistically significant differences were observed between the right and the left FPMs regarding D, M, and F prevalences by age group, age, and gender (p>0.05) (Table 3, 4). Mean DMFT6 for maxillary FPMs were 1.12 ± 0.84 as compared to 1.54 ± 0.66 for mandibular FPMs. The differences according to mean D, M, F ve DMF values in FPMs were statistically significant according to the jaw (p<0.001) but not statistically significant according to side (p>0.05) (Table 5).

The total rate of CF6 of the participants was 41%. The highest and lowest prevalences of CF6 were observed respectively in 7 and 13 years old for females and males. Children in the 7-8 age group were more caries-free than the other age groups (p<0.001). For all ages except 9,10 and 12, males demonstrated a higher percentage of CF6 than females. The education

level of most participants' parents was at a primary school level for mothers (39.1%) and at a high school level for fathers (33.3%). Furthermore, as the parent's education level increased, the number of children being CF6 increased (p<0.05). The CF6 percentage of children who brushed their teeth twice a day or more was significantly higher than those who brushed their teeth once a day or less (p<0.05) (Table 6).

Table 3. Distrubition of D, M, and F percentages of first permanent teeth in relation to ages, age groups, and gender

Age groups	N (%)	Maxillary First Permanent Molars N (%)					
		Right D	Left D	Right M	Left M	Right F	Left F
7-8	2640 (34.5)	88(13.3)	91(13.8)	-	-	16(2.4)	11(1.7)
9-10	2432 (31.8)	164(27.0)	157(25.8)	1(0.2)	-	39(6.4)	35(5.8)
11-13	2576 (33.7)	189(29.3)	207(32.1)	2(0.3)	3(0.5)	116(18.0)	102(15.8)
p		0.669		0.273		0.825	
Ages							
7	1376 (18.0)	35 (10.2)	42(12.2)	-	-	7(2.0)	1(0.3)
8	1264 (16.5)	53 (16.8)	49(15.5)	-	-	9(2.8)	10(3.2)
9	1296 (19.5)	74 (22.8)	68(21.0)	-	-	16(4.9)	14(4.3)
10	1136 (14.8)	90 (31.7)	89 (31.3)	1 (0.4)	-	23(8.1)	21(7.4)
11	1036 (13.5)	73 (28.2)	79 (30.5)	-	1(0.4)	35(13.5)	32(12.4)
12	792 (10.3)	56 (28.3)	67 (33.8)	1 (0.5)	-	40(20.2)	29(14.6)
13	748 (9.8)	60 (32.1)	61 (32.6)	1 (0.5)	2(1.1)	41(21.9)	41(21.9)
p		0.914		0.343		0.540	
Gender							
Female	3908 (51.1)	222(22.7)	241(24.7)	2(0.2)	2(0.2)	91(9.3)	82(8.4)
Male	3740 (48.9)	219(23.4)	214(22.9)	1(0.1)	1(0.1)	80(8.6)	66(7.1)
p		0.431		1.000		0.696	
Total	7648 (100)	441(23.1)	455(23.8)	3(0.2)	3(0.2)	171(8.9)	148(7.7)

N: number of teeth examined, D: Decayed, M: Missing, F: Filled chi-square, p*<0.05 statistically significant

Table 4. Distrubition of D, M, and F percentages of first permanent teeth in relation to ages, age groups, and gender

