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Research Araştırma

The Prevalence And Characteristics Of Supernumerary Teeth In Nonsyndromic Dental Patients Of A Turkish Subpopulation

Bir Türk Alt Popülasyonunun Sendromik Olmayan Diş Hastalarında Süpernümerer Dişlerin Prevalansı Ve Özellikleri

ABSTRACT

Objective: The aim of this study was to determine the incidence of supernumerary premolar teeth (SPs) in a Turkish sub-population of non-syndromic patients using digital panoramic radiography (DPR) based on gender and age. Characteristics such as number, shape, direction, position, eruption status, and degree of formation were also analyzed. The study also aimed to evaluate the incidence of supernumerary premolar teeth and related complications in the community.

Material and Methods: This study was a retrospective analysis of DPRs from 11960 patients. Participants were aged 15 years and over. Statistical analysis was performed using descriptive statistics with SPSS software. The relationship between SP teeth and gender, maxillary-mandibular location, right-left location, unilateral-bilateral distribution, and type was evaluated separately using a one-way chi-squared test. A significance level of 0.05 was used.

Results: The age range of the participants was 15-97 years with a mean age of 38.84 years. Forty-nine SP teeth were found in 35 patients (%0.29). Of the 35 patients with SP teeth, 26 had only one, while the rest had several. 39 SP teeth were fully impacted, 6 partially erupted and 4 fully erupted. 43 were supplemental, 5 conical, and 1 tuberculate. No odontoma was found. No complications were observed in 83.7% (41) of the SP teeth.

Conclusion: The study showed that the incidence of supernumerary premolars in this population was 0.29%. Most SPs were impacted and showed no symptoms. Early diagnosis of SPs with digital panoramic radiography is crucial to prevent potential complications.

Key Words: Supernumerary Premolar, Hyperdontia, Dental Anomaly, Complication.

ÖZ

Amaç: Bu çalışmanın amacı, sendromik olmayan bir Türk alt popülasyonunda dijital panoramik radyografi (DPR) kullanılarak süpernümerer premolar dişlerin (SPs) görülme sıklığını cinsiyete ve yaşa göre belirlemektir. Sayı, şekil, yön, konum, erüpsiyon durumu ve oluşum derecesi gibi özellikler de analiz edildi. Çalışma ayrıca toplumda süpernümerer premolar dişlerin görülme sıklığını ve buna bağlı komplikasyonları değerlendirmeyi amaçladı.

Gereç ve Yöntemler: Bu çalışma 11960 hastanın DPR'lerinin retrospektif bir analiziydi. Katılımcılar 15 yaş ve üzerindeydi. İstatistiksel analiz SPSS yazılımı ile tanımlayıcı istatistikler kullanılarak yapıldı. SP dişler ile cinsiyet, maksiller-mandibular lokasyon, sağ-sol lokasyon, unilateral-bilateral durum ve tipleri arasındaki ilişki tek yönlü ki-kare testi kullanılarak ayrı ayrı değerlendirildi. Anlamlılık düzeyi 0.05 olarak belirlendi.

Bulgular: Katılımcıların yaş aralığı 15-97, yaş ortalaması 38,84 idi. 35 hastada kırk dokuz SP dişi bulundu (%0,29). SP dişleri olan 35 hastanın 26'sında sadece bir tane, geri kalanında birden fazla vardı. SP dişlerinin 39'u tamamen gömülü, 6'sı kısmen sürmüş ve 4'ü tamamen sürmüştü. 43'ü suplemental, 5'i konik ve 1'i tüberküllüydü. Odontoma bulunamadı. SP dişlerinin %83,7'sinde (41) komplikasyon görülmedi.

Sonuç: Çalışma, bu popülasyonda süpernümerer premolar diş insidansının % 0.29 olduğunu gösterdi. Çoğu SP gömülüydü ve hiçbir semptom göstermedi. SPs'nin dijital panoramik radyografi ile erken teşhisi, olası komplikasyonları önlemek için çok önemlidir.

Anahtar Kelimeler: Süpernümerer Premolar, Hiperdonti, Dental Anomali, Komplikasyon.

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INTRODUCTION

Supernumerary teeth (ST) or hyperdontia are developmental number anomaly that defines the condition of having an extra number of teeth (1–3). The exact etiology of supernumerary teeth is unclear, but it is believed to be influenced by both genetic and environmental factors (4). Various theories have been proposed for the origin of supernumerary teeth including atavism, dichotomy, hyperactivity of the dental lamina, third dentition, progress zone theory, and heredity (5–7). ST can affect both deciduous and permanent dentition. The incidence of ST in deciduous dentition is lower than in permanent dentition. This result is thought to have arisen from ST in deciduous dentition being overlooked by parents (4). The prevalence of ST ranges from 0.5-5.3% in permanent dentition and 0.2-0.8% in deciduous dentition in different societies (8–10). The majority of ST are asymptomatic, so they are detected incidentally on dental radiographs during routine dental examinations (11–13). However, they can lead to various complications such as delayed permanent tooth eruption, displacement of permanent teeth, development of odontogenic cysts, rotation of permanent teeth, root resorption, or tooth crowding (14–18). ST is classified based on the teeth's location and morphology into different terms such as mesiodens (between the maxillary central teeth), paramolar (buccally or lingually in the molar tooth region), distomolar (distal to the maxillary third molars), and para-premolar (extra premolar teeth in the premolar region). The incidence of ST is common as follows; mesiodens, maxillary fourth molar, mandibular premolar, maxillary lateral incisor, mandibular fourth molar, and maxillary premolars (11). Supernumerary premolar (SP) teeth or para-premolar teeth are mostly used to describe ST that are morphologically similar to premolars or located in the premolar region (11,17,19). They can present as single or multiple, unilateral or bilateral, erupted or unerupted, in one or both jaws. Multiple supernumerary teeth may be associated with various syndromes, such as cleft palate and lip, cleidocranial dysplasia, Gardner's syndrome, and pycnodysostosis (20–22). The incidence of SP teeth in permanent dentition ranges from 0.07% to 0.26% (23). SP teeth constitute approximately 10% of total ST cases, and the majority of them are located in the mandible (22,24,25). In the reported cases, the incidence of single SP teeth ranges from 76-86%, double SP teeth are 12-23%, and multiple SP teeth are less than 1% of all cases (29). SP teeth are more common in males compared to females (26). The shape of the teeth is associated with their position in the jaws and has evolved for specific functions (27). Owing to paleontological and forensic purposes, it is very important to classify teeth precisely (28). ST are classified based on their morphological characteristics. The classification of ST includes supplemental, tuberculate, conical, and odontoma types (3,9,17,29). ST can be erupted or impacted, and can also be in an inverted position. Moreover, they can also be ectopically located (30). The eruption of permanent maxillary and mandibular premolar teeth begins between the ages of 10-12, and root development is completed between the ages of 12-14 (1). The initiation of root formation is crucial for the eruption process, which requires both a force to move the teeth and the removal of obstacles in the eruption pathway such as bone, gingival tissues, and deciduous teeth roots (31). Complications such as delayed eruption or impaction of teeth can occur due to the complex nature of the eruption process. The incidence of impacted teeth, excluding third molars, ranged from 5.6% to 18.8% (32). Radiographic examination can reveal impacted or supernumerary teeth (1). The objective of this study is to examine the characteristics of supernumerary premolar teeth, including the number, morphology, orientation, jaw quadrants, eruption status, and degree of formation, using digital panoramic radiography (DPR) among a Turkish subpopulation of non-syndromic dental patients. The study also aims to determine the incidence of SP teeth based on gender and age, evaluate related complications, and contribute to the data on oral health in Turkish society by emphasizing the importance of DPR in the early diagnosis of ST teeth.

MATERIAL AND METHODS

This retrospective study was conducted at the Department of Oral, Dental and Maxillofacial Radiology at Gülhane Faculty of Dentistry, Health Sciences University in Turkey, and analyzed 15,083 dental panoramic radiographs (DPRs) taken between January 2019 and June 2021.

The images were captured using the Planmeca ProMax 2D S3 dental panoramic x-ray machine, with exposure settings of 65-90 kVp, 15 mA, and 13 s, resulting in an effective dose of 21.4 mSv (110 mGy cm). The images were evaluated using the MicroDicom Dicom Viewer (version 3.8.1) program on a computer under consistent conditions.

Patients were divided into age groups (15-29 years, 30-44 years, 45-59 years, 60-74 years, and 75 years and older) and gender, and SP teeth were categorized based on morphological features and complication status.

The supernumerary premolars were classified based on:

• Jaw quadrants; 1st quadrant (R1; right region of maxilla), 2nd quadrant (L1; left region of maxilla), 3rd quadrant (L2; left region of mandible), 4th quadrant (R2; right region of the mandible),

• Side; unilateral, bilateral,

• Eruption status; erupted, semi-erupted, impacted (29),

• Degree of formation; crown only, partial root, whole tooth (17,33),

• Morphologies; supplemental, conical, tuberculate, odontoma (16,17),

• Orientations; vertical, horizontal, inverted, mesioangular, distoangular (33).

In addition, the study evaluated complications of permanent teeth (failure of eruption, displacement, crowding, pathology) and pathologies associated with the SP teeth (cyst development, root resorption, root malformation, decay), and whether the SP teeth were accompanied by other dental anomalies (24,34-36).
The study excluded syndromic patients, individuals under 15 years of age, patients without premolar teeth, those who underwent surgery due to trauma. Radiographs that were duplicates or had magnification, artifact or distortion making them unreadable were also excluded.