Age groups	N (%)	Mandibular First Permanent Molars N (%)						Total N (%)		
		Right D	Left D	Right M	Left M	Right F	Left F	D	M	F
7-8	2640 (34.5)	146(22.1)	139(21.1)	-	-	28(4.2)	27(4.1)	464 (17.6)	0 (0)	82 (9.7)
9-10	2432 (31.8)	205(33.7)	207(34.0)	5(0.8)	5(0.8)	77(12.7)	81(13.3)	733 (30.1)	11 (27.5)	232 (27.4)
11-13	2576 (33.7)	224(34.8)	229(35.6)	10(1.6)	14(2.2)	156(24.2)	158(24.5)	849 (33.0)	29 (72.5)	532 (62.9)
p		0.888		0.656		0.959				
Ages										
7	1376 (18.0)	71(20.6)	75(21.8)	-	-	9(2.6)	9(2.6)	223 (10.9)	-	26 (3.1)
8	1264 (16.5)	75(23.7)	64(20.3)	-	-	19(6.0)	18(5.7)	241 (11.8)	-	56 (6.6)
9	1296 (19.5)	101(31.2)	103(31.8)	1(0.3)	2(0.6)	32(9.9)	32(9.9)	346 (16.9)	3 (7.5)	94 (11.1)
10	1136 (14.8)	104(36.6)	104(36.6)	4(1.4)	3(1.1)	45(15.8)	49(17.3)	387 (18.9)	8 (20)	138 (16.3)
11	1036 (13.5)	88(34.0)	95(36.7)	3(1.2)	4(1.5)	49(18.9)	58(22.4)	335 (16.4)	8 (20)	174 (20.6)
12	792 (10.3)	70(35.4)	66(33.3)	5(2.5)	6(3.0)	53(26.8)	45(22.7)	259 (12.7)	12 (30)	167 (19.7)
13	748 (9.8)	66(35.3)	68(36.4)	2(1.1)	4(2.1)	54(28.9)	55(29.4)	255 (12.5)	9 (22.5)	191 (22.6)
p		0.965		0.922		0.955				
Gender										
Female	3908 (51.1)	314(32.1)	308(31.5)	7(0.7)	8(0.8)	135(13.8)	141(14.4)	1085 (53.0)	19 (47.5)	449 (53.1)
Male	3740 (48.9)	261(27.9)	267(28.6)	8(0.9)	11(1.2)	126(13.5)	125(13.4)	961 (47.0)	21 (52.5)	397 (46.9)
p		0.723		0.790		0.768				
Total	7648 (100)	575(30.1)	575(30.1)	15(0.8)	19(1.0)	261(13.7)	266(13.9)	2046 (26.8)	40 (0.5)	846 (11.1)

N: number of teeth examined, D: Decayed, M: Missing, F: Filled chi-square, p*<0.05 statistically significant

Table 5. Distrubition of mean D, M, F, DMFT values and percentages of first permanent molars as location (jaw and side)

Jaw	N (%)	Decayed N (%)	Decayed Mean (SD)	Missing N (%)	Missing Mean (SD)	Filled N (%)	Filled Mean (SD)	DMFT6 Mean (SD)
Maxillar	3824 (50.0)	896 (23.4)	1.03 (0.82)	6 (0.2)	0.00 (0.06)	319 (8.3)	0.08 (0.31)	1.12 (0.84)
Mandibular	3824 (50.0)	1150 (30.1)	1.34 (0.73)	34 (0.9)	0.02 (0.15)	527 (13.8)	0.18 (0.48)	1.54 (0.66)
p		**<0.001***	**<0.001***	**<0.001***	**0.010***	**<0.001***	**<0.001***	**<0.001***
Side								
Right	3824 (50.0)	1016 (26.6)	1.18 (0.68)	18 (0.5)	0.01 (0.10)	432 (11.3)	0.14 (0.40)	1.34 (0.66)
Left	3824 (50.0)	1030 (26.9)	1.19 (0.69)	22 (0.6)	0.01 (0.11)	414 (10.8)	0.12 (0.37)	1.33 (0.68)
p		0.718	0.737	0.526	0.636	0.512	0.237	0.760
Total	7648 (100.0)	2046 (26.8)	1.07 (1.35)	40 (0.5)	0.02 (0.98)	846 (11.1)	0.44 (0.98)	1.53 (1.54)

DMFT: Decayed, Missing or Filled Teeth, SD: Standart Deviation, *p**<0.05 statistically significant

Table 6. Distrubition of percentage of the caries-free criterion in the first permanent molars of patients by ages, age groups, parental education and tooth brushing frequency