The statistical data were collected and analyzed using Statistical Package for the Social Sciences (SPSS) software version 22.0 (SPSS Inc, Chicago, IL, USA). Descriptive statistics were analyzed by simple division methods. Associations between SP teeth and gender, maxilla-mandible, right-left, unilateral-bilateral, and their morphological types were evaluated separately using Pearson's chi-square test and Fisher's exact test. The difference in the mean age was appreciated with the Mann-Whitney U test and Kruskal Wallis test. The confidence interval was determined as 95% ($p<0.05$). This retrospective study involving human participants adhered to the ethical standards set forth by the institutional and national research committees, as well as the 1964 Helsinki Declaration and its subsequent amendments, or similar ethical standards. The study was approved by the Gülhane Scientific Research Ethics Committee of the University of Health Sciences in June 2021 (Decision number: 2021/278; Meeting number: 2021/12).

RESULTS

According to the exclusion criteria, 3123 panoramic images were excluded, leaving 11,960 patients (6026 women and 5934 men) in the study. In total, 49 SP teeth were detected in 35 patients (%0.29) (Table 1). The average number of SP per person was 1.4. The patients' age range was 15 to 97 years, with a mean of 38.84 ± 16.32 years. Unilateral SP teeth were more prevalent (77.1%) compared to bilateral SP teeth (22.9%) (Figure 1). The rate of unilateral SP teeth was higher in both genders. Whilst, 26 of SP teeth were located on the left side, 23 were on the right side. More SP teeth were located in the mandible (77.6%) than in the maxilla (22.4%), and this was found to be statistically significant ($p<0.05$). Thirty-nine of SP teeth were impacted while 6 were partially erupted and 4 were fully erupted. The difference between these eruption status was statistically significant ($p<0.05$). In terms of development stage, 26 SP teeth had full crowns and roots, 18 had partial roots, and 5 had full crown only. The difference between the formation degrees was statistically significant ($p<0.05$). The majority of impacted SP teeth (46.2%), that were developed partial roots. The eruption status and development stage of the SP teeth showed a statistically significant difference ($p<0.05$). Supplementally shaped SP teeth were the most common (n=43) followed by conical (n=5) and tuberculate (n=1). No odontomas were found. There was statistically significant ($p<0.05$). Vertically positioned SP teeth (n=37) were the most common, followed by mesioangularly positioned (n=6) and distoangularly positioned (n=5). One tooth was in an inverted position The position of the supernumerary teeth was statistically significant ($p<0.05$). Of the vertically positioned supernumerary teeth, 54.1% had full crowns and roots, 35.1% had partial root, and 10.8% had full crown. The development stage of an inverted supernumerary tooth had only fully crown. There was a statistically significant difference between the development stages and positions of the supernumerary teeth ($p<0.05$) (Table 2). Most of the SP teeth (83.7%) were not associated with complications, which was statistically significant ($p<0.05$). The crowding was observed in 7 SP teeth and was found to be more prevalent than other complications ($p<0.05$). The only pathology found was caries in one tooth (2%) (Table 3). Furthermore, 55.1% of the SP teeth were single in the jaws, while 44.9% were associated with different dental anomalies (Figure 2) such as supernumerary teeth (96.2%) and odontomas (3.8%) (Table 3). Patients with dental anomalies associated with complications or pathology ranged from 15 to 29 years.