Variables	Caries Free Index N (%)				
Age groups	**N (%)**	**Female N (%)**	**Male N (%)**	**Total N (%)**	***p***
7-8	660 (34.5)	195 (29.6)	211 (32.0)	406 (61.5)	**<0.001***
9-10	608 (31.8)	125 (20.6)	107 (17.6)	232 (38.2)	
11-13	644 (33.7)	70 (10.9)	75 (11.7)	145 (22.5)	
p		0.335			
Ages					
7	344 (18.0)	109 (31.7)	117 (34.0)	226 (65.7)	**<0.001***
8	316 (16.5)	86 (27.2)	94 (29.7)	180 (57.0)	
9	324 (17.0)	73 (22.5)	68 (21.0)	141 (43.5)	
10	284 (14.8)	52 (18.3)	39 (13.7)	91 (32.0)	
11	259 (13.5)	30 (11.6)	34 (13.1)	61 (23.6)	
12	198 (10.4)	28 (14.1)	23 (11.6)	51 (25.8)	
13	187 (9.8)	12 (6.4)	18 (9.62)	30 (16.0)	
p		0.596			
Mother education					
Primary	748 (39.1)	115 (15.4)	131 (17.5)	246 (32.9)	**<0.001***
Secondary	322 (16.8)	62 (19.2)	63 (19.6)	125 (38.8)	
High	532 (27.8)	124 (23.3)	115 (21.6)	239 (45.0)	
University	310 (16.2)	89 (28.7)	84 (27.1)	173 (55.8)	
p		0.678			
Father education					
Primary	521 (27.2)	81 (15.5)	93 (17.8)	174 (33.4)	**<0.001***
Secondary	278 (14.5)	55 (19.8)	54 (19.4)	109 (39.2)	
High	637 (33.3)	123 (19.3)	130 (20.4)	253 (39.7)	
University	476 (24.9)	131 (27.5)	116 (24.4)	247 (51.9)	
p		0.587			
Tooth brushing frequency					
None	184 (9.6)	21 (11.4)	39 (21.2)	60 (32.6)	**0.039***
Sometimes	1360 (71.1)	269 (19.8)	289 (21.3)	558 (41.0)	
Once a day	335 (17.5)	89 (26.6)	59 (17.6)	148 (44.2)	
≥2 daily	33 (1.7)	11 (33.3)	6 (18.2)	17 (51.5)	
p		**0.003***			
Total	1912 (100.0)	390 (20.4)	393 (20.6)	783 (41.0)	

N: number of patients examined, Chi-square, *p**<0.05 statistically significant

The surface most affected by caries was the occlusal surface in both the upper and lower FPMs. Teeth with caries on two and ≥three surfaces followed, respectively, which was valid for all FPMs. Statistically significant differences were found between FPMs 16, 26,

36, and 46 regarding the number of decayed and filled FPMs (p<0.05). Of the teeth evaluated, 1% had been treated with root canals, and 61.3% of these teeth were in the lower jaw (Table 7).

Regarding the types of treatment needed, 19.6% of the FPMs needed one surface restoration, 2.2% needed two and 0.2% needed ≥three restorations, 4.5% needed endodontic therapy, and 0.4% required extraction treatment. Lower FPMs needed more one- and two-surface restorations, endodontic therapy, and extraction treatment than upper FPMs (p<0.05). The need for treatment varied significantly by age and age groups (p<0.05) (Table 8).

Table 7. Distribution of dental status (decayed, missing, filled, root canal treated, sound) of first permanent molars

Status		16 N (%)	26 N (%)	36 N (%)	46 N (%)	Total N (%)	*p*
Decayed	**Occlusal**	361 (18.9)	371 (19.4)	438 (22.9)	435 (22.8)	1605 (21.0)	**0.015***
	OM/OD	68 (3.6)	73 (3.8)	106 (5.5)	107 (5.6)	354 (4.6)	
	MOD	12 (0.6)	11 (0.6)	31 (1.6)	33 (1.7)	87 (1.1)	
	Total	441 (23.1)	455 (23.8)	575 (30.1)	575 (30.1)	2046 (26.8)	
Filled	**Occlusal**	140 (7.3)	127 (6.6)	236 (12.3)	226 (11.8)	729 (9.5)	**0.007***
	OM/OD	28 (1.5)	21 (1.1)	20 (1.1)	29 (1.5)	98 (1.3)	
	MOD	3 (0.2)	-	10 (0.5)	6 (0.3)	19 (0.3)	
	Total	171 (8.9)	148 (7.7)	266 (13.9)	261 (13.7)	846 (11.1)	
Root canal treated		17 (0.9)	12 (0.6)	24 (1.3)	22 (1.15)	75 (1.0)	
Missing		3 (0.2)	3 (0.2)	19 (1.0)	15 (0.8)	40 (0.5)	
Sound		1297 (67.8)	1306 (68.3)	1052 (55.0)	1061 (55.5)	4716 (61.7)	

OM: Occlusal-Mesial, OD: Occlusal-Distal, MOD: Mesial Occlusal Distal, N: Number of patients examined, Chi-square p*<0.05 statistically significant

Table 8. Distribution of first permanent molars requiring treatments according to gender, age, age groups, jaw and side

Gender	N (%)	One surface filling N (%)	Two surface filling N (%)	≥Three surface filling N (%)	Endodontic therapy N (%)	Extraction N (%)	Total N (%)	*p*
Female	3908 (51.1)	798 (53.3)	78 (47.3)	6 (50.0)	191 (56.2)	12 (36.4)	1085 (53.0)	
Male	3740 (48.9)	698 (46.7)	87 (52.7)	6 (50.0)	149 (43.8)	21 (63.6)	961 (47.0)	0.119
p		0.053	0.321	0.939	0.055	0.092	**0.041***	
Age groups								
7-8	2640 (34.5)	384 (25.7)	24 (14.5)	2 (16.7)	54 (15.9)	0	464 (22.7)	**<0.001***
9-10	2432 (31.8)	547 (36.6)	55 (33.3)	7 (58.3)	118 (34.7)	6 (18.2)	733 (35.8)	
11-13	2576 (33.7)	565 (37.8)	86 (52.1)	3 (25.0)	168 (49.4)	27 (81.8)	849 (41.5)	
Ages								
7	1376 (18.0)	187 (12.5)	9 (5.5)	1 (8.3)	26 (7.7)	0	223 (10.9)	**<0.001***
8	1264 (16.5)	197 (13.2)	15 (9.1)	1 (8.3)	28 (8.2)	0	241 (11.8)	
9	1296 (19.5)	263 (17.6)	29 (17.6)	4 (33.3)	50 (14.7)	0	346 (16.9)	
10	1136 (11.36)	284 (19.0)	26 (15.8)	3 (25.0)	68 (20.0)	6 (18.2)	387 (18.9)	
11	1036 (13.5)	217 (14.5	36 (21.8)	2 (16.7)	71 (20.9)	9 (27.3)	335 (16.4)	
12	792 (10.3)	172 (11.5)	26 (15.8)	0	57 (16.8)	4 (12.1)	259 (12.7)	
13	748 (9.8)	176 (11.8)	24 (14.5)	1 (8.3)	40 (11.8)	14 (42.4)	255 (12.5)	
Jaw								
Maxilla	3824 (50.0)	698 (46.7)	63 (38.2)	5 (41.7)	117 (34.4)	13 (39.4)	896 (43.8)	**<0.001***
Mandibula	3824 (50.0)	798 (53.3)	102 (61.8)	7 (58.3)	223 (65.6)	20 (60.6)	1150 (56.2)	
p		**0.004***	**0.002***	0.563	**<0.001***	**0.222***	**<0.001***	
Side								0.922
Right	3824 (50.0)	743 (49.7)	87 (52.7)	6 (50.0)	164 (48.2)	16 (48.5)	1016 (49.7)	
Left	3824 (50.0)	753 (50.3)	78 (47.3)	6 (50.0)	176 (51.8)	17 (51.5)	1030 (50.3)	

p		0.773	0.479	1.000	0.506	0.862	0.718
Total	7648 (100.0)	1496 (19.6)	165 (2.2)	12 (0.2)	340 (4.5)	33 (0.4)	2046 (26.8)

N: Number of patients examined, Chi-square, $p^*<0.05$ statistically significant

DISCUSSION

The active population of a country consists of children aged 6-7 years, the age at which FPMs begin to erupt, and children aged 7-12 ages, in the mixed dentition period. The fact that preventive programs are not applied to children in these age groups and that the problem-oriented treatment approach is dominant in children results in a high risk of caries.

Although there are differences in cultural habits, socioeconomic status, diet, and oral care habits in populations, the most affected teeth by caries are FPMs. The caries prevalence of FPMs in children of different age ranges in different populations has been recorded as 21.7% in North America,[14] 24.6%-66.4% in Asia,[5,15-21], and 14.0%-68% [6-10] in Turkey. In this study, the caries prevalence of FPMs in children aged 9-10 and 11-13 was more than 50%. Today, the high caries prevalence among FPMs in children may be related to the inadequate implementation of dental health promotion activities and preventive measures, inadequate oral hygiene habits, and increased cariogenic food consumption. In addition, the fact that our study group consisted of patients who visited the clinic due to problems in their teeth may be another reason for the high caries prevalence observed.