Patient Number	Gender	Age	Number Of Sp Teeth	Unilateral /Bilateral	Eruption Status, Degree of Formatıon, Morphology, Orientation	
					Right	Left
PATIENT 1	M	58	1	Uni	-	1 (Mand; I, PR, Supp, V)
PATIENT 2	M	48	1	Uni	1 (Mand; I, PR, Supp, V)	-
PATIENT 3	M	20	1	Uni	-	1 (Mand; SE, T, Supp, MA)
PATIENT 4	M	23	1	Uni	-	1 (Max; I, PR, Con, V)
PATIENT 5	F	18	2	Bi	1 (Mand; I, C, Supp, V)	1 (Mand; I, PR, Supp, V)
PATIENT 6	M	23	2	Uni	2 (Mand; E, T, Supp, V/ S, T, Supp, V)	-
PATIENT 7	M	22	1	Uni	1 (Mand; SE, T, Supp, V)	-
PATIENT 8	M	23	2	Bi	1 (Mand; I, PR, Supp, V)	1 (Mand; I, PR, Supp, V)
PATIENT 9	M	25	4	Bi	2 (Max; E, T, Supp, V/ Mand; I, T, Supp, V)	2 (Max; S, T, Supp, V/ Mand; I, T, Supp, V)
PATIENT 10	F	28	1	Uni	-	1 (Mand; I, PR, Supp, V)
PATIENT 11	F	23	4	Bi	2 (Maxx; I, PR, Supp, V/ Mand; I, PR, Supp, V)	2 (Max; I, T, Supp, V/ Mand; SE, T, Supp, V)
PATIENT 12	M	43	1	Uni	-	1 (C; I, T, Supp, V)
PATIENT 13	F	36	1	Uni	-	1 (Mand; I, T, Supp, V)
PATIENT 14	M	26	2	Bi	1 (Mand; I, T, Supp, DA)	1 (Mand; I, T, Supp, DA)
PATIENT 15	F	16	1	Uni	1 (Mand; I, C, Supp, V)	-
PATIENT 16	M	27	1	Uni	-	1 (Mand; I, T, Supp, DA)
PATIENT 17	F	18	1	Uni	1 (Mand; I, C, Supp, V)	-
PATIENT 18	M	21	1	Uni	-	1 (Mand; SE, T, Tu, V)
PATIENT 19	M	22	1	Uni	1 (Max; I, C, Supp, V)	-
PATIENT 20	M	27	1	Uni	1 (Mand; I, PR, Con, V)	-
PATIENT 21	M	50	1	Uni	-	1 (Max; I, PR, Supp, MA)
PATIENT 22	M	23	1	Uni	-	1 (Max; I, C, Con, INV)
PATIENT 23	M	27	1	Uni	1 (Max; I, T, Supp, V)	-
PATIENT 24	M	20	1	Uni	1 (Mand; I, PR, Supp, V)	-
PATIENT 25	M	23	1	Uni	-	1 (Mand; I, T, Supp, V)
PATIENT 26	F	51	1	Uni	-	1 (Mand; I, PR, Con, MA)
PATIENT 27	M	23	1	Uni	1 (Mand; I, T, Supp, V)	-
PATIENT 28	M	27	1	Uni	-	1 (Max; I, PR, Con, MA)
PATIENT 29	M	21	2	Bi	1 (Mand; I, PR, Supp, V)	1 (Mand; I, PR, Supp, MA)
PATIENT 30	M	24	1	Uni	1 (Mand; I, PR, Supp, V)	-
PATIENT 31	M	20	3	Bi	1 (Mand; I, T, Supp, V)	2 (Mand; SE, T, Supp, V/ I, T, Supp, V)
PATIENT 32	F	25	2	Bi	1 (Mand; I, T, Supp, V)	1 (Mand; I, T, Supp, V)
PATIENT 33	F	17	1	Uni	-	1 (Mand; I, T, Supp, DA)
PATIENT 34	M	27	1	Uni	-	1 (Max; I, PR, Supp, MA)
PATIENT 35	**F**	**26**	**1**	**Uni**	1 (Mand; I, T, Supp, DA)	-

Table 1. Features of patients with supernumerary premolars and SP teeth.

* SP, supernumere premolar; F, female; M, male; Uni, unilateral; Bi, bilateral; Max, maxilla; Mand, mandible; C, region of coronoid process; E, erupted; SE, semi-erupted; I,impacted; C, only crown; PR, partial root; T, whole tooth; Supp, supplemental; Con, conical; Tu, tuberculate; O, odontoma; V, vertical; H, horizontal; Inv, inverted; MA, mesioangular; DA,distoangular

	Female		Male		
	N	%	N	%	*p*
Right	7	30.4	16	69.6	0.980
Left	8	30.8	18	69.2	
Maxilla	2	18.2	9	81.8	0.464
Mandible	13	34.2	25	65.8	
Erupted	0	0	4	100	0.331
Semi-erupted	1	16.7	5	83.3	
Impacted	14	35.9	25	64.1	
Only crown	3	60	2	40	0.435
Partial root	5	27.8	13	72.2	
Whole tooth	7	26.9	19	73.1	
Supplemental	14	32.6	29	67.4	0.768
Conical	1	20	4	80	
Tuberculate	0	0	1	100	
Odontoma	0	0	0	0	
Vertical	12	32.4	25	67.6	0.83
Horizontal	0	0	0	0	
Inverted	0	0	1	100	
Mesioangular	1	16.7	5	83.3	
Distoangular	2	40	3	60	

Table 2. Distribution of location, region, eruption status, degree of formation, shape, orientations of the SP teethaccording to gender variable and evaluation with Chi-square test (p>0.05)

Figure 1. Digital panoramic radiograph of the patient with bilateral supernumerary premolars in the maxilla and mandible.

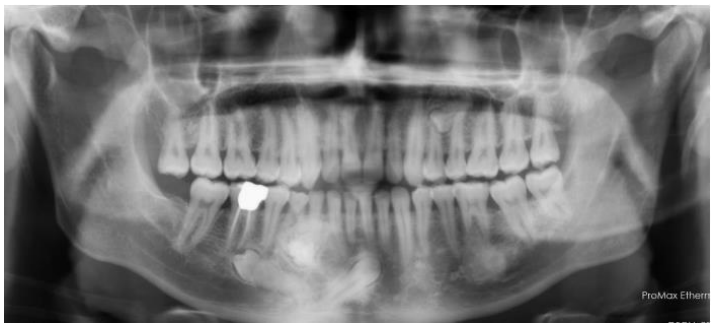

Figure 2. SP teeth with other dental anomalies (supernumerary canine tooth, complex odontoma) in the jaws.