Caries activity continues throughout life, and the incidence of caries increases with age.[8,9,15,16,22-25] In the present study, the caries prevalence of FPMs was 34.1% in children aged 7-8 years, while this rate was observed to be more than 50% after 9 years of age. Bulucu et al.[6] reported the caries prevalence of FPMs as 9% in 6-year-olds, 51% in 9-year-olds, and 61% in 12-year-olds, respectively. In the studies conducted in our country within the last five years, the caries prevalence of FPMs for children in the 7-9 age group; 51.2%,[8] in the 7-12 age group; 41%,[9] in the 8-12 age group; 58.6%[25] were reported. These data showed that FPMs are at risk of caries at an early age and that the rate of caries increases at later ages primarily because preventive treatments are not applied promptly and on time.

Failure to perform timely preventive treatments for FPMs may result in tooth extraction due to the increased risk of caries. While there was no extraction of FPMs in children aged 7-8 years in the study group, similar findings were reported in previous studies.[23,26] In the present study, patients who had their FPM/s extracted by the age of 9 were observed, and the highest number of tooth extractions occurred in children aged 11-13. Bulucu et al.[6] reported that tooth extraction or extraction indication begins after the age of 9 and reaches 7% at the age of 12, whereas the age of 11-12 represents the period when the teeth are most exposed to extraction. In previous studies, the percentage of FPM loss for children at 12 ages, 1.5%,[18] at 6-12 age groups, 0.6%[27] and 1%[28] were reported, and tooth loss was stated to increase with increasing age. In this study, statistically significant relationships were found between age, age group, and the number of extracted teeth ($p<0.05$), but not with gender as in other studies ($p>0.05$).[9,28] However, Kılınc et al.[7] reported that there was more tooth loss in males.

The DMF index and each of its components are well established as the key measures of caries and the most common epidemiological scale used in studies.[29] In this study, the mean DMF6 index was 1.53 (1.54). The results of this study showed that the mean DMFT6 index in children aged 7-13 years was high compared to WHO standards in 2010 (≥1).[30] The caries experience of FPMs in our

study was lower than other similar studies,[4,12,22] but higher than those reported in others.[8,10,19,20,31] The different results may be related to the children's age and the designs of the studies. Mean DMFT6 index values may increase with increasing age.[26] This finding was consistent with our study due to the increased number of decayed and restored teeth with age. In the study, the mean DMFT6 index was 1.48 (1.51) for males and 1.59 (1.56) for females; gender does not have an effect on mean DMF6 values. While similar results have been observed by other authors,[10,12,18,32] gender has also been reported to be an important factor.[8,18,24,31] This can be explained through long-term exposure to caries risk factors due to premature teeth eruption in girls, anatomical differences in teeth, differences in dietary and oral hygiene habits, early puberty in girls, and possible quantitative and qualitative changes in the saliva.

When the relationship between the dental status of the FPMs and the jaws is examined, the number of DMFTs was determined to be higher in the lower jaw than in the upper jaw.[5,7,9,15,17,22,25,33,34] The results obtained from the present study also support these findings. Certain factors cause lower FPMs to be more affected by caries and subsequently extracted; pit-fissure caries, which facilitate food accumulation, are more common in these teeth, cleaning is more difficult in the lower region, and the palatal salivary gland duct opening to the buccal surface of the upper FPMs has a cleansing effect.[7,9] On the contrary, Mimoza et al.[24] reported that the upper left FPMs were the most affected by caries in children with mixed dentition, followed by the upper right, lower left, and right FPMs, respectively.

When the caries and missing status of the FPMs are evaluated according to the right and left regions of the jaws, no difference was found,[7,9,27,34] while Khodadadi et al.[33] reported that the number of DT was higher on the right side. In the present study, significant results of evaluating DMFT6 according to side were not found. This may be caused by the mechanical cleaning effects of foods when chewing and the handedness, which affects the brushing ability.[27]

The surface most affected by caries in FPMs is the occlusal surface,[7,9,17,34] followed by the proximal surfaces.[5,17] Since the increased incidence of caries on the occlusal and proximal surfaces is related to the morphology of these regions, this result of the present study is expected. In addition, while the number of teeth with occlusal fillings was determined to be higher among FPMs than in other treatments, a study by Kılınc et al.[7] presented similar findings.