			N	%	*P*
Are there any associated complications?	Yes		8	16.3	**0**
	No		41	83.7	
	Complication of permanent tooth	Failure of eruption	1	10	**0.016**
		Displacement	1	10	
		Crowding	7	70	
		Pathology	1	10	
Are there any associated pathologies?	Yes		1	2	**0**
	No		48	98	
	Pathology of permanenttoot	Cyst development	0	0	
		Root resorption	0	0	
		Dilaceration	0	0	
		Decay	1	100	
Does it accompanya different dental anomaly?	Yes		22	44.9	**0.475**
	No		27	55.1	
	Dental anomaly	Supernumerer premolar toot	21	80.77	**0**
		Supernumerer central tooth	2	7.69	
		Supernumerer distomolar tooth	2	7.69	
		Odontoma	**1**	**3.85**	

Table 3. Prevalance of the complications and pathology associated with SP teeth, distribution of the SP teethwith another dental anomalies, and evaluation with Chi-square test.

DISCUSSION

A limited number of detailed studies examining the prevalence of SP teeth were found in the literature. A more comprehensive study was not found in Turkey. The first study on this subject was carried out by Rubenstein et al (37) in 1991. Otherwise, the most recent study was conducted by Gunduz et al [38] in Turkey in 1991. Similar studies reported the prevalence of patients with SP teeth from 0.03% to 0.89% (17,19,22,24,29,37,39-42, 43,44,). The differences in prevalence may be due to the sampling method of the participating groups, genetic and environmental factors, and differences in clinics. The results of our study were consistent with the literature. Öztaş et al (29), Hajmohammadi et al (40), Şişman et al (44) reported this value as 1.41, 1.5, 1.2 and 1.5, respectively. In a study conducted in Korea, the mean age of patients with multiple mandibular SP teeth was reported to be 17.8 years, which was lower than in our study (22). Similar to our study, the mean age of patients with multiple ST was reported as 25.5 years by Brinkmann et al (45), and the mean age of patients with SP teeth was reported as 28 years by Öztaş et al (29). Furthermore, Kiso et al (46) reported that 65.1% of ST were SP teeth, whereas this finding was less than 9.3% in people aged 60 years and older. The percentage of patients with SP teeth aged between 15 and 29 years was 82.9%. On the other hand, no SP teeth were found in people over the age of 60 in our study. The reason for this could be that there were fewer older people in the study and that the proportion of SP teeth decreased with age. The teeth were lost for reasons such as caries, trauma, prosthetic reasons, and periodontal disease with age, and therefore the SP tooth and the permanent premolar can be confused with each other. Previous studies have identified two or more teeth as "multiple" (19,34,38,47). Salcido-Garcia et al. (43), Martinez-Gonzalez et al. (24) reported the percentage of patients with only one SP tooth as 53.6% and 53.5%, respectively, and Öztaş et al. Brinkmann et al (48) reported the percentage of patients with only one ST as 69.9%. On the contrary, the percentage in our study was higher (74.3%). Furthermore, the prevalence of multiple SP teeth was 0.075%. This result was found to be lower than that of Kaya's study (19) and higher than that of Hyun's study (22). Hajmohammed et al. (40) and Kantaputra et al. (35) reported unilateral SP teeth in 71.1% and 70.2%, respectively. Similarly, our findings were 77.1%. Lower than this, Kaya et al. (19) showed that 30% of the participants had unilateral SP teeth. In the previous studies, SP teeth located in the mandible ranged from 66.6% to 89.9%, which was similar to ours (17,19,24,29,34,39,40,48). In addition, SP teeth were more common on the right side of the jaw, as in our study. Amini et al. (49) showed that the supernumerary teeth were equally distributed on the right and left sides. Esenlik et al. (17), Hyun et al. (22), and Kiso et al. (46) reported that SP teeth were located more on the right side in both jaws. In contrast, Herath et al. (50) reported that erupted ST were located more on the left side.

CONCLUSION

More than half of SP teeth (79.6%) were affected, a finding consistent with several studies (19,24,29,33,34,51,52). This finding emphasizes the importance of diagnostic radiology for the detection of ST, as most cases cannot be diagnosed by inspection alone. It has been reported that the shape of ST teeth is usually conical (11,53,54). Some researchers have described the non-extra teeth as dimorphic, heteromorphic or rudimentary (29,38,45,48,50,51). Herath et al [50] found that 98.3% of erupted dentition was dimorphic. On the other hand, the prevalence of additional SP teeth was reported to range from 70.8% to 100% (17,24,29,38,52). These results are compatible with ours. In general, supernumerary teeth differ from the normal tooth shape and are mainly observed in a conical shape. In contrast, SP teeth usually have a complementary shape. Therefore, it may be difficult to determine which of the premolars is the SP tooth on radiographs. Similar to our study, Ma et al. (34), Esenlik et al. (17) and Shokry and Alenazy (51) found that SP teeth were most often in a vertical position. However, Mossaz et al. (52) and Kaya et al. (19) reported that 62.5% and 70% of SP teeth were inclined, respectively. There was no consensus on this issue in the previous studies. Horizontal or inverted SP teeth were rarely found. Few studies were found in the literature that evaluated the complications and pathologies associated with supernumerary teeth. It was expected that SP teeth would lead to complications such as delayed eruption or displacement of the permanent tooth, crowding and pathological conditions such as cysts, root resorption, root malformation and caries. However, contrary to our hypothesis, only eight (16.3%) of all SP teeth were found to have complications and only one tooth was found to have pathology. On the contrary, our study, Kantaputra et al. (35) and Brinkmann et al. (45) frequently found related complications. Similar to our study, crowding is a complication most commonly encountered in a previous study (50). Martinez-Gonzalez et al. (24) and Kaya et al. (19) found lower rates of pathology in SP teeth. These results were compatible with ours. For a correct diagnosis, it is recommended that radiographs be supported by clinical findings. No study has examined the coexistence of supernumerary premolars

with any other dental anomaly. In our study, SP teeth were mostly seen alone in the jaw. In cases where they were seen with another dental anomaly, the anomaly was often the SP tooth. The eruptive movements begin when root formation begins. The erupted teeth are expected to have completed their root development. Gupta et al. (33) found that erupted supernumerary teeth often had completed root and crown development. In agreement with our study, 57% of the erupted teeth were found to have incomplete roots and this result was statistically significant. Our retrospective study of digital panoramic images had some limitations. Because DPR is a two-dimensional imaging method, the buccal-lingual positions of the SP teeth could not be determined, and a complete interpretation of the relationship with the permanent teeth could not be made. Occlusal radiographs can be used in addition to DPR for detailed diagnosis of supernumerary teeth. Instead, cone beam computed tomography, which is a three-dimensional imaging technique, may be sufficient alone (55). In addition, it may not provide accurate results to comment on complications caused by SP teeth in the evaluation made only on the two-dimensional radiographs. Therefore, radiographic examination, in addition to clinical examination and detailed medical history, gives healthier results. Usually, supernumerary premolars are detected as incidental findings on radiographs because they are often impacted and asymptomatic. Although they can cause various complications, early diagnosis of SP teeth can prevent complications that may develop in the future. This study emphasizes the importance of regular dental visits and the use of DPR in dentistry.

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REFERENCES

1. Farman AG, Nortje CJ, Wood RE. Panoramic Radiologic Appraisal of Anomalies of the Dentition. In: Panoramic radiology saminars. Farman AG editor, 1st ed., Springer; 2007,p 41-72.

2. Laganà G, Venza N, Borzabadi-Farahani A, Fabi F, Danesi C, Cozza P. Dental anomalies: prevalence and associations between them in a large sample of non-orthodontic subjects, a cross-sectional study. BMC Oral Health. 2017;17:62.

3. Shah N, Jadhav GR, Mittal P, Logani A. Conservative management of dens evaginatus and attached supernumerary tooth/odontome in mandibular premolar with dual radiolucencies. Contemp Clin Dent. 2015;6:S269–73.

4. Raina SA. Supernumerary teeth in premolar and molar regions and their effect on overall restorative treatment plan. Int J Prosthodont Restor Dent. 2016;6:98–101.

5. Wang XP, Fan J. Molecular genetics of supernumerary tooth formation. Genesis. 2011;49:261–77.

6. Jensen BL, Kreiborg S. Development of the dentition in cleidocranial dysplasia. J Oral Pathol Med. 1990;19:89–93.

7. Murashima-Suginami A, Takahashi K, Kawabata T, Sakata T, Tsukamoto H, Sugai M, vd. Rudiment incisors survive and erupt as supernumerary teeth as a result of USAG-1 abrogation. Biochem Biophys Res Commun. 2007;359:549–55.

8. Alhashimi N, Abed Al Jawad FH, Al Sheeb M, Al Emadi B, Al-Abdulla J, Al Yafei H. The prevalence and distribution of nonsyndromic hyperdontia in a group of Qatari orthodontic and pediatric patients. Eur J Dent. 2016;10:392–6.

9. Bandi S, Nunna M, Palavalli B, Nuvvula S. Favorable outcome of a maxillary supplemental premolar. Contemp Clin Dent. 2018;9:659–62.

10. Soin A, Sharma G, Soin G, Raina A, Mutneja P, Nagpal A. Multiple geminated supernumerary premolars: a rare case report. Case Rep Dent. 2015;2015:1–4.

11. Gupta S, Goswami M. Asymptomatic nonsyndromic multiple supernumerary premolars. Int J Clin Pediatr Dent. 2012;5:84–6.