In children, endodontic therapy for severely decayed teeth may be required. In the study, 1% of the FPMs evaluated were root canal treated and 82.7% of them were in children aged 11-13 years. In previous studies conducted in Turkey, the percentage of FPMs with endodontic treatment for children in the 6-12 age groups was 0.47%[27] and 1%,[28] in the 7-12 age group; 0.6%,[9] in the 10-12 age group; 1%[34] were reported. As in a previous study, no differences were observed in the present study regarding the presence of root canal-treated teeth in the right and left jaws, while root canal treatment was applied mostly to the mandibular FPMs.[27] This result is expected due to the differences in the anatomical structures and eruption times.

Determining the treatments needed by FPMs is important to shed light on the severity of caries and intervene early to prevent tooth loss. In the present study, 19.6% of the evaluated teeth needed one surface filling, 4.5% needed endodontic treatment and 0.4% needed extraction. Studies conducted on children aged 6-12 years in Turkey reported that 21% of FPMs needed one surface filling, 3-4% needed endodontic treatment, and 0.2-0.47% needed extraction.[23,27] The results of the present study were similar to those of the previous studies.

Demirbuga et al.[27] reported that the number of teeth that need root canal treatment is higher than those with root canal treatment in children aged 6-12 years. The observation of this situation in the present study may be because the patients neglected routine dental checkups and went to the dentist only when they experienced tooth pain.

In the present study, the total rate of CF6 of the participants was 41% and the percentage of the CF criteria decreased with increased age. In the previous studies, the percentage of CF6 values in the 7-9 age group; 48.8%,[8] in the 7-10 age group; 33.7%,[5] in the 6-12 age group; 72%,[28] in the 7-12 age group; 34.7%,[12] in the 12 ages; 33.9%[35] and 51.5%[31] were reported**.** The reason for CF6 as age increases can be attributed to the fact that caries, being a continuous process, has increased.[5]

Parental education level and children's tooth brushing frequency positively affect children's mean DMF6 values.[4,31] Children who brush their teeth twice or more a day have lower caries incidence than children who brush once or not.[22] In the present study, the percentages of CF6 were increased with increasing parental education and the participants' brushing frequency but decreased with increasing participants' age (p<0.05). However, Sadat-Sajadi et al.[32] reported that the parents' education level may not have any effect on the mean DMF6 values of the children. To prevent caries in FPMs, it is important to provide children with good oral hygiene habits and regular dental controls before the FPMs erupt to ensure the effective implementation of preventive programs and inform parents accordingly.

The limitations of the study were that the psychosocial, behavioral, and clinical factors, such as dietary habits and socioeconomic status of the subjects, could not be taken into consideration. Inferences made without considering these factors need to be confirmed. Future studies are recommended to collect data on the relationships between dental caries and these factors such as dietary practices and socioeconomic status. Also, this study relied on records of 7-13-year-olds from a single pediatric dental clinic of a university, so the results can not be generalized to the Turkish population. Future research should consider large multicenter studies encompassing many age groups and FPM caries-related variables.

Despite the limitations of this study, its strengths of performing both radiographic and clinical evaluations when determining the dental status and treatment needs of FPMs, as well as being the first large-scale study on this subject in children living in the Western Mediterranean Region of Turkey, are worth noting.

CONCLUSION

The present study showed that the prevalence of dental caries in FPMs and the mean DMFT6 of children aged 7-13 years in a Turkish pediatric population were relatively high. The tooth brushing frequency of children and the level of parental education have important effects on caries prevalence. To protect FPMs from caries, families and children should be aware of oral care at early ages, and protective practices should be applied by determining the caries risk status of individuals. For clinical implications, oral and dental health policies can be developed to encourage regular dental check-ups and tooth brushing, so that the implementation of preventive programs can effectively support the management of caries risk.

Ethical Approval

Ethical approval was obtained from the Research Ethics Committee at Suleyman Demirel University, Faculty of Medicine (13.12.2018/233).

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Conflict of Interest

The author denies any conflicts of interest related to this study.

Author Contributions

Design: EÖ, Data collection and processing: EÖ, Analysis and interpretation: EÖ, Literature review: EÖ, Writing: EÖ.

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