12. Chanagay SKV, Singh V, Bantwal SR, Muniyappa M. An unusual case of bilateral maxillary and mandibular para premolar: a case report. J Dent. 2013;10:383–7.

13. Santos T de S, Silva ER, Faria AC, de Mello Filho FV, Xavier SP. Multiple supernumerary teeth in a nonsyndromic 12-year-old female patient - a case report. Braz Dent J. 2014;25:79–82.

14. Murali R V., Gnanashanmugam K, Rajasekar L, Kularashmi BS, Saravanan B. A rare case of impacted supernumerary premolar causing resorption of mandibular first molar. J Pharm Bioallied Sci. 2015;7:309–13.

15. Kasat V, Saluja H, Kalburge J, Kini Y, Nikam A, Laddha R. Multiple bilateral supernumerary mandibular premolars in a non-syndromic patient with associated orthokeratised odontogenic cyst-a case report and review of literature. Contemp Clin Dent. 2012;3:S248-52.

16. Schmuckli R, Lipowsky C, Peltomäki T. revalence and morphology of supernumerary teeth in the population of a Swiss community. Short communication. Schweiz Monatsschr Zahnmed. 2010;120:987–93.

17. Esenlik E, Sayin MÖ, Atilla AO, Özen T, Altun C, Başak F. Supernumerary teeth in a Turkish population. Am J Orthod Dentofac Orthop. 2009;136:848–52.

18. Gibson N. A late developing mandibular premolar supernumerary tooth. Aust Dent J. 2001;46:51–2.

19. Kaya GŞ, Yapici G, Ömezli MM, Dayi E. Non-syndromic supernumerary premolars. Med Oral Patol Oral Cir Bucal. 2011;16:e522-525.

20. Parolia A, Kundabala M, Dahal M, Mohan M, Thomas MS. Management of supernumerary teeth. J Conserv Dent. 2011;14:221–4.

21. White SC, Pharoah MJ. Dental Anomalies. In: Oral radiology principles and interpretation. Editors; Mallya SM, Lam WN, 7th ed., Mosby; 2014, p. 786-861.

22. Hyun HK, Lee SJ, Ahn BD, Lee ZH, Heo MS, Seo BM, vd. Nonsyndromic Multiple Mandibular Supernumerary Premolars. J Oral Maxillofac Surg. 2008;66:1366–9.

23. Yassaei S, Goldani Moghadam M, Tabatabaei SMA. Late developing supernumerary premolars: reports of two cases. Case Rep Dent. 2013;2013:1–4.

24. Martínez-González JM, Brinkmann JCB, Calvo-Guirado JL, Arias-Irimia O, Barona-Borado C. A clinical epidemiologic analysis of a sample of 73 supernumerary premolars. J Am Dent Assoc. 2010;141:1435–41.

25. Ramakrishna A, Rajashekarappa KB. Multiple supplemental supernumerary premolars: unusual presentation in a nonsyndrome patient. Case Rep Dent. 2013;2013:1–3.

26. Suga SS, Kruly PDC, Garrido TM, Matumoto MSS, Suga USG, Terada RSS. Radiographic follow-up during orthodontic treatment for early diagnosis of sequential supernumerary teeth. Case Rep Dent. 2016;2016:7–13.

27. McCollum M, Sharpe PT. Evolution and development of teeth. J Anat. 2001;199:153–9.

28. Mühlreiter E. Anatomie des menschlichen gebisses, mit besonderer rücksicht auf die bedürfnisse der zahnersatzkunde. Anat. des Menschl. Gebisses, mit Bes. Rücksicht auf die Bedürfnisse der Zahnersatzkunde. 2011.

29. Öztaş B, Bardak Ç, Kurşun EŞ, Akbulut N. Clinical characteristics of non-syndromic supernumerary teeth in a cohort of Turkish patients. Oral Radiol. 2011;27:108–13.

30. Xue DJ and F. Combined orthodontic-surgical treatment for skeletal class III malocclusion with multiple impacted permanent and supernumerary teeth: case report. Open Dent J. 2014;8:43–8.

31. Proffit WR, Frazier-Bowers SA. Mechanism and control of tooth eruption: overview and clinical implications. Orthod Craniofac Res. 2009;12:59–66.

32. Fardi A, Kondylidou-Sidira A, Bachour Z, Parisis N, Tsirlis A. Incidence of impacted and supernumerary teeth-a radiographic study in a North Greek population. Med Oral Patol Oral Cir Bucal. 2011;16:e56-61.

33. Gupta S, Praveen Kumar P. A study on prevalence, complications, and possible etiologic factors of supernumerary teeth in 6–12-year-old schoolchildren of Rohtak, India. Indian J Dent Sci. 2017;9:141.

34. Ma X, Jiang Y, Ge H, Yao Y, Wang Y, Mei Y, vd. Epidemiological, clinical, radiographic characterization of non-syndromic supernumerary teeth in Chinese children and adolescents. Oral Dis. 2021;27:981–92.

35. Kantaputra PN, Coury SA, Tan WH. Impaired dentin mineralization, supernumerary teeth, hypoplastic mandibular condyles with long condylar necks, and a TRPS1 mutation. Arch Oral Biol. 2020;116:1–4.

36. Açikgöz A, Açikgöz G, Tunga U, Otan F. Characteristics and prevalence of non-syndrome multiple supernumerary teeth: a retrospective study. Dentomaxillofacial Radiol. 2006;35:185–90.

37. Rubenstein LK, Lindauer SJ, Isaacson RJ, Germane N. Development of supernumerary premolars in an orthodontic population. Oral Surg Oral Med Oral Pathol. 1991;71:392–5.

38. Gündüz K, Avsever H, Orhan K, Canıtezer G, Açıkgöz A, Öz U, vd. A multi-centre evaluation of multipl supernumerary premolar prevalence. Aust Orthod J. 2015;31:149–56.

39. Harris EF, Clark LL. An epidemiological study of hyperdontia in American blacks and whites. Angle Orthod. 2008;78:460–5.

40. Hajmohammadi E, Najirad S, Mikaeili H, Kamran A. Epidemiology of supernumerary teeth in 5000 radiography films: investigation of patients referring to the clinics of Ardabil in 2015-2020. Int J Dent. 2021;2021:1–7.

41. Celikoglu M, Kamak H, Oktay H. Prevalence and characteristics of supernumerary teeth in a non-syndrome Turkish population: Associated pathologies and proposed treatment. Med Oral Patol Oral Cir Bucal. 2010;15:4–7.

42. Tetay-Salgado S, Arriola-Guillén LE, Ruíz-Mora GA, Castillo AA Del, Rodríguez-Cárdenas YA. Prevalence of impacted teeth and supernumerary teeth by radiographic evaluation in three Latin American countries: A cross-sectional study. J Clin Exp Dent. 2021;13:e363–8.

43. Salcido-García JF, Ledesma-Montes C, Hernández-Flores F, Pérez D, Garcés-Ortíz M. Frecuencia de dientes supernumerarios en una población Mexicana. Med Oral Patol Oral Cir Bucal. 2004;9:403–9.

44. Şişman Y, Tarım Ertaş E, Akgünlü F. Süpernümerer premolar dişlerin değerlendirilmesi: klinik bir çalışma. J Heal Sci. 2007;16:164–70.

45. Brinkmann JCB, Barona-Dorado C, Martínez-Rodriguez N, Martín-Ares M, Martínez-González JM. Nonsyndromic multiple hyperdontia in a series of 13 patients: epidemiologic and clinical considerations. J Am Dent Assoc. 2012;143:e16–24.

46. Kiso H, Takahashi K, Mishima S, Murashima-Suginami A, Kakeno A, Yamazaki T, vd. Third dentition is the main cause of premolar supernumerary tooth formation. J Dent Res. 2019;98:968–74.

47. Gurung D, Sun JH, Xie NN, Sun TZ, Shrestha M. Supernumerary teeth and their complications: a cone beam computed tomography study. JNDA. 2021;21:46–51.

48. Brinkmann JCB, Martínez-Rodríguez N, Martín-Ares M, Sanz-Alonso J, Marino JS, Suárez García MJ, vd. Epidemiological features and clinical repercussions of supernumerary teeth in a multicenter study: a review of 518 patients with hyperdontia in spanish population. Eur J Dent. 2020;14:415–22.

49. Amini F, Rakhshan V, Jamalzadeh S. Prevalence and pattern of accessory teeth (hyperdontia) in permanent dentition of Iranian orthodontic patients. Iran J Public. 2013;42:1259–65.

50. Herath C, Jayawardena C, Nagarathne N, Perera K. Characteristics and sequelae of erupted supernumerary teeth: a study of 218 cases among Sri Lankan children. J Investig Clin Dent. 2017;8:1–5.

51. Shokry SM, Alenazy MS. Consanguinity-related hyperdontia: an orthopantomographic study. Dent Res J. 2013;10:732–6.

52. Mossaz J, Kloukos D, Pandis N, Suter VGA, Katsaros C, Bornstein MM. Morphologic characteristics, location, and associated complications of maxillary and mandibular supernumerary teeth as evaluated using cone beam computed tomography. Eur J Orthod. 2014;36:708–18.

53. Singh VP, Sharma A, Sharma S. Supernumerary teeth in Nepalese children. ScientificWorldJournal. 2014;2014:1–5.

54. Burhan AS, Nawaya FR, Katbi MEA, Al-Jawabra AS. Prevalence of supernumerary teeth in a nonsyndromic Syrian sample. J Egypt Public Heal Assoc. 2015;90:146–9.

55. Gürler G, Delilbaşı Ç, Delilbaşı E. Investigation of impacted supernumerary teeth: a cone beam computed tomograph (cbct) study. J Istanb Univ Fac Dent. 2017;51:18–24